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Barbara Burchard
1930-2016

EDITORIAL

Barbara Burchard (1930-2016), throughout the entire period of her professional activity, was associated with the Kraków branch of the Institute of Archaeology and Ethnology of the Polish Academy of Sciences. She was fascinated by the Middle Neolithic period in Central Europe. Her field research focused on the famous sites of the Lesser Poland Neolithic, including Samborzec, Niedźwiedź, Bronocice and Zagaje Stradowskie. For many years she co-organized the scientific life of the Kraków center. She also served on the editorial team of *Sprawozdania Archeologiczne*, coordinating work in some sections of the journal.

Though many years have passed, the research problems formulated by Barbara Burchard in the second half of the 20th century have remained with us. She liked to share these problems with numerous friends who belonged to several generations of European Neolithic researchers. For their part, they liked to hear once again about „assemblages of Niedźwiedź type", „tombs of Niedźwiedź type", the unclear chronological position of ceramics from Giebułtów or the current socio-political situation. Many of the authors of this volume of *Sprawozdania Archeologiczne* continue these discussions through their contributions to this field. The collection of articles presented here honours the work of an outstanding researcher. For many of us, it is an opportunity to return for a short conversation with her.

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ARTICLES

Piotr Włodarczak*

BARBARA BURCHARD AND STUDIES ON THE CHRONOLOGY OF THE FUNNEL BEAKER CULTURE IN LESSER POLAND

ABSTRACT

Włodarczak P. 2020. Barbara Burchard and studies on the chronology of the Funnel Beaker culture in Lesser Poland. *Sprawozdania Archeologiczne* 72/1, 11-29.

Barbara Burchard (1930-2016) was one of the most important researchers in the field of the Funnel Beaker culture (FBC) in southeastern Poland. In her studies she managed to highlight certain crucial problems related to the Middle Eneolithic period: (1) the origins of the FBC in Lesser Poland, (2) the process known as Badenisation, and (3) the reception of the megalithic burial rite. Therefore, it is worth looking at her research achievements from the perspective of present-day studies on the Neolithic in southeastern Poland. The results obtained by Burchard remain largely valid today, as does the list of unsolved problems specified by her.

Keywords: Funnel Beaker culture, Lesser Poland, Eneolithic, radiocarbon dating, funeral rite
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1. INTRODUCTION

Of crucial importance to Polish taxonomic and chronological research concerning the Funnel Beaker culture (FBC) was Konrad Jażdżewski's work, published in the 1930s (Jażdżewski 1936). It was particularly important for Lesser Poland, an area included in the southeastern (or Lesser Poland) group of this culture, which was distinguished at that

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Fig. 1. Barbara Burchard in 1950s.
Photo from the family archive (courtesy of Joanna Schoen)

time. However, in that period and in subsequent decades there was a lack of valuable publications of sufficiently large collections of Middle Eneolithic materials originating from regular excavations, despite the awareness of an abundance of finds in the loess uplands of Lesser Poland. Beginning her career in the Institute of the History of Material Culture of the Polish Academy of Sciences, Barbara Burchard [1930-2016] (Figs 1 and 2) chose as the basis of her studies the best known collection of FBC materials from western Lesser Poland at the time, namely that from Książnice Wielkie, Proszowice district (together with Anna Eker: Burchard and Eker 1964). From that moment, taxonomic-chronological studies and analyses of burial rites continued to be the focus of her research for the next half-century. Although sometimes in the shadow of her other, wide-ranging works, these studies merit attention and epitomise 20th-century research on the Neolithic of Lesser Poland. Their results remain largely valid today, as does the list of unsolved problems specified by Burchard.

Scholars investigating the Neolithic of Lesser Poland put emphasis on the issues of taxonomy and chronology, which stemmed from their conviction about the importance of reconstructing detailed timeframes of cultural relations, an approach that was inscribed indelibly into the paradigm of cultural-historical archaeology. It also continued to influence the nature of research carried out from the 1960s onward, in acceptance of many assumptions of the "new archaeology". This is particularly true with respect to settlement studies in the Lesser Poland loess uplands, which included the development of models of the Neolithic economy (primarily: Kruk 1973; 1980). Cultural-chronological findings were always taken into account in this research, adjusting the resolution of taxonomic and

chronological divisions accordingly. The chronometry of the Middle Eneolithic in Lesser Poland continues to be discussed today (*e.g.* Włodarczak 2006; Nowak 2009; 2017; Kruk *et al.* 2018), although with the focus shifted towards the application of absolute dating methods. Nevertheless, the establishment of temporal frameworks for particular stages representing diagnostic states of cultural development still remains the essence of these studies. In practice, it is still about building chronological and typological models that would best illustrate prehistoric processes. There is little doubt that, in her studies, Barbara Burchard managed to highlight certain crucial problems related to these issues. They concerned the following: (1) the origins of the FBC in Lesser Poland, (2) the process known as Badenisation, and (3) the reception of the megalithic burial rite. Therefore, it is worth looking at her research achievements from the perspective of present-day studies on the Neolithic in southeastern Poland.

Fig. 2. Together with Jadwiga Kamieńska (on the right) Barbara Burchard (on the left) conducted field research on important sites of the Lesser Poland Neolithic, including in Samborzec in the Sandomierz Upland. Photo from the family archive (courtesy of Joanna Schoen)

2. DIVISION INTO THE OLDER PHASE AND THE "CLASSIC PERIOD"

In Barbara Burchard's studies on the chronology of the FBC, determination of general developmental stages was an issue of crucial importance. She emphasised two caesuras: /1/ the beginning of the older phase, understood as the time immediately preceding the period of clear predominance of "classic" materials in loess areas of western Lesser Poland

(beginning in the 1980s, these materials have often been described as BR II and BR III after two chronological phases of the Bronocice settlement), and /2/ the beginning of the period of "southern influences", *i.e.* the influences of the Baden complex (together with the Pre-Baden phase known as Boleráz). These two horizons mark the boundaries of the "classic phase" in western Lesser Poland, and this is where the majority of FBC sites known from the area belong (Burchard 1973a; 1981, 225-229; Burchard *et al.* 1991, 97-98). As it was at the time when this model was being created, it is difficult today to find conclusive arguments for placing these two caesuras in time. Moreover, the very existence of the older ("pre-classic") phase has not been fully and confidently demonstrated as yet. In many approaches, material relics of this period are assumed to be ceramic assemblages stylistically older than sub-phase IIIB in the lowland zone (the late Wiórek phase; Nowak 2009, 326 f.; Kruk and Milisauskas 2018, 66). So far, assemblages that could be described as clearly Sarnowo or Pikutkowo in style are lacking in the area of our interest (Nowak 2009, 334, 335), and materials believed to be the oldest (*e.g.* Kraków-Nowa Huta, site 49 – "Stacja Zdawcza") do not differ much from those representing the beginnings of the "classic phase".

Thus, the question of the integrity of ceramic materials of phase I of the FBC in Lesser Poland remains unsolved. Their relationship to the older stage of the classic horizon, *e.g.* the relationship between pottery from Kraków-Nowa Huta sites 49 and 62 on one hand, and the materials from Zawarża on the other, is difficult to determine. From the perspective of stratigraphy, of particular importance are the materials from phase BR I discovered in the Bronocice site. However, their early chronological position was fixed by only a single radiocarbon date (Kruk and Milisauskas 1990, 198, 199), and the scope of sources included into this phase is modest (recently: Kruk and Milisauskas 2018). The genetic relationship between phases BR I and BR II is even harder to demonstrate. Sławomir Kadrow pointed to a noticeable boundary between these periods, referring to both the genetic differences and the differences observed by Janusz Kruk and Sarunas Milisauskas with respect to economic and settlement patterns (Kadrow 2009). In his opinion, older assemblages (corresponding to phase BR I) show connections with the eastern group in the lowlands, and only younger materials from western Lesser Poland (BR II and BR III) should be included into the southeastern group. In such an approach, the term "southeastern group" becomes a genetic indicator rather than a territorial one. A weak point of this concept, however, is the lack of archaeological evidence for genetic differences between assemblages representing the earliest (BR I) and later (BR II) phases of the FBC. The existing analyses of source materials (still few) highlight above all the continuity of development between these two phases (see *e.g.* Kulczycka-Leciejewiczowa 2002; Kluzik 2010). In addition, no distinctly "older" ceramic assemblage has as yet been found in Lesser Poland that would pre-date the "Wiórek phase" in the lowlands. Summing up, we are still unable to precisely determine the nature of cultural relationships in the last quarter of the 4th millennium BC, *i.e.* the relationships among the oldest developmental phases of the FBC, the Lublin-Volhynia culture, and the Wyciąże-Złotniki group.

Often used by Burchard, the term "classic phase" has come under criticism in the 21st century (*e.g.* Nowak 2009, 336; Kadrow 2009, 1438-139). It has been argued that the label reflects a certain style of ceramic assemblages that may actually represent different chronological horizons, *e.g.* later ones in the cases of cultural stagnation. This is allegedly proven by radiocarbon dates, some of which suggest a very late chronology of classic assemblages, like those from Kichary Nowe and Zimne (Zimno in Polish; Bronicki *et al.* 2003; Włodarczak 2006, 56-57; Nowak 2009, 336). In my opinion, this criticism has not always been justified. True, the concept of the "classic phase" involves a generalisation and incorporates a majority of the materials analysed to date into one group – perhaps even the entirety of materials from Lesser Poland pre-dating the appearance of the Baden style. Attempts at determining more precisely the absolute age of FBC finds from the discussed area typically point at a time span much narrower than previously assumed (of fewer than 500 years, instead of up to 1,000 years as previously believed). From this perspective, the term "classic" should be applied to the materials younger than the Lublin-Volhynia culture and older than the Boleráz horizon, which means falling within *ca.* 3800-3500/3300 BC, thus correlating with the late Wiórek style in the lowlands. In such an approach, the term "classic phase" can be seen as an indicator of a clearly distinguishable prehistoric process.

3. THE NIEDŹWIEDŹ TYPE

Among the results of Burchard's excavations at Niedźwiedź, Kraków district (1965-1973) was the discovery of materials distinguished by a previously unknown combination of cultural traits. Ceramic objects retrieved from pits 29 and 39 were given the name of "assemblages of the Niedźwiedź type" (Burchard 1977). For a long time, their only analogies were sparse materials known from sites in the Kraków-Nowa Huta area (Godłowska 1976, 31, 32; Kaczanowska 1976, 249, 253; Burchard 1981, 231). In the opinion of Burchard, these finds were younger than the "classic" FBC, and were linked with the early horizon of Baden influences (Burchard 1981, 231, 232). They were to mark the earliest stage of these influences, pre-dating the assemblages that J.K. Kozłowski defined as the Wyciąże-Książnice group. The synchronisation of Niedźwiedź-type materials with surrounding cultural units proposed by Burchard seems controversial today, since it groups together cultural phenomena of clearly diversified chronology: Bodrogkeresztúr – Lažňany – Furchenstich – Ohrozim – Boleráz. Moreover, Burchard argued that in the late FBC period (*i.e.* Proto-Baden) one can find in western Lesser Poland materials of a diversified nature, allegedly reflecting their diversified origins. She mentioned in this context the Wyciąże-Książnice group (Post-Polgár), FBC-Baden materials (the Bronocice type), and the Niedźwiedź type (Burchard 1973b, 110, 111). This approach to the Pre-Baden horizon, recognising the importance of division into Post-FBC and Post-Polgár materials, is continued by Albert Zastawny (2018).

In attempting to reinterpret the pits from Niedźwiedź, one should note the different natures of pit 29 and 39, which may imply their different chronology. The more modest assemblage from pit 39 is easier to assess, as the whole of it finds good analogies in FBC-Baden materials from the loess uplands of western Lesser Poland – both those attributed to the Wyciąże-Książnice group (including the finds from Książnice Wielkie and Smroków – Burchard and Eker 1964; Włodarczak 2013) and those from Bronocice from phases BRIII-IV (Kruk and Milisauskas 1983; 2018). Pit 39 can thus be placed in the earliest horizon of the FBC-Baden assemblages in western Lesser Poland, which postdates the "classic" stage of the FBC (*ca*. 3400-3100 BC – according to the most recent chronometric findings). The rich assemblage from pit 29 (Fig. 3) does not find such clear analogies among FBC-Baden

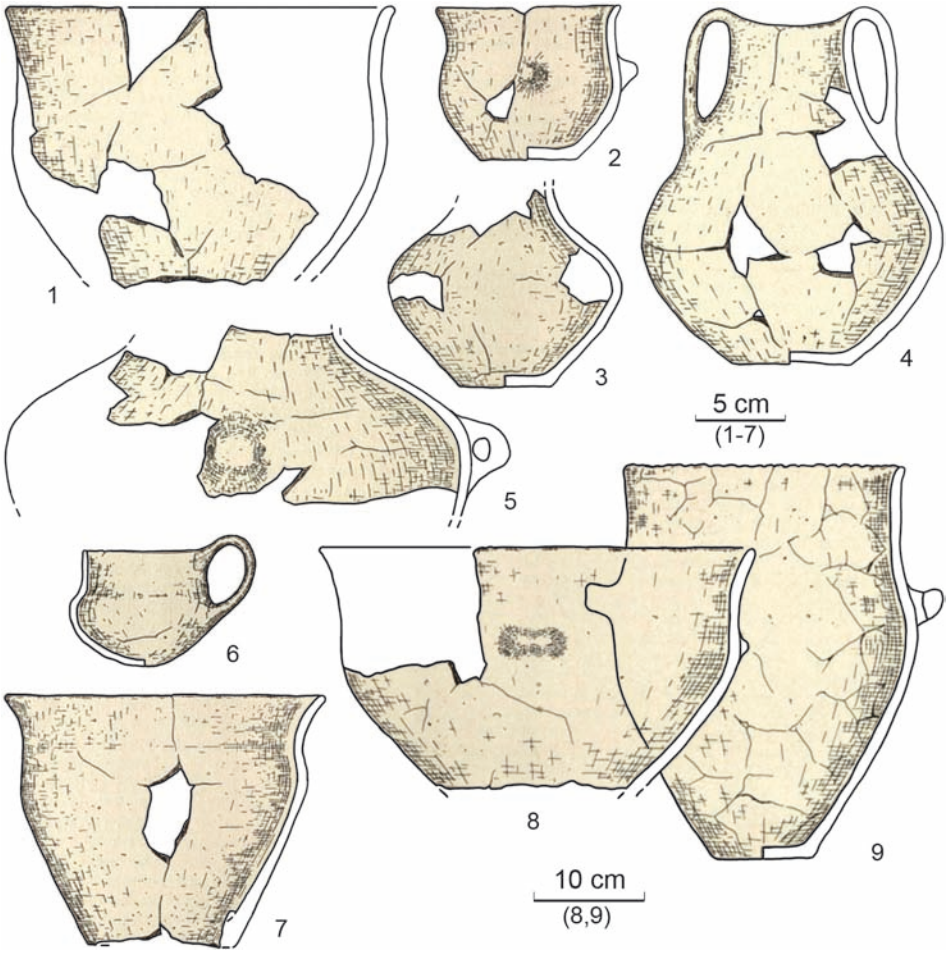

Fig. 3. Niedźwiedź, Kraków district, site 1. Ceramic from pit no. 29. Acc. to Burchard 1977

materials in Lesser Poland. Instead, it shows certain traits that link it with the style characteristic of the late stage of the broadly understood circle of southern cultures. Burchard mentioned in this context of Lažňany and Furchenstich, among others. If these connotations are to be accepted, the assemblage from pit 29 should not be linked with the Post-FBC – early Baden period, but rather with an older period, contemporary with the beginnings of FBC settlement in the loess uplands of Lesser Poland. This adds particular importance to comparisons with materials having a similar cultural-chronological position, discovered in recent years. Materials revealing "southern" traits and pre-dating classic FBC assemblages are known from site 5 at Modlnica (Zastawny and Grabowska 2011). Their distinct trait is the Furchenstich ornamentation, featuring above all on vessels having the proportions of cups. Other vessels from these assemblages refer to the Late- and Post-Lengyel horizons, and to Baalberg assemblages. Therefore, they are probably earlier than the classic horizon of the FBC, and later than the Bodrogkeresztúr horizon. Materials revealing similar characteristics have also been found at archaeological sites in Kraków-Bieżanów, where they co-occurred with finds representing the early FBC (Zastawny and Grabowska 2017).

Summing up, the "Niedźwiedź type" today seems to be a phenomenon largely limited to just one feature (pit 29), with some analogies in a few other sites of the early FBC horizon, above all among assemblages with pottery decorated using the Furchenstich technique. As for the absolute chronology of these materials, presently one can only intuitively point at a time span of 3900-3700 BC, more likely its later section.

4. PHENOMENON OF FBC-BADEN GROUPS

Discussing the FBC chronology, an important caesura is connected to the appearance of finds revealing characteristics of the Baden complex (including the Pre-Baden stage of Boleráz). Within the range of the southeastern group, this process is clearly noticeable only in western Lesser Poland, where materials combining traits typical of the FBC and the Baden culture, *i.e.* FBC-Baden materials, have been identified. Burchard investigated this phenomenon in the 1960s and 70s (1970; 1973a; 1973b; 1977). Simultaneously, a different view was presented by Janusz Krzysztof Kozłowski (*e.g.* 1968; 1971; 1973) on the basis of research at the Kraków-Wyciąże site. Later, in the context of the taxonomical division of the materials from Bronocice, Janusz Kruk and Sarunas Milisauskas presented their model, considerably enriched by abundant FBC-Baden materials of differing chronology (phases BR III and BR IV). In an attempt to connect all the above findings, Albert Zastawny presented Pre-Baden materials in Lesser Poland as a distinctly diversified group (Zastawny 2011; 2018). At the same time, he followed J.K. Kozłowski's proposition to attribute some of these materials (assemblages of the Wyciąże or Wyciąże-Książnice type) to the "Late Polgár" Wyciąże-Złotniki group (Zastawny 2018, 497). Summing up, the following genetically diversified manifestations of the Pre-Baden stage were distinguished: the Wyciąże group,

the Niedźwiedź type, TRB-Baden materials, and Boleráz-type materials from cave sites. Kruk and Milisauskas came to the conclusion that these propositions are overly complicated, and that the Niedźwiedź type, the Wyciąże group, and the Bronocice materials from phases BRIII-BRIV can all be considered similar manifestations of the early stage of the process of Badenization (Kruk and Milisauskas 2018, 71-75). Moreover, more recent chronometric data do not corroborate the temporal proximity of Wyciąże-type (Pre-Baden) and Wyciąże-Złotniki (Late- and Post-Polgár – Hunyadihalom) assemblages (see Nowak 2017; Kruk *et al.* 2018). Despite formal similarities in pottery identified by J.K. Kozłowski, a direct genetic relationship between Late Polgár and Pre-Baden settlement cannot be proved. One can only point to a similar – southern (Transcarpathian) – direction of genetic relationships, resulting in certain general stylistic resemblances in archaeological material.

Test excavations carried out by Burchard at Bronocice uncovered materials revealing traits of the early Baden-Boleráz type (Burchard 1975). Later, large-scale excavations conducted in this site by a Polish-American expedition produced a vast collection of sources linked with the "FBC-Baden" groups (*e.g.* Kruk and Milisauskas 1981; 1983; 1990; 2018). Bronocice remains to this day the only extensively excavated site connected with this phenomenon. The location of the site, and above all a series of radiocarbon dates it produced (recently: Kruk *et al.* 2018), have caused the FBC-Baden materials (phase BR V) to be seen as a phenomenon parallel with the late-classic Zesławice-Pleszów and Mogiła groups of the Baden culture (*e.g.* Kruk and Milisauskas 1983; 1990; Zastawny 1999, 28-31), a view maintained in recent publications as well (Kruk *et al.* 2016, 34, 35, Table 3). Such a synchronisation was proposed in spite of distinct differences in ceramic materials, with FBC-Baden materials representing Boleráz (BR III), post-Boleráz (BR IV), and early-classic (BR V) styles, and materials of the Mogiła and Zesławice-Pleszów groups representing primarily the late-classic style of the Baden culture (*cf.* Kruk and Milisauskas 1983; 2018). The first series of radiocarbon dates obtained for charcoal from Bronocice apparently corroborated this reconstruction, although a significant portion of the samples had very large standard deviations, considerably hampering interpretation of the results (Kruk and Milisauskas 1990). The dates suggested the puzzling possibility of a relatively late chronology of some Baden culture materials from BR V – as late as *ca.* 2600 BC. On the one hand, this hinted at a very long duration of the FBC-Baden phase, and on the other it allowed for the synchronisation of its younger section with the Corded Ware culture (with the older barrow phase, or even with the beginnings of the Kraków-Sandomierz group).

5. IN LIGHT OF RADIOCARBON DATING

The first radiocarbon dates were obtained for the Lesser Poland FBC as early as the 1960s (Jażdżewski 1961; Kowalczyk 1968; Bakker *et al.* 1969). Until the late 1970s there were only single age determinations, insufficient for creating a chronological model of cultural

processes. C^{14} dates obtained for sites like Ćmielów, Niedźwiedź, or Stryczowice applied to crucial sites, but they were few and often insufficiently precise. A larger number of dates were obtained for the settlement at Gródek, Hrubieszów district. In this case, however, the insufficient understanding of their context and the lack of a coherent approach to the settlement's chronology diminished the importance of these results. The situation improved with a series of ^{14}C dates from Bronocice (Kruk and Milisauskas 1983; 1990), which became a benchmark for dating Middle- and Late Eneolithic materials throughout Lesser Poland (Fig. 4). Its huge advantage was that the absolute chronology was tied with clearly defined occupational phases. With time, however, certain deficiencies of even this series became evident, including insufficient precision of results and insufficient distinctiveness of the published materials associated with the earliest phase. In addition, the results obtained at that time, especially those linked with the earliest (BR I) and latest (BR V) phases of the settlement's development did not allow for credible estimations of the duration of particular phases. These early results can only partly be verified by means of a new series of dates, obtained for human and animal bones using the AMS technique (Kruk *et al.* 2018). This new series is characterised by high precision (small standard deviations) and better sample contexts than in the older series. However, it is worth noting that even with this new series, the possibilities of dating FBC settlement phases in western Lesser Poland are still far from satisfactory, which stems from the scarcity of high-precision results, necessary for deter-

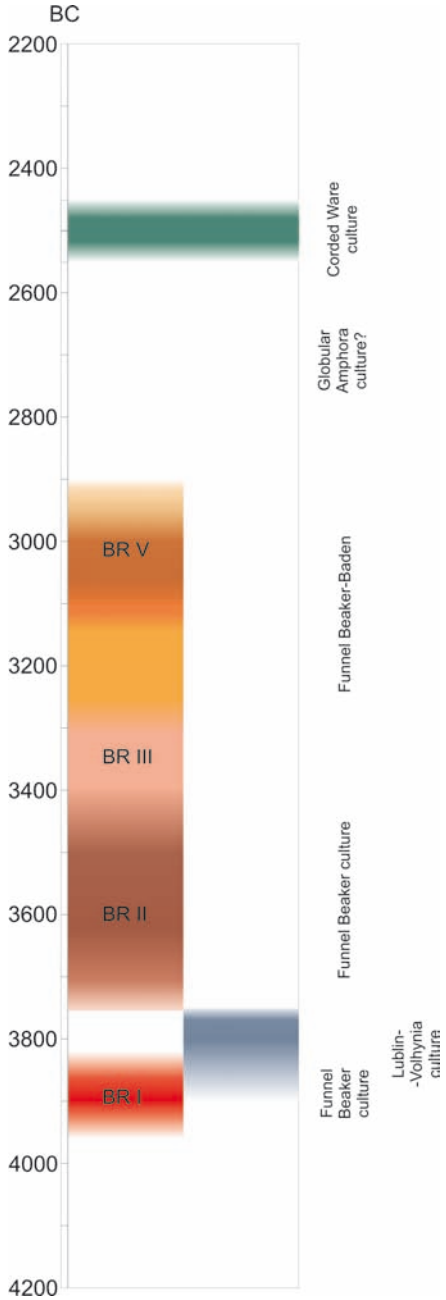

Fig. 4. The chronological scheme of FBC in Lesser Poland based on radiocarbon dates from site 1 at Bronocice. Acc. to Kruk *et al.* 2018

mining the timeframes for particular phases. Series from newly investigated sites, like a settlement at Mozgawa, Pińczów district (Nowak 2017, 254, fig. 12), will perhaps improve the situation. Other problems include the absence of good data for determining chronologies of certain cemetery types (including tombs of the Niedźwiedź type), and poor data for settlements from sandy areas and for places where raw flint materials were exploited.

Today, the greatest shortcoming of the chronometric data is the impossibility to precisely determine the chronology of the earliest stage of FBC development in western Lesser Poland. A single ^{14}C date from feature 5-B6 at Bronocice is of poor quality (Kruk *et al.* 2018, 33, 36), and its cultural context is contested (Nowak 2009, 326; Kadrow 2009, 139; see comments in: Kruk and Milisauskas 2018, 117). Furthermore, it is difficult to compare age determinations of different quality obtained in different laboratories. Thus, one cannot but agree with the sceptical view expressed by Marek Nowak with respect to the reliability of single results pointing at an early date (*ca*. 4000-3800 BC) of the FBC in western Lesser Poland, a short series of ^{14}C dates from Gnojno (Nowak 2017, 263-264) being an example. These problems can – in many cases – be overcome by renewed dating of controversial results and by obtaining coherent series of results for the sites in question.

The aforementioned rejection of certain radiocarbon results calls for – in my opinion – a consequently selective approach to all series of ^{14}C dates available for the Eneolithic in Lesser Poland. Samples of poor quality, including those originating from uncertain contexts and those having large standard deviations, should not be taken into account when calculating the ages of particular cultural phenomena. The problem is evident, since some of these phenomena have been reconstructed on the basis of results of inconsistent quality, including the Lublin-Volhynia culture and the Wyciąże-Złotniki group (*cf*. Nowak 2017, 252-253, figs 10-11).

The inclusion of all dates results in long timespans and apparent chronological overlapping (sometimes even complete) of many cultural phenomena. In other words, with such an approach, absolutely any hypothesis can be proved.

Given the above, poor quality dates obtained for the materials recovered by Barbara Burchard at Niedźwiedź (Burchard 1973b) no longer play any significant role in determining the chronology of the FBC in Lesser Poland today. What would be important, however, is to verify these results by new attempts at dating, as the materials from Niedźwiedź are linked with the late stage of the "classic phase" in western Lesser Poland (Burchard 1981), a period with thus far insufficient chronometric coverage. It would also be important to determine the age of the Niedźwiedź-type materials. There is no doubt that the chronological questions expressed by Burchard on the basis of the materials she discovered deserve to be addressed by future chronometric research.

6. TOMBS OF THE NIEDŹWIEDŹ TYPE AND THE TRANSFORMATIONS OF BURIAL RITES IN WESTERN LESSER POLAND

A trapezium-shaped structure discovered at Niedźwiedź in 1968 (Fig. 5) was initially incorrectly associated with cultures of the Lengyel-Polgár complex and interpreted as a dwelling (Burchard 1973c). This changed slightly later, after correspondence between Burchard and Professor Magdalena Midgley. Advice received from Prof. Midgley, an expert in megalithic funerary rituals, induced Burchard to reinterpret the feature as a Middle Eneolithic tomb (Burchard 1998; 2006). Such a function was indicated by its shape, and by the discovery of a Corded Ware culture burial within the structure (CWC often dug their burials into FBC tombs, which is also confirmed by new discoveries made during rescue excavations carried out in connection with road-building projects in Lesser Poland). However, no Middle Eneolithic graves have been found at Niedźwiedź. They were probably damaged by erosion, as was the case with many tombs in the Polish Lowlands published by Seweryn Rzepecki (2011a). A good analogy for the structure from Niedźwiedź is a tomb from Lublin-Sławinek (Jastrzębski and Ślusarska 1985).

Fig. 5. Niedźwiedź, Kraków district, site 1. General view on the construction of trapezoidal tomb. Photo from archive of IAE PAS, Igołomia

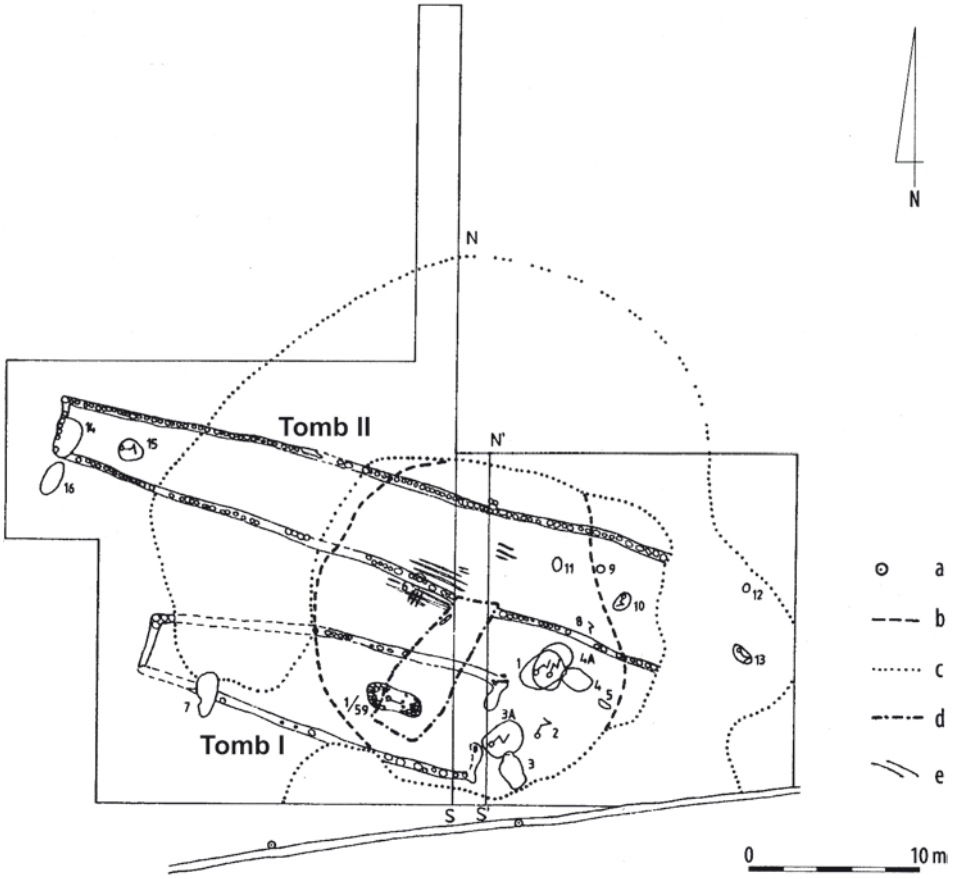

Fig. 6. Zagaje Stradowskie, „Mogiła Stradowska" barrow. Plan of the excavation unit. Acc. to Burchard 2006, modified. A – measurement points, b – outline of the mound, c – outline of the near-barrow pit, d – modern trench, e – plowing traces. Numbers of features: 1/59 – Funnel Beaker culture grave, 3, 3A, 4, 4A, 10, 13, 15 – Corded Ware culture graves, 1, 2, 8 – Mierzanowice culture graves, 7 – animal grave

In her pursuit of a comprehensive understanding of megalithic rites in Lesser Poland, Burchard resumed excavations of the "Mogiła Stradowska" (Stradów Tomb) in the 1990s, more than 30 years after it was investigated by Jan Gromnicki (Gromnicki 1959). The research, conducted methodically and using interdisciplinary methods, resulted in the documentation of many interesting details of the megalithic burial rite (Fig. 6; Burchard 1998; 2006). However, the results have never been fully published. The number of timber-and-earth tombs known from Lesser Poland has been constantly growing since the last years of the 20th century, with Słonowice, where 10 tombs have been found, being the most important site documenting this phenomenon (also lacking full publication; Tunia 2006). The

results of research at Słonowice demonstrated the evolution of the form of tombs towards the gradual reduction of timber elements lining the sides of the earthen embankment (Przybyła and Tunia 2013, 158-160; Jarosz *et al.* 2013).

In recent years, tombs of the Niedźwiedź type have also been explored in a few new sites (among other places, in Czaple Wielkie, Giebułtów, and Pielgrzymowice – the research by M.M. Przybyła). A better understanding of such structures also results in their increasingly frequent identification in non-invasive research (primarily analyses of LiDAR images and geomagnetic surveys). As a result, tombs of the Niedźwiedź type should be seen not as a particularly unique and sublime manifestation of funeral rites, but rather as a widespread element of FBC funerary behaviours, represented in all micro-regions throughout western Lesser Poland. Recently, it has been recorded for the first time in the sub-Carpathian area as well – at the Szczytna and Skołoszów sites (Król *et al.* 2014).

Radiocarbon dates from Słonowice and Malżyce indicate that tombs of the Niedźwiedź type, and probably other similar structures (involving the use of stone) as well, were erected in a period corresponding to the "classic" phase of the FBC: between *ca.* 3700/3600 and 3400/3300 BC. No tombs have been found as yet that could be dated later, *i.e.* to the times of the predominance of the FBC-Baden style in the western Lesser Poland FBC (tombs from the western part of the Nałęczów Plateau have sometimes been mentioned as having a late chronology, but no dates have as yet been published. Today, it would be necessary to verify these determinations with modern techniques regardless. Without such verification, their different chronological position in relation to the dating of tombs in other parts of Lesser Poland cannot be accepted). Thus, the megalithic trend in Lesser Poland is a phenomenon that links closely with ideological tendencies observable over the whole of Europe, corresponding to megalithic Kuyavian tombs in the lowlands and Early Neolithic long tombs in Scandinavia, to mention only a few examples. Apparently, with the process of Badenization, the custom of erecting long, monumental tombs was abandoned in western Lesser Poland.

The "Stradów Tomb" in Zagaje Stradowskie illustrates the accumulation of many stages through which a funerary-ceremonial centre was used by several Eneolithic and Early Bronze Age communities (Fig. 5). In the period between the construction of the long tombs and the digging of the CWC niche graves, the area of the site was reshaped by the erection of a circular mound. It is difficult to determine whether this took place in the Final Eneolithic or during the existence of the FBC – as was probably the case at Malice Kościelne, Sandomierz district (Bargieł and Florek 2006), and perhaps at Kolosy, Kazimierza Wielka as well (Włodarczak 2008). The genesis of the ritual that involved erecting circular mounds, represented by one fully certain feature from Malżyce site 30 – barrow no. 1 (Fig. 6; see Tunia and Włodarczak 2013) – is still unknown. It may be linked with southern influences (Baalberg), or with the early stage of steppe influences. The former possibility also points at the direction of cultural contacts that became particularly important in the second half of the 4th millennium BC and resulted in the rise of the FBC-Baden groups. In this line of

interpretation, barrows (*i.e.* circular or oval tombs) would mark the closing stage in the trend of long "megalithic" tombs, where timber-and-earth structures of the Niedźwiedź type also belong.

7. SUMMARY: SPECIFICITY OF THE LESSER POLAND CULTURAL-CHRONOMETRIC MODEL

The nature of Barbara Burchard's studies on the FBC settlement in western Lesser Poland still remains in the mainstream of research on the issue carried out in Poland. Research tools are being constantly improved, new materials keep emerging, and new approaches sometimes disprove previous perspectives on prehistoric processes. Despite all these advances, some of the problems singled out by Burchard concerning the genesis of the Lesser Poland FBC, the dynamics of its development, the genesis of its funeral rites,

Fig. 7. Barbara Burchard consulting the FBC ceramic during visit at site 30 in Malżyce near Zagaje Stradowskie. 14th September 2004. Photo by P. Włodarczak

and the role of communities from the 4th millennium BC in the rise of the new world of the Late and Final Eneolithic still cannot be convincingly solved. Her cautious scepticism (Fig. 7) regarding the possibility of finding satisfactory answers to these questions has found good justification over the decades in obstacles encountered by subsequent generations of archaeologists. Nevertheless, step by step, new field discoveries supported by proper analyses allow for expanding the limits of our knowledge in this respect. Tombs of the Niedźwiedź type offer a good illustration of this process: they were discovered in the 1970s but initially misinterpreted (Burchard 1977); in the 1980s and 90s they came to be regarded as unique manifestations of funerary behaviours of FBC communities in Lesser Poland (Burchard 1998); and in the 21st century, they are known from many examples and are considered common ceremonial structures typical of every settlement micro-region in Lesser Poland (Rzepecki 2011b; Król 2011). As was also true in the past, new discoveries result in new perspectives.

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JANUSZ KRUK'S SETTLEMENT ARCHAEOLOGY: INTELLECTUAL INSPIRATIONS AND DETERMINANTS

ABSTRACT

Kadrow S. 2020. Janusz Kruk's settlement archaeology: intellectual inspirations and determinants. *Sprawozdania Archeologiczne* 72/1, 31-45.

This article is dedicated to the inspirations and intellectual determining factors of Janusz Kruk's settlement archaeology. For this purpose, the article focuses on the well-known literary theory of "the Death of the Author". It has been assumed that Kruk's scientific output should be assessed in the light of his most important work – and not his last work. Kruk's scientific output is dominated by the view that functional relations between settlement, economy, and natural environment are of key importance for the historical process. Equally vital is the opinion that settlement, economic, and environmental changes are affected by human influence on the natural environment (anthropopressure), inspired indirectly by George Perkins Marsh and directly by the first report of the Club of Rome. Janusz Kruk's settlement archaeology is permeated by the principles of functionalism, but its originality is determined by the presence of the elements of "geographical possibilism".

Keywords: Janusz Kruk, settlement archaeology, anthropopressure, natural environment, economy
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The settlement network and material remains of the south-eastern group of the Funnel Beaker culture play an important role in Janusz Kruk's settlement archaeology (Fig. 1). In the context of that group and the entire culture, the settlement complex in Bronocice (Fig. 2) may be considered as the icing on the cake. This is a sufficient reason to attempt

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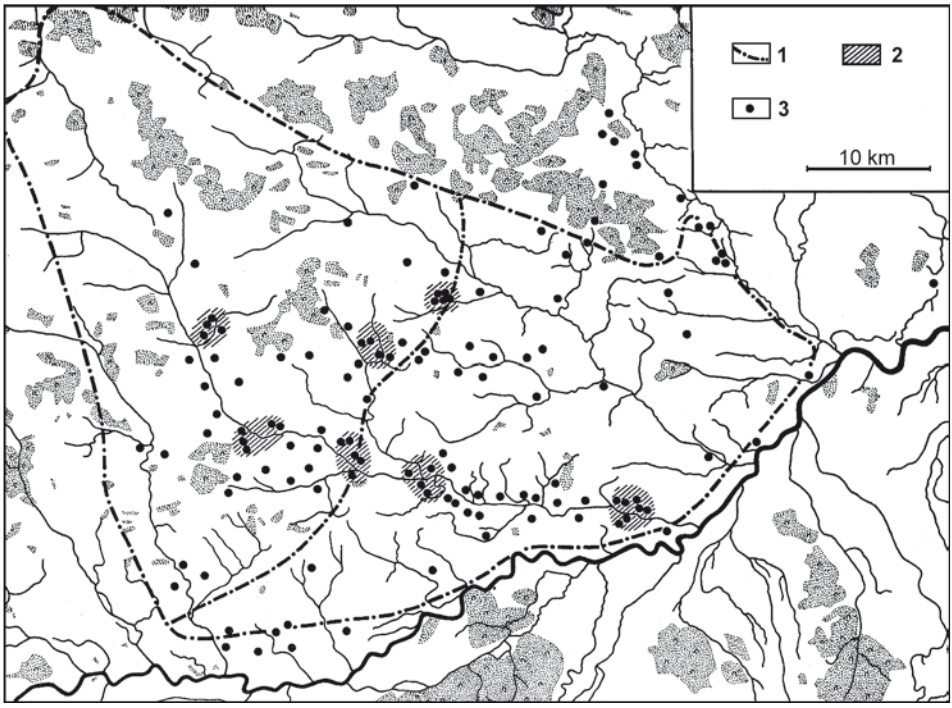

Fig. 1. SW part of the Niecka Nidziańska region. Settlement of the Funnel Beaker culture; 1 – subregion borders, 2 – settlement points, 3 – selected settlement agglomerations (acc. to Kruk 1973)

a reconstruction of that trend of studying settlement networks in research in the present volume. An even more important reason for the considerations in this article is the ongoing discussion on the theoretical and source-related aspects of this kind of settlement study, primarily in Polish archeology (*cf*. Kadrow 2010; Włodarczak 2013; Diachenko *et al*. 2016). There is no indication that this discussion will soon end. It must of course be admitted that this topic in archeology is already beyond international popularity (*cf*. Howell 1983; Bintliff 2013, 21, 22).

I have already proposed an interpretation of Janusz Kruk's settlement archaeology and its selected elements in several papers (Kadrow 1992; 2010; 2013; Kadrow and Machnik 2001). But now, for the first time, I am going to examine its intellectual determinants and inspirations.

My attempted reconstruction of Janusz Kruk's settlement archaeology will be based solely on my analysis of his publications. I want to resist the temptation of directly questioning the researcher about the sources of his inspiration or the meaning, significance and circumstances of his achievements. The debate between Jan Machnik (2015; Woźny 2014) and Sarunas Milisauskas (2015), important participants in the Polish-American research

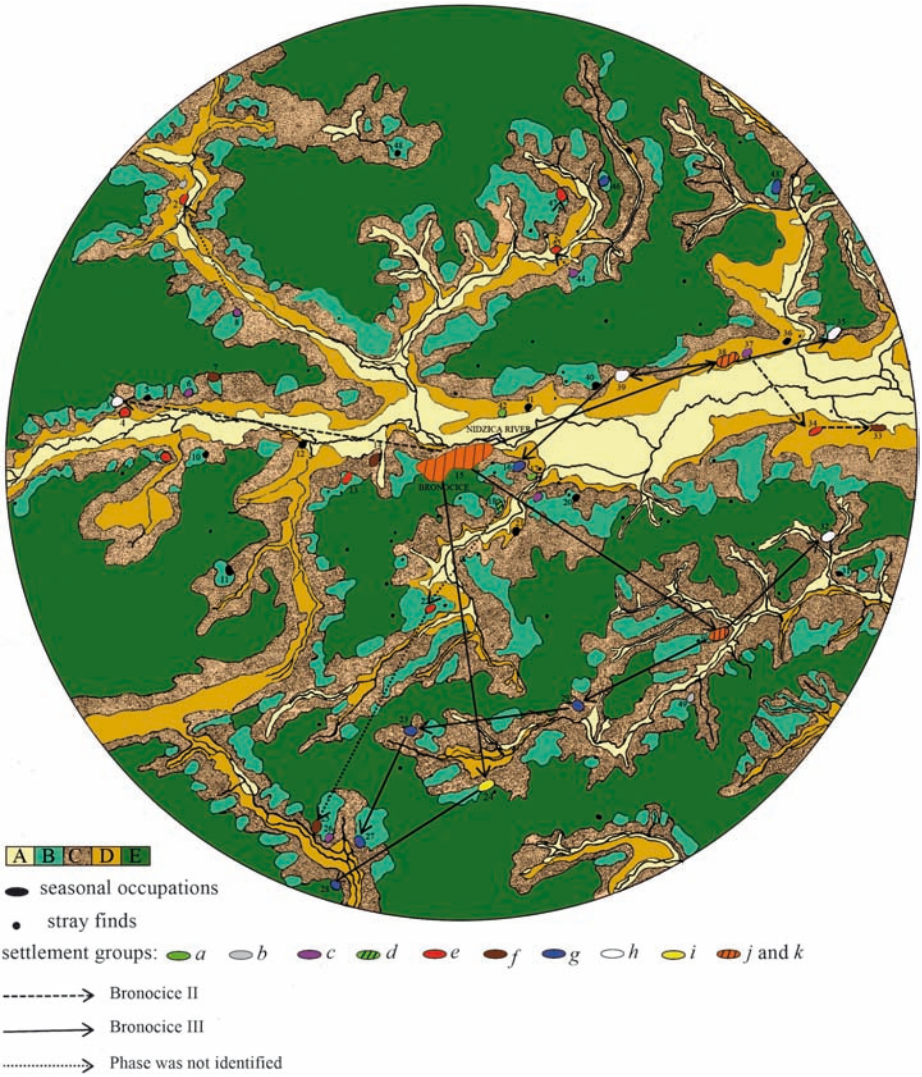

Fig. 2. Settlements of the FBC. 'Circle' with ecological zones in an area of 10 km around the Bronocice site. A – alluvial zone, B – valley edge zone, C – slopes of the upland zone, D – edges of the upland zone, F – upland zone; Settlement size: a – 1.80 ha; b – 2.00 ha; c – 2.20-2.30 ha; d – 2.50 ha; e – 2.70-3.10 ha; f – 3.40-3.70 ha; g – 4.00-4.50 ha; h – 5.00-5.10 ha; I – 5.60 ha; j – 8-9 ha; k – 21 ha (acc. to Diachenko *et al.* 2016)

project from 1966-1978, is related directly to the issues discussed here, and is quite instructive in itself, as it has shown the distinct disparity in their opinions on certain aspects of the project. This suggests that the accounts of people engaged directly in an event may be marked by subjectivity and ambiguous assessments.

For this reason, I have turned to the theory of "the Death of the Author" known from literary criticism (*cf.* Barthes 2006), which opposes the view equating the significance of a text with the author's intention. The same stance has been taken by Russian formalism, American New Criticism and French structuralism (Compagnon 2010, 39-42). In literature, the theory means that the most important element in the sequence "the author – the work – the reader/critic" is the work, and its significance is interpreted by the reader or the critic. By analogy, the most important element in the sequence "the producer – material culture – the archaeologist", is material culture, whose significance is decoded by the archaeologist. The theory of "the Death of the Author" seems an apt illustration of the cognitive potential of archaeology.

However, my approach, *i.e.* omitting the inquiry about the author's presumable intentions, has been inspired most directly by the distinctive version of "the Death of the Author" theory as presented in Marcel Reich-Ranicki's autobiography *Mein Leben* (1999). This version proved so controversial that it evoked a response from Martin Walser (2002), who maliciously interpreted Reich-Ranicki's achievement in his novel *Tod eines Kritikers*.

In December 1952, Reich-Ranicki had a two-hour conversation with Anna Seghers in Warsaw. He praised the composition of her novel *Das siebte Kreuz*. Seghers disagreed with him because, in her view, the composition was what she had taken from Alessandro Manzoni's novel *Die Verlobten*. Reich-Ranicki read Manzoni's book the following week, finding there no analogies worth noting. The book had made a great impression on Seghers, but its function as a model for *Das siebte Kreuz* was obvious only to her. Reich-Ranicki began to think that Seghers did not understand her own novel at all. She had no idea about its sophisticated literary devices and its masterly composition. The conversation convinced him that most writers knew no more about literature than birds did about ornithology. It was the critic's task to analyse in depth what the author had written (Reich-Ranicki 1999, 340-343).

I do not share Marcel Reich-Ranicki's extreme view on the significance, or rather insignificance, of the author to the reading of their work. However, I consider concentration on the work and on its determinants as the most promising method for an archaeologist who wants to fathom the meaning of the remote past and the publications that describe it.

Hans-Georg Gadamer stated that the meaning of human life crystallizes around a decisive experience, not around the last one (Gadamer 1967). Paraphrasing his remark, I would say that Janusz Kruk's archaeological achievement should not be assessed by his last publication, which still remains to be written, but by his most important one, which is his PhD thesis *Studia nad neolitem wyżyn lessowych* (Studies of the Neolithic Settlement of the Loess Uplands; Kruk 1973).

This is Janusz Kruk's decisive publication for several reasons. I will mention the most important ones. The thesis is based on the assumption that functional relations between settlement (Fig. 3), economy and the environment (Fig. 4) are crucial to the historical process. Kruk has worked on that assumption ever since. In his PhD thesis, the human effect

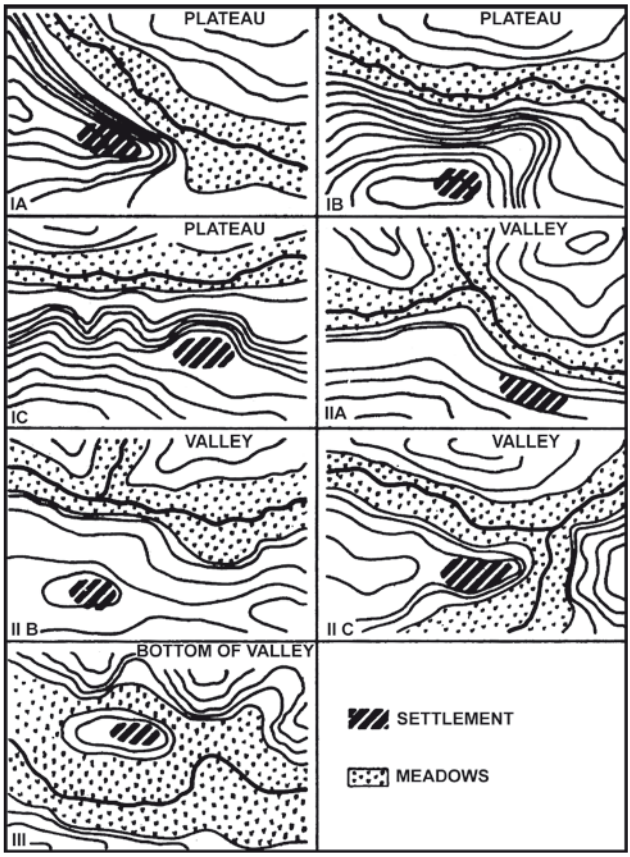

Fig. 3. Models of the topographic setting of Neolithic settlements on loess uplands (acc. to Kruk 1973)

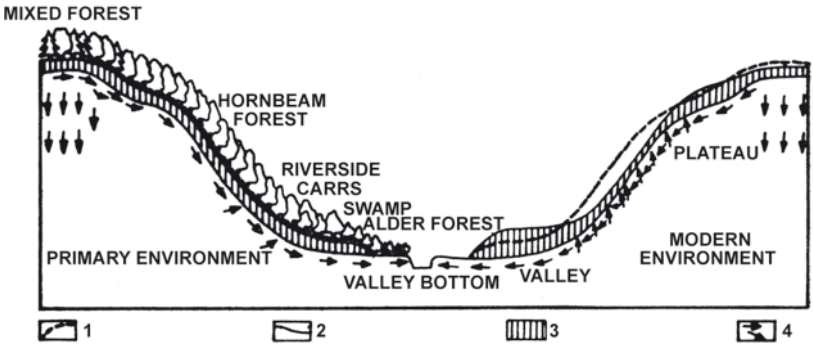

Fig. 4. A scheme of the ecology of primary environments on the loess uplands; 1 – primary form of the slope, 2 – contemporary form of the slope, 3 – depth of the soil, 4 – direction and intensity of groundwater movement (acc. to Kruk 1980b)

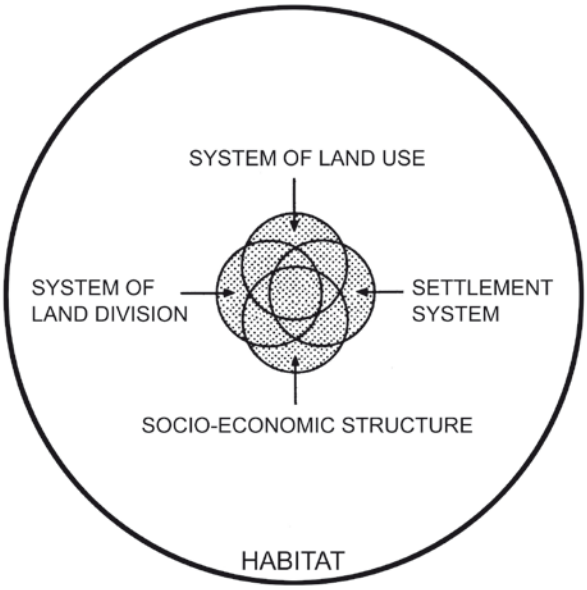

Fig. 5. Human occupation as a system with subsystems (acc. to Kruk 1980b)

on the environment, later termed "anthropopressure", is the key factor in economic, environmental and settlement changes. In all his subsequent texts, Kruk has focused on transformations of the environment caused by human activity; his analysis of the historical process has been restricted to the environment, economy and settlement. He has consistently omitted issues linked to society and spiritual culture, considering them inaccessible to scholarly research. He still holds that view today.

New elements in Kruk's subsequent publications strengthen the claims and propositions from his PhD thesis. The author defines selected notions more precisely and expands his source base, but his conclusions in crucial matters are of the same nature. In his postdoctoral thesis (Kruk 1980a), he broadens his materials concerning the environment and economy to include palaeobotanical and palaeozoological data, thus paying tribute to the standards of German settlement archaeology (*cf.* Jankuhn 1977). He also makes references to the British school of palaeoeconomy (Vita-Finzi and Higgs 1970). Functional relations between settlement, economy and the environment are replaced with the relations of systems theory (Kruk 1980b – *cf.* Fig. 5), and spatial analyses are used to a greater extent (see Clarke 1977; Hodder and Orton 1976).

Slightly later, Kruk and Lesław Przywara defined botanical aspects of landscape zones (Kruk and Przywara 1983 – *cf.* Fig. 2, 4). In 1984, with Sarunas Milisauskas, Kruk introduced the notion of the "Bronocice circle" (Milisauskas and Kruk 1984 – Fig. 2), a method of analysing relations between the environment and economy taken from the British school

of palaeoeconomy, employing, for example, the rule of minimization of effort (Johnson 1977). In 1996, with Stefan Alexandrowicz, Sarunas Milisauskas and Zbigniew Śnieszko he added geomorphological and malacological data to the source base and he included demographic analyses into research on the historical process (Kruk *et al.* 1996).

Later still, Kruk and Milisauskas developed the idea of central places and their evolution in the context of Funnel Beaker settlement in Małopolska (Kruk and Milisauskas 1999). In 2008, Kruk expanded the scope of his research to include other European areas (Kruk 2008), but it brought about no change in his premises or results.

Assuming the decisive role of Janusz Kruk's PhD thesis (1973) in the assessment of his method of studying prehistory or, more precisely, the Neolithic Age, it is worth going through the text itself to find the author's explicit comments on his aims, contexts, inspirations and borrowings. The purpose of the thesis is to determine the nature and scope of transformations carried out by primitive societies in the environment of the uplands of southern Poland (Kruk 1973, 7). The author planned to achieve that by studying Neolithic occupation and exploitation of that area (Kruk 1973, 7), *i.e.* by examining the settlement and economy in the context of the natural environment, with the settlement serving as an introduction to the study of the basis for the economy (Kruk 1973, 7, 10), *i.e.* the basis for subsistence.

Janusz Kruk did not name his inspirations for the choice of his aims and research method. He even skipped Eugene Odum's influential book on the fundamentals of ecology (Odum 1971). He rarely refers to other researchers, mentioning only Tadeusz Wiślański's publication (1969, 219) as helpful to him in broadening his analysis of the methods of land exploitation, *i.e.* economy in the context of the environment. However, his debt to Graham Clark (1957, 17) as regards functional relations between settlement and economy (culture) on the one hand, and the environment (nature) on the other, is unquestionable. Stanisław Kurnatowski (1966) may be viewed as another obvious influence, because of the key role Kruk ascribes to settlement analysis.

Surface survey has been presented as an important element of field investigation aimed at reconstructing a settlement network with its environmental determinants (Kruk 1973, 23-34). The significance of such surveys was shown earlier by archaeologists from the Poznań centre, particularly by Stanisław Kurnatowski (1963) and Tadeusz Wiślański (1966).

The drawing up and realisation of the research project outlined above was entrusted to Krakow's Unit of Małopolska Archaeology of the Institute of the History of Material Culture at the Polish Academy of Sciences (currently, the Centre for the Archaeology of Hills and Uplands of the Institute of Archaeology and Ethnology of the Polish Academy of Sciences). The framework of an analogous programme had been prepared at Poznań's Unit of Wielkopolska Archaeology of the Institute of the History of Material Culture at the Polish Academy of Sciences, in 1953-1954 (Wiślański 1969, 7-12). The first stage of the implementation of the programme was crowned with Tadeusz Wiślański's well-known

study *Podstawy gospodarcze plemion neolitycznych w Polsce północno-zachodniej* (The economic basis of Neolithic tribes in north-western Poland), finished in December 1967 (Wiślański 1969, 7-8).

The obvious question is why the project was granted to Kraków and not to Poznań, though the Poznań centre already had considerable achievements in that field.

The decision taken by the head of the Institute of the History of Material Culture in Warsaw seems to have been influenced by the arrival of Sarunas Milisauskas, a Fulbright scholar, in Poland in 1965. At first, Milisauskas intended to organise a research project in collaboration with Konrad Jażdżewski, but the plan failed due to Jażdżewski's opposition to the Polish communist authorities. His position was euphemistically characterised by Jan Machnik as a lack of the necessary pragmatism (Woźny 2014, 287, 288). Consequently, James Griffin, Milisauskas' superior and teacher, turned to Witold Hensel, the head of the Institute, in order to establish cooperation. Details of that undertaking (1966-1980) have been given in a number of publications (see Hensel and Milisauskas 1985; Milisauskas 2015, 316-318), and its effects are still noticeable today. Hensel referred the American archaeologists to Kraków. Milisauskas later described his co-operation with Janusz Kruk as fundamental to his research in Poland (Milisauskas 2015, 318). The project *Studia osadnicze nad neolitem wyżyn lessowych* (Studies of the Neolithic Settlement of the Loess Uplands; *cf*. Kruk 1973) was, therefore, a natural and necessary complement to the Polish-American project *Chronologia oraz gospodarcza i społeczna organizacja społeczności neolitycznych i wczesnobrązowych w Polsce południowo-wschodniej* (Chronology and socioeconomic organisation of Neolithic and Early Bronze communities in south-eastern Poland).

Janusz Kruk began his field investigation, an element of his archaeological research, in 1967; at the same time, excavations started in the loess areas near Krakow as part of the Polish-American co-operation. The collaboration between Kruk and Milisauskas had not been planned in advance. It resulted from various factors, mostly those from outside their discipline, but it proved extremely fruitful, particularly because it led to the development of one of the most effective trends in Polish archaeology.

One major component of Janusz Kruk's settlement archaeology is the concept of anthropopressure as a prime mover in the historical process. People reproducing conditions of their existence by managing their resources bring about changes in their environment. These environmental changes, in turn, determine and seriously affect changes in the strategies of occupation and exploitation of the settled area.

The concept of anthropopressure seems even more original when we remember that then, no less than now (*e.g*. Gronenborn 2010 and many others), the dominant theory was that the historical process is to a greater or lesser extent under the one-sided influence of climatic changes external to human communities. Kruk (1973, 120-128), however, perceives no relation between the trajectories of climatic changes and those of changes in economy and settlement. In this, he disagrees explicitly with German anthropogeography,

particularly in regard to Robert Gradmann's *Steppenheidentheorie* (1901; 1936; Kruk 1973, 123, 124; *cf.* also Kadrow 2013, 526). However, John Bintliff sees serious anthropogeographical inspirations in Kruk's settlement studies (Bintliff 2013, 22).

Kruk's PhD thesis and subsequent publications do not name the sources that may have inspired that concept. One hint can be found in the following sentence, written in a paper from 1983: "people seem to have forgotten too long ago that the earth had been given to them only to use, not to use up or, even less, to ravage" (Kruk and Przywara 1983, 41). The remark, given without quotation marks or reference to its source, is a literal quotation from the Polish version of a book by ecologist I.G. Simmons (Simmons 1979, 44). Simmons points to the original author of that sentence, Georg Perkins Marsh (1801-1882), an American defender of nature and a precursor of ecological movements, the author of *Man and nature, or Physical geography as modified by human action* (Marsh 1865). The title alludes to one of Marsh's key points: the influence of human action on the environment. Marsh wrote his book as a warning against using up or ravaging the earth. Corresponding with this idea, the Neo-Malthusian paradigm became, at the same time, a source of belief in the significant impact of humans on the environment in American archeology (*cf.* Ucko and Dimbleby 1969; Flannery 1972).

It is no surprise that the renaissance of Marsh's thought was contemporaneous with the activities of the Club of Rome, founded in 1968. What may be surprising is the general lack of response to the idea of anthropopressure in continental European archaeology – except for Janusz Kruk's research. The first report by the Club of Rome, *The Limits to Growth*, was published no sooner than 1972 (Maedows *et al.* 1972), but it was preceded by an energetic promotional campaign that lasted several years. The report focused on the limited natural resources and the destruction of the natural environment due to demographic growth. Kruk's PhD thesis was written in the same period. The inspiration for his notion of anthropopressure, therefore, seems quite clear.

Another major trait of Janusz Kruk's settlement archaeology is, paradoxically, his interest in the cultural determinants of turning points in settlement processes or, more broadly, the historical process. In periods of stabilisation, the historical process is determined by interdependent changes in economy and the environment, reflected in changes in settlement. In the rare, but decisive moments of thorough transformation, however, cultural factors come to the fore. This was shown, for example, by the "volitional" decision (*i.e.* undetermined by external environmental or political factors) taken by the earliest migrants from the Danube area (the Linear Pottery population) to colonize the Polish loesses, or by the equally "volitional" decision of the Funnel Beaker population from the European Lowland to settle the loess uplands in Małopolska. The combination of the systematic interplay of interdependent environmental and economic factors with the effects of such "volitional" decisions in prehistoric communities is reminiscent of Vidal de la Blanche's geographical possibilism (1903; *cf.* also Geremek and Kula 2004), implemented effectively, for example, by Fernand Braudel in his research (2004).

Janusz Kruk has never quoted any geographical or historical publications related with the notion of possibilism, but he has read Tadeusz Wiślański (1969), who cites Witold Kula (1963), who was well-versed in Vidal de la Blanche's and Fernand Braudel's theories. The presumptive inspiration may have been unconscious, but this does not mean it was absent or insignificant.

Kruk's settlement archaeology also includes such essential traits as modelling the past, lack of interest in isolated objects, phenomena or events, and concentration on long-term processes and general categories, *e.g*. landscape zones, central places, settlement patterns, the size of the population, strategies of land exploitation, *etc*. This is evidenced by all his work.

However, some propositions and declarations resulting from a compromise with the beliefs dominant in certain academic circles (*cf*. remarks in Bourdie and Wacquant 2001, 32), and which neither express nor reflect the real character of one's research, may sometimes lead to misguided opinions. This happens when comprehensive, thoroughgoing appraisal of scholarly achievement is replaced by the fetishization of unconnected statements taking the form of not necessarily adequate manifestos.

In his postdoctoral thesis, Janusz Kruk wrote: "The aim has been to examine in detail several groups of sources and thus to identify tangible evidence of Neolithic subsistence strategies. Filling in the considerable shortage of information, made explicit by the analysis, with suggestions supported by so-called non-source based knowledge or solely by a scholar's intuition has been in fact a departure from the adopted method" (Kruk 1980a, 324). This is a clear example of a superficial tribute paid to trends predominating in Kraków at that time (*cf*. *e.g*. Godłowski 1960).

Taking that statement as an expression of Janusz Kruk's real intentions, Janusz Ostoja-Zagórski commented disparagingly: "contrary to S. Tabaczyński's suggestion ... inductionism in its empirical form, which has already acquired a classical status, does not belong to the past any more. In Central-European archaeology, it is still the basic tool of methodological reflection, as demonstrated by Kruk's confessions closing his innovative, it would seem, dissertation on Neolithic economy" (Ostoja-Zagórski 1988, 253). And he added: "Inductionism, then, has not lost its importance. On the contrary, it has taken the form of logical empiricism and is gaining new followers" (Ostoja-Zagórski 1988, 253).

It would be difficult to find a more obvious example of a gap between Ostoja-Zagórski's opinion and the real character of Kruk's archaeological achievement.

Janusz Kruk's approach is also characterised by his exclusive concentration on "scientifically" identifiable aspects of reality and by his consistent shunning of sociocultural issues, "world images", ritualization etc. Despite the lack of references to specific archaeological publications, his intellectual debt to Graham Clark (1939) is unquestionable on that point.

Although the basis of Janusz Kruk's settlement archaeology is functional, processual tendencies have become, with time, more pronounced in his research (*e.g*. Kruk 1980b). In

formal terms, a prominent trait of his approach is the prevalent lack of references to his inspirations. John Bintliff (2013, 22) also thinks similarly, pointing among others to the lack of references to the work of Eugene P. Odum (1971), which clearly influenced the content of Kruk's doctoral dissertation. However, the obtained results have proved so important that one may disregard the question of whether this is a function of Kruk's conscious self-creation or of his becoming subconsciously permeated with ideas drawn from personal contacts and informal discussions, rather than assimilating them in library sessions.

Final remarks

In popular, unofficial statements (I do not know any publication that would clarify this discursively) one may come across the thesis that the scope of serious inspirations of Kruk's work is exhausted by the references therein to the scientific achievements of Tadeusz Wiślański (Wiślański 1969). This thesis is consistent with the tendency – popular especially among positivists – to identify the sense of the work with the author's intention (Compagnon 2010, 37). It could be reduced to the opinion that, with regard to sources of intellectual inspiration and questions about materials and method, one should simply ask the author (in this case Kruk). As a result of this approach, we would receive some "proven" knowledge on the subject. In contrast, inquiries based on the interpretation of the work itself are supposed to be burdened with a flaw of arbitrariness.

The desire to achieve full objectivity in scientific research is commendable. The problem is that it is also difficult to achieve. This is demonstrated not only by the position and achievements of the previously mentioned schools of literary criticism (formalism, New Criticism, structuralism and theory of "the Death of the Author"), but above all by a relationship discovered by Pierre Bourdieau in which some propositions and declarations in scientific activity result from a compromise with beliefs dominant in certain academic circles (*cf.* remarks in Bourdie and Wacquant 2001, 32), and which neither express nor reflect the real character of one's research (*cf.* also Kadrow 2014, 15). This situation explains Janusz Ostoja-Zagórski's (1988) aforementioned false trail in the interpretation of the theoretical foundations of Kruk's settlement studies.

The practice of selectively citing inspirational publications is neither a scandal, nor is it rarely found in scientific literature. To some extent, it results from the need/necessity to enter into the beliefs that dominate in a given environment. For example, according to Bintliff (2013, 23), the concept of „community areas" in Czech settlement studies was inspired in part by Kruk (1973; 1980a); however, in the program article of Evžen Neustupný (1991) there is no mention of this.

In 1960s and at the turn of the 1960s and 70s, there was a revival in settlement research in the East (*e.g.* Gurba 1961; Bibikov 1965; Kruk 1973) and the West (Ucko and Dimbleby 1969; Flannery 1972 etc.), which resulted in some unification of research issues.

This type of unification, however, probably stemmed more from global sensitivity to politically driven ecologism than from the same theoretical traditions.

Nearly fifty years ago David Clarke called for clear theoretical assumptions in every publication (Clarke 1973). Kruk fulfilled his duty and outlined the methods he used (Kruk 1973) exceptionally clearly, as per the customs in Polish archeology. In his work, he anticipated the position of David Clarke, which in modern science, including archeology, seems obvious and necessary.

The problem in the case of Kruk's work is not the lack of theory and method, but the lack of information about their sources. The purpose of this article is to reconstruct inspirations and intellectual determinants, which, according to accepted theory, usually escape the consciousness of the creator of both an artistic and scientific work.

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ISSUES OF SPATIAL DISTRIBUTION OF THE MONUMENTAL CEMETERIES OF THE FUNNEL BEAKER CULTURE IN THE LOESS LANDSCAPE OF SOUTHEASTERN POLAND

ABSTRACT

Król D. 2020. Issues of spatial distribution of the monumental cemeteries of the Funnel Beaker culture in the loess landscape of southeastern Poland. *Sprawozdania Archeologiczne* 72/1, 47-62.

Varied monumental cemeteries were one of the most characteristic attributes of the Funnel Beaker culture communities in the 4th Millennium BC. These structures have been well recognized in Northern, Western and Central Europe. This article shows several patterns of the placement of Funnel Beaker culture monumental cemeteries related to the natural landscape in southeastern Poland. Based on GIS spatial and statistical testing, it is reasonable to indicate possible rules of their functioning in the loess areas.

Keywords: monumental cemeteries, Funnel Beaker culture, landscape, spatial analysis, statistics, GIS
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INTRODUCTION

Funnel Beaker culture (hereinafter: FBC) monumental cemeteries are among the most thought-provoking and still unsatisfactorily understood funeral remains of the Middle Neolithic period. During the 4th Millennium BC, they were widespread in Northern, Western and Central Europe (*e.g.* Chmielewski 1952; Madsen 1979; Midgley 1985; Kossian 2004; Rzepecki 2011). Apart from their obvious sepulchral function, it should be mentioned that

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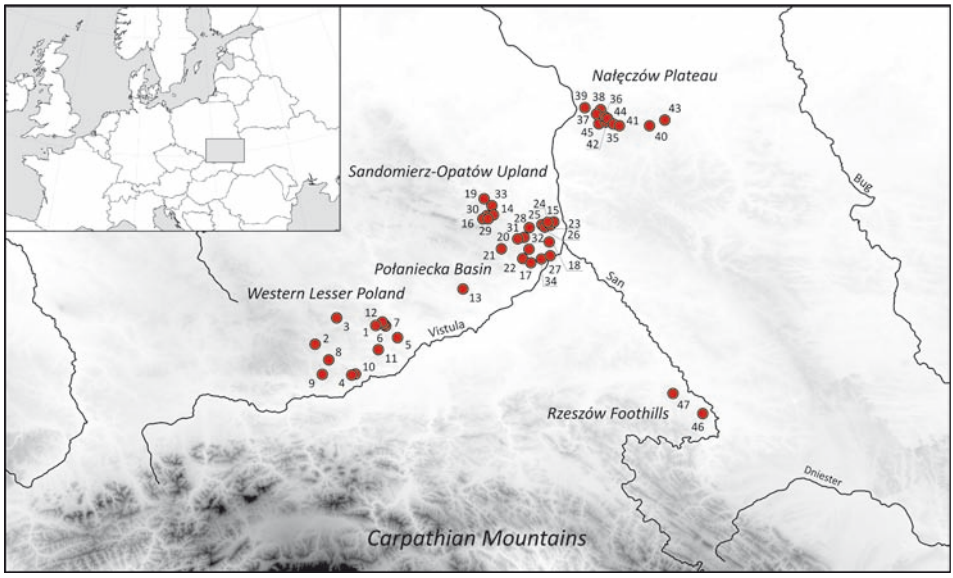

Fig. 1. Distribution of FBC monumental cemeteries in southeastern Poland. Western Lesser Poland: 1 – Dębiany; 2 – Czaple Wielkie 14; 3 – Giebułtów 15; 4 – Karwin 43; 5 – Kolosy; 6 – Malżyce 30; 7 – Malżyce 31; 8 – Niedźwiedź 1; 9 – Pielgrzymowice 15; 10 – Rudno Górne 8; 11 – Słonowice 5; 12 – Zagaje Stradowskie 43. Połaniecka Basin: 13 – Grzybów 1. Sandomierz-Opatów Upland: 14 – Broniszowice 5; 15 – Czyżów Szlachecki 13; 16 – Garbacz-Skała 1; 17 – Gorzyczany 4; 18 – Kichary Nowe 2; 19 – Kunów 1; 20 – Malice Kościelne 1; 21 – Mydłów 58; 22 – Nasławice 50; 23 – Pawłów 3; 24 – Pawłów 10; 25 – Prusy 36; 26 – Prusy 44; 27 – Sandomierz 105; 28 – Stodoły-Kolonia 35; 29 – Stryczowice 1A; 30 – Stryczowice 7; 31 – Studzianki 7; 32 – Święcica 1; 33 – Świrna 1; 34 – Złota 6. Nałęczów Plateau: 35 – Antopol; 36 – Chruszczów-Kolonia 1; 37 – Karmanowice 35; 38 – Klementowice 6; 39 – Las Stocki 71; 40 – Lublin Sławinek 2; 41 – Miłocin-Kolonia 1; 42 – Nałęczów-Kolonia 1; 43 – Pliszczyn 9; 44 – Strzelce-Kolonia 1; 45 – Wąwolnica 7. Rzeszów Foothills: 46 – Skołoszów 7; 47 – Szczytna 6

some of these structures can be also interpreted in alternative ways as a result of different social and/or economic interactions. It is worth mentioning the most important ones. Over the last fifty years, monumental cemeteries have been interpreted as territorial markers (*e.g.* Wierzbicki 1999; 2006; Gorczyca 2005), kinds of landmarks – stable components of communication networks (Hoika 1986; van Ginkel *et al.* 1999; Gorczyca 2005), or examples of rights to a particular area with its reservoirs (Randsborg 1975; Chapman 1981). They are also seen as a result of multifaceted confrontations between adjacent populations of the FBC, or rivalry between these farming communities and mesolithic hunters-gatherers (Czerniak 1994; Wierzbicki 1999; Müller *et al.* 2013). Finally, it is believed that one of the main functions of monumental cemeteries was the integration and stabilization of societies. Their space might be a specific area of bilateral interactions between the "worlds" of the living and the dead (Andersen 2000; Sjögren 2003; Furholt and Müller 2011; Furholt *et al.* 2012; Schülke 2014).

More than 40 FBC monumental cemeteries have been recognized in southeastern Poland so far (Fig. 1). These constructions occurred in several areas: western Lesser Poland (*e.g.* Burchard 1998; 2006; Tunia 2006; Tunia and Włodarczak 2011; Przybyła and Tunia 2013; Jarosz *et al.* 2009; 2013; Przybyła – personal communication), the Sandomierz-Opatów Upland (*e.g.* Bąbel 2006; Matraszek and Sałaciński 2006; Bargieł and Florek 2006ab; Florek 2008), the Nałęczów Plateau (*e.g.* Jastrzębski and Ślusarska 1982; Nogaj-Chachaj 1991; Chmielewski 2015), the Połaniecka Basin (Garbacz 2006) and the Rzeszów Foothills (Król *et al.* 2012; 2014). This is an important dataset (*cf.* Król 2011; 2016). Therefore, we ought to formulate the question as to what kind of content is encoded in these cemeteries. Can spatial analyses of the dispersion of these cemeteries prove their alternative functions? Let us try to understand their meanings by analysing some of the territories.

GENERAL DISTRIBUTION PATTERNS

Based on GIS methods such as Kernel Density Estimation – KDE (*e.g.* Baxter *et al.* 1997) and Delaunay triangulation – DT (*e.g.* Zimmermann 1992), many interesting examples of the distribution pattern of FBC monumental cemeteries are well-visible in two nearby areas: the Sandomierz-Opatów Upland and the Nałęczów Plateau (Fig. 1). In the first case, there are two slightly isolated clusters of cemeteries: A – in the Kamionka basin on the Świętokrzyskie Mountain foreland, and B – about 30 km away to the east in the Czyżowianka Basin (Fig. 2). Both areas differed slightly from each other. For instance, some cemeteries cluster B were placed on the rolling loess foothills. The most representative cemetery of this cluster is the non-exposed site 3 in Pawłów (Bargieł and Florek 2006b). It is very important to note that three different types of monumental barrows (with stone and/or kerb remains) have been discovered there, while only one type of barrow with stone kerb was found in cluster A. In contrast to cluster B, each of the barrows in cluster A were situated in a highly varied landscape, with significant differences in altitude between the highest elevations and the floor of the valley (*cf.* Kowalski 1997). Many cemeteries were situated very high in cluster A, even more than 50 m above the floor of the valley of the Kamionka River. When compared with the two described clusters, others cemeteries were a bit scattered — however in a fairly regular way (Fig. 2).

In comparison with an adjacent (east group) FBC territory, many flat graves in the context of barrows, as well as in theoretically autonomous flat cemeteries, have been recognized in the Sandomierz-Opatów Upland (Florek 2006; 2008). Nevertheless, it is debatable whether the cemeteries identified as flat were originally monumental cemeteries — perhaps all of them? There are several problematic sites in the Sandomierz Opatów Upland, such as Wojciechowice 1, that do not seem to be unambiguously flat (Bąbel 2000; *cf.* Florek 2006). So let us assume that many of the flat cemeteries (or even all of them) were origi-

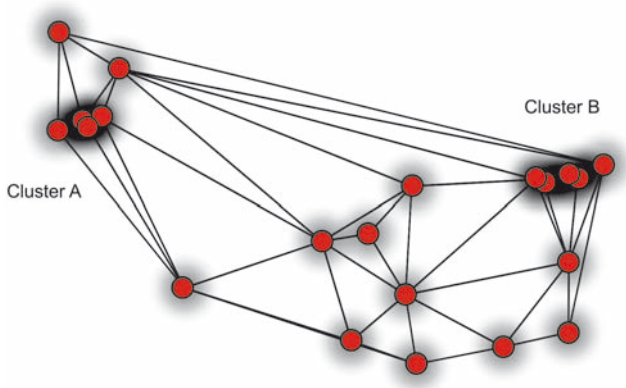

Fig. 2. KDE and DT visualizations of the distribution of FBC monumental cemeteries in the Sandomierz-Opatów Upland

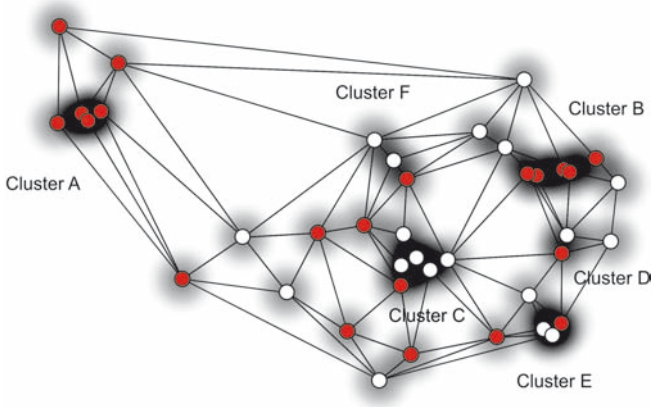

Fig. 3. KDE and DT visualizations of the distribution of FBC monumental and flat cemeteries in the Sandomierz-Opatów Upland. Red dot – FBC monumental cemeteries; white dot – FBC flat cemeteries

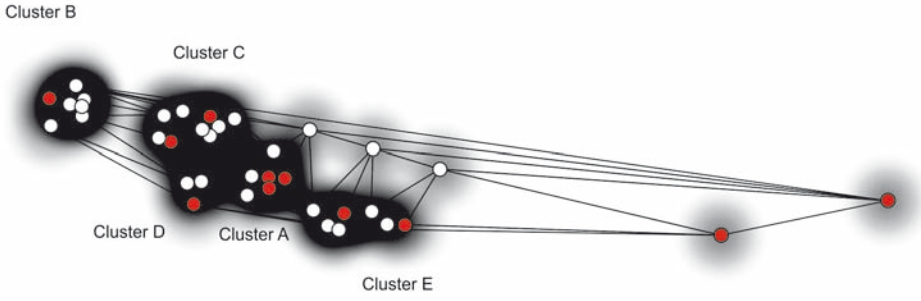

Fig. 4. KDE and DT visualizations of the distribution of FBC monumental and flat cemeteries in the Nałęczów Plateau. Red dot – FBC monumental cemeteries; white dot – FBC flat cemeteries

nally monumental cemeteries and test them in the context of all confirmed monumental cemeteries.

As a result of GIS analysis, an interesting model has been obtained. In the case of the two well-known clusters of monumental cemeteries A and B, "new" cemeteries have appeared in the area of the Czyżowianka Basin within cluster B, which leads to an increase in the cemetery density coefficient (Fig. 3). A similar situation can be observed in other regions, *e.g.* in the area of Swięcica 1 (cluster C), neighbouring the cemetery in Dacharzów 1 (Florek 2006). Another new cluster (E) is visible in the area of Sandomierz 105 when the cemetery in Kamień Łukawski 1 and others (Florek 2008) are taken into consideration. In spite of the fact that new clusters appeared here, the previously observed, fairly regular model is still "active" (Fig. 3).

These results are confirmed by the analysis of the distance between nearest cemeteries (in the sense of neighbourhoods). Accordingly, the following ranges and values were obtained: 0-1000 m – 25.9%; 1001-2000 m – 22.2%; 3001-4000 m – 7.4% and 5001-6000 – 14.8%. The first of these indicators refers to clusters, while the others refer to "autonomous cemeteries".

Now let us move on to the Nałęczów Plateau. In this territory, there is only one confirmed cluster (A) of FBC monumental cemeteries, consisting of three such sites: Chruszczów-Kolonia 1; Nałęczów-Kolonia 1 and Strzelce-Kolonia 1 (Fig. 4). Other monumental cemeteries seem to be somewhat autonomous (Fig. 4). Apart from that, there are several dozen theoretically flat cemeteries in this region (Gajewski 1952; Nogaj-Chachaj 2004). Therefore, the same questions arise as in the case of the Sandomierz-Opatów Upland. How many of those defined as flat cemeteries could originally belong to the category of monumental cemeteries? Is it possible that all of them are monumental? The most serious problem of the FBC cemeteries on the Nałęczów Plateau is their extremely poor state of preservation, which is a result of intensified erosion processes (Maruszczak 1973; Nogaj-Chachaj 2004; Janicki *et al.* 2010). For this reason, we will once again test the assumption that so-called flat cemeteries were originally monumental cemeteries.

Each spatial study confirms the existence of several distinct clusters of FBC cemeteries, although one of them, in the western part of the Nałęczów Plateau (B) in the area of Las Stocki 71, seems to be isolated (Fig. 4). Other interesting clusters occurred to the east of the aforementioned cluster, although the boundaries between them are often blurred, especially between A, C and D (Fig. 4). Undoubtedly, this was not the only spatial pattern that could exist there. It is interesting to note that many cemeteries were not in clusters (Fig. 4). These autonomous cemeteries were sometimes found in intriguing spatial configurations such as linear systems. Cemeteries in Bronice 1, Gutanów 1 and Ługów 1 in the northern part of Nałęczów Plateau were situated in such an arrangement (Fig. 4). The distances between each of them are almost equal (about 3.5 km).

The general results of the distance measurements between the cemeteries are worth considering. The nearest neighbour indicator in the range 0-1000 m is 53.6%. The other

values are: 1001-2000 m – 21.4%, 2001-3000 – less than 10%, 3001-4000 m – 14.3%. The last one is related to the aforementioned linear pattern of the FBC cemeteries' distribution.

TOPOGRAPHY, HYDROLOGY AND VISIBILITY

After having presented the general patterns of distribution of the FBC monumental cemeteries in two selected regions, it is necessary to more closely analyze the topographical and hydrological contexts of their occurrence. Regarding the whole territory of the southeastern group of the FBC, most of the monumental cemeteries were located in the valley areas, especially at the valley edges (*ca*. 70%). They were also located on various parts of the slopes, and even near the floor of the valley, as in Słonowice 5 (Przybyła and Tunia 2013). This is probably an exception, which is contrary to "the high and dry" principle in the FBC landscape (Kruk 1980), *i.e*. many cemeteries were located at higher elevations (*e.g*. Jarosz *et al*. 2013).

Many similarities can be seen in the spatial orientation of the FBC monumental cemeteries. Most of them were located on the southern part of the terrain rather than on southeastern or southwestern terrains. Other variants are incidental (*e.g*. Król *et al*. 2012). What might be indicated by the presented topographical tendencies? What was the meaning of such placement?

To find answers to these questions, a viewshed analysis was conducted. These studies consisted of two stages. In the first stage, only cemeteries with confirmed barrows were analyzed, while in the second stage all cemeteries were analyzed together. This is an obvious

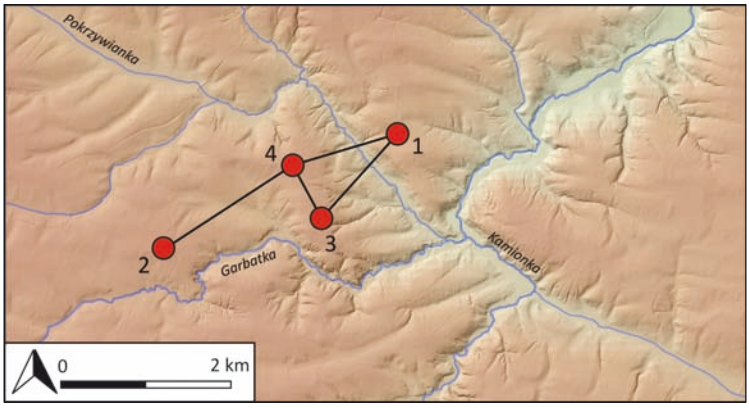

Fig. 5. Visibility scheme of FBC monumental cemeteries in the Broniszowice 5 – Garbacz-Skała 1 sector in the Sandomierz-Opatów Upland. Red dot – monumental cemeteries; black line – visibility confirmed. 1 – Broniszowice 5; 2 – Garbacz-Skała 1; 3 – Stryczowice 1A; 4 – Stryczowice 7

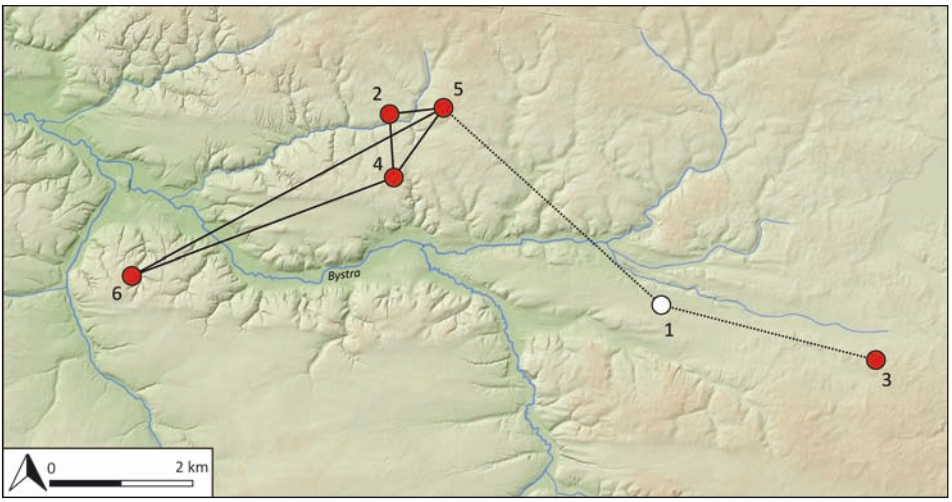

Fig. 6. Visibility scheme of FBC monumental cemeteries in the Wąwolnica 7 – Miłocin-Kolonia 1 sector in the Nałęczów Plateau. Red dot – FBC monumental cemeteries; white dot – hypothetical location of FBC monumental cemeteries; black line – visibility confirmed; black dotted line – hypothetical visibility. 1 – Antopol; 2 – Chruszczów-Kolonia 1; 3 – Miłocin-Kolonia 1; 4 – Nałęczów-Kolonia 1; 5 – Strzelce-Kolonia 1; 6 – Wąwolnica 7

continuation of the approach that assumes that theoretically flat cemeteries originally had a different morphological and spatial configuration. In order to carry out an analysis of visibility, two regions were chosen: the well-known Sandomierz-Opatów Upland and the Nałęczów Plateau. With regard to the first one, the Broniszowice 1 – Garbacz-Skała 1 sector seems to be very intriguing, since almost all of the local cemeteries were connected by visibility in this sector (Fig. 5; *cf.* Iwaniszewski 2006). These cemeteries were located at the confluence of the Garbatka and Pokrzywianka Rivers (left tributaries of the Kamionka River), and formed a specific and hermetic spatial module (Fig. 5).

The visibility relationships in the Nałęczów Plateau are more complex and challenging to assess. The most characteristic examples are spatial relationships occurring in the sector of Wąwolnica 7 – Miłocin-Kolonia 1. This model is largely theoretical and cannot be treated literally. It is not difficult to diagnose the type of relationship between the cemetery in Wąwolnica 7 to the other cemeteries in cluster A, such as Nałęczów-Kolonia 1, nor between the cemeteries within this particular cluster, itself. Only the "eastern expansion" of this model is unclear. The problem is the ambiguous location of the cemetery in Antopol. Nevertheless, the theoretical location of this cemetery was marked out.

It was possible to address this problem through an analysis of archival maps, and by determining hypothetical locations of this burial site based on the possibility of its synchronization (in the sense of visibility) with the nearest cemeteries (Miłocin-Kolonia 1 and Strzelce-Kolonia 1). The resulting model is an illustration of the potential meanings of the

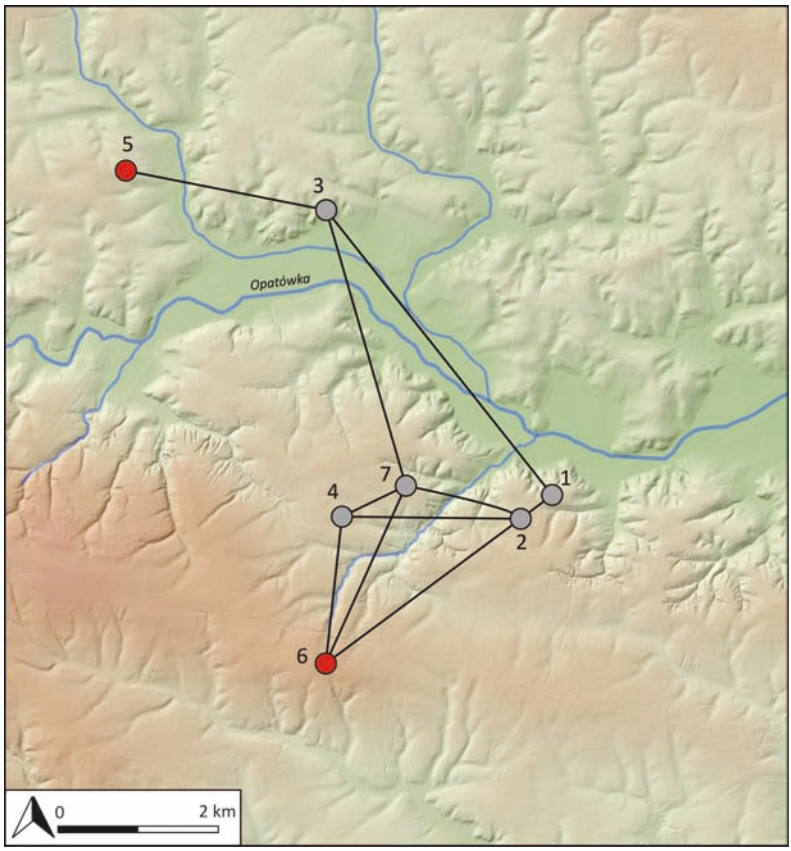

Fig. 7. Visibility scheme of all FBC cemeteries in the Święcica 1 – Studzianki 7 sector in the Sandomierz-Opatów Upland. Red dot – FBC monumental cemeteries; grey dot – FBC flat cemeteries; 1 – Dacharzów 1; 2 – Dacharzów 23; 3 – Daromin 5; 4 – Komorna 22; 5 – Studzianki 7; 6 – Święcica 1; 7 – Zagrody 13

visibility relationship on the east-west axis. It is possible that these relations were based on a hydrographic network, mainly the Bystra River (Fig. 6)

Each of these theoretical models is modified by adding flat cemeteries. Sometimes these flat cemeteries become sensible links between places where barrows are confirmed. The classic example of this is the Święcica 1 – Studzianki 7 sector within cluster C in the Sandomierz-Opatów Upland. There are numerous and complex visibility relationships within the sector that are likely to be related to the hydrographic network of the Opatówka Basin (Fig. 7).

Another significant example of complicated cemetery arrangements has been observed in the Wąwolnica 7 – Miłocin-Kolonia 1 sector in the Nałęczów Plateau (Fig. 8). In this updated scheme, the hypothetical location of the cemetery in Antopol is still unchanged. This sepulchral place can be synchronized with others, such as Bochotnica 4, as well as

Bochotnica-Kolonia 1 and 2. Still, the main axis of this system seems to be the Bystra River with its tributaries (Fig. 8).

An aquatic context seems to be quite significant in regard to the location of FBC monumental cemeteries (*cf.* Chmielewski 1952; Midgley 1985; 2005). There are two "aquatic" tendencies in the location of such burial sites in the Sandomierz Opatów-Upland and the Nałęczów Plateau. An analysis of the distance of the cemeteries from the water provided the following values: 201-400 m – 25.8%; 401-600 m – 25.8% and 0-200 m – 19.4%. Only one site was situated less than 100 m from water. Furthermore, it is interesting that in the range 1001-1500 m, another 22.6% of cemeteries were identified. The latter group is typical of the cemeteries of cluster B in the Sandomierz Upland. Furthest from the water were the cemeteries in Prusy 44 (almost 1500 m) and Pawłów 3 (1030 m). Nevertheless, there were generally similarities between the Sandomierz Opatów-Upland and the Nałęczów Plateau, especially manifested in the 201-400 m and 401-600 m distance preferences.

Another important characteristic relates to a special kind of aquatic context: springs. The issue of springs can be approached in two ways — either by focusing on each spring separately or by considering in their entirety the more complex hydrological areas, characterized by more strongly developed spring networks on an arbitrary, relatively small area.

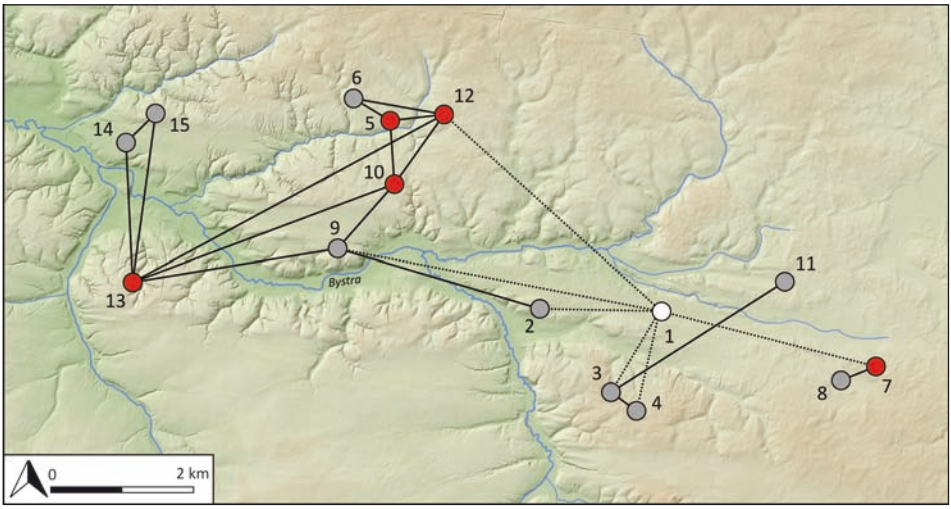

Fig. 8. Visibility scheme of all FBC cemeteries in the Wąwolnica 7 – Miłocin-Kolonia 1 sector in the Nałęczów Plateau. Red dot – FBC monumental cemeteries; white dot – hypothetical location of FBC monumental cemeteries; grey dot – FBC flat cemeteries; black line – visibility confirmed; black dotted line – hypothetical visibility. 1 – Antopol; 2 – Bochotnica 4; 3 – Bochotnica-Kolonia 1; 4 – Bochotnica-Kolonia 4; 5 – Chruszczów-Kolonia 1; 6 – Drzewce-Kolonia 1; 7 – Miłocin-Kolonia 1; 8 – Miłocin 11; 9 – Nałęczów 2; 10 – Nałęczów-Kolonia 1; 11 – Sandurki 2; 12 – Strzelce-Kolonia 1; 13 – Wąwolnica 7; 14 – Zgórzyńskie 1; 15 – Zgórzyńskie 7

In this case, careful research should be maintained. This also concerns the presence of dried-out springs as well as places of groundwater discharge (*cf.* Rasmussen and Skousen 2012).

To estimate the relationship between FBC monumental cemeteries and the developed spring network, only relevant data has been selected. Each of sites was analyzed in terms of its distance to the nearest three sources. The arbitrary reference point was set at 500 m. If the distance to a spring was less than or equal to this value, and a distance difference between the cemetery and particular springs was relatively close, then the spring context of the cemetery would be considered to be quite probable. In the matter of the Sandomierz-Opatów Upland and the Nałęczów Plateau, the distance of the first of the three springs was less than 500 m in only 7 cases (*i.e.* 22.6%; Fig. 9). In this range, the shortest distance was 373 m. On the other end of the spectrum are the monumental cemeteries, located even over 1000 m from the nearest source. For instance, the cemetery in Pawłów 3 was located 1405 m from the nearest spring, 1925 m from the second closest, and 3322 m from the third (Fig. 9). The case of Pawłów is a bit extreme, although not unique. What does it all mean?

Based on these analyses, it can be seen that the importance of springs in the selection of the optimal location for a monumental cemetery could be minimal or even negligible. Compared to watercourses that could have pragmatic transportation and communication functions (see viewshed issues), other water areas (especially wetlands and sources) are often attributed to the symbolic dimension (Midgley 1985; 2005). Interestingly, this is particularly emphasized in discussions on the symbolic meaning of barrows in the Polish

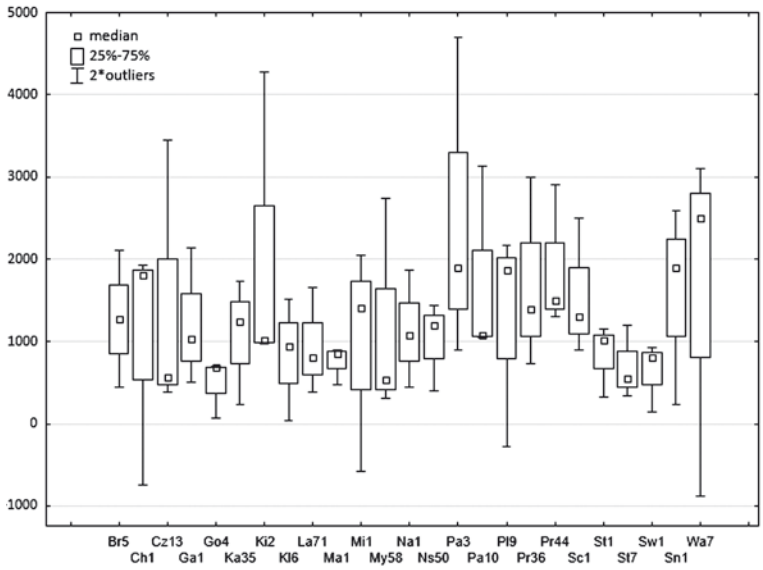

Fig. 9. Box-plot of the distance between FBC monumental cemeteries and the three nearest springs in the Sandomierz Opatów-Upland and the Nałęczów Plateau

Lowland (*e.g.* Woźny 1996). In fact, there are examples of cemeteries located very close to springs in the Kuyavia region, even at a distance of less than 100 m (*i.e.* Buszkowo 1; Gorczyca 2005). On the other hand, there is Central Pomerania (Łupawa Basin), where the spring context (or rather the lack thereof) is similar to southeastern Poland.

SUMMARY AND CONCLUSIONS

What can we conclude from the presented studies? Do we have arguments that FBC monumental cemeteries were built in spaces specially selected for their alternative functions and meanings? It is definitely clear that analyses of the basic patterns of monumental cemetery distribution (especially if we include in this category the many debatable flat cemeteries) may indicate the existence of two basic approaches to spatial organization: clustered and scattered (Fig. 3-4). Could it be a characteristic of their varied functions? This question is difficult to answer due to insufficient data on the absolute chronology of FBC monumental cemeteries. This fact has very serious consequences, because it does allow for the creation of a dynamic model of the functioning of these cemeteries. The analysis of static points shows certain trends, but these trends can only be interpreted as various possibilities. We do not know whether the monumental cemeteries within the clusters (*e.g.* A and B in the Sandomierz-Opatów Upland) existed at the same time or not. It is currently not possible to exclude any of these scenarios.

The chronological uncertainties of the FBC settlement network are also particularly noticeable during viewshed analysis. Generated visibility relationships (Fig. 6-9) make sense only when they are composed of units of the same chronology. Viewshed analyses are potentially important in identifying the communication meanings (as territorial markers) of cemeteries. However, in order to validate these models, it is also necessary to gather data on landscape deforestation (*cf.* Demnick *et al.* 2008; Diers *et al.* 2014). Forest-free spaces are a *sine qua non* for the functioning of such a system. Especially important in this context is one issue. The traditional — or rather the most basic — role of cemeteries, barrows and graves is to provide space for the deposition of the deceased. In this sense, cemeteries are active as long as the dead are being buried within them. If we assume that they also have alternative roles, it follows that they might also be important after the end of the funeral process – until the appearance of the forest. This fact leads to a very important conclusion. The progress of research on the absolute chronology of FBC monumental cemeteries can provide optimal results only in the context of conjunction with parallel research on the environmental context of such sites.

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CULTURAL AND SETTLEMENT CHANGES IN THE SECOND HALF OF THE 4TH MILLENNIUM BC IN THE AREA BETWEEN THE BUG, DNIESTR AND PRUT RIVERS

ABSTRACT

Rybicka M. 2020. Cultural and settlement changes in the second half of the 4th Millennium BC in the area between the Bug, Dniestr and Prut rivers. *Sprawozdania Archeologiczne* 72/1, 63-85.

The literature on the subject emphasizes the migration of the CII Tripolye culture from south to north. A particularly interesting issue is the presence of imports of the Funnel Beaker Culture in the environment of the Moldovan Brînzeni group, and especially from which regions they come. Volhynia was suggested to be the area from which these materials came, because along with ceramics of the Funnel Beaker Culture in the Brînzeni group, objects of Volhynian raw material were also discovered in the literature.

The discovery of a stable Funnel Beaker culture settlement north of the Brînzeni group, in Kotoryny near Zhydachiv, has raised a number of questions about this problem. Also, the identification in the Western Volhynian region of the Tripolye Culture settlement in Novomalin-Podobanka near Ostrog, from which vessels with the characteristics of the Brînzeni group and Funnel Beaker Culture are known, shows that clarification of the relationships between South and North Tripolye Culture communities requires further research.

Keywords: Funnel Beaker culture, Tripolye culture, Western Ukraine, Brînzeni group, Neolithic
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INTRODUCTION

The second half of the 4th Millennium BC was a time of disintegration of the classical settlement system of the Tripolye culture (TC), which resulted in economic changes of this unit (*e.g.* Kruc 1994; Videyko 2007; Harper *et al.* 2019). Many researchers claim that these events were strongly affected by climate change (Harper 2013), which resulted in steppe formation (Makohonienko 2011). In the descriptions of economic changes in the TC, the matter of food acquisition is vaguely discussed in the context of demographic change (Harper *et al.* 2019; Diachenko 2019). In the period between 3600-3000 BC, the greatest emphasis is placed on the transition from agriculture to pastoral farming.

Such a general assessment of changes characterizes the Lengyel-Polgar, Funnel Beaker culture (FBC) and Baden culture communities that settled the uplands and lowlands between the Oder and Bug rivers in the 4th Millennium BC (Kruk and Milisauskas 1999; Pelisiak 2018). In palynological diagrams (Kruk 1980) with accurate dating (Pelisiak *et al.* 2006; Grygiel 2008; Wacnik and Rybicka 2012; Szmyt 2013), the changes are marked by evidence of human exploitation of the environment in a variety of ways. Economic changes in "western" communities correlate with the changes in settlement models (Kruk 1980; Kruk and Milisauskas 1999). Instead of settling lowlands, as was done by Lengyel-Polgar communities that were actively farming, the FBC communities started to settle in higher and drier areas used for agricultural purposes, and began to use the farming method known as slash-and-burn agriculture. At the end of the 4th millennium, the significance of animal husbandry in the Funnel Beaker-Baden and Globular Amphora Culture communities also increases (Kruk 1980; Szmyt 2013).

The reasons for economic changes within the TC and, for example, in the FBC are explained in different ways. In the first case, the main reason seems to be climate change (Harper 2017), whereas in the second, the anthropogenic impact on the environment is considered (Kruk 1980; Kruk *et al.* 1996; Pelisiak *et al.* 2006). In Eastern Europe, we may observe climate change not in a regional, but a macro scale (Harper 2017). This shows that in order to understand the phenomenon and the dynamics of changes in the TC, regional studies that are empirical and analogous to those carried out in Talianky (Harper 2012) should be performed. Currently, it is not possible to describe the dynamics of changes of economic systems used by communities of the TC and western cultures (Lengyel-Polgar and FBC) in the areas from North Moldova to Western Volhynia. This is the result of a lack of studies on economic and settlement patterns that incorporate archaeozoological and archaeobotanical analyses. Moreover, it is not always possible to precisely date the appearance of different cultural groups of the TC (Rybicka 2017; Harper *et al.* 2019).

According to many researchers, socio-cultural changes of the TC were visibly influenced by migrations of people (e.g from the Tomaschivka group: Harper *et al.* 2019). The same reason is given to explain the appearance of groups representing the early CII stage, with the characteristics of the Moldavian Brînzeni group, in Volhynia (Dergachev 1980; Tkachuk

1998; Rizhov 2007), and synchronized with Troyaniv group. Aleksandr Diachenko and Aleksandr Kirilenko (2016, 129) wrote "… Considering the above arguments, one can agree with the opinion of S. Rizhov about the settlements left by the migrants from Brînzeni as the earliest in the studied region…". The nature of settlements like Lystvyn-Holishyv, which represent communities with characteristics of the Moldavian Gordineşti group in Western Volhynia, is debatable (Pozikhovskyj 2019b; Verteletskyi 2019a; 2019b). Some researchers claim that the appearance of these groups is a result of influences of the youngest TC group (Kruts and Ryzhov 2000, 108). The question is whether the occurrence of these groups may be the consequence of migrations from the South to the North. According to M. Videiko (2000, 67), at that time "….Migratory processes, mainly of the population of the Carpathian Basin, resulted in the appearance of the Gordineşti, Troyaniv cultural types. Their subsequent translocation to the east gave rise to the Sofievka type…". In the territory of Western Volhynia, we may observe the presence of western groups or their characteristics visible in pottery of the TC (*e.g*. Rybicka 2015; 2017; Diaczenko *et al*. 2016).

It is difficult to present the set of stylistic features of TC ceramics, especially from the early CII stage (Markevich 1981; Diachenko and Kirilenko 2016; Rybicka 2017), which hampers the evaluation of changes at the time of the CII stage of the TC. With regard to studies carried out under the auspices of the project, "Between the East and the West. Dynamic of Social Changes from the Eastern Carpathians to the Dnieper in 4th – beginning of 3rd mil. BC" (Diachenko *et al*. 2019), there will be an attempt to specify the changes that have occurred in the explored area in the second half of the 4th Millennium BC, in the context of changes in ceramic decoration and new radiocarbon dating. Particular attention will be paid to the importance of migration, direct contacts between various groups, innovations, imitation and unification observed in the ceramic styles of communities living in the studied region.

THE SOCIAL AND CULTURAL SITUATION IN THE SOUTH AND NORTH PERIPHERIES OF THE TC IN THE AREA FROM MOLDOVA TO WESTERN VOLHYNIA

The beginnings of stage CII of the TC

In the second half of the 4th Millennium, the Brînzeni cultural group, occupying northern Moldova and the areas by the Dniester, in the context of the TC, was characterized by medium-size settlements located in hilly terrain (from a few to several hectares) with different elevations (Fig. 1: A; Markevich 1981; Król 2019). Moldovan settlements of this group in Brînzeni, site III, and in Costeşti, site IV, were built on an oval plan with a partly built-up maidan. There were about 30 houses. It is difficult to specify whether all buildings were of a social character, or whether, perhaps, there were areas intended for agriculture and rituals.

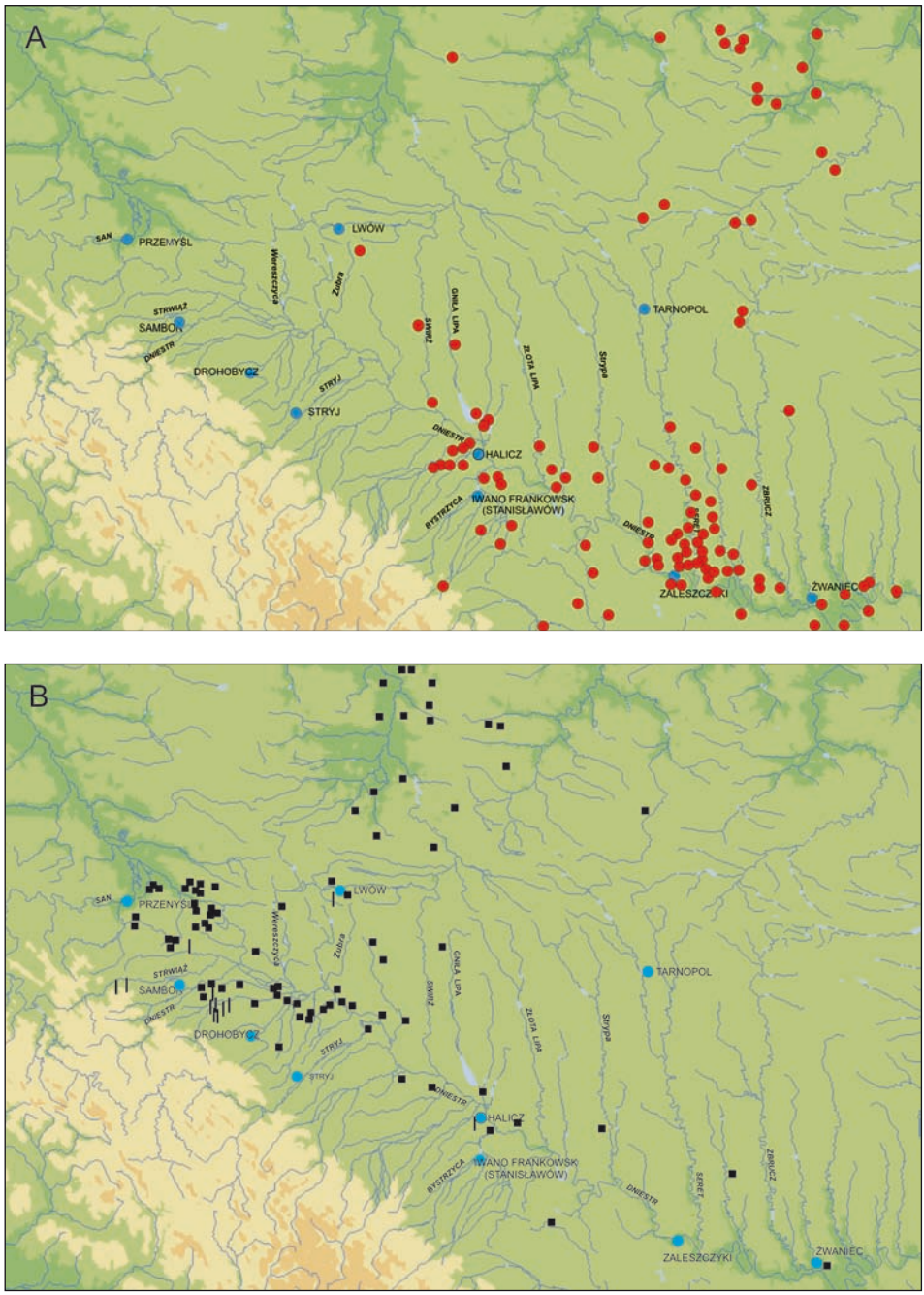

Fig. 1. Settlements of the CII stage of the Tripolye culture (A) and the Funnel Beaker culture (B) (acc. to Pelisiak 2005)

According to V. Markevich (1981, 136), the settlers were farming cereals (various species of wheat, and barley and millet?) and legumes (peas), using tools made of an imported Volhynian material. The main livestock were cattle, sheep, horses (mobile species), whereas the role of swine was not very significant (Markevich 1981, 136). The basic consumption products were domesticated species.

Communities of that group had strong connections with the FBC, which is exemplified by the so-called imports of FBC ceramics from settlements in Brînzeni (Markevich 1981; Movsha 1985), Costeşti IV (Markevivh 1981), and Zhvaniets (Movsha 1985), found within houses. The issue of relations between the FBC and the TC has been broadly discussed in recent times (Rybicka 2017). The available dating for sites in Brînzeni and Costeşti IV are younger than radiocarbon dates obtained for settlements of the FBC where imports from the Brînzeni group were identified (Włodarczak 2006; Rybicka 2017). The observed asynchronicity clearly shows that the accepted time frames for the Brînzeni group are questionable (Rybicka 2017).

The presence of imports of the FBC is an indicator of direct contact between communities of the two cultures. However, the provenience of the FBC vessels identified at the aforementioned sites, in which objects of Volhynian raw material also have a significant share, is debatable. Assuming that the import of tools made of such flint are from Western Volhynia, where FBC and syncretic ceramics have been found in settlements of the TC (Rybicka 2015; Rybicka and Diachenko 2016; Rybicka 2017), it may be suggested that, together with Volhynian material, FBC ceramics reached the area of the Brînzeni group. However, the interpretation of that fact is debatable. Therefore, it is worth taking a closer look at the cultural situation in the territory between Volhynia and northern Moldova.

As a result of recent studies, the upper Dniester in the area of Zhydachiv has been set out as the south-eastern border of the west Ukrainian type of FBC. The southernmost settlement of the FBC in this territory is in Kotoryny, Grodzisko III, in the region of Zhydachiv (Harmatowa *et al.* 2013; Hawinskyj *et al.* 2013). The distance between the abovementioned settlement and the Brînzeni group is about 250 km (Fig. 1: A; 1: B). As in Western Volhynia (Rybicka 2017), it may be suggested that cultural interactions on the border of the FBC and the TC were strongly visible, and communities of the Brînzeni group had direct contact with people of the FBC; thus, the pottery discovered in settlements of the Brînzeni group could have originated in the FBC (Rybicka 2017). Is it possible that together with FBC vessels, the Volhynian material could have reached the Brînzeni group? It is difficult to specify the original region of the Volhynian material, as the of "Turonian" flint (Konopla 1998; 2013) discovered in the trans-Dniester region is macroscopically similar and hard to distinguish from the kind excavated in Western Volhynia (Konopla 1998). Moreover, there is no information about any settlement functioning in the area of the upper Dniester that could be a centre of distribution of Volhynian flint items within the Brînzeni group, as in the case of the FBC trading post identified in Gródek by the Bug river (Balcer 1983; Diachenko and Rybicka 2019). The FBC settlement functioning in the above-

mentioned region serves as a distribution centre for items made of Volhynian flint to south-eastern and eastern groups of this culture (Balcer 1983; Diachenko and Rybicka 2019). Yet another possible interpretation of the origin of Volhynian material within the range of the Brînzeni group, is as an import from Western Volhynia. It is hard to say whether the communities of the Brînzeni group received finished, semi-finished or processed products made of Volhynian material in settlements of that group (Markevich 1981).

The features of the Brînzeni group have been shall be recorded in Volhynia (Kruts and Ryzhov 2000), including the Ostrog area, where they can be observed in settlements like Khoriv and Novomalin-Podobanka (Diachenko and Kirilenko 2016). There are a few possibilities that may explain their appearance in the mentioned region:

– migration of some part of the population or a small group of people (Dergachev 1980, 132; Tkachuk 1998; Rizhov 2007; Diachenko and Kirilenko 2016),

– features of the Brînzeni group appear in Volhynia due to the trade or exchange of Volhynian material (Dergachev 1980, 133).

Why did some segment of the Brînzeni group decide to migrate to the north, to Volhynia? What could have been the impetus and when did it happen?

Based on the data obtained in the area of northern Moldova and Transnistria (Fig. 1: A; Król 2019), it can be claimed that occupation of the Brînzeni group was not very intensive, and settlements were relatively small. No more than 30 houses were identified in Brînzeni and Costeşti, which suggests a small number of inhabitants. The authors of the published study on the relationship between the state of the environment and the population size presented the assumption that the suitability of a given habitat for colonization is a function of the availability of resources, while the usefulness decreases as population density increases (Harper *et al.* 2019). Taking into account the aforementioned data, migration of Brînzeni groups was not a consequence of the increasing number of people or an environmental crisis caused by anthropopresion, in which it was not possible to carry out agricultural activities. According to T. Harper (2017), between 3825-3650 BC, the climate cooldown in Moldova (and elsewhere) caused changes in settlement and economic systems in favour of a more mobile lifestyle, whereas more convenient economic conditions appeared around 3300 BC (Harper *et al.* 2019). On the basis of radiocarbon dating, benchmark settlements of the Brînzeni group may be dated to the period between 3400-3100 BC (Fig. 2: A), whereas settlements like Novomalin-Podobanka may date to between 3500-3300 BC (Rybicka 2017). The latter date range conforms well to the chronology of settlements of the eastern and south-eastern FBC that include imports with features of the Brînzeni group (Rybicka 2017). Interesting analytical results have been found based on relations between the environment and the size of the population in Volhynia, "...where habitat suitability predictably decreases as population increases during the Neo-Eneolithic, but then increases with population during the Terminal Eneolithic and EBA transition. This may be reflective of changes in subsistence strategy accompanying the colonization of the region by populations

belonging to the Brynzenskaya local group…" (Harper *et al.* 2019). In the cited work, there is no data about the settlements included in the presented analyses, and no mention of whether the sites serve as representatives for the whole Volhynian region or only for its particular sub-regions. A complicated settlement and cultural situation, relatively poor reconnaissance of the territory, and the cultural borders in this region between the western and eastern world (Rybicka 2017) are problematic for geographical and settlement analysis. Although it is possible to determine the scope of the oecumene of the FBC in Volhynia, with the left bank of the Styr River as the borderline, it is difficult to identify the size of the area occupied by previous western communities (Malice culture – MC, Lublin-Volhynian culture – LVC). The settlement strategies of these communities are well described for the occupied regions west of the Bug River (Kruk 1980; Kruk and Milisauskas 1999; Rybicka 2004; Grygiel 2008; 2016), and probably in the area by the right bank of the Bug are not much different from the strategies typical for these communities in their original territories.

A complicated settlement and cultural situation is especially observed in the area of Dubno and Ostrog (Pozikhovskiy and Samoliuk 2008; Pasterkiewicz *et al.* 2013; Diaczenko *et al.* 2016; Bardeckiy and Verteletskiy 2018). Materials of the MC, LVC, or FBC (Pozikhovskiy and Samoliuk 2008; Rybicka 2017) discovered within TC contexts, the presence of functionally differentiated remains of the TC (*e.g.* flint workshop; Mezhyrich), relatively high-lying permanent settlements (Ostrog-Zeman: Pozikhovskiy and Samoliuk 2008; Pozikhovskyj 2019a; Novomalin-Podobanka: Diaczenko *et al.* 2016), and low-lying, small settlements of particular economic functions, like Kurgany-Dubova (Diaczenko *et al.* 2016), show that models of settlement were diversified, and the choice of land to colonize could have been made according to the type of activities carried out there (*cf.* Kobyliński 1988; Kruk *et al.* 1996). If we consider that settlements combining traditions of the TC and MC, like Ostrog-Zeman (Pozikhovskiy and Samoliuk 2008), dated to around 4000-3800 BC, were situated at both higher and lower elevations in the landscape, similar to settlements with features of the Brînzeni group (high-lying: Novomalin-Podobanka: Diachenko *et al.* 2016; low-lying: Mezhyrich: Pasterkiewicz *et al.* 2013), then it is hard to agree with the presented hypothesis (Harper *et al.* 2019) that colonies with features of the Brînzeni group are connected with a change of settlement and agricultural strategies – especially because these are not well recognized in either case. Nevertheless, it is worth mentioning that the period between 4000-3600 BC is characterized by the presence of settlements combining TC and MC or LVC in this region. There is no information about colonies that are purely of the LVC or the FBC, for example. However, in case of the FBC, there is a description of a region in the area of Ostrog where relations between communities of the FBC and the TC could be observed, and which resulted in the appearance of syncretic phenomena (Rybicka 2017). Economic strategies of FBC communities in the territory between the Bug and Oder Rivers are well identified. Their typical feature is extensive slash-and-burn agriculture, when in the years between 3600-3300 BC, a significant role was played by Volhynian raw

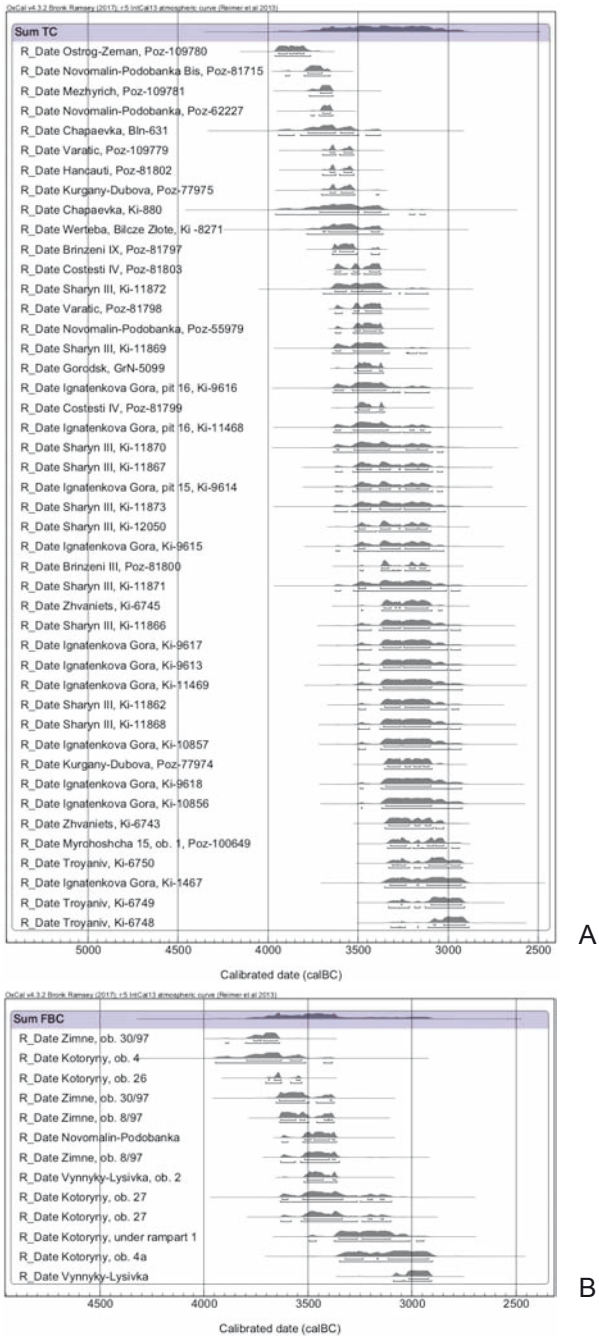

Fig. 2. Radiocarbon dates for the Tripolye culture (A) and the Funnel Beaker culture (B) from the 4th millennium for sites between northern Moldova and Volhynia (acc. Rybicka *et al.* 2019)

material (Kruk and Milisauskas 1999; Rybicka 2004; 2017; Grygiel 2016). The remains of the settlement of the FBC and the TC from Novomalin-Podobanka chronogically fit well in in this problem (Rybicka 2016b; 2017). It is difficult to determine the agricultural system of the TC in Volhynia at that time, and to tell whether the communities colonizing this region in the first half of the 4th Millennium were actively engaged in agriculture like the communities of the Lengyel-Polgar culture, or whether there was a different kind of agricultural strategy. The change of agricultural strategy suggested by Harper, Diachenko, Rassamakin and Kennett (2019) was not necessarily the effect of a migration of people from the south, especially because those people were not representative of all features of the Brînzeni group of the TC. The migrants did not enter the unsettled area, as the land was previously inhabited by the western Polgarian communities and TC groups. It is hard to tell what the nature of the interactions between the cultures was, and how intensive the settlement of the TC was. According to A. Diachenko and A. Kirilenko (2016, 126) "… The pure cultural complexes of TC near Ostrog are clearly unknown. As for the possible single import from the TC in the materials of the MC, such a possibility is theoretically not excluded, especially considering the location of settlements of the BII stage to the south and east of the analyzed region…" Taking into account the presence of a pottery kiln in Ostrog-Zeman (Pozikhovskyj 2019a) and the predominance of TC artefacts in a flint workshop in Mezhyrich, for example – dated between 3800-3600 BC (Pozikhovskyi; personal communication; Fig. 2: A) – it may be assumed that the identified ceramics with Polgarian features can be treated as imported items. These facts show the continuity of colonization processes in the Ostrog region.

A good understanding of the production technology of the Volhynian flint tools characteristic for inhabitants of the settlement in Novomalin-Podobanka weakens any arguments for the migration of people from the Brînzeni group to Ostrog territory (Dobrzyński and Piątkowska 2015). A. Diachenko and A. Kirilenko (2016, 126) associate the tools with the second stage of settlement in the discussed region by communities with Brînzeni features. In the future, it would be desirable to compare whether the treatment method of Volhynian raw material from the workshop in Mezhyrich (Pozikhovskyi; personal communication) was analogical to the one characteristic for Novomalin-Podobanka. If the production technology is analogous, it means that information regarding the discussed matter was continuously passed from one generation to another. A. Diachenko and A. Kirilenko (2016, 129) suggested that

"…Because the migrants appeared north and east of the native range of the Brînzeni group (…) with the ready-created "package" of topographical features of settlements, interior design of houses, and ceramic complex, it is reasonable to date a large wave of emigration no earlier than in the second stage of the local group's development…". It is difficult to estimate the degree of similarity between the materials from colonies in Volhynia (*i.e.* Kolodyazhyn, Korzhivka-Selysko and northern Moldova – Brînzeni group); however, it is possible to assume that the observed features of the Brînzeni group are the result of a mi-

gration of people from the south. The appearance of these people in Western Volhynia may be an effect of other cultural behaviors.

Stylistics of ceramics is another factor weakening the significance of the assumption about migration. According to A. Diachenko and A. Kirilenko (2016, 129) "… As V. Kruts and S. Ryzhov have already noted, the appearance of settlements with the characteristics of the Brînzeni group in Volhynia does not mean their ceramic complexes are identical to those of the Brînzeni group in their native area…". Not many features characteristic of the style of the Brînzeni group (*e.g.* motifs of figures, narrative scenes, extensive symbolism; *cf.* Markevich 1981) were identified in the complex of Novomalin-Podobanka – currently the most distinctive settlement of the early CII stage from Western Volhynia. Only the most common features, like the motif of wolf's teeth, were distinguished (*cf.* Verteletskiy 2016). The decoration of vessels in this collection is much different from that characteristic of the Brînzeni settlement in Zhvaniets (Movsha 1982).

If we, however, consider that settlements like Novomalin-Podobanka are the result of migrations from the south, we may ask why they do not represent the whole collection of features – for example, stylistic features of Brînzeni group – but only show the most common motifs, which do not indicate cultural identity (*cf.* Levi-Strauss 1979). Such information undermines the concept of migration of Brînzeni communities to the north. Regarding other characteristics of the Brînzeni group, such as the manner of spatial development of the settlements, it is impossible to make such a comparison due to lack of data for Western Volhynia. Currently we cannot determine whether the influence of the Brînzeni group decreased with distance.

Valentin Dergachev (1980, 133) wrote "…the most intense cultural and trade connections of the Volhynian tribes with the Brînzeni people […] numerous items from Volhynian flint…". According to B. Balcer (1981, 97; 1983) the presence of imported flint materials may reflect the intensity of contacts between different cultural groups. However, it is currently difficult to assess the importance of products from Volhynian raw material in the CII TC groups from Eastern Volhynia. In the case of the Brînzeni group, objects from this raw material are assigned an important role in the economy (Markevich 1981). In the FBC, due to the exchange of raw Volhynian flint, TC features are sometimes identified in areas far away from area TC (Rybicka 2017). It can be assumed that as a result of direct contacts related to the exchange of Volhynian flint between the groups inhabiting Eastern and Western Volhynia, the influence from the Brînzeni group reached the Ostrog region, while the FBC influence was felt in Eastern Volhynia (Korzivka-Selysko: Kruts and Ryzhov 2000, 97).

To conclude, the archaeological data do not give any reasons for total acceptance of the hypothesis about the migration of Brînzeni group communities from the south to East Volhynia. However, the presence of Volhynian raw material in collections from Brînzeni settlements in their homeland emphasizes the importance of material exchange. Such activities may relate to the spread of features of the Brînzeni group from the south to the

north, and the appearance of imitations of ceramics and anthropomorphic figures from this group in the region of Ostrog (Verteletskiy 2016).

FBC in the territory of Western Ukraine (3700/3600-3000/2900 BC)

The study of the FBC in Western Ukraine allowed for the definition of the border of the eastern range of the culture (Fig. 1: B; 2: B; Hawinskyj *et al.* 2013; Gavinskiy 2009; 2013; Gavinskiy and Pasterkevich 2016). In Western Volhynia, the range of mobile settlement is marked by Styr River (Fig. 1: B; Rybicka 2017), whereas the remains of settlement of this culture identified in the area of Ostrog or Dubno do not confirm the permanent habitation of the FBC; however, the findings might be treated as the effect of mutual and direct contact with the TC (Rybicka 2017). It is difficult to determine the culture's southern range. The southeastern border might be set by the upper Dniester in the region of Zhuravno (Harmatowa *et al.* 2013). The boundary is defined by the settlement in Kotoryny, situated by the upper Dniester (Hawinskyj *et al.* 2013; Król 2019), with origins dating back to 3700-3600 BC (Fig. 2: B). The ornamental style of the ceramics refers to early stages of the eastern group of this culture (Czerniak and Kośko 1993; Grygiel 2016). Recently, some analogical materials have been distinguished in the Rzeszów-Przemyśl loess areas (Rybicka 2016a; Sieradzka and Głowacz 2017).

The information concerning the existence of a multi-phase settlement in Kotoryny until the period around 3300/3100 BC (Fig. 2: B) is based upon radiocarbon dating. Settlements like Vynnyky-Lysivka (Gavinskiy 2013; Diachenko *et al.* 2019; Rybicka *et al.* 2019), Lezhnitsa, site Czub (Rybicka *et al.* 2019), and stage II of the settlement in Zimne (Peleshchishin 2004; Rybicka *et al.* 2019) represent the youngest stage of the FBC in Ukraine. It is characterized by a conservative style of ceramics. The collections do not include many examples with decorations suggesting younger stages of the eastern and southeastern group of the FBC, such as broad decorations made with cord or channel ornamentation (Kośko 1981; Rybicka *et al.* 2014). The basic ornamentation motifs are simple decorations characteristic for early stages of the eastern group (Fig. 3: 2, 10; 4: 8), with a minor role of features of the southeastern group (Fig. 4: 1-5; 5: 3-5), neighbouring with the oecumene of the Western Ukrainian type of FBC.

Volhynian flint was the primary type used by the communities in the above-mentioned region, both in eastern Roztoche (Sobkowiak-Tabaka 2019) and by the upper Dniester (Konopla 2013), whereas the role of western materials like Świeciechów flint was minor, and could have been imported in the younger stages of the discussed culture (Konopla 2019).

The limited presence of stylistic features typical for the southeastern FBC group, along with the flint materials predominating in this region, show that communities residing in the region between the upper Dniester and upper Bug had not been in constant contact with the FBC communities living in the western regions (Rybicka *et al.* 2019). An interesting

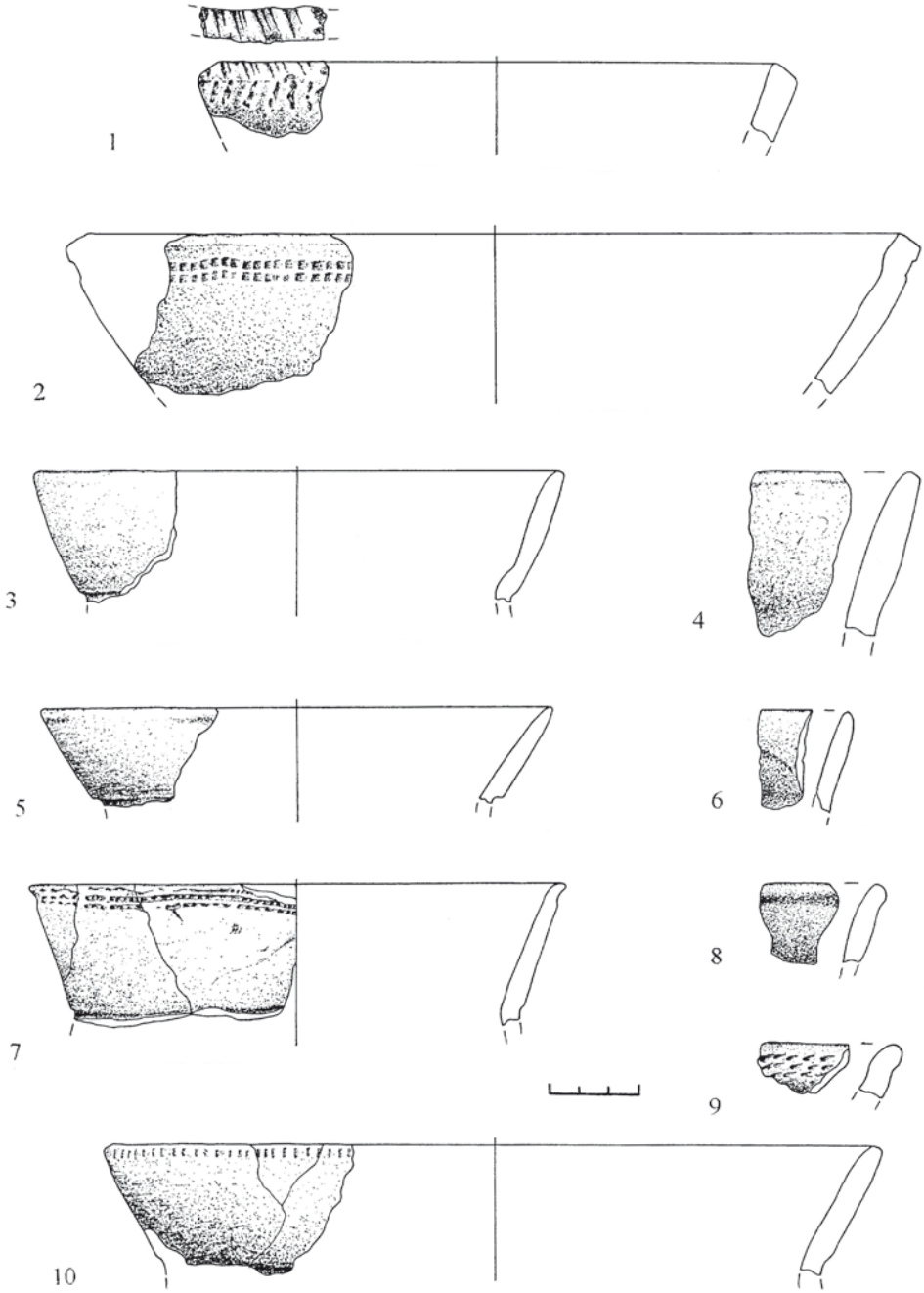

Fig. 3. Lezhnitsa, site Czub, Ivanychi raion. Funnel Beaker culture ceramics (acc. to Rybicka *et. al*. 2019)

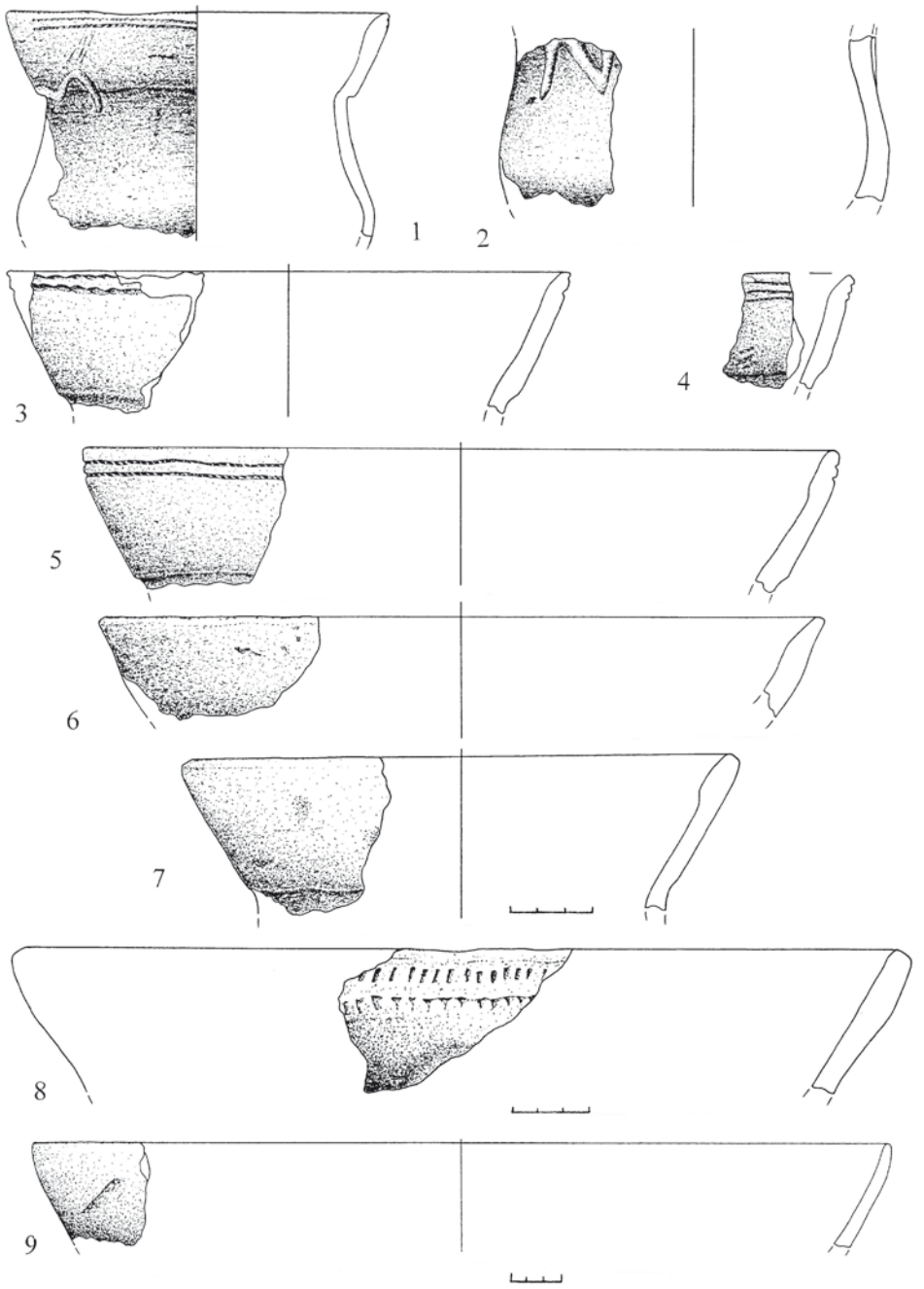

Fig. 4. Lezhnitsa, site Czub, Ivanychi raion. Funnel Beaker culture ceramics (acc. to Rybicka *et. al.* 2019)

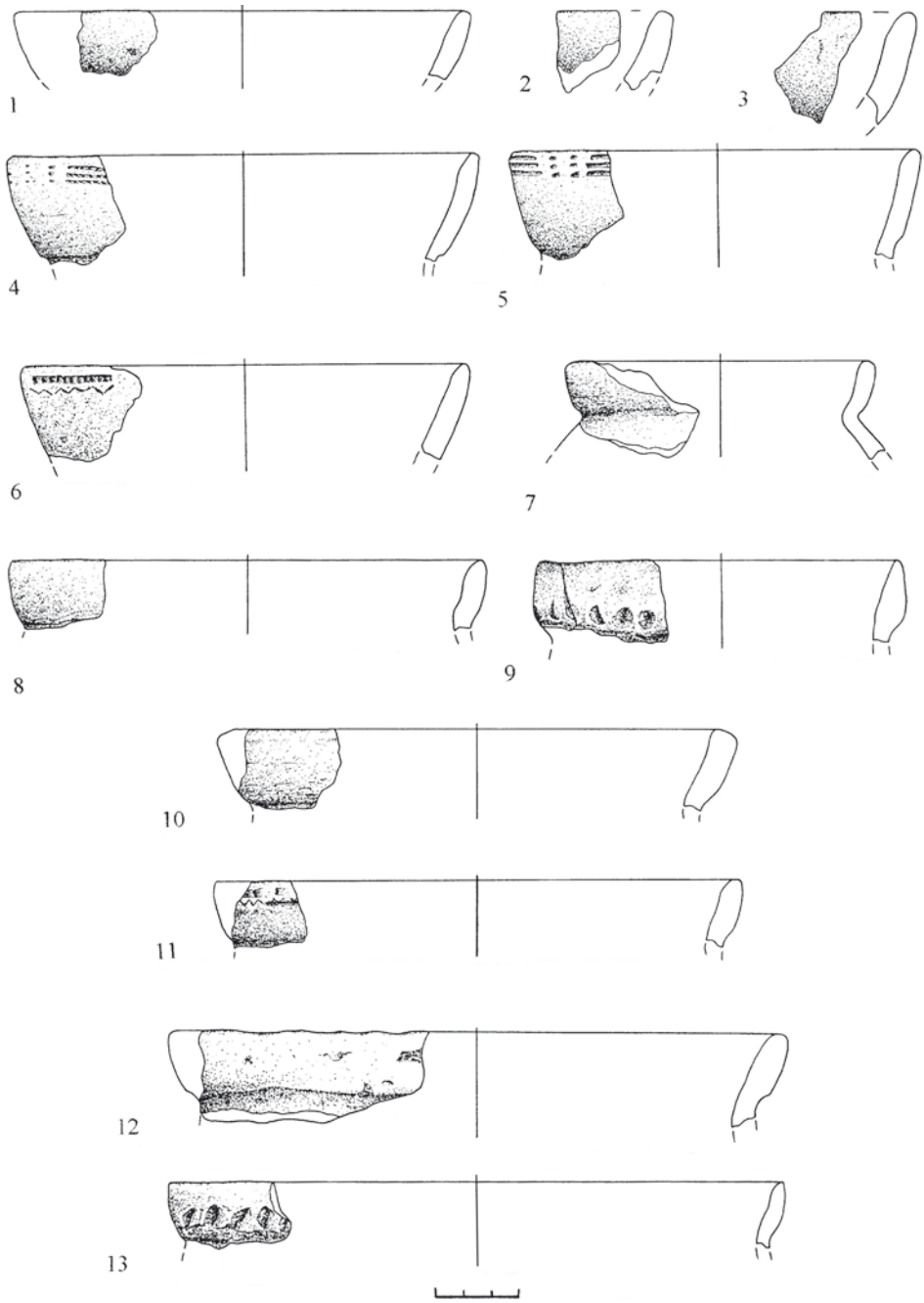

Fig. 5. Lezhnitsa, site Czub, Ivanychi raion. Funnel Beaker culture ceramics (acc. to Rybicka *et. al*. 2019)

fact is that, despite the small distance from the reserves of Volhynian flint (about 80 km), the inhabitants of a settlement in Vynnyky, site Lysivka, were very economical with their use of this material (Sobkowiak-Tabaka 2019).

From the very beginning, the groups of the FBC from west Ukraine maintained relationships with communities of the TC, as reflected in the imports of tableware ceramics identified in the early stages of settlements in both Kotoryny (Hawinskyj *et al.* 2013) and Zimne (Peleshchishin 2004), dated to the period between 3650-3400 BC (Fig. 1: B; 2: B; Rybicka *et al.* 2019), and in the later stage represented by settlements like Rudniki (Konopla and Gavinskiy 2013), Małe Grzybowice (Gavinskiy 2009), Lezhnitsa, site Czub (Rybicka *et al.* 2019), and Vynnyky, site Lysivka (Gavinskiy 2013; Diachenko *et al.* 2019; Rybicka *et al.* 2019).

Within the collections of the three aforementioned settlements, there were some examples following the technologies (Fig. 6; Rybicka *et al.* 2018; Diachenko *et al.* 2019) and style (Rybicka *et al.* 2019) of ceramics of the TC (*cf.* Rauba-Bukowska 2019; Rybicka 2015; 2016b). Their chronology corresponds to stage II of Gródek nad Bugiem and the settlement in Zimne (Rybicka *et al.* 2019). Similar to how the CII stage of the TC in Western Volhynia adapted the patterns of Funnel Beaker technologies for making kitchenware ceramics (Rybicka 2017), the communities living in the presented settlements adopted some features of the TC (Diachenko *et al.* 2019; Rybicka *et al.* 2019).

In western Ukraine, most of the known permanent settlements of the FBC were situated in the high situated flat areas (*e.g.* Kotoryny, Grodzisko III, Trostianets, Lezhnitsa, Vynnyky-Lysivka, Mali Hrybovychi, Zimne; Diachenko *et al.* 2019; Hawinskyj *et al.* 2013; Gavinskiy and Pasterkevich 2016; Rybicka *et al.* 2018; Rybicka *et al.* 2019; Gavinskiy 2009; 2013; Konopla and Gavinskiy 2013; Peleshchishin 2004). Therefore, their location is similar to the settlements of the Brînzeni and Gordineşti groups (Król 2019). The areas suitable for settlement were not larger than 4 hectares (Vynnyky-Lysivka). The settlements themselves were not large. It is not possible to say how were they constructed or how many houses were functioning at any one time. The remains of houses were identified in the form of clusters of daub. They are not equivalent with the construction features of the Brînzeni group (Markevich 1981). Moreover, the households were much different from the ones characteristic for the TC (*cf.* Markevich 1981; Rybicka *et al.* 2018; Diachenko *et al.* 2019). Currently, it is not possible to describe the dynamics of changes in the manner of planning the settlements of the FBC. It is difficult to tell whether the intensification of relations between the FBC and the TC resulted in changes in agricultural and settlement systems of the FBC. According to A. Sady (2019), we may observe much similarity in the range of cultivated plants between the FBC and the TC, with the predominance of *Triticum dicoccon,* whereas *Triticum monococcum* is only an additive in sowing emmer wheat and does not form the basis for monocultural cultivation. Based on available data, it is impossible to describe, both in case of the FBC and the TC (Markevich 1981; Zabilska-Kunek 2013), the agricultural practices for cultivation and farming (Kruk 1980, 326-333) or

Fig. 6. Lezhnitsa, site Czub, Ivanychi raion.
Ceramics with Funnel Beaker culture (A) and Tripolye culture features (B) (acc. to Rybicka *et al*. 2019)

which animals were intended for consumption. The lack of data that would allow for comparison of changes between the agricultural and settlement systems hampers the description of mutual relations between the two cultures.

CONCLUSIONS

Is it possible to observe two parallel processes, gradual "Tripolization" of the FBC and "Beakerization" of the TC in western Ukraine?

Some researchers have connected the first process with Bug communities of the FBC (Kośko 1981; Jastrzębski 1989). Intensification and diversity in relations between the two cultures may be observed in the Volhynian borderlands, where Volhynian flint was an accelerant (Rybicka 2017, 148-151). On the basis of available data, it is suggested that in the early stage of CII, dated to 3500-3350 BC, there were vessels of the FBC made with TC kitchenware technology, and a small collection of TC kitchenware made of clay weakened with fire clay (Fig. 2A; Novomalin-Podobanka; Rybicka 2017). Between 3300-3100 BC, there was a change in the production of everyday-use vessels of the TC (Rybicka 2016b). In case of Vynnyky, site Lisivka, and Lezhnitsa, site Czub – representing the end of the 4th millennium BC – there appeared FBC ceramics made in a method similar to the technology of TC tableware (Rybicka *et al.* 2019). The available sources prove the process of "Tripolization" of FBC and "Beakerisation" of TC vessels in Western Volhynia (Pasterkiewicz *et al.* 2013; Rybicka 2017, 151; Rybicka *et al.* 2019).

To sum up, research conducted in recent years in Western Ukraine regarding the FBC and TC showed not only how strong were the relationships between their communities, but also what problems should be analyzed in the future (*e.g.* technology of flint-tool production, settlement patterns, features of the natural environment).

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PLANTS OF THE FUNNEL BEAKER CULTURE IN POLAND

ABSTRACT

Nowak M., Lityńska-Zając M., Moskal-del Hoyo M., Mueller-Bieniek A., Kapcia M., Kotynia K. 2020. Plants of the Funnel Beaker culture in Poland. *Sprawozdania Archeologiczne* 72/1, 87-114.

Neolithic communities appeared in Polish territories around the mid-6th millennium BC. However, until the beginning of the 4th millennium BC, they inhabited only small enclaves. This situation changed within the first half of the 4th millennium BC, when the most of the Polish territories became settled by Neolithic groups attributed to the Funnel Beaker culture (TRB). There is a fairly large amount of data on plants cultivated by TRB people. Based on this, one can conclude that mainly *Triticum dicoccon*, *T. monococcum* and *Hordeum vulgare* were grown. *T. dicoccon* and *T. monococcum* could be sown together. It should be noted that large amounts of weeds typical of cereal fields have been recorded. It is much more difficult to determine the economic importance of other cultivars because of their low numbers. Nevertheless, the TRB inventories contain remains of *Pisum sativum*, *Lens culinaris*, *Linum usitatissimum* and *Papaver somniferum*.

Keywords: Poland, Neolithic, Funnel Beaker culture, cultivated plants, cultivation model
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INTRODUCTION

Neolithic communities appeared in Polish territories after the mid-6th millennium BC. The early phase of the Neolithic is represented by the Linear Band Pottery culture (*Linearbandkeramik* = LBK), like in other parts of Central Europe (*e.g.* Czekaj-Zastawny *et al.* 2020; Bogucki 2008a). Settlement of the LBK can be described as island-like, because the majority of sites concentrate in relatively small enclaves, which are characterized by ecological conditions favourable for agriculture. After the disappearance of the LBK in the early 5th millennium BC, the pattern of spatial distribution of Neolithic settlement remained basically unchanged. A substantial majority of sites of the Stroke Band Pottery culture and archaeological groupings belonging to the so-called Lengyel-Polgár complex (L-PC) still occurred in the same enclaves as sites of the LBK (*e.g.* Bogucki 2008b; Pyzel 2010; 2018, 138-200).

In the very late 5th millennium BC and onwards, this pattern began to change. The area of Neolithic settlement was gradually expanding, and tended to cover the whole landscape. Consequently, the island-like settlement pattern disappeared. At about 3500 BC *ca.* 80% of territories in the Vistula and Oder basins were included into the Neolithic formation. It is possible to say that during the first half of the 4th millennium BC, the Second Stage of Neolithisation took place in east-central Europe, which was equally as important as the first one (Kozłowski and Nowak 2019; Nowak 2001, 2009). This stage is connected with the Funnel Beaker culture (*Trichterbecherkultur* = TRB), which covers not only Poland, also but vast territories from the Netherlands to western Ukraine, and from southern Sweden to Lower Austria.

MATERIALS AND METHODS

Currently, there is a relatively large amount of data on plants connected with the TRB. In the paper, analyses made on 57 sites will be used. However, our study is first and foremost based on sites where more than 10 specimens of all taxa were found, although in the literature other methods of material selection have also been applied (*e.g.* Kirleis and Fischer 2014; Mueller-Bieniek and Walanus 2012; Wasylikowa *et al.* 1991). Sites that meet this requirement are concentrated in western Lesser Poland, in Lower and Upper Silesia as well as in Kuyavia and Greater Poland (Fig. 1). We are aware that this situation is disadvantageous in terms of the spatial representativeness of these data. The vast territories in which quantitatively and qualitatively substantial remains of TRB communities have been recorded – important for our knowledge of this phenomenon – such as Pomerania, Chełmno Land, Central and Eastern Lesser Poland, have provided little, if any, relevant information. Notwithstanding the absence of sites that correspond to the above criterion, this state of affairs is also due to a somewhat objective factor, *i.e.* the low number of archaeobotanical

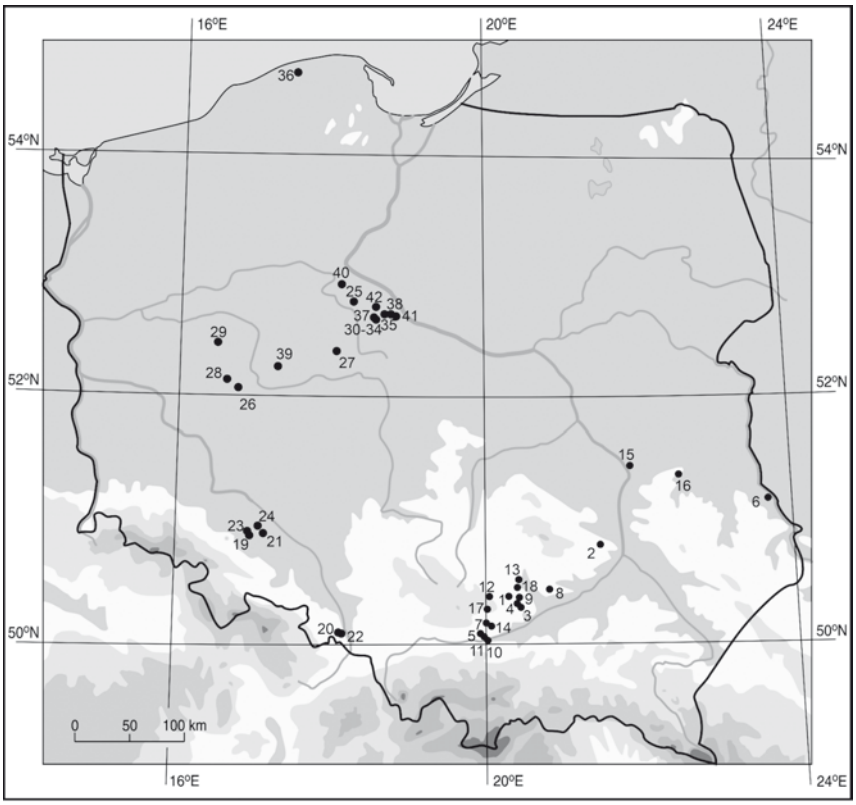


Fig. 1. Locations of the TRB sites on which the sum of the preserved specimens of all taxa exceed 10 pieces. **Lesser Poland:** 1. Bronocice (Lityńska-Zając 2007a; Kruk *et al*. 2016); 2. Ćmielów (Podkowińska 1961); 3. Donatkowice, site 23 (Mueller-Bieniek, unpublish.); 4. Donosy, site 3 (Lityńska-Zając 2007a); 5. Giebułtów, site 1 (Lityńska-Zając unpublish.); 6. Husynne, site 1 (Klichowska 1969a); 7. Iwanowice-Klin (Lityńska 1990), 8. Kawczyce, site 1 (det. by Lityńska-Zając in: Nowak 1994); 9. Kobylniki, site 4 (Kruk *et al*. 2016); 10. Kraków-Mogiła, site 62 (Gluza *et al*. 1988; Kapcia and Mueller-Bieniek 2018); 11. Kraków-Prądnik Czerwony (Rook and Nowak 1993); 12. Miechów, site 3 (Moskal-del Hoyo *et al*. 2017; Mueller-Bieniek *et al*. 2018a); 13. Mozgawa, site 1-3 (Kotynia 2016; Moskal-del Hoyo *et al*. 2018); 14. Niedźwiedź (Burchard and Lityńska-Zając 2002); 15. Parchatka, site 12 (Lityńska-Zając 1995); 16. Pliszczyn, site 9 (Sady 2015); 17. Smroków, site 17 (Lityńska-Zając 2010); 18. Zawarża, site 1 (Lityńska-Zając 2002); **Silesia:** 19. Janówek (Klichowska 1968); 20. Pietrowice Wielkie (Klichowska 1969b); 21. Polwica-Skrzypnik (Lityńska-Zając 2009a); 22. Racibórz, site 423 (Sady 2014); 23. Strachów, site 2 (Lityńska-Zając 1997b); 24. Wojkowice, site 15 (Lityńska-Zając 2009b); **Kuyavia, Greater Poland and Pomerania:** 25. Inowrocław-Mątwy, site 1 (det. by Klichowska in: Kośko 1981); 26. Kokorzyn, site 2 (Klichowska 1972); 27. Kopydłowo, site 6 (Abramów 2015); 28. Kotowo, site 1 (Klichowska 1972); 29. Mrowino, site 3 (Klichowska 1972; det. by Dzięczkowski in: Wierzbicki 2013); 30. Opatowice, site 1 (Koszałka 2007a); 31. Opatowice, site 3 (Koszałka 2014); 32. Opatowice, site 12 (Klichowska 1979); 34. Opatowice, site 42 (Koszałka 2007b); 35. Osłonki, site 2 (Mueller-Bieniek 2016); 36. Poganice, site 4 (Klichowska 1985, det. by Luijten, Polcyn and Wasylikowa in: Wierzbicki 1999); 37. Radziejów Kujawski (Klichowska 1970); 38. Smólsk, site 2/10 (Mueller-Bieniek 2016; Mueller-Bieniek *et al*. 2016); 39. Szlachcin, site 3 (Klichowska 1966); 40. Tarkowo, site 23A-23B (det. by Klichowska in: Kośko 1981); 41. Wolica Nowa (Bieniek 2007; Mueller-Bieniek 2016); 42. Zarębowo, site 1 (Klichowska 1972)

samples. However, it is our belief that waiting for this situation to improve is unrealistic, or in any case it would take too long. The available database, despite its uneven dispersion, is so extensive and scientifically valuable that it deserves to be synthesized these days.

The identification of cultivated and wild plants was possible thanks to the examination of charred remains and/or plant impressions on burnt clay. Charred remains were either scattered in different kinds of features (pits, postholes, fireplaces) or found concentrated in storage pits. Different numbers of samples were analysed at archaeological sites. These were either single samples or numerous samples, collected systematically in many features. At some sites only imprints preserved in daub and/or on pottery were taken into account. Archaeobotanical analyses of only four graves were executed; all these graves come from Bronocice (Lityńska-Zając *et al*. 2016). This makes consideration of social and ritual behaviours connected with plants impossible (see *e.g*. Kirleis *et al*. 2012).

The cereal remains were preserved as the charred caryopsis and fragments of spike and spikelet as glume, palea, lemma, spikelet forks, spike (rachis internodes) and stem fragments. Other cultivated and wild plant remains preserved as charred seeds and fruits. Only fruits of *Lithospermum arvense* (field gromwell) and *L. officinale* (common gromwell) were mostly uncharred. Other uncharred remains found in settlements are considered to be younger or present-day contaminations. Burnt clay fragments and ceramics contained cereal impressions of caryopsis and vegetative part of plants. Some of them contained charred plant fragments preserved inside.

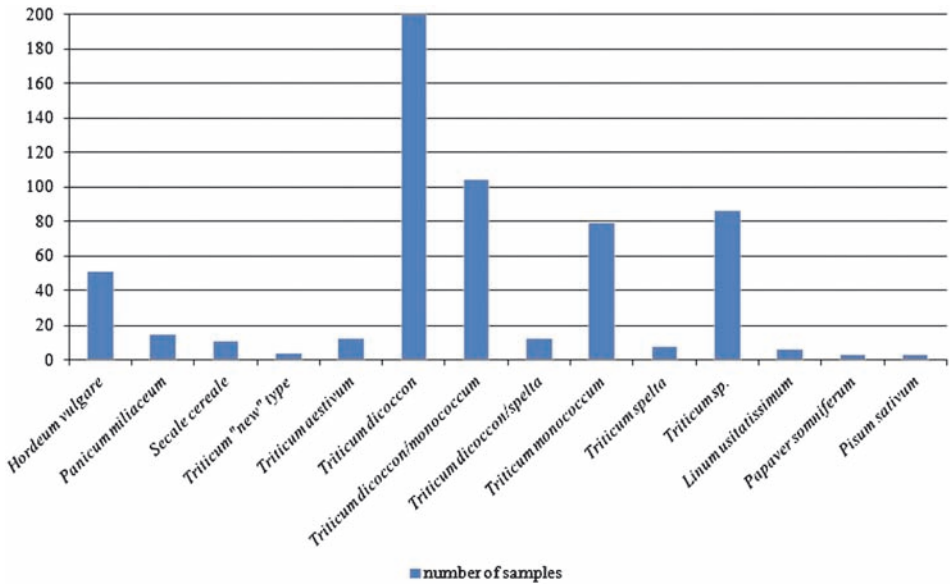


Fig. 2. Frequency of cereals and other cultivated plants, in number of samples with cultivated plants in the LBK

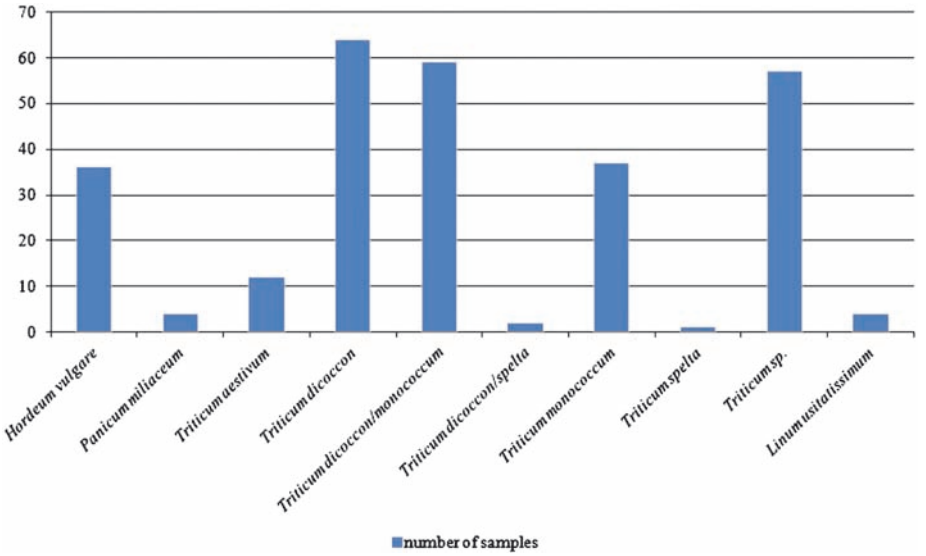


Fig. 3. Frequency of cereals and other cultivated plants, in number of samples with cultivated plants in the L-PC

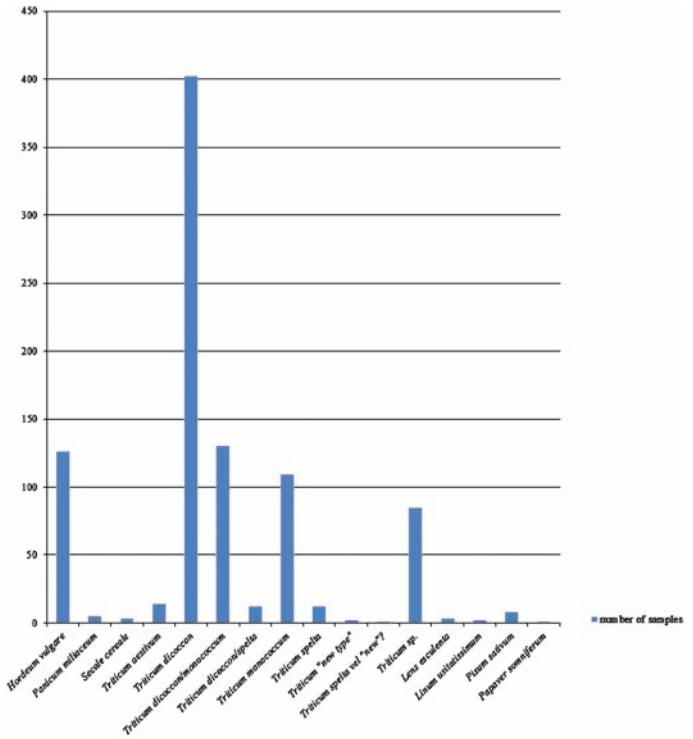


Fig. 4. Frequency of cereals and other cultivated plants, in number of samples with cultivated plants in the TRB

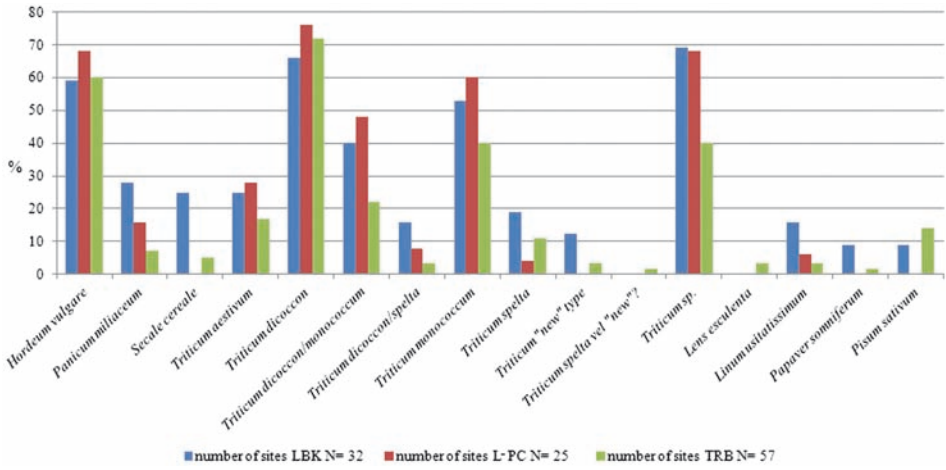


Fig. 5. Frequency of cereals and other cultivated plants by percent, calculated in relation to the total number of sites with cultivated plants in three archaeological Neolithic phenomena

Based on the TRB sites from Poland, 8 species of cereals, 4 of other cultivated plants, as well as 13 species and 18 genera of wild herbaceous plants were identified (see Lityńska-Zając 2005, table VI). Due to aforementioned regional concentrations of sites with archaeobotanical data analysis of the structure of crops was carried out with regard to the division into three regions: Lesser Poland (Table 1), Upper and Lower Silesia (Table 2), and Greater Poland, Kuyavia and Pomerania (Table 3).

Numbers of plant remains have not been compared. This is due to two reasons: 1. For some sites we do not have quantitative data; in some cases, we know only that there were numerous findings of particular species, 2. Comparison of the number of specimens from storage pits – occurring in the thousands in each pit – with single remains, preserved scattered in different features, would mean that a given deposit of grain can be crucial for the alleged dominance of a particular species, found in this deposit. Deposits of this kind usually are not very representative, even for a specific site, and are not relevant to the structure of cultivated plants in a particular village, because they probably contain grain from only one harvest (Lityńska-Zając 1997a).

In order to standardize results of analyzes and facilitate further interpretations, a comparison method was used (Tables 1-3) in which remains of cereals were grouped into caryopses and chaff. State of preservation was omitted. Consequently, burned and imprinted specimens were treated together. The following numerical intervals were used: 1. Up to 10 specimens, 2. 11-100, 3. 101-1000, 4. Over 1000 specimens. Remains described only as *Cerealia* indet. or *Cerealia* indet. vel. Poaceae indet. were also skipped. For a given taxon, remains identified to the species level and probably to the species ("cf.") level were included.

The TRB in many respects differs from the so-called Danubian Neolithic, *i.e.* the LBK and L-PC. It is interesting to investigate, therefore, whether the crystallisation and development of the TRB correlate with changes in plant economy. Thus, the TRB data were compared to data from these two older phenomena. Such comparison was made taking into account the number of samples with cereals and other crops, calculated for these three archaeological units, across all of Poland (Figs. 2-4). The mutual quantitative proportions of cereals and other crops are shown in Fig. 5.

RESULTS

Cereal crops

In Lesser Poland, seven cereal species were identified (Table 1). Remains of plants occur mainly scattered in various kinds of anthropogenic features. At some sites, they were found in storage pits. *Triticum dicoccon* (emmer) was discovered very frequently (16 of 18 sites taken into consideration) and in large amounts. At five sites, several hundred caryopses and imprints were recorded, not to mention the foregoing deposits where the number of identified specimens exceeded 1,000. An extreme case is feature 32 at Kraków-Prądnik Czerwony, where this figure is estimated at 150,000 (Rook and Nowak 1993). *T. monococcum* (einkorn), preserved also as caryopses and chaff, co-occurred with *T. dicoccon* at 13 sites. There are no cases of the exclusive occurrence of *T. monococcum*. Einkorn was generally less numerous than emmer. The quantity of *Hordeum vulgare* (barley) is relatively small. Its most numerous assemblage was found at Niedźwiedź (267 imprints on daub – Burchard and Lityńska-Zając 2002). Despite small numbers, *H. vulgare* occurred relatively frequently, *i.e.* at 13 sites, in two of which neither emmer nor einkorn was identified. At a few sites, finds of *T. spelta* (spelt), *Secale cereale* (rye), as well as – at one site – *Panicum miliaceum* (millet) were recorded.

In the case of the multi-phase settlement at Bronocice (Kruk *et al.* 2016), *T. dicoccon*, *T. monococcum* and *H. vulgare* were present in all phases. In the very first (BR I) phase, dated, according to different views (Kruk and Milisauskas 2018; Kruk *et al.* 2018; Nowak 2017 – these quotations refer also to later Bronocice phases), to *ca.* 3950/3750-3800/3700 BC, *H. vulgare* is the most frequently found, but in the subsequent phases of BR II (*ca.* 3700/3600-3500 BC), BR III and BR IV (*ca.* 3500/3400-3200/3100 BC), *T. dicoccon* is the most important cereal crop. In the last phase (BR V – *ca.* 3200/3100-2850/2750 BC), *H. vulgare* "returns," but in lower frequency than in phase BR I. Starting from BR III, specimens of *T. spelta* were also found in plant assemblages.

In all of the analysed sites in Silesia (Table 2), *T. dicoccon* and *H. vulgar*e were recognized, whereas *T. monococcum* occurred in only two sites. The numbers of identified charred remains and imprints were low. Only on the sites of Strachów and Polwica were more than 10 specimens of *T. dicoccon* found.

Table 1. Occurrence of cultivated plants on sites of the TRB in Lesser Poland. Explanations: State of preservation: ch – charred remains, i – imprint; kind of remains: c – caryopsis, s – seed, chaff – including fragments of spike and spikelet as glume, palea, lemma, spikelet forks, spike rachis. Frequency X: up to 10 specimens, XX: 11-100 specimens, XXX: 101-1000 specimens, XXXX: over 1000 specimens

taxa name	state of preservation	kind of remains	Bronocice	Ćmielów	Donatkowice, site 23	Donosy, site 3	Giebułtów, site 1	Husynne, site 1	Iwanowice-Klin	Kawczyce, site 1	Kobylniki, site 4	Kraków-Mogiła, site 62	Kraków-Prądnik Czerwony	Miechów, site 3	Mozgawa, site 1-3	Niedźwiedź	Parchatka, site 12	Pliszczyn, site 9	Smroków, site 17	Zawarża, site 1
Hordeum vulgare	ch, i	c	XX		XX	XX	X	X		X	X	X			X	XXX		XX	XX	X
	i	chaff			X						X					X		X	X	
Panicum miliaceum	ch	c									X									
Secale cereale	i	c	X												X					X
Triticum aestivum	ch	c	X					X						X				X		XX
Triticum dicoccon	ch, i	c	XXX	XXXX	XX	XX	X		X		X	XXXX	XXXX		XXX	XX	XXXX	XX	XXX	XX
	ch, i	chaff	XX		XXX	XX					XX	XX	?	XX	X	XXX	XXX	XX	XXX	XX
Triticum dicoccon vel *T. spelta*															X					
Triticum monococcum	ch, i	c	XX		XX	X					X	XX	XX		XX	X	XX	X	X	X
	ch, i	chaff	XX		XXX							X		XX	X	X	X	XX	X	X
Triticum dicocoon vel *T. monococcum*	ch, i	c	XX			XXX									XX	X	XXX			
	s	wkł			XXX	XXX										XX	XX		XXX	

taxa name	state of preservation	kind of remains	Bronocice	Ćmielów	Donatkowice, site 23	Donosy, site 3	Giebułtów, site 1	Husynne, site 1	Iwanowice-Klin	Kawczyce, site 1	Kobylniki, site 4	Kraków-Mogiła, site 62	Kraków-Prądnik Czerwony	Miechów, site 3	Mozgawa, site 1-3	Niedźwiedź	Parchatka, site 12	Pliszczyn, site 9	Smroków, site 17	Zawarża, site 1
Triticum spelta	ch, i	c	XXX															x		x
	i	chaff																	x	
Triticum sp.	ch, i	c	x		XX		x		x			?			XX	XX		XX		x
	ch, i	chaff			XX					x				XX	XX					x
other cultivated plants																				
Lens culinaris	ch	s	x												XX					
Linum usitatissimum	ch	s		?											x					
Pisum sativum	ch	s		?											XX					

Table 2. Occurrence of cultivated plants on sites of the TRB in Silesia; explanations in Table 1

taxa name	state of preservation	kind of remains	Janówek	Pietrowice Wielkie	Polwicea-Skrzypnik	Racibórz, site 423	Strachów, site 2	Wojkowice, site 15
Hordeum vulgare	ch, i	c	X	X	X	X	X	X
	i	chaff		X	X			
Triticum dicoccon	ch, i	c	X		X		XX	X
	ch, i	chaff		X	XX	X	XX	X
Triticum monococcum	ch, i	c			X		X	
	ch, i	chaff					X	
Triticum dicoccon vel *T. monococcum*	ch, i	c			X	X	X	XX
	ch, i	chaff			X	X		X
Triticum sp.	ch, i	c				X		X

In Kuyavia, Greater Poland and Pomerania, seven species of cereal crops were identified (Table 3). *T. dicoccon* occurred in 13 of the 18 investigated sites. On eight of these 13 sites charred remains and imprints of *T. monococcum* were recorded. *T. monococcum* was found without emmer on only one site (Szlachcin). On the other hand, there were sites in Kuyavia where *T. monococcum* predominates and *T. dicoccon* is scarcely represented, *e.g.* Osłonki 2 (159 specimens of einkorn *vs.* 14 of emmer – Mueller-Bieniek 2016). *H. vulgare* was recorded on 10 sites. *T. aestivum, T. spelta* and "new" glume wheat were identified in a smaller number of plant assemblages, similar to *P. miliaceum*.

The numbers of remains of the aforementioned taxa in single assemblages usually did not exceed a few dozen specimens, even in the case of emmer. This is a situation similar to Silesia, and different from Lesser Poland, where amounts of identified finds were generally higher. This observation applies, interestingly enough, even to those sites in Kuyavia and Greater Poland that have been investigated in recent years, *i.e.* sites in which systematic sampling has been performed (Kopydłowo, Osłonki, Smólsk, Wolica Nowa), though no doubt this resulted in a greater taxonomical diversity (*vide* Kopydłowo, Wolica Nowa). The exceptions are constituted by hundreds of charred grains and imprints of *H. vulgare* at Mrowino 3 (Wierzbicki 2013, 251) and thousands of charred grains of *T. dicoccon* on the Pomeranian site of Poganice 4 (Wierzbicki 1999). Certainly, deposits discovered at Opatowice 12, Radziejów Kujawski, Zarębowo 1, and Poganice 4, containing several thousand specimens of *T. dicoccon* mixed with *T. monococcum* (but not at Poganice 4), constitute another exception.

Other cultivated plants

Only four taxa of other cultivated plants were identified on the TRB sites (Tables 1-3): *Linum usitatissimum* (flax), *Papaver somniferum* (opium poppy), *Lens culinaris* (lentil) and *Pisum sativum* (pea). The numbers of identified specimens were very low. The only exception is at the newly investigated site of Mozgawa, due to a higher amount of *L. culinaris* and *P. sativum* (Kotynia 2016). We cannot exclude, however, that this results from the extensive sampling strategy.

Wild plants

On the whole, 31 weed taxa were identified at TRB sites,, including 19 archaeophytes and 12 apophytes (see the full list in: Lityńska-Zając 2005, table VI). Table 4 presents the 10 species of weeds that were found at the highest number of sites (sites of the LBK and L-PC were also included there). In the examined materials, remains of *Bromus secalinus* (rye brome), *Agrostemma githago* (corn-cockle), *Echinochloa crus-galli* (cockspur), *Chenopodium album* (goosefoot) and *Fallopia convovulus* (wild buckwheat) were most often represented. Of the other wild plants that might have had alimentary importance, *Malus sylvestris* (wild apple), *Pyrus* sp. (wild pear) and hazelnuts should be mentioned (Bieniek 2007; Bieniek and Lityńska-Zając 2001; Kruk *et al.* 2016; Wierzbicki 1999, 220, 223-226).

Comparison with earlier Neolithic units

Turning to the comparison between the TRB and the earlier, Danubian Neolithic units, we find that the L-PC is characterized by the lowest taxonomical variability. However, this could be the result of the L-PC having the lowest number of investigated sites, as the variability for the LBK and TRB is similar. In other words, we should not interpret this observation as a reflection of any trends or changes within the plant economy of the L-PC. In general, there are no conspicuous differences between the TRB and earlier Neolithic units. In all of them, emmer is the most important crop, while einkorn and barley are ranked in second and third place, respectively (see Figs. 2-4). Only minor differences can be postulated. The importance of einkorn seems to be lowest in the TRB. In case of the absolute number of sites, these ratios are 53% for the LBK, 60% for the L-PC and 42% for the TRB. On the other hand, if we calculate the ratio of einkorn to emmer by the number of samples, it turns out that it amounts to over 50% for the LBK and the L-PC, and approx. 30% for the TRB. These trends are clearly visible in specimens identified as *T. dicoccon* vel *T. monococcum*. In the TRB, there are even lower proportions of einkorn as compared to barley. In turn, barley seems to have a bit lower share in the LBK, at least when we consider quantity of samples.

Table 3. Occurrence of cultivated plants on sites of the TRB in Kuyavia, Greater Poland, and Pomerania; explanations in Table 1

taxa name	state of preservation	kind of remains	Inowrocław-Mątwy, site 1	Kokorzyn, site 2	Kopydłowo, site 6	Kotowo, site 1	Mrowino, site 3	Opatowice, site 1	Opatowice, site 3	Opatowice, site 12	Opatowice, site 33	Opatowice, site 42	Osłonki, site 2	Poganice, site 4	Radziejów Kujawski	Smólsk, site 2/10	Szlachcin, site 3	Tarkowo, site 23A-23B	Wolica Nowa, site 1	Zarębowo, site 1
Hordeum vulgare	ch, i	c	XXX	XX	X	XX	XXX					X		X		XX	X	XXX		
	i	chaff	XX		X		XXX											XX		
Panicum miliaceum	ch	c	X														XX	X		
Triticum aestivum	ch, i	c								XX		X			XX		X			X
Triticum dicoccon	ch, i	c		X	X		X	X	X	XXXX	X	X		XXXX	XXXX				X	XXXX
	ch, i	chaff			XX					XX		X	XXX	XXXX					X	
Triticum dicoccon vel *T. spelta*														X						
Triticum monococcum	ch, i	c			X			X		X		X			XXX		X		X	XXX
	ch, i	chaff			XX			X				X	XX						XX	
Triticum "new" type																			X	
Triticum spelta	i	c				X						X								
Triticum spelta vel "new"?	i	chaff											X							
Triticum sp.	ch, i	c	X			X	XX	X	X			X	X						XX	
	ch, i	chaff			X			X	X			X							XX	
other cultivated plants																				
Lens culinaris	i	s									X									
Pisum sativum	ch, i	s		X								X					X		X	
Papaver somniferum	ch	n																	X	

Table 4. Frequency of weeds in archaeological sites representing the LBK, L-PC, and TRB and their present day phytosociological classification (after Matuszkiewicz 2001 and Zarzycki *et al.* 2002). Present day phytosociological classification: A – *Aperion*, Bt – *Bidention tripartiti*, Caucalid – *Caucalidion lappulae*, Cc – *Centuretalia cyani*, L – *Linion*, Pan-Setar – *Panico-Setarion*, Pol-Chen – *Polygono-Chenopodietalia*, Stel med – *Stellarietea mediae*

species name	phytosociological classsification	LBK	L-PC	TRB
Agrostemma githago	Cc	2	3	14
Bromus secalinus	A	5	3	21
Chenopodium album	Stel med, Pol-Chen	15	13	13
Echinochloa crus-galli	Stel med, Pol-Chen	9	4	12
Fallopia convolvulus	Stel med	7	11	12
Galium spurium	L, Caucalid	7	3	3
Lithospermum arvense	Cc	1	1	4
Polygonum lapathifolium s.l.	Pol-Chen, Bt	8	2	4
Polygonum persicaria	Stel med	6	2	2
Setaria pumila	Pan-Setar	10	1	3

An interesting observation is connected with other crops. Most of them seem to be the least important in the TRB (see especially Fig. 4). This applies particularly to *P. miliaceum*, *S. cereale*, *T. aestivum*, "new" glume wheat, *L. usitatissimum* and *P. somniferum*. Against this background, the predominance of emmer, as well as the considerable importance of barley and einkorn, is seen even more convincingly.

As regards cultivated plants other than cereals, it should be emphasized that from a general perspective, their significance was low in all three cultural units. In the TRB, *L. usitatissimum* and *P. somniferum* seem to comprise a slightly smaller share and Fabaceae a slightly higher one than in the earlier Neolithic.

DISCUSSION

Crops in the TRB

In the TRB in Polish territories, three cereal species clearly predominate: *T. dicoccon*, *T. monococcum* and *H. vulgare*. This is also reflected by the high shares of *T. dicoccon* vel *T. monococcum*. *T. dicoccon* is definitely ranked first. The importance of the other two crops is similar, perhaps with a slight predominance of barley. These three cereals occurred at a significant majority of the analyzed sites. There are only three sites where emmer was not "accompanied" by einkorn and barley, and four sites where einkorn or barley occurred "alone".

The great importance of cereal cultivation can be demonstrated by storage pits containing deposits of grain. They were discovered in at least eight sites of the TRB (Ćmielów, Kraków-Mogiła 62, Kraków-Prądnik Czerwony, Opatowice 12, Parchatka 12, Poganice 4, Radziejów Kujawski and Zarębowo 1). In these deposits, emmer distinctly predominates, but there is almost always an admixture of einkorn. Certainly, this suggests joint cultivation of these taxa (maslin), since both have similar edaphic requirements and similar life cycles (sowing, flowering, harvesting). One pit at Ćmielów, where clean grain of emmer was recorded, is an exception. Similarly, of the cereals, only emmer grains were registered in three or four pits at the site of Poganice 4. However, in addition to emmer, quite a number of hazelnut shells were discovered in these pits. It is worth noting that only three pits of this kind were found in the LBK and L-PC (Gluza 1984; Godłowska and Gluza 1989; Grygiel 2008, 550, 664-665; Lityńska 1990). In the TRB deposits, there is no barley. We should add, however, that barley deposits were recorded in the TRB context in the Czech Republic (Dreslerová and Kočár 2013).

Other cultivated plants formally appear to have minimal significance. Of course, the question arises whether a small share of other wheats, millet, pulses, flax, and poppy in macroscopic remains may result from their marginal role in past crops or from other causes, i.a. the number of tested samples, or certain taphonomic disturbances. For example, in the multi-cultural site 3 at Miechów (Fig. 1), some grains of millet were found in the Lublin-Volhynian features. However, one grain was ^{14}C dated and the result clearly indicated a chronology of the Late Bronze Age (Mueller-Bieniek *et al.* 2018a, 605).

In the case of pulses, there are suggestions that their poor representation in sub-fossil materials is conditioned by the fragility of the charred Fabaceae seeds. For instance, at the site of Tell el-Kerkh, 29 specimens of *Vicia faba* (broad beans) were obtained through flotation. However, after the transportation and unpacking of samples, only four pieces survived (Tanno and Wilcox 2006). On the other hand, at the TRB site at Mozgawa, pulses were found quite often and in a good state of preservation. In addition, we cannot forget that on many archaeological sites from later periods, numerous remains of pulses were present (*e.g. L. culinaris* at the Bronze Age site of Sobiejuchy in eastern Greater Poland – Palmer 2004). This corresponds to the views of some authors (*e.g.* Kohler-Schneider 2001), that pea and lentil became popular only in the late Bronze Age, simultaneously with the spread of millet. Besides, these plants (in the full, "Near Eastern" set, *i.e. Lathyrus sativus*, *L. culinaris*, *P. sativum*, *Vicia ervilia* and *V. faba*) are represented in the First Temperate Neolithic in the Balkans (*e.g.* Conolly *et al.* 2008). Thus, in these cases, the fragility of charred seeds did not negatively affect their preservation.

Altogether, one could wager that pea and lentil were probably sown in gardens by the TRB people, as was the case of the LBK and L-PC (Bogaard 2004; Kruk and Milisauskas 1999; Kruk *et al.* 2016, 147; Nowak 2009, 184, 392), but their importance in the diet was lower than in subsequent ages.

The status of *S. cereale*, *T. aestivum* and *T. spelta*, not only in the context of TRB, remains debatable. It is common belief that rye and spelt were only weeds of cereal crops in the Neolithic (Behre 1992; Lityńska-Zając 2007b, 213; Wasylikowa *et al.* 1991, 222-224), and we cannot rule out that such status should be assigned to all three aforementioned plants (Lityńska-Zając 2007a, 323). On the other hand, the identification of *T. spelta* in three phases at Bronocice (Kruk *et al.* 2016) suggests that this wheat could be grown, at least locally. The relatively early presence of *T. spelta* in eastern Central Europe should be studied in detail in the light of other European findings (Akeret 2005). Let us add that spelt is not very demanding in terms of soil, and it is resistant to low temperatures and excessive humidity (Janushevich 1976); furthermore, it produces a luxurious flour. For Neolithic people, these factors could be arguments for its cultivation.

Wild herbaceous plants

The frequent presence in the sub-fossil materials of herbaceous taxa, such as *B. secalinus*, *E. crus-galli*, *Ch. album* and *F. convovulus*, may result from their economic usefulness. Even *A. githago*, also frequently represented, can be used therapeutically and as a poison (Mueller-Bieniek 2012, 100; Zemanek 2012). Diasporas of these plants could have been intentionally collected (Behre 2008; Colledge and Conolly 2014; Mueller-Bieniek *et al.* 2018b; 2019a), or perhaps stored food was not cleaned of them, because they were fit for human consumption. Some of them are characterized by high fertility, *e.g.* one specimen of goosefoot produces about 100,000 seeds (Tymrakiewicz 1962, 31-32).

Regardless of their potential usefulness, the presence of field weeds in macroscopic assemblages provides important information about the patterns of cultivation. Cereal predominance in the plant economy of the TRB is implied not only by deposits and taxa structures, but also by weeds found in the context of the TRB, including the foregoing deposits as well. As we already know, the degree of weed infestation in grain found in deposits is insignificant. This could be due not only to the very good cleaning of grain by the farmers of the time, but also due to low (natural) contamination of crops. The degree of infestation of fields depends *i.a.* on the duration of their use. Therefore, a small number of weeds typical of cereal crops may reflect the short use of these fields.

According to M. Lityńska-Zając (2005, 264-267) plants found in cereal deposits of the TRB are linked (acc. to the current phytosociological perspective) with different environments: field, ruderal and forest. The large share of apophytes from riverine grasslands, meadows, and forest communities, and the predominance of perennial species among them, indicate that new stretches of land were taken for tillage. Native species, undamaged in the course of preparing the soil for sowing, could grow there. At the same time, a modest number of sites containing large amounts of weeds can be, to some extent, an argument for the sowing of cereals on freshly prepared fields. This aspect somewhat resembles the LBK

(Lityńska-Zając 2005, 267). Generally, all these facts and interpretations may mean that fields were located in different ecological conditions, including areas not previously exploited for agricultural purposes.

Trajectories and models of the plant economy

A serious deficiency in our knowledge on the plant economy of the TRB in Poland is due to the almost complete lack of information about early stages of this culture. Data obtained from the first phase of the TRB settlement at Bronocice point to the existence of a cereal economy as early as the first quarter of the 4th millennium BC (Kruk *et al.* 2016), similar to the not-so-distant site of Kawczyce (Nowak 1994). As regards the early phase of the eastern group of the TRB, currently only one imprint of *T. aestivum* on a pottery fragment at Łącko 6 (Domańska and Kośko 1983), and only two imprints of supposed *T. dicoccon* and *T. monococcum* on pottery fragments at Redecz Krukowy 20 (Mueller-Bieniek 2018) can be mentioned, which does not prove the everyday usage of cereals or their by-products. Perhaps it is significant that in the meticulously investigated site of Dąbki (north-central Pomerania), there are no domesticated plants in the context of the local early TRB, up to approx. 3700 BC (Czekaj-Zastawny *et al.* 2013, 423). Most probably, what we see here is the continuation of patterns of the local Mesolithic (Kalis *et al.* 2015). The cereal economy in the early TRB is also supported by pollen spectra obtained from ploughing furrows in the monumental, unchambered tomb no. 8 at Sarnowo 1 (Kuyavia), as well as from anthropogenic features at the settlement on the same site. They provided i.a. pollen of wheat and barley (Dąbrowski 1971). Similarly, an analysis of phytolites from ploughing furrows under the barrows of the monumental tombs at Zagaje Stradowskie (western Lesser Poland) suggests a cultivated field with wheat and probably barley (Polcyn *et al.* 1999).

Overall, the scarce data from the early TRB seem to demonstrate that cultivation was practiced by TRB people since the very beginning, although the significance of cereal cultivation, particularly in the Lowland zone, may have been moderate until *ca.* 3700/3600 BC. This interpretation closely mirrors observations made in northern Germany (Kirleis and Fischer 2014; Kirleis *et al.* 2012).

If we consider the global (*i.e.* not restricted to early stages) relationships to other groups of the TRB, we should indicate some similarities to the southern groups of this culture (Dreslerová and Kočár 2013), and some differences in relation to the northern group. In the latter, in addition to the noticeable importance of free threshing wheats in the Early Neolithic I, the share of barley is incomparably higher. In a large part of the Early Neolithic II and Middle Neolithic sites, it is the dominant species. On the other hand, the share of einkorn is surprisingly low (Kirleis and Fischer 2014).

Differences between the "Polish" archaeobotanical assemblages of the LBK, L-PC, and TRB seem to be small, both in quantitative and qualitative terms. They consist of a slightly

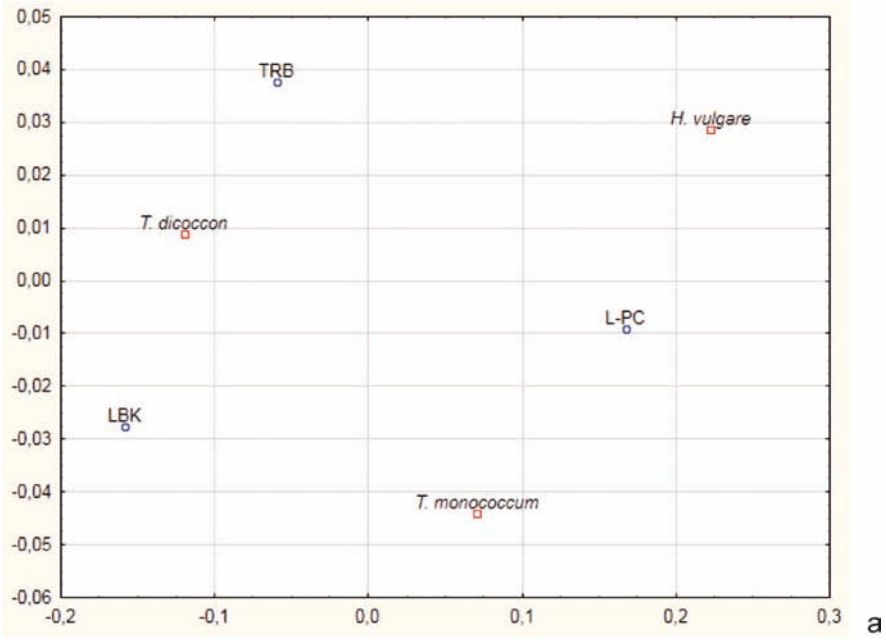
greater predominance of emmer, and a slightly greater importance of barley, in the case of the TRB. Interestingly enough, this impression has been confirmed by χ^2 test, performed on the basis of the data presented in Figs. 2-4 for emmer, barley, and einkorn. The resulting *p*-value of 0.0244 means that there is a statistically significant difference between the LBK, L-PC and TRB. This conclusion is also visible in the correspondence analysis for the same data (Fig. 6: A). It shows that the differences between the LBK and L-PC are of the same order as that between the Danubian Neolithic units and the TRB. A similar picture has been obtained (Fig. 6: B) when complemented with the respective ratios for *T. aestivum*, *T. spelta*, *S. cereale* and *P. miliaceum* (due to the small sample sizes of these taxa, the χ^2 test cannot be applied).

The comparison of these three archaeological units with respect to weeds is perhaps more interesting (Table 4). In current phytosociological terms, segetal weeds are classified in two distinct groups. The first includes species characteristic of cereal crops, and the second comprises species related to root plants (Matuszkiewicz 2001). This division, in spite of various objections to its usefulness in palaeoecology (Jones 2002, see further literature), is reflected in analyses of fossil sources. To weeds associated with root-crop communities (*Polygono-Chenopodietalia* and *Panico-Setarion*) belong *Ch. album*, *E. crus-galli*, *Polygonum lapathifolium* (pale persicaria) and *Setaria pumila* (yellow foxtail). Segetal communities found in cereal crops (*Aperion*, *Caucalidion lappulae* and *Centaureetalia cyani*) include *A. githago*, *B. secalinus*, *G. spurium* and *L. arvense*.

It turns out that some species associated with root crops (*P. lapathifolium* and *S. pumila*) occur more often on sites of the LBK and L-PC. On the other hand, some weeds occurring in cereal crops (*A. githago* and *B. secalinus*) were recognized more frequently on TRB sites. This may be related to changes in patterns of cultivation. Remains of the weeds of root-crop communities usually occurred in conjunction with remains of caryopses of hulled wheats and/or barley. Therefore, the presence of these weeds should rather be connected with cereal cultivation, in which soil was prepared with a technique similar to hoe farming (Kruk 1993). This was very close to the techniques used for root crops. In turn, the frequent presence of cereal weeds in the TRB was associated with cultivating fairly large amounts of land and giving up hoe farming techniques (*e.g.* Lityńska-Zając 2005, 367; Mueller-Bieniek 2016). In other words, in the TRB, an extensive cultivation of cereals would have prevailed.

The aforementioned data and interpretations, in themselves, do not give a clear answer to the question about patterns of plant cultivation in the TRB. The suggested picture of the dominant role of cereal crops might, however, compliment the classic model describing Neolithic settlement and economy, formulated in Polish literature by J. Kruk in 1970s (1973; 1980), and later developed in collaboration with S. Milisauskas (Kruk *et al.* 1996; Kruk and Milisauskas 1999).

This model assumes that the economy and settlement pattern of the TRB communities required the exploitation of extensive areas. The predominant type of farming was slash-



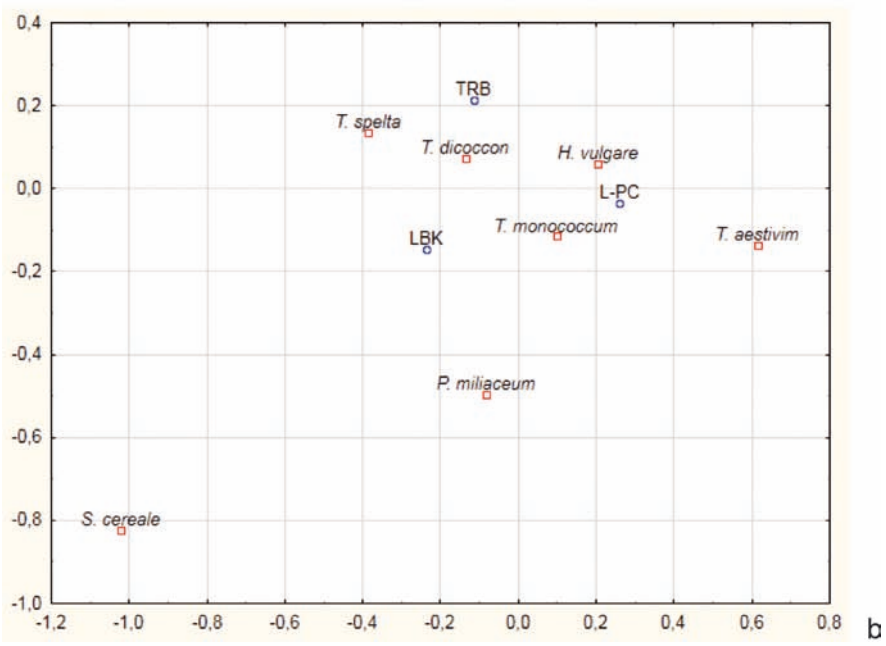


Fig. 6. Correspondence analysis of the LBK, L-PC, and TRB data (see Figs. 2-4) for a) emmer, einkorn, and barley and b) emmer, einkorn, barley, bread wheat, spelt, rye and millet

and-burn shifting cultivation practised on a massive scale, and the basic tool of agricultural technology was fire. Such a system was focused on cereal crops (Kruk and Milisauskas 1999, 147). The final result of this system was the significant deforestation of the landscape. The model under discussion referred primarily to the loess upland zone. However, some processes of anthropogenic deforestation could also have taken place in lowland areas (Kruk and Milisauskas 1999, 255-256).

It is worth mentioning at this point the recent analyses of isotopic compositions of carbonized cereal grains from the territory of Poland, including the TRB grains (Mueller-Bieniek *et al.* 2019b). The $\delta^{15}N$ values indicated that almost all cereal fields from which the TRB samples originated "could have received some inputs of fertilizer, including manure and household waste" (Mueller-Bieniek *et al.* 2019b, 11). This seems to contradict the above mentioned hypotheses of landscape deforestation, and implies intensive, permanent cultivation, at least in the upland zone of southern Poland, as almost all TRB samples come from there. On the other hand, in theory, it cannot be entirely ruled out that such isotopic signals of manuring may result from intentional burning of the vegetation to clear the land for agriculture (Mueller-Bieniek *et al.* 2019b, 2, 10, see further literature) the more so since δ13C values demonstrate that part of the TRB fields in southern Poland existed in more open, elevated landscapes, with lower water availability (Mueller-Bieniek *et al.* 2019b).

Obviously, this is a very complex issue among other reasons because not all categories of palaeoenvironmental data and not all palaeoenvironmental interpretations support Kruk's views. At present, his model seems to be supported more by geomorphological data, indicating intensive slope erosion in the 4th millenium BC (Kruk *et al.* 1996; Poręba *et al.* 2012; Szwarczewski 2009), than by palynological data, though of course there are some profiles with indicators of a substantial opening of woodland cover and traces of fire (*e.g.* Nowak 2001). On the other hand, we can easily point to many pollen profiles, obtained in regions with quite intensive TRB settlement, in which human traces are quite scarce (*i.a.* they contain little to no cereal pollen). This applies mainly to lowland areas (*e.g.* Herking 2004; Niewiarowski and Noryśkiewicz 1999; Noryśkiewicz 2006), but also upland ones (*e.g.* Nalepka 2003). We must remember, however, that palynological data are much less frequent in the loess highlands. It may therefore give a false impression of minimal human activity, based on the overrepresented lowland pollen data. For instance, the situation recorded in the recently investigated pollen profile at Mozgawa (*i.e.* in the loess zone) is very significant. The series of anthropogenic indicators seems to support the thesis of intense and widespread human environmental impact (Moskal-del Hoyo *et al.* 2018).

It should be emphasized that the lack of differences in palynological indicators of cereals between the LBK, L-PC and TRB (Milecka *et al.* 2004) does not necessarily imply similar cultivation systems. Palynological data do not reflect the actual species composition, nor the role of given crops (Grikpėdis and Motuzaitė Matuzevičiūtė 2016; Latałowa 2003; 2007). Species of the *Triticum* and *Hordeum* are self-pollinated; therefore, the possi-

bility of dispersions of sporomorphs is significantly reduced. As a result, their real importance is undervalued. To an even greater extent, this applies to *P. miliaceum* (Latałowa 2003, 279; Milecka *et al*. 2004).

The discussion of the possibility of distinguishing between permanent and shifting cultivation, based on archaeobotanical, palynological and archaeological data, has been going on for years (Ehrmann *et al*. 2014; Robin and Nelle 2014; Rösch *et al*. 2014; Baum *et al*. 2016; Jacomet *et al*. 2016; Rösch and Lechterbeck 2016). Totally opposed opinions have occurred in this regard. Universal indicators of these two types of cultivation have not been worked out, despite the fact that, in many cases, incomparably superior sets of source data (*e.g*. Jacomet *et al*. 2016) were available, when compared, for example, with the "Polish" TRB. Therefore, we took the liberty not to propose a decisive hypothesis for the "Polish" TRB in this matter. We are of the opinion that the current state of data and interpretations do not authorize us to do so. Certainly, this does not mean that shifting cultivation could not be practiced by the TRB communities in the Vistula and Oder basins. We can suppose that there was a patchwork of agricultural techniques, which best fit the local environmental and social conditions.

CONCLUSIONS

The following are the most important conclusions that should be put forward as regards the plants and the plant economy of the Funnel Beaker culture in Poland.

1. There is a predominance of *Triticum dicoccon* in the TRB, both in scattered material and in deposits.

2. *Triticum monococcum* frequently co-occurs in deposits as an admixture in small amounts. The pattern of deposition of caryopses of these two species of wheat suggests that they could be sown together, in the form of maslin with a predominance of emmer (up to 90%).

3. *Hordeum vulgare* occurs in a slightly higher number of sites than *Triticum monococcum*, but in lower amounts (mostly detected as imprints); there are no confirmed deposits of *Hordeum vulgare*.

4. The proportions (and importance) of other cereals and other cultivated plants are insignificant.

5. Weeds connected with the extensive cultivation of cereals grow in importance when compared to the Danubian Neolithic.

6. New archaeobotanical data suggest that pulses (pea and lentil) and flax were locally cultivated.

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SOME REMARKS ON FLAT GRAVES OF THE SOUTHEASTERN GROUP OF THE FUNNEL BEAKER CULTURE

ABSTRACT

Oberc T. 2020. Some remarks on flat graves of the southeastern group of the Funnel Beaker Culture. *Sprawozdania Archeologiczne* 72/1, 115-146.

Flat graves of the southeastern group of the Funnel Beaker Culture (FBC SE) are a phenomenon underrepresented in archaeological studies of the Eneolithic. Researchers' focus on "the megalithic idea" in recent decades left other forms of burial largely unexplored. In fact, it seems that even 70% of graves of the FBC SE could be described as part of the latter group. In this study, some comments on the location of flat graves within cemeteries, the construction and orientation of graves, as well some insights about the buried population will be provided. This research is based on a sample collected from previously published studies from most of the known geographical range of the FBC SE. As will be shown, the problem of flat graves is a complex one, which should be considered in the context of the entirety of FBC SE funerary practices.

Keywords: SE group of Funnel-Beaker Culture, Funnel Beaker Culture, cemeteries, funerary practises
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INTRODUCTION

This study focuses on graves of the southeastern group of the Funnel Beaker Culture (henceforth FBC SE), that have been found outside monumental tombs. So-called flat graves of the southeastern group of the FBC SE, despite quite large quantities of known

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examples, remain a poorly understood phenomenon. One possible reason for that is the fact that most of discussions on the funerary sphere of this cultural formation are focused on its monumental forms. Although there is no denying that the appearance of monumentalism is one of most distinctive traits of the Funnel-Beaker Culture, in terms of conceptualising funerary practices, flat graves are equally important, as they are present in all of its regional variations (for example, at sites such as Ostorf in NE Germany, Dragsholm in Denmark, and Sarnowo, site A1 in Kuyavia; Sjögren *et al.* 2015, 5; Król 2015, 108-109). This is especially true for the southeastern group of the FBC, where flat graves – both those spatially connected to chamberless tombs, and those set apart from them – are a complementary (or even major, in terms of the numbers of buried dead) element of funeral practice. For this reason, the aim of this work is to represent different aspects of these burials. The underlying question, therefore, is whether "monumental" vs. "non-monumental" is the only axis of diversification of FBC SE burials. Are there deeper differences in burial customs between the two groups, and how can we define them? To answer this, a more detailed question needs to be asked about flat graves found in the vicinity of monuments: do they represent the same, or a complementary funerary tradition to monumental barrows, or should they be considered separate flat cemeteries, "incidentally" set on the same site? For that purpose, the spatial context of the graves will be used as a major factor distinguishing them for further comparison.

This study focuses on the possibilities of classification of burial practices of the FBC SE as manifested in the archaeological record; there is no attempt to build a universal model of burial practices within the whole range of the FBC. The reason for the chosen focus is that the existing models for funeral practices in a regional scale are mostly either based on chamberless tombs (which are, in fact, more studies of monumentality than of the entirety of burial customs; *e.g.*, Król 2015; 2016), or they are case studies. In this context, two works of Marek Florek are worth noting; one specifically focuses on flat graves (Florek 2006a), while the second is a regional study of funeral rites of the FBC SE in the Sandomierz Upland (Florek 2008). These studies, however, do not exhaust the subject – which the present work, it is humbly hoped, will in some part fill in.

Data used in this study, suitable – in terms of quantity and quality – for wider analyses include constructions of graves, their location and orientation at the site, the state of preservation and number of individuals, their position, orientation (usually in relation to a grave), sex determination and estimation of age at death. In some graves, post-mortem manipulations have been registered, along with the use of fire and other traces of supposedly ritual activities. They are, however, not numerous enough for wider comparison. Though their presence is noted, for now they are considered variations in the more general categorisation. Grave goods have been found in a minority of graves and are usually limited to ceramic vessels or their parts and stone objects. Therefore, more elaborate methods of estimating relative wealth have not been used. Instead, the frequency of graves equipped with different categories of goods has been used for comparison between groups.

The terms "monumental tomb", "monumental barrow", "chamberless tomb" and similar labels will be used for large, stone, earthen or timber structures (or made of any combination of those materials) under which burials have been found, or into which have they been dug. Terms like "megalith" and "megalithic" will be avoided when possible, as will be any other material-specific equivalents of it (*e.g.* "megaxylon"). Graves that have not been part of these structures will be conventionally named "flat graves", while the term "flat cemetery" will be reserved only for groups of these graves, found on sites where no remains of chamberless tombs have been discovered.

For the analyses, plots, and map, open source software has been used, such as: QGIS, R, RStudio, and additional R packages (corrplot, ggplot2, plotly; cited as: R Core Team 2013; Wickham 2016; Wei and Simko 2017; QGIS Development Team 2019; RStudio Team 2019; Sievert 2020).

DATABASE

Examples chosen for this study come from well-known and published funeral sites of the FBC SE. The classification of a grave form, location, orientation, and position, as well as analyses of the anthropological characteristics of buried bodies were carried out based

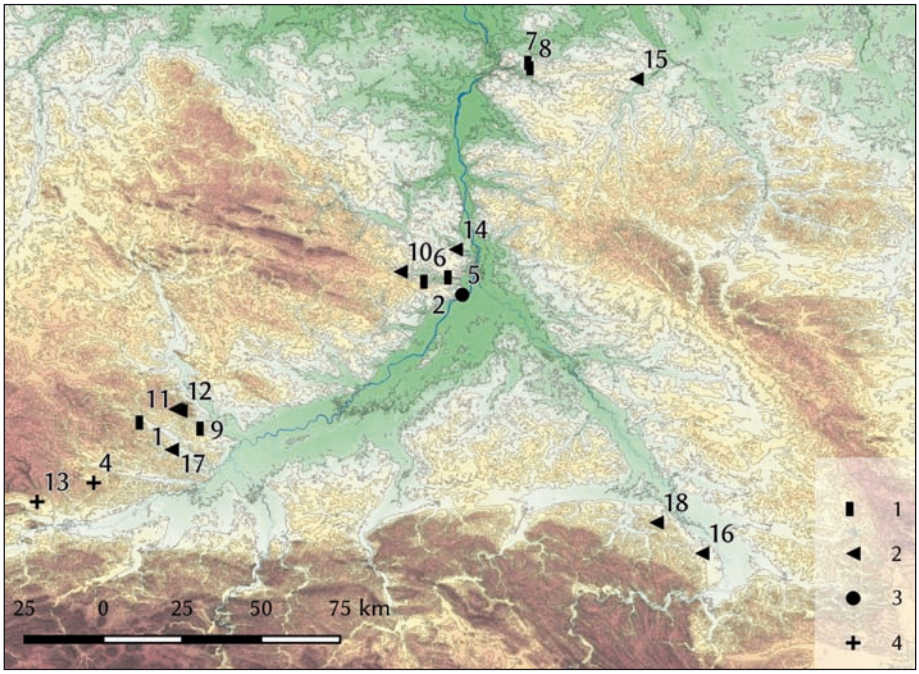

Fig 1. The area of interest with marked sites included in analyses. 1 – Flat cemeteries, 2 – Cemeteries with monumental tombs, 3 – Burials in settlements, 4 – unknown type of site. Numbering of sites as in Table 1

Table 1. Graves included in database. Burial zones as in Fig. 3

No.	Site	Monument = Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Flat cemetery = Zone 5	Settlement = Zone 6	Source
1	Bronocice 1	-	-	-	-	-	13	4	Milisauskas *et al.* 2016
2	Dacharzów 1	-	-	-	-	-	6	-	Florek 2006a; 2008
3	Gorzyczany 7	-	-	-	-	-	-	1	Florek 2006a; 2006b; 2008
4	Goszyce	-	-	-	-	-	3	-	Reyman 1936
5	Kamień Łukawski 1	-	-	-	-	-	-	1	Kempisty 1965; Florek 2006a
6	Kichary Nowe 2	-	-	-	-	-	6	-	Kowalewska-Marszałek *et al.* 2006
7	Klementowice XII	-	-	-	-	-	7	-	Uzarowiczowa 1966
8	Klementowice XIV	-	-	-	-	-	17	-	Uzarowiczowa 1970
9	Kolosy	-	-	-	-	-	2	-	Kempisty 1970; Włodarczak 2008
10	Malice Kościelne 1	18	7	8	-	-	-	-	Bargieł and Florek 2006a
11	Małżyce 30	4	-	-	-	-	-	-	Jarosz *et al.* 2009; Szczepanek 2009; Tunia and Włodarczak 2011;
12	Małżyce 31	1	-	-	-	-	-	-	Jarosz *et al.* 2013
13	Modlnica 5	-	-	-	-	-	-	1	Zastawny *et al.* 2011
14	Pawłów 3	10	-	8	-	11	-	-	Bargieł and Florek 2005; 2006b
15	Pilszczyn 9	10	-	-	-	-	-	1	Chmielewski 2015a
16	Skołoszów 7	7	-	21	-	3	-	-	Król *et al.* 2014a; Król *et al.* 2014b
17	Słonowice 5	7	-	12	6	-	-	-	Tunia 2006; Przybyła and Tunia 2013
18	Szczytna 6	1	-	-	-	7	-	-	Król *et al.* 2014b
19	Zagaje Stradowskie	1	-	-	-	-	-	-	Burchard 1998; 2006
Sum in zones		**59**	**7**	**49**	**6**	**21**	**54**	**8**	
Sum of flat graves		**59**	**145**						

on the authors' original descriptions and drawings in case studies and later, in published analyses. The main analytical database consists of 231 records representing human individuals buried in 204 graves, inside or outside of monumental structures (58 and 146, accordingly) from a total of 19 sites in SE Poland (Table 1, Fig. 1). Sites included in the data-

base should be considered a sample, not a complete list of sites including flat graves of the FBC SE. Many of the graves associated with this archaeological taxon remain unpublished or only partially published. This is the case of the well-recognised site 35 in Karmanowice (Nogaj 1987).

Data are grouped on the basis of observed clusters that are discovered inside supposed chamberless tombs, in aggregations outside of them, or in relative separation from any other graves. Of the graves in the database, about 185 could be described according to their construction, or at least by the presence or absence of stone elements in them. The age of the deceased could be approximated for 153 individuals, and sex could be estimated for 75. Information on the position and orientation of a body was available in 114 and 140 cases, respectively. The presence of grave goods had been confirmed in 72 cases.

Data concerning flat graves consists of 145 structures, with 161 burials within them. Of that number, 83 graves have been found along with monumental tombs, 54 in "flat" cemeteries, and 8 in settlement context.

In all analysed geographical areas, a majority of graves were found outside monumental tombs. They consist of about 71% in whole analysed sample. This number is more or less constant in the analysed regions. In western Lesser Poland, it is 75.9%, in Sandomierz Upland, 63.2%, in the Rzeszów Foothills, 79.4%, and in the Lublin area, 71.4% of graves consists of those not buried inside nor dug-in chamberless tombs. Unfortunately, the analysed data do not allow a more detailed comparison of regional differences. The reason for that is that most of the sites included in the database come from the first two of the aforementioned regions.

ABSOLUTE CHRONOLOGY

A precise chronology of flat graves of the FBC SE is, at this point, hard to establish. This type of burial seems to be in use throughout the duration of the southeastern group of the Funnel Beaker culture, with both the earliest and possibly the latest of dated graves (Fig. 2, Table 2). Although, the latter (*i.e.* Kichary Nowe 2) is the subject of discussion in terms of classification and dating (see Florek 2006a, 410; Włodarczak 2013, 375; Król 2015, 219). The earliest dated grave, no. XX from Bronocice, is a burial in an irregular pit. Three published dates from Słonowice come from graves supposedly aligned to chamberless tombs M VII and M VIII. The pits had a rectangular shape and no stone constructions, although traces of a wooden coffin have been found in grave 111. No burial goods have been found in any of the graves. In case of dated grave 1233 from Skołoszów, it was a rectangular pit set along the remains of a monumental tomb. A collared flask has been found in this grave. Two other dated flat graves, associated with classical phase of the FBC SE, are grave nos. 14 and 18 from Bronocice. The former is a burial in storage pit, while grave 18 was found in the vicinity of grave 19. These were probably part of cemetery, as both were burials in

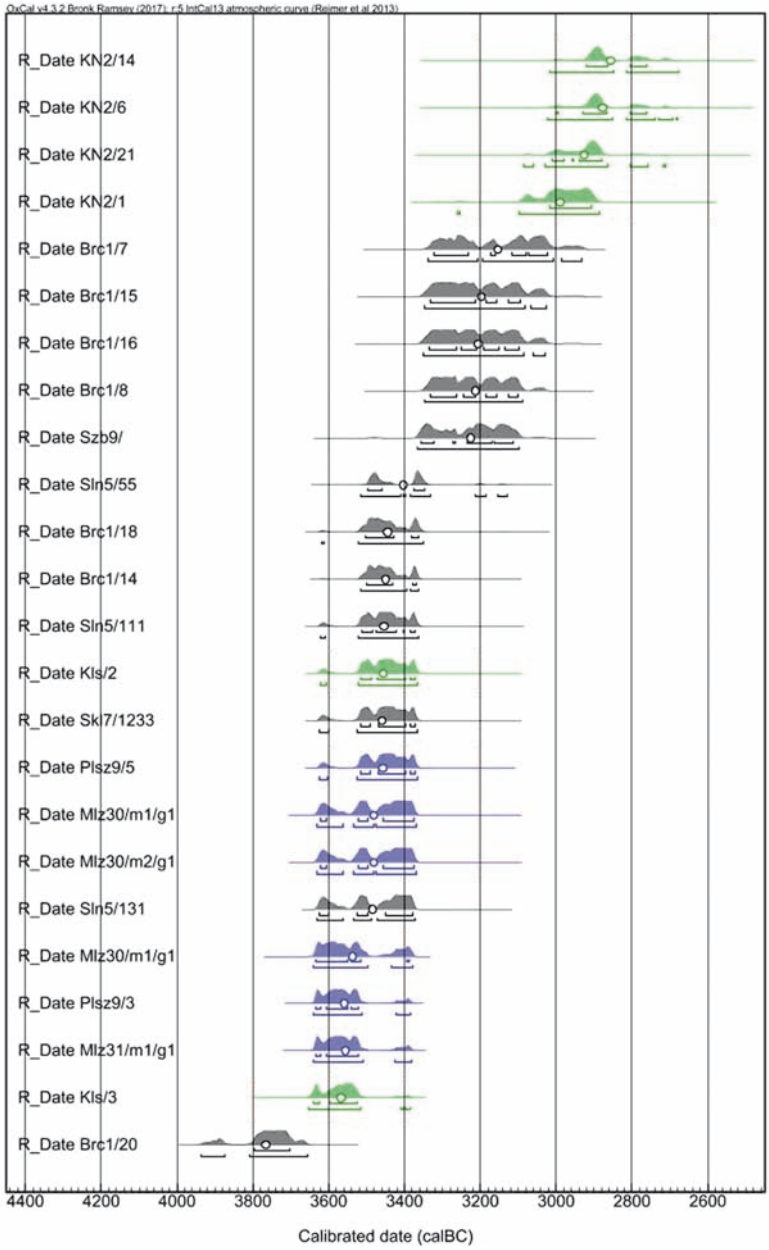

Fig. 2. Plot of radiocarbon dates from graves of the FBC SE. KN2 – Kichary Nowe, site 2, Brc1 – Bronocice, site 1, Szb9 – Szarbia, site 9, Sln5 – Słonowice, site 5, Kls – Kolosy, Sk7 – Skołoszów, site 7, Plsz9 – Pilszczyn, site 9, Mlz30 – Malżyce, site 30, Mlz31 – Malżyce, site 31; Grey – flat graves (from cemeteries and settlements), blue – graves from monumental tombs, green – graves from possible monumental tombs (see Table 2 for details and references)

Table 2. Details of radiocarbon-dated samples used in paper. Hbone – human bone

No.	Code	Site	Grave	Material	Lab code	BP	Std	13C‰ VPDB	Reference
1	KN2/14	Kichary Nowe 2	14	Hbone	Ki-6760	4260	50		Kowalewska-Marszałek *et al*. 2006, 348
2	KN2/6	Kichary Nowe 2	6	Hbone	Ki-6147	4270	50		Kowalewska-Marszałek *et al*. 2006, 348
3	KN2/21	Kichary Nowe 2	21	Hbone	Ki-6761	4295	50		Kowalewska-Marszałek *et al*. 2006, 348
4	KN2/1	Kichary Nowe 2	1	Hbone	Ki-6759	4350	50		Kowalewska-Marszałek *et al*. 2006, 348
5	Brc1/7	Bronocice 1	7		ICA-B/0422	4450	40		Milisauskas *et al*. 2016, 46-47, Tab. 1
6	Brc1/15	Bronocice 1	15	Hbone	ICA-B/0417	4480	40		Milisauskas *et al*. 2016, 46-47, Tab. 1
7	Brc1/16	Bronocice 1	16		ICA-B/0421	4490	40		Milisauskas *et al*. 2016, 46-47, Tab. 1
8	Brc1/8	Bronocice 1	8	Hbone	ICA-14B/0738	4490	30		Milisauskas *et al*. 2016, 46-47, Tab. 1
9	Szb9/	Szarbia 9		Hbone	Poz-34684	4530	40		Włodarczak 2013, 374
10	Sln5/55	Słonowice 5	55	?	Poz-53329	4605	35		Przybyła and Tunia, 2013, 157
11	Brc1/18	Bronocice 1	18	Hbone	ICA-15B/0614	4640	40		Milisauskas *et al*. 2016, 46-47, Tab. 1
12	Brc1/14	Bronocice 1	14	Hbone	ICA-14B/0737	4650	30		Milisauskas *et al*. 2016, 46-47, Tab. 1
13	Sln5/111	Słonowice 5	111	?	Poz-53330	4665	35		Przybyła and Tunia, 2013, 157
14	Kls/2	Kolosy	2	Hbone	Poz-9455	4670	35		Włodarczak 2008, 154
15	Skl7/1233	Skołoszów 7	1233	Hbone	Poz-82441	4675	35		Król 2018, 47, Tab. 2
16	Plsz9/5	Pilszczyn 9	5	Hbone	Ua-41756	4675	33	-19.7	Chmielewski 2015b, 220
17	Mlz30/m1/g1	Malżyce 30	m1/g1	*Quercus* sp.	Poz-34736	4700	40		Tunia and Włodarczak 2011, 210
18	Mlz30/m2/g1	Malżyce 30	m2/g1	Hbone	Poz-27989	4700	40		Jarosz *et al*. 2009, 209
19	Sln5/131	Słonowice 5	131	?	Poz-53331	4705	35		Przybyła and Tunia, 2013, 157
20	Mlz30/m1/g1	Malżyce 30	m1/g1	*Quercus* sp.	Poz-34682	4750	40		Tunia and Włodarczak 2011, 210
21	Plsz9/3	Pilszczyn 9	3	Hbone	Ua-41757	4763	32	-19.4	Chmielewski 2015b, 220
22	Mlz31/m1/g1	Malżyce 31	m1/g1	Hbone	Poz-48428	4765	35		Jarosz *et al*. 2013, 300
23	Kls/3	Kolosy	3	Hbone	Poz-9456	4790	40		Włodarczak 2008, 154
24	Brc1/20	Bronocice 1	20	Hbone	AA-90115	4978	40		Milisauskas *et al*. 2016, 46-47, Tab. 1

rectangular pits, with typical extended supine position. No grave goods have been found in any of them.

All dated burials in chamberless tombs are associated with the classical phase of the FBC SE. They consist of two graves from Pliszczyn, one from Malżyce, Site 30, mound 1 (two dates), one from mound 2 at the same site, and one from mound 1 in Malżyce, site 31. Except for grave 1 from mound 1 in Malżyce 30, all had some kind of stone construction. Pottery was discovered in two of them. From grave 1 in mound 1 at Malżyce 30, an "ansa lunata" cup was obtained, and in grave no. 3 at Pliszczyn, an amphora and a jug were found. Two graves from Kolosy, discovered by A. Kempisty (Kempisty 1970; Włodarczak 2008), were found under a circular mound of unknown chronology. Structures such as that are traditionally recognized as related to Corded Ware Culture in Lesser Poland. Since features associated with this taxon were also found at the site, and at least one of the FBC SE graves seem to be older than the embankment of the mound (grave no. 3, Włodarczak 2008, 153), in this study, the mound was therefore assumed as not related to FBC SE, and the graves are classified as a (part of?) flat cemetery. However, the case of barrow I from Malżyce, site 30, shows that a circular form of chamberless tomb could be also present in the FBC SE. The five remaining dates consist of 4 from Bronocice, and one from Szarbia. Only the latter and grave 8 from Bronocice had rectangular pits. The construction of grave 15 from Bronocice is uncertain, as according to excavators it was dug into an older storage pit (Milisauskas *et al.* 2016, 79). The positions of the bodies, suggest that they were carefully laid, although child was found in a flexed position on its right side. These 5 graves yielded dates more likely connected with the Funnel Beaker-Baden horizon. The younger dating comes, as mentioned above, from Kichary Nowe, site 2. In this study, it is classified as a flat cemetery. However, stratigraphic observation during excavation (Kowalewska-Marszałek *et al.* 2006, 342-344) suggests that the graves may be part of some kind of larger construction. In this case the embarkment does not seem to damage the graves, as has been observed in Kolosy. Moreover, some graves seem to be secondarily dug into the fill of it. This suggests that some monumental structure might be present there.

CLUSTERS AND BURIAL ZONES

In the analysed sample of flat graves, 19 were described as single graves and 12 as pairs, along with 2 groups of 3, and 2 of 4 graves, 3 clusters of 5 graves, and two clusters of 6 graves. Groupings of 7, 8, 13 and 15 graves have been found only once each. For comparison, among the chamberless tombs, the maximal size of the clusters was 7 graves, but a tendency toward smaller groups is also visible. The predominantly small sizes of these clusters generally do not allow for detailed comparison between them. Because of this, groups of graves have been assigned to larger burial zones. Graves found in the supposed outline of chamberless graves have been assigned as zone 0, regardless if considered primary or

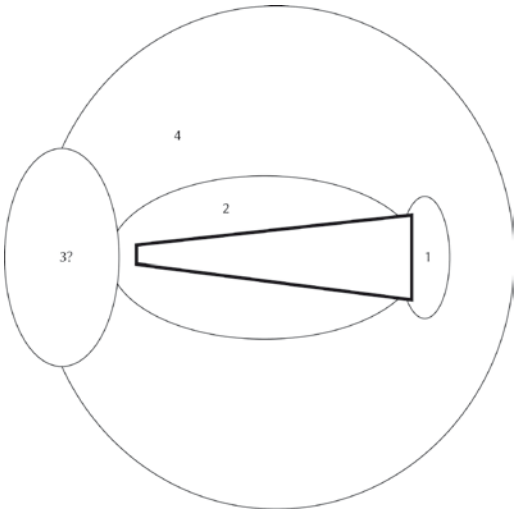

Fig. 3. Schematic zones of occurrence of flat graves at cemeteries with monumental barrows. 0 – graves inside the outline of a monumental tomb. 1 – in front of the forehead of a barrow, 2 – along a barrow, 3 – behind the tail of a barrow, 4 – beyond the barrow area

secondary graves in structure. The area surrounding the monumental constructions was divided based on the observed spread of graves in relation to their orientation and geometry (Fig. 3). Zone 1 includes space near the supposed forehead of the construction, while zone 2 refers to its sides (usually Southern and Northern), and zone 3 to the area "behind", on the western side of it. Zone 4 aggregates the remaining burials that are found in the same complex as monumental barrows, and have no visible spatial relation to them. Additionally, zones 5 and 6 have been defined for consistency of description, including flat cemeteries (complexes without known remains of chamberless tombs) and graves inside or in the vicinity of settlements, which could not be defined as cemeteries.

In burial zone 1, that is, in the area to the east of a forehead or near the entrance to a monumental barrow, 7 flat graves have been found in Malice Kościelne. Only at this site have graves been located in this position. They clustered in front of the entrances to chamberless tombs I and II. All but one of them have some kind of stone construction element. In three cases, this consisted of a stone frame and paving at the bottom of the grave (nos. 5, 7, 8). In another two, layers of stone covering them has been documented (nos. 4 and 6). There is an interesting observation that sandstone was use for the construction of these graves, not the limestone used for the other graves on the sites and walls of monumental barrows (Bargieł and Florek 2006a, 377). Another grave was a rectangular pit with only covered by stone pavement (no. 9), while none of these stone elements were discovered in last one (no. 19). Graves were mostly oriented on a NNW-SSE axis, more or less perpendicularly to the tombs themselves. Only graves 8 and 9 were aligned to a WSW-ENE axis.

Interestingly, there are only singular burials of children in this cluster. Grave 5 was a double burial of a *Maturus* female and a child (*Infans I*).

Burial zone 2 are areas along a barrow. Altogether, there were 49 graves in zone 2 areas: 8 in Malice Kościelne (nos. 12/3, 12/4, 12/5, 12/6, 12/7, 12/12, 12/14, 12/15), 8 in Pawłów (nos. 8, 18, 32, 33, 34, 37, 40, 41), 21 in Skołoszów (nos. 538, 638, 639, 640, 641, 1220-1228, 1231, 1233, 1234, 1240, 1251, 1265, 1272, 1273, 1278, 1280), and 12 in Słonowice (nos. 55, 101, 105, 111, 114-117, 119, 120, 123 and 131). In Malice Kościelne, all of the graves from this area have been paved with stones and aligned to the monumental barrow (WSW-ENE axis). They seem to make up one cluster along the wall (and probably with graves on the opposite side of the tomb outline). In all graves, a single body was laid in an extended supine position with the head towards the WSW. Out of 8 graves, 5 were children in the *Infans I* age-class, 2 were adults (probably females), and in one case, age and sex determination is lacking. Graves buried along a wall inside a tomb bear stark similarities to those described above. All 7 of them keep the same alignment to the WSW-ENE axis, and all have bottoms paved with stones. There are also mostly children buried in them – 3 described as *Infans I* and 1 as *Infans II*. Of the three remaining graves, one was an *Adultus* female, one was a *Maturus* of undetermined sex, and one was an adult without more a precise description of age or sex. Graves in zone 2 from Pawłów were set on the northern and southern sides of barrow 2. The southern group consisted of 4 graves (nos. 8, 9, 11 and 18). Some more detailed information is available only for graves 8 and 18. Grave 8 was constructed with a stone frame, filled with stones and covered by yet another layer of stones. It was oriented on a N-S axis. Inside, the remains of an individual in the *Infans I* age-class was found, but the position and orientation of the body could not be determined. Grave 18 had a paved bottom and was covered with stones . It was oriented along a W-E axis and consisted of a burial of a *Maturus* male individual, laid in an extended position on his back, with his head toward the west. The second group of graves, found on the northern side of the barrow, had characteristics similar to the graves from zone 2 in Malice Kościelne. Three of them were grouped together (nos. 32, 33 and 34), about 10 meters west of the eastern end of the chamberless tomb, along its northern wall. The remaining three were also buried along the wall, with some distance between them, in the western part of the "tail" of this barrow (nos. 37, 40, 41). Of these 6 graves, all were aligned along a W-E axis. Four of them were rectangular pits without stone constructions, and two had paved bottoms (nos. 32 and 33). In the latter graves, two children (both *Infans I*) were buried, with their heads toward the western side of pits. In grave 34, a *Maturus* female was buried in an extended supine position, but in the opposite direction – with her head to the east (and towards the children). Data on the individuals from the 3 remaining graves is unavailable. Graves from the northern group are in some ways similar to those from zone 2 from Malice Kościelne: all are set along the monumental barrow, with a rather simple grave construction. Also, there are singular graves of children, and none of the sexed adult graves included a male. A cluster of graves found on the southern side of the mound, however, bears

closer resemblance to the graves from zone 1 in Malice Kościelne, or to the graves from chamberless tombs at Pawłów. Especially puzzling is the rite of filling a burial pit with stones, which, aside from grave no. 8, is found exclusively in the supposedly "central graves" of monumental barrows. Also, the nonlinear layout of all four graves in this cluster is not consistent with the "northern graves" of the barrow or the graves from zone 2 in Malice Kościelne. This pattern seems to be visible also in Słonowice. Graves registered in zone 2 make up 2 clusters, consisting of 7 (nos. 111, 114-117, 119, 120) and 2 graves (nos. 123, 131). There are also 3 relatively separated graves (nos. 55, 101, 105). Data on grave construction are available for only 3 graves (nos. 111, 114 and 115). All three are rectangular pits, and in grave 111, traces of a wooden coffin have also been found. All graves in this area were oriented along a W-E axis (with a deviation toward NW-SE in the case of grave no. 105). In graves nos. 111, 114 and 115, the body was laid in an extended position, with the head toward the west (in the case of graves 111 and 114) or the east (in the case of grave 115). The first cluster consisted of the burials of 6 children (*Infans I*) and one *Maturus*, probably female individual (grave 111). In the second cluster, a child and an *Adultus* female were buried). In grave 55, the remains of a probable female of the *Maturus*/*Senilis* age-class were found, while grave 105 included an *Adultus*/*Maturus* female, and grave 101, an *Adultus* female. In Skołoszów, there are 21 burials in the areas along the sides of the chamberless tomb. They formed 2 clusters, consisting of 15 (nos. 538, 1220-1228, 1231, 1233, 1234, 1240, 1251, 1265, 1272, 1273) and 6 graves (nos. 638-641, 1278, 1280). All of them were rectangular pits, generally oriented along a W-E axis (with deviations both toward NW-SE and SW-NE). Grave 1280 was oriented closer to a NNE-SSW axis. Only in grave 1233 could the orientation of the body itself be determined. It was consistent with the WNW-ESE orientation of the grave pit. In this grave, the remains of a *Maturus* individual were found. A determination of age-at-death was also possible for grave 1240, where the remains of an *Adultus* individual were found.

The relationship to monuments is less certain in the case of graves set in burial zones 3 and 4. The former is set "behind" the tails of barrows. This spatial arrangement may be adjusted to (thus, later than) mounds, but graves in the area do not keep closely to axes of monumental constructions, nor form specific clusters aligned to them. Graves have been found in this location only in Słonowice. There, 6 graves were found in such a location; four of them are clustered in two pairs, with the other two graves placed separately. All of them consisted of a nearly rectangular pit, and two were oriented on a W-E axis (graves nos. 130 and 143), two on a N-S axis (nos. 142, 149) and two on a NNE-SSW axis (nos. 125, 126). Information on the position and orientation of the body is only available for two of them, both laid in an extended supine position – one with the head toward the west (no. 130) and the other toward the north (no. 125). No data on age-at-death or sex are available. Due to the small number of graves, they will be analysed together with graves from zone 4.

Burial zone 4 includes the rest of the graves that do not correspond with any observable remains of chamberless tombs, but occur together in the same site. In zone 4, 21graves

have been counted. They consist of 11 graves from Pawłów, site 3, 7 from Szczytna 6 and 3 from Skołoszów 7. At Pawłów, site 3, graves have been clustered in one group of 5 (graves nos. 28, 29, 30, 31 and 39) and one of 4 (nos. 43, 44, 45, 46). Also, two separate graves (nos. 27 and 42) have been found. In Szczytna, graves formed two pairs (nos. 376 and 377, 367 and 378) with 3 separated from the others (nos. 95, 351, 354). At the cemetery of Skołoszów, two graves were found near each other (no. 1223 and 1241), and one was located separately (no. 1250). There are differences between the construction of graves in Pawłów and cemeteries from the Rzeszów Foothills. Almost all graves from zone 4 in Pawłów have some stone elements of construction, with the exception of graves 44 and 28. Graves 29 and 30 have bottoms paved with limestone and stone frames supporting the walls. The group of burials 44, 45, 46 and 43 is the only aggregation with a dominant N-S axis in Pawłów 3. This is even more interesting, since 3 of 4 graves in this concentration are collective burials, and some of them are characterised by unusual arrangements of the bodies. Graves in the other cluster in zone 4 from this site are uniformly oriented on a WSW-ENE axis, along with grave 42. Grave 27 seems to be set closer to an actual W-E axis. What is interesting is that the graves without any stone constructions have been found in each of the two concentrations, one per cluster. The orientation of grave no. 28 is consistent with other graves in its cluster; it is aligned to a N-S axis, the same way the 2 other graves in this cluster are. Graves in zone 4 from Szczytna and Skołoszów have the form of rectangular pits. In the cases of both sites, alignment to a W-E axis is dominant, with some graves deviating towards a SW-NE axis. Skeletal remains were not preserved in any of the graves from these sites, so a comparison of even the positions and orientations of buried bodies is impossible.

Burials in cemeteries without chamberless graves – *i.e.* burial zone 5 – have been found in Bronocice, site 1 (13 graves), Dacharzów, site 1 (6 graves), Klementowice XII (7 graves), and Klementowice IV (17 graves). Additionally, 6 graves from Kichary Nowe, site 2, 2 from Kolosy, and 3 graves from Goszyce have been included in analysis. In case of Bronocice and Dacharzów, the presence or absence of a monumental structure is a matter of discussion. In Kichary Nowe, 5 graves were found in a depression of elongated shape and oriented on a WSW-ENE axis. However, no other visible traces of monumental construction the construction have been found. In vicinity of this structure, graves of the Corded-Ware Culture and Mierzanowice Culture have been located in a pattern similar to cases in which a monumental barrow is present. The graves associated with the FBC SE were not damaged by the depression, and some of seem to have been set after it was filled (Kowalewska-Marszałek *et al.* 2006). Graves at the site in Kolosy were found under a round mound of unknown chronology. In this case, however, the embankment damaged at least one of the graves. Graves from Bronocice, due to their uncertain stratigraphic position and the unclear spatial relation of at least some of the graves in region C, have been divided between two groups – a flat cemetery and graves inside the settlement – due to their overlapping ranges. According to the excavators, the settlement from phases BR II and III did not occupy region C,

where the majority of graves were found. Since only classic FBC SE graves are included in this study, all graves should be classified as belonging to (probably) one cemetery. This is not the case, however, since some of the graves dated to this stage were burials in storage pits. These have been uniformly classified as burials in the settlement. Similarly, a burial in a storage pit from Pilszczyn have been classified, despite the fact, that it was found about halfway between the place where a settlement supposedly was (or, at least, where other features related to the settlement concentrate), and a funerary complex. At Dacharzów, site 1, 5 graves were clustered together, and one was set separately. In the first group, 3 were constructed with paved bottoms, a stone wall construction and a stone covering (graves nos. 2, 3 and 4), one consisted only of stone walls (no. 6), and one had only a stone pavement covering a rectangular pit (no. 7). Grave 5 was constructed in the same way as grave nos. 2, 3 and 4. Grave nos. 2, 3, 6 and 5 were aligned to a WNW-ESE axis, while graves 4 and 7 to a W-E axis. Graves 4 and 7 consisted of two burials, while in each of the remaining 4 burials only one body was found. Information on the position and orientation of the bodies is available for graves 2, 3 and 5, and for one of the bodies in grave 4. In every case the dead was lying in an extended supine position with the head toward the WSW or W (in accordance with the orientation of the grave). In grave 2, an *Adultus* female was buried, in grave 3 a *Maturus* male, in 5 gave an *Adultus* male, and in grave 6 an *Adultus* female. Both double burials consisted of one *Iuvenis* of unknown sex and one *Infans I*. It is interesting that the double burials are constructed on a slightly different angle (on a W-E axis) than the single graves. In Klementowice XII, 6 out of 7 graves were grouped together, and one (grave no. 7) was set separately. All of the graves had some stone elements of construction: graves 1, 4, and 6 had a stone covering, and in graves 2, 3, 5, and 7 the bottom was also paved. Two graves were oriented along a N-S axis (nos. 2 and 3), two along a W-E axis (nos. 6, 5), one on a NW-SE axis and one on a WSW-ENE axis (graves 4 and 7, respectively). The orientation of grave 1 is unknown. Only in grave no. 4 were two bodies buried, while all others are single burials. The position of the body was determined for grave nos. 2, 4, 5, 6 and 7, and with the exception of individual 2 in grave 4, all of them lay in an extended, supine position. Individual 2 from grave 4 was also extended, but slightly moved to the right side. All bodies were oriented along with the grave pits, but with different directions. In grave no. 2, the head was directed to the north, while in grave 3 toward the south. In graves 5 and 6, both bodies were directed with their heads to the west, and in grave 7 toward the WSW. In grave 4, one of the bodies lay with its head toward the SE, while the second was towards the NW (ind. 2). No data on age or sex is available for this site. In Klementowice XIV, 17 graves were excavated and classified into 3 aggregations. The first consisted of 13 graves, and the other 2 numbered 2 graves each. The most numerous cluster contained grave nos. 1, and 4-15. All of them consisted of some kind of stone construction, except for grave 7, on which no data is available. In grave nos. 6, 10, 11, 12, and 15 only a stone covering was documented, while in graves 4 and 5 there were additionally stone frames supporting the walls. In grave 14, the bottom was also paved, forming

a cist-like construction. In other graves from this group, the character of stone construction was undefined. In the second cluster, grave 2 consisted of a paved bottom and was covered with a layer of stones, while grave no. 16 had only a stone frame and covering, like graves 4 and 5. The third group was comprised of grave number 3 and "pit 1" (different than grave 1). Stone elements of grave 3 are undefined. "Pit 1" was rectangular in shape, without any stone elements. The orientation of graves varied in the first cluster, with 4 graves oriented along a N-S axis (nos. 7, 8, 14, 15), 4 along a W-E axis (nos. 4, 6, 11, 12), 3 on a WNW-ESE axis (nos. 1, 5, 10), and one on a NW-SE axis (no. 4). Orientation of grave 13 is unknown. In the remaining clusters, all graves were oriented on a W-E axis. Graves 7 and 14 consisted of the remains of 3 individuals each, while graves nos. 2 and 9 were double burials, and all other graves were singular. In "pit 1", only the skull of a *Maturus* male individual was buried, and in grave 14, along with two individuals, the teeth of a third were found. Bodies were almost uniformly laid in an extended, supine position, when the position could be determined. The only exception was grave 10, in which an *Infans II* individual lay in a flexed position on their left side). In Kichary Nowe, 5 graves were found inside of the depression, and one (no. 25) outside of it. All graves had stone constructions, and all – except the partially destroyed grave no. 5 – they could be classified as cist-like graves. Graves 1 and 14 were covered by stone pavements separately, and additionally covered by yet another layer of stones together. All graves were oriented on a WSW-ENE axis, and buried bodies were laid in an extended, supine position with their heads directed toward the WSW. In Grave no. 5, the arrangement of the body could not be determined. All graves were single burials. One child was found (*Infans I*, in grave no. 6), and one individual was described as *Adultus* (grave no. 5). In grave no. 14, a *Maturus* female was found, while grave no. 1 contained a *Maturus* male, and grave no. 21, an individual of age *Maturus* who was also probably male. The individual from grave 25 was classified as an adult, without sex specification.

Graves found in settlements that were included in the analyses consisted of 8 burials. Among these, there are 4 graves from Bronocice (graves VII, XIV, XVI and XX) and one burial from each of following sites: Gorzyczany, site 1; Kamień Łukawski, site 1, Modlnica, site 5, and Pliszczyn, site 9. In grave VII from Bronocice, a skeleton was found at a depth of 30-50 cm, in the NW part of a pit. A *Maturus* female lay on her abdomen with slightly flexed legs and her hand under her body (Milisauskas *et al.* 2016, 75-76, fig. 24-25). In grave XVI, an *Infans I* individual lay near the southern part, on the bottom. The body lay in an extended position on its left side, with its head unnaturally twisted toward its back. In grave XIV, a body was found lying on the bottom of a storage pit in extended, supine position with its head directed toward the south. In grave XX, the body of an adult female was found in the western part of an irregular pit, near to the bottom of it. The body was twisted toward its left side, with a hand extended toward the western wall of the pit. Marek Florek (2006b) interprets the pit in Gorzyczany as a trapezoidal storage pit, although only the lower parts of it have been preserved. The body of a child was found at the bottom of

the pit, along with waste. The grave in Kamień Łukawski, described by E. Kempisty, was a burial of (probably) a girl that died at age 7-9 years old. The body was found in an ellipsoidal pit, between 64 and 92 cm from the surface (an outline of the pit was spotted at a depth of about 60 cm; Kempisty 1965, 159). The body lay on a NE-SW axis, with the head directed toward the SW. The body was sloping towards the NE, with the legs lying deeper than the head. Above the head, a large, flat stone was found. Near the bones of the right hand was a bone awl. It is impossible to establish whether it was placed there as a grave good, or was just included in the fill of the pit. In Modlnica, site 5, a rectangular pit was found in the vicinity of the remains of a settlement. Unfortunately, no bones were preserved. The grave goods consisted of numerous pottery fragments, including large parts of a pot, an amphora, and other forms. These forms (except the amphora) and a quantity of pottery fragments stand out from other graves of the FBC SE. Fragments of at least 3 spindle whorls were also found (Zastawny *et al.* 2011, 240-242). In Pliszczyn 9, the body of a child was found near the bottom of a pit, although the publication lacks a detailed description of the feature (Chmielewski 2015a, 161, pl. 21).

CONSTRUCTION OF GRAVES

Grave constructions in the analysed sample vary. Some consist of stone elements such as layers of stone at the bottom of a pit, walls, and covering, while some present themselves as just rectangular or nearly rectangular pits, without stone elements. In some graves, timber elements have been found. In grave nos. 104 and 135 from Słonowice, wooden elements were arranged as supports or as the floor of grave pit. In grave no. 111 from the same site, the probable remains of a coffin were discovered (Przybyła and Tunia 2013, 154). In some others, the presence of such elements is also suspected (*e.g.* grave no. 25 from Kichary Nowe, site 2; Kowalewska-Marszałek *et al.* 2006). Although it is suspected that wooden elements were used more often, at this point it is impossible to estimate the frequency of these constructions.

Graves with stone constructions have been divided into more specific groups according to the type of stone construction. The classification concerned the presence of pavements on the bottoms of pits, stone walls or frames (usually erected with large, flat blocks of limestone – or sandstone, in the case of some graves at Malice Kościelne). Lids and pavements covering the graves are often damaged or disturbed due to external activity, or decomposition of supposed wooden constructions of the graves (*e.g.* Włodarczak 2008, 153). Because of that, and the differences in descriptions, differentiation between lids and pavements covering a grave is nearly impossible. Therefore, in following analyse and in figures a term coating will be used for all kind of coverings of the graves, and for distinction for pavements set below the level of skeleton. Those elements appeared separately or in combinations in graves (Fig. 4: A:a-f, Table 3). In this no-stone – all-stone spectrum, on the

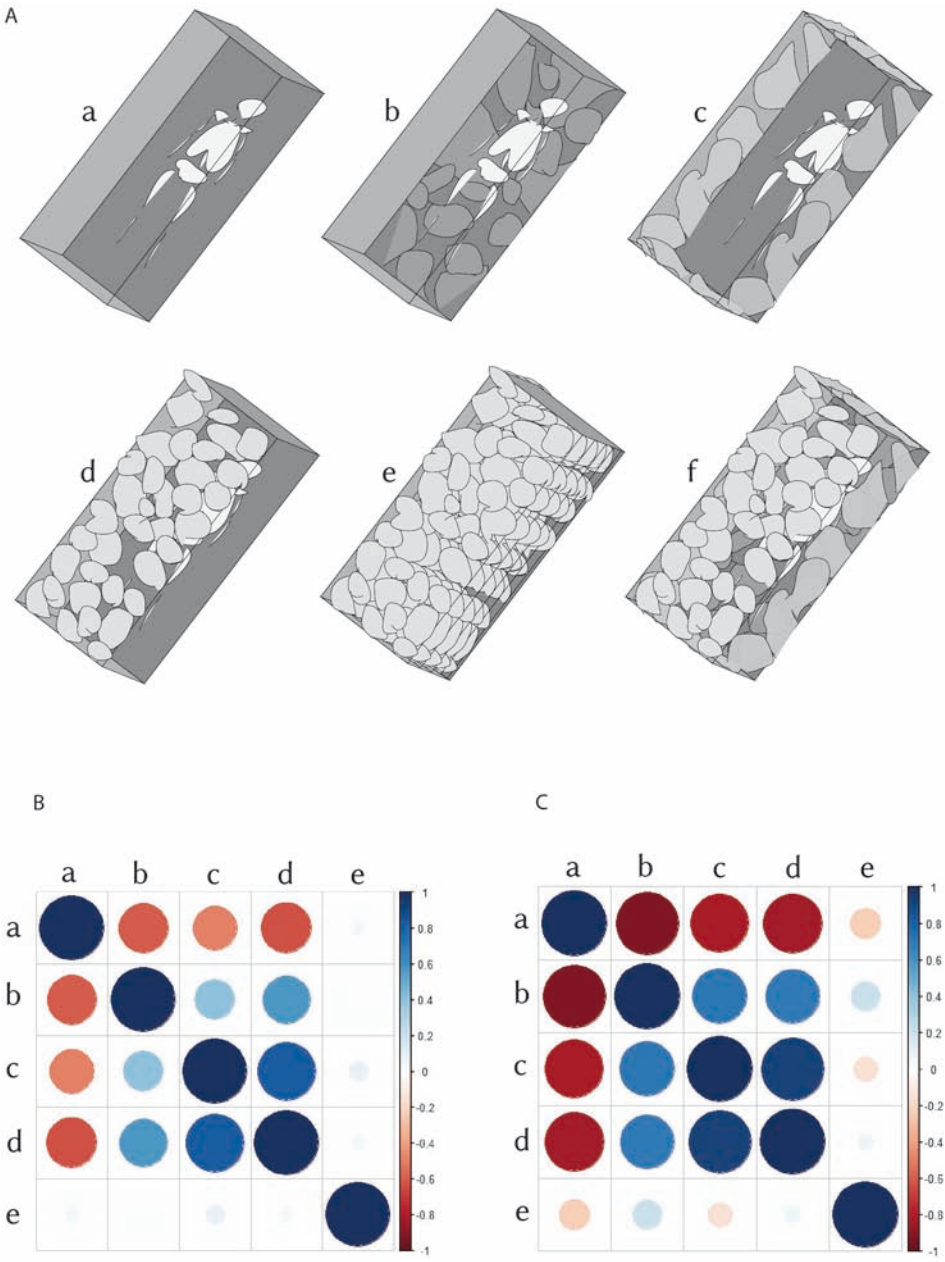

Fig. 4. A: Elemental types of grave constructions in FBC SE graves and correlation matrices of their co-occurrence at sites (B) and in burial zones (C). A: a – pit without stone constructions, b – stone pavement on bottom, c – frame of stone walls, d – stone coating, e – stone fill of the grave, f – combination of b, c and d. Size of circle in matrices B and C represents the strength of correlation, while colour represents its direction: blue for positive and red for negative. Reference text for details

Table 3. Number of graves of each type in burial zones included in analyses; types of graves as in Fig. 4A and text; description of burial zones in text

Burial zone	a	b	c	d	e
0	17	19	9	16	6
1	1	3	5	5	0
2	28	2	1	11	1
3 and 4	18	0	2	2	0
5	14	27	14	15	0
6	8	0	0	0	0

one end there are graves from Bronocice, Słonowice or Skołoszów, among which either no graves, or only a very few graves, have stone constructions. On the other end, there are funerary constructions from Pawłów, Malżyce or Kichary Nowe, with apparently prepared stone bottoms, walls and coatings, and some constructions are even filled with stones. The differences in structures of graves in sites and in aggregations should be discussed further. Particular elements of stone construction are coded as 1 when present, and 0 when absent, in the respective columns of the table. Note, that in case of construction type a in Fig. 4: A:a (*i.e.* pit graves without stone elements), it is mutually exclusive with other types, which are sometimes combined together (*e.g.* Fig. 4: A:f). To limit the effect of overrepresentation of graves with stone elements, they have been weighted in relation to graves with no stone structures, and all data have been normalised to 1 before further calculations. Correlations represented in Fig. 4: B and 4: C show a somewhat similar pattern, although comparison between burial zones is characterised by stronger negative correlations between simple pit-graves and those with stone elements, than in comparison between sites. At the same time a stronger positive correlation between the occurrence of various types of stone elements can be seen between burial zones than between sites. This may suggest a higher consistency between these groups. The number of graves filled with stones (Fig. 4: A:e) shows little correlation with other groups. This is outcome is expected, as graves of this type are generally rare. It is probably worth noting that this stone element of construction has been noted only in graves found in monumental tombs. The only exception is grave no. 8 from Pawłów.

Pit graves are often close to rectangular in shape and section. These include grave no. 19 in Malice Kościelne, 28 and 44 in Pawłów, 24 graves from Skołoszów, grave no. 769 in Modlnica, 7 graves from Szczytna, 9 graves from Słonowice (including one with traces of a wooden coffin), and 12 graves from Bronocice. They seem to be found rather in distinctive geographical areas than in specific settings. In Szczytna and Skołoszów, and also in Słonowice, graves in pits have been found in all burial zones. In the flat cemetery in Bronocice, only pit burials have been found. Pits in settlements in which burials have been found, with the exception of some found in regular rectangular pits, were not different from others

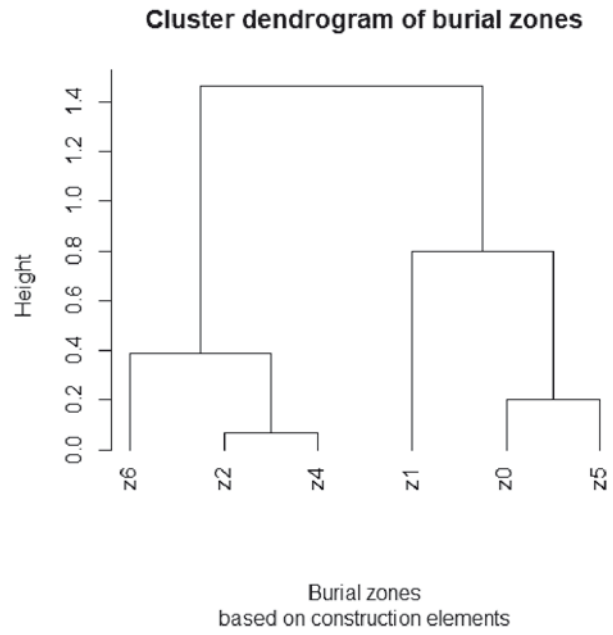

Fig. 5. Dendrogram of burial zones, based on types of grave construction. Zones numbered according to text; zones 3 and 4 counted together as "z4"

used for economic purposes. In general, burials in rectangular pits without any stone constructions are more often found in certain regions, namely the western part of Little Poland, and the Rzeszów foothills. The reason for that is unknown; however, M. Florek suggested that a lack of the needed material in these areas explained this fact (Florek 2006a, 413).

Based on the frequency of different types of graves a hierarchical clustering analysis has been performed in order to reveal the most similar zones (Euclidean distance and Ward's clustering method have been used in hclust function of 'stats' package of R; Fig. 5). Interestingly, graves from flat cemeteries and monumental tombs seem to be grouped close together, along with the less-related group of graves from zone 1. Graves located in the remaining parts of funerary complexes were clustered together, along with more distant relation to graves from settlements. As clearly shown in Fig. 4: A and 4Ba, the main line of division was the relative frequency of graves without stone elements. Therefore, this result has limited interpretative importance, especially when we consider the aforementioned regional patterns in the usage of stone in the construction of graves. Nonetheless, the observation that the constructions of graves do not necessarily follow the distinction between monumental tombs and flat graves is an informative one. Even more importantly, differences seen between flat graves from different contexts should be examined more closely.

ORIENTATION OF GRAVES

The orientations of grave axes according to the cardinal directions were determined on the basis of available published descriptions and plans. As most of the graves have been described rather generally, the results also need to be considered in the same way. In this study, graves were subdivided by directional axes, more for pointing out deviations from general rules observed on the site, than for giving exact descriptions of grave orientations (Fig. 6). As far as the collected data are reliable in this aspect, flat graves seem to follow similar preferences for a W-E axis (with deviations) over a N-S axis, versus the pattern observed in graves from "chamberless" tombs. NE-SW and NW-SE directions were usually avoided. The differences are mostly seen in zones 1 and 3, with 71.4% and 66.6% of graves aligned to a N-S axis (or with slight deviations), respectively. Graves in monumental tombs are oriented this way in 22.1% of cases. It is worth noting, that, while in flat cemeteries this proportion is higher (29.5%), it is more similar to graves from chamberless barrows and other burial zones.

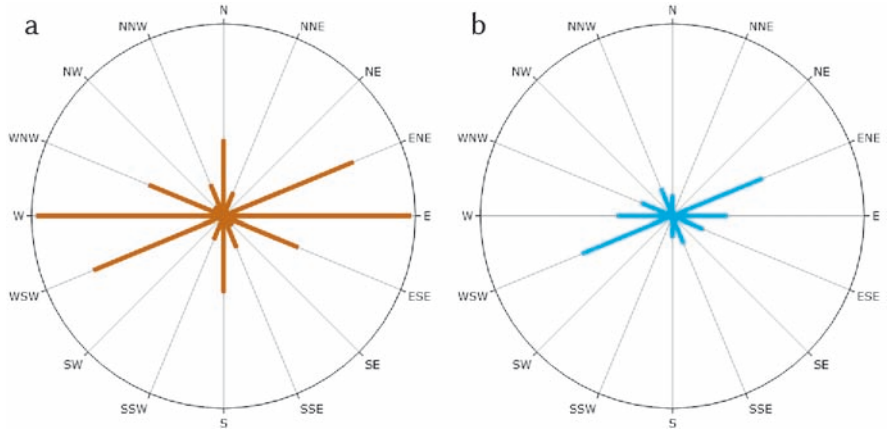

Fig 6. Polar plots representing proportions of flat graves (a; not including burials in storage pits) and graves from monumental tombs (b) in specified orientations

BURIED DEAD

In analysed sample, out of 231 burials, the age-at-death was determined in 153, among which all categories of age are represented. The group of *Infans I* burials consisted of 33 individuals, ranging from *ca*. 0-7 years old, with representation of all major stages of development. There were 10 individuals in the *Infans II* class, of which one was possibly female, and one was classified as *Infans I/II*. The *Iuvenis* age-class was represented by 7

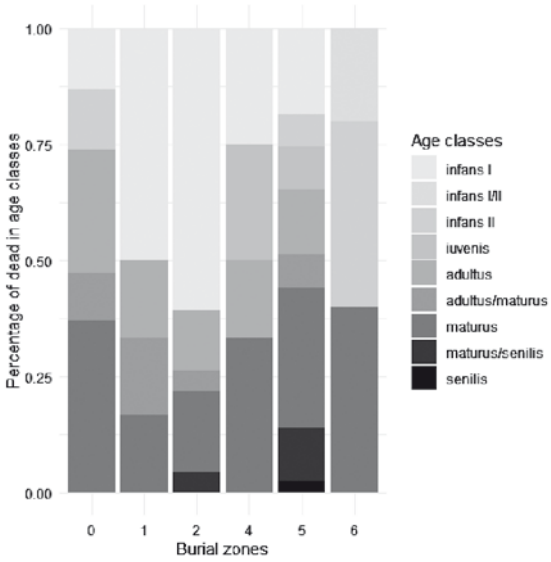

Fig. 7. Structure of ages-at-death of individuals buried in burial zones (without zone 3 ; "adults" and "children" are omitted)

individuals, and possibly one more who may have also died at this age. For two of them, sex has been estimated as one male and one female. In the class of *Adultus*, 22 individuals were found, with 10 females, 3 possible females, 2 possible males, and 3 males. Nine individuals have been described as *Adultus/Maturus*, of which sex has been estimated for 6: 3 females, 1 possible female, and 2 males. The class *Maturus* consisted of 38 individuals of which 8 were females, 5 possible females, 2 possible males, 17 males and 5 undetermined. In the class *Maturus/Senilis*, 1 female, 1 possible female, 1 possible male, and 3 males were found. One individual described as *Senilis* was found in the sample, and was estimated to be female. In addition, 3 individuals were described as children without more specific descriptions, along with 22 individuals as adults.

The proportion of age-classes among the dead varies across burial zones (Fig. 7). Most of the youngest children (*Infans I*, 72.7%), were buried in single graves. Of them, most graves (58.3%) were located alongside monumental tombs. About 12.5% of children were buried inside monumental tombs. Interestingly, single burials of *Infans I* individuals were located only in the "tail" part of monuments, seemingly dug into the already existing structure. The same number have been found in flat cemeteries. Equally, *ca.* 8.3% of the youngest children were found in zone 1, as well as in zones 3 and 4, combined. Children classified as *Infans II* were buried in single graves in 70% of cases. About 57.1% of them were found in monumental tombs, 28.6% were buried in settlements, and the remaining 14.3% in flat cemeteries. Individuals in the *Iuvenis* age-class were most often buried in collective burials

(71.4%). Of the remaining 28.6%, all were found in zone 4. *Adultus* individuals were buried in single graves in 63.6% of cases. Most often, they were found in flat cemeteries (35.7%), in chamberless barrows (28.6%) and in zone 2 (21.4%). Zones 1 and 4 accounted for 7.1% each. Individuals in the *Maturus* age-class were buried in single graves 78.9% of the time, most often located in chamberless tombs and flat cemeteries (40.0% and 36.7%, respectively). About 13.3 % of them were buried in zone 2, and another 6.7% in settlements. Only 3.3% of individuals who died at this age were buried in zone 4. The only individual of the *Senilis* age-class was found in a flat cemetery.

The overall age distribution of the individuals described above is fairly similar to that observed in graves of the FBC SE in the Lublin Region. There, the sample of 156 individuals consisted of about 25.1% *Infans I*, 13.3% *Infans II*, 2.1% *Iuvenis*, 18.6% *Adultus*, 38.4% *Maturus*, and 1.9% *Senilis* (Kozak-Zychman and Winiarczyk 2016, 112, Table 1). In the present study, *Infans I* makes up 26.2%, *Infans II* – 8.2%, *Iuvenis* – 6.3%, *Adultus* – 20.7%, *Maturus* – 35.6% and *Senilis* – 3.2% of the 128 individuals in the sample (after the even redistribution of individuals in intermediate age classes; "adults" and "children" are omitted).

A total of 13 collective burials were found: grave nos. 4 and 7 in Dacharzów (2 individuals each), grave no. 5 in Malice Kościelne (2 ind.), grave nos. 43 (2 ind.), 44 (2 ind.) and 46 (3 ind.) in Pawłów, grave no. XV in Bronocice (2 ind.), grave no. 3 in Kolosy, grave nos. 2 (2 ind.), 7 (3 ind.), 9 (2 ind.) and 14 (3 ind.) in Klementowice XIV, and grave no. 4 in Klementowice XII (2 ind.). None of them was a separated from the main grouping of burials on the cemetery or a grave laid in a storage pit, with the exception of grave XV in Bronocice, which was the only one found in trench C1, and according to excavators was dug into an earlier feature (Milisauskas *et al.* 2016, 79). A radiocarbon dating of the grave suggests that it should be associated with the Funnel Beaker-Baden horizon. Most of the collective burials in flat graves were found in cemeteries without traces of monumental structures, or at some distance from chamberless barrows (zone 4). Only one grave was found supposedly near the entrance to a tomb: grave no. 5 in Malice Kościelne (zone 1). There is no correlation between the construction of a grave and the number of individuals buried there. Most of the collective burials consist of children at different stages of development, accompanied by an adult. Among the flat graves, only grave no. 44 consisted of a buried *Maturus* female and *Iuvenis* individuals. The arrangement of the bodies was also unique in this grave, as the younger individual was laid directly(?) on the woman. Moreover, the arrangement of bones of a younger individual suggested that the body was cut in half and buried in different directions prior to skeletonization (Bargieł and Florek 2005, 21-22). In chamberless tombs, there are 8 collective burials. In three of them, no remains of children were discovered: grave no. 7 from Pawłów, and grave nos. 1 and 3 from barrow 2 in Malżyce, site 30.

A hierarchical clustering analysis based on ages-at-death from single and collective burials (rendered with the use of Euclidean distance and Ward's clustering method) resulted

Fig. 8. Dendrogram of burial zones, based on percentage of dead in age classes in each burial zone (without zone 3 ; "adults" and "children" are omitted)

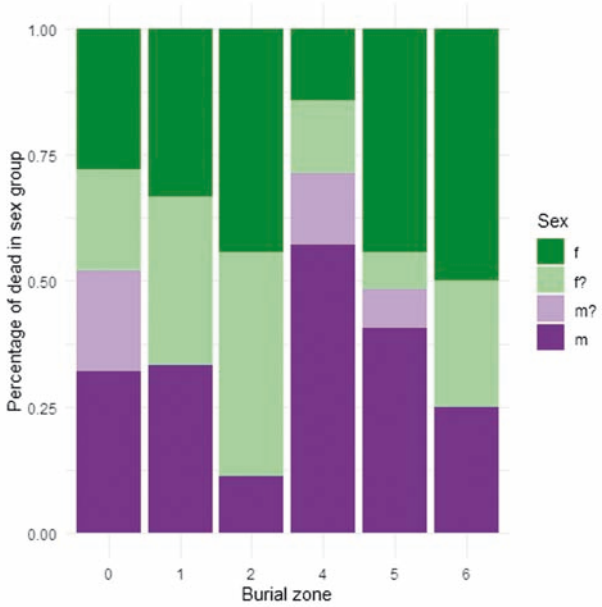

Fig. 9. Structure of sex of individuals buried in burial zones (without zone 3)

in three clusters, the first of which contained graves from chamberless tombs and flat cemeteries. Graves from zone 4 were relatively close to these. The second cluster contained graves from zones 1 and 2, while the third cluster contained graves from settlements (Fig. 8). These results seem to at least partially support observations on the constructions of stone graves. Again, flat cemeteries and monumental barrows show some similarities, while graves set along the barrows reveal a different pattern. Conversely, similarities in the constructions of graves from zone 1 and 4 do not reflect the population buried there.

The proportions of females and males are equal in graves from chamberless tombs and in flat cemeteries (Fig. 9). Other burial areas show, however, disproportions in this respect. There are almost no male graves in zone 2. In zone 1 and in settlements males are represented in 1/3 and 1/4 of graves. Conversely, in zone 4, a majority of individuals with estimated sex were males. However, only in case of graves from monumental tombs and flat cemeteries (zones 1 and 5) number of individuals which sex have been estimated exceeds 10 (25 and 27 individuals, respectively). Differences seen in other zones cannot be, therefore, considered reliable.

POSITION AND ORIENTATION OF BODIES

The dominant position of bodies in graves was supine. It was observed in the majority of graves – for nearly 9 out of 10 skeletons for whom position could be determined, regardless of the type of cemetery, burial area, grave type, sex and age of the dead. The only exceptions are observed in settlement pits in Bronocice and Gorzyczany (burials XX, VII, XV and XVI in the former site, and burial 1 in the latter), as well as burial no. 44 in Pawłów, and burial 5 in Malice Kościelne, consisting of a *Maturus* female and a child.

The orientations of bodies, however, vary. In one group of graves from flat cemeteries, the dominant trend seems to be with the head towards the west. There is also a group of graves in which the dead are set with their heads directed to the north. In both groups, some deviations can be observed, especially among the west-oriented graves, in which some are directed more toward the SW. In general, directing the head to west corresponds well with graves from chamberless tombs, and to the tombs themselves (Fig. 10). The second group, the north-oriented burials, is puzzling. Apparently, this orientation was not popular in graves related to monuments. Even in graves set perpendicularly to monuments, the heads of the dead are rather directed toward the S or SSE. Out of 23 graves in which the head of the dead was directed toward the north (with deviations toward the NE and NW), 19 were found in flat cemeteries, in zone 4 and in monuments (43.5%, 21.7% and 17.4%). Moreover, it seems that there is some sort of difference in orientation between males and females, with a slight preference for the W-E axis for the former, and the N-S for the latter group (Fig. 11). In the group of graves with heads directed northward, out of 14 examined bodies, 7 were females and 3 probable females. Seemingly, an eastern orientation

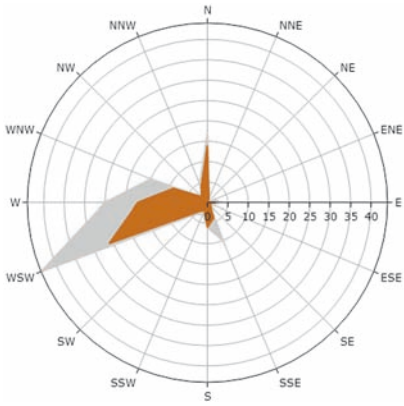

Fig. 10. Body orientation in analysed graves

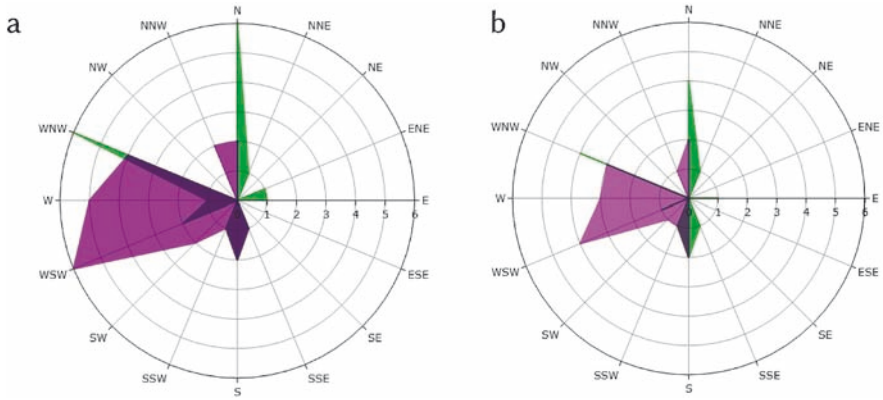

Fig. 11. Body orientation by sex: a – all graves, b – flat graves; green – female, purple – male

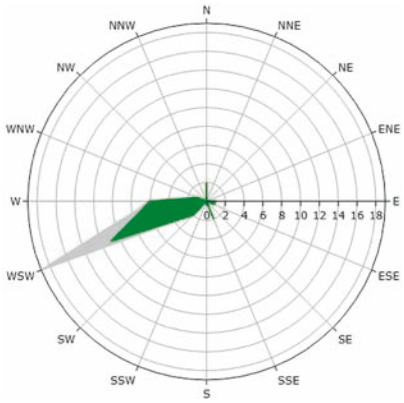

Fig. 12. Body orientation of children in flat graves (green) versus all children individuals (grey)

of the head is avoided for individuals of both sex groups. Although not numerous, there are some exceptions to this pattern. Bodies of children seem to be mostly oriented along the axes of monumental structures, mostly with heads to the west, with some deviation toward the SW (Fig. 12). That pattern is visible in most graves of children, whether they were constructed inside, later dug into, or not connected with monumental structures. Generally, only children deviating from this pattern are buried in collective burials and storage pits.

BURIAL GOODS

In the analysed group 33.8% of burials have some form of grave inventory. Interestingly, differences are visible between groups of graves, based on their burial spaces: in monumental tombs, *ca*. 35.6 % of graves have some grave inventory, similar to graves from flat cemeteries (*ca*. 37,0 %), while graves located in zone 2 were equipped only in 18.4% of cases. Zones 1, 3 and 6 are not numerous, so their statistics can be misleading, but they are as follows: 28.6% of graves in zone 1 have accompanying goods, 33.3% in zone 3, and 75% for burials in settlements. In zone 4, 42.3% of graves had grave goods, and when combined with zone 3, the figure is 40.7% of graves. As limited as the interpretation of this pattern may be, it seems that graves from chamberless tombs, flat cemeteries, and possibly graves from zone 1 are similar in this account. Graves from zone 2, however, depart from this pattern. Also, when combining all graves from areas surrounding chamberless tombs, there is still a visible difference between the frequency of equipped graves in these areas (*ca*. 26.5%) versus graves from monuments and flat cemeteries. Pottery was found in 36.2% of equipped, and 12.3% of all graves. Numbers vary from 7.4 % when counting zones 3 and 4 together, to 16.7% in flat cemeteries. No pottery was observed in graves from zone 1. Aside from this latter zone, differences in the proportions of graves with pottery are not large: 11.8% in monuments, 12.3% in zone 2, 7.4% in zones 3 and 4 combined, and 12.5% in settlement burials. Overall, 9.6% of graves surrounding monumental tombs were equipped with pottery. Similarly to the pottery, flint tools were found in 36.2% of equipped, and 12.3% of all graves graves – most often in monumental tombs and flat cemeteries (17.0% and 16.7%, respectively). They are almost as frequent in zone 1 (14.3%), while in other zones, less than 10% of graves have any flint tools (2.0% in zone 2, 0.7% in zones 3 and 4 combined). Altogether, only about 4.8% of graves from the surroundings of monuments are equipped with flint tools, and the figure is similar in settlement burials. Tools and other objects made of clay (spindle whorls, loom weights), stone (including flakes and pieces of flint), copper or bone have been observed only sporadically. Copper daggers have been found only in monuments and flat cemeteries, namely in Goszyce, Kichary Nowe and Słonowice. In general, grave goods were found more often in male burials than in female burials (*ca*. 48.4% to 30.3% accordingly). This difference diminishes slightly, however, when the burials of possible males and females are added (43.2% for males and 31.8% for

females). Pottery was found in 7.7% of female burials, and 20.8% of male burials, and flint tools were found in about 11.5% of female burials and 29.1% of male burials.

SUMMARY

The performed analyses do not resolve all problems concerning flat graves of the FBC SE. In particular, the relative chronology of different burial customs, and the sequence of burials in supposedly more developed funerary complexes, could not be fully understood. The reason for that is the small number of absolute dates and chronology-sensitive artefacts in graves.

About 60-80% of burials in all analysed regions consist of some form of flat graves (including those inside settlements). Even though the Lublin region is underrepresented in the data base, a deviation from the obtained 70.1% probably would not exceed the above range. In any case, it should be stated that flat graves are substantial elements of the funerary rites of the FBC SE.

The available absolute dates suggest the more or less contemporary development of monumental and flat cemeteries. The dates obtained from the surroundings of monumental tombs at Słonowice and Skołoszów fit in the same range. The small sample size of radiocarbon dates does not allow for the building of more detailed chronological models that would be reliable. The earliest date from Bronocice seems to predate this chronological range. It is unclear, however, if this structure – burial no. XX – should be classified as part of the cemetery or as a burial in the settlement. Only dated burials of the latter kind are known from this site, and were used throughout the whole span of the FBC and FBC-Baden occupation. The very late dating of Kichary Nowe, due to controversies regarding the classification of the site and the dates themselves, can be regarded only as a suggestion that some funerary activities of the FBC might have been performed at the beginning of the 3rd millennium BC.

Graves in flat cemeteries have shared characteristics with graves found in chamberless tombs. This is particularly visible in graves with stone constructions. Only the custom of filling a grave with layers of stone seems to be more strongly related to the latter group. The proportion of graves aligned to an W-E axis seems to be more similar in these two groups. The almost identical age and sex structures of the dead add to the overall similarities between groups. Lastly, the frequency of burials with grave goods, such as pottery, is also similar between the two groups. Unfortunately, the scarcity of radiocarbon dates provides only limited insight into the chronology of the flat cemeteries (and monumental ones). As can be seen, all dated graves from monumental tombs point to the classical phase of the FBC SE, that is 3650-3400/3300 BC. The only dates concerning flat cemeteries came from Bronocice. The chronological range is wider here, even excluding the latest of them, more probably relating to the Funnel Beaker-Baden horizon. It should be assumed

that both types of cemeteries were more or less contemporary, with, possibly, a slightly earlier beginning for flat cemeteries, assuming that burial XX from Bronocice was a part of the regular cemetery. Dates from Kolosy, regardless of the interpretation of this site, fit this chronological model. It is unclear, however, if graves with stone constructions were built outside chamberless tombs in the classic phase of the FBC SE. The shortage of radiocarbon data from the Nałęczów area is especially perceptible in this context. Quite opposite to Kolosy, dates from Kichary Nowe do not fit the chronological model in any way. The relative and absolute chronology of the FBC SE from the Sandomierz Upland is, however, poorly understood as a whole. The later phases of the 4th millennium BC, which in the western area of this group can be distinguished by Baden influences, need more attention in future research.

Graves that were placed in front of the tomb (*i.e.* along the supposed longer base of the trapeze) in Malice Kościelne do not distinguish themselves with regard to their construction. However, age structures in this area are more similar to graves from zone 2. The dominant orientation of graves along a N-S axis here is similar only to the pattern observed among the equally small number of graves from zone 3 in Słonowice. This location of graves has not been observed in other sites.

Burials located along monuments are oriented the same way as the monuments themselves, and rarely consist of stone wall supports or coatings. Grave goods are less frequently found in this than in other zones. In such locations, mostly children (*Infans I*) and adult women were buried. Although this pattern has been observed in Pawłów and Słonowice, in Malice Kościelne, these characteristics seem to be shared by graves found in the "tail" of barrow I. This fact, and the lack of detailed data on most of the graves from Słonowice, suggest caution in the interpretation of this zone.

Zones 3 and 4 (combined) aggregate the remaining graves from the surroundings of chamberless tombs. Their relations to monuments are uncertain. The fact that these zones consist of scattered groups of graves makes it difficult to treat them as homogeneous. The age and sex structures of burials from zone 4 connect it mostly to graves from chamberless tombs and flat cemeteries. However, the overrepresentation of males and the youngest group of children (*Infans I*), and the lack of *Iuvenis* individuals, is visible.

The last burial zone consists of singular graves set in settlements or in their proximity. These burials differ from nearly all others. The generally small number of published graves of this type, and the quite high variability among them makes it hard to describe them together. To this group, generally single graves that were found in settlements have been classified. However, also double burials occure in this group. Some of the burials were set in rectangular pits, and others (most of them?) in storage pits. They are mostly graves of children (*Infans II*) and women(?). Although among some of them the position and orientation of the grave is similar to other graves, they look less carefully made, as the remains of the dead often deviate from an extended position. In one case at Kamień Łukawski, the body was sloping downward, but in an extended, supine position. It may be that the lack

of preparation in those graves leads to later, taphonomic disruptions. This does not seem to be the case, however, in grave XX from Bronocice, where the arms and torso seem to be intentionally arranged in position deviating from standard of FBC SE. Some other burials in storage pits are also known. In pit no. 16 in Zawichost-Podgórze, site "Pieczyska", a nearly complete skeleton of an *Adultus* male was found in non-anatomical position, but in a manner that suggested intentional arrangement (Balcer 1968, 326). The body was found at a depth of 90-120 cm, *i.e.* about 35 cm above the bottom of the pit. Apart from the presence of the body, the pit did not differ from other storage pits of the FBC SE (Balcer 1967, 32). In the fill of the pit, above the level of the body, a bone from a human fetus was also found (Balcer 1968, 326). In Niedźwiedź, a body was found in a supine position, with its head directed westward, on the bottom of trapezoidal storage pit no. 46. In pit 60-61 on the same site, a human skull was found at a depth of 40 cm. About half a meter deeper, a bowl was found (Burchard 1977, 69-70). The small number of graves of this type, as well as their variability, suggests caution in interpreting them on an equal scale with other burial zones. The characteristics of these forms of graves seem to suggest that there was no widespread custom of burying people inside of settlements, and that these kinds of burials were, in fact, incidental.

In conclusion, the adopted approach to the problem of flat graves of the FBC SE produced a picture of complex funerary rituals among these societies. The general distinction between monumental and flat cemeteries does not seem to comprehend the variability of grave forms in this group. Although groups of graves found in chamberless tombs reveal similarities to non-megalithic cemeteries, the same cannot be said about flat graves that are part of cemeteries with monuments, which is best illustrated by zone 2. Other graves from the surroundings of monumental tombs show less consistent characteristics, so it is not clear whether they (or which of them) should be considered part of a separate cemetery, of a complex (chronologically or functionally consistent with monuments), or yet another variant of the funerary tradition. Presently, the lack of datable material in most graves, the low resolution of the relative chronology based on ceramic forms, and the small number of radiocarbon dates, hinder further interpretations of these problems.

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FIELD SURVEY AND MATERIALS

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POTTERY KILNS FROM THE TRIPOLYE SETTLEMENT OF KAMENETS-PODOLSKIY, TATARYSKY, THE 2019 EXCAVATION CAMPAIGN: REGARDING THE ISSUE OF THE EVOLUTION OF TRIPOLYE POTTERY KILNS

ABSTRACT

Diachenko A. and Sobkowiak-Tabaka I. 2020. Pottery kilns from the Tripolye settlement of Kamenets-Podolskiy, Tatarysky, the 2019 excavation campaign: Regarding the issue of the evolution of Tripolye pottery kilns. *Sprawozdania Archeologiczne* 72/1, 147-171.

This paper presents two pottery kilns of an archaic construction, which were excavated at the Tripolye BII settlement of Kamenets-Podolskiy, Tatarysky, in 2019. The site, dated to the beginning of the 4th mil. BC, is attributed to the Mereshovskaya group of the Western Tripolye culture. Analysis of the construction details of our kilns compared to similar structures, which are known from other Tripolye sites and outside the Cucuteni-Tripolye cultural complex, made possible the typological specification of Cucuteni-Tripolye pottery kilns and a contribution to the issue of major trends in their evolution.

Keywords: Neolithic, pottery kilns, Cucuteni-Tripolye cultural complex, Western Tripolye culture, ceramics
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INTRODUCTION

Cucuteni-Tripolye cultural complex, and especially its northeastern, Tripolye component significantly differs from numerous earlier and later cultures and cultural complexes between the Carpathians and the Dnieper with regard to its well-made ceramics. Therefore, the issues of technology and scales of its production are being actively investigated, while the evolution of pottery kilns remains one of the most important issues influencing the overall state of debates (*e.g.* Ellis 1984; Ryzhov 2001; Tencariu 2010; Tsvek 1994; 2004; Videiko 2002; 2013). The goal of this paper is the detailed publication of pottery kilns excavated at the settlement of Kamenets-Podolskiy, Tatarysky, in 2019, allowing several important conclusions considering the evolution of ceramic production in the Western Tripolye culture.

For a long time the 'Tripolye perspective' on Cucuteni-Tripolye pottery kilns was framed by the view from the Eastern Tripolye culture (distinguished by E. Tsvek 1989; 2006; hereinafter – ETC) due to the finds made mainly during the excavations of sites attributed to this taxonomical unit (*e.g.* Tsvek 1994; 2004). The contribution from the Western Tripolye culture (distinguished by S. Ryzhov 2007; hereinafter – WTC) mainly focused on the structures excavated in Zhvanets (Movsha 1971). However, recent geophysical prospection, followed by the excavations at the WTC mega-sites Nebelevka, Dobrovody, Talianki and Maidanetske in Ukraine, led to the discovery of pottery kilns of previously unknown type (Fig. 1). Such structures are not subdivided into subterranean

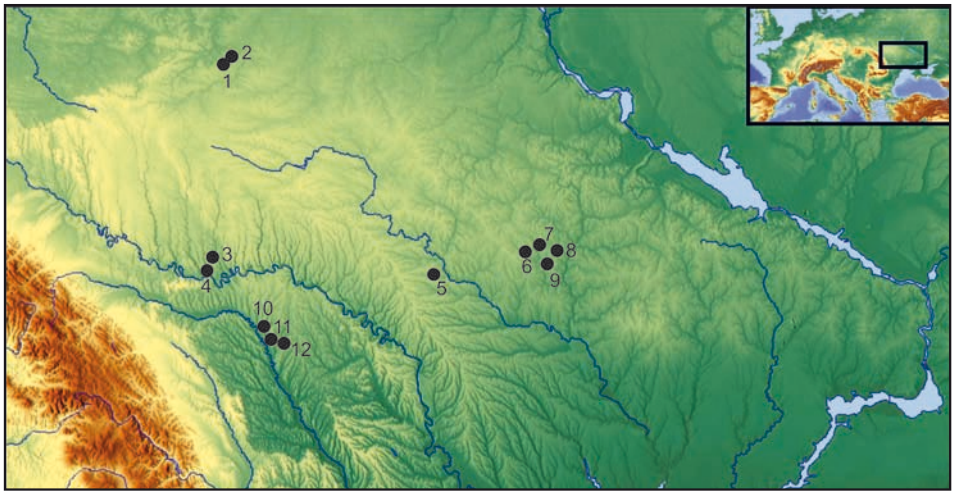

Fig. 1. Locations of the sites with pottery kilns that were considered in this paper. 1 – Novomalin-Podobanka, 2 – Ostrog-Zeman, 3 – Kamenets-Podolskiy, Tatarysky, 4 – Zhvanets, 5 – Trostianchyk, 6 – Dobrovody, 7 – Talianki, 8 – Maidanetske, 9 – Nebelevka, 10 – Trinca-Izvorul lui Luca, 11 – Hancăuți I – „La Frasin", 12 –Stolniceni I (base: https://maps-for-free.com/)

fueling chamber and elevated firing chamber placed over each other. Instead, fuel was burnt in pits located near the kilns or right on surface next to them, and passed through the channels made by supports and holes in the elevated platform to the firing chamber (Burdo and Videiko 2016; Korvin-Piotrovskiy *et al.* 2016; Videiko 2019; *cf.* Chapman and Gaydarska 2016). New finds also made possible the interpretation and re-interpretation of related structures from the excavations in Western Volhynian sites, Ostrog-Zeman (Pozikhovskyi 2019) and Novomalin-Podobanka (Videiko 2019: properly reassessed from Diachenko 2016). Reigniting interest in the topic, the discoveries at the Tripolye mega-sites led to the publication of kilns from the earlier excavations in Northern Moldova (Sîrbu 2015; Sîrbu and Bicbaev 2017), while new geophysical surveys and fieldwork in this region, among others, resulted in the investigation of double-chamber kilns in Stolniceni I (Ţerna *et al.* 2016; 2017; 2019).

Rapidly accumulated empirical evidence made possible generalizations considering specific construction details, as well as the chronology and evolution of pottery kilns discovered at the WTC mega-sites in the Southern Bug and Dnieper interfluve (*e.g.* Korvin-Piotrovskiy *et al.* 2016; Videiko 2019). In this respect, we should especially note the recent publication of V. Rud and his co-authors (2019), extending and specifying the information from the preliminary report on excavations at the Tripolye BII settlement of Trostianchyk in the Bug region (Rud 2016). The latter two papers present the analysis of clay discs and units ('truncated-pyramidal clay objects'), which were found in one of the pits and interpreted as construction elements of a pottery kiln, questioning the archaic stages in the evolution of such structures. Contributing to the discussion raised by V. Rud, we will present the context of similar finds from the settlement of Kamenets-Podolskiy, Tatarysky, which were only briefly described in the preliminary report (Diachenko *et al.* 2019), and then suggest the reconstruction of evolutionary trajectories of Tripolye pottery kilns. However, let us begin with the information on excavations in Kamenets-Podolskiy, Tatarysky, and the discussion of chronology of this and related sites.

EXCAVATIONS AT THE SETTLEMENT OF KAMENETS-PODOLSKIY, TATARYSKY: RESEARCH AIMS AND POSITION OF THE SITE IN THE CHRONOLOGICAL AND TAXONOMICAL DIVISION OF CUCUTENI-TRIPOLYE SETTLEMENTS

Fieldwork at the WTC settlement of Kamenets-Podolskiy, Tatarysky, in 2019 was conducted as part of the research project 'Dynamics of prehistoric culture: Comprehensive analysis of records from Southeastern and Central Europe' funded by the National Science Center of Poland (2018/29/B/HS3/01201; Iwona Sobkowiak-Tabaka, PI). Excavations were preceded by geophysical surveys (Diachenko *et al.* 2019). Fieldwork aimed the for-

mation process of archaeological records, reduction of information and accumulation of material remains in discrete time. Due to these goals, we have chosen to excavate the Tripolye ploschadka, *i.e.* the rectangular-shaped structure, including burnt daub, ceramics, tools and animal bones, which represents the remains of a burnt house, and pits in its close vicinity. In a certain way, the ploschadka encompases the construction of a dwelling, activities conducted by inhabitants within, and its ritual burning after the placement of vessels, tools and figurines in various parts, as well as the possible deliberate destruction of the 'heart of the house' – a hearth (*e.g.* Gershkovich 2003; Kruts 2003; *cf.* Chernovol 2012).

In the search for a particular Tripolye site to excavate, we have chosen the settlement of Kamenets-Podolskiy, Tatarysky, located in the Middle Dniester region. This site was chosen in consideration of an imbalance in fieldwork in different areas of the Cucuteni-Tripolye cultural complex (hereinafter – CTCC) after the discovery of mega-sites in the Southern Bug and Dnieper interfluve, and their subsequent large-scale excavations, accompanied by geophysical prospection and regional surveys since the 1970s (for the recent overview see: Chapman *et al.* 2014; Menotti and Korvin-Piotrovskiy 2012; Müller *et al.* 2016; Videiko 2013). Moreover, material culture of the Middle Dniester region and the Southern Bug and Dnieper interfluve is characterized by the development of two 'genetic lines' (using a term suggested by V. Dergachev 1980), both rooted in the Rakovetskaya local group of the Middle Dniester region (Chernysh 1973; Popova 1989; Ryzhov 2007; Sorokin 1990; Tkachuk and Shevchuk 2007). Let us briefly consider the discussion on the taxonomy and chronology of the related sites.

V. Sorokin suggested two subsequent site types in the development of the first half of Tripolye BII sites in the Middle Dniester region, the Rakovetskiy and Mereshovskiy types, respectively, seeing their origin in the sites of the Yablona type (Sorokin 1990). This division is generally followed by S. Ryzhov; however, he considers the Zaleschitskaya and Solonchenskaya groups as the bases of formation of the Rakovetskiy type, and refers the site of Yablona to the latter (Ryzhov 2007). T. Tkachuk considers the differences in ceramic assemblages of the related sites as being significant enough to distinguish the Rakovetskaya and Mereshovskaya local groups (*e.g.* Tkachuk and Shevchuk 2007). In this respect, we should note that in the Cucuteni-Tripolye taxonomy, the duration of a unit's existence, its territorial extension and the difference in pottery styles increase from 'site type' to 'local group'. Based on the analysis of ceramics, Ryzhov (2007) suggested that part of the population of the Rakovetskiy type and later populations of the early phase of the Mereshovskiy type migrated to the east and formed the settlements of the Voroshilovka type and the later Nemirov type in the Bug region, as they were distinguished by S. Gusev (1993). Mixing with the populations of the Eastern Tripolye culture and Post-Klischev groups further to the east, those populations formed the sites of the Vladimirovskaya, and later the Nebelevskaya group in the Southern Bug and Dnieper interfluve. The core area of the Mereshovskiy type, already in the early phase of its development, became the base of the formation of the Petrenskaya local group (Ryzhov 2007). The migratory hypothesis find its confirmation in

population and environmental proxies (Diachenko 2012; 2019; Diachenko and Menotti 2017; Harper 2017; Harper *et al.* 2019; Weninger and Harper 2015). According to T. Tkachuk and S. Ryzhov, populations of the Mereshovskaya group extended their territory from the Middle Dniester region to the Middle Dniester and Prut interfluve and the southern part of the Bug region. According to T. Tkachuk, the second phase of their development may be synchronized with the early sites of the Shypinetskaya group, while the third phase was the time of the migration of populations of the Mereshovskaya group further to the east (Tkachuk and Shevchuk 2007).

The settlement of Kamenets-Podolskiy, Tatarysky, is located on the hill-shaped ledge of a plateau to the south of Kamenets-Podolskiy castle. The site has been known since 1926. Collections from surface surveys are kept by the State Historical Museum-Preservation of Kamenets-Podolskiy and the Archaeological Laboratory of the Ivan Ohienko National University of Kamenets-Podolskiy (Levinzon 2018; 2019). Analysis of surveyed ceramics allowed S. Ryzhov (2003) to attribute the site to the formation phase of the Petrenskaya local group. Later on T. Tkachuk (2015) referred Kamenets-Podolskiy, Tatarysky, to the second phase of the development of the Mereshovskaya local group, hence suggesting its similar chronological position. However, his attribution of the site in cultural taxonomy confronts Ryzhov's opinion.

Considering the location of the settlement and numerous fragments of Tripolye pottery annually found on its modern surface, we decided to begin fieldwork by testing the intensity of erosion processes influencing the preservation of the cultural layer. For this purpose, a 10 m long and 1 m wide trench was excavated on the eastern slope of the hill-shaped ledge of the plateau. Remains of two pottery kilns were found at the bottom of the trench. Therefore, the latter was included in excavation site I in order to investigate these structures completely. Ploschadka was investigated in excavation site II, located in the other part of the site.

Unfortunately, painted ornamentation was not preserved on the vast majority of vessels in the ceramic assemblage obtained in the 2019 excavation campaign. Nonetheless, we may note some archaic pottery traditions in this sample. These include the nearly equal relative number of conical and spherico-conical bowls, funnel-shaped rims, the predominance of spherico-conical vessels over biconical ones, goblets with metopic ornamentation of early variations, and painting on both sides of bowls (Figs. 2 and 3). Some of the listed archaic shapes and ornaments were already noted at the site by T. Tkachuk (Tkachuk 2015; also see Tkachuk and Shevchuk 2007 for the chronological indicators). Moreover, the ceramic assemblage includes four fragments of pottery with incised decoration, which, according to V. Sorokin, accounts for 2-4 % of the all ceramic assemblages of the Rakovetskiy type, but is not noted by him for the Mereshovkiy type (Sorokin 1990). It should be highlighted that the aforementioned percentage 'increases' when it is estimated using the total number of table pottery as counted by S. Ryzhov and T. Tkachuk and their followers, including the authors of this paper. Additionally, taking into account the territorial and spatial

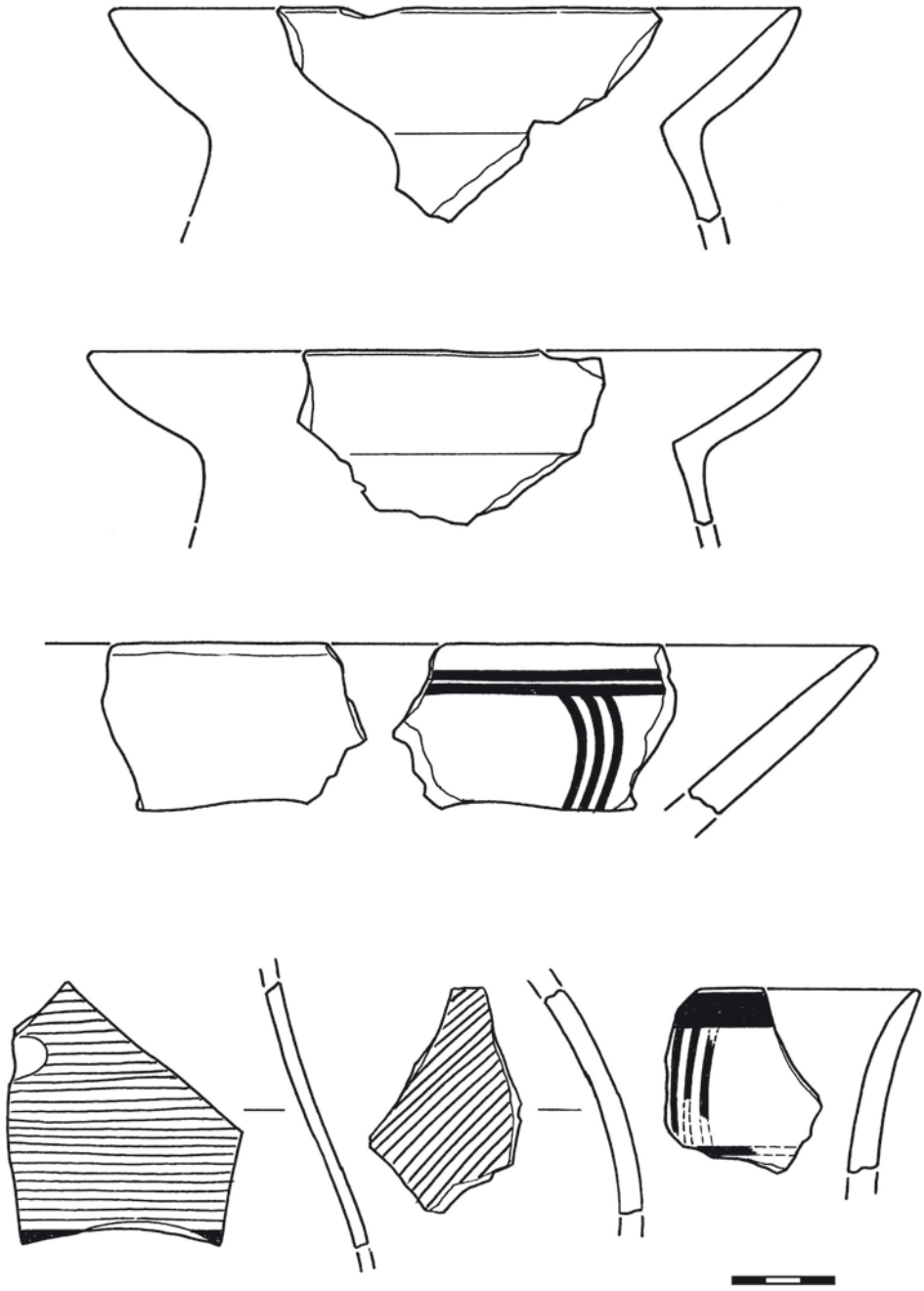

Fig. 2. Kamenets-Podolskiy, Tatarysky. Examples of table pottery from excavation site I (drawings by D. Kushtan)

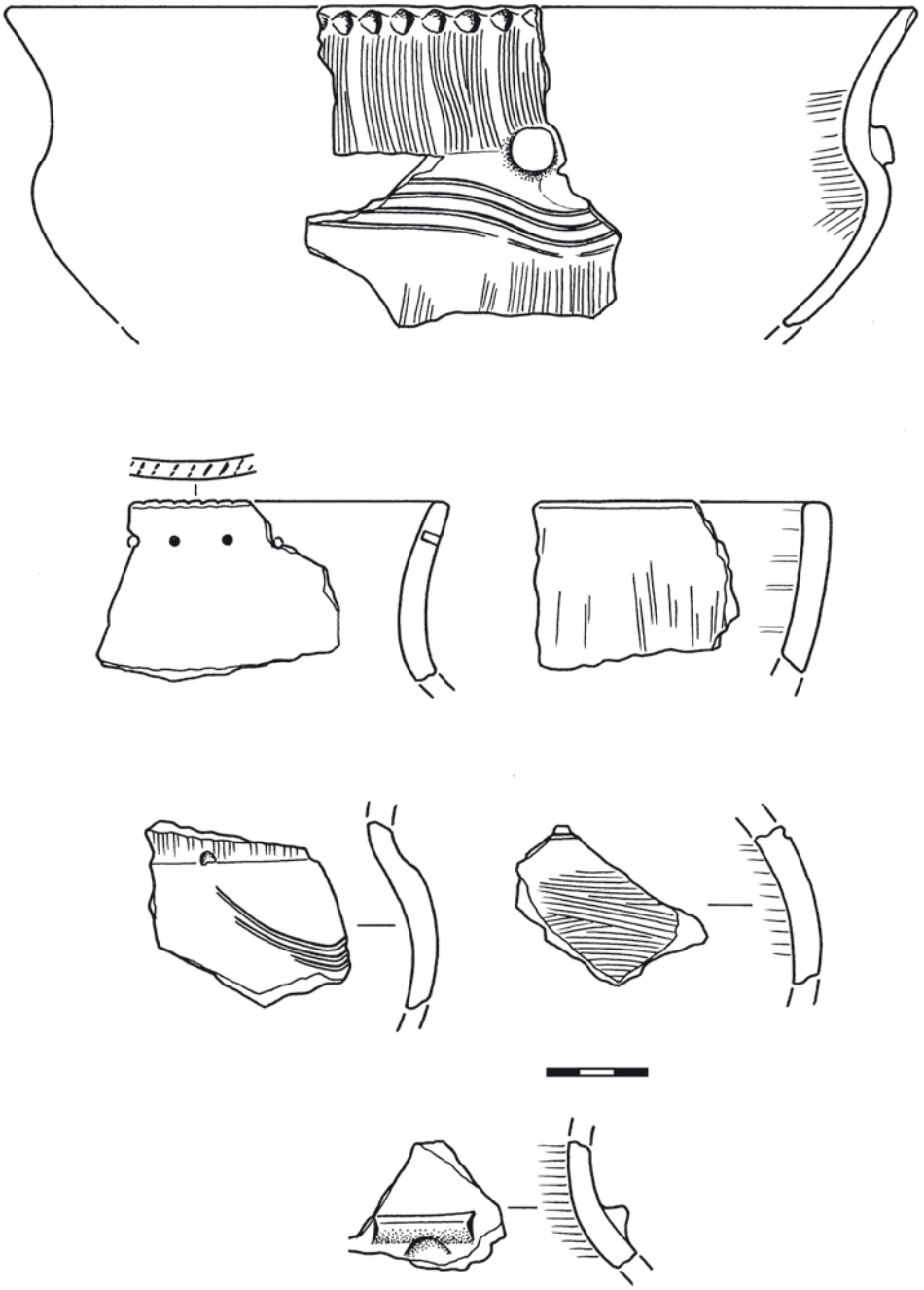

Fig. 3. Kamenets-Podolskiy, Tatarysky. Examples of kitchen pottery from excavation site I (drawings by D. Kushtan)

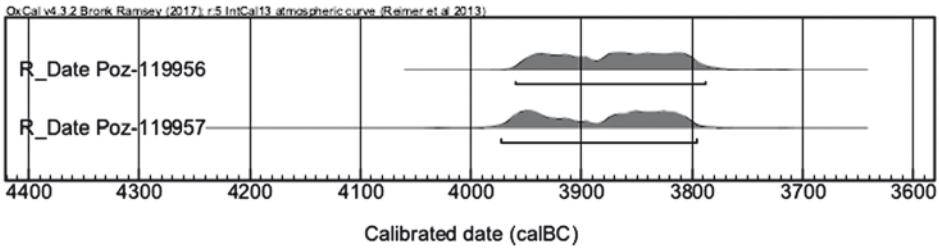

Fig. 4. Kamenets-Podolskiy, Tatarysky. Radiocarbon dates made on animal bones from excavation site II (*ploschadka*). Dates were calibrated according to the IntCal 13 Northern Hemisphere curve (Reimer *et al.* 2013) in OxCal (Bronk Ramsey 2017) version 4.3.2

extension as secondary taxonomical criteria in distinguishing local groups, we may preliminary agree with Tkachuk's division of the Middle Dniester Tripolye BII sites into the Rakovetskaya and Mereshovskaya local groups, referring the analyzed site to the latter.

The low frequency of table pottery with incised ornamentation (below 1%) noted for Kamenets-Podolskiy, Tatarysky, is also typical for the first phase of the development of the Nebelevskaya local group in the Southern Bug and Dnieper interfluve (Ryzhov 1993). Consideration of the ceramic seriation and ^{14}C dates (Fig. 4) allows the dating of the settlement of Kamenets-Podolskiy, Tatarysky, to the range of c. 3950-3900 BC. This suggests synchronicity of settlements belonging to the first phase of the Nebelevskaya local group and the Mereshovskaya group sites of Trostianchyk and Kamenets-Podolskiy, Tatarysky, with a certain extension of the duration of the mega-site of Nebelevka (Chapman *et al.* 2018; Rud *et al.* 2019; also see: Diachenko 2010; 2012; Harper 2017; *cf.* Chapman 2017; Chapman *et al.* 2018; 2019; Nebbia *et al.* 2018).

POTTERY KILNS FROM KAMENETS-PODOLSKIY, TATARYSKY

Let us now consider pottery kilns investigated at excavation-site I at Kamenets-Podolskiy, Tatarysky. These structures were sunken into the sterile earth, represented by limestone, which preserved them from later destruction by intensive erosion processes. Kilns were placed 2 m apart from each other along a NNE-SSW axis (Fig. 5). The difference in elevations at this part of the slope reached 1.3 m along the 10-meter-long west-east axis. The location of the analyzed kilns on the edge of the ledge of a plateau in Kamenets-Podolskiy, Tatarysky, has analogies in Zhvanets (Movsha 1971), Trinca-Izvorul lui Luca (Sîrbu 2015), Hancăuți I – „La Frasin" (Sîrbu 2015; Sîrbu and Bicbaev 2017) and other sites. Such placement decreased the risk of fire and supported the additional circulation of air in the kilns (Sîrbu 2015).

Pottery kiln 1 had a nearly square form with rounded corners. The size reached c. 2.2 m along the west-east axis and 2.1 m along the north–south axis. The entrance to the kiln was turned to the east (Fig. 6). A shallow pit of a depth of 0.08-0.15 m, 'dug out' by removing small blocks of limestone, was cleared in front of the entrance (Fig. 7). The surface, initially prepared by removing the sterile soil (the difference in elevation reaches 0.4 m along the west-east axis), was covered by a thin, 2-2.5 cm layer of clay. It was only partly preserved – probably in the places where the most hot air was passing through the channels formed by supports (also known as 'козлы' in Russian or 'goats' in articles on Tripolye pottery kilns – *e.g.* Korvin-Piotrovskiy *et al.* 2016; further in this paper, supports of kiln 1 are numbered from 1 to 6, counting from the south to the north – Fig. 8). More specifically, the clay layer placed over the bottom of the kiln was preserved near the entrance, along the channels in the middle of the structure, and also between the supports and the back wall. Additionally, this clay layer was joined to the vertical side of the supports, which can be seen on supports 3 and 4 (Fig. 9: A).

Exploration of support 4 has shown that it was placed on the clay bottom, which was already burnt during previous usage(-s) of the kiln (Fig. 8). This leads to the conclusion that kiln 1 functioned over multiple phases. Units composing a support that were damaged during the use of the kiln could be replaced by new ones. Therefore, the appearance of kiln 1 represents the construction details of this structure during the final stage of its functioning (Figs. 8, 10).

Unlike the contemporaneous kiln excavated in Nebelevka and later structures from the other sites in the Southern Bug and Dnieper interfluve and Western Volhynia, which number

Fig. 5. Kamenets-Podolskiy, Tatarysky. Pottery kilns at excavation site I, cleaning. Photo I. Sobkowiak-Tabaka

Fig. 6. Kamenets-Podolskiy, Tatarysky. Pottery kiln 1, cleaning. Photo I. Sobkowiak-Tabaka

Fig. 7. Kamenets-Podolskiy, Tatarysky. Shallow pit near the entrance to pottery kiln 1. Photo I. Sobkowiak-Tabaka

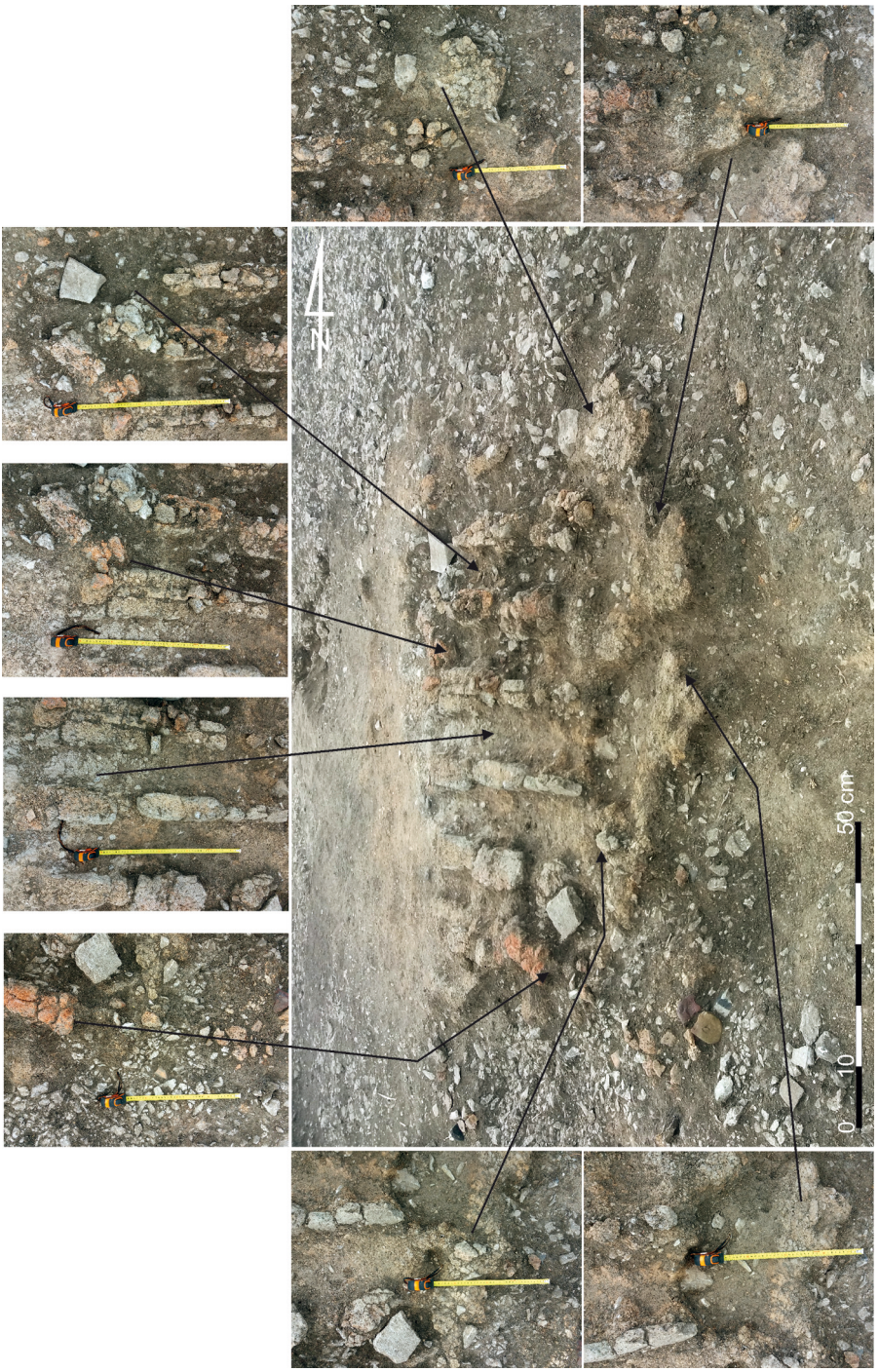

Fig. 8. Kamenets-Podolskiy, Tatarysky. Pottery kiln 1, exploration. Photo I. Sobkowiak-Tabaka

Fig. 9. Kamenets-Podolskiy, Tatarysky.
Construction details traced on channels and supports:
A – layer of clay covering the bottom of kiln 1 was joined to supports; B – possible placement of units (a unit found in the channel between supports 4 and 5 stands on support 5); C – an example of smoothed walls of the supports.
Photo I. Sobkowiak-Tabaka

Fig. 10. Kamenets-Podolskiy, Tatarysky.
Exploration of pottery kiln 1:
A – view from the east; B – view from the north; C – view from the south. Photo A. Diachenko

up to four supports, kiln 1 in Kamenets-Podolskiy, Tatarysky, included six supports. Together with the walls, they formed seven channels of an average width of c. 14-16 cm. Each support consisted of three units made of clay with an admixture of sand (one unit was not preserved in support 1 but was indicated by the remains of burnt clay on the surface, and one unit in support 5 along with two units in support 6 were significantly damaged). Units had a nearly rectangular shape with rounded edges and smoothed walls. In some cases, such units were produced as a single element over a relatively short period of time (*e.g.* in supports 1, 2 and 3). In some cases the units consisted of two (*e.g.* in support 6) or three parts (support 4), suggesting that those parts were joined together when the formed clay mass became dry (Fig. 8). Their size varied, reaching 24 x 9, 28 x 12, 28 x 10, 28 x 12, 29 x 13, 32 x 10, or 32 x 11 cm. Composing a support, the units were placed at a distance of c. 6-8 cm of each other, allowing the circulation of air and the uniform distribution of its temperature inside the kiln (Fig. 10). Notably, before the usage of this structure in its final stage, two such units were replaced by a fragment of previously used grinding stone (support 2) and the rim of a crater, *i.e.* a certain type of table pottery (support 6 – Fig. 8). None of the supports touched the walls of kiln 1, making possible the additional circulation of air. Clay units forming the supports had smoothed walls and a relatively thick, flattened top. One such unit was found in a channel between supports 4 and 5, lying on its vertical side. This suggests that the units were placed one on top of the other in the form of a 'chessboard'. Therefore, the height of the supports was at least 6-8 cm higher, reaching at least 12-16 cm (Fig. 9: B, C).

Fig. 11. Kamenets-Podolskiy, Tatarysky. Clay discs from kiln 1. Photo I. Sobkowiak-Tabaka

Supports were covered by round discs made of clay with an admixture of sand and relatively rare inclusions of organics (Fig. 11). This way, the discs formed a removable channel covering or, in other words, a removable platform for the placement of pottery before firing (Burdo and Videiko 2016; Korvin-Piotrovskiy *et al.* 2016; Ţerna *et al.* 2017; *cf.* Rud *et al.* 2019). In one case, a fragment of a clay disc was recorded on top of supports 2 and 3 (Fig. 6). However, considering the possibility of the greater height of supports, the location of this fragment could have resulted from its re-deposition after abandonment of the kiln. Microscopic observations on similar clay units and discs from Tronstianchyk by A. Rauba-Bukowska indicated that these construction elements were fired at a similar temperature as pottery from the site. This confirms the interpretation of the structures composed of such units and discs as pottery kilns (Rud *et al.* 2019). The high temperature of pottery firing in kiln 1 from Kamenets-Podolskiy, Tatarysky, is confirmed by the relatively thick layer of soil (up to 10 cm) affected by fire beneath the clay layer covering the bottom of the structure.

Aside from those of relatively large discs, fragments of discs of a smaller diameter were found in kiln 1 as well. The latter ones were produced of clay with an admixture of sand. Considering the direct analogies of distinct finds of discs from Parcova (Bodean 2016), and indirect evidence from Talianki where smaller discs were 'replaced' by fragments of broken bowls (Korvin-Piotrovskiy *et al.* 2016), they could be used for controlling the temperature inside the kiln or controlling the flow of oxygen.

Besides some re-deposited pottery fragments, the filling of channels in kiln 1 also included small fragments of burnt daub with traces of thin sticks and twigs. Taking into account the analogies from other WTC kilns (*e.g.* Burdo and Videiko 2016; Korvin-Piotrovskiy *et al.* 2016), these fragments represent the walls and/or vault of the kiln.

Pottery kiln 2 had a rectangular shape with rounded corners, and was placed into a surface preliminary prepared by removal of the sterile earth (difference in elevations reaches 0.17 m along the west-east axis; Fig. 12). The size of this structure is estimated to be 1.4 m along the north-south axis and c. 0.7 m along the west-east axis. Two channels of c. 0.7 m long were 'dug out' by removing small limestone blocks in the northern part of the structure. This indicates that the location of the entrance was in the northern part of the kiln. However, no pit (*i.e.* firebox) was found there. In this respect, we should note that some of the excavated WTC pottery kilns were also not accompanied by pits, suggesting that fuel could have been burned on the ancient surface next to the entrance of the kiln (*e.g.* kiln A in Talianki, construction phases 2 and 3 of the Maidanetske kiln, *etc.* – Korvin-Piotrovskiy *et al.* 2016).

Sterile earth between the channels of kiln 2 was preserved for forming the base of a support. Remains of the latter are represented by a single unit, analogous to the ones found in kiln 1. This unit, of rectangular shape with rounded edges, was made of clay without organic admixtures. Its size is estimated to be 26 by 8 cm (Fig. 13).

A small firing chamber of c. 0.7 by 0.65 m in kiln 2 was somewhat sunken into the sterile soil. Vertical fragments of burnt daub (up to 6 cm thick) with substantial organic

Fig. 12. Kamenets-Podolskiy, Tatarysky. Pottery kiln 2, cleaning. Photo I. Sobkowiak-Tabaka

Fig. 13. Kamenets-Podolskiy, Tatarysky. Pottery kiln 2, exploration. Photo I. Sobkowiak-Tabaka

admixtures were explored near the southern and western wall of the chamber. This may suggest a relatively high temperature inside the kiln (Fig. 13). Fragments of a clay disc were found in the fill of the firing chamber of kiln 2. The fragments are analogous to the ones found in kiln 1. The fill of the firing chamber also included small fragments of burnt daub with substantial organic admixtures, which preserved traces of wood, and were interpreted as the remains of walls and/or the vault of the kiln. In the southern edge of the structure, fragments of clay with organic admixtures were placed over sterile soil. Most probably, they represent portions of the base of the walls.

Considering the location of this structure near kiln 1, and its size, which is comparable to the dimensions of related structures in the other WTC sites, it is difficult to explain the functional need for the location of a small kiln near the 'normal'/'large' one. According to S. Ryzhov (personal comment in July 2019), usage of this structure could be related to the firing of pottery with bichromic painting, *i.e.* black and white or red and white, which is seen on WTC sites of this time period at low frequencies. Black and red paint was made of ochre and required a higher temperature of firing, as compared to white paint made of chalk (the composition of paint and the temperature of firing is discussed in Ryzhov 2001). Therefore, ceramics with bichromic black and white or red and white ornamentation had

Fig. 14. Kamenets-Podolskiy, Tatarsky. Feature 3 in excavation site I: the structure sunken into the ground (preparation of area prior to the construction of a pottery kiln?), exploration. Photo A. Diachenko

to be fired twice, *i.e.* red or black paint was fixed in fire first, and white paintings were fixed subsequently. The proposed assumption finds indirect conformation in similar features, which are known from the site of Zadubravlje (Northern Croatia) and related to the white-painted Linear A phase of the Starčevo culture (Minichreiter 2007). The kilns at Zadubravlje were located within working pits 12 and 14. The smaller kiln with dimensions of 1.3 x 0.4 m was 0.3 m high, and the bigger one with dimensions of 2.7 (originally 2.0 m) x 0.35 m was 0.65 m high. Both of them were built of clay balls, yellowish and reddish in color (mosaic structure). The kilns were elongated, of 'cigar' shape, and were used for firing fine and painted pottery. At the same time, much larger structures, *i.e.* feature 9 (a cylindrically shaped kiln) were used for firing large, coarse vessels (Minichreiter 1992; 2001, Fig. 6).

To the west of kiln 1 in Kamenets-Podolskiy, Tatarysky, we excavated feature 3, of unknown function, sunken into the ground. In its central part, blocks of limestone were removed up to 8-10 centimeters deeper than the 'average' depth of the feature, giving an impression of the preparation of two channels and bases for supports (Fig. 14). Meanwhile, its fill did not include any layers of clay mixed with sand, fragments of daub with substantial organic admixture etc., leaving our assumption unproven.

DISCUSSION AND CONCLUSIONS

The results of our excavations support V. Rud's interpretation of clay units and discs from the contemporaneous site of Trostianchyk as elements of pottery kilns of archaic construction (Rud 2016; Rud *et al.* 2019). Moreover, exploration of such kilns in Kamenets-Podolskiy, Tatarysky, allows for the specification of construction details and several assumptions related to the evolution of pottery production among populations of the CTCC.

Taking into account the relation between fuel, draught and vessels, and the position of the chamber(s) in reference to the soil's surface, F.-A. Tencariu (2010) distinguished five main types of Neo-Eneolithic pottery kilns. The first type (A), represented by open firing (with/without isolation), is known only from ethnographic studies. The second one (B) comprises firing pits (a series of pits of different shapes and dimensions), which are known from the Early and Middle Neolithic and the Middle Chalcolithic. The third type (C), which includes surface-level, one-chambered kilns (with/without lateral opening for fueling the fire; with lateral extended opening in the shape of a tunnel), occurred in the Cucuteni culture, the Middle Neolithic and the Middle Eneolithic. The fourth type (D) is represented by subterranean kilns with lateral fueling tunnels and access holes (one-chambered, or with two connected chambers for vessels) known from the Early and Middle Neolithic. The last type (E) comprises kilns with two chambers, placed vertically and separated from each other by a perforated grid made of clay. This is the most complex type of firing pottery workshop known from the Middle Chalcolithic. It is worth noting that there is no linear

evolution of these installations, since different types – more simple and more complex – were being used simultaneously by communities related to the same culture (Tencariu 2010).

This scheme may be contributed by the evolutionary trends of pottery kilns we have analyzed in this paper. Despite the similarity in construction, we tend to attribute kiln 1 and kiln 2 from Kamenets-Podolskiy, Tatarysky, to different variations, considering differences in their size, which probably indicates functional differences.

As noted above, 'large' structures are characterized by supports consisting of clay units or solid supports, and removable (*i.e.* represented by clay discs) or solid platforms for standing vessels. Since a solid platform may be placed only on solid supports, correlation of these variations provides three groups of kiln construction, which are also visible in the archaeological data. The first group comprises the structures with removable supports and a removable platform. Kilns of the second group have solid supports and a removable platform. The third group includes structures with both solid supports and platforms. The available data indicates chronological differences between pottery kilns of these groups.

Ceramic seriation and ^{14}C dates indicate the synchronous usage of the analyzed structures attributed to the first and second groups (group 1: Kamenets-Podolskiy, Tatarysky, and Trostianchyk, group 2: Nebelevka). Meanwhile, taking into account the archaic elements in pottery assemblages of the Mereshovskaya group, we could assume that these ceramics were also fired in kilns of archaic construction. Therefore, group 1 includes the earliest variations of kilns of the analyzed type, which for a certain period of time coexisted with the structures attributed to group 2. The question of when kilns attributed to group 1 originated remains open. Structures belonging to group 2 are dated to Tripolye BII and CI (*e.g.* Nebelevka – see Burdo and Videiko 2016; Chapman and Gaydarska 2016; Maidanetske – Korvin-Piotrovskiy *et al.* 2016). However, their earlier development should not be excluded. Structures included in group 3 are known from Tripolye CI sites (*e.g.* Talianki – Korvin-Piotrovskiy *et al.* 2016). Most probably, kilns of group 1 were no longer being constructed by the time of the appearance of structures attributed to group 3. Kilns belonging to groups 1 and 2 are characterized by a greater number of supports (four to six) than the later structures of group 3 (up to four). This numerical difference may be a function of the requirements of the removable or solid platform. A greater number of supports was needed for clay discs of larger diameters.

In summary, we can suggest the following evolutionary trend for Tripolye pottery kilns with supports and multiple channels. The most archaic group (1) includes structures with removable supports and platform. Already at the end of the first half of Tripolye BII, earlier kilns coexist with structures characterized by solid supports and removable platforms. By Tripolye CI, kilns of group 1 were most likely not being constructed anymore. However, the new modification, *i.e.* kilns with solid supports and platform, appear simultaneously with the structures attributed to group 2, as exemplified by the kiln from Maidanetske (Korvin-Piotrovskiy *et al.* 2016). The double-chamber kilns, which are attributed to type 'E' after Tencariu (2010) and known from Tripolye CI and CII (respectively, Stolniceni I,

2016-2017 campaigns – Țerna *et al.* 2019; and, for example, Zhvanets, Trinca-Izvorul lui Luca, Hancăuți I – „La Frasin" – Movsha 1971; Sîrbu 2015; Sîrbu and Bicbaev 2017), seem to originate from groups 2 and 3 of the analyzed structures or their combination with a type of firing pit (type 'B' after F.-A. Tencariu). It should be noted that kilns from Stoniceni I are attributed to type 'E,' because their fueling chamber was completely sunken into the ground below the firing chamber, similar to the construction of later structures listed above. This technological solution significantly impacts the firing process (Ryzhov 2001).

Most probably, the genesis of small-sized Tripolye kilns, represented by kiln 2 in Kamenets-Podolskiy, Tatarysky, is linked to the modification of even more archaic 'cigar'-shaped structures, such as were discovered at the site of Zadubravlje in Starčevo (Minichreiter 1992). It is important to note that structures of a similar shape (which, however, does not necessarily mean similar function!) were recorded in a number of chronologically different and spatially distinct Neolithic sites – *e.g.* the Butmir culture settlement Okolište (Hofmann *et al.* 2006, 95, fig. 40) and the Tripolye BI settlement Ozhevo-Ostrov (Chernovol 2014; Chernovol and Radomskyi 2015, 368, fig. 1). Therefore, we would not exclude the functioning of 'cigar'-shaped kilns in Tripolye settlements and their coexistence with more complex firing structures. This issue will be solved with further accumulation of empirical data.

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FORTIFIED SETTLEMENTS OF THE FUNNEL BEAKER-BADEN PHASE IN WESTERN LESSER POLAND

ABSTRACT

Przybyła M. M. 2020. Fortified settlements of the Funnel Beaker-Baden phase in western Lesser Poland. *Sprawozdania Archeologiczne* 72/1, 173-195.

At the end of the fourth millennium BC, in the area of western Małopolska, existing Funnel Beaker culture structures south of the Szreniawa River had disintegrated and were replaced by the settlement of the allochthonous Baden culture. North of the river, the development of the FBC still continued, strongly influenced by the Baden culture, leading to the specific form of the syncretic FB-BC. In this period only a few, but very extensive, central settlements surrounded by smaller sites remained active. The most important of them is the settlement at Bronocice, Pińczów district, fortified in the youngest phase of its use. Apart from Bronocice, only a few other sites, surrounded by ditches, belong to this horizon. Three of them are known almost exclusively through non-invasive methods: in Gniazdowice and Muniaczkowice, both in the Proszowice district, and in Marchocice, Miechów district. Another site in the town of Miechów (in the district of the same name) was also excavated.

Keywords: Eneolithic, Funnel Beaker culture, Baden culture, fortified settlement, defensive structures, enclosures, magnetometric investigations
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INTRODUCTION

At the end of the 4th millennium BC, the western part of Lesser Poland witnessed major transformations in the settlement network. The former organisation of structures developed within the Funnel Beaker Culture in the region located to the south of the Szreniawa

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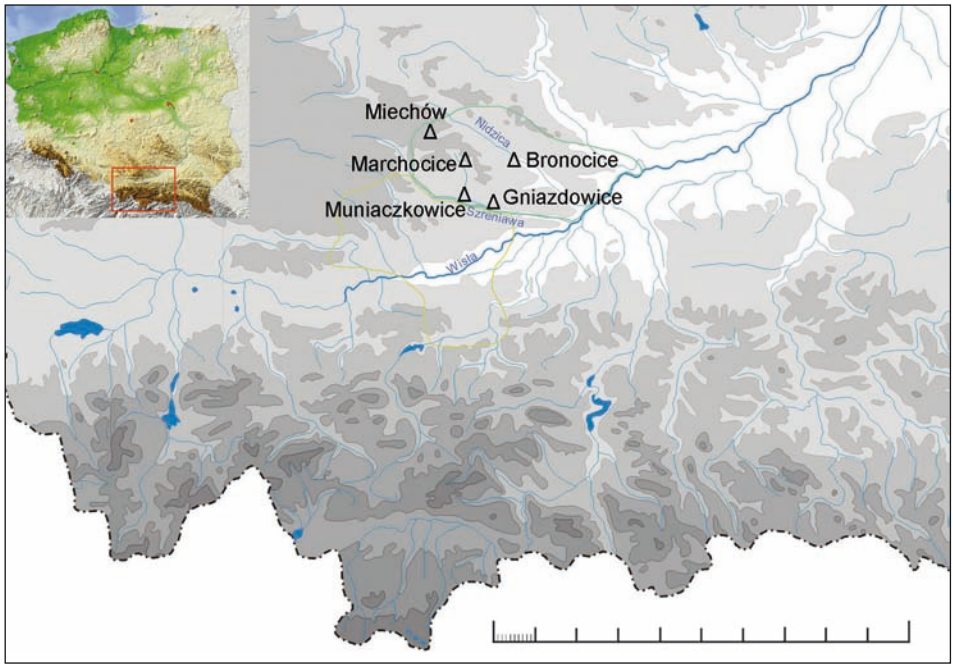

Fig. 1. Location of the sites discussed in this paper. The extent of the Funnel Beaker-Baden settlement is marked in green. The extent of the Baden settlement in western Lesser Poland is marked in yellow. After: Zastawny 2008

River valley collapsed. These were replaced by the settlement of allochthonous communities of the Baden culture. In the territories situated to the north of the Szreniawa, the Funnel Beaker culture (FBC) continued its development, strongly influenced by the Baden environment, which lead to an emergence of a very specific, syncretic cultural unit, namely the Funnel Beaker-Baden group (Zastawny 2008; Kruk and Milisauskas 1999, 174). Within the history of the organisation of the Funnel Beaker settlement network, this stage corresponds with a period of reduction and concentration of its settlement structure. In the preceding stage, associated with the development of the Funnel Beaker classical phase, *i.e.* the period of a "central places", there were numerous, large central settlements surrounded by a network of smaller sites, varied in terms of their function. Later, in the time of settlement network reduction and concentration, the few remaining active dwelling sites were vast central settlements surrounded by smaller sites (Kruk and Milisauskas 1999, 135, 174). They were spread over a considerably small area, embracing roughly the Nidzica River basin. Its southern boundary was marked by the Szreniawa River valley, constituting a borderland between the Baden and the Funnel Beaker-Baden settlements (Zastawny 2008, 177). In the existing literature, only a few sites of the Funnel Beaker-Baden phase

have been reported so far (Zastawny 2008, fig. 2). Amongst those sites, a multi-phase settlement in Bronocice is unquestionably the most important, due to which it has become the reference point for all considerations relating to this period in western Lesser Poland. However, recent years have yielded the discovery of a certain number of new interesting sites sharing one common feature, namely fortification-type structures (Fig. 1).

Bronocice, Pińczów district, site no. 1

The site was located on three flat-topped hills at the ridge of the Nidzica Valley (Fig. 2). This location was not favourable in terms of its defensiveness. The site was investigated by the corporate Polish and American expedition in the years 1974-1977 (Kruk and Milisauskas 1981, 65). The materials recovered from Bronocice provided the grounds for distinguishing successive developmental phases of the FBC on the loess soils of the western Lesser Poland. Its two youngest phases, *i.e.* Bronocice IV and V, belonged to the Funnel

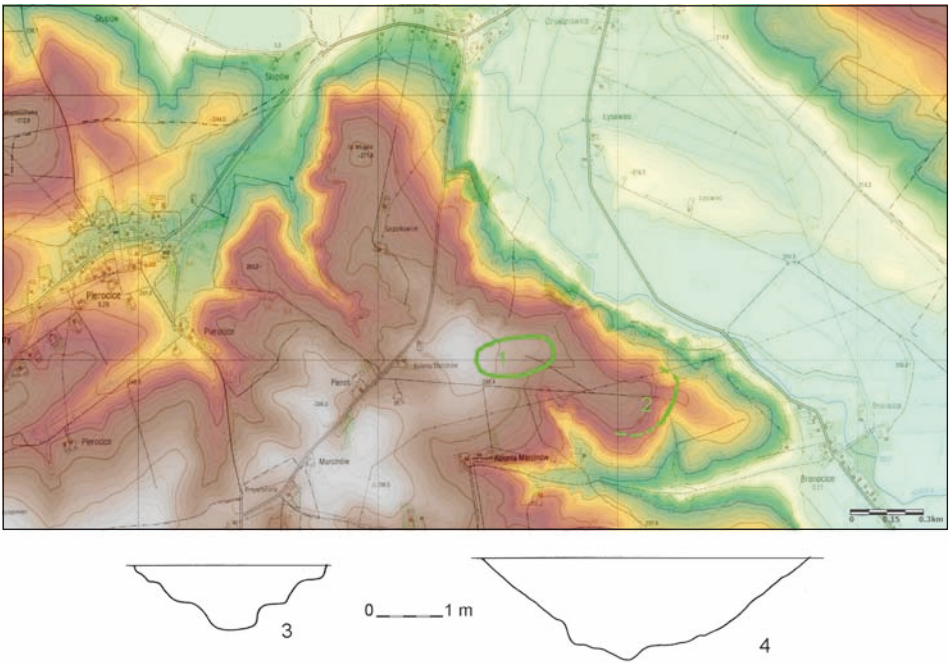

Fig. 2. Bronocice, Pińczów district. 1 – location of the ditch associated with the phase Bronocice IV; 2 – location of the archaeologically recognised portions of ditches associated with the phase Bronocice V; 3 – profile of the ditch from the phase Bronocice IV; 4 – profile of the ditch from the phase Bronocice V. After: Kruk and Milisauskas 1981

Fig. 3. Bronocice, Pińczów district. Selection of pottery. 1-4: phase Bronocice IV; 5-12: phase Bronocice V. After: Kruk and Milisauskas 1983, 1990

Beaker-Baden group (Fig. 3). During phase IV, the settlement reached its maximum size, encompassing an area of *ca*. 26 ha (Kruk and Milisauskas 1999, 175). It included an oval space surrounded by a ditch with dimensions of 340 x 160 m, and an area of *ca*. 4.6 ha. The structure in question was situated on the gently descending, eastern slope of a promontory where the settlement was founded. The ditch was 4 m wide in its upper portion, and reached a depth of 1.5 m. Taking into account the erosion of the terrain, its original depth could be estimated at 2.5 m. The ditch had the shape of an obtuse triangle in its cross-section (Kruk and Milisauskas 1981, 73). The investigators and authors who elaborated the materials from Bronocice tended to interpret the above-mentioned structure as an enclosure for cattle (Kruk and Milisauskas 1999, 175). In the final phase of the settlement (Br V), it covered a slightly smaller area, amounting to 17 ha (Kruk and Milisauskas 1999, 175). Most likely, the settlement had already been completely fortified by that time. It was surrounded by a ditch, the shape of which resembled that of the ditch recorded in the Br IV phase, though it was significantly wider and deeper. Accounting for deformations caused by erosion, its primary width in the upper portion amounted to 8.5 m, and it reached down to a depth of 4 m (Kruk and Milisauskas 1981, 75). The size of the stronghold developed in the Br V phase is difficult to evaluate, though it could have enclosed the entire area of the settlement, namely 17 ha.

Gniazdowice, Proszowice district, site no. 1

The site in Gniazdowice was situated on a loess promontory jutting into the Szreniawa Valley (Fig. 4). Thanks to its location, the site had fine, naturally defensive qualities. To the south, it was surrounded by an extremely steep embankment rising above the river valley. To the north, east and west, the promontory was cut off by a ditch at the base of the slope. The ditch was uncovered in the course of small-scale rescue excavations carried out by Przemysław Wierzbicki (Wierzbicki 2011). Following this discovery, a series of aerial photographs of the site was taken (photographs by P. Wroniecki), and magnetic prospecting was performed over an area of 2.5 ha (Fig. 5: 1). The latter revealed a part of a ditch that was accompanied by a significantly narrower grove, possibly a relic of a palisade, running parallel along the inner edge of the ditch, as well as numerous anomalies associated with archaeological features completely contained within the ditch. A field survey was then conducted, resulting in the recovery of myriad ceramic and flint materials, almost entirely connected with the Funnel Beaker-Baden phase (Fig. 6). The spatial distribution of the materials in question was perfectly enclosed within the boundaries of the ditch. The investigations performed at the site provided strong grounds for linking the fortifications – and the great majority of features encountered there – with the Funnel Beaker-Baden settlement. Moreover, the terrain along the ditch profile was subject to examinations using the method of electrical resistivity tomography 2D to determine its depth and shape in

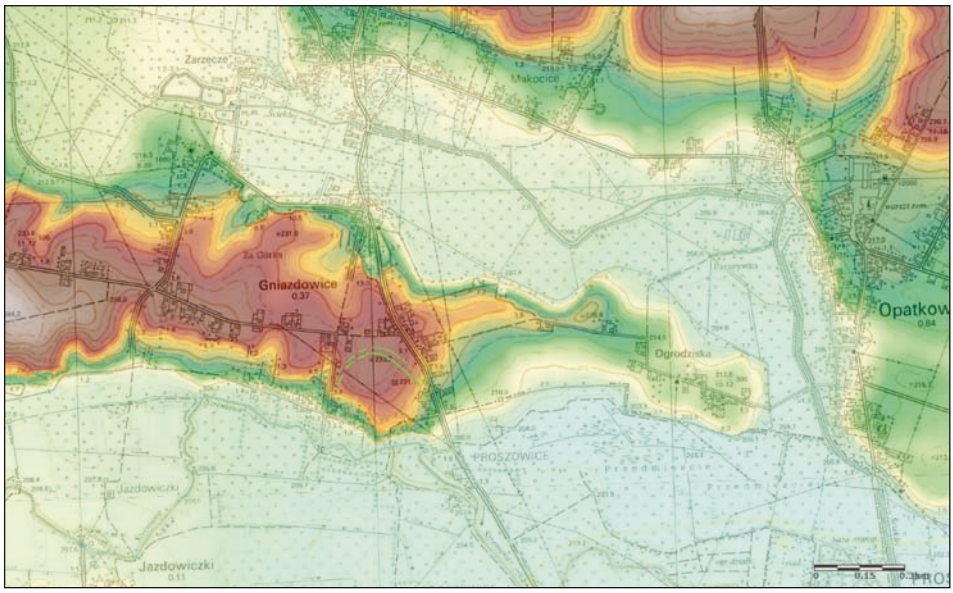

Fig. 4. Gniazdowice, Proszowice district.
The course of fortifications established based on archaeological excavations, magnetic prospecting and analyses of aerial photographs, is marked in green

vertical cross-section (Fig. 5: 2). The non-invasive examinations carried out at the site allowed the investigators to estimate that the ditch had a width of *ca*. 3-4 m in its upper portion, and a maximum depth of 3.5 m. The impact of advanced erosion on the soil cover was clearly visible at the site, which supported the hypothesis that the ditch was originally slightly deeper and wider (Przybyła *et al*. 2015).

Miechów, Miechów district, site no. 3

The site was situated on a gently descending, southern slope of the Miechówka Valley, in a location lacking any traits of natural defensibility (Fig. 7). In 2011, the site was subject to widespread rescue excavations carried out by Kamila Peschel, Grzegorz Pryc and Artur Buszek. In 2018, further excavations were carried out by Kamila Peschel, Igor Pieńkos and Marcin Przybyła. A total of 2.5 hectares of land was exposed. In the course of these investigations, abundant materials were recovered, dating from the Early Neolithic until the Middle Ages. Among many others, a multi-phase settlement of the FBC was recorded there. During the youngest phase of its development, corresponding with the phases Bronocice IV-V, the settlement was fortified with a ditch and possibly a palisade as well.

At the level of its discovery, the ditch had a width of 3-4 m. Its profile was trough-like in shape. Its depth reached 180 cm below the current ground level. However, taking into account the fact that it was uncovered below the humus and cultural layers at a depth of 140 cm, its primary depth must have exceeded 2 m. The portion of the ditch revealed at the site had a length of 105 m (Fig. 8). In its fill, a significant amount of archaeological material was found, linked with the chronological phases Br IV/V (Fig. 9). There was another

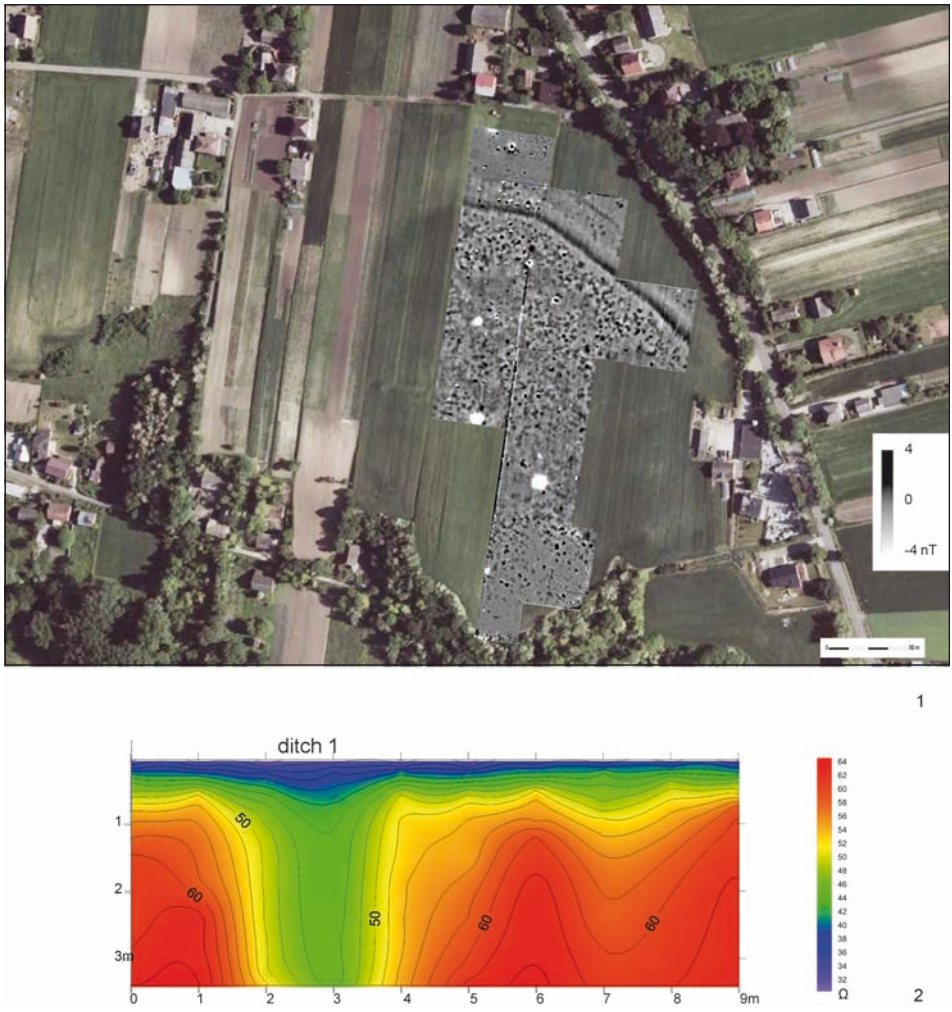

Fig. 5. Gniazdowice, Proszowice district. 1 – magnetic map with legible anomalies associated with the occurrence of the ditch, alleged palisade, and numerous features of a storage-pit type, 2 – map displaying the distribution of apparent electrical resistivity along the ditch profile

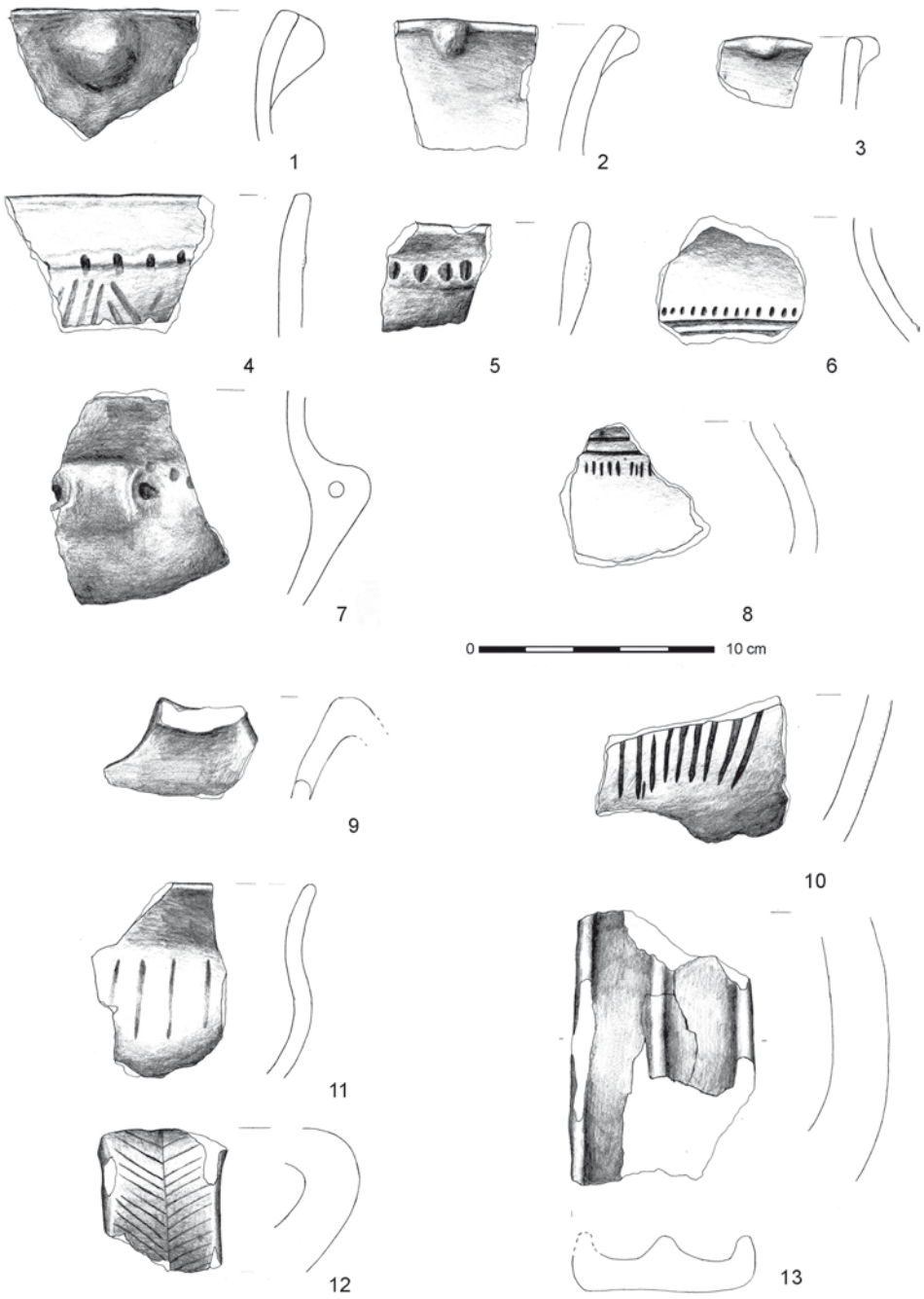

Fig. 6. Gniazdowice, Proszowice district. The Funnel Beaker-Baden pottery collected from the surface of the settlement. Drawn by M. Podsiadło

structure accompanying the ditch, namely a narrow (0.5 m) and shallow (1 m at the level of its discovery) groove running parallel to the former, unfortunately lacking any datable indicators. Its chronological relationship with the ditch is not explicit. Noteworthy is the fact that the groove occurred alternately on the inner, or the outer edge of the ditch. Since the course of the "palisade" groove was basically identical to the course of the ditch conjoining with the oxbow, and both of these systems revealed a clear stratigraphic relationship (intersecting features), it cannot be excluded that it was the very same Funnel Beaker-Baden community that erected a light fortification structure of a palisade type, and then replaced it with a more complex system consisting of a defensive ditch accompanied by an embankment.

The size of the entire defensive construction is difficult to assess. The distance between the oxbow and the ditch (on the N-S axis) amounted to 150 m at maximum. Unfortunately, the length of the settlement on the W-E axis could not be determined precisely. It seems to be similar. The estimated size of the defensive settlement is therefore about 2 hectares. At present, basically the entire area of the site is covered by municipal infrastructure and housing, due to which any further recognition of the site using geophysical methods, for example, is impossible.

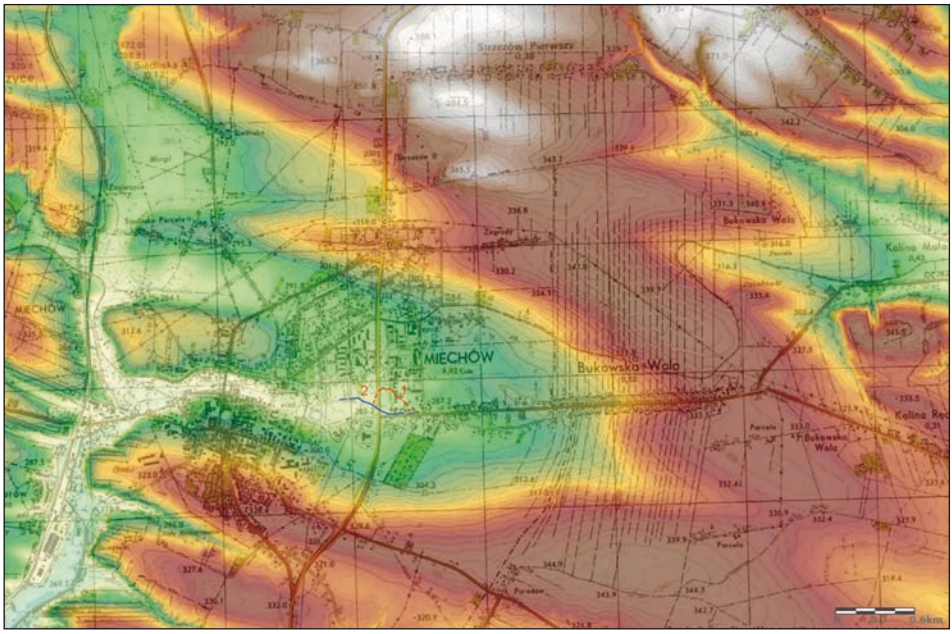

Fig. 7. Miechów, Miechów district.
1 – location of the ditch from the Funnel Beaker-Baden phase is marked in red. 2 – the Miechówka River oxbow is marked in blue

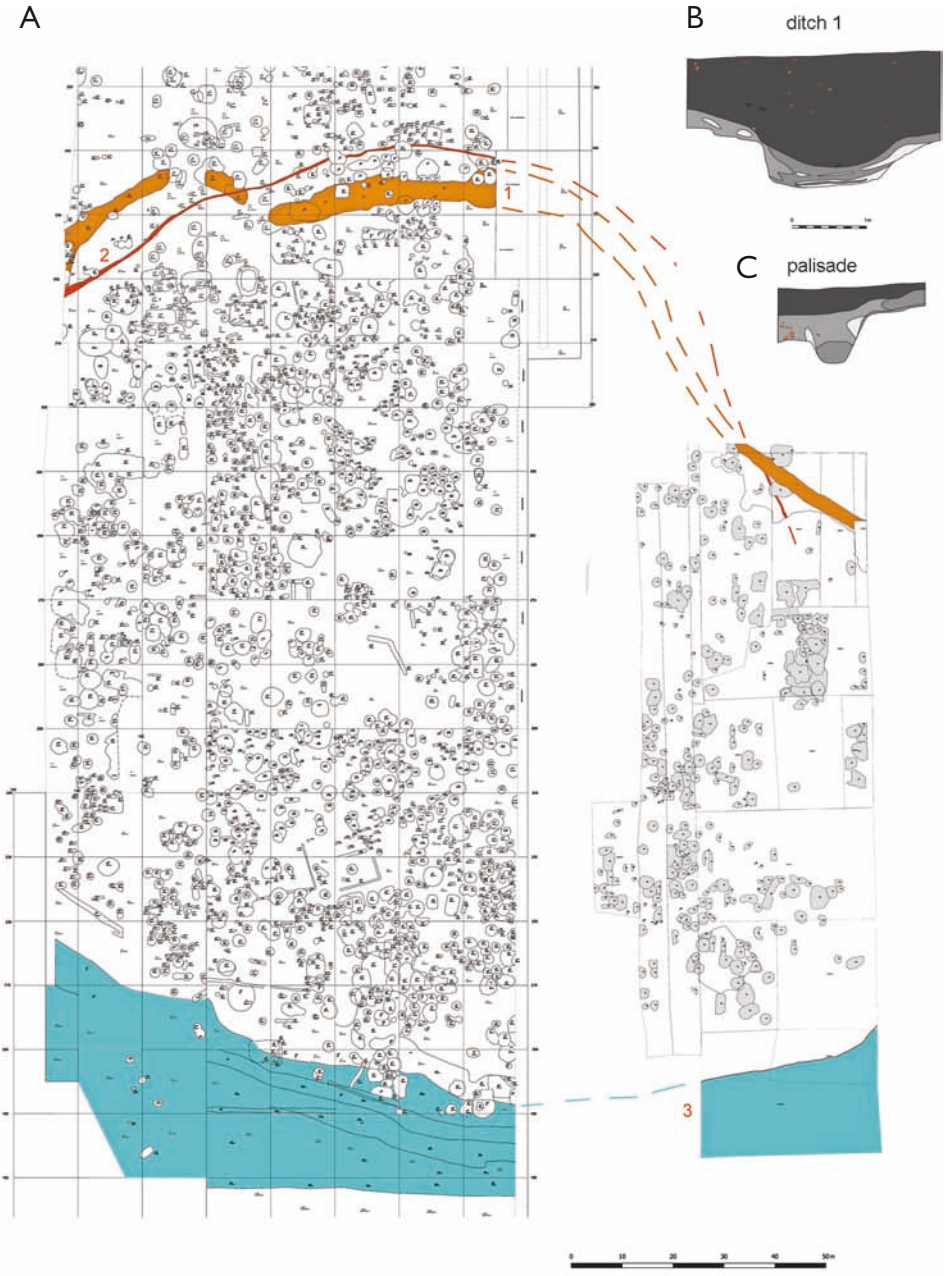

Fig. 8. Miechów, Miechów district. A – plan of the southern part of site no. 3 in Miechów (1 – location of the ditch from the Funnel Beaker-Baden phase; 2 – palisade; 3 – Miechówka River oxbow); B – profile of the ditch from the Funnel Beaker-Baden phase; C – profile of the palisade (based on the documentation by K. Peschel, G. Pryc, A. Buszek and I. Pieńkosi

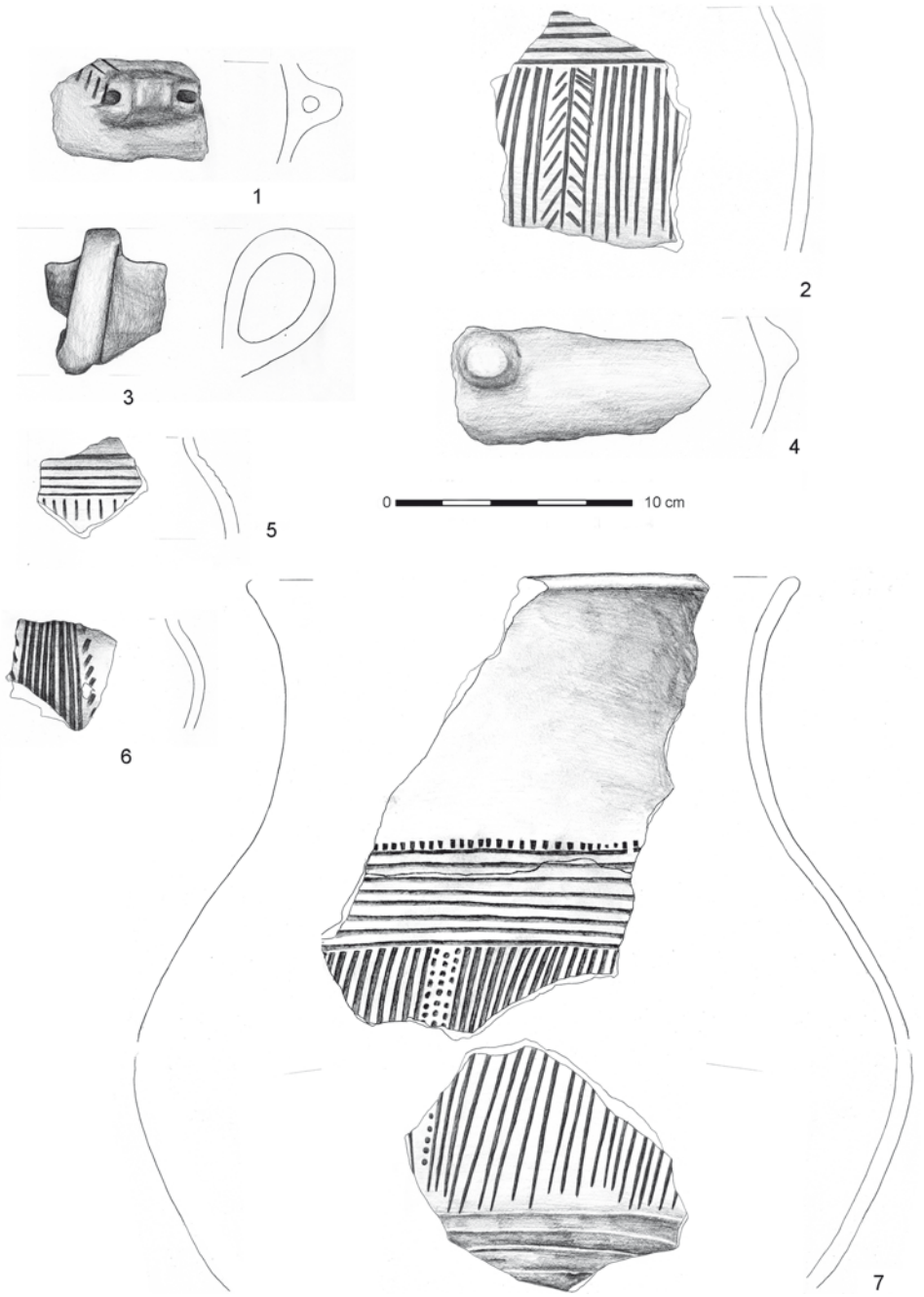

Fig. 9. Miechów, Miechów district. The Funnel Beaker-Baden pottery found in the fill of the ditch. Drawn by M. Podsiadło

Marchocice, Miechów district, site no. 2

The site was located on a conspicuous promontory with a shape resembling an elongated triangle. The promontory jutted out into the valley of a small river named Ścieklec (Fig. 10). Multi-aspect, non-invasive investigations, including aerial imaging, magnetic prospecting and a field survey, were conducted in 2010 and 2011 by a research team headed by Przemysław Dulęba, Piotr Wroniecki and Roman Brejcha (Dulęba *et al.* 2015). The examinations performed at the site revealed the existence of a vast settlement of a stronghold type, fortified with at least six parallel ditches, located in the western part of the promontory (Fig. 11). The above-mentioned ditches varied in terms of their widths. One of these structures was more complex, consisting of a wide ditch accompanied by a narrow groove (a palisade, maybe). Results of the field survey proved that the site was inhabited for a long period of time. The oldest materials encountered there were associated with the Lengyel-Polgar complex. Younger chronological periods recorded at the site were represented by numerous artefacts of the FBC and specimens linked with the Bronze Age. The final phase of occupancy at the site was indicated by the occurrence of artefacts dated to the Late Hallstatt Period. Having analysed the ceramic material presented in the article, the author formulated a hypothesis that some part of the earthenware that had been ascribed to the Lusatian culture from the Bronze Age (Dulęba *et al.* 2015, fig. 10: 4-9, 12, 14) should be actually associated with the Funnel Beaker-Baden group (Fig. 12). The specimens in question were ornamented in a manner typical of the latter taxonomic unit. However, similar, though not identical, motifs can be found on Lusatian pottery as well.

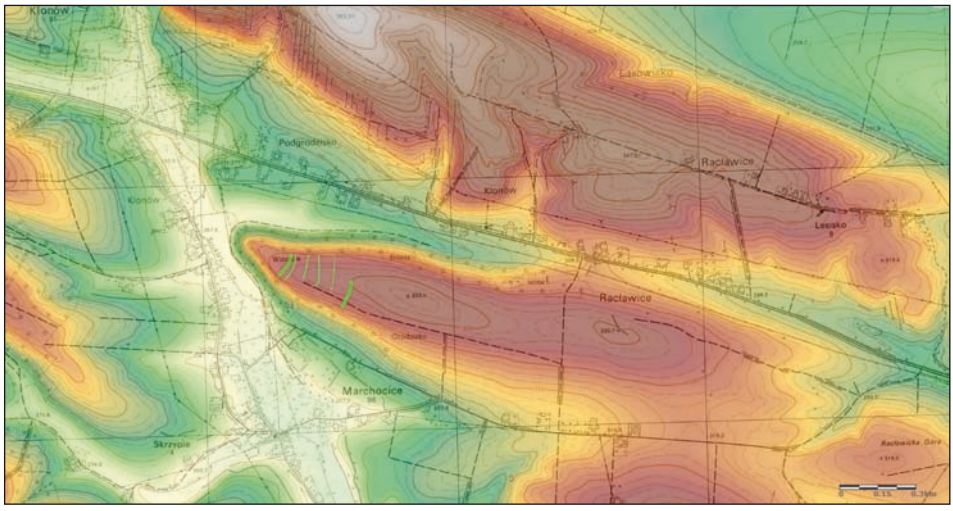

Fig. 10. Marchocice, Miechów district.
Linear features. Based on: Dulęba *et al.* 2015

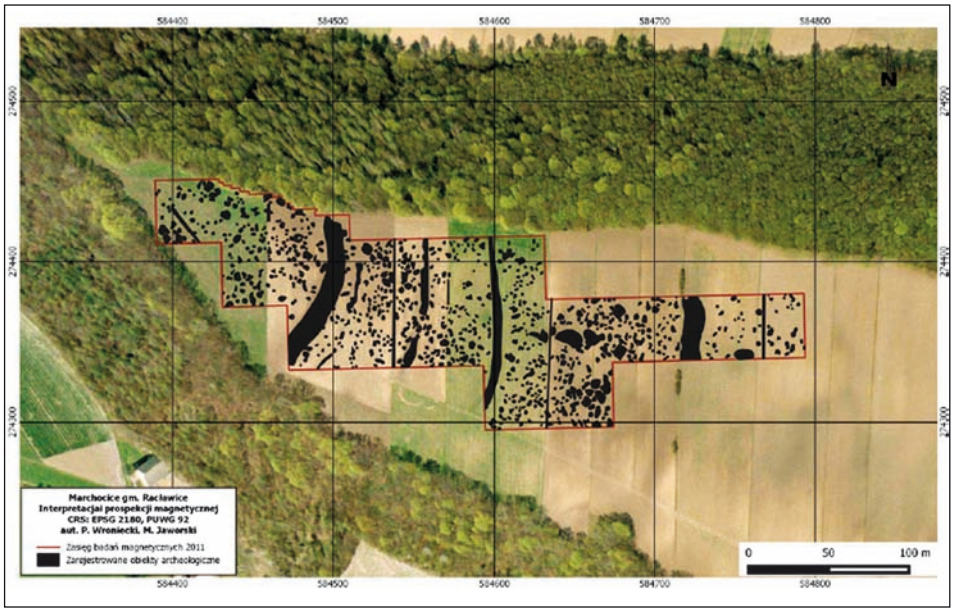

Fig. 11. Marchocice, Miechów district. Interpretation of the results of magnetic prospecting. Legible archaeological features, including ditches. After: Dulęba *et al*. 2015

Taking into account the number of ditches uncovered at the site, they were assumed to be established in different, distant chronological phases. Fortifications of various types, with moats as one of their construction elements, are known from sites of both the Lengyel-Polgár complex (*e.g*. Złota, Sandomierz district – Sałacińska and Zakościelna 2007) and the older developmental phases of the Lusatian culture (*e.g*. Witów, Proszowice district – Bochnak 2004). Nevertheless, it seems that a certain part of the fortifications in question should be linked with the Funnel Beaker-Baden group due to a significant number of representative artefacts found within them.

Muniaczkowice, Proszowice district, site no. 1

The site is located on a highly exposed promontory. Its western part is limited by the Szreniawa valley. The southern and western slopes are relatively steep. The northern one is less inclined. To the east, the promontory connects with the edge of the upland.

The site was discovered during surface research conducted in 1968 by the Department of Archeology of Lesser Poland IHKM PAN (Kruk 1970, 290). In 2018, it was the subject of surface and magnetic research (Przybyła *et al*. 2019, 316-319).

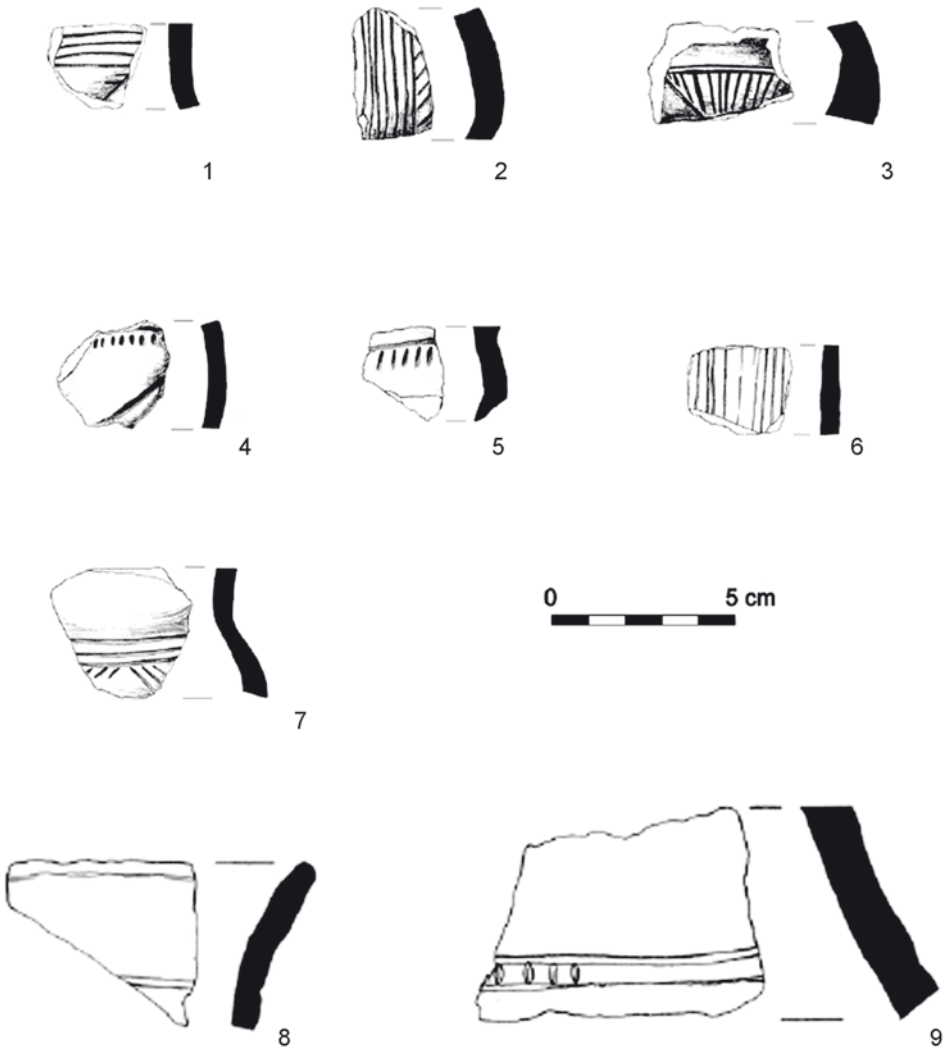

Fig. 12. Marchocice, Miechów district.
Pottery linked with the Funnel Beaker-Baden phase. After: Dulęba *et al*. 2015

During investigation, two independent fortification systems, indicated by positive linear anomalies, were discovered (Fig. 13, 14). The first anomaly is interpreted as a ditch (Fig. 13: feature 1). It cuts off the most exposed part of the promontory (the western settlement) at its narrowest part. It starts from the Szreniawa valley, and then it heads north, surrounding the promontory, before turning east along the northern slope of the hill. The anomaly is not equally clear in all places, as at the culmination it almost disappears. This

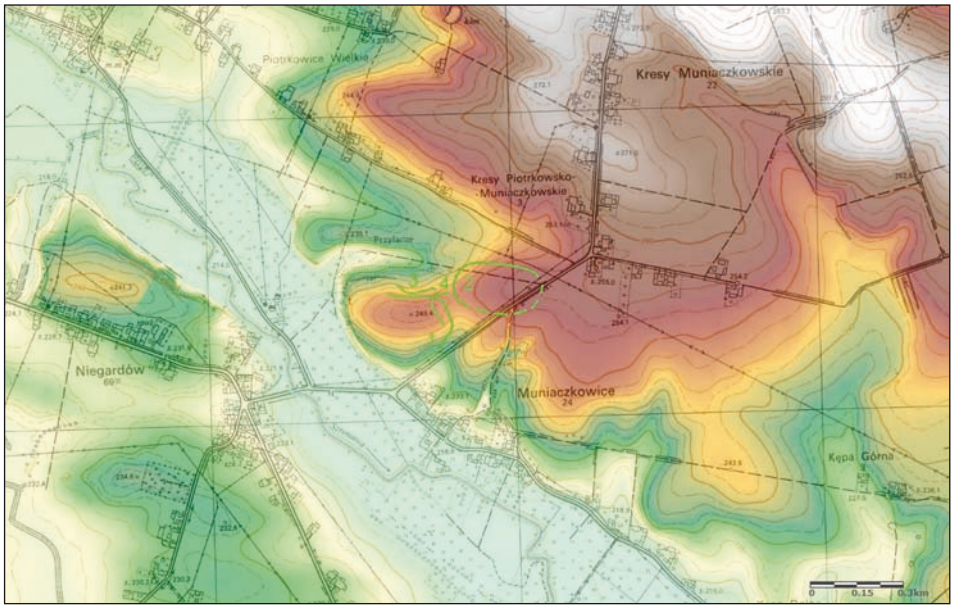

Fig. 13. Muniaczkowice, Proszowice district. The course of fortifications established based on magnetic prospecting, analyses of satellite photographs, and observation of soil markers, is marked in green

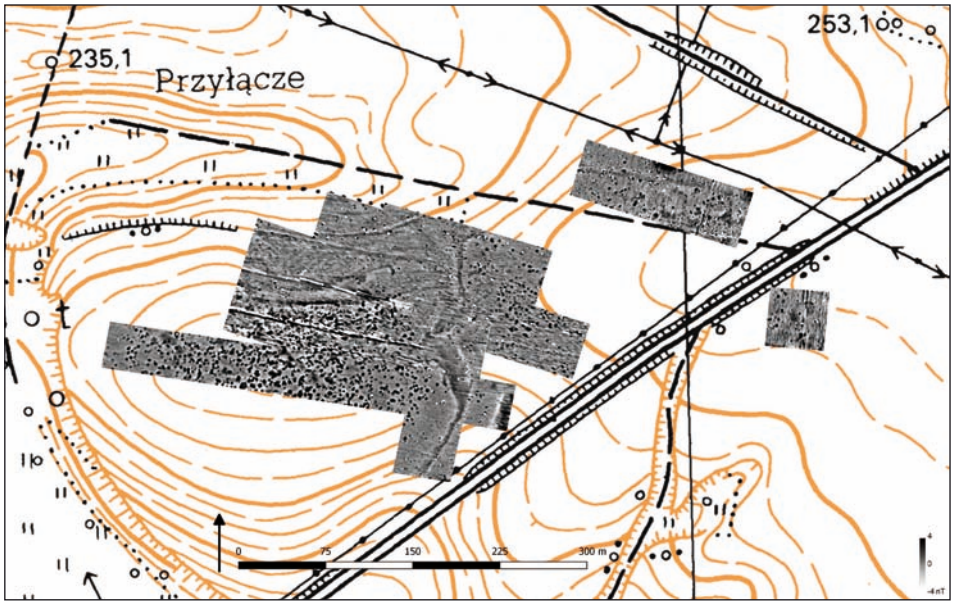

Fig. 14. Muniaczkowice, Proszowice district. Magnetic prospecting-based map with legible anomalies associated with the occurrence of the ditch and numerous features of a storage-pit type

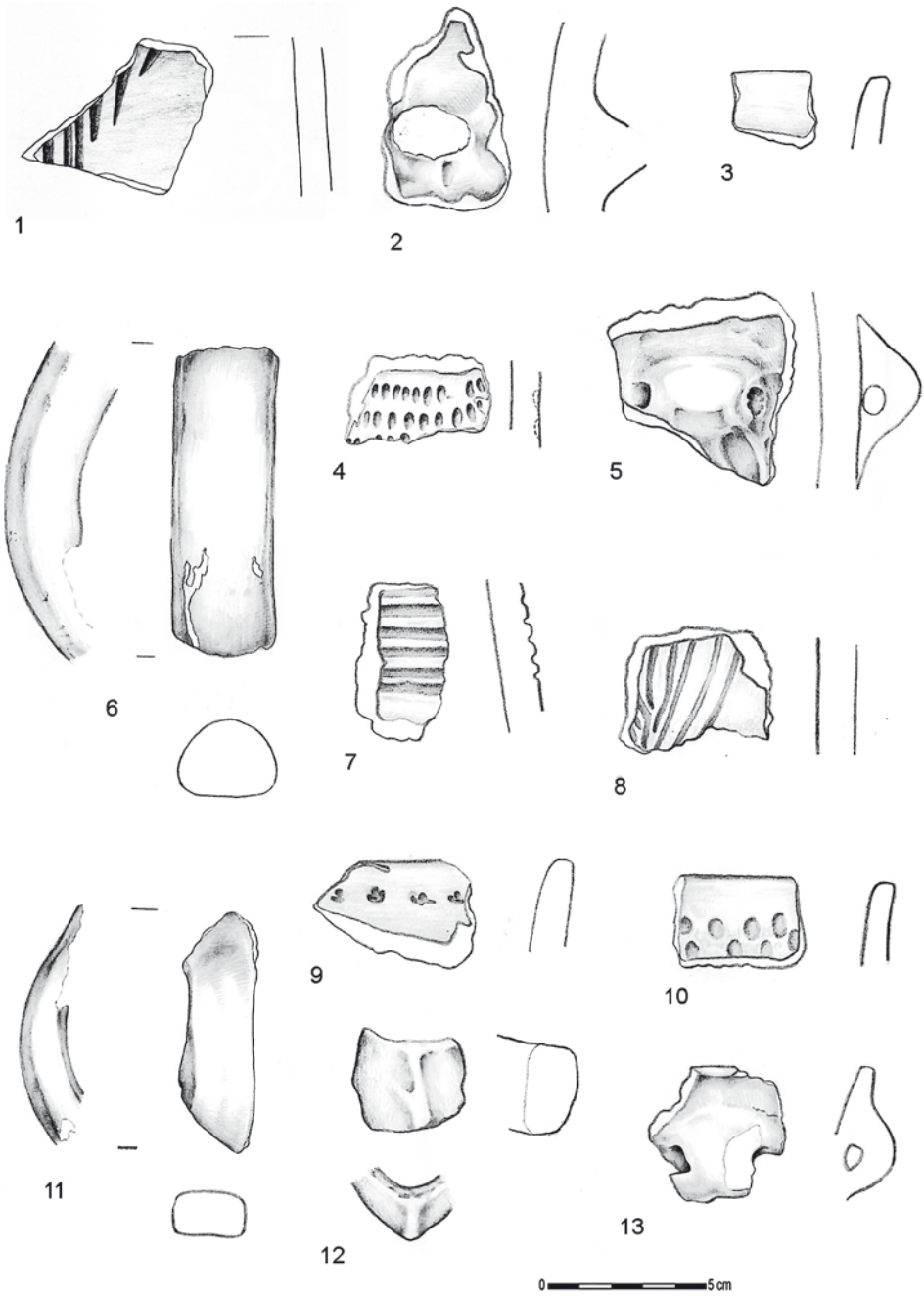

Fig. 15. Muniaczkowice, Proszowice district. The Funnel Beaker-Baden pottery collected from the surface of the settlement. Drawn by M. Podsiadło

is probably due to strong erosion in this location. Another ditch (Fig. 13: feature 3) runs parallel with the northern part of feature 1 and is possibly another element of the same fortification system. The additional fortifications on the northern slope seem justified by the gentle slope, depriving the settlement of its natural defensive qualities. Another ditch (Fig. 13: feature 2) encloses the eastern settlement, which is located on an elevation within the plateau, above the edge of the Szreniawa valley. In contrast to feature 1, it forms an oval structure. Unfortunately, it was not possible to carry out research on the entire course. The portion to the east of the modern road, in particular, was almost completely inaccessible to magnetic investigations. This anomaly was also not equally well readable throughout its course. The values of the anomaly were relatively low, which may indicate a significant degree of damage to the ditch. Another ditch is in the middle part of the site (Fig. 13: feature 4). It has a semi-circular course. Its size is consistent with a palisade groove structure. It crosses feature 1. Its arms are directed towards the eastern settlement. This may mean that both features – 2 and 4 – belong to the same fortification system. Magnetic investigations revealed numerous positive point anomalies. They group very clearly within both foundations. In the case of the western settlement, their spatial distribution is chaotic. In the case of the eastern settlement, they seem to be organized into linear systems, possibly connected with large, post-constructed buildings. The western settlement has an area of 7 ha. It stretches on a W-E axis and measures 360 x 220 m. However, the size of the eastern settlement cannot be accurately estimated due to its incomplete identification. If feature 2 surrounds the culmination similarly as in the western part, the area of the eastern settlement should cover an area of about 8 ha, and should measure 400 x 270 m. If ditch 4 is considered as a part of that settlement, the area could reach 12 ha and could measure 500 x 350 m.

During the field survey, a number of artefacts were collected. In the western settlement artifacts of the Funnel Beaker-Baden phase (Fig. 15) prevailed (59 potsherds and 4 battle-axes). In the eastern settlement artefacts were less numerous, but included potsherds and lithics from the FBC (2 sp.), the Mierzanowice culture (2 sp.) and the Trzciniec Culture (3 sp.). Summing up the results of the investigation, the western settlement should be dated to the Funnel Beaker-Baden phase. The eastern settlement may be dated to the Early Bronze Age. However, its relationship with the FBC cannot be ruled out.

SUMMARY

The emergence of fortified settlements in late phases of the FBC in the northern part of the loess-covered regions of western Lesser Poland could have been stimulated by a specific political and economic situation, provoked by the arrival of the Baden communities to the region near Cracow. This might have resulted from the demographic impact of new human groups migrating from the Transcarpathian regions (Kaczanowski

and Kozłowski 1998, 128). Another factor that could have influenced the formation of these structures was the emergence of the Corded Ware culture in the loess-covered regions of western Lesser Poland (Kruk and Milisauskas 1999, 172), and as recent discoveries show, also of the Globular Amphora culture (Włodarczak and Przybyła 2013). Although the chronology of the phenomena discussed here has not been sufficiently explained (Włodarczak and Przybyła 2013, 238-240), the fact of their partial (at least) contemporaneity should be acknowledged. Migrations of human groups must have caused a certain political pressure that resulted in the concentration of communities of the late FBC phases in less numerous, more defensible, vast settlements. Moreover, it cannot be excluded that the depletion of natural resources due to the escalating economic crisis (Kruk and Milisauskas 1999, 171-172) was the major reason for competition between the Funnel Beaker-Baden communities.

The chronology of the defensive settlements horizon is based only on radiocarbon and stylistic dating of Bronocice. Radiocarbon dates obtained for both Funnel Beaker-Baden phases set the ranges between 3350/3300 – 3200-3100 BC for Br IV and 3150/3100-2900-2800 BC for Br V (Kruk *et al.* 2018, 77). This allows the framing of the entire horizon between 3300-2800 BC.

The enclosures discussed here do not represent one type of fortification. With regard to the site in Bronocice during the older period of the Funnel Beaker-Baden phase (Bronocice IV), the recognition of which is presently the most comprehensive, only a certain part of the entire extent of the settlement was enclosed within a system of fortifications, consisting of a large structure surrounded by a ditch. It is possible that during the development of the settlement, the pressure of any external threat was not strong enough to force its inhabitants to erect cost-intensive fortifications encircling the entire village. The fortifications that were actually built could have played a refugial role. This is supported by the fact that only a few features typical of dwelling sites were encountered within the structure in question (Kruk and Milisauskas 1981, 73). This situation had significantly changed in the younger phase, Bronocice V. The external threat was so severe that it must have encouraged the inhabitants to make an enormous effort to erect a fortification system encircling the entire settlement, taking up an area of 17 ha in that time.

Other sites discussed in this paper were considerably smaller fortified settlements. Due to the fact that elaboration of the materials recovered from Miechów has just begun, and the data collected exclusively in the course of non-invasive investigations are rather fragmentary, development of those sites during the Funnel Beaker-Baden phase cannot be explained in detail at the moment. The fortified settlements in Miechów, Marchocice and Muniaczkowice (western settlement) as well, constituted the final stage of the Funnel Beaker settlement recorded there, which could have been initiated in the classical phase of the FBC (Bronocice I-III?), as was proved for the site in Bronocice.

With regard to the site in Miechów, it cannot be excluded that the fortifications recorded there were erected in two different time periods (stages). In the older stage there

might have been a light, palisade-type construction of more provisional nature. In the younger stage it was replaced by a moat that could have been accompanied by an earthen embankment.

When erecting strongholds the Funnel Beaker-Baden communities preferred naturally defensible places, mainly promontories located near rivers. Such a selection allowed human groups to minimise their efforts and the scope of work required for erecting fortifications. With respect to the sites in Marchocice, Gniazdowice and Muniaczkowice, these works must have been reduced to cutting off only one side of the promontory with a moat, and the system could have been complemented with an earthen embankment and possibly a palisade (Gniazdowice). Another solution was implemented at the sites in Bronocice and Miechów, where other factors beyond defense (maybe economic, social, or prestige-driven), required a much more labour-intensive manner of erecting fortifications around the settlements, which were located in places lacking any naturally defensive qualities.

The fortified settlements under scrutiny seem to share one common feature. They had become production and/or distribution centres where salt was obtained from brine springs. At the settlement in Bronocice numerous fragments of salt vessels were encountered (Fig. 16: 1-4). This type of pottery emerged in the phase Bronocice III, though it was most intensely utilised in the Funnel Beaker-Baden phases, namely Bronocice IV and V (Kruk and Milisauskas 1983, 278, 291-292, 299). An occurrence of salt beakers (*briquetage*) can be associated with an increasing demand for salt, stimulated by the periodic homesteading of large herds of domesticated animals nearby the settlement (Kruk and Milisauskas 1999, 175). However, it seems that there is another explanation that can be proposed for the flourishing of salt production within the Nida Basin in the Funnel Beaker-Baden phase. New settlers of the Baden culture not only deprived the FBC communities of a certain share of lands attractive for agricultural use, situated to the south of the Szreniawa River; they also took over their access to brine springs in the Wieliczka-Bochnia region, which was even more grievous. This resulted in termination of salt production by the FBC societies in the classical phase of this cultural unit. Their place was taken by new manufacturers representing another cultural unit, namely the Baden culture (Przybyła 2015, 168-173). This forced the Funnel Beaker-Baden communities to intensify or even initiate production of salt obtained from local brine springs. The issue of their existence has not been clarified until present, though recent discoveries have shed more light on the local salt production, as evidenced by an increasing number of records. An abundant collection of salt beakers associated with the Funnel Beaker-Baden phase (Fig. 16: 8-11) was encountered in Miechów. Salt vessels of the Lusatian culture were also discovered at this site, and some specimens are likely to represent other chronological periods as well. Fragments of salt pottery were found on the surface of the settlement in Gniazdowice, and within the fill of the investigated portion of the ditch (Fig. 16: 5-7). Salt vessels were also discovered at the settlement in Marchocice (Dulęba *et al*. 2015, fig. 9: 2). Taking into account the importance of salt production to prehistoric societies (Harding 2013, 109-110, 121), one can conclude

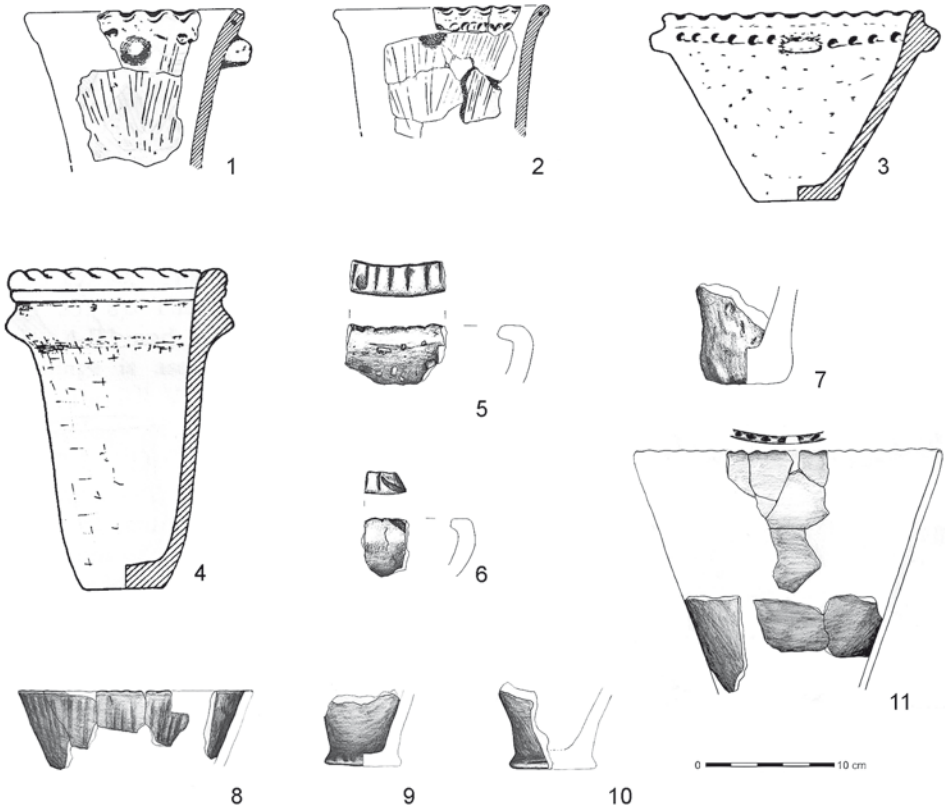

Fig. 16. Salt vessels from the Funnel Beaker-Baden phase.
1-4: Bronocice (acc. to Kruk and Milisauskas 1990); 5-7: Gniazdowice; 8-11: Miechów.
Drawn by M. Podsiadło

that the issue of accessibility to brine springs might have been one of the major factors determining the location of strongholds.

Another question that needs to be answered pertains to the impulse that inspired the erection of structures of this type. In the territories of western Lesser Poland, open settlements clearly prevailed during the older phases of the FBC. Amongst them, a settlement in Stryczowice, Opatów district, has been recognised most comprehensively (Uzarowicz-Chmielewska and Sałacińska 2013), and it is linked with the Br III phase (Włodarczak 2006, 40-42). Fortifying structures are most numerously represented at the FBC sites in the territories of the Czech Republic, *e.g*. in Chleby, Nymburk district (Gojda 2006, fig. 2.4), and Makotřasy, Kladno district (Podborský and Kovárník 2006, fig. 4.4: 8). On the other hand, the emerging Funnel Beaker-Baden fortifications could have been modelled on chronologically closer fortified settlements of the Baden culture in the Transcarpathian

regions. Nevertheless, the latter were structures of a different nature than those known from the loess-covered regions of western Lesser Poland. For instance, there was a small, circular structure (diameter of 40 m) encountered in Bajč-Vlkanovo in Slovakia (Bistákova and Nevizánsky 2015). Another example from the territory of Slovakia is a vast settlement situated on a mountaintop in Zvolen, probably surrounded by an embankment built of stones (Beljak-Pažinova *et al.* 2015). It is also possible that the emergence of large, fortified settlements within the Funnel Beaker-Baden environment could have been of local origins – a kind of adaptive behaviour to changing conditions.

The author of this paper proposed the hypothesis that the type of settlement in question had become predominant at the decline of the development of communities cultivating the traditions of the FBC in western Lesser Poland. The number of prehistoric strongholds discovered throughout the history of Polish archaeology is extremely small when compared with that recorded in the territories of neighbouring countries. Not until recent years have non-invasive methods of investigation developed, represented in particular by aerial imaging and magnetic prospecting, resulting in a rapid increase in the number of archaeologically recognised fortified settlements, in some regions at least. This is well evidenced by integrated research agendas that led to discoveries of numerous fortified settlements of various chronologies in the area of the Dobużek Escarpment (Skarpa Dobużańska) in the western part of Lublin Voivodeship (Chmielewski *et al.* 2015), and within the area of the Nida Basin (Wroniecki 2016). The above-mentioned discoveries bring some hope for revealing new sites belonging to the category of settlement discussed in this paper.

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FLINT AXES FROM THE FUNNEL BEAKER AND FUNNEL BEAKER-BADEN SETTLEMENT PHASES AT SITE 1 IN KSIĄŻNICE WIELKIE, PROSZOWICE DISTRICT

ABSTRACT

Brzeska-Zastawna A. 2020. Flint axes from the Funnel Beaker and Funnel Beaker-Baden settlement phases at site 1 in Książnice Wielkie, Proszowice district. *Sprawozdania Archeologiczne* 72/1, 197-211.

Excavations at site 1 in Książnice Wielkie were conducted between 1921 and 1924 by Józef Żurowski. It is one of the most important sites of the Funnel Beaker culture (FBC) in western Lesser Poland (Zastawny and Brzeska-Zastawna 2020). The materials of the FBC with Baden elements were published by Barbara Burchard and Anna Eker, and graves of the Corded Ware culture were published by Jan Machnik (Burchard and Eker 1964; Machnik 1964). This article is focused on the issues related to flint axes discovered in the context of FBC and Funnel Beaker-Baden assemblages. So far they have not been the subject of detailed elaboration.

Keywords: flint axes, Jurassic G flint, Funnel Beaker culture, Funnel Beaker-Baden assemblages, Lesser Poland
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1. INTRODUCTION

Site 1 in Książnice Wielkie is located on the northern border of the Lesser Poland Upland, on the right side of the Szreniawa River valley, in the vicinity of its mouth to the Vistula River. At this site, materials of different cultures and ages were found. As regards the Neolithic, there were materials of the classic Funnel Beaker culture (FBC), Funnel

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Beaker-Baden (FB-B) and elements of the Wyciąże group (WG), not to mention graves of the Corded Ware culture. Based on general views on middle Neolithic ceramic development in western Lesser Poland, the FBC and FB-B materials perhaps belong to the BR I-IV/V phases. Frequently, these different ceramics were present in the same features.

The FBC and Baden materials from the site were elaborated by Barbara Burchard and Anna Eker in 1964. The artifacts from site 1 at Książnice Wielkie are stored in the collection of the Archaeological Museum in Kraków.

In 19 features at the site, flint axes and other artifacts relating to their use were discovered. The aim of this paper is their comprehensive examination. In total, 73 artifacts were analyzed: 8 axes (including 1 formal core), 1 chisel, 7 splintered pieces, 11 tools, 2 spalls from tools, 44 flakes, blades, blade-flakes, and chunks. It should be emphasized that chronologically and culturally diversified pottery materials were found in features where these artifacts were recorded.

2. ANALYSIS

2.1. Axes and chisel

Nine artifacts were included in Table 1: 5 (Tables 1-5 are at the end of this volume) whole axes, including 3 of original length (A1 – Fig. 4: 2, A2 – Fig. 2: 2, A4 – Fig. 5: 1) and 2 with a shortened length due to repair of the cutting edge (A3 – Fig. 2: 1, A9 – Fig. 3: 2), 1 with a strongly damaged cutting edge, but with the entire length of the axe preserved (A5 – Fig. 3: 1), 1 with only a part at the butt preserved (A8 – Fig. 7: 1), 1 chisel made from the blade of an axe (A7 – Fig. 4: 1), and 1 formal core made on a large fragment of an axe (A6 – Fig. 5: 2). All specimens were made from Jurassic G flint.

The axes have total lengths of 67-123 mm. Almost all specimens have a more or less widening cutting edge. Only in one case (A4 – Fig. 5: 1) the maximum width is not at the cutting edge, but rather just behind it. For 3 of the axes, the maximum thickness is at mid-length, about 2/3 of the length from the cutting edge; another 3 axes have maximum thickness at the butt; and for the remaining 2 axes, at 1/3 of the length from the cutting edge, the part at the cutting edge turns into a medial part. All eight specimens are axes with rectangular cross-sections. The chisel (A7), which was probably made from the blade of an axe, has a trihedral cross-section.

In the FBC, butts are most often poorly extracted and inaccurately formed (Balcer 1975, 118). Part of a specimen from Ksiażnice Wielkie had trimmed and thinned butts. Thinned butts (which result in an axe with a lenticular longitudinal section) – sometimes almost edge butts – are common in the FBC (Balcer 1975, 116; 1983, 142; Gumiński 1989, 137). Three axes had visibly separated butts (A1; A3; A9). Some specimens had a half-separated butt, which means that the butt was separated from one of the lateral surfaces,

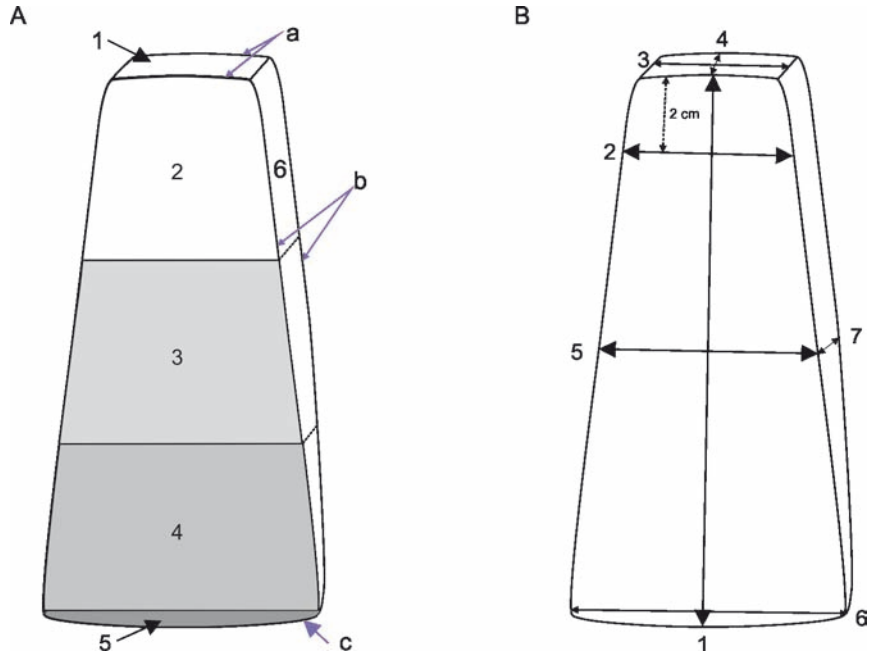

Fig. 1. A – schema: parts of an axe (the names used in the article): 1 – butt, 2 – part at butt, 3 – mid part, 4 – part at cutting edge, 5 – cutting edge, 6 – side, a – edges of a butt, b – lateral egdes, c – edge of cutting edge. B – dimensions of an axe: 1 – total length, 2 – width of the upper part of an ax, 3 – butt width, 4 – butt thickness, 5 – width of the mid-length of the specimen, 6 – cutting edge width, 7 – thickness in the mid-length of the specimen. Drawing: A. Brzeska-Zastawna

but trimming of the opposite surface was part of the preparation of the butt (A2, A6, A8, A9). Perhaps this was an intentional effort, which simplified putting the axe in a haft.

Most often (in 4 specimens), edges were shaped by centripetal blows from two main surfaces. Less often (in 3 specimens), edges were prepared by parallel blows from the opposite main surfaces. In a single case (A6), one edge was trimmed by parallel blows, but the second was trimmed from two main surfaces by centripetal blows. Frequently, edges converged quite strongly towards a butt, forming a regular and trapezoidal shape for the whole specimen. Axes with expanding cutting edges (usually with thick butts, but sometimes also with flat butts) are very typical for the FBC in Lesser Poland (Balcer 1983, 152).

The last stage of finishing included treatments that increased the effectiveness of these tools (Balcer 1983, 39). The analyzed axes were ground, smoothed and polished. These treatments left some characteristic traces visible on surfaces of the axes (Hansen and Madsen 1983; Madsen 1984; Borkowski and Migal 1996). Traces of grinding are visible only on parts of the main surfaces, because, after grinding, the other parts were successively

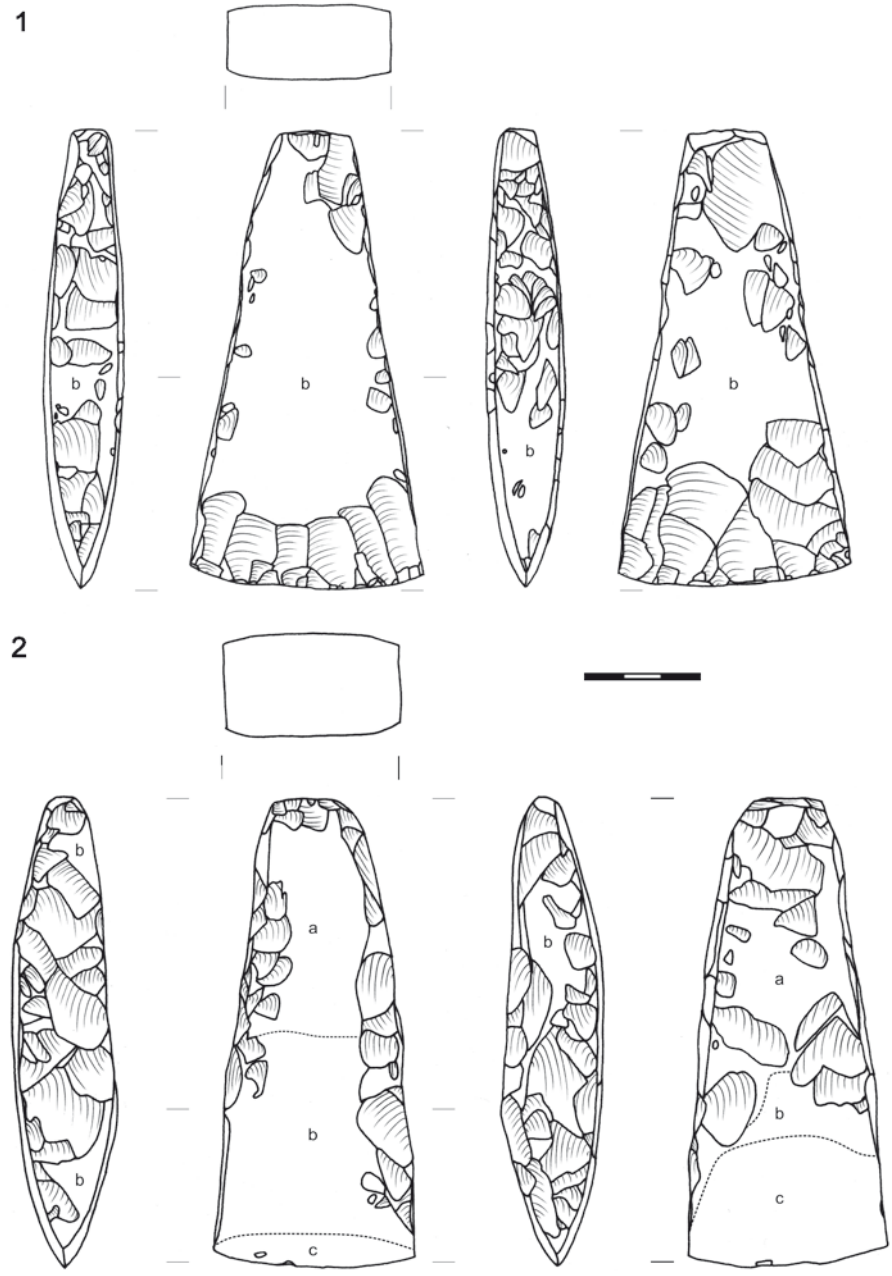

Fig. 2. Książnice Wielkie, site 1, Proszowice district. The axes made from Jurassic G flint: 1 – A3; 2 – A2 (from the collection of the Archaeological Museum in Kraków); a – grinding; b – smoothing; c – polishing. Drawing: A. Brzeska-Zastawna

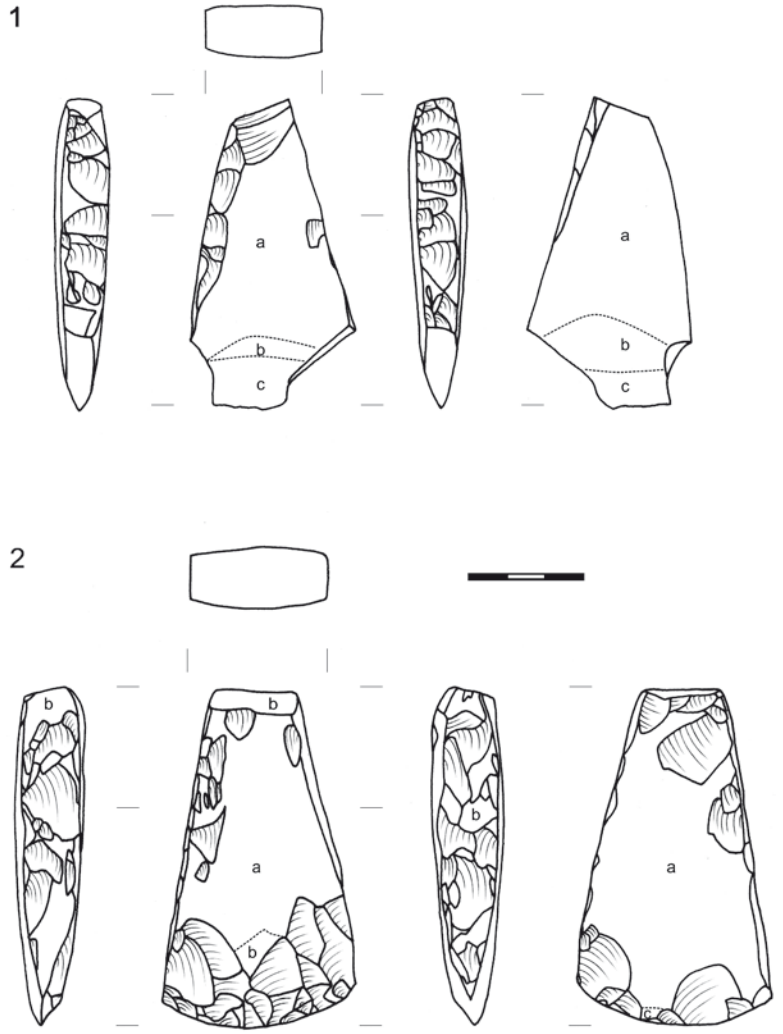

Fig. 3. Książnice Wielkie, site 1, Proszowice district. The axes made from Jurassic G flint: 1 – A5; 2 – A9 (from the collection of the Archaeological Museum in Kraków); a – grinding; b – smoothing; c – polishing. Drawing: A. Brzeska-Zastawna

subject to the treatments mentioned above. Most often, sides as well as surfaces at the cutting edge were smoothed. Three specimens were smoothed along the whole surface (however, sometimes smoothing was inaccurate, in particular on parts further from the cutting edge). Five axes had visible traces of polishing. Frequently, axes were polished only at the cutting edge. Sometimes (in 3 of the 5 examples mentioned above), polishing encompassed

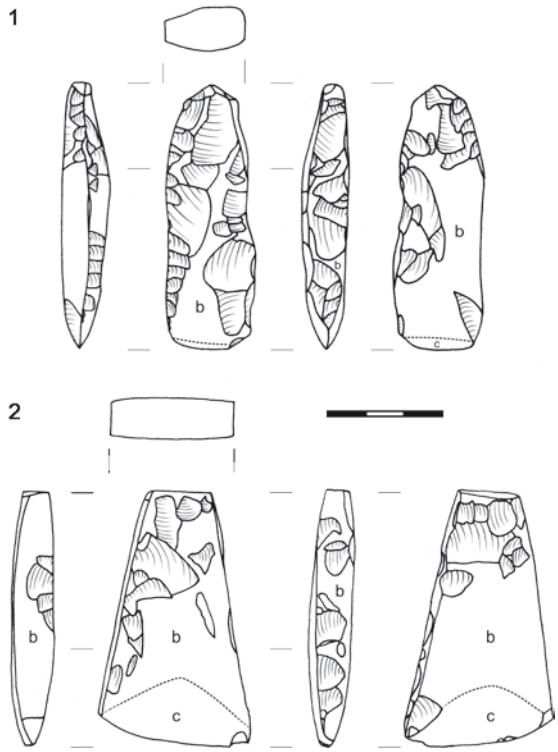

Fig. 4. Książnice Wielkie, site 1, Proszowice district. 1 – the chisel (A7) made from Jurassic G flint; 2 – the axe (A1) made from Jurassic G flint (from the collection of the Archaeological Museum in Kraków); a – grinding; b – smoothing; c – polishing. Drawing: A. Brzeska-Zastawna

also further surfaces at the cutting edge. On these same axes, there are traces visible on the part where the tools were put in a handle. In macroscopic view, this sometimes looks like wiping, gloss or traces of smoothing in the part at the butt. Most often in the FBC, axes were only partially smoothed (Balcer 1975, 122) – a portion of each axe was not smoothed at all. Total surface smoothing and polishing of the axes shows great care and willingness to maximize the technical value of the tools.

Cutting and adjacent edges were the parts most exposed to damage. Traces of repair of these parts are clearly visible on two specimens (A3, A9) and in a fragmentary way, on one-specimen (A6). The cutting edge was repaired by a very precise technique using a punch, as well as by the pressure technique. From the cutting edge towards the butt, small and flat bladelets were removed alternately (Fig. 2: 1; 6: 2). The same technique was used in forming a cutting edge (Sałaciński and Migal 1997, 341). According to W. Migal and S. Sałaciński, this was the most effective approach to forming of this part of an axe (1996, 127). One of these axes (A3; Fig. 2: 1) is similar in shape and longitudinal section to specimens of half-pro-

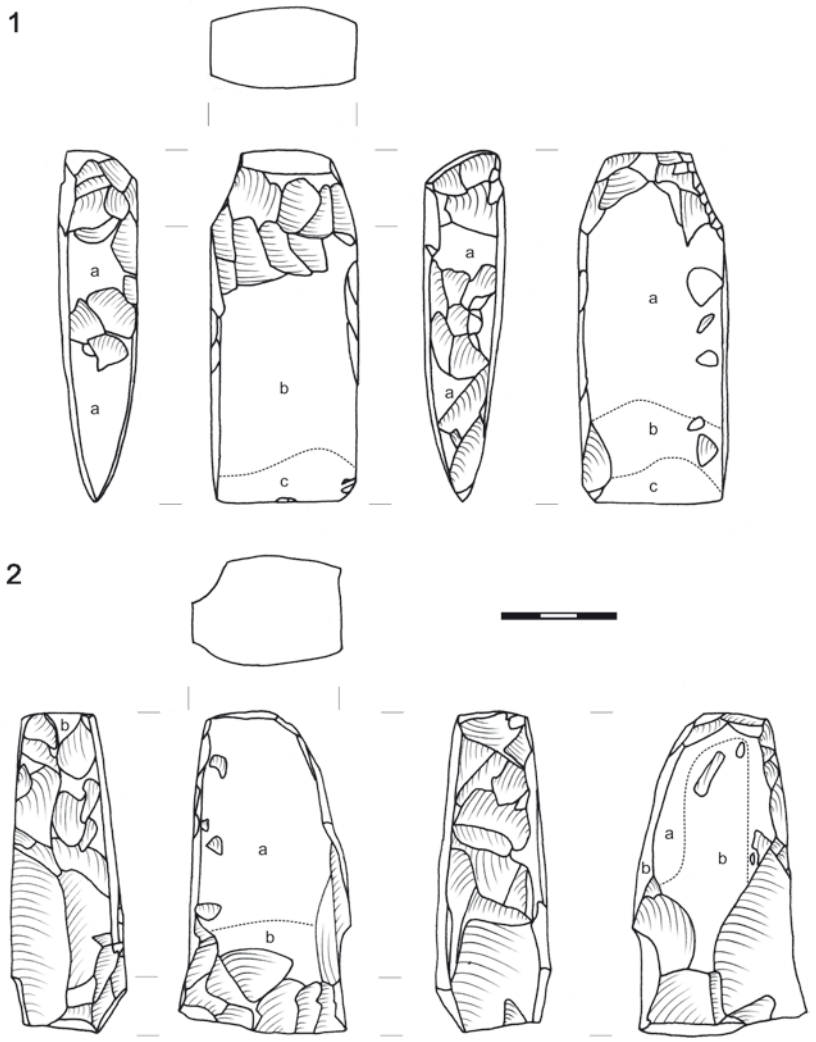

Fig. 5. Książnice Wielkie, site 1, Proszowice district. 1 – the axe (A4) made from Jurassic G flint; 2 – the formal core made from a fragment of the axe (A6) made from Jurassic G flint (from the collection of the Archaeological Museum in Kraków); a – grinding; b – smoothing; c – polishing.
Drawing: A. Brzeska-Zastawna

ducts of the Globular Amphora culture (GAC) from Koszyce (Konopka *et al.* 2016, 80: fig. 9: A). The presence of GAC artefacts at the discussed site is indicated by the identification of a fragment of the amphora of this culture in materials from J. Żurowski's research (Zastawny and Brzeska-Zastawna 2020). Very regular, rectangular transverse sections, strongly widening cutting edges, separated flat butts, meticulous smoothing on all surfaces, and small di-

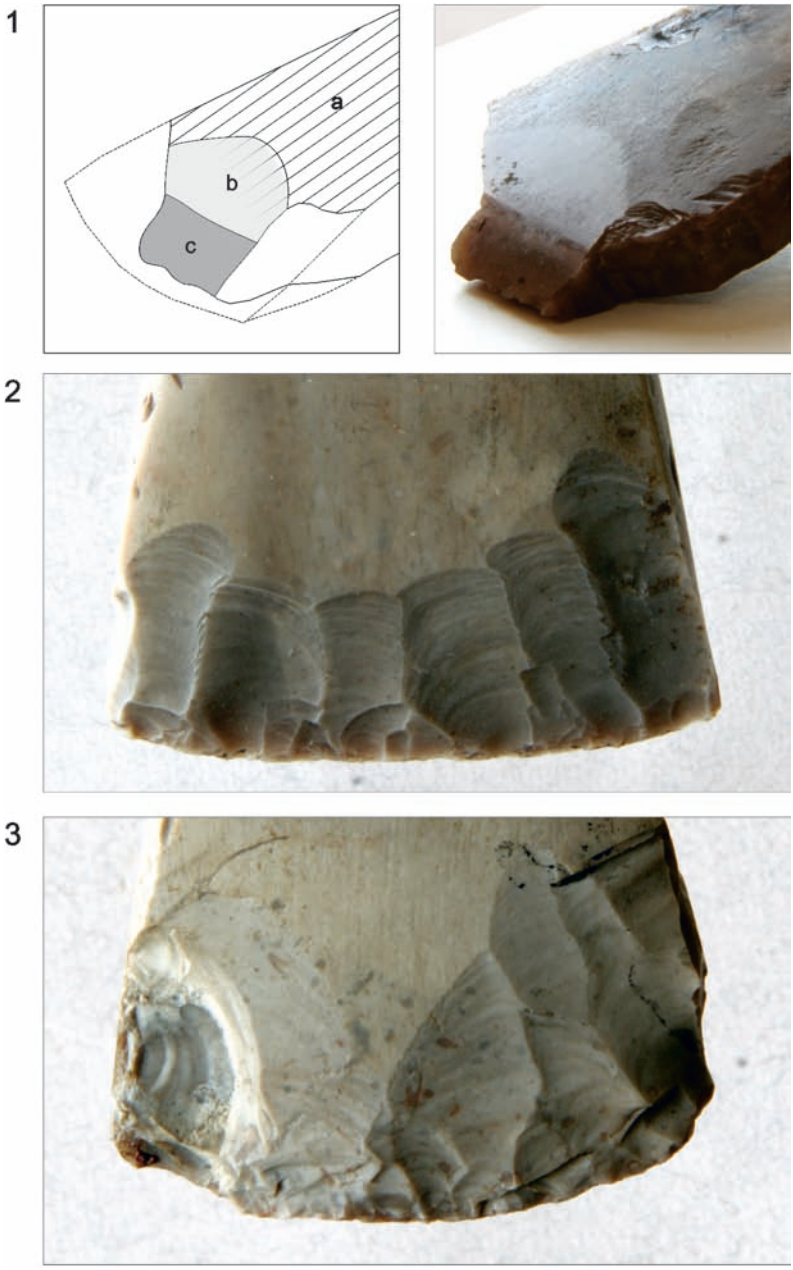

Fig. 6. Książnice Wielkie, site 1, Proszowice district. Detail of the parts of the flint axes: 1 – the part at the cutting edge of the axe (A5) with visible traces of grinding (a), smoothing (b) and polishing (c), 2-3 – the parts at the cutting edge of the axes (A3, A9) with traces of repair (from the collection of the Archaeological Museum in Kraków). Drawing and photo: A. Brzeska-Zastawna

mensions (A1; Fig. 4: 2) are also common in axes of the GAC (Balcer 1983, 209, 210, fig. 40: 5-6). In this example, the differences concern the raw material. In the GAC, axes were most often made of striped flint from the Krzemionki region. The function of such axes in the GAC was also different than in the case of specimen A1 from Książnice Wielkie 1. In the GAC, such specimens most often relate to a "prestigious" function, due to the context of discoveries (graves); often, there are no traces of use, and the quality of striped flint is fairly poor. Such is not the case of the analyzed axe (A1), which was made from Jurassic G flint. Some similarities to specimens from Książnice Wielkie 1 are visible not only in the GAC, but also in the Corded Ware (CWC) and Baden cultures, which were using Jurassic G flint in axe making. For example, similarities are visible in the case of flat specimens with parallel main surfaces and edges converging towards the butt (*e.g.* A3, A9). A similar type is known from the CWC, but on the whole, with a smaller difference (than in the case of examples A3 and A9 mentioned above) between the width of the butt and the cutting edge (Włodarczak 2006, 25, Fig. 10; 27, 245, IB type). However, specimens with lentiform longitudinal sections are not very frequent in the CWC, because axes have the thickset butt (as in the case of the A6) and, in relation to it, they have a wedge-shaped cross-section. Some similarities to flint axes from Książnice Wielkie 1 can also be seen in axes made from Jurassic G flint in the Baden culture in western Lesser Poland. This is probably due to the derivation of flint-axe-making technology from the FB-B. For example, it relates to tetrahedral specimens in the Baden culture with thinned butts, lentiform longitudinal sections, and with regular edges that converge in the direction of the butt, forming the trapezoidal shape of the axe in horizontal projections (Kaczanowska 1982/83, 79, fig. 5: f). Similarities are especially visible in the case of axes relating to variant A in the FBC (Balcer 1975; 2002, 90; Valde-Nowak 1988, 31). In the analyzed materials, there is only the one example of an axe of consistent width from the cutting edge to the part at the butt. It is the only specimen that relates to variant B in the FBC, according to B. Balcer (1975, 116). It is necessary to elaborate a larger set of flint axes of FB-B assemblages, which will enable comparative studies that will help to distinguish different features of axes of this culture and the other mentioned above.

The small axe with an asymmetrical cutting edge (A1), along with specimen A5 and the chisel (A7) were probably used in minor works, such as the making of wooden handicrafts. One of the axes (A4) stands out among the others in terms of its longitudinal section, which is the most wedge-shaped of the group.

All analyzed axes are the finished and redone forms. There are no traces (*e.g.* initial forms, half-products or unfinished axes) of axe production on the site. Fan-shaped flakes most often display faint traces of smoothed surfaces (Fig. 7: 5), indicating that they derive from the reutilization of axes. They were made outside the settlement sites in specialized workshops. Finishing treatments (grinding, smoothing and polishing) were made within the settlement sites, on supplied final-shape forms, to improve the efficiency of axes. This is confirmed by – among other evidence – the lack of traces of grinding in typical workshop sites (Kopacz and Pelisiak 1992, 110).

2.2. Other findings relating to the repair and processing of axes

The other artifacts (44 specimens; Tables 2-5; Fig. 7: 2-10) related to axes or axe-like tools are metrical flakes, blades, blade-flakes, etc. Most of them derived from the processing, reutilization and repairing stages of axes. Moreover, among the materials from site 1 in Książnice Wielkie related to the reuse of axes, there were 7 splintered pieces, 2 spalls from tools and 11 tools made from fragments of the axes (Brzeska-Zastawna 2018).

Most of this material was derived from trihedral or tetrahedral forms. Almost all specimens (except for 5 undetermined) were made from Jurassic G flint: 35 flakes, including 7 fan-shaped flakes (Kopacz and Pelisiak 1989, 348; Fig. 7: 5) and 3 flakes from splintered pieces, 4 blades (*e.g.* Fig. 7: 8, 10), including 1 technical specimen (formal burin spall or resharpening spall), 2 blade-flakes and 1 burned chip. A burin spall could derive from renovation or direct percussion on a back surface of the axe. The upper sides of flakes, on which there are visible, unambiguous surfaces of axes, most often displayed portions of a main surface (65%; *e.g.* Fig. 7: 2, 4, 5) or an edge of an axe (59%; *e.g.* Fig. 7: 4). Twenty-two percent of flakes had surfaces from portions adjoining the cutting edges (Fig. 7: 3, 6, 9), whereas 14% of specimens derive from the part at the butt (*e.g.* Fig. 7: 7). The same number (14%) had a fragment of the butt and also preserved two main surfaces. Only 2 fragments derive from the cutting edge, and 1 flake preserved two lateral edges of an axe. Most of the flakes chipped from the edge of an axe (excessive flakes), displayed a lateral surface and sometimes one of the main surfaces of the axe (*e.g.* Fig. 7: 5). Some specimens were chipped from an axe already shortened, as evidenced by the surface of a flake butt, and which is also visible on a flake edge and on the main surfaces of the axe (*e.g.* Fig. 7: 6). Flakes most often had a straight or bent to bottom side longitudinal section. Traces of breakages on 2 flakes probably indicate they were chipped from the butt or from a part of an axe used as a hammer. Some smoothed axes or axe-like tools may have retained residue from the cortex. This is indicated by some flakes with a partial covering of this material. As in the case of flakes, blades most often took portions of lateral edges and main surfaces of axes. All blades had a trihedral transverse section. Most of the blades and flakes had *lisse* and flat butts of a triangular shape. Right angles of butts are prevailing. The thickness of a butt is most often similar to the average thickness of the specimen, but in the case of flakes, the butt is also often thick. The flakes have frequently damaged or invisible bulbs. Both flakes and blades have flake scars on the upper side, arranged parallel and diagonally or transverse. Sometimes, flakes and blades derived from axes were used as tools *ad hoc* (2 "use-flakes" and 1 "use-blade" with slanted cracks). The analyzed flakes and blades come from repairs and reutilization of axes, and almost all have traces of grinding and smoothing (variant IVB; Balcer 1975, 83).

Generally, in the FBC, fragments of axes were reutilized for cores, splintered pieces and tools (Budziszewski 2000, 262). Apart from one core already mentioned above (Table 1, A6; Fig. 5: 2), there are also 7 splintered pieces (two-sided multipolar and bipolar) and tools

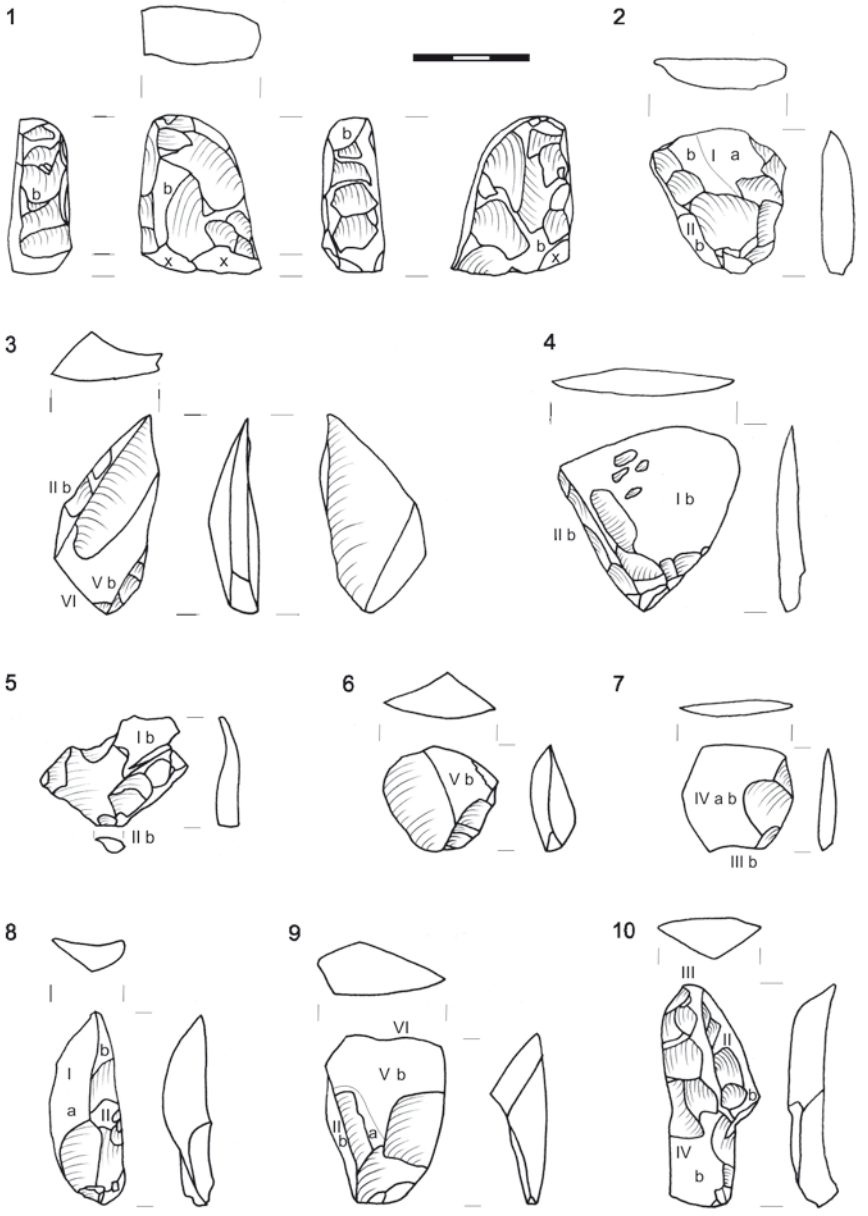

Fig. 7. Książnice Wielkie, site 1, Proszowice district. 1 – The part at the butt (A8) from the axe made from Jurassic G flint; 2-7, 9 – flakes from the axe; 8, 10 – blades from the axe (from the collection of the Archaeological Museum in Kraków); a – grinding, b – smoothing, c – polishing, x – thermal cracking; I – the main surface of the axe, II – the side of the axe, III – the butt of the axe; IV – the surface of the part at the butt of the axe, V – the surface at the cutting edge of the axe, VI – the cutting edge of the axe.
Drawing: A. Brzeska-Zastawna

(1 burin, 4 retouched flakes, 1 trapeze, 2 hammerstones, 2 retouched blades and 1 combined tool) among the analyzed artifacts. Formally, in the group of tools made from axe fragments, there is also the chisel mentioned above (A7). All artifacts were made from Jurassic G flint.

3. SUMMARY

All analyzed artifacts (except for the undetermined ones) were made from Jurassic flint of the G variant (Kaczanowska and Kozłowski 1976). Its outcrops and workshops, where flint axes were made, were identified in the central part of the Polish Jura. Part of them probably relate to the FBC and/or FB-B. More specifically, the workshops likely correspond to the "Late Funnel Beaker" identified in the vicinity of the Krztynia River (Pradła and Huta Szklana), Jasna Cave in Strzegowa, Barańskie Mountains (Kopacz and Pelisiak 1987; 1990; Rybicka and Cyrek 1997; Pelisiak 2006, 79, 80). Some of the workshops mentioned above might also have been used by the Lengyel-Polgár and other cultures that made flint axes, such as the Baden culture or Corded Ware culture.

Jurassic raw materials of the G variant were used in the utmost scale in the BR III-V (Kopacz and Pelisiak 1991, 171). Its share in inventories of the "late phase of the Bronocice settlement microregion" reached from 60 to 100% (Pelisiak 2006, 81). According to A. Pelisiak, the apogee (100%) of the use of this raw material occurred in phase V at Bronocice (Pelisiak 2008, 149). Thus, Jurassic flint of the G variant was intensively used in FB-B assemblages in western Lesser Poland. Also, it was used in the WG, which developed in the vicinity of the FB-B, in the BR III-IV (Brzeska-Pasek 2018, 513). At site 1 in Książnice Wielkie, the pottery typical for the WG was present in some of the features with pottery of the FB-B. A very interesting tendency to "repossess" tradition in the flint industry, *e.g*. the use of Jurassic flint of the G variant and the use of flint axes, can be observed in the WG. Beyond Książnice Wielkie 1 we only have one published site (site 17 in Kraków-Pleszów) where features of both the FB-B (in the oldest horizon of the FB-B, of the Niedźwiedź type) and the WG were found. However, features of both units constituted two separated groups there, contrary to the situation in Książnice Wielkie (Godłowska 1976, 55-56).

Generally, the analyzed axes display visible differentiation in typology, but not the use of raw material. The same differentiation in typology, but with the use of various raw materials (*e.g*. Świeciechów, Volhynian, striped flints) is visible in all flint axes in the Lesser Poland industry of the FBC (*e.g*. Ćmielów, Gródek Nadbużny, Bronocice, Mozgawa; Balcer 1975; Kruk and Milisauskas 1981, 83; 1983, 268, table 4; Gumiński 1989, 135-137; Florek and Wiśniewski 2008). All axes correspond to variants distinguished at the other sites of the FBC (*e.g*. Balcer 1975; 2002). However, assuming similar proportions, they are generally smaller and flatter than the majority of their analogous shapes in the classic FBC (in particular variant A according to B. Balcer; 1975). Probably, it is one of the characteristic

features of the production of flint axes in the FB-B horizon, in the western Lesser Poland Loess Upland. These are the features that make these axes similar to GAC forms, not to mention the similarities to Baden axes. These are interesting observations, especially in the context of changes at the end of the 4th and the beginning of the 3rd millennium BC. Most typical for the FB-B assemblages is the use of Jurassic raw material of the G variant. For example, in "classic FB-B phases" (BR IV, V) in Bronocice, this is almost the only kind of raw material that was used (Kruk, Milisauskas 1981: 83; 1983). In the same timeframe, raw material at this site was used very sparingly (Kruk and Milisauskas 1981, 83). A quite similar tendency is visible at Książnice Wielkie 1, where – as in Bronocice – splinters or cores were made from parts of axes. This is probably related to the high quality of Jurassic G flint. However, it could be assumed that Bronocice had better access to outcrops of this kind of raw material (Kopacz and Pelisiak 1992, 111). Perhaps the settlement in Książnice Wielkie received this raw material indirectly from the other (production?) settlements, where artifacts such as those with traces of cortex were found (Balcer 1983, 144, fig. 24: 6; Kopacz and Pelisiak 1991, 167, fig. 4: a). Damaged axes were repaired or processed into cores, splintered pieces and tools. These kinds of remains (flakes from repairs and reutilized forms from axes) are typical for a "settlement of users" (Balcer 1983, 30). The remaining flint inventory from Książnice Wielkie 1 indicates such a type of settlement.

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MEGALITHIC CEMETERIES OF THE FUNNEL BEAKER CULTURE IN THE SANDOMIERZ UPLAND

ABSTRACT

Florek M. 2020. Megalithic Cemeteries of the Funnel Beaker culture in the Sandomierz Upland. *Sprawozdania Archeologiczne* 72/1, 213-232.

In the Sandomierz Upland, 39 confirmed or putative cemeteries of the Funnel Beaker culture have been discovered so far, in addition to 4 burials found within settlements. Archaeological excavations have been conducted on 17 of these cemeteries, and on 8 of them large stone tombs have been discovered. The most common form of the megalithic tombs are very long trapezoids, built along a west-east axis, with stone casing on their sides, and a large, post-framed room in the eastern, wider part of the trapezoid. The main grave, covered with a mound of earth, could be found behind the room, containing two parallel chambers, or a single tomb, most often with double burials. Large tombs are accompanied by flat graves, usually constructed using stone material.

Clear examples of funerary practices include deposits of flint tools and items, as well as the peculiar treatment of bodies discovered on some cemeteries, which might be described as apotropaic and anti-vampire rituals.

Keywords: Sandomierz Upland, Funnel Beaker culture, Megalithic graves, Funeral rites
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In the Sandomierz Upland, thirty-nine confirmed or putative cemeteries of the Funnel Beaker culture (FBC) have been discovered so far (*cf.* Florek 2008, reviewing research up until 2006) (Fig. 1). The putative cemeteries are archaeological sites that are known only from surface surveys, which revealed stone constructions associated with artifacts typical

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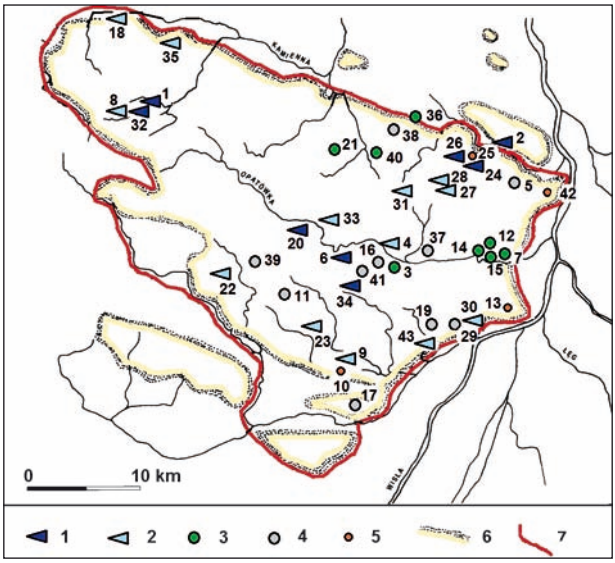

Fig. 1. Cemeteries and burials within settlements of the FBC in the Sandomierz Upland area. Labels: 1 – confirmed cemeteries with megalithic tombs; 2 – putative cemeteries with megalithic tombs; 3 – non-megalithic cemeteries; 4 – cemeteries of unknown type; 5 – graves within settlements; 6 – range of the loess cover; 7 – the Sandomierz Upland boundary.

1 – Broniszowice (site V), Ostrowiec Świętokrzyski district; 2 – Czyżów Szlachecki (site 13), Sandomierz district; 3 – Dacharzów (site 1), Sandomierz district; 4 – Daromin (site 1A), Sandomierz district; 5 – Dąbie (site 6), Sandomierz district; 6 – Dobrocice (site 21), Sandomierz district; 7 – Dwikozy (site 3), Sandomierz district; 8 – Garbacz-Skała (site 1), Ostrowiec Świętokrzyski district; 9 – Gorzyczany (site 4), Sandomierz district; 10 – Gorzyczany (site 7); 11 – Goźlice (site 2), Sandomierz district; 12 – Góry Wysokie (site 1), Sandomierz district; 13 – Kamień Łukawski (site 1), Sandomierz district; 14 – Kichary Nowe (site 2), Sandomierz district; 15 – Kichary Stare (site 1), Sandomierz district; 16 – Komorna (site 22), Sandomierz district; 17 – Koprzywnica (site 110), Sandomierz district; 18 – Kunów (site 1), Ostrowiec Świętokrzyski district; 19 – Malice (site 2), Sandomierz district; 20 – Malice Kościelne (site 1), Opatów district; 21 – Mierzanowice (site 5), Opatów district; 22 – Mydłów (site 58), Opatów district; 23 – Nasławice (site 50), Sandomierz district; 24 – Pawłów (site 3), Sandomierz district; 25 – Pawłów (site 9); 26 – Pawłów (site 10), Sandomierz district; 27 – Prusy (site 36), Opatów district; 28 – Prusy (site 44), Opatów district; 29 – Sandomierz (site 45), Sandomierz district; 30 – Sandomierz (site 105), Sandomierz district; 31 – Stodoły Kolonia (site 35), Opatów district; 32 – Stryczowice (site VII and 1A), Ostrowiec Świętokrzyski district; 33 – Studzianki (site 7), Opatów district; 34 – Święcica (site 1), Sandomierz district; 35 – Świrna (site 1), Ostrowiec Świętokrzyski district; 36 – Tominy (site 6), Opatów district; 37 – Wilczyce (site 3), Sandomierz district; 38 – Wlonice (site 43), Opatów district; 39 – Włostów (site 1), Opatów district; 40 – Wojciechowice (site 1), Opatów district; 41 – Zagrody (site 13), Sandomierz district; 42 – Zawichost-Podgórze (site 1), Sandomierz district; 43 – Złota (site 6), Sandomierz district. Edited by M. Florek

of the FBC, along with human remains. Additionally, accidental discoveries, not yet verified by archaeologists, have been made, and objects have been found whose sepulchral function has not been unequivocally confirmed. Four tombs were also discovered within FBC settlements: Gorzyczany (site 7), Kamień Łukawski (site 1), Zawichost-Podgórze (site 1), and Pawłów (site 9) (Florek 2006). The last one was originally thought to be related to

another cemetery (site Pawłów 3), lying approximately 120 meters to the southwest (Florek 2011a). Later, it turned out to be located within a settlement between the sites of Pawłów 3 and Pawłów 10.

Seventeen cemeteries have been the subject of archaeological excavations of different types, ranging from rescue works to multi-year excavation campaigns. Within 8 of these cemeteries (in Broniszowice, Czyżów Szlachecki, Daromin, Dobrocice, Malice Kościelne, Pawłów sites 3 and 10, Stryczowice and Święcica), the excavations revealed large stone tombs, constructed in the shape of a trapezoid or a tall triangle, which will henceforth be referred to as megalithic tombs, by analogy with similar objects found in Kujawy, Greater Poland and Pomerania. One needs to note, however, that considering the size of stones used, and the fact that sometimes only parts of the tombs were constructed using this material, the usage of the term „megalithic" in the context of objects from the Sandomierz Upland (and other similar tombs found in different areas) might be debatable (*cf*. Rzepecki 2011, 13). In the case of a further 13 sites known from surface surveys or accidental discoveries (Daromin, Garbacz-Skała, Gorzyczany, Kunów, Mydłów, Nasławice, Prusy sites 36 and 44, Sandomierz site 105, Stodoły Kolonia, Studzianki, Świrno, Złota), we can infer the very likely presence of similar, large trapezoidal tombs. The cemetery in Tominy, which has been the subject of research during the past couple years (see Szeliga 2012), is also suspected to contain such constructions, most likely occupying the south-eastern part of the site.

It appears, however, that the presence of megalithic tombs can be ruled out in site 2 in Kichary Nowe. The hypothesis that five FBC stone-box graves discovered there were covered with a single earthen mound (Kowalewska-Marszałek *et al.* 2006, 356-357) is no longer supported, and archaeological analogies for such an object would be difficult to find.

CEMETERY LOCATIONS

Both confirmed and putative megalithic cemeteries were located in exposed places: on ridges, and at higher altitudes of valley slopes, highland peaks, or knolls. Very often these places had been occupied by neolithic settlements (*e.g*. in Daromin, Kichary Nowe, Tominy, Złota), and therefore they had some permament characteristics of cultural landscape; most importantly, they were deforested (see Iwaniszewski 2006, 265).

There has been no research on the spatial relationship between FBC cemeteries and contemporary settlements in the area of the Sandomierz Upland (one exception being Stryczowice and Broniszowice, see Iwaniszewski 2006). In light of existing information, it appears that the distance between a cemetery and the closest settlement ranged from 100 to 300 meters, sometimes even less (in Pawłów, Malice Kościelne, Tominy, Dacharzów, Czyżów Szlachecki). In Wojciechowice and Stryczowice, cemeteries were founded on the site of older FBC settlements.

One of the most interesting examples of spatial relationships between FBC sites can be observed in Pawłów, near Zawichost. One cemetery (Pawłów site 3), which has been excavated (*cf.* Bargieł and Florek 2006b; Florek 2008 and references therein), is located directly to the south of a settlement (Pawłów site 9), while another one (Pawłów site 10), which was accidentaly discovered, is located to the north. Archaeological excavations conducted in 2002 demonstrated that there used to be a depression – a small, dry valley – between the southern cemetery (Pawłów site 3) and the settlement (Bargieł and Florek 2005, 30). The terrain topography suggests that another depression might also have separated the settlement and the northern cemetery (Pawłów site 10).

Such co-location of these sites does not appear to be coincidental. The depression might have been a border, both physical and symbolic, between the world of the living and the world of the dead. It needs to be emphasised, however, that in the absence of precise chronological markers or absolute dates, we cannot be certain that both cemeteries and the settlement were indeed contemporary to each other.

SPATIAL PATTERNS

Cemeteries containing megalithic tombs often form complex and differentiated spatial and functional complexes. Apart from large trapezoidal tombs, they also include flat graves, burials dug into into earthen mounds, and sometimes other objects.

At Pawłów site 3 (Fig. 2), there was only one trapezoidal tomb (I), the largest discovered so far in the Sandomierz Upland. It was located in the northern part of the cemetery, with a length of 52 meters, oriented along a west-east axis. Not far (8-16 meters) from the western part of tomb I was another one (tomb II), in the form of a large, elongated building, with post-frame walls, and containing graves within. On its southern end, excavations revealed a trench dug in a crescent shape, and three graves with stone casings (two of which were joined together). Further east, the remains of a rectangular building with a roof supported by 7 or 8 wooden posts were discovered. All these objects were interpreted as belonging to another large tomb (III). Apart from tombs I-III, the cemetery contained flat graves, sometimes including different stone constructions, sometimes lacking them entirely. Four of these graves were located between the eastern part of trapezoidal tomb I and the post-framed structure (tomb II); the rest were clustered to the south of tomb III. Also worth noting is the empty space separating different burial clusters, and the differentiated spatial orientation of flat graves located in the southern part of the cemetery (see Bargieł and Florek 2006b, and references therein).

In Malice Kościelne (Fig. 3), which so far appears to be the best-researched FBC cemetery in the Sandomierz Upland, two parallel trapezoidal tombs were discovered, along with flat graves located between the tombs towards the front, as well as directly to the east. A number of large pits with burned out loess bottoms was also revealed by excavations; while they

Fig. 2. Pawłów site 3, map of the FBC cemetery. Labels: 1 – megalithic stone constructions; 2 – post pits and cavities; 3 – remains of wooden constructions; 4 – trenches; 5 – graves with stone casings; 6 – burial pits without stone casings; 7 – skeletons; 8 – excavation plots. Edited by M. Florek

appeared to be similar in size, shape, and orientation to the graves, no bone fragments nor any other artifacts have been found (Bargieł and Florek 2006a). They might be interpreted as cenotaphs or other ritual objects, *e.g.* with the purpose of symbolic fire purification.

It is likely that another pair of parellel (but displaced) megalithic tombs was also located in Broniszowice (Bąbel 2006), their remains being mound A (which was excavated) and mound B (not excavated). Two mounds (only one of which remains today) containing

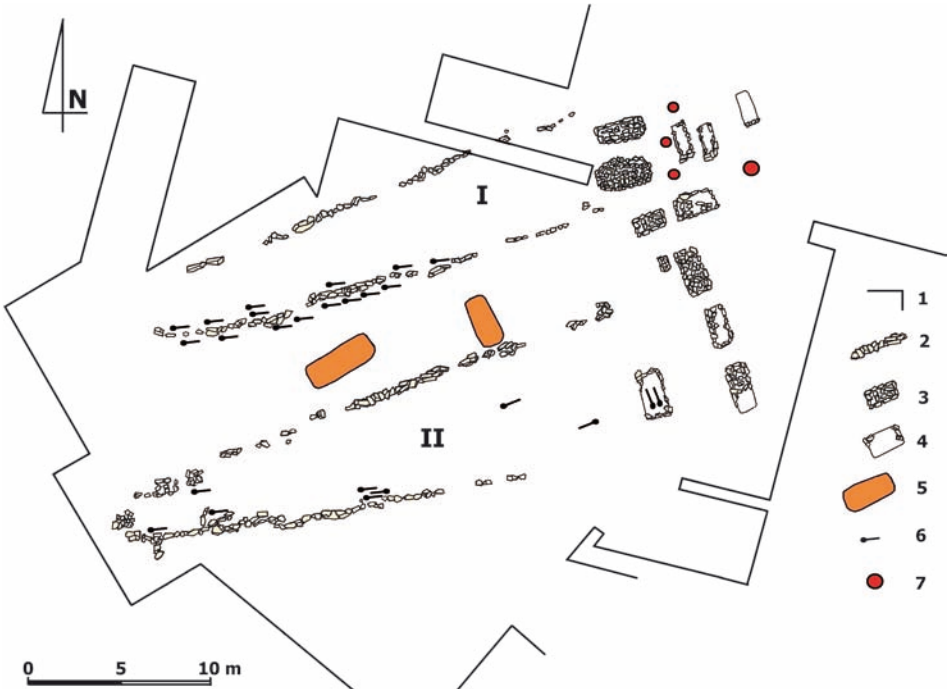

Fig. 3. Malice Kościelne site 1, map of the FBC cemetery. Labels: 1 – excavation plots; 2 – stone casings of megalithic tombs; 3 – burial pits and stone box graves; 4 – burial pits with single stone elements; 5 – loess pits bearing traces of fire; 6 – secondary graves dug into embankments of megalithic graves; 7 – post pits. Edited by M. Florek

megalithic objects might have been present in Kunów (Bąbel 1998, 9-11; Florek 2011b, 249). It is also possible that two parallel megalithic tombs are inside the so-called mound I in Święcica (Fig. 4). However, because archaeological surveys conducted there resulted only in very limited and fragmentary information, the status of this object is unclear (see Szeliga and Florek 2007).

Because of the relatively low number of surveyed cemeteries, we do not know if the appearance of the megalithic tombs in pairs is significant. It is, however, worth mentioning that a similar spatial situation was discovered in Grzybów near Staszów, another megalithic cemetery close to the Sandomierz Upland area (Garbacz 2006), and also in Zagaje Stradowskie (Burchard 2006).

In Stryczowice, 3 parallel trapezoidal tombs were discovered, along with a number of accompanying flat graves (Matraszek and Sałaciński 2006). The putative cemetery in Garbacz-Skała included 5 (*cf.* Bąbel 1998, 12; Florek 2011b, 248) or 6 mounds (as inferred from LIDAR analysis), each of which might contain one megalithic tomb. If such is the case, it would be the largest megalithic cemetery of the FBC in the Sandomierz Upland area.

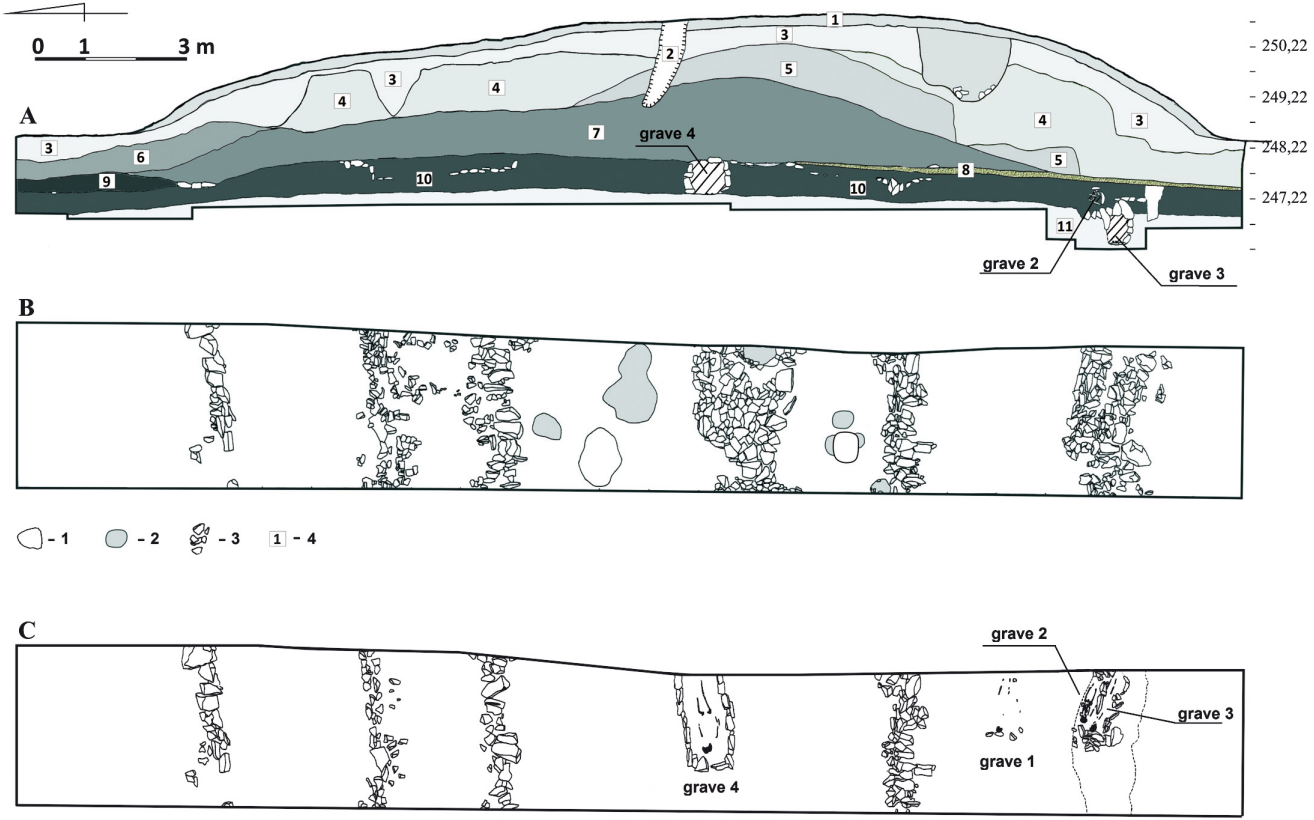

Fig. 4. Święcica site 1. A. Cut along the north-south axis of the mound and megalithic construction. B. Map of cemetery on the functional level. C. Map of stone constructions and graves on the top of the loess layer level. Labels: 1- modern trenches; 2 – fire pits and cavities of the Trzciniec culture; 3 – stone constructions and graves of the FBC; 4 – designations of mound layers: 1-7 – embankment; 8 – charcoal and burned clay layer, predating the mound construction; 9-10 – primary soil of the chernozem type; 11 – loess. After M. Szeliga, M. Florek 2007

Other cemeteries with trapezoidal megalithic tombs (Dobrocice, Gorzyczany, Pawłów site 10, Czyżów Szlachecki), have not yet been surveyed in sufficient detail to determine their layout and exact composition, apart from them containing at least one megalithic tomb.

The best-researched megalithic cemeteries can usually be subdivided into several zones, each of which included a group of graves of a certain type or character. In Malice Kościelne, the western parts of the tombs' embankments (and especially tomb I) contained dug-in secondary burials of women and children. In Pawłów site 3, individuals buried along the northern wall of the trapezoidal tomb (I) were also exclusively women and children. The southern part of the cemetery contained another group of graves, where research revealed peculiar funeral practices: body binding and fragmentation, secondary or fragmentary burials, and human remains in a prone position, *etc.* (Bargieł and Florek 2006b, 392). Similar practices in the context of medieaval or modern burials are usually interpreted as anti-vampiric ones, the purpose of which is to prevent the deceased from returning and hurting the living (*cf.* Żydok 2004).

In no cases could a separate zone for funerary rituals or sacral practices be found. The entrances to the trapezoidal tombs – and in the case of the Pawłów site, to other sepulchral structures, as well (tombs II and III) — were usually located on their east ends, but no such ritual zone was ever found there. According to observations made in Broniszowice, roads leading to the megalithic tombs should also be located on the east side (Bąbel 1998, 22; Iwaniszewski 2006, 262). In the case of Malice Kościelne, however, there was another flat-grave cemetery directly in the front of the megalithic tombs, and a terrain depression behind it. That would also preclude the existence of a special ritual zone in the eastern part of the cemetery in Malice.

This issue, and the problem of the spatial layout of cemeteries in general, obviously requires more research and archaeological surveys.

TYPES OF TOMBS

The most basic type of megalithic tomb of the FBC in the Sandomierz Upland includes objects built on a surface, in the shape of a very long trapezoid or a triangle. They were constructed from wood and stone, and covered at least partially with earthen mounds or embankments. Stones were used for building walls that enclosed the longer sides of the trapezoid (and sometimes also its base at the front), as well as for the construction of central grave structures enclosed by the tombs. In Malice Kościelne and Pawłów, a number of flint deposits (flakes, axes, and hammer stones) was discovered within the stone walls; in Dobrocice shattered pottery was found there. Such artifacts can be interpreted as foundation sacrifices.

Megalithic tombs of this type have been discovered in Broniszowice, Czyżów Szlachecki, Dobrocice, Malice Kościelne, Pawłów (sites 3 and 10), Stryczowice and Święcica. Remains

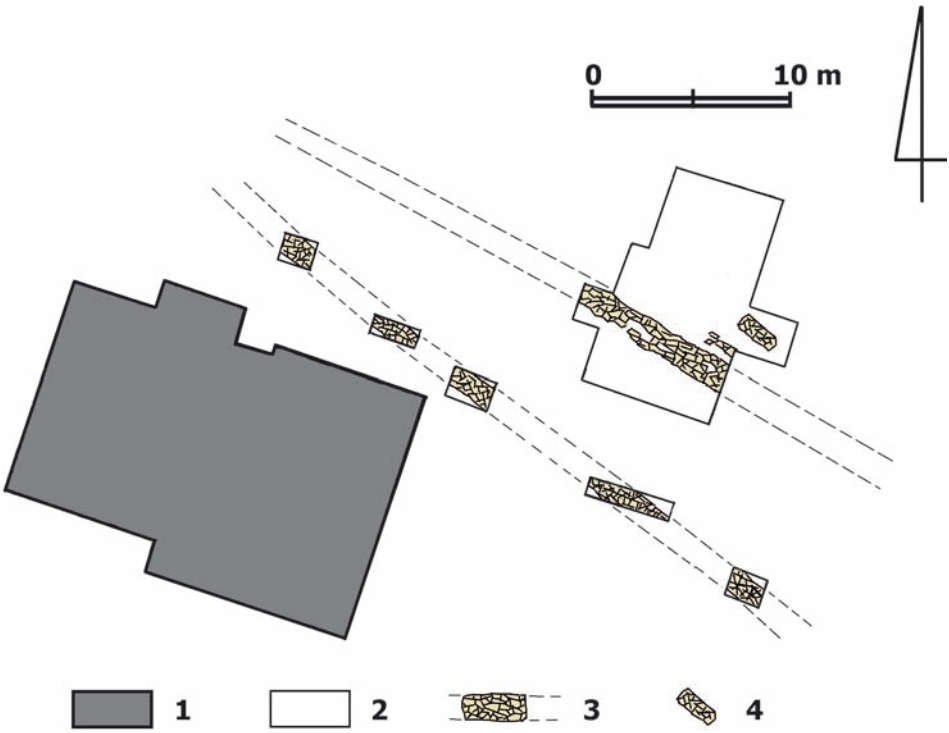

Fig. 5. Czyżów Szlachecki site 13, plan of the megalithic tomb. Labels: 1 – existing building; 2 – archaeological plots; 3 – megalithic constructions; 4 – grave outside the megalithic complex. Edited by M. Florek

of earthen embankments with visible stone casings, or just stone constructions alone, known from surface surveys or accidental discoveries (in Daromin, Garbacz-Skała, Gorzyczany, Komorna, Kunów, Mydłów, Nasławice, Prusy sites 36 and 44, Stodoły Kolonia, Studzianki, Świrna, Zagrody, Złota), also appear to belong to the same category of megalithic tombs.

Trapezoidal tombs identified so far in the Sandomierz Upland were oriented more or less along a west-east axis, with the wider base facing east. The largest deviation from this pattern was encountered in Czyżów Szlachecki, where the tomb was oriented along the NW-SE axis, with its base facing SE (Fig. 5). It is however possible that the (putative) tomb in Daromin, on the Opatówka River, is the only known exception to this rule. In this village, where a stone grave with skeletal remains was accidentally discovered, Włodzimierz Antoniewicz conducted excavations in 1924, revealing another grave (Antoniewicz 1925, 249-250, fig. 17). The grave, uncovered only partially, took the form of two rows of stones, between which a body was buried in a fetal position on the side (Fig. 6). Considering the layout of the parellel stone structures, and the lack of walls enclosing the grave from the

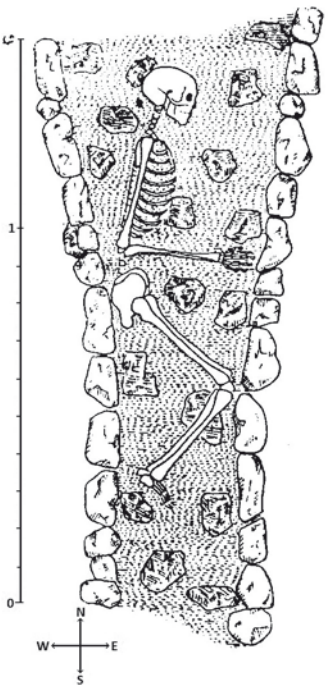

Fig. 6. Daromin site 1A.
Plan of (a fragment of) a putative megalithic tomb, with a secondary dug-in early Bronze Age grave.
After W. Antoniewicz 1925, fig. 17

other two sides, it appears that Antoniewicz unearthed the narrow end (the so-called „tail") of the trapezoidal megalithic tomb, with a secondary grave of the Mierzanowice culture dug into its embankment, and not, as he interpreted it, a stone grave from the early Bronze Age (*cf.* Antoniewicz 1925, 250). The practice of the people of the Corded Ware and Mierzanowice cultures of digging into embankments of older FBC tombs is known from other locations, *e.g.* a cemetery in Malice Kościelne, and – outside the Sandomierz Upland area – from Grzybów and Zagaje Stradowskie (see Bargieł *et al.* 2001; Garbacz 2006; Burchard 2006). If this interpretation is correct, then the putative tomb in Daromin would be oriented along the N-S axis, with its base facing south (although there are discrepancies between the description of the grave and its illustration, in terms of its orientation – see Antoniewicz 1925, 249-250, and fig. 17), making it therefore different from other, confirmed megalithic tombs from the Sandomierz Upland area.

In the wider parts of trapezoidal tombs, located usually at their eastern ends (apart from the putative tomb from Daromin described above), there was a rectangular room, likely with a roof supported by wooden posts. Such constructions, discovered in tomb I in Pawłów, in both tombs in Malice Kościelne, and also in Broniszowice, might have been places where funeral rituals or other sepulchral practices were conducted. Behind them – possibly separated by a wall – was located the central (main) chamber of the tomb. In Malice Kościelne, these (ante-) rooms also contained graves, but their stone casings were placed below the floor level.

The largest surveyed tomb in the Sandomierz Upland was found in Pawłów site 3. It measured 52 meters in length, with a base 8.5 meters wide (Fig. 7). The length of the partially surveyed tomb from Czyżów Szlachecki was determined to be roughly 40 meters, with its base measuring 9-10 meters (Fig. 5). Tombs in Malice Kościelne were 27 and 23 meters long, with wider bases measuring 5 and 4.5 meters, respectively (Fig. 8). Finally, tomb „A" in Broniszowice was approximately 25-39 meters long, and 10 meters wide at its base. While it is difficult to estimate the size of other, not so well surveyed, megalithic tombs, it is clear that objects of this type, found in the Sandomierz Upland area, are smaller than similar tombs found in lowland areas.

Although tombs II and III from Pawłów, as described above, differ from other „typical" trapezoidal constructions, they share the same ideo-functional elements, such as an elongated shape, orientation along a west-east axis, a room in the eastern part of the tomb, and graves containing stone constructions within.

Tomb II was built completely above the surface, on a plan of two trapezoids joined together at their bases. It was 30 meters long, 6 meters wide at the center, but only 3 meters wide at the western end. Its walls were of the vertical-post log – or possibly braided – type, with a gable or hip roof supported by wooden posts (Fig. 9).

Inside this structure, seven graves were discovered. The first three graves, located in the eastern part of the building (where the entrance had most likely been), were oriented along a north-south axis. Similar to graves unearthed in Malice Kościelne, their stone casings were below the floor level. The other 4 graves (including a cenotaph with grave good deposits), which were dug on the opposite site of the building, were oriented along a W-E axis, and their stone casings reached above the contemporary floor level.

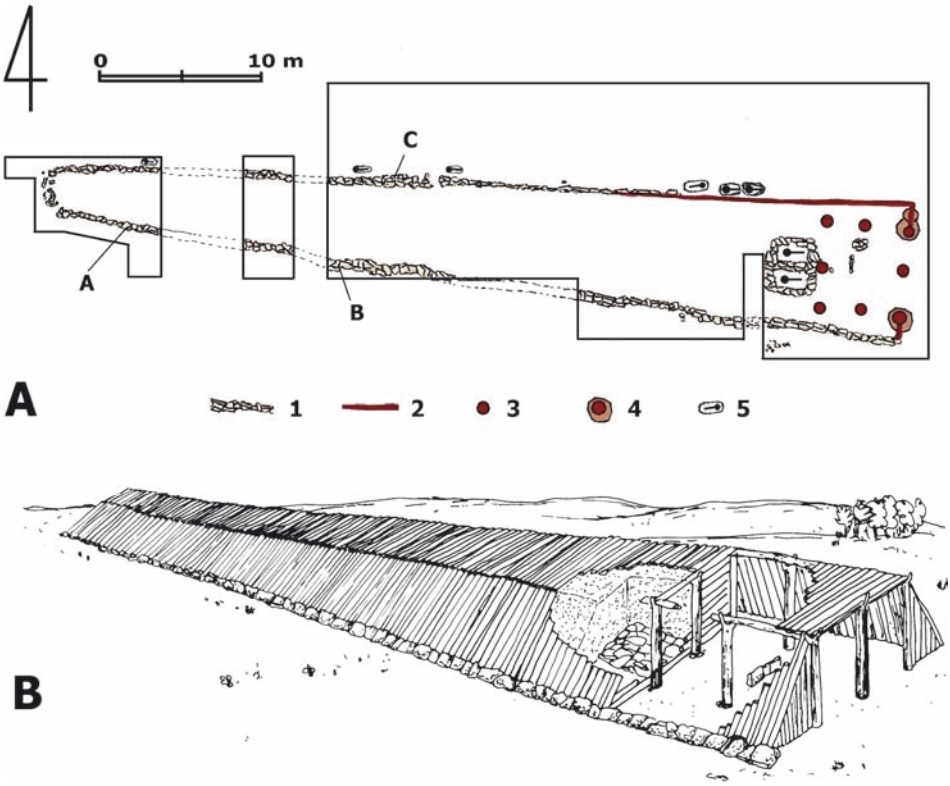

Fig. 7. Pawłów site 3. A. Plan of tomb I and the location of flint deposits: A – axes; B – flakes; C – hammerstone. Labels: 1 – megalithic casings of the tomb; 2 – remains of wooden constructions; 3 – post pits; 4 – large pits with dug-in posts; 5 – burials outside the tomb. B. Reconstruction of the tomb. Edited by M. Florek

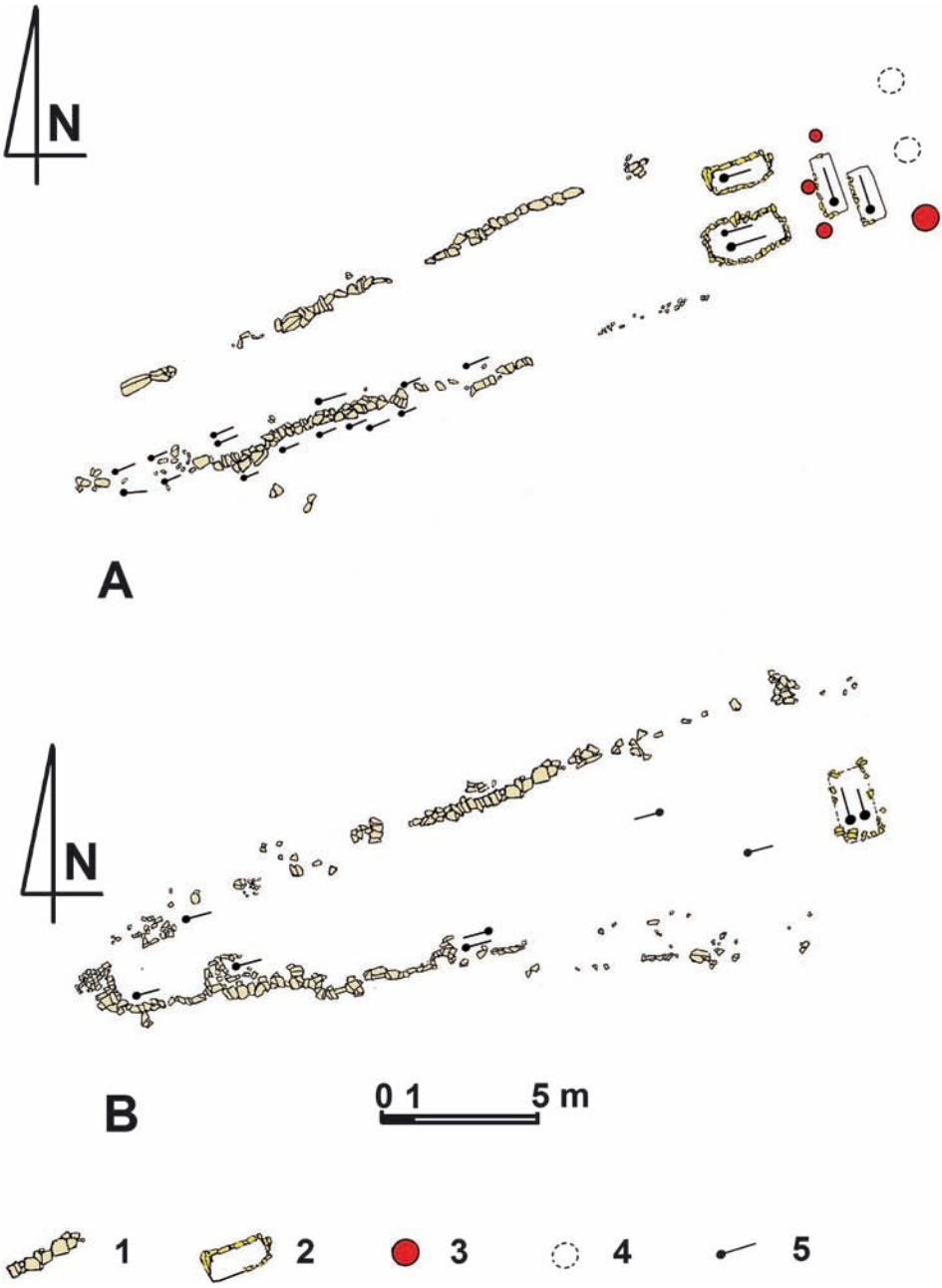

Fig. 8. Malice Kościelne site 1. Plans of megalithic tombs. A – Tomb I; B – Tomb II. Labels: 1 – megalithic constructions; 2 – graves with stone casing within and outside the tombs; 3 – post pits; 4 – reconstructed post pits; 5 – burials. Edited by M. Florek

In the eastern part of tomb III, there was a room (4.5 x 3.8 m) with a roof supported by 7 or 8 wooden posts, and with an entrance from the eastern direction. Behind it, 3 stone graves were discovered (Fig. 10). One of them contained the burial of an adult man; another, adjacent one, contained the remains of 2 women and a child; the third one was also a burial of a woman. The graves were most likely covered by a trapezoidal embankment measuring over 15 meters in length, surrounded by a trench in the shape of a crescent.

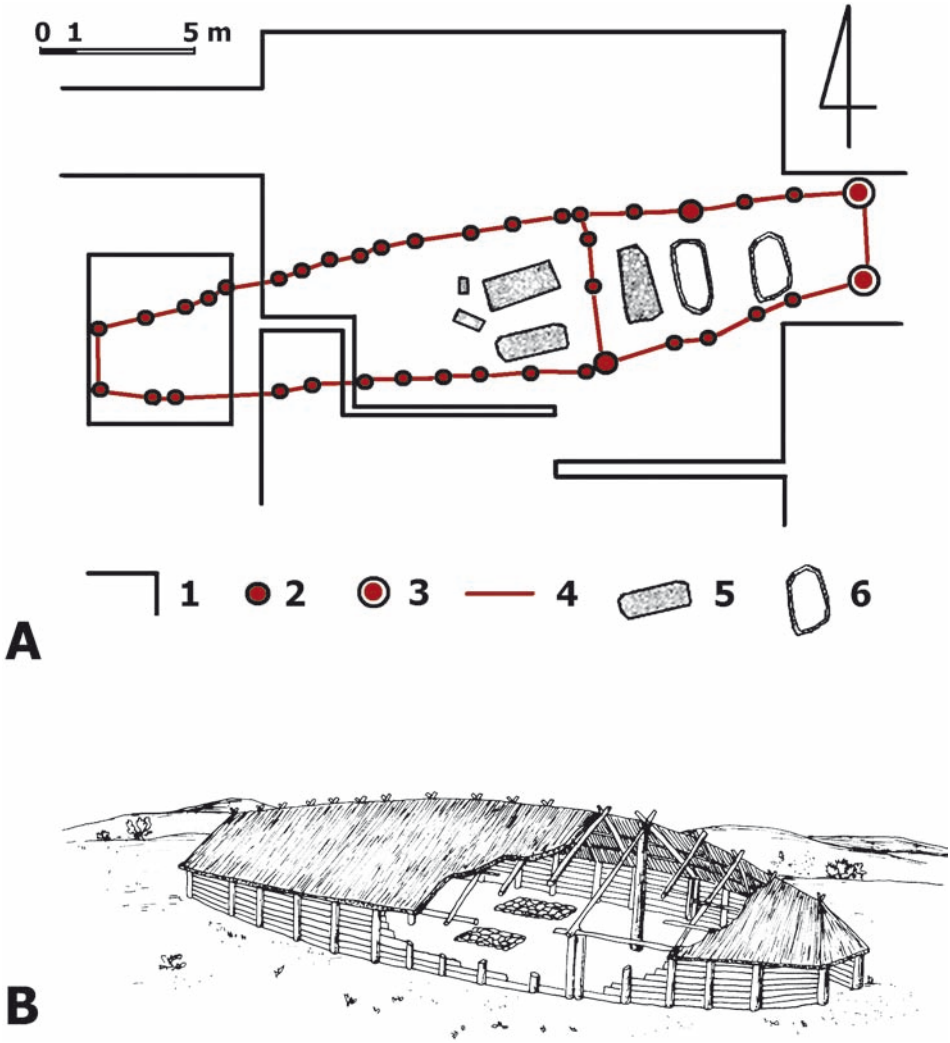

Fig. 9. Pawłów site 3. A. Plan of tomb II. Labels: 1 – archaeological plots; 2 – post pits; 3 – large pits with dug-in posts; 4 – reconstructed boundary of tomb II; 5 – graves with stone casings; 6 – burial pits without stone elements. B. Reconstruction of the tomb. Edited by M. Florek

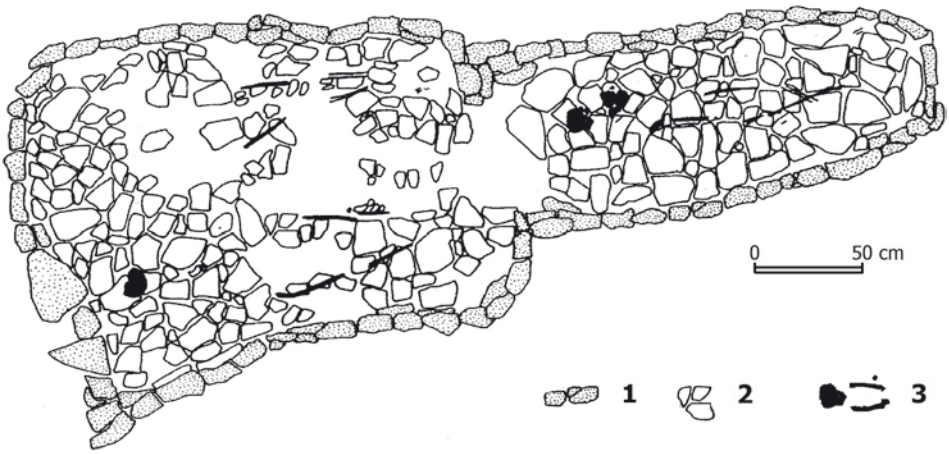

Fig. 10. Pawłów site 3. Plan of the central grave in tomb III. Labels: 1 – stone casings; 2 – stone floor of the tomb; 3 – human remains. Edited by M. Florek

FUNERAL RITES

Most, if not all, burials performed by the people of the FBC in the Sandomierz Upland were inhumations (skeletal burials). It is worth noting, however, that the remains of a person buried in the central trapezoid tomb (I) in Pawłów were affected in some way by fire (Zychman-Kozak and Szeliga 2005, 36). In Malice Kościelne, two rectangular pits, bearing signs of some intensive fire activity, were discovered between megalithic tombs, of a size and orientation similar to graves located nearby. These pits, containing a large amount of tiny charcoal fragments, blackened stones and singular animal bones, might be interpreted as cenotaphs.

On the non-megalithic cemeteries of the FBC, a uniformity of burial practicies can be observed; most graves contained only one body (only in Dacharzów two double graves were discovered, and another one in Góry Wysokie, see Florek 2006, 409; Tabaczyńscy 1973, 54), which was placed in a supine position along a west-east axis, with the head to the west (with the exception of the double grave in Góry Wysokie, where the bodies had been placed in opposite directions). The megalithic cemeteries, on the other hand, were much more differentiated in terms of the number and orientation of the dead. Other unusual practicies were also observed, like partial and secondary burials, binding of the deceased, or fragmentation of the bodies, which might be intepreted as anti-vampiric rituals.

The most uniform burials were observed in the central graves of the largest tombs. If the central grave contained two grave chambers, each one would contain a single burial (*e.g.* at Pawłów site 3, tombs I and II), while if only one central chamber was present, it would include most often a double burial of an adult and a child or a younger individual

(*e.g.* at Malice Kościelne, tombs I and II). Bodies were always placed in a supine position, most often along an east-west axis, with heads to the west. There were some exceptions, however – for instance, a central grave in tomb II at Malice Kościelne, where burials were oriented along the south-north axis, with heads pointing south.

In the case of flat graves located outside megalithic tombs, graves dug into their embankments, and burials placed in buildings constructed in the eastern part of the tombs, bodies were also frequently placed in a single grave each, in supine position, with hands along the body or palms resting on the pelvis. The exceptions include double graves (graves no. 7 and 45 at Pawłów site 3; grave no. 5 at Malice Kościelne; and, at Czyżów Szlachecki, a grave found outside the megalithic construction) and triple graves (grave no. 16/3 at Malice Kościelne, grave no. 46 at Pawłów site 3).

The orientation of burials was much more diversified. While most remains of the dead were found to be along a west-east axis (with some deviations) with heads pointing west, some bodies had been placed the other way round (*i.e.* with the head to the east) – for instance, grave no. 34 at Pawłów site 3; grave no. 2 and a female burial in double grave no. 16/3 at Malice Kościelne. The north-south orientation was also quite common, with heads pointing towards the south (*e.g.* three graves in the structure built in the eastern part of tomb I at Malice Kościelne, grave no 5 at the same site, and double grave no. 7 in the eastern part of tomb II at Pawłów site 3) and north (flat graves nos. 4 and 6 at Malice Kościelne, grave nos. 44, 45 and 46 at Pawłów site 3, three flat graves in the Stryczowice cemetery).

As mentioned before, peculiar burial practices were observed in the southern part of the site 3 cemetery in Pawłów, including secondary burials in which the deceased appear to have had their hands tied behind their backs and their bodies fragmented (graves no. 29, 30, 44), graves that included skeletal elements from a different person (grave no. 43), a triple grave with the remains of a man, a woman, and a child (grave no. 46), and a double grave (no. 44). Grave no. 5 at Malice Kościelne might also be considered unusual; the remains of a woman in a prone position were found with one leg curled up and placed above the other, along with the body of a child in a fetal position, with both legs curled up, and the head pointing south and facing the body of the woman (*cf.* Florek and Libera 1997, fig. 3: B).

GRAVE GOODS

Burials discovered at cemeteries containing megalithic tombs were also very diverse in terms of the grave goods present. Among three graves found within tomb A at Broniszowice, only one contained pottery fragments of an undetermined number of vessels, including a collared bottle. A stone axe and an axe made from striped flint were found nearby, and might have come from one of the destroyed graves (Bąbel 1998, 25). Inside a central grave in tomb I at Pawłów only a single flake made from Volhynian flint was found. Another burial, in tomb III at the same cemetery, contained a scraper made from Świeciechów flint.

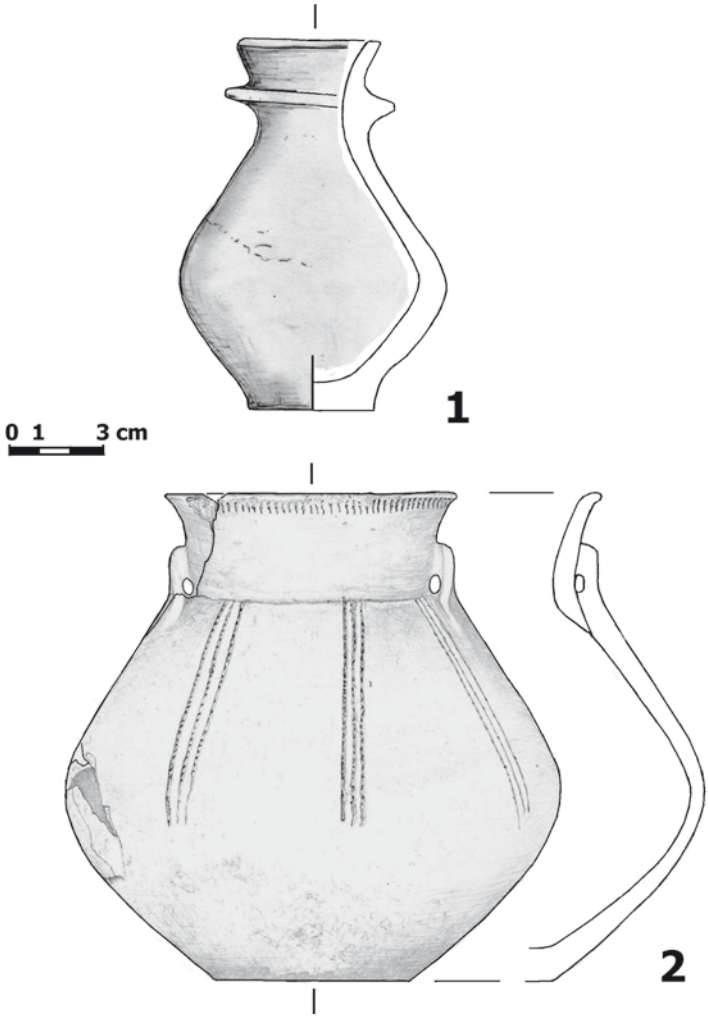

Fig. 11. Grave goods from accidental discoveries: 1 – Pawłów site 10 – collared bottle; 2 – Wlonice site 43 – amphora. Drawn by M. Florek (1), R. Galej (2)

Grave goods were also discovered inside 3 of 7 post construction graves (tomb II) in Pawłów, with the largest number of deposits found in grave no. 3, which, while containing no human remains (and therefore being a cenotaph), included an amphora, a stone axe, an axe of Świeciechów flint, a scraper, and a retouched flake made from Volhynian flint. Among flat graves in Pawłów, only one (no. 42) contained a deposit – namely, a small axe made from striped flint. In the other cemetery in the same location (site 10), a collared bottle was found.

Even fewer grave goods were discovered in graves from the Malice Kościelne cemetery. The central grave (no. 10) of tomb I contained a fragment of a blade made from chocolate flint and a scraper made from a boar's tusk; inside the central grave (no. 3) of tomb II, several fragments of animal bones (including parts of skulls, jaws, and long bones of cattle) were found with the remains of an adult and a child. Grave goods were also present in: grave no. 14 – a fragment of a retouched flake; no. 19 – a scraper (both artifacts made from Świeciechów flint), and no. 5 – a bone awl (Bargieł *et al.* 1998, fig. 3: 4, 10-12, Bargieł and Florek 2006a, fig. 11: 5, 14).

Some pottery was also found accompanying graves known only from accidental discoveres, at Pawłów site 10 and Wlonice (Fig. 11).

CHRONOLOGY

The cemeteries with megalithic tombs discussed above can be dated, on the basis of the discovered artifacts and a few pubished absolute dates, to belong to the classical phase of the south-eastern group of the FBC. On the other hand, cemeteries that do not include megalithic constructions, and contain uniformly orientated flat graves, are probably younger, and related to the late phase of the south-eastern group of the FBC (*cf.* Nowak 2009, 341-348, 477-478; Król 2011, 89-95).

CONCLUSION

1. In the area of the Sandomierz Upland, two types of FBC cemeteries can be found: megalithic ones, which include large tombs built at ground level from stone, wood, and excavated earth (rarely from wood only), with a number of burials inside; and non-megalithic ones, which contain only flat graves. In FBC settlements, a number of burial pits (sometimes repurposed) have been discovered.

2. Most of the megalithic tombs were in the form of elongated trapezoidal constructions, with stone casings built along their walls, oriented on a west-east axis, with a post-framed room in the eastern, wider part of the trapezoid. Behind the room, a central grave was located, with two parallel stone chambers, or one chamber, most often with a double burial. These constructions were covered with an earthen embankment.

3. Both types of cemeteries include flat graves with different types of stone constructions (walls, casings, boxes *etc.*). Burial pits lacking any stone constructions were rarely found. Megalithic cemeteries could include graves oriented both along a west-east, as well as a north-south axis. Non-megalithic cemeteries contained graves along a west-east axis only (allowing for some deviation, which remained consistent for a given cemetery).

4. Both types of cemeteries contained only skeletal inhumations in most often single – but occasionally double, and very rarely triple – burials. A supine body position, with arms along the body, was the norm. Rarely, partial burials were encountered, as well as some so-called anti-vampiric practices.

5. Only a few graves contained artifacts that might be considered intentional grave goods, and it appears that flat graves found on non-megalithic cemeteries were richer and more diversified in that regard.

6. Flint deposits, found within stone casings of trapezoidal tombs, might be considered evidence for certain funerary practices.

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ANIMALS IN THE LIFE OF INHABITANTS OF THE NEOLITHIC SETTLEMENT AT NIEDŹWIEDŹ

ABSTRACT

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This paper presents the results of zoological analyses of bone materials retrieved from Funnel Beaker culture features discovered in Niedźwiedź site 1, Słomniki commune. The analyses included species and anatomic determinations, as well as determinations of the age, sex, and size of animals. The identified remains included bones of domestic (cattle, goats/sheep, pigs, and dogs) and wild mammals (horse, deer, roe deer, boar, beaver, hare, and small rodents), birds (mallard, common buzzard, and hawfinch), and a European pond turtle.

Keywords: Funnel Beaker culture, bone material, zoological analysis, mammals, birds, reptile
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METHODOLOGY OF RESEARCH

Information concerning the animals that played a role in the life of people inhabiting the Neolithic settlement at Niedźwiedź (Słomniki commune) was obtained on the basis of zoological analyses of the bone material retrieved from Funnel Beaker culture (TRB) features discovered at site 1 in this locality. The analyses involved species and anatomic deter-

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minations, calculations of the total number of fragments (NISP – *Number of Identified Specimens per Species*) and the minimum number of individuals (MNI), bone measurements, and the determination of the age, sex, and size of animals.

When calculating the number of remains (NISP), it was accepted that fragments of one bone belonging to the same individual form a single osteological unit. The assessment of the minimum numbers of individuals was performed separately for particular features, and taking into account the diversity among animals in terms of age, sex, and size (Bökönyi 1970; Chaplin 1971, 70-75). The osteometric analysis of bones followed the study by A. Driesch (1976). The age at death was estimated based on the state of dentition and the state of epiphysial fusion. Four age classes were distinguished, corresponding with young (*iuvenis*), nearly adult (*subadultus*), adult and mature (*adultus* + *maturus*), and old individuals (*senilis*) (Uerpmann 1972, 15-16; Makowicz-Poliszot 1983, 269). Sex was determined for cattle, goat/sheep, and pig bones, with the diagnostic elements including horncores (cattle, goat, sheep), metacarpal bones (cattle), and mandibles with tusks or tusk alveoli (pig). Animal sizes were assessed based on measurements of selected bones and estimates of withers height, the latter calculated using appropriate indices: Matolcsi (1970) for cattle, Teichert (1975) for sheep, Teichert (1969) for pigs, and Harcourt (1974) for dogs. Metrical data obtained for cattle and pig bones (bone measurements in mm and withers heights in cm) were given points on a scale from 0 to 100 in order to assess an animal's size. The scale was divided into three groups, corresponding with small animals (0-30 pts), mid-sized animals (31-70 pts), and large animals (71-100 pts) (Lasota-Moskalewska 2008, 242-243, 245).

RESULTS

The bone material from TRB features discovered at site 1 in Niedźwiedź comprised 4,179 bone remains, most of which (59.3%) have been identified in terms of species and anatomy. They belong to mammals, birds, and one reptile. Mammal bones make up the largest group. They include bones of domestic mammals (cattle *Bos taurus* L., goat/sheep *Capra hircus* L./*Ovis aries* L., pig *Sus domesticus* L., and dog *Canis familiaris* L.), as well as wild mammals (horse *Equus* sp., deer *Cervus elaphus* L., roe deer *Capreolus capreolus* L., boar *Sus scrofa* L., beaver *Castor fiber* L., hare *Lepus europaeus* Pal.) and small rodents *Rodentia* (including hamster *Cricetus cricetus* L.; Tables 1-4).

The majority of mammal bones belong to domestic animals, 2,386 remains in total. Among them, the most well-represented group are cattle bones, whose percentages calculated in terms of NISP and MNI are the largest. Cattle are followed by goats/sheep and pigs in similar shares; goats/sheep are second in terms of NISP, while pigs move to second place when MNI is taken into account. The share of dog remains among domesticated mammals is small, not exceeding a few percent (Table 3).

Among wild mammals, the largest proportions are those of *Cervidae* (regarded as one group: deer, roe deer), hare, and boar. Bird bones include remains of mallard *Anas platyrhynchos* L. (probably wild), common buzzard *Buteo buteo* L. (a large predatory bird from the *Accipitridae* family), and hawfinch *Coccothraustes coccothraustes* L. (a small passerine bird from the *Fringillidae* family). Reptiles are represented by shell fragments of a European pond turtle *Emys orbicularis* L. (Tables 4-5).

The age structure of cattle, goats/sheep, and pigs is presented in Table 6. Among these species, the highest proportions of remains (calculated based on NISP and MNI) belong to adult and mature animals, with the highest values recorded for cattle. The share of young and subadult individuals is comparable for cattle and pigs, while for goats/sheep the share of young individuals is strikingly high, at about 34%. The proportions of old animals are relatively low for all these species, and do not rise above a few percent.

Domestic mammal remains represent nearly all parts of the skeleton, including phalanges. Bone remains of small ruminants include skeletons of 2 very young goats between 4 weeks and 3 months of age, while a portion of the dog bones belongs to an incomplete skeleton of a subadult individual between 7 months and 1.5-2 years of age (Table 7).

The remains of wild mammals (excluding bones of small rodents, which may be a modern admixture) belong to the trunk and hind leg (horse), the head (antler in particular) and single leg bones (deer, roe deer), the head and legs (pig), teeth (beaver), and the trunk and legs (hare) (Table 8).

The bones of cattle, goats/sheep, and pigs have been divided into those originating from body parts of high and low value for consumption (Tables 9-11). The anatomic distribution analysis for cattle and goats/sheep shows the prevalence of valuable parts of the carcass. The distribution is different for pig remains, where bones from parts of low value prevailed. Bones from the trunk (vertebrae, ribs) were most numerous among the parts valuable for consumption in the analysed species, while those of low value included primarily elements of the head, with their highest share recorded for pigs (nearly 46%).

Sex was determined on the basis of bones of cattle, goats, sheep, and pigs. Cattle remains included elements belonging to 16 females, 3 males, and 4 castrates. One of the goat horncores was identified as male, and another one as female. The identified sheep bones belonged to 3 female animals and one castrate, while for pigs, one fragment belonged to a female animal and 4 to males (Tables 12, 16, 23, and 26).

Cattle size was determined based on withers height calculations and measurements of horncores, scapulae, humeri, radii, metacarpal bones, femora, tibiae, talus bones, calcanei, metatarsal bones, and first phalanges. Withers height values for cattle were calculated from the lengths of two metacarpal bones, one female and one male. The obtained values were 122.7 cm (female) and 136.1 cm (male), which means a mid-sized animal and a large animal. These data, combined with the measurements of bones, produced 151 points, which allowed for distinguishing mid-sized animals (which prevailed at 70.9% of points),

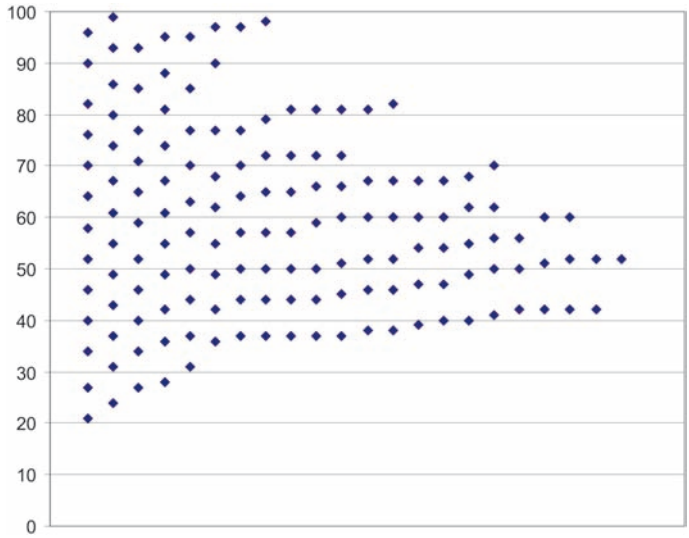

Fig. 1. Niedźwiedź, site. 1. Size distribution of cattle. Point scale. X-axis – points, y-axis – metrical data

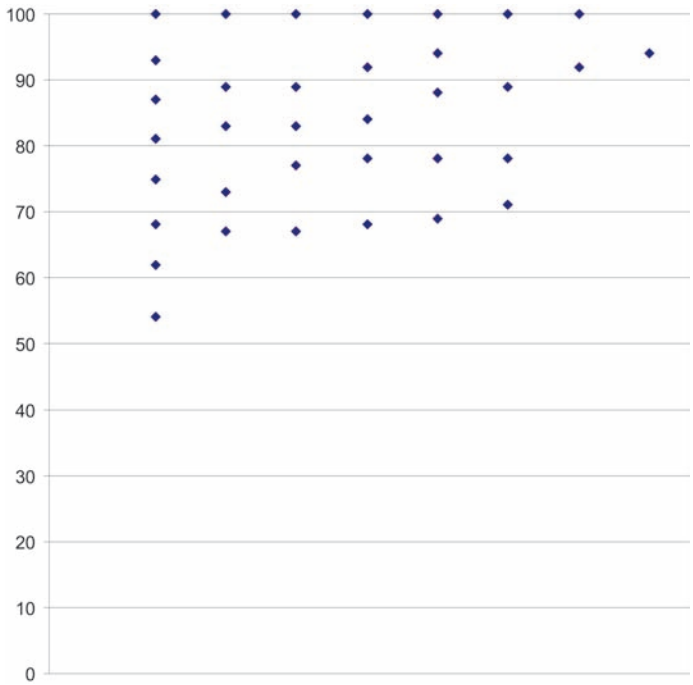

Fig. 2. Niedźwiedź, site. 1. Size distribution of pig. Point scale. X-axis – points, y-axis – metrical data

large animals and animals from a transitional range between cattle and aurochs (25.8% of points), and small animals (3.3% of points) (Tables 12-22; Fig. 1).

For sheep, the size was determined based on the withers height, which was calculated from the lengths of two metacarpal bones and one metatarsal bone (Tables 24-25). The three values obtained were 62.1 cm, 62.3 cm, and 59 cm. The first two correspond to sheep of middle size, and the last one to a small individual (Lasota-Moskalewska *et al.* 1998, 324).

The withers height in pigs was calculated from the lengths of two metacarpal bones (III and IV), six talus bones, one calcaneus, and one metatarsal bone (IV), with the resulting values from 73.4 cm to 83.2 cm. These data, combined with the measurements of scapulae, femora, tibiae, talus bones, and one calcaneus, produced 41 points, of which most (34 points) belong to large and transitional animals (from range between domesticated pig and boar) (Tables 27-33; Fig. 2).

For dog, the withers height was calculated as 40.5 cm by measuring a tibia. This value is characteristic of a small animal (Table 34; Wyrost 1963, 227; Bökönyi 1984, 66).

CONCLUSIONS

The majority of bone remains from Niedźwiedź represent the typical post-consumption material. This is indicated by significant bone fragmentation (40.7% undetermined fragments) and the occurrence of meat eating traces, for instance numerous traces of fire (on remnants of domestic and wild mammals), cut marks (on cattle ribs), or chop marks (mainly on cattle longbone shafts). Traces of fire are leftovers from roasting meat with bones, cut marks formed when the meat was filleted during the meal, and chop marks are evidence for marrow extraction (Lasota-Moskalewska 2008, 190, 194-195).

Quantitative analysis of the bone material from the discussed site reveals a clear prevalence of domestic mammal remains over wild mammal remains, amounting to 97.3% in terms of NISP and 89.6% in terms of MNI. Thus, domestic mammals were the basic source of meat for the inhabitants of the Neolithic settlement at Niedźwiedź. Breeding these animals played a major role in the economy, with hunting for wild mammals playing a much less prominent role. The largest group among the remains of domestic mammals was that of cattle bones, and beef played a fundamental role in consumption. Cattle was the most well-represented species in the livestock, while the shares of small ruminants and pig in the livestock and in consumption were smaller. Their proportions, calculated in terms of NISP and MNI, are considerably lower than for cattle. Dog was the least represented species in the bone material, and played a very limited role in the life of the Neolithic inhabitants of the Niedźwiedź settlement. Some long bones of this species (humerus, femur, tibia) bear traces of burning, which suggests that dog meat was also consumed (Tables 2-3).

The results of quantitative analysis of the animal bones from Niedźwiedź have been compared to analogical results obtained by the author of the article for other TRB sites

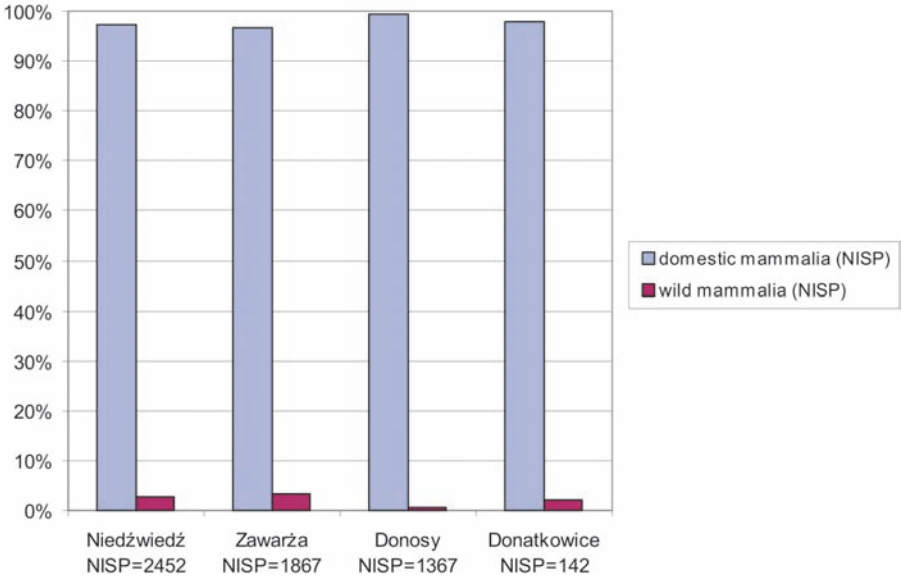

Fig. 3. Percentage of domestic and wild mammalia according to the number of bones (NISP) in the bone material from the TRB sites in the loess uplands of western Lesser Poland

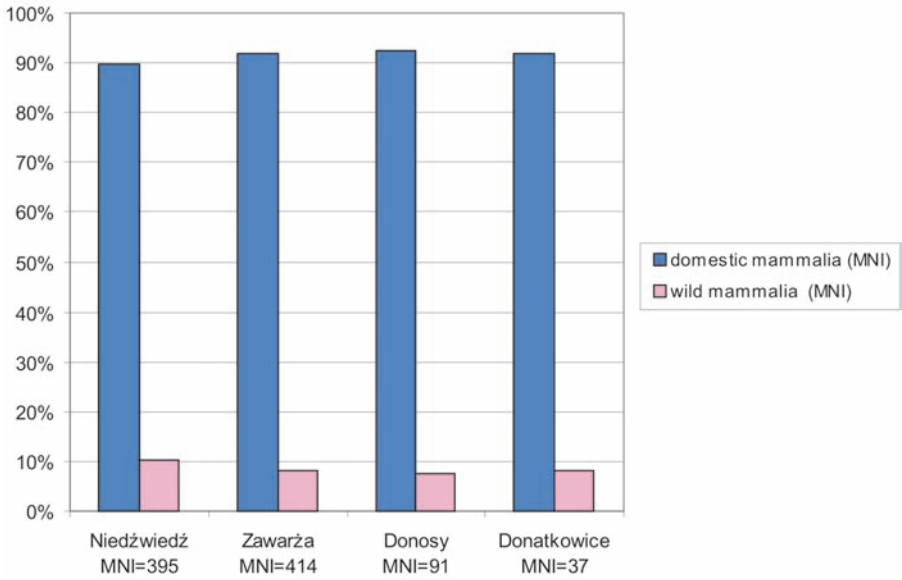

Fig. 4. Percentage of domestic and wild mammalia according to the minimum number of individuals (MNI) in the bone material from the TRB sites in the loess uplands of western Lesser Poland

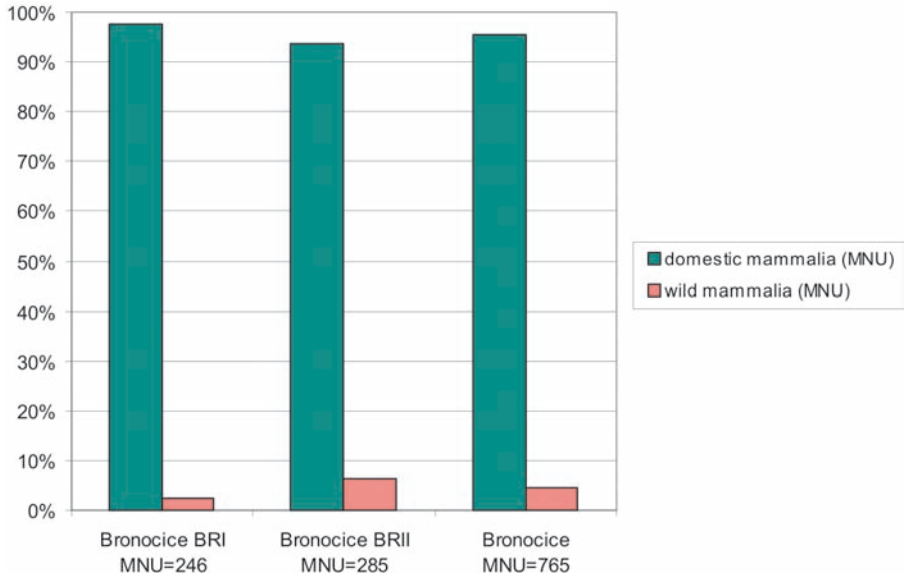

Fig. 5. Percentage of domestic and wild mammalia according to the minimum number of bone units (MNU) in the bone material from the TRB site in Bronocice

situated in the loess uplands of western Lesser Poland (upper Vistula basin), such as Zawarża, Donosy, Donatkowice and Bronocice (phases 1, 3, 4; BR I-III). For comparative purposes, such analyses from a few other TRB sites in southeastern Poland were also taken into account, including Ćmielów, Kamień Łukawski, Zawichost-Podgórze, and Gródek Nadbużny. Bone assemblages from all these sites also show a notable predominance of domestic mammals over wild mammals (as in Niedźwiedź), from 92.5% to 99.3% NISP, from 91.8% to 92.3% MNI, and from 93.7% to 97.6% MNU (*Minimum Number of bone Units*; Bronocice). The analysis of anatomical distribution of domestic mammal remains in the comparative materials reveals the largest proportions of cattle, followed by either goat/sheep or pig in second place, or with similar shares of these two latter species. In most of these assemblages dog comes last in terms of the number of bones (Figs 3-10; Kruk 1980, 301-303; Krysiak 1950; 1952; 1956; 1966; Krysiak and Lasota 1971; Makowicz-Poliszot 2002, 136, 138-140, 142; 2007, 145, 148, 150, 151, 153, 176, 177, 179; Milisauskas *et al.* 2012, 24-27).

For the Neolithic settlement at Niedźwiedź, age structure has been analysed for cattle, small ruminants, and pig. As for cattle, the predominance of adult and mature individuals in the bone material indicates that animals were kept not only for meat, but also for their milk, labour, and manure. A much greater proportion (than in cattle) of young goats/sheep suggests breeding these animals mainly for meat, or selective culling in connection with

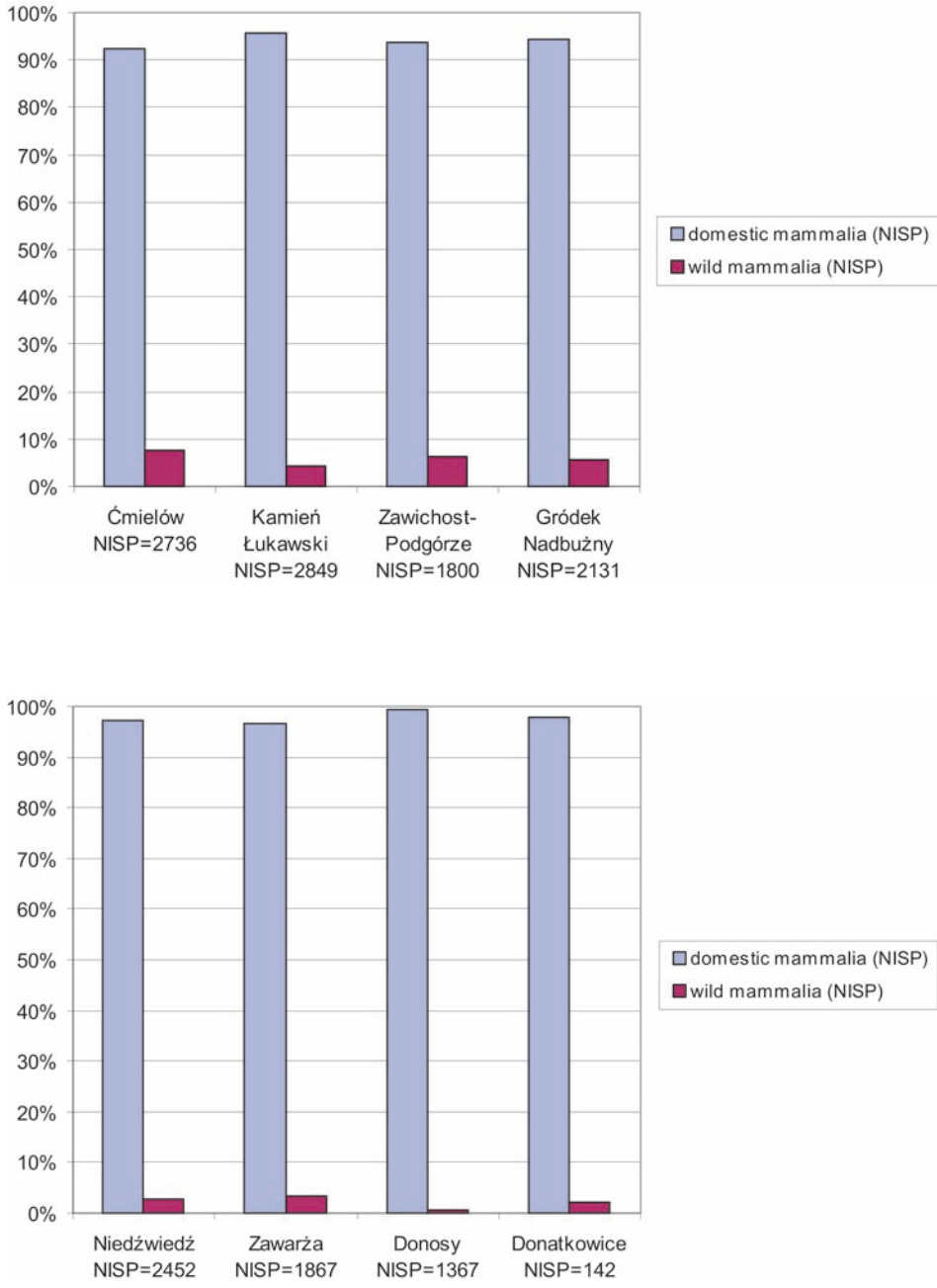

Fig. 6. Percentage of domestic and wild mammalia according to the number of bones (NISP) in the bone material from the TRB sites in southeastern Poland

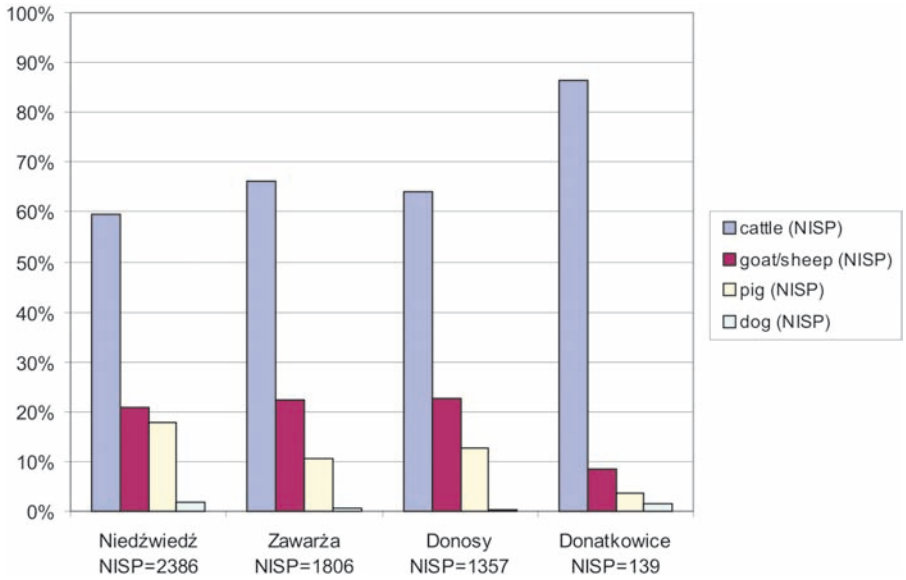

Fig. 7. Percentage of domestic mammalia according to the number of bones (NISP) in the bone material from the TRB sites in the loess uplands of western Lesser Poland

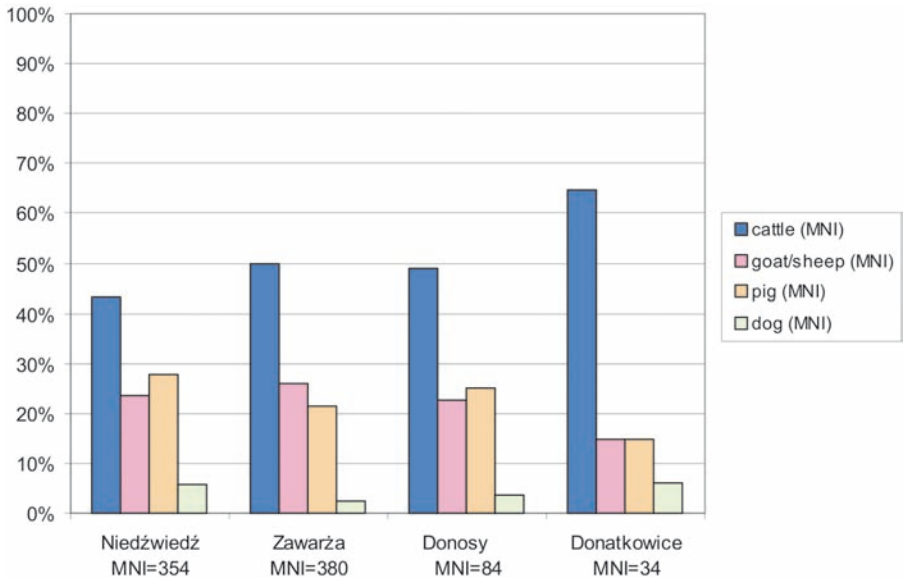

Fig. 8. Percentage of domestic mammalia according to the minimum number of individuals (MNI) in the bone material from the TRB sites in the loess uplands of western Lesser Poland

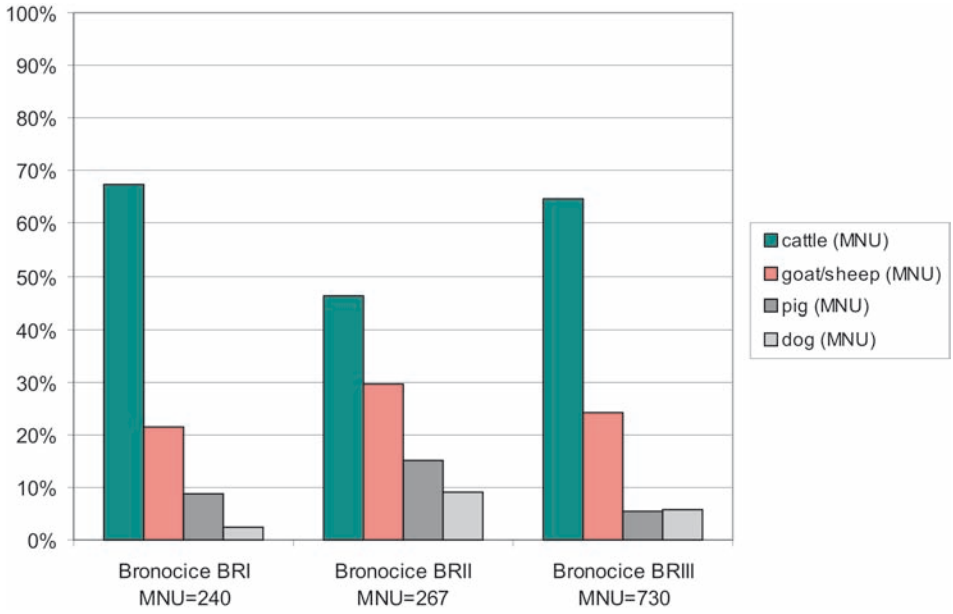

Fig. 9. Percentage of domestic mammalia according to the minimum number of bone units (MNU) in the bone material from the TRB site in Bronocice

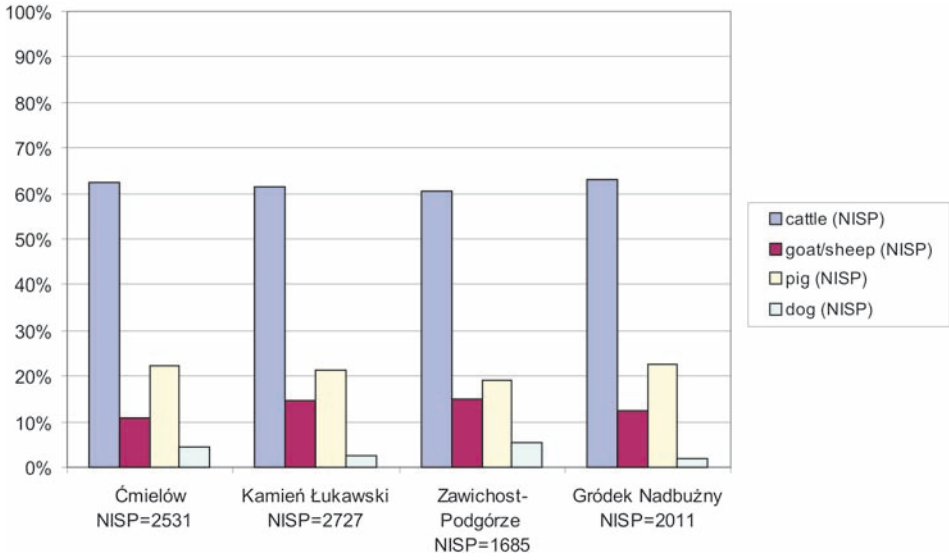

Fig. 10. Percentage of domestic mammalia according to the number of bones (NISP) in the bone material from the TRB sites in southeastern Poland

fodder shortages. Analysis of the age at death of pigs, with the number of mature individuals slightly higher than that of young and subadult animals (calculated jointly) may be indicative of breeding oriented towards the production of meat and fat (Table 6).

The distribution of bones of major meat-producing species: cattle, goat/sheep, and pig in terms of consumption value (with low-value parts including slaughter waste) reveals a preference for carcass parts belonging to the trunk. These correspond to such (currently identified) parts of the carcass as the neck (in all the mentioned species), prime rib and brisket in cattle and goats/sheep, flat rib, fore rib, and rump cut in cattle, saddle in goats/sheep, and loin, ribs, and bacon in pigs. The diet was also supplemented with edible parts of the head (primarily pigs), such as the brain and tongue (Tables 9-11; Głowacka 1964; Milisauskas *et al.* 2012, 157).

Conclusions concerning breeding structure can be derived from sex determinations for cattle and sheep. For cattle, the majority of the determinations points to female individuals. This allows one to assume that cows, bred for milk, were prevalent in the herd. Apart from cow remains, the bone material included skeletal elements belonging to bulls and oxen, the latter possibly used for traction. The inhabitants of the Neolithic settlement at Niedźwiedź castrated not only bulls, but also rams, as evidenced by the identification among sheep bones of a horncore belonging to a castrated individual. Castrated rams could have been harnessed as well, which is suggested by (among other data) a Neolithic figurine of two rams (previously interpreted as "oxen") in a yoke, discovered in Krężnica Jara in Lubelskie Province, Poland (Tables 12, 16, 23; Lasota-Moskalewska 2005, 108).

Animal size was determined for cattle, sheep, pig, and dog. The osteometric analysis of the cattle bones identified primarily mid-sized and large individuals. Three fragments originate from animals representing transitional forms between cattle and aurochs, or crossbreeds of these two species. Withers height calculations for sheep suggest breeding of small (up to 59.9 cm) and mid-sized animals (60.0-69.9 cm; Lasota-Moskalewska *et al.* 1998, 324), while pig size determinations indicate that mainly large animals were bred. Several pig bones belong to crossbreeds of domesticated pig and boar. The height calculated for the only dog from Niedźwiedź corresponds with that of a small individual (Tables 12-22, 24-25, 27-34; Figs 1-2).

The small proportion of wild mammals in the bone material from Niedźwiedź, amounting to 2.7% in terms of NISP and 10.4% in terms of MNI, is indicative of a very limited role of hunting in meat acquisition. Low shares of wild mammals have also been recorded in bone assemblages from comparative sites, and they fall within ranges of 0.7% to 7.5% NISP, 7.7% to 8.2% MNI, and 2.4% to 6.3% MNU. *Cervidae* (deer and roe deer) were the most often hunted species in Niedźwiedź, followed by hare and boar. Wild horses and beavers were also hunted, as well as birds such as mallard, common buzzard, and hawfinch. The bone assemblage from Niedźwiedź also included remains of the European pond turtle, which may have played some role in the diet (Tables 2, 4-5; Figs 3-5; Makowicz-Poliszot 2002, 138-142; 2007, 147, 149, 150, 152-154; 177-180; Milisauskas *et al.* 2012, 24, 25).

Table 1. Niedźwiedź, site 1. List of animal remains

Group of animals	NISP	
	n	%
Domestic mammalia	2386	57,1
Wild mammalia	66	1,6
Birds	22	0,5
Reptiles	3	0,1
Undetermined	1702	40,7
Total	4179	100

Table 2. Niedźwiedź, site 1. Participation of domestic and wild mammalia in the bone material

Group of animals	NISP		MNI	
	n	%	n	%
Domestic mammalia	2386	97,3	354	89,6
Wild mammalia	66	2,7	41	10,4
Total	2452	100	395	100

Table 3. Niedźwiedź, site 1. Participation of particular species of domestic mammalia in the bone material

Species	NISP		MNI	
	n	%	n	%
Bos taurus L.	1421	59,6	153	43,2
Capra hircus L./*Ovis aries* L.	495	20,7	83	23,5
Sus domesticus L.	428	17,9	98	27,7
Canis familiaris L.	42	1,8	20	5,6
Total	2386	100	354	100

Table 4. Niedźwiedź, site 1. Participation of particular species of wild mammalia in the bone material

Species	NISP		MNI	
	n	%	n	%
Equus sp.	4	6,1	3	7,3
Cervus elaphus L.	13	19,7	11	26,9
Capreolus capreolus L.	4	6,1	3	7,3
Sus scrofa L.	11	16,7	6	14,6
Castor fiber L.	2	3,0	1	2,4
Lepus europaeus Pal.	18	27,3	9	22,0
Cricetus cricetus L.	10	15,0	5	12,2
Rodentia	4	6,1	3	7,3
Total	66	100	41	100

Table 5. Niedźwiedź, site 1. Participation of particular species of birds and reptile in the bone material

Group of animals	Species	NISP		MNI	
		n	%	n	%
Birds	*Anas platyrhynchos* L.	2	9,1	1	25,0
	Buteo buteo L.	1	4,6	1	25,0
	Coccothraustes coccothraustes L.	16	72,7	1	25,0
	Undetermined	3	13,6	1	25,0
	Total	22	100	4	100
Reptile	*Emys orbicularis* (L.)	3	100	3	100

Table 6. Niedźwiedź, site 1. Age structure of cattle, goats/sheep and pig in the bone material

Class of age	Cattle				Goats/sheep				Pigs			
	NISP		MNI		NISP		MNI		NISP		MNI	
	n	%	n	%	n	%	n	%	n	%	n	%
iuvenis	148	18,4	28	19,0	97	33,8	26	34,2	64	21,3	20	21,7
subadultus	113	14,0	31	21,1	34	11,8	15	19,7	51	17,0	22	23,9
adultus + maturus	544	67,5	87	59,2	155	54,0	34	44,8	177	59,0	44	47,9
senilis	1	0,1	1	0,7	1	0,4	1	1,3	8	2,7	6	6,5
Total	806	100	147	100	287	100	76	100	300	100	92	100

Table 7. Niedźwiedź, site 1. Elements of the skeleton of domestic mammalia in the bone material

Element of skeleton	*Bos taurus* L.	*Capra hircus* L. *Ovis aries* L.	*Ovis aries* L.	*Capra hircus* L.		*Sus domesticus* L.	*Canis familiaris* L.	
Processus cornualis	34	-	9	5	1	-	-	-
Cranium	105	32	2	-	1	56	6	1
Mandibula	109	41	-	-	4	76	4	1
Dentes	103	52	-	-	-	63	2	-
Os hyoideum	1	3	-	-	-	-	-	-
Vertebrae cervicales	60	13	-	-	5	4	5	13
Vertebrae thoracales	43	10	-	-	-	10	2	18
Vertebrae lumbales	59	13	-	-	10	6	-	7
Sacrum	4	-	-	-	1	-	1	1
Vertebrae caudales	7	-	-	-	-	-	-	-
Vertebrae	11	3	-	-	23	2	-	-
Costae	230	89	-	-	40	52	5	39
Sternum	-	-	-	-	1	-	-	1
Scapula	76	12	1	-	3	10	2	2
Humerus	44	15	2	-	3	27	2	1
Radius	46	35	3	-	3	7	-	2
Ulna	26	5	1	-	3	14	1	2
Carpalia	26	-	-	-	12	1	-	3
Metacarpus	42	23	9	-	3	8	1	1
Pelvis	58	7	4	-	2	2	1	-
Femur	66	20	-	-	4	9	3	-
Patella	4	-	-	-	1	3	-	-
Tibia	73	25	-	-	4	27	3	-
Fibula, os malleolare	1	1	-	-	2	4	-	-
Tarsalia	61	4	3	-	15	16	-	-
Metatarsus	56	24	5	-	4	6	4	-
Metapodium	10	5	-	-	-	10	4	1
Phalanx I	45	16	-	-	11	8	1	3
Phalanx II	35	2	-	-	5	5	-	-
Phalanx III	10	2	-	-	4	2	-	-
Ossa sesamoidea	8	-	-	-	1	-	-	-
Total	1453	452	39	5	166*	428	47	96**

* – skeletons of two very young individuals, ** – part of the skeleton of almost adult individual

Table 8. Niedźwiedź, site 1. Elements of the skeleton of wild mammalia in the bone material

Element of skeleton	*Equus* sp.	*Cervus elaphus* L.	*Capreolus capreolus* L.	*Sus scrofa* L.	*Castor fiber* L.	*Lepus europaeus* Pal.
Os cornu	-	8	3	-	-	-
Cranium	-	-	-	1	-	-
Mandibula	-	-	-	1	-	-
Dentes	-	1	-	2	2	-
Vertebrae lumbales	1	-	-	-	-	1
Costae	1	-	-	-	-	1
Scapula	-	-	-	-	-	3
Humerus	-	-	-	3	-	1
Radius	-	1	-	-	-	1
Ulna	-	-	-	2	-	3
Carpalia	-	-	-	1	-	
Metacarpus	-	-	-	-	-	1
Femur	1	-	-	-	-	
Tibia	1	-	-	-	-	
Metatarsus	-	1	1	1	-	8
Metapodium	-	1	-	-	-	-
Phalanx I	-	1	-	-	-	-
Total	4	13	4	11	2	19

Table 9. Niedźwiedź, site 1. More and less valuable body parts of cattle based on the bone material

Anatomical part		n	%
Valuable parts of carcass	Trunk (neck, prime rib, brisket, flat rib, fore rib, rump cut)	407	28,0
	Proximal parts of fore limb (shoulder, fore shank)	192	13,2
	Proximal parts of rear limb (leg, hind shank)	202	13,9
	Total	801	55,1
Not very valuable parts of carcass	Head (brawn)	352	24,2
	Distal parts of fore limb (trotters/feet)	122	8,4
	Distal parts of rear limb (trotters/feet)	171	11,8
	Others (teil)	7	0,5
	Total	652	44,9
Total		1453	100

Table 10. Niedźwiedź, site 1. More and less valuable body parts of goats/sheep based on the bone material

Anatomical part		n	%
Valuable parts of carcass	Trunk (neck, prime rib, brisket, saddle)	128	25,8
	Proximal parts of fore limb (shoulder, fore shank)	74	14,9
	Proximal parts of rear limb (leg, hind shank)	57	11,5
	Total	259	52,2
Not very valuable parts of carcass	Head (brawn)	144	29,0
	Distal parts of fore limb (trotters/feet)	45	9,1
	Distal parts of rear limb (trotters/feet)	48	9,7
	Total	237	47,8
Total		496	100

Table 11. Niedźwiedź, site 1. More and less valuable body parts of pigs based on the bone material

Anatomical part		n	%
Valuable parts of carcass	Trunk (neck, loin, ribs, bacon)	74	17,3
	Proximal parts of fore limb (shoulder, fore shank)	58	13,6
	Proximal parts of rear limb (butt, leg, hind shank)	45	10,5
	Total	177	41,4
Not very valuable parts of carcass	Head (brawn)	195	45,6
	Distal parts of fore limb (trotters/feet)	22	5,1
	Distal parts of rear limb (trotters/feet)	34	7,9
	Total	251	58,6
Total		428	100

Table 12. Niedźwiedź, site 1. Measurements (mm) of cattle horncores. Measurements: 1 – horncore basal circumference, 2 – greatest diameter of the horncore base, 3 – least diameter of the horncore base, 4 – length of the outer curvature of the horncore, 5 – index, 6 – sex (fe. – female person, m. – male person, o. – ox), 7 – points

Measure-ments	Results									
1	138,5	144,0	144,5	149,0	(150,0)	154,0	154,0	159,0	161,0	165,0
2	48,5	50,0	53,0	53,0	53,0	52,5	56,0	56,0	54,0	56,6
3	39,5	41,0	38,5	40,0	(40,4)	44,0	40,5	42,5	44,5	45,0
4	(168,0)	235,0	-	200,0	(220,0)	-	246,0	-	-	-
5	81,4	82,0	70,0	75,5	76,4	83,8	72,0	75,9	82,4	79,6
6	fe.	fe.	fe.	fe.	fe.	fe.	fe.	fe.	fe.	m.
7	24	27	28	31	31	34	34	37	38	41

Measure-ments	Results									
1	169,0	170,0	173,0	184,0	195,5	201,5	223,0	230,0	232,0	(241,0)
2	60,5	61,0	61,0	65,0	70,5	75,5	77,0	80,0	81,0	82,0
3	44,0	45,5	48,0	51,0	52,5	52	60,0	62,0	62,0	65,0
4	-	-	-	-	300	-	-	292,0	-	-
5	72,7	74,6	78,7	78,4	74,5	68,9	77,9	77,5	76,5	79,3
6	fe.	fe.	fe.	fe.	fe.	fe.	o.	m.	o.	
7	43	44	46	52	60	63	77	81	82	88

Measure-ments	Results		
1	249,0	249,0	254,0
2	83,0	84,0	90,0
3	66,5	65,5	72,0
4	-	-	-
5	80,1	78,0	80,0
6	o.		o.
7	93	93	96

Table 13. Niedźwiedź, site 1. Measurements (mm) of cattle scapulae. Measurements: 1 – smallest length of the Collum scapulae, 2 – points

Measure-ments	Results								
1	43,5	48,0	50,0	52,5	53,0	58,0	62,0	65,0	67,5
2	44	52	60	66	67	80	90	97	104

Table 14. Niedźwiedź, site 1. Measurements (mm) of cattle humeri. Measurements: 1 – greatest breadth of the distal end, 2 – points

Measure-ments	Results									
1	75,0	78,5	79,0	84,0x2	85,0	87,0	88,0	90,5	93,0	94,0
2	50	57	58	68x2	70	74	76	81	86	88

Measure-ments	Results	
1	95,0	97,5
2	90	95

Table 15. Niedźwiedź, site 1. Measurements (mm) of cattle radii. Measurements: 1 – greatest breadth of the proximal end, 2 – greatest breadth of the distal end, 3 – points

Measure-ments	Results							
1	88,5	96,5	101,5	-	-	-	-	-
2	-	-	-	71,0	72,5	79,0	79,5	89,5
3	46	66	79	77	81	97	99	124

Table 16. Niedźwiedź, site 1. Measurements (mm) of cattle metacarpi. Measurements: 1 – greatest length, 2 – greatest breadth of the proximal end, 3 – smallest breadth of the diaphysis, 4 – greatest breadth of the distal end, 5 – diaphysis breadth index, 6 – sex (fe. – female person, m. – male person), 7– withers height (cm), 8 – points

Measure-ments	Results									
1	203,5	215,0	-	-	-	-	-	-	-	-
2	62,5	72,0	52,5x2	55,0	55,5	58,0	59,0	71,0	-	-
3	34,5	41,0	-	-	-	-	-	-	-	-
4	62,0	71,0	-	-	-	-	-	-	57x3	59,5
5	16,9	19,1	-	-	-	-	-	-	-	-
6	fe.	m.	-	-	-	-	-	-	-	-
7	122,7	136,1	-	-	-	-	-	-	-	-
8	67,61,62, 50,54	81,85,95, 72,77	36x2	42	44	50	52	82	37x3	44

Measure-ments	Results		
1	-	-	-
2	-	-	-
3	-	-	-
4	60,5	69,0	71x2
5	-	-	-
6	-	-	-
7	-	-	-
8	46	67	72x2

Table 17. Niedźwiedź, site 1. Measurements (mm) of cattle femurs. Measurements: 1 – greatest breadth of the distal end, 2 – points

Measurements	Results		
1	82,5	90,0	98,0
2	21	40	60

Table 18. Niedźwiedź, site 1. Measurements (mm) of cattle tibiae. Measurements: 1 – greatest breadth of the distal end, 2 – points

Measure-ments	Results										
1	59,0	59,5	60,0	61,0x2	63,5	64,5	65,0	68,0	69,5	72,0	72,5
2	38	39	40	42x2	47	49	50	56	59	64	65

Table 19. Niedźwiedź, site 1. Measurements (mm) of cattle tali. Measurements: 1 – greatest length, 2 – points

Measurements	Results										
1	57,0	63,0	63,5	64,0	66,0	66,5	67,0	68,0x2	68,5	69,0	70,0x2
2	27	42	44	45	50	51	52	55x2	56	57	60x2

Table 20. Niedźwiedź, site 1. Measurements (mm) of cattle calcanei. Measurements: 1 – greatest length, 2 – points

Measurements	Results					
1	125,0	128,0	131,0	132,5	134,0	147,5
2	62	70	77	81	85	119

Table 21. Niedźwiedź, site 1. Measurements (mm) of cattle metatarsi. Measurements: 1 – greatest breadth of the proximal end, 2 – points

Measurements	Results						
1	45,5	47,0	48,0	49,5	50,0	51,0x2	51,5
2	52	57	60	65	67	70x2	72

Table 22. Niedźwiedź, site 1. Measurements (mm) of cattle phalanges I. Measurements: 1 – greatest length of the peripheral half, 2 – points

Measurements	Results									
1	55,0x3	56,0x2	57,0x2	58,5	59,0	59,5x3	60,0x2	60,5	61,0x2	61,5
2	37x3	40x2	42x2	46	47	49x3	50x2	51	52x2	54

Measurements	Results										
1	62,0x2	63,0	63,5	64,0	64,5	65,0	65,5	66,0	67,0x2	68,5	69,5
2	55x2	57	59	60	61	62	64	65	67x2	71	74

Table 23. Niedźwiedź, site 1. Measurements (mm) of goats/sheep horncores. Measurements: 1 – horncore basal circumference, 2 – greatest diameter of the horncore base, 3 – least diameter of the horncore base, 4 – length of the outer curvature of the horncore, 5 – species, 6 – sex (fe. – female person, m. – male person, o. – ox)

Measurements	Results					
1	98,0	122,0	89,0	104,0	119,0	137,0
2	37,0	46,0	34,5	38,0	46,0	53,5
3	25,5	31,5	18,5	25,0	26,5	32,5
4	175,0	219,0	92,0	114,5	142,5	-
5	*Capra h.*	*Capra h.*	*Ovis a.*	*Ovis a.*	*Ovis a.*	*Ovis a.*
6	fe.	m.	fe.	fe.	fe.	o.

Table 24. Niedźwiedź, site 1. Measurements (mm) of sheep metacarpi. Measurements: 1 – greatest length, 2 – greatest breadth of the proximal end, 3 – smallest breadth of the diaphysis, 4 – greatest breadth of the distal end, 5 – withers height (cm)

Measurements	Results	
1	127,0	127,5
2	21,5	23,0
3	13,5	15,5
4	26,5	25,5
5	62,1	62,3

Table 25. Niedźwiedź, site 1. Measurements (mm) of sheep metatarsus. Measurements: 1 – greatest length, 2 – greatest breadth of the proximal end, 3 – smallest breadth of the diaphysis, 4 – greatest breadth of the distal end, 5 – withers height (cm)

Measurements	Results
1	130,0
2	20,0
3	11,5
4	24,0
5	59,0

Table 26. Niedźwiedź, site 1. Measurements (mm) of pig mandibles. Measurements: 1 – greatest diameter of the canine alveolus, 10 – sex (fe. – female person, m. – male person)

Measurements	Results			
1	12,0	19,5	20,0	23,0x2
2	fe.	m.	m.	m.

Table 27. Niedźwiedź, site 1. Measurements (mm) of pig scapulae. Measurements: 1 – smallest length of the Collum scapulae, 2 – points

Measurements	Results					
1	21,5	22,5	23,5	25,0	26,0x2	27,0
2	54	62	71	83	92x2	100

Table 28. Niedźwiedź, site 1. Measurements (mm) of pig humeri. Measurements: 1 – greatest breadth of the distal end, 2 – points

Measurements	Results						
1	39,0	40,0	40,5	41,0	41,5	43,0	44,5
2	69	75	78	81	84	94	103

Table 29. Niedźwiedź, site 1. Measurements (mm) of pig metacarpi. Measurements: 1 – greatest length, 2 – number of bone, 3 – withers height (cm), 4 – points

Measurements	Results	
1	73,0	74,5
2	III	IV
3	78,3	78,4
4	87	88

Table 30. Niedźwiedź, site 1. Measurements (mm) of pig tibiae. Measurements: 1 – greatest breadth of the distal end, 2 – points

Measurements	Results					
1	30,0x2	31,0x2	31,5	32,0	32,5	33,0x3
2	67x2	78x2	83	89	94	100x3

Table 31. Niedźwiedź, site 1. Measurements (mm) of pig tali. Measurements: 1 – greatest length, 2 – withers height (cm), 3 – points

Measurements	Results				
1	41,0	44,0x2	44,5	45,5	46,5
2	73,4	78,8x2	79,6	81,4	83,2
3	77,68	100x2,89x2	104,93	111,100	119,107

Table 32. Niedźwiedź, site 1. Measurements (mm) of pig calcaneus. Measurements: 1 – greatest length, 2 – withers height (cm), 3 – points

Measurements	Results
1	80
2	74,7
3	68,73

Table 33. Niedźwiedź, site 1. Measurements (mm) of pig metatarsus. Measurements: 1 – greatest length, 2 – number of bone, 3 – withers height (cm), 4 – points

Measurements	Results
1	92,5
2	IV
3	81,8
4	101

Table 34. Niedźwiedź, site 1. Measurements (mm) of dog tibia. Measurements: 1 – greatest length, 2 – greatest breadth of the proximal end, 3 – smallest breadth of the diaphysis, 4 – greatest breadth of the distal end, 5 – withers height (cm)

Measurements	Results
1	135,5
2	27,0
3	9,0
4	17,5
5	40,5

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UNIQUE STRUCTURE OF A MEGALITHIC TOMB OF THE FUNNEL BEAKER CULTURE FROM STRYCZOWICE, OSTROWIEC ŚWIĘTOKRZYSKI DISTRICT

ABSTRACT

Sałacińska B. and Sałaciński S. 2020. Unique structure of a megalithic tomb of the Funnel Beaker culture from Stryczowice, Ostrowiec Świętokrzyski district. *Sprawozdania Archeologiczne* 72/1, 259-276.

The cemetery of the Funnel Beaker culture at Stryczowice is situated in the Sandomierz Upland region. Three megalithic tombs and a flat cemetery were discovered and examined. The most well-preserved tomb is about 30 m long, and its plan has a trapezoidal shape. Its stone settings formed a kind of dry-stone wall – a phenomenon on a European scale. In the front part of this tomb, a central grave has been examined, consisting of two stone chests – one at ground level and the other built into the ground. In this second feature, fragments of a male skeleton were discovered. Around the central grave, six burials were uncovered. Each of the megalithic tombs were accompanied by a flat cemetery. Six graves and a stone pavement were excavated. The burial pits were constructed of low, stone chests. Some of the deceased were equipped with burial goods – collared flasks, a shaft-hole axe, retouched flint blades, and some hematite lumps.

Keywords: Neolithic, Funnel Beaker culture, megalithic tombs, grave constructions, Sandomierz Upland
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The purpose of the article is to present one of the investigated megalithic tombs at the site VII in Stryczowice (Ostrowiec Świętokrzyski district) – unique both within Poland and also on a European scale – as well as a description of its stone structure and the central grave within the chamber.

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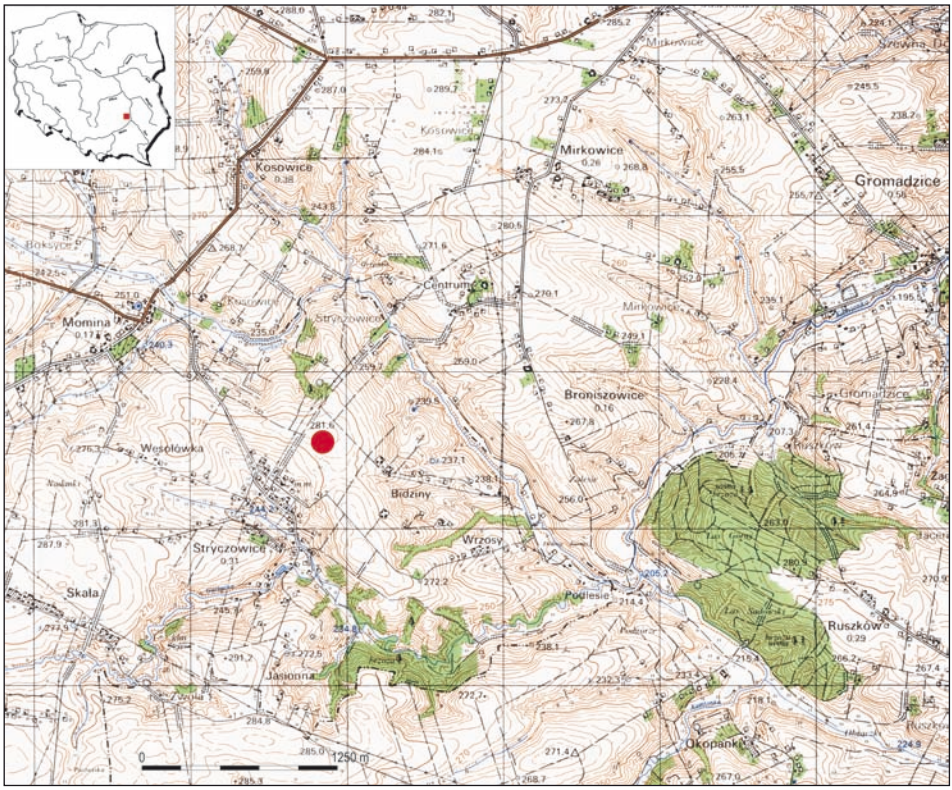

Fig. 1. Stryczowice, site VII, Ostrowiec Świętokrzyski district. Site location. Topographic map, map emblem Waśniów 144.41. Graphic design B. Sałacińska

The megalithic cemetery of the southeastern group of the Funnel Beaker culture (FBC) at Stryczowice is one of several objects of this type situated in the Sandomierz Upland region. The site is situated in the peak zone (Fig. 1) of a loess upland stretching between the valley of the Garbatka stream (in the south) and the Pokrzywianka stream (in the north-east), at a local, exposed culmination, on an elevation of 281.60 m. (50°52'22"N 21°17'33"). A picturesque landscape extends from the site, offering excellent conditions for an unobstructed 360-degree view, with a maximum visibility of up to 30 km in a straight line. In the south, the Jeleniowskie Mountain Range dominates, while the silhouette of Mount Łysa Góra in the Łysogóry Mountain Range attracts attention in the west. About 25 km to the north-west, the distant hills of the Sieradowickie Mountain Range, including Mount Sieradowska, can be observed. In the north-east, a forest appears, spreading out over the complex of prehistoric banded flint mines at Krzemionki Opatowskie, 18 km away. In the south-east, one can see the contour of the Sadowski Forest and the dip of the Opatówka

River valley. Other megalithic cemeteries of the FBC, situated at Broniszowice and Garbacz-Skała, are well visible from the site. Preliminary archaeoastronomical research related to the cultural landscape, spatial location and orientation of tombs, as well as the visibility between sepulchral sites and settlements in the microregion of Stryczowice, was conducted in the years 1997-1998 and 2000 by Stanisław Iwaniszewski (2000; 2006, fig. 1; 2016).

Excavations were conducted there by the authors of this article for six seasons between 1997 and 2004 (with interruptions, for a total of seven months). They were financed by the State Archaeological Museum in Warsaw and the Provincial Monument Conservator in Kielce. Help for the expedition was also provided by the authorities of the Waśniów commune. Approximately ten acres have been studied, revealing features of several cultures. Their results were partially published (Matraszek 2001; Matraszek and Sałaciński 2003; 2006).

Excavations were aimed at recognising the megalithic cemetery of the Funnel Beaker culture population. In the course of the excavations, features were explored related to the settlement of the communities of the Early Neolithic groups, as well as a culturally unidentified symbolic burial, a multiple burial (initially linked to the Trzciniec culture), and graves from an early medieval cemetery (initially dated to the XI-XII century, with traces of anti-vampire practices). During the archaeological work, a course of trenches from the Second World War was also noted (Fig. 2).

The cemetery of the FBC population consisted of three megalithic tombs and a flat cemetery. The tombs were oriented along a SE-NW axis, facing SE. The best preserved was megalithic tomb No. 1, which was situated between two other tombs – No. 2 and No. 3. It was partially destroyed by the construction of rifle-pits and today during fieldwork. Tombs Nos. 2 and 3 were recorded in fragmentary form only; they were heavily destroyed during construction of the symbolic grave in prehistory, and thereafter by graves from the early medieval burial ground, as well as by the extraction of stones disturbing the fieldwork.

Megalithic tomb No. 1 had a trapezoidal plan, but had been destroyed in its rear portion (Fig. 3). There was an antechamber in its front part. The length of the tomb was about 30 m, while the width of the inner front was 6.2 m, the width of the front of the antechamber – 5.2 m, the length of the antechamber – 1.5-2.2 m, and the width of the so-called "tail" part – 4.4 m.

The stone settings in tomb No. 1 were preserved to a height of about 60-80 cm. In the tail part they were the lowest as a result of the above-mentioned damage. They were made of stones selected on the basis of their size and shape, piled one on top of another, without mortar, forming a kind of "dry-stone wall" (Figs. 4, 5). In the best-preserved fragments, four layers of stone have survived, but of course, originally there were more. A portion of the stones forming the setting had slipped into the basin-like excavation pits (Matraszek and Sałaciński 2003; 2006, 236-238, Figs. 2-6). Stones vary in size, and can be divided into three categories based on size – large: up to 80-90 cm (50-90×34-40×19); medium:

Fig. 2. Stryczowice, site VII, Ostrowiec Świętokrzyski district. Combined features plan: a – Early Neolithic features; b – postholes; c – graves of the Funnel Beaker culture at the flat cemetery; d – graves of the Funnel Beaker culture in the megalithic tombs; e – grave of the Trzciniec culture; f – early medieval graves; g – grave number/skeleton number; h – tomb number/skeleton number.
Drawn by A. Potoczny, graphic design B. Sałacińska

Fig. 3. Stryczowice, site VII, Ostrowiec Świętokrzyski district. Megalithic tomb No. 1, exploration work carried out in the area of the so-called "tail". Photo B. Sałacińska

Fig. 4. Stryczowice, site VII, Ostrowiec Świętokrzyski district.
Fragment of the stone setting of tomb No. 1, stone row No. 1. Photo B. Sałacińska

Fig. 5. Stryczowice, site VII, Ostrowiec Świętokrzyski district. Exploration works in the front area of megalithic tomb No. 1 and the central grave (feature 38). View from SW. Photo. B. Sałacińska

Fig. 6. Stryczowice, site VII, Ostrowiec Świętokrzyski district. Exploratory works in the forehead area of megalithic tomb No. 1 and the central grave (feature 38). View from SE. Photo. B. Sałacińska

up to 50 cm (30-50×15-32×8-10); and small: up to 30 cm (10-30×10-16×6-10 cm). Mainly sandstones with a red, yellow, white, or sometimes an orange tint were used for construction of the stone structure of megalithic tomb No. 1. Rarely used were conglomerates, limestones and boulders of erratic origin such as granitoids, amphibolites, gneisses (Bąbel 2000; Wróblewski 2006). At the base of megalithic tomb No. 1, two stone settings were exposed, constituting two separate fronts (Fig. 6). The so-called outer front (outside of the structure) was separated from the inner one, dividing the central grave from the antechamber. The outer front structure consisted of end-jointed stones and large-sized stone slabs, which were probably originally placed vertically (Fig. 7). The inner face of tomb No. 1 was made of large sandstones set up vertically or overlapping. The preserved height of the stone setting of the inner tomb face reached 70 cm and consisted of five stone layers (Fig. 8).

Two trough-like excavations – were investigated between the three uncovered tombs, one on either side of tomb No. 1. The excavations measured from about 1 m to 2.3 m wide at the top, with a maximum depth of about 0.75 m to 1.1 m (Fig. 2). Their fills were stratified, showing evidence of bonfires in the frontal part of the tombs, as indicated by preserved clusters of charcoals and burnt layers of loess toward the bottoms of the pits.

During the archaeological excavations of megalithic tomb No. 1, a structure in the frontal part was unearthed, unique not only with respect to its stone settings, but also in terms

Fig. 7. Stryczowice, site VII, Ostrowiec Świętokrzyski district. The forehead area of megalithic tomb No. 1 with the central grave (feature 38). View from SE. Photo B. Sałacińska

Fig. 8. Stryczowice, site VII, Ostrowiec Świętokrzyski district. Internal face of megalithic tomb No. 1. View from SE. Photo. B. Sałacińska

of the central grave (feature No. 38). In the front part of this tomb, a central grave oriented on a SW-NE axis was examined. It had a double construction. It consisted of two stone cists; the first was laid on the original ground level, and the second was dug into the ground.

The cist founded on the original ground level was made of large sandstones, stacked on top of each other, overlapping, and covered with massive stone slabs. The outer dimensions of the cist were 1.45-1.75×2.6-2.9 m, and the interior dimensions were 0.9-1×2-2.2 m. Its preserved height reached up to about 60 cm. A stone pavement was uncovered at its base, below which another stone cist was discovered (Fig. 9).

The other cist, dug below the original surface level was built of flat sandstone slabs, less massive than those of the overground one. The internal dimensions of the cist were 0.9×2.1 m, with a height of about 30-40 cm (Fig. 10). It was only in such a cist that the deceased was buried, probably lying extended on his back, and oriented along a SW-NE axis, with the head to the SW (Fig. 11). Unfortunately, the skeleton preserved only in the form of fragments of the lower limb bones and some bones of a very massive cranium – of a male, *adultus* or *maturus* (Wróbel 2006). Unfortunately, the burial was devoid of grave equipment.

In our opinion, the double structure of the central grave cist combines two construction systems: a low cist made of stone slabs covered with stone pavement, which reflects the ideas visible in the flat cemetery and a cist of massive stacked stones, which repeats the construction of the stone settings of the megalithic tomb.

Fig. 9. Stryczowice, site VII, Ostrowiec Świętokrzyski district. Central grave (feature 38) – stone structure of the ground-based cist. Photo B. Sałacińska

Fig. 10. Stryczowice, site VII, Ostrowiec Świętokrzyski district. Central grave (feature 38) – ceiling of the cist dug into the ground. Photo B. Sałacińska

Toward the front of the megalithic tomb, 6 burials were discovered, located around the central grave (Fig. 2). There were two single burials – skeleton 5 male? aged 20-X and skeleton 2 woman, aged 20-30 years, as well as two double burials – children's skeleton 9 (aged 4±1 years) and skeleton 10 (aged 7±1 years), and the other with two adults, *matures* (skeletons 18 and 19). One individual burial (skeleton 22, adult) was also found located in the antechamber (Wróbel 2000; 2006). Two of the above described skeletons were destroyed during the digging of trenches during World War II. The dead were deposited inside the grave barrow. They were in an extended position laid on the ground. There were no traces of burial pits; only the double burial of children had a kind of "setting?" of two stones (granitoids; Matraszek and Sałaciński 2006, 238-241, fig. 7). In the double burials, the dead were laid oriented in opposite directions along the axis. These burials, like those in the central grave, were devoid of grave goods.

The orientation of burials corresponds to the orientation of the tomb, *i.e.* on a SE-NW axis. The woman was laid with her head towards the SE, facing SW; the man, whose skull did not preserve, was laid with his head to the NW; the children were laid alternately – one with its head to the SE, the second to the NW. On the other hand, the burials deposited between the central grave and the tomb face, as well as the one in the antechamber were oriented on a SW-NE axis. In the double burial of adults and the single burial in the ante-

Fig. 11. Stryczowice, site VII, Ostrowiec Świętokrzyski district.
Central grave (feature 38) – a burial deposited into the in-ground cist. Photo B. Sałacińska

chamber (both burials destroyed by a rifle-pit) the dead were buried according to the orientation of the central grave, perpendicular to the stone settings of the tomb (Fig. 2).

The dead who were buried around the central grave were probably placed in the megalithic tomb at different times or in different seasons, as the skeletons were uncovered at different heights in relation to the original surface level. The double burial of children, as well as the burials of the adult woman and the adult man, were found at the height of the original level of the earth. The double burial of adults was located at the same height as the top of the ground-based cist from the central grave, in a cultural layer associated with the use of the tomb, including evidence of ceremonies related to the worship of the dead. In this layer a few charred human and animal bones were found, probably related to leftovers from funeral meals or other rituals.

The megalithic tombs were accompanied by a flat cemetery located to the SW (Fig. 2). On the burial ground, seven features (including 6 graves, and one stone pavement lacking a burial pit, burial goods and a skeleton) were uncovered. The graves were oriented along a N-S axis (grave No. 5 – male?, *maturus*/*senilis* or *senilis*; grave No. 6 – male?, *adultus*/*maturus*, pavement No. 8) and a W-E axis (grave No. 7A – adult *maturus I*; 7B – male, *maturus II*; 9 – female?, *maturus II*; 21 – adult, *senilis*; Matraszek and Sałaciński 2003; 2006, fig. 8). The burial pits each had a length of about 2 m, and a width of about 90 cm. The construction of the burial pits consisted of a low cist made of flat stone slabs (mainly sandstones, sometimes limestones). They were covered with a compact, multi-layered stone pavement with a thickness up to about 50 cm (Figs. 12, 13).

Some of the dead buried in the flat cemetery were equipped with collared flasks and flint tools (mostly retouched blades) of local Świeciechów flint as well as imported Volhynian flint. Grave No. 5 was the richest grave in terms of discovered grave goods. At the head of the deceased, a shaft hole axe with a knob-like poll was found, and on the left side at the height of the forearm (the hand was not preserved), lay flint tools (a retouched blade, a sickle inset of Volhynian flint and a flake of Volhynian flint). At the left hip (pelvis) a four-legged collared flask was placed, while by the right leg (at the height of the femur), a quartzite object (probably a quartz fire-starter) was found (Fig. 14). However, in grave No. 21 – the most destroyed feature in the flat cemetery – a collared flask and a retouched blade of Volhynian flint (Fig. 15) were found, laid probably next to the head of the deceased (only a few fragments of the skull have survived). Moreover, in grave No. 7A, a large number of hematite lumps (about 1 kg) were found laid down intentionally, and arranged above the head of the deceased (B. Matraszek, S. Sałaciński 2003; 2006, 241-243, Figs. 10-13). A similar type of grave good is known, for example, from the investigations of the megalithic tomb in Miłocin-Kolonia (now Kolonia Miłocin), Lublin district. In the bottom part of the burial pit there, fragments of a collared flask, a retouched blade and lumps of ochre were found (Gurba 1976, 39). According to Jacek Woźny, ochre in Neolithic graves is one manifestation of the ritual expression of the idea of the rebirth of the dead (2011, 66). The magic and symbolic significance is attributed to the dye. Ochre of a red tint could symbolise

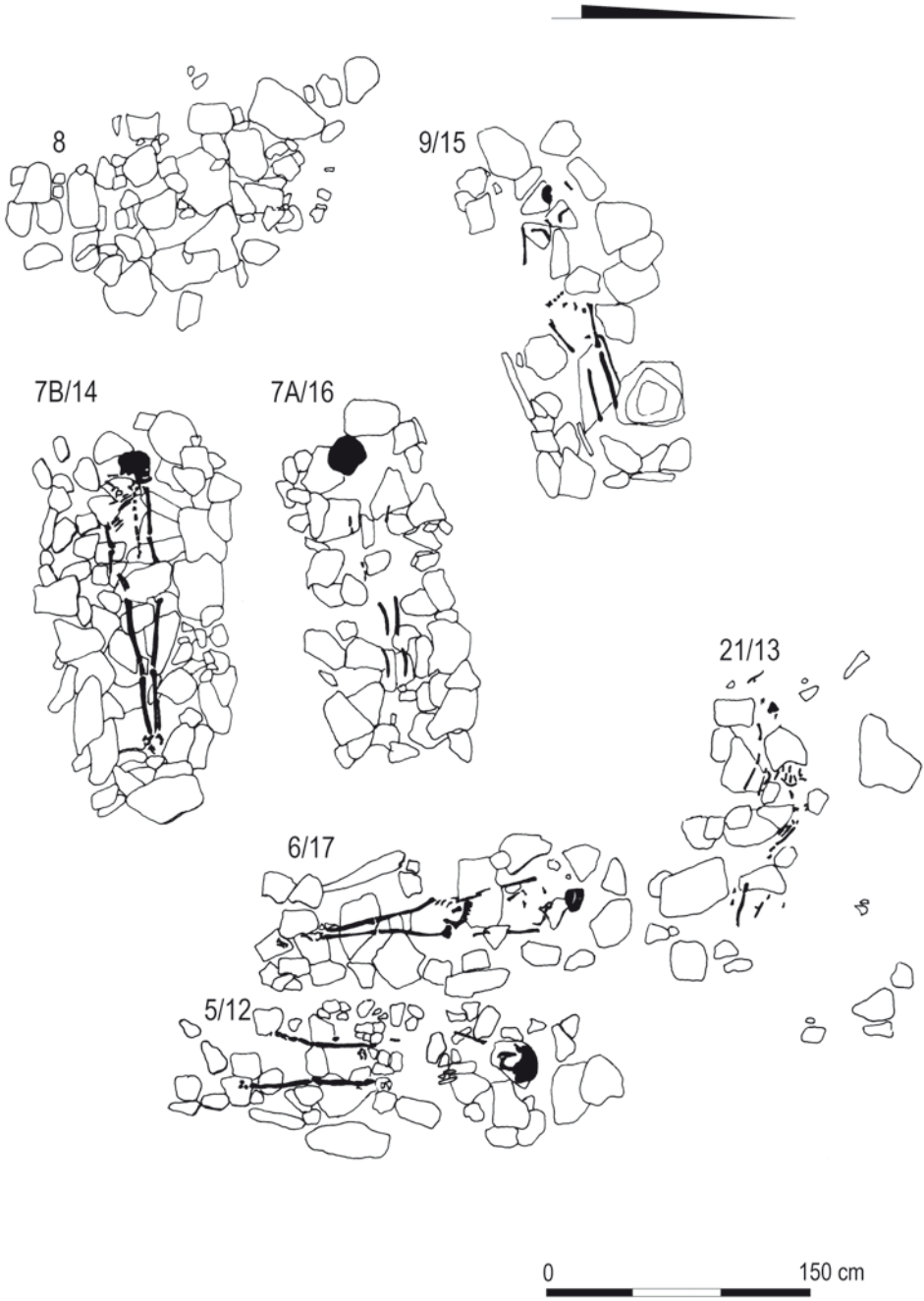

Fig. 12. Stryczowice, site VII, Ostrowiec Świętokrzyski district. Plan of the flat cemetery. Drawn by A. Potoczny, graphic design B. Sałacińska

blood, and thus life. Perhaps it was a sign connecting life with death (Kozak-Zychman 2014, 67).

Another important component of the megalithic cemetery in Stryczowice is the region in which the raw stone material used for the construction of the tombs and box graves was probably stored, selected and pre-worked. This place was located to the east of the flat FBC cemetery (features 24, 26). Unearthed there were raw stone materials of different sizes, probably deposited on the original ground level, as no traces of digging or of structures were found during excavations (Fig. 2).

The megalithic features studied in Stryczowice shall be classified as Group B of the general architectural taxonomy (as determined by Seweryn Rzepecki) of tombs equipped with a stone setting, dating back to 4,200-2,900 BC (2011a, 169; 2011b, 218).

The megalithic cemetery of the southeastern FBC group in Stryczowice is one of several objects of this type located in the Sandomierz Upland. Few sites have been recognised through open-area excavations, revealing the studied megalithic cemeteries to a significant extent, including Malice Kościelne, site 1, Opatów district (Bargieł and Florek 2006a), and Pawłów, site 3, Sandomierz district (Bargieł and Florek 2006b). Some were recognised in a limited area, *e.g.* Broniszowice, site V, Ostrowiec Świętokrzyski district (Bąbel 2006), Czyżów Szlachecki, site 13, Sandomierz district (Florek 2008, 101), Święcica, barrow I, Sandomierz district (Szeliga and Florek 2007, 41, 43, fig. 5; Florek 2008, 101), and Złota, site 6, Sandomierz district (Florek 2008, 101).

Fig. 13. Stryczowice, site VII, Ostrowiec Świętokrzyski district. Flat cemetery. Photo S. Sałaciński

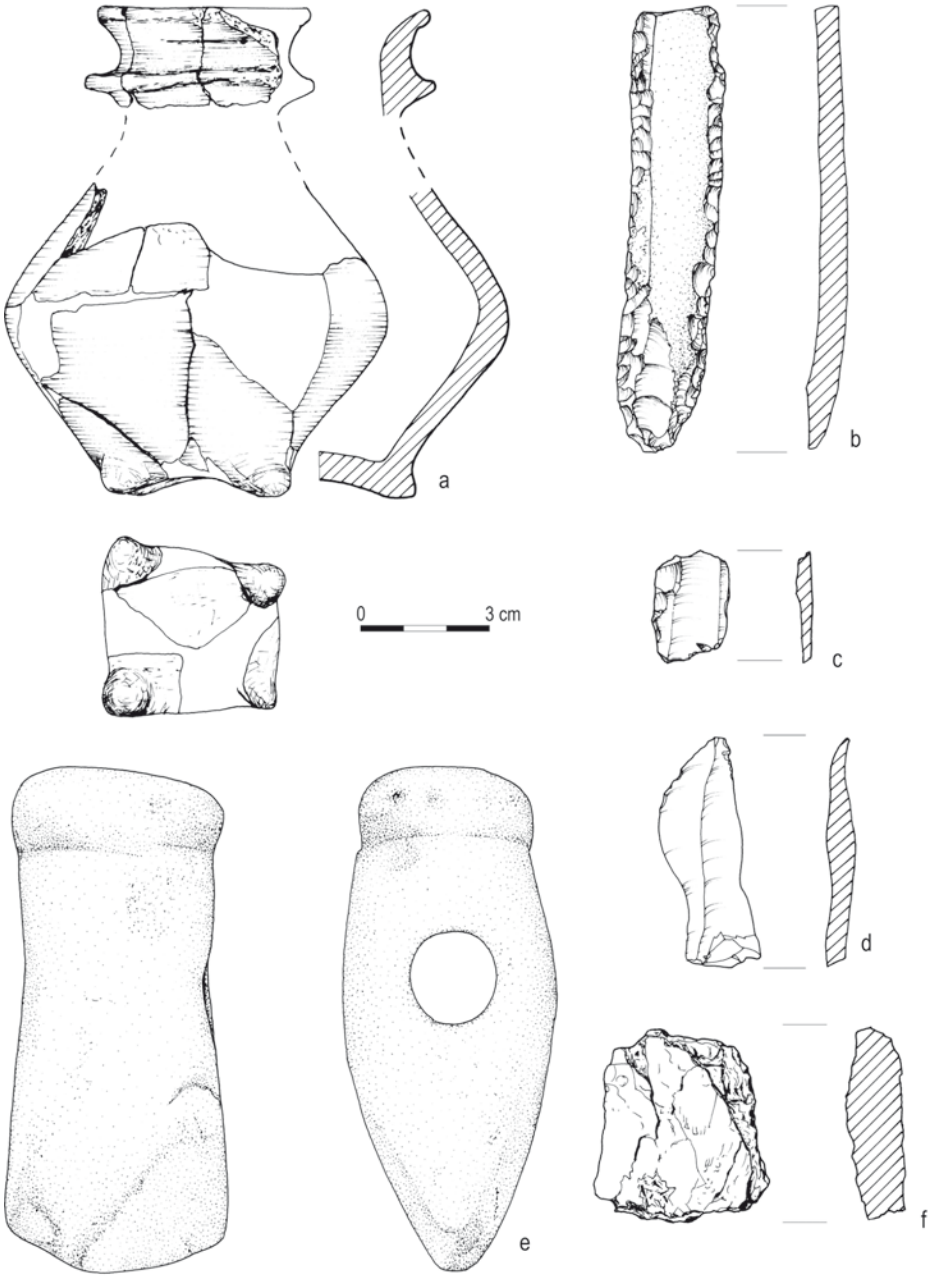

Fig. 14. Stryczowice, site VII, Ostrowiec Świętokrzyski district. Burial goods from grave No. 5.
a – collared flask; b – retouched blade of Świeciechów flint; c – sickle inset of Volhynian flint; d – flake of Volhynian flint; e – shaft-hole axe with a knob-like poll; f – quartz fire-starter.
Drawn by G. Nowakowska (a), B. Karch (b-f), graphic design B. Sałacińska

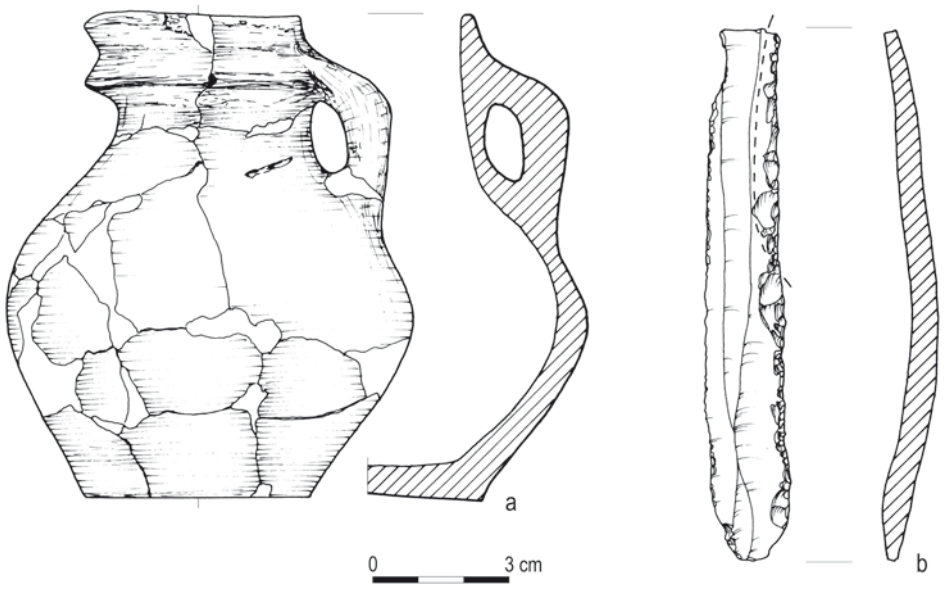

Fig. 15. Stryczowice, site VII, Ostrowiec Świętokrzyski district. Burial goods from grave No. 21.
a – collared flask; b – retouched blade of Volhynian flint.
Drawn by G. Nowakowska (a), B. Karch (b), graphic design B. Sałacińska

The examined FBC megalithic tombs on the Sandomierz Upland show considerable diversity with regard to their structure outlines at the exposed level, their construction and the materials used, and burial forms (Florek 2008, Tab. 1, Fig 1). Stone and earth structures are known, including Malice Kościelne, site 1 (Bargieł and Florek 2006a), as well as structures of stone, earth, and wood, including Broniszowice, site V (Bąbel 2006), and Pawłów, site 3 (Bargieł and Florek 2006b). It is difficult to express an unequivocal opinion about the type of construction of tombs in partially excavated cemeteries, on which fragments of stone structures have been documented and examined, including Czyżów Szlachecki, site 13, Sandomierz district (Florek 2008, 101), Złota, site 6, Sandomierz district (Florek 2008, 101), and Święcica, barrow I, Sandomierz district (Szeliga and Florek 2007, 41, 43, fig. 5; Florek 2008, 101).

Judging by the megalithic cemeteries that have thus far been located, the population of the southeastern FBC community chose elevated places on the upper parts of valley slopes (*e.g.* Czyżów Szlachecki, site. 13, and Malice Kościelne, site 1), or at the local culminations of the high plain (*e.g.* Pawłów, site 3, and Stryczowice, site VII). Very often, a place was chosen, the terrain of which had already been previously occupied by Neolithic settlement (Florek 2008, 103). The well-situated locations of the FBC megalithic cemeteries were later eagerly chosen and used for sepulchral purposes. There, the communities of the

Corded Ware culture, the Mierzanowice culture (Malice Kościelne, site 1), the Trzciniec culture (Stryczowice, site VII), and – in the case of the cemetery at Stryczowice – communities of the early Middle Ages, deposited their deceased. The attractiveness of these places in terms of sepulchral usefulness contributed to the destruction of megalithic structures already in prehistory. Further destruction was brought by World War II and modern agriculture, as well as the erosion of loess slopes. Unfortunately, all the megalithic structures so far discovered on cemeteries in the southeastern group of the Funnel Beaker culture on the Sandomierz Upland have been largely destroyed.

The structure of the stone setting of megalithic tomb No. 1, and above all its state of preservation, is unique and, so far, there is no analogy on the Sandomierz Upland. However, it could be an example of what such structures may have looked like at other sites, where megalithic tombs were preserved only in the form of closely matched stones (arranged on the surface or slightly dug into the ground) marking their outline, including Malice Kościelne , site 1 (Bargieł and Florek 2006a, 365, Figs. 3, 4, 7-9) and Pawłów, site 3 (Bargieł and Florek 2006b, 387, Fig. 2).

A similar structure of stone settings as in the case of the megalithic tomb I, although less well preserved than the tomb from Stryczowice, was found at site 1 in Grzybów, Staszów district, located in the eastern part of the Nida Basin, in the area adjacent to the Sandomierz Upland. The tomb was built of sandstone blocks arranged vertically and covered from above with smaller stones (sandstones). The largest blocks were found in the frontal part of the tomb (Garbacz 2006, 309-310, Figs. 3, 4-6).

The intention of our article was to present the most important aspects related to the stone structures of megalithic tomb No. 1 and the central grave (feature No. 38) from Stryczowice. The researched stone structures comprise one of the best preserved megalithic tombs on the Sandomierz Upland.

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RETURN TO KSIĄŻNICE WIELKIE NEAR KRAKÓW

ABSTRACT

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In 1964, Barbara Burchard and Anna Eker published a study of the Funnel Beaker culture materials from Książnice Wielkie, Proszowice district. These materials were obtained by Józef Żurowski, who conducted large rescue excavations in 1921-1924. He has never published the results of research, and the study by B. Burchard and A. Eker is so far the only comprehensive one of the Funnel Beaker culture settlement there. Since then, this site has not been the subject of detailed research and analysis. The huge, as yet untapped, research potential of this site has become the reason for a scientific return to Książnice Wielkie. After almost 100 years since J. Żurowski's fieldwork, the Archaeological Museum in Kraków resumed research. In 2017, magnetic prospecting was carried out, and since 2018, rescue excavations have been directed. Stone artefacts are also being studied, and radiocarbon analyses of materials obtained in the 1920s are being conducted.

Keywords: Funnel Beaker culture, Funnel Beaker-Baden assemblages, Lublin-Volhynian culture, Corded Ware culture, Globular Amphora culture

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INTRODUCTION

The site in Książnice Wielkie, near Kraków, is known to all Neolithic researchers of southeastern Poland. The history of its discovery, excavation research and material development is over a hundred years old. Although it has been known since the interwar period, we owe the introduction of Książnice Wielkie to scientific circles to Barbara Burchard, Anna Eker and Jan Machnik, who in 1964 developed and published materials from Józef Żurowski's former research (Burchard and Eker 1964; Machnik 1964). The site was discovered accidentally during World War I while digging trenches in the vicinity of the local cemetery. We owe information about archaeological features destroyed at the time and collected artefacts to priest J. Later - parson of the parish in Książnice Wielkie. A few years after the war, he described the finds of J. Żurowski, from the Archaeological Museum of the Polish Academy of Arts and Sciences in Kraków, who in 1921-1924 carried out large excavations. In an area of approximately 20 ares, he discovered about 70 Neolithic features

Fig. 1. Książnice Wielkie, site 1, Proszowice district. Location of the site (illustration by A. Zastawny)

Fig. 2. Książnice Wielkie, site 1, Proszowice district. A – location of the site against the background of the Szreniawa Valley and slopes of the loess upland (view from southeast), B – view from the west of the site and contemporary cemetery (photo by A. Zastawny)

(Burchard and Eker 1964), forming the Funnel Beaker culture settlement (FBC) and the Corded Ware culture (CWC) cemetery. Materials from these studies are still stored in the collections of the Archaeological Museum in Kraków.

Since the publication of the FBC and CWC materials in the 1960s, this site has not been subject to more detailed material analysis. Its enormous, untapped research potential has become the reason for scientific return to Książnice Wielkie. Many issues still need to be re-examined (stylistics and relative chronology of the FBC pottery), and some completely new research (*e.g*. absolute chronology) is being conducted. In 2017, together with the Institute of Archaeology of Jagiellonian University, the Archaeological Museum in Kraków began work on the publication of research materials from 1921-1924. Analyses of selected pottery and flint assemblages, as well as analyses of archival documentation were carried out to reconstruct the layout of settlement pits and graves, as well as to develop an absolute chronology of Neolithic settlement. In order to verify the results of analyses on "old" materials, field research was also resumed. In 2017, magnetic prospection was carried out at the site, and since 2018 rescue excavations are being carried out (Brzeska-Pasek and Zastawny 2018; Brzeska-Zastawna and Zastawny 2019). As a result, a further part of the Funnel Beaker-Baden (FB-B) settlement and CWC cemetery were discovered, whose research began with J. Żurowski 99 years ago.

Książnice Wielkie is located 45 km east of Kraków, on the southern edge of the Lesser Poland Upland (Fig. 1). It is located on the right bank of the Szreniawa River (Fig. 2: A), not far from its mouth to the Vistula. The archaeological site is located on a hill in the central part of the village, near the parish church and cemetery. The contemporary cemetery is entirely located within the range of the site. The hill, covered with a thick layer of loess, slopes northwards towards the Szreniawa floodplain. From the east and west, they are limited by small side valleys, which are crossed by ravines (Fig. 2: B). In documentation of the *Polish Archaeological Record*, the site is marked with No. 1 (AZP 100-62/88). Administratively, Książnice Wielkie belongs to the commune of Koszyce, Proszowice district, and to the Lesser Poland Voivodeship.

J. ŻUROWSKI'S EXCAVATIONS IN THE YEARS 1921-1924

In 1920, Józef Żurowski (Fig. 3), as an employee of the Archaeological Museum of the Polish Academy of Arts and Sciences, was appointed as the Conservator of Prehistoric Monuments in Western Lesser Poland (Jakimowicz 1936). This position was directly subordinate to the Ministry of Religious Denominations and Public Enlightenment in Warsaw. One of the first tasks of J. Żurowski was to review demesnes that were subject to parceling, as well as to collect data to protect archaeological sites (Tyniec 2015). On this occasion, he visited many sites located on the lower Szreniawa, including Jaksice, Majkowice, Witów, Sokołowice. In 1921, he came to Książnice Wielkie, where he was informed

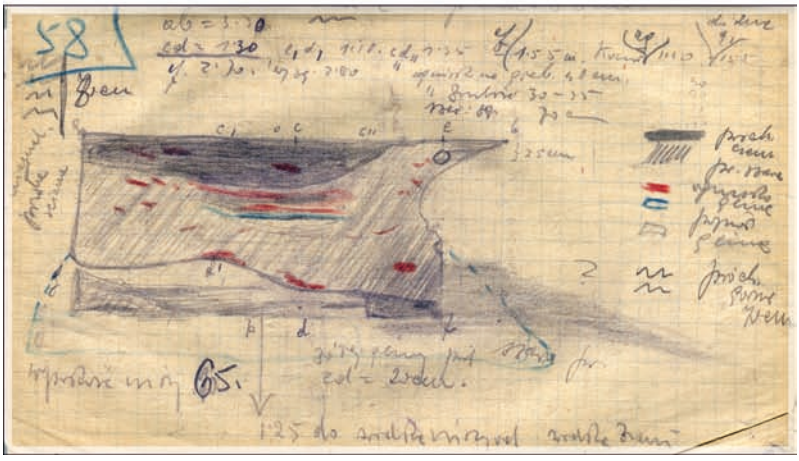

Fig. 3. Józef Żurowski (1892-1936) – researcher of the site in Książnice Wielkie in 1921-1924. Below: sketch from the field notebook of J. Żurowski from 1924 with documentation of a vertical section of FBC pit No. 58 (Archives of the Archaeological Museum in Kraków)

by the parish priest, J. Later, about archaeological findings discovered during World War I in the area of the local cemetery. Then, as a gift to the Archaeological Museum, J. Żurowski was given a fully preserved CWC clay amphora, removed from a grave destroyed by war trenches in 1914 (Żurowski 1921, Fig. 11). In addition to the amphora, he also received other artefacts: spindle whorls, fragments of vessels, shells and flint products. He collected some of them himself by visiting a place he was shown in the field behind the cemetery (Żurowski 1921).

It is unclear whether excavations were started in 1921. J. Żurowski's information on this subject does not coincide with this date. In the field notebook of excavations in Książnice Wielkie, we find a record about "preliminary research" in 1921. Although he confirms this by stating that he conducted research between 1921-24 (*e.g.* Zabłocki and Żurowski 1934), in several publications he writes about the beginning of excavations in 1922 (Żurowski 1921; 1923a; 1923b). Archival documentation also points to 1922. Therefore, it should be recognized that systematic excavations were started in 1922, *i.e.* a year after the first visit of J. Żurowski to Książnice Wielkie. However, the first visit to the site, when he collected artefacts from the fields and obtained materials donated to the Archaeological Museum in Kraków (discovered during World War I), must be associated with 1921.

Based on published research reports and archival documentation, it can be assumed that the total area of the terrain surveyed in 1922-1924 was about 20 ares (Żurowski 1923a; 1925; 1929). The first trench encompassed the place from which the artefacts from the FBC settlement pit and the CWC grave came, destroyed by the trench in 1914. Traces of the buried military ditches were still visible at the beginning of excavations (Żurowski 1923b). In 1922, 26 FBC settlement pits and 6 CWC burials (including 5 niche graves), destroyed older pits and 1 destroyed grave – covering a total area of approx. 800 m^2 – were discovered just below the surface (Żurowski 1923a). In 1923, the research covered an area of approximately 625 m^2. A further part of the FBC settlement was discovered, revealing about 40 features (Żurowski 1925). In the third and last season of excavations in 1924, J. Żurowski examined an area of approximately 700 m^2 and explored 36 features (data from archival documentation), including another 6 graves of the CWC (Żurowski 1925). In the same season, he also discovered an Early Medieval skeletal cemetery with 21 graves arranged in rows (Żurowski 1926). After completing the research, Żurowski wrote that the total number of features discovered "reaches hundreds" (Żurowski 1925). The archival documentation contains information about features with numbers from 1 to 66. Many of these pits, however, were complexes of 2-3 features, and most of the CWC graves were discovered during the exploration of other pits. Taking this into account, and using field documentation and publications, it is possible to estimate the number of Neolithic settlement pits at approx. 90, CWC graves at 12 (or 14), and Early Medieval graves at 21. In total, this gives us over 120 archaeological features of various typologies, chronologies and cultural affiliations.

It is worth emphasizing that the excavations of J. Żurowski were of a rescue nature, and were carried out in the area of fields purchased by the parish in Książnice Wielkie in order to enlarge the cemetery. This is confirmed by information from Żurowski, who reports that even before the end of the investigations, the deceased began to be buried in the area already excavated. The author of the study also reports accidental discoveries while digging modern graves in the cemetery, and indicates that the area occupied by the settlement is much larger than that identified during excavations (Żurowski 1923a; 1925).

From the research of J. Żurowski, quite extensive archival documentation has been preserved, stored together with materials from excavations at the Archaeological Museum in Kraków. It consists of a field notebook and its "official" version, rewritten and divided into three parts, corresponding to the individual seasons in 1922, 1923 and 1924 (incomplete season 1924). Descriptions and sketches of the features (Fig. 3) are supplemented by approximately 40 photographs of selected artefacts (mainly whole vessels), along with photographic records of the exploration, taken during the excavations (Fig. 4). A large part of the materials are original drawings of artefacts and pits used in scientific publications. Also, tabular lists of features and artefacts discovered therein have been preserved (for 1922 and 1923), as well as inventories of artefacts, which were divided into individual types (for 1922). The remaining part of the documentation is drafts of articles and reports, as well as public appearances and official and private correspondence regarding the excavations in Książnice Wielkie. It is important to emphasize the diligence and detail of the author's field observations. An undoubted drawback of the documentation in question is the nature of J. Żurowski's handwriting, which makes it impossible to reproduce much of the information. The Archives of the Archaeological Museum in Kraków also contain a personal folder of J. Żurowski, in which one can find, among other things, his correspondence with parish priest J. Later.

J. Żurowski regularly described the results of the research in Książnice Wielkie in reports published mainly in "Wiadomości Archeologiczne" (Żurowski 1921; 1923; 1925; 1929). In addition to basic information, he extensively discussed problems related to the interpretation of his discoveries. He devoted most attention to the CWC niche graves and their relationship to the older FBC settlement pits in which they were discovered. He figured that the graves and settlement pits were homogeneous, had a uniform construction (graves in living quarters) and belonged to the same culture (population). He described the pottery decorated with cord impressions as reserved for funerary purposes, while the vessels with FBC and Baden features (*i.e.* according to Żurowski's "Nordic" and "radial" ones) corresponded to the remains of dwelling pits. The combination of various elements in the ornamentation of pottery and the discovery of "grave-dwelling" features was considered unique, and were the inspiration for the proper name of this type of construction: "Książnice type of home graves" (Żurowski 1925). The author of the research in Książnice Wielkie never summed up his views. As has been said many times, he also did not publish materials from excavations. The exceptions are two pits (No. 41 and 43), in which J. Żurowski

Fig. 4. Książnice Wielkie, site 1, Proszowice district. Archival photographs from the investigations in 1924: A – „cross" exploration of settlement pit No. 48 with the FB-B materials, B – level of discovery of burials in the CWC niche graves (46/7, 46/8, 46/9), dug into the fill of FBC pit No. 46 (photo from the Archives of the Archaeological Museum in Kraków)

discovered rich and interesting paleobotanical materials. They became the basis for a very detailed study (in terms of the archaeology), with extensive descriptions and illustrations of finds (Zabłocki and Żurowski 1934). This article provides a glimpse of a publication that was never created, with the results of research in Książnice Wielkie. Much information about excavations can also be found in J. Żurowski's popular science articles, which he willingly prepared, *e.g*. for the regional press (Żurowski 1923b).

Simultaneously with the work on pottery, J. Żurowski strove to study other finds. As mentioned above, J. Zabłocki from Jagiellonian University donated paleobotanical materials, which they published together (Zabłocki and Żurowski 1934). He also conducted studies on animal bones, in which he involved specialists from the Polish Academy of Arts and Sciences and Jagiellonian Univeristy. He was particularly interested in anthropological materials. In 1926, he lent human skeletal remains from 20 graves of the CWC and Early Medieval cemeteries to researcher J. Talko-Hryncewicz from the Jagiellonian University for analysis. Żurowski asked S. Krukowski from Warsaw for an opinion on selected flint artefacts. The results of anthropological, flint and archaeological research did not become the subject of separate articles, but Żurowski used these results in articles discussing his excavations.

The excavations in Książnice Wielkie were the first major fieldworks for J. Żurowski. Three full research seasons were not only a scientific and interpretative challenge, but also organizational and technical (Jakimowicz 1936). It can be mentioned here that in each season of research, J. Żurowski changed and corrected the numbering of the explored pits. Today, this makes it difficult to locate some assemblages of artefacts and to reconstruct the pit arrangement.

At the same time, when he was conducting research in Książnice Wielkie, he organized and conducted other excavations (*e.g*. Jaksice, Witkowice, Giebułtów, Modlnica), conducted an inventory of caves near Kraków, served in the Polish army and defended his doctoral thesis at Jagiellonian University. He took full advantage of the experience he gained in his important subsequent archaeological research in Modlnica near Kraków, and then in Złota near Sandomierz.

STUDIES BY B. BURCHARD, A. EKER AND J. MACHNIK

J. Żurowski did not manage to analyze materials obtained by donation and through excavations in Książnice Wielkie in 1921-1924. That task was assigned to the next generation of Kraków archaeologists. Work on the settlement of the FBC was entrusted to Barbara Burchard and Anna Eker (Fig. 5), while Jan Machnik took over research on the CWC cemetery (Burchard and Eker 1964; Machnik 1964). A third author, Anna Dzieduszycka-Machnikowa, took part in the studies concerning the materials from the FBC settlement, whose analysis of stone products were published as a separate chapter (Burchard and Eker

Fig. 5. Barbara Burchard (1930-2016) and Anna Eker (1920-2001). The Authors of the study of the Funnel Beaker culture materials from J. Żurowski's research in Książnice Wielkie (photo from the Archives of the Institute of Archeology and Ethnology of the Polish Academy of Sciences in Kraków)

1964, 276-282). An independent analysis of animal bone remains was carried out by L. Sych and published in volume 4 of the "Prace Komisji Archeologicznej PAN" edited by S. Nosek – the same volume in which the previously mentioned articles were printed (Sych 1964).

The study of the FBC settlement, which was conducted in the first half of the 1960s, has become partially outdated, especially in relation to taxonomic and chronological issues (Burchard and Eker 1964). At the same time, it is still a high-quality source of information on numerous archeological materials. The authors of the study presented meticulously, and in detail, the characteristics of pit inventories. In particular, the descriptions of the features, based on the original archival documentation of J. Żurowski (which was extremely difficult to read) were irreplaceable contributions. B. Burchard and A. Eker described and discussed the FBC materials from 66 settlement pits and 2 trenches from World War I, along with material from the secondary deposit. Several of these pits (features no. 4, 5, 6, 46, 47), in which the graves of the CWC found, were described in less detail by J. Machnik (Machnik 1964). Pottery, bone and stone artifacts are presented in 36 tables and grouped according to the categories and types of artefacts (including forms and types of decorations on pottery).

These tables fail to present assemblages divided into individual features, making them more difficult to use. In the case of only a small part of the features, the authors presented

drawings of horizontal and vertical cross-sections of the pits (incomplete documentation). Due to incomplete documentation, a large number of features in catalog Nos. 48-66 also do not have descriptive characteristics. However, we can now fill this gap. Descriptions and drawings of most of the above-mentioned features have been preserved in the draft of J. Żurowski's field notebook. Perhaps the authors did not have access to it. The biggest drawback to the presentation of research on the FBC settlement, as well as the CWC cemetery, however, is the lack of plans showing the locations of the features, resulting from the poor condition of archival documentation (Burchard and Eker 1964, 192; Machnik 1964, 339). The description of the CWC cemetery included all grave complexes from J. Żurowski's research, as well as stray finds and information about destroyed graves (Machnik 1964). Twelve CWC graves were described and discussed in detail, including 7 niche graves discovered in 1922 and 1924, as well as stray vessels (cups and amphora) discovered in two further damaged graves (Machnik 1964, 339).

In the publications discussed, the question of the relation of the CWC graves to the FBC settlement pits remained basically open. The authors of the FBC settlement study excluded such features from their study, considering them to be related to the CWC (Burchard and Eker 1964, 192). As mentioned earlier, J. Żurowski interpreted FBC and CWC graves buried in them as contemporaneous (settlement pits with graves). J. Machnik disagreed with this opinion, considering the CWC graves younger, constructed immediately after the disappearance of the FBC settlement, and even partly during its existence (Machnik 1964, 364). The surprising convergence of the location of the CWC graves in FBC pits was problematic here.

The introduction of sources and interpretations of the FBC and CWC finds from Książnice Wielkie into scientific circulation was of great importance for past and present attempts to explain cultural changes in Lesser Poland in the late Neolithic. Despite the difficulties in assessing some assemblages (suspected of post-excavation mixing of materials), J.K. Kozłowski distinguished the syncretic cultural group Wyciąże-Książnice – which was to be the oldest phase of Baden culture in Lesser Poland (Kozłowski 1961, 1971) – based on materials from Książnice Wielkie. In opposition to this view, B. Burchard interpreted the elements of the Baden circle as part of the stylistic features typical of the late FBC phase (Burchard and Eker 1964; Burchard 1981). M. Godłowska also accepted this view (Godłowska 1981). Further discussion on this topic led to the attachment of an ever-greater significance to the FBC "Badenization process" and, as a result, to the separation of independent FB-B assamblages, in which Ksiażnice Wielkie held an important place (Kruk *et al.* 1996; Burchard 1997; Kruk and Milisauskas 2018). Grave finds from Książnice Wielkie have also become the basis for the definition, by J. Machnik, of the so-called Książnice Wielkie type (vessels of the Książnice Wielkie type) of CWC as the oldest (transitional) stage of development of the Kraków-Sandomierz group of this culture, with references to the FBC (Machnik 1964; 1966).

FIELD SURVEY AND TEST EXCAVATION 1970, 1980, 1998

In 1970, field surveys were carried out by J. Rydzewski from the Institute of the History of Material Culture of the Polish Academy of Sciences in the lower Szreniawa basin (Rydzewski 1972). They also encompassed the area of the site in Książnice Wielkie, which was then designated as "site K". During the course of this project, very few materials belonging to the Lengyel culture, the period of Roman influence and the Early Middle Ages (pottery, stone products) were obtained. Again, the field surveys were conducted under the auspices of the *Polish Archaeological Record* program. In 1998, they were carried out by B. Konieczny. The designations of archaeological sites in the area of Książnice Wielkie were ordered at that time. The site in question in this paper was designated as No. 1 (AZP 100-62/88). The documentation from these studies incorporated basic data on previous fieldwork and studies. The chronology of the finds, which were associated primarily with Neolithic cultures, as well as the period of Roman influence and the Early Middle Ages, was also summarized.

During the field survey in 1998, only 4 fragments of clay vessels were discovered (including 3 from the early Middle Ages). It is worth noting that prior to excavations, a search of the available area of the site was conducted by the authors of this article in 2018, and similarly showed the presence of only individual finds. This may indicate relatively minor damage to the top layer of the ground as a result of agricultural work and natural erosion processes.

The *Polish Archaeological Record* contains information about a little-known (unpublished) field survey at the discussed site, the documentation and materials of which are kept in the Kraków branch of the Institute of Archeology and Ethnology of the Polish Academy of Sciences (thank you to K. Tunia for providing information on these surveys). On behalf of this institution, in 1980, a small test excavation, preceded by a surface survey, was carried out by P. Radwan. In the arable field to the south of the modern cemetery, two trenches measuring 30 x 2 m (designation No. I in the EW axis) and 20 x 2 m (designation No. II in the NS axis) were placed, located perpendicular to each other at a distance of about 30 m. As a result of this research, the outlines of 8 features and the backfill of a modern trench were discovered. Fills of these pits have been documented at the level of discovery, but no further exploration has been undertaken. Numerous characteristic artefacts came from the upper parts of the exposed pits, as well as from the area between them, including a fully preserved cup of the FBC with a stamp ornament under the rim and an FBC or FB-B mug with an ear protruding over the rim.

This collection also contains rims of beakers of the FBC, ornamented with a stamp, along with fragments of vases with knobs characteristic of FB-B assemblages, spindle whorls and a fragment of an axe from Jurassic flint of variant G. Most materials come from trench I, located closer to the parish cemetery (7 features); the second of the excavations,

located further to the south, only revealed the outline of 1 pit. We were able to locate the test excavations from 1980 in the field. In addition, during the 2019 excavations, the outline of the northern border of trench I was unveiled, and one of the FB-B pits, discovered by P. Radwan, was completely excavated. The materials from 1980 will be the subject of a detailed study in reference to the results of new excavations, commenced in 2018.

RETURN TO MATERIALS FROM J. ŻUROWSKI'S FORMER RESEARCH

Since 1964 – that is, since the publication of the FBC and CWC materials by B. Burchard, A. Eker and J. Machnik – numerous and important archaeological (and other) sources from Książnice Wielkie have not been the subject of detailed studies. Materials from J. Żurowski's research between 1921-1924 certainly deserve and require republication. In this part of the article, we present a brief outline of the works that constitute the first stage of this task. So far, analyses of selected pottery and stone assemblages, as well as archival documentation, were carried out to reconstruct the arrangement of settlement and grave features. In addition, the first data for the development of the absolute chronology of Neolithic settlement at the site was obtained.

Reconstruction of the arrangement of features and excavation trenches

As previously mentioned, there are no plans with the arrangement of features from the FBC settlement and CWC cemetery among the analyzed materials from Książnice Wielkie (Burchard and Eker 1964; Machnik 1964). This is due to gaps in the archival documentation and publications of J. Żurowski, who did not leave a plan with the location of the pits. However, thanks to the detailed review of the illustrated archival documentation, field notebook, notes and working sketches of J. Żurowski, it is possible to attempt to reconstruct the site plan with the location of settlement pits and graves from excavations carried out in 1922, 1923 and 1924. The sketches of J. Żurowski, made separately for each of the research seasons, provide our starting point. These sketches can be found in various places in his extensive documentation. They show the boundaries of excavation trenches (more or less accurately), traces of the trenches of World War I, some characteristic elements of the landscape (buildings, road, cemetery boundary), a meter scale and, above all, locations of the features, marked by points (dot or schematic pit shape). On some sketches, Żurowski noted distances between individual features. The above information, combined with sketches of pit outlines and data about their shapes and sizes (Żurowski's notebook), made it possible to reconstruct the location of features within individual research excavations. This reconstruction is not yet completed. Here, we present the plan from the last research season in 1924 (Fig. 6).

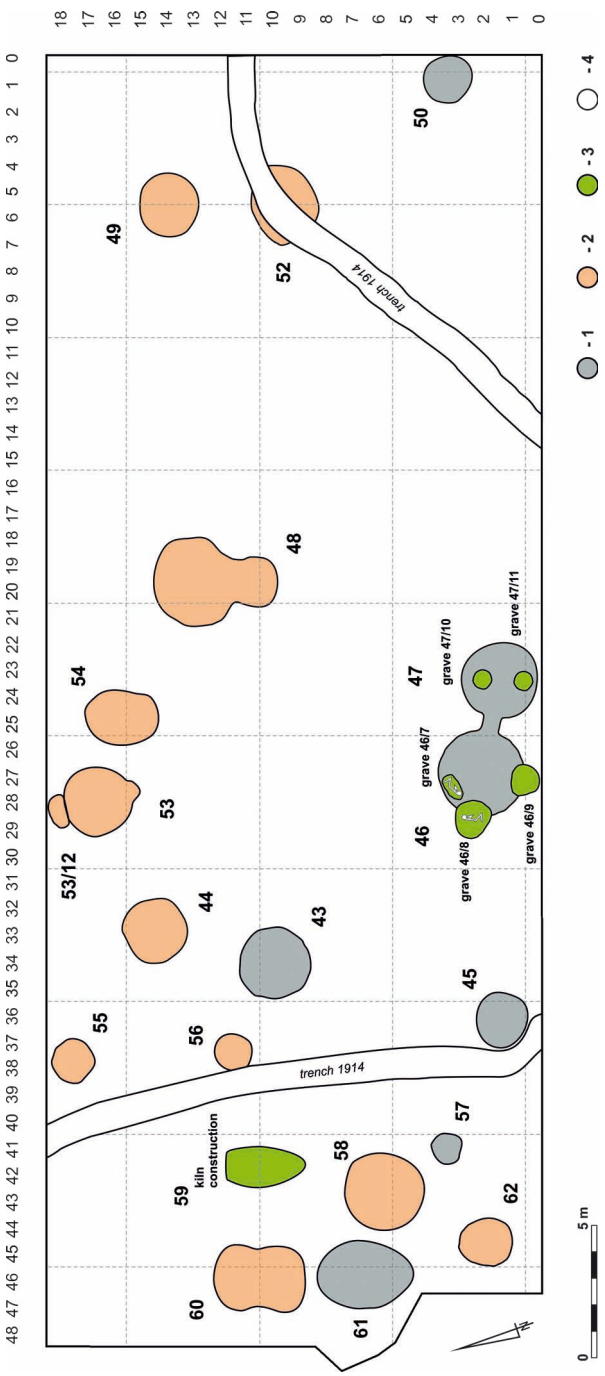

Fig. 6. Książnice Wielkie, site 1, Proszowice district. Reconstruction of the plan with the arrangement of features in the trench of J. Żurowski from 1924: 1 – FBC, 2 – FB-B, 3 – CWC, 4 – modern period (illustration by A. Brzeska-Zastawna)

The plan presents a portion of the FBC and FB-B settlements, along with a part of the CWC cemetery. It depicts the location and appearance of 25 features (Nos. 43-50, 52-62) and two sections of the WWI trench, located in the archeological trench with an area of 702 m^2. These are not all the features excavated in 1924. It was not possible to locate 10 pits, which we know to have been discovered in the last research season (34-42, 64; artefacts obtained at the modern cemetery have been inventoried under No. 65 and 66), and above all 21 graves from an Early Medieval row cemetery. We do not know much about this cemetery. J. Żurowski mentions it more widely in one article with no plans or drawings (Żurowski 1926, 13-16; see also Zoll-Adamikowa 1966, 80-83). A few items (some iron knives and their fragments) from very poorly equipped graves are in the collections of the Archaeological Museum in Kraków, and human skeletons, submitted for analysis in 1926, are at the Department of Anthropology of Jagiellonian University. It is highly probable that the graves in question (arranged in three rows, according to Żurowski), in which the deceased were oriented mainly along a W-E axis, can be located in the central part of the research excavation from 1924, in the zone between structures No. 43-48, 53, 54 and the rifle trench (Fig. 6). This is indicated by information about the partial destruction of the ceiling of FBC pit No. 43 by a "row grave" with a human skeleton (Zabłocki and Żurowski 1934, 9), as well as the disturbance of one of the graves by a rifle trench (Zoll-Adamikowa 1966, 82).

The chronology of the features on the reconstructed plan (Fig. 6) was established on the basis of the analysis of materials, carried out by the authors of the article (in relation to the FBC and FB-B pits) and data from the 1964 publications (Burchard and Eker 1964; Machnik 1964). Most features were assigned to the FB-B assemblages (12), located in a fairly uniform arrangement in the northern part of the archaeological trench. The FBC materials (without Baden traits) came from 7 settlement pits. Finds related to the CWC include 6 graves with burial goods, discovered in the outline of 2 FBC pits (Nos. 46 and 47), and 1 kiln construction (feature no. 59), located at the western border of the study area (Fig. 6). The pit with the kiln construction (with a small amount of material uncharacteristic of the FBC in the ceiling of the feature) was originally assigned to the FBC (Burchard and Eker 1964). In field notes by J. Żurowski, it was presented as an oval pit with dimensions of 300 x 150 cm and a depth of about 40 cm, with a characteristic orange burn mark at the bottom part of the fill. Kiln constructions are known from several CWC grave sites in western Lesser Poland, including Modlnica 5, where the most of them (4 features) were discovered (Włodarczak *et al.* 2011, 408, 409; Grabowska and Zastawny 2011, 422, 461), as well as from other areas (Jarosz 2017). Identifying the kiln construction in Książnice Wielkie is an interesting supplement to the arrangement of the CWC cemetery, consisting of at least two clusters of graves (Machnik 1964). It is 15 m away from the nearest grouping of niche graves No. 46 / 7-9 (Fig. 6).

The biggest difficulties during the reconstruction of the plans of research from 1922-1924 were locating the excavations themselves and attempting to indicate the location of

trenches in the modern surroundings of the parish cemetery in Książnice Wielkie. J. Żurowski indicated this place in sketches and descriptions, locating them generally in the fields just behind the southern boundary of the cemetery. The fact that research began in conjunction with plans to expand the cemetery, along with information about the construction of new tombs in the already excavated area, indicated that an expansion of the cemetery at the place of the excavations was established rather quickly. Recall that, today, the area examined by J. Żurowski is entirely within the extension of the cemetery, according to data from parish records on the increase of the area of the cemetery over the last hundred years. This belief has become established in the literature and in the documentation of the *Polish Archaeological Record*. With exactly the same conviction, the authors of this article also began excavations in 2018, which thoroughly verified the current findings.

In the 2019 excavation season, a portion of the expanse of the "old" excavation, conducted by J. Żurowski in 1924, was uncovered and examined. There was a place after excavations of the FBC pit complex (features No. 46 and 47) and the graves of the CWC (Nos. 46/7-9 and 47/10, 11) dug into them (in 2019 they were marked Nos. 14, 15, 20; see Fig. 9). The discovery of traces of J. Żurowski's trenches is very important. On this basis, it can be concluded that only a small part of the area investigated in the 1920s is within the modern cemetery (NW part of the trench from 1924), and the area of excavations from 2018 and 2019 partly overlaps with the research area of J. Żurowski (see Figs 6 and 10). It must be added here that the parish cemetery in Książnice Wielkie has actually grown significantly over the years, not in a southerly, but a westerly direction. This is documented, on military maps from 1915, among other places. The findings also indicate a selectivity in the exploration of features by J. Żurowski, which is difficult to explain today. However, we will refer to these issues in subsequent publications about Książnice Wielkie.

The following findings summarize information on the location and size of the area investigated by J. Żurowski in 1922-1924, as well as the location and chronology of traces of prehistoric settlement and the Early Medieval cemetery. The excavated area covered approximately 20 ares (approximately 2,100 m2). It was divided into three large research excavations, established in individual research seasons: approx. 800 m^2 in 1922, 625 m^2 in 1923, and 702 m^2 in 1924. At least two of them were adjacent (those from 1923 and 1924), and their northern edge was the southern border of the cemetery at the time. At present, this border overlaps a considerable section of the current boundary of the old part of the cemetery (largely no longer used) with graves from the 1930s. Most of the excavated area by J. Żurowski is today within a large arable field, which is owned by the parish in Książnice Wielkie, and is intended for a new cemetery, though it is still available for investigations. The total number of features excavated in 1922-1924 is about 120, which is more than indicated in the publications. These include about 90 features forming the settlements of the FBC and FB-B, 12 (14?) graves of the CWC and 21 Early Medieval graves.

Pottery. Typological and cultural assessment

Since the publication of the study of the FBC settlement by B. Burchard and A. Eker, it has been established that sources from Książnice Wielkie are partly heterogeneous (Burchard and Eker 1964, 284; Machnik 1964; Kozłowski 1965; 1989; Zastawny 2009).

Potential mixing of pottery with different features (already during the research of J. Żurowski or in storage facilities after the excavations) is thought to be the result of interpretative problems in the scope of chronological and, above all, taxonomic assessments of the assemblages. The problem was the identification and classification of features that included vessels with Baden elements and accompanying ceramics. Such assemblages were assigned to three different taxonomic units. First of all, they were included in the early Baden Wyciąże-Książnice group, which was to be part of the oldest phase of the Baden culture of Lengyel-Polgár genesis (Kozłowski 1961; 1971). Secondly, these assemblages were associated with the late phase of the FBC with Baden elements, as in the form known from Bronocice (Burchard and Eker 1964; Burchard 1981). The third concept held that elements present in Książnice Wielkie (the so-called "rough pottery") referred directly to the Late-Classical Zesławice-Pleszów group of the Baden culture and assemblages from the settlement in Kraków-Pleszów 17 (Burchard and Eker 1964).

The diversity of material and inconsistency of its classification, as outlined above, was one of the main reasons for the scientific return to materials from the former excavations of J. Żurowski. Analysis of the stylistic features of pottery and flint artefacts showed that materials from Książnice Wielkie are not so diverse and settlement "stratified" that they can correspond to three taxonomic units with Baden elements. The relationship between pottery from Książnice Wielkie and the Zesławice-Pleszów group of the Baden culture should be ruled out, as has already been pointed out by J. K. Kozłowski (Kozłowski 1965). One should also be skeptical about the possibility of the presence at the discussed site of features of both cultural (and territorial) groups, *i.e.* Wyciąże-Książnice and the late, "Badenized" FBC. M. Godłowska, who introduced the name "Wyciąże group" (instead of "Wyciąże-Książnice"), wrote many times about related doubts, and excluded the site in Książnice Wielkie from the notion of this phenomenon (Godłowska 1976; 1979). Godłowska also pointed out interesting (but also problematic in interpretation) similarities between these groups and stressed the need to study their taxonomic affiliation (Godłowska 1981; 1986). The forms, and above all the decorative style of FBC pottery from Książnice Wielkie, which refers to the Baden circle, should therefore be connected only with an FBC background. This was clearly confirmed by the results of open-area excavations in Bronocice, which contributed a huge number of stylistically and chronologically diverse materials of the FB-B character (Kruk and Milisauskas 2018; Kruk *et al.* 2018). In this regard, the current findings were closest to the original concept of B. Burchard and A. Eker, which connected most of the materials with Baden features from Książnice Wielkie to the youngest phase of the FBC (Burchard and Eker 1964, 283).

Commingling of materials from J. Żurowski's research should be assessed as fairly minimal, and it does not have a significant influence on the interpretation of finds. The fact is that the archeological material was usually put into boxes without marking the depth or the layer from which it was obtained. There are also cases of joint inventorying of artefacts from the pit fill with fragments of pottery from the plow zone above the feature (with an admixture of chronologically younger materials). However, there are no grounds to claim that there was mixing on a larger scale, *e.g.* materials from various pits, with different styles of ornamentation and chronology.

The ceramic elements of the Boleráz culture, the oldest horizon within the Baden complex, are poorly represented at Książnice Wielkie. There is, for example, no "wolf's teeth" ornament (known from Bronocice) or incised decorations, arranged in a zigzag or herringbone pattern, covering large spaces of the belly (for comments on such decorations, see below). The Boleráz style of groove and fluted technique can be observed on only a few fragments of the vessels. These are small parts of the belly with groove ornaments arranged in various motifs (parallel lines, herringbone motif), neighboring and/or overlapping (Burchard and Eker 1964, Pl. XXVII: 6). The vast majority of decorations in the Baden style are grooved and fluted in vertical, horizontal and diagonal linear systems (Burchard and Eker 1964, Tabl. XXVI, XXVII). They correspond to numerous series of materials from Bronocice, distinguished there in the form of two settlement phases – BR IV and BR V. Most of the similarities between materials from Książnice Wielkie and Bronocice can be seen in the assamblages of the BR IV phase.

While working on the interpretation of ornamentation and the cultural attribution of pottery from J. Żurowski's research, several important corrections, additions and discoveries were made. In feature No. 1, published in 1964, fragments were found of a vessel decorated with an engraved herringbone ornament on a cylindrical neck, as well as groups of oblique lines on the belly, alternately oriented, and lined from below with a row of oval impressions (Burchard and Eker 1964, Pl. VIII: 9 , IX: 2). These fragments, assigned to the FBC, are in fact the upper part of the CWC broad-mouth beaker (Fig. 7: 10), which should be considered as material unrelated to the pit. Feature No. 1 was discovered in the first trench located by J. Żurowski in 1922, in the place where the rifle trench destroyed the FBC pit and CWC grave (amphora offered to Żurowski). It cannot be excluded that the vessel in question belonged to the burial goods of the destroyed grave. However, it is distinguished by ornamentation that has no analogy in any of the 12 graves of the CWC in Książnice Wielkie (see Machnik 1964).

Decoration in the form of an engraved herringbone pattern on cups is known from the CWC sites located south of the Vistula, and is more typical for settlement sites (*e.g.* campsite in Stanisławice 9, Kraków-Bieżanów 33 and Tarnów 98; Jarosz 2015; Jarosz *et al.* 2010; Włodarczak 2012), as well as in barrow and flat graves (*e.g.* Szczytna; Jarosz and Machnik 2017). In turn, decoration of the belly is very rare on pottery from the CWC (thanks to P. Jarosz and P. Włodarczak for consultation in this matter). The ornamentation

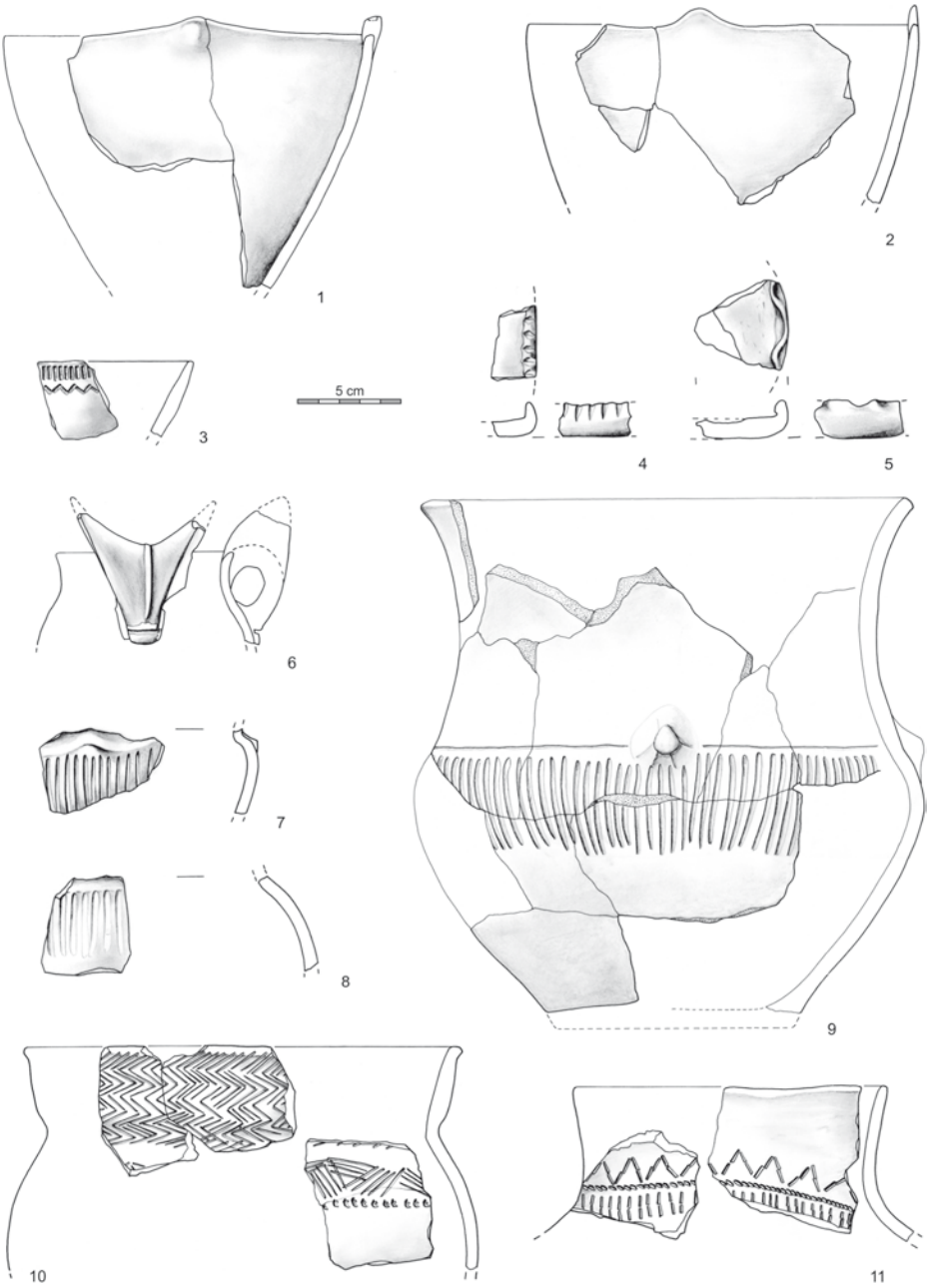

Fig. 7. Książnice Wielkie, site 1, Proszowice district. Selected Neolithic pottery from J. Żurowski's excavations: 1, 2 – Lublin-Volhynian culture, 3-6 – Funnel Beaker culture, 7-9 – Funnel Beaker-Baden assemblages, 10 – Corded Ware culture, 11 – Globular Amphora culture (illustration by A. Brzeska-Zastawna, B. Grabowska, A. Zastawny)

of the vessel in question has caused many misinterpretations and false associations with pottery of the Boleráz culture, to which the ornamentation is essentially similar (herringbone motif and diagonal lines). The authors of the publication on the FBC settlement did not present their view on this matter (Burchard and Eker 1964, 195). On the other hand, J. K. Kozłowski strongly pointed to the connection with Boleráz pottery. He assigned this vessel to the assemblage of materials defining the oldest, Boleráz horizon of the Baden culture in Poland (Lesser Poland group), and placed Książnice Wielkie in the group of the main sites of this horizon (Kozłowski 1965, 190, Pl. I: 28). A similar position was taken by Z. Sochacki, placing this site in the early horizon of the Baden culture in Lesser Poland and in its connection with the FBC (Sochacki 1980, 48, Pl. VII.BII.24). This view and relationship with the FB-B assamblages has become established and can be found even in the latest literature (Kruk and Milisauskas 2018, fig. 26: 15).

One very interesting observation in the study of old materials of J. Żurowski was the presence of fragments of three vessels of the "Tisa" character (Burchard and Eker 1964, 200, 266, Pl. XXVI: 1; Machnik 1964, 352, Pl. V: 11). Material verification allows us to assign them to the Lublin-Volynian culture. All fragments come from vessels of a similar type, *i.e.* flower-pot vessels with upwardly widening walls and triangular thickening or protrusions on the edge. None of them comes from a feature that could be considered a pit of the Lublin-Volynian culture. The fragments of the vessel with a large triangular protrusion on the edge (Fig. 7: 2) come from a stray find. A vessel with a raised edge, ending with a small protrusion with stamp impressions (Fig. 7: 1), was discovered in a secondary deposit in pit No. 2, with FBC and FB-B materials. The third vessel was discovered in feature No. 46, associated with the FBC, into which three niche graves of the CWC were dug (Machnik 1964, 352). These finds, with an unclear context (settlement or grave), should be treated as evidence of a settlement. The existence of a settlement of the culture in question here, on which younger settlements accumulated, is supported by the discovery, during excavations in 2018, of a single pit with pottery material (information later in the article). Remains of the Lublin-Volhynian culture settlement have not yet been recognized at Książnice Wielkie.

Fragments of a Globular Amphora culture vessel constitute a completely new and surprising discovery made during the review of materials from investigations of the 1920s (here we want to thank M. Szmyt for consultation regarding these materials). These fragments form the upper part of (presumably) an amphora with a low, slightly everted neck, and a partially preserved transitional section into a clearly separated belly (Fig. 7: 11). An omnidirectional horizontal ornament in the technique of stamp-and-cord imprints was made at the transition between the neck and the belly. Its upper part is occupied by a horizontal zigzag made with rectangular stamp impressions. Under it runs a single line impressed with a cord, and below, a row of vertical lines made with a weakly visible stamp. The whole linear arrangement lowers in one place, probably towards the absent handle. The described fragments are stray finds, originating from a trench from 1924. Thanks to

them, Książnice Wielkie joins a group of few, taxonomically confirmed sites on the map of settlements of Globular Amphora cultures in western Lesser Poland (Rosiejów, Tunia 1997; Bronocice, Kruk and Milisauskas 2018; Koszyce, Przybyła *et al.* 2013). Książnice Wielkie is separated from Bronocice – where individual fragments of pottery as well as stone materials were also found – by a distance of 28 km, while Koszyce, where a collective grave was discovered, lies only 4 km away.

In the assemblage of materials of the FBC from Książnice Wielkie, it is worth pointing out the categories of pottery, which in the publication from 1964 were not given much attention. In the first place, they include clay plates (Fig. 7: 4, 5). These are represented by several forms, preserved in small fragments. They were listed in the inventories of several features, and some of them were illustrated (Burchard and Eker 1964, Pl. XXVI: 4, XXVII: 9). Plates are rare forms in the FBC assemblages in Lesser Poland (see Kruk and Milisauskas 2018; Zastawny *et al.* 2011). They are considered to be an important chronological indicator associated with the oldest stages of the FBC (*e.g.* Papiernik and Płaza 2018). In the final assessment of the relative chronology of the FBC settlement in Książnice Wielkie, they will have a diagnostic significance. The second group of pottery, which is much more diverse, includes fragments of vessels for salt production, described in the publication as heavily fired "rough ceramics" of unspecified purpose (Burchard and Eker 1964, 274). This category includes the bottoms of narrow-diameter vessels with widening upward walls (Burchard and Eker 1964, Pl. XXVI: 6) and small bowls with an inwardly bent edge (Burchard and Eker 1964, Pl. XXVI: 3). It was this type of ceramics that was mistakenly assessed as a close analogy to pottery from the settlement of the Zesławice-Pleszów group of the Baden culture from Kraków-Pleszów 17, where salt-production pottery was also found (Bielenin 1959; Rook 1971). It should be clarified that such vessels in the late FBC assemblage were not known at the time of publication of the materials in 1964. The presence of salt pots in Książnice Wielkie is another feature with close analogies to the FBC and FB-B materials from the Bronocice site (Kruk and Milisauskas 2018, Ill. 75, 109, 139).

The correctness of the presentation of materials, which are the basic source for analysis, especially in relation to collections from old studies, has a great influence on the assessment of pottery from Książnice Wielkie. Verification of pottery as well as flint assemblages indicated the need for thorough additions in this respect (*cf. e.g.* Fig. 7: 9 and Burchard and Eker 1964, Pl. XXVI: 8, as well as fig. 7: 10 and Burchard and Eker 1964, Pl. XVIII: 69, IX: 2). In the course of further analysis, it will be necessary to reconstruct and illustrate the FBC and FB-B materials again.

Flint products

As in the case of ceramic materials, a new view and new analyses require a set of stone products obtained from the FBC and FB-B features (see study: Burchard and Eker 1964, 276-282). Works on selected issues in the field of the manufacture and use of stone tools

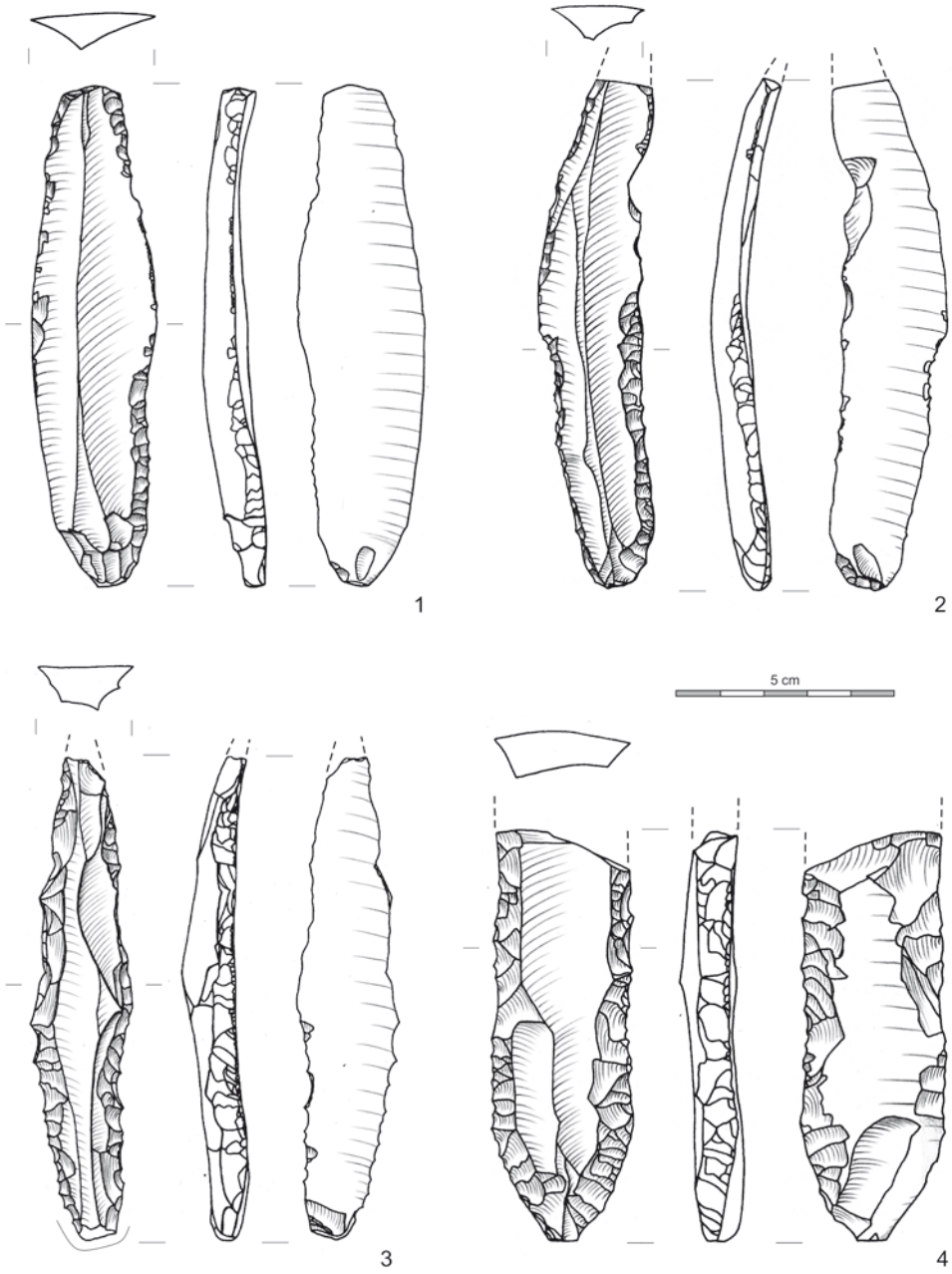

Fig. 8. Książnice Wielkie, site 1, Proszowice district. Selected retouched blade tools made from Jurassic G flint from J. Żurowski's excavations: 1, 2 – Funnel Beaker culture/Funnel Beaker-Baden assemblages, 3, 4 – Funnel Beaker-Baden assemblages (illustration by A. Brzeska-Zastawna)

have already been partially summarized in several publications, mainly in relation to the use and reutilization of flint axes (Brzeska-Zastawna 2018; Brzeska-Zastawna 2020; Brzeska-Zastawna and Zastawny *in print*). Flint products from Książnice Wielkie are extremely important and valuable materials for comparative analysis for several reasons. First of all, the FBC settlement is represented here from the earliest stages of this culture in Lesser Poland to the younger horizon of the FB-B assemblages (BR IV/V), not to mention the Lublin-Volhynian settlement. There are no older cultures (aside from individual Linear Pottery culture finds from the village of Książnice Wielkie with no known location). Therefore, it is possible to perform a comparative analysis between the inventories of the FBC and FB-B; and, hopefully, future research will uncover Lublin-Volhynian flint artefacts, because we have so little data on the flint production of this culture in western Lesser Poland. Perhaps it is research on the diversity of the inventories of these cultures that will help answer questions about the transformation occurring in the 4th millenium BC in western Lesser Poland. Preliminary studies on the variability of these products from different phases of the FBC and FB-B are already promising at this stage. Secondly, Książnice Wielkie is the site furthest from the Jurassic flint G outcrops among all known FB-B settlements. Contrary to appearances, this is not *in minus* for the study of inventories in this case. Inventories are mostly selected products, often macrolithic (Fig. 8: 1-4), and sometimes heavily processed, *e.g.* by secondary retouching (Fig. 8: 3). However, inventories give the impression of being compact and with very distinct typo-technological features. Sometimes, such variation is difficult to grasp when analyzing very large series of stone products. Flint products from Książnice Wielkie have great potential and can provide interesting observations on the relationships between communities developing in the late Neolithic of western Lesser Poland.

Absolute chronology

Up until now, materials from Książnice Wielkie had never been a source for research on the absolute chronology of the FBC settlement at this site, nor on the chronology of the settlement of this culture in western Lesser Poland, in general. This is surprising, because datable materials (animal bones) are well preserved here, and are represented in large numbers. Perhaps the reason was the previously-mentioned opinion about the heterogeneity of artefacts in the features. During the stylistic and chronological analyses of the materials, carried out by the authors of the article, several features for radiocarbon research were selected. Consistency of the stylistic features of pottery was the primary criterion here.

The presence of animal bones in features with materials with “classic” FBC elements, as well as pits with FB-B inventories gave an additional opportunity to obtain data for the reconstruction of chronological phases of settlement at the site. In the first stage of analysis, carried out at the Poznań Radiocarbon Laboratory, AMS dates were obtained for 3

features, excavated by J. Żurowski in 1923 and 1924: feature Nos. 14 (FBC), 31 and 41 (FB-B). A detailed discussion of the results of this dating will be the subject of a separate article (Brzeska-Zastawna and Zastawny in print). It can be mentioned here that in terms of the duration of settlement (the total time interval of age measurements) and the variability of cultural features (FBC and FB-B), Książnice Wielkie has clear analogies to Bronocice, site 1 (Kruk *et al.* 2018), which represents settlement within the chronological range from phase I to BR IV/V.

NEW EXCAVATION AND FIELD WORKS 2017-2019

In parallel to the commencement of work on materials and documentation from the former excavations of J. Żurowski, efforts were made to obtain funds to start a new stage of field investigations in Książnice Wielkie. The purpose of the new excavations was to obtain data for the verification of previous findings on many aspects of the issue of Neolithic settlement (and not only). This included locating research excavations from 1922-24, developing the relative and absolute settlement chronology, assessing the size and structure of the FBC and FB-B settlements and the CWC cemetery, examining mutual stratigraphic relationships between CWC graves and older features, and verifying the location of the Early Medieval cemetery discovered and examined by J. Żurowski in 1924.

In 2017, a threat to the archaeological sites was identified during a site visit. While constructing a modern tomb in the new part of the cemetery, a prehistoric grave was partially destroyed (affecting the lower part of the human skeleton in the grave pit). The location of this tomb lay at the beginning of the expansion of the parish cemetery in Książnice Wielkie towards a southern direction. The new area is about 1 hectare. It is fenced, but still used for agriculture (arable field, parish ownership). In agreement with the current parish priest in Książnice Wielkie (priest W. Baran), a plan was drawn up to conduct geophysical surveys in the danger zone. They were to reveal the location of archaeological features, and then help take action to protect them.

Non-invasive geophysical surveys using the geomagnetic method were carried out by the DOLMEN company from Kraków in autumn 2017 (by M. M. Przybyła), commissioned by the Archaeological Museum in Kraków. The surveys were financed by the Provincial Heritage Protection Office in Kraków (Brzeska-Pasek and Zastawny 2018). Not all zones at the cemetery were suitable for investigation. The area in the immediate vicinity of the headstones, as well as at the metal fence in the new part of the cemetery, showed numerous disturbances with modern objects. As a result, a total area of 1.22 ha was examined and divided into two zones: one within the outline of the fenced part of the new cemetery (Fig. 9: A), and the other outside the fence (south of the first zone). The results of the measurements clearly confirmed the supposition that archaeological features continue south of the line marking the current border of the cemetery. The graphic image of geophysical

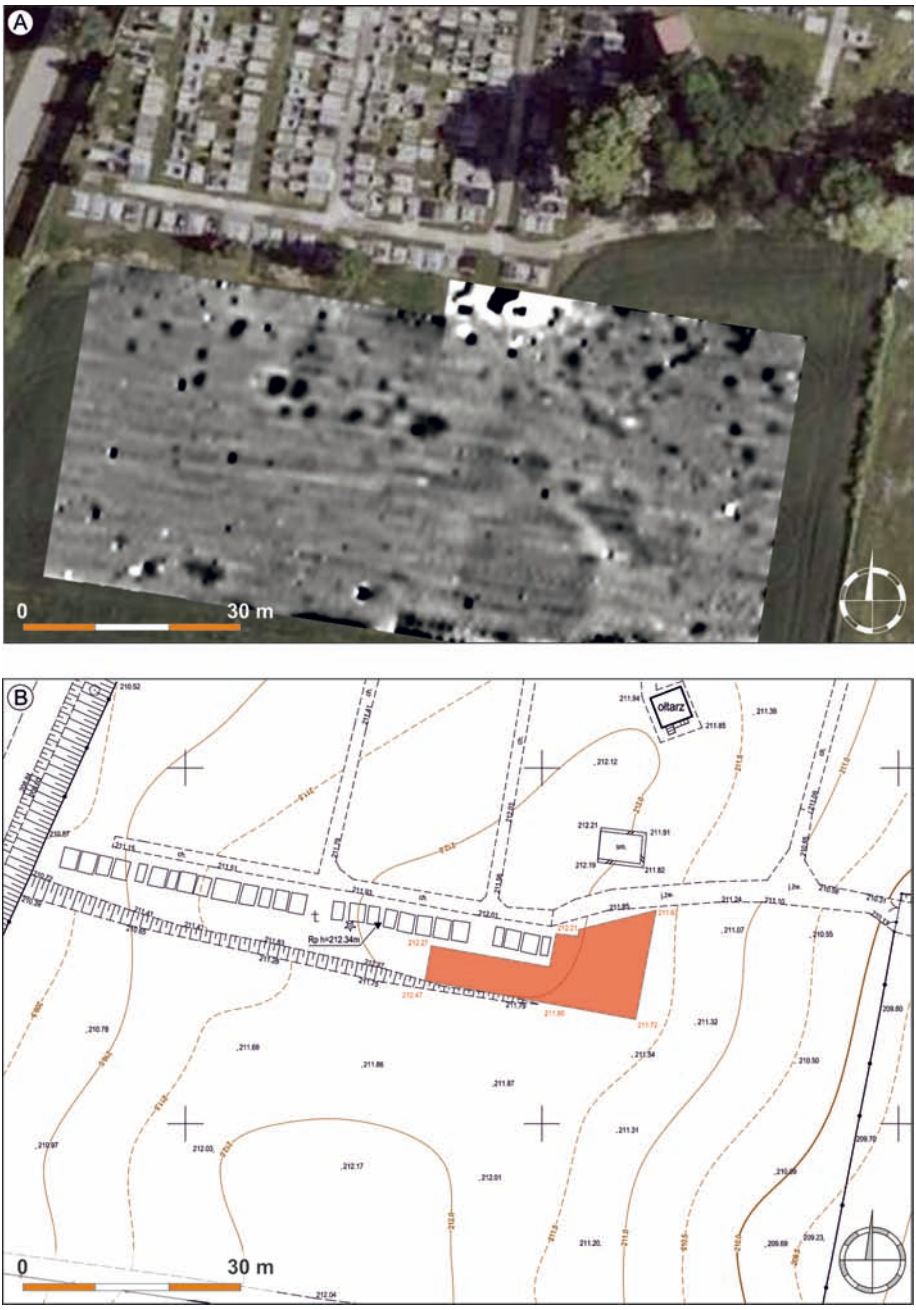

Fig. 9. Książnice Wielkie, site 1, Proszowice district. Field research in 2017-2019 in the central part of the site (new cemetery): A – geomagnetic survey area in 2017 with visible outlines of archaeological features, B – map with the area of rescue excavations in 2018 and 2019 (illustration by A. Zastawny)

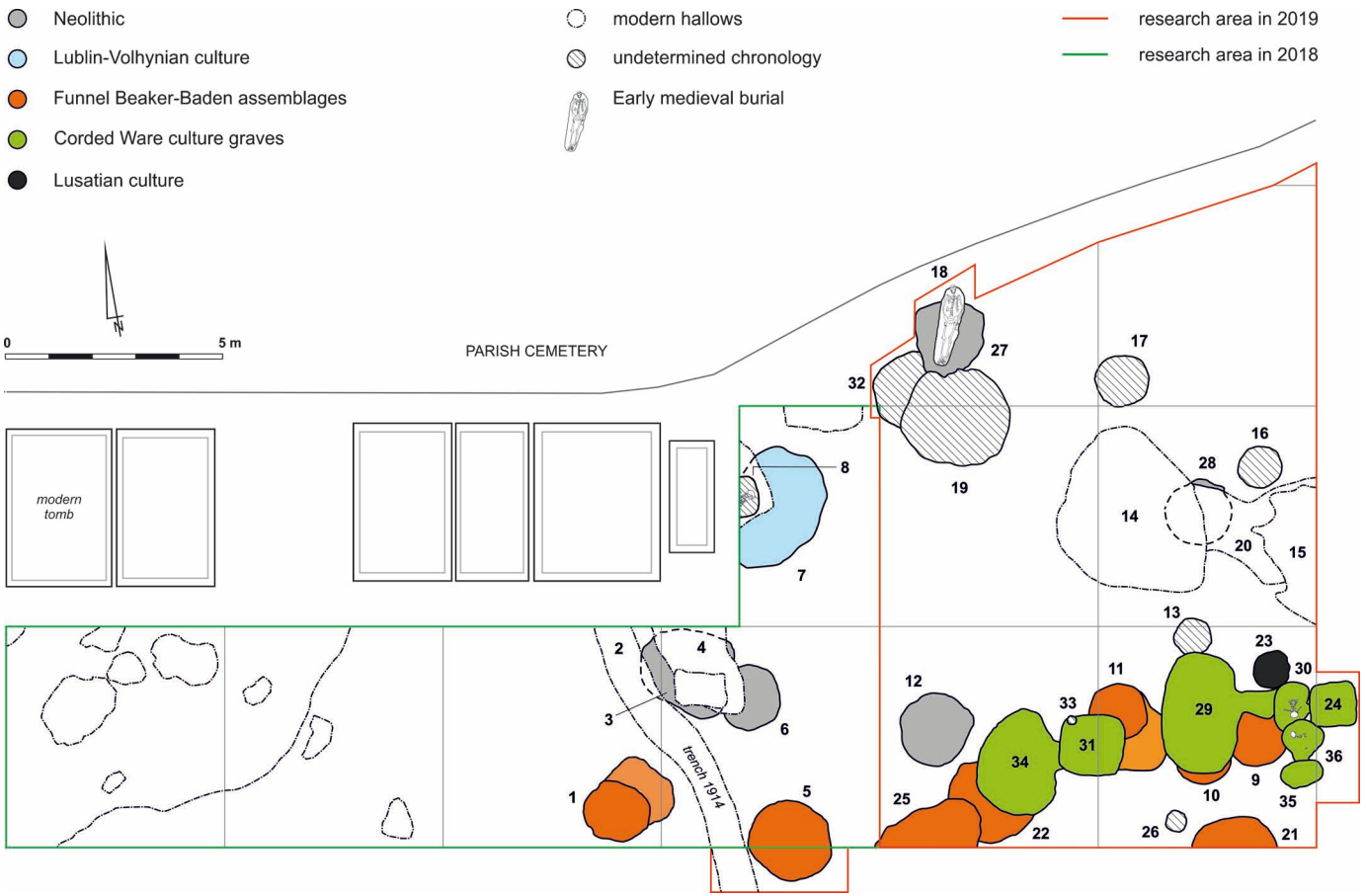

Fig. 10. Książnice Wielkie, site 1, Proszowice district. Rescue excavations at the site in 2018 and 2019 (illustration by A. Zastawny)

research revealed numerous settlement traces, with the largest clusters of pits at the site of the highest elevation of the area. Interpretation of magnetic investigations indicated a large variety of features: settlement pits, settlement pits with traces of thermal processing (hearth, daub), grave features (including complex elements, such as niche construction), as well as features with ambiguous interpretations, *e.g.* circular structures, which may be natural formations or traces of barrows.

Based on the positive results of the geomagnetic investigation, it was decided to undertake rescue excavations at the site, which were started in 2018 and continued in 2019 (Fig. 9: B; 10). These works were financed by the Provincial Heritage Protection Office in Kraków. The research was carried out on behalf of the Archaeological Museum in Kraków in cooperation with the Institute of Archeology of Jagiellonian University (Brzeska-Zastawna and Zastawny 2019). In 2018, the works were even conducted in connection with the construction of new headstone (Fig. 11: A). In both research seasons, excavations covered the area located in the immediate vicinity of the modern cemetery (Fig. 11: A, B). In total, an area of 258 m^2 was tested (Fig. 9: B). Thirty-two archeological features and several modern ones were discovered within this relatively small area. Among the latter (apart from excavations related to the functioning of the modern cemetery), the outline of one of the sections of the rifle trench line from 1914 – which was already found during excavations in 1921-1924, as well as during a test excavation in 1980 – was unveiled.

As a result of the excavations undertaken, a further part (previously discovered and partially investigated by J. Żurowski) of the FB-B settlement and the CWC cemetery was uncovered. The most numerous finds are related to the FB-B settlement. Eight settlement pits (features Nos. 1, 5, 9, 10, 11, 21, 22, 25) were found within an area of 15 x 5 m (Fig. 10). Pits that are oval in horizontal projections, as well as those that are trapezoidal and hemispherical in transverse profiles predominate. Two of them were accompanied by small, shallower entrance annexes (No. 1, No. 11), to which J. Żurowski has already drawn attention. Abundant ceramic material, along with numerous bone tools, spindle whorls and loom weights, well-preserved animal bones (and large fragments thereof), and construction daub were obtained from the fill of the pits. A relatively small number of flint artefacts is associated with the site, which is fairly distant from the nearest outcrop of Jurassic flint G (about 80 km). Feature No. 5 is distinguished here (Fig. 12), in which several whole or reconstructable vessels with FB-B features were discovered, including a jug with knob ornamentation, two amphorae with groove ornamentation on the belly, a cup with a strap-like handle extending above the rim, and a vase with a groove-knob ornament. The outlines of this pit were partially exposed during surveys in 1980, but exploration was not undertaken at that time. Of particular interest is a pit with traces of animal-bone processing and the production of bone tools (No. 11), in which finished awls and chisels were found, along with semi-finished products for their manufacture (*e.g.* ribs with traces of cutting and breaking). Several FB-B settlement pits have been partially destroyed by the CWC niche graves.

Fig. 11. Książnice Wielkie, site 1, Proszowice district. Excavations in 2018 and 2019. A – outlines of Neolithic features and the rifle trench from 1914, explored in 2018 (view from S), B – excavations from 2019, view from the northeast (photo A. Zastawny)

Fig. 12. Książnice Wielkie, site 1, Proszowice district. Excavations in 2019. Documentation and exploration of pit No. 5 with the FB-B materials (photo A. Brzeska-Zastawna, A. Zastawny)

Fig. 13. Książnice Wielkie, site 1, Proszowice district. Excavations in 2019. Exploration of a double, niche grave of the CWC; No. 29. At the bottom, visible elements of burial goods of one of the two symbolic burials: amphora, beaker, flint axe (photo A. Zastawny)

A very important result of the research undertaken was the discovery in 2019 of a cluster of 4 CWC niche graves, located at the site of the largest accumulation of prehistoric features (Fig. 10). The graves occupied a small space of 9 x 4 m. Without exception, all of them disturbed the older FB-B pits. The grave chamber of the largest of the graves of the CWC (No. 29) disturbed the fill of 3 adjacent pits with FB-B material (Nos. 9-11). The placement of entrance pits into graves and grave niches, themselves within the outlines of older (FBC or FB-B) settlement pits, is a characteristic feature of the CWC cemetery in Książnice Wielkie (see description of J. Żurowski's research). In 2019, 2 children's graves (niche Nos. 30 and 36 with entrance pit Nos. 24 and 35), 1 double symbolic grave (grave niche No. 29) and 1 single grave (grave niche No. 34 and entrance pit No. 31) were discovered. The skeletons are poorly preserved. In both children's graves, skulls and fragments of long bones and ribs were discovered partially out of anatomical order. In the niche of a single grave (No. 34), only very damaged human bones and individual teeth were found. At this stage of research, it is difficult to assess whether they are the remains of the deceased buried there, or whether they ended up in the fill of the grave by accident. Grave No. 29 did not contain human remains. Two analogous sets of burial goods, depo-sited in two opposite parts of the grave chamber, indicate that it is a symbolic grave, prepared for two people (Fig. 13). With the exception of one of the children's graves, with a niche and an entrance pit oriented along a N-S axis (Nos. 35 and 36), the remaining constructions were aligned on a W-E axis. The CWC burials included rich burial goods, consis-ting of clay vessels (amphoras, cups), stone tools (battle-axes, flint arrowheads, axes, blades, flakes), bone and horn tools (awls, wedge), and ornaments in the form of bone pendants, antlers, animal teeth, shell beads, boar tusk, and a so-called tourniquet ornament made from a rib with a hole in the thickened central part. In total, 45 grave goods were found among the 4 burials.

The CWC graves discovered in 2019 are part of a larger cemetery, probably composed of several burial groups. Together with the graves examined by J. Żurowski (12 certain and 2 presumed), it consisted of at least 18 burials. The newly discovered graves belonged to a larger grouping of features, forming a separate cluster. Only 2.5 m north of grave Nos. 29 and 30, buried cavities (Nos. 14, 20, 15, Fig. 10) were discovered after exploration of graves 46/7 (in 1924), 46/8, 46/9 and 47/10, 47/11, and were examined in 2019 (Fig. 6). Therefore, the whole group consisted of 9 graves, including 3 for children (Nos. 47/11, 30, 36), 5 individual burials of adults (Nos. 46/7, 46/8, 46/9, 47/10, 34) and 1 symbolic double grave (No. 29). It cannot be excluded that in the next season of excavations, this cluster will increase by further burials.

A new element in the history of Neolithic settlement in Książnice Wielkie is the discovery of the settlement pit of the Lublin-Volhynian culture (Fig. 10). The presence of traces of this culture at the site has so far been confirmed by only two fragments of vessels (identified as the pottery with "Tisa" character), discovered during J. Żurowski's research on the secondary deposit, in the fills of younger pits (Burchard and Eker 1964; Machnik 1964).

The pit in question (No. 7) was heavily damaged in the upper portion by modern trenches and a grave (No. 8) of unknown chronology (without burial goods). Its bottom portion has survived with a dark layer of soil from which the characteristic ceramic material originated (*e.g.* flower-pot vessels with triangular shaping of the lip rim and a small pot with two handles on the edge).

A small pit of the Lusatian culture (No. 23), in which lay a completely preserved vessel, was an isolated find. This is the only feature in previous research (including excavations from 1922-1924) representing the Bronze Age. Another single find is a burial from the Early Middle Ages (No. 18), with a very well preserved human skeleton, deposited in a strongly elongated, oval burial pit (Fig. 10). The deceased was equipped with only one item – an iron knife placed in the left hand. This burial must certainly be associated with the row cemetery, which J. Żurowski found in 1924.

FINAL REMARKS

Ninety-nine years ago, Józef Żurowski acquired the first archaeological materials in Książnice Wielkie, introducing this site to the archeological map of Lesser Poland. It was permanently preserved in the scientific literature thanks to the studies of B. Burchard, A. Eker and J. Machnik from 1964. Since then, views on many issues have changed, in which materials from Książnice Wielkie played a leading role (Wyciąże – Książnice Wielkie group of the Pre-Baden horizon; Książnice Wielkie type in the CWC; late phase of the FBC with Baden elements). The requirements and standards of contemporary source studies and auxiliary analyses have also changed. The definition of the relative chronology of features and their arrangement requires clarification and reconstruction as well as further research. The study of an absolute chronology of settlement will be a completely new and important issue. The return to materials from Książnice Wielkie is fully justified, and research potential of this site is still untapped. The results of the study on J. Żurowski's materials will also be able to be verified in comparison with the results of new excavations, resumed at the site in 2018. Fieldwork and laboratory studies will be continued, and their results will be published.

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FUNNEL BEAKER CULTURE TOMBS IN THE EASTERN PART OF THE WODZISŁAW HUMMOCK

ABSTRACT

Jarosz P., Włodarczak P. and Tunia K. 2020. Funnel Beaker culture tombs in the eastern part of the Wodzisław Hummock. *Sprawozdania Archeologiczne* 72/1, 313-332.

The paper sums up the field research carried out at the complex of ceremonial and funerary sites at Małżyce and Zagaje Stradowskie in the northern part of the loess uplands of western Lesser Poland. The research revealed differences in construction among chamberless tombs of the Funnel Beaker culture (FBC) in western Lesser Poland (Małopolska). The results of these investigations were later confirmed by data obtained at other sites explored in recent years. Typological and chronometric studies point towards a similar age of all distinguished tomb types: around 3650-3350 BC. In addition, a chronological sequence of transformations in the megalithic burial rite of the FBC communities is proposed.

Keywords: Eneolithic, Funnel Breaker culture, funeral rite, long barrows, Lesser Poland
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1. INTRODUCTION

The first chamberless tomb in the loess uplands of western Lesser Poland was explored in 1968 in Niedźwiedź, Kraków district (Burchard 1973a). The find was long interpreted as a relic of a Middle Neolithic longhouse (*cf.* Kulczycka-Leciejewiczowa 1979, 105, fig. 42; Midgley 1985). Although constantly growing, the number of tombs discovered in the region still remains relatively small. Important information concerning this aspect of the Funnel Beaker culture (FBC) megalithic rite was obtained during research in the Wodzisław Hummock (Garb Wodzisławski) microregion (eastern part of the Nida Basin), in Malżyce and Zagaje Stradowskie (both in Czarnocin commune, Kazimierza Wielka district). The area lies in the interfluve of the Nidzica and Nida Rivers, left-bank tributaries of the Vistula River. Vast hills built of Cretaceous rock prevail in the landscape, which is covered with loess in the eastern part (Kondracki 2000, fig. 38, 266). The hills of the Wodzisław Hummock generally stretch along a NW-SE axis, and are separated by valleys and ravines. The absolute height in the locations occupied by archaeological sites in Malżyce and Zagaje Stradowskie ranges from 300 to 312 m a.s.l. The discussed sites stretch over approx. 2.5 km, occupying the tops of the hills (Fig. 1).

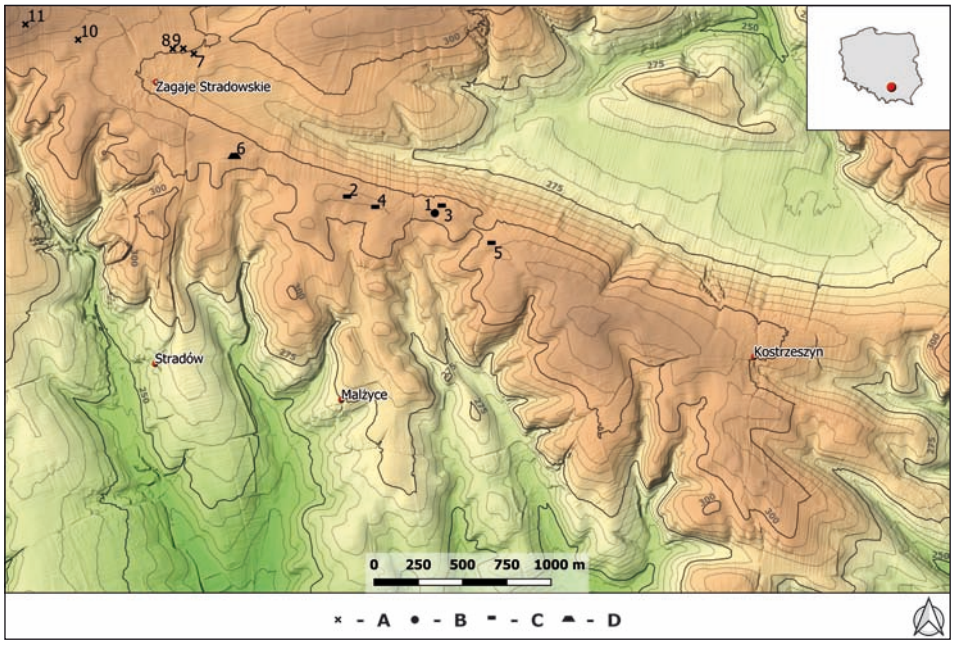

Fig. 1. Location of FBC cemeteries at Malżyce and Zagaje Stradowskie. Illustration R. Skrzyniecki. 1-4 – Malżyce, site 30 (1 – tomb 1, 2 – tomb 2, 3 – tombs 3/I and 3/II, 4 – tomb 4/not excavated), 5 – Malżyce, site 31, 6 – Zagaje Stradowskie, "Mogiła Stradowska" site, 7-11 – Zagaje Stradowskie, destroyed graves of the FBC (7-9 – zone A, 10 – zone B, 11 – zone C)

The area became the subject of research as early as the late 1950s. At that time, a grave in a stone setting was discovered by Jan Gromnicki under a mound – the so-called Stradów Tomb – in Zagaje Stradowskie, which was associated with the FBC population (Gromnicki 1961). Research at the site was resumed by Barbara Burchard in the 1990s, when two tombs were investigated (Burchard 1998; 2006). Apart from these excavations, surface surveys in the vicinity were performed soon after by Krzysztof Tunia, which inspired further fieldwork in the first and early second decade of the 21st century at site nos. 30 and 31 in Malżyce, already badly damaged by that time (*e.g.* Jarosz *et al.* 2009; 2013a; 2013b; Tunia and Włodarczak 2011). The excavations uncovered the remains of multicultural sepulchral complexes, which offered a new insight into the burial rites at the turn of the Neolithic and Early Bronze Ages in Lesser Poland.

In total, the excavations carried out at the sites of Zagaje Stradowskie and Malżyce resulted in the discovery of seven tombs associated with the FBC. In addition, graves linked with the Corded Ware and Mierzanowice cultures were discovered near FBC tombs in Zagaje Stradowskie ("Stradów Tomb") and Malżyce, site no. 30 (barrows nos. 1 and 2). Thus, we are dealing here with a sepulchral complex established in the 4th millennium BC, which came to be used again (after a gap of around one thousand years) in the 3rd and early 2nd millennia BC.

The purpose of the article is to summarize data on the complex of FBC cemeteries located in Malżyce and Zagaje Stradowskie. Information obtained on the construction types of chamberless tombs is particularly important in the context of studies on the funeral rite in the middle Eneolithic period.

2. FUNERARY STRUCTURES

2.1. Zagaje Stradowskie, site 1 ("Mogiła Stradowska"/"Stradów Tomb")

Tombs I and II from Zagaje Stradowskie represent a chamberless type of structure typical of western Lesser Poland, with boundaries delineated by foundation trenches (*e.g.* Król 2011; Rzepecki 2011; Przybyła and Tunia 2013, 141, fig. 2). The tombs differed in size and shape. The better-preserved tomb I was built on the plan of a trapezium (Fig. 2: A). It was approx. 20 m long, with the southeastern front approx. 7 m wide, and the shorter northwestern side approx. 4 m wide. The tomb was framed by wooden posts fixed in foundation trenches. The entrance to the tomb opened to the east and was approx. 2 m wide. The trenches framing the entrance were set deeper than the remaining trenches. No traces of posts were recorded in these trenches, while stones were discovered in the fill. Approximately 4 m from the entrance was a grave in the form of a rectangular box built from limestone slabs, oriented along a NW-SE axis. The grave held the remains of an individual of undetermined sex and age, buried with the head to the NW. The burial was furnished with a cup with a handle of the *ansa lunata* type.

Tomb II was situated approx. 4 m north of tomb I, with its longer axis oriented NW-SE. It resembled an elongated trapezium in its plan. The front was damaged, probably due to erosion. The tomb's length can be estimated at approx. 40 m. The shortest side was 4 m wide, while the width of the damaged front side likely did not exceed 8 m. Traces of wooden

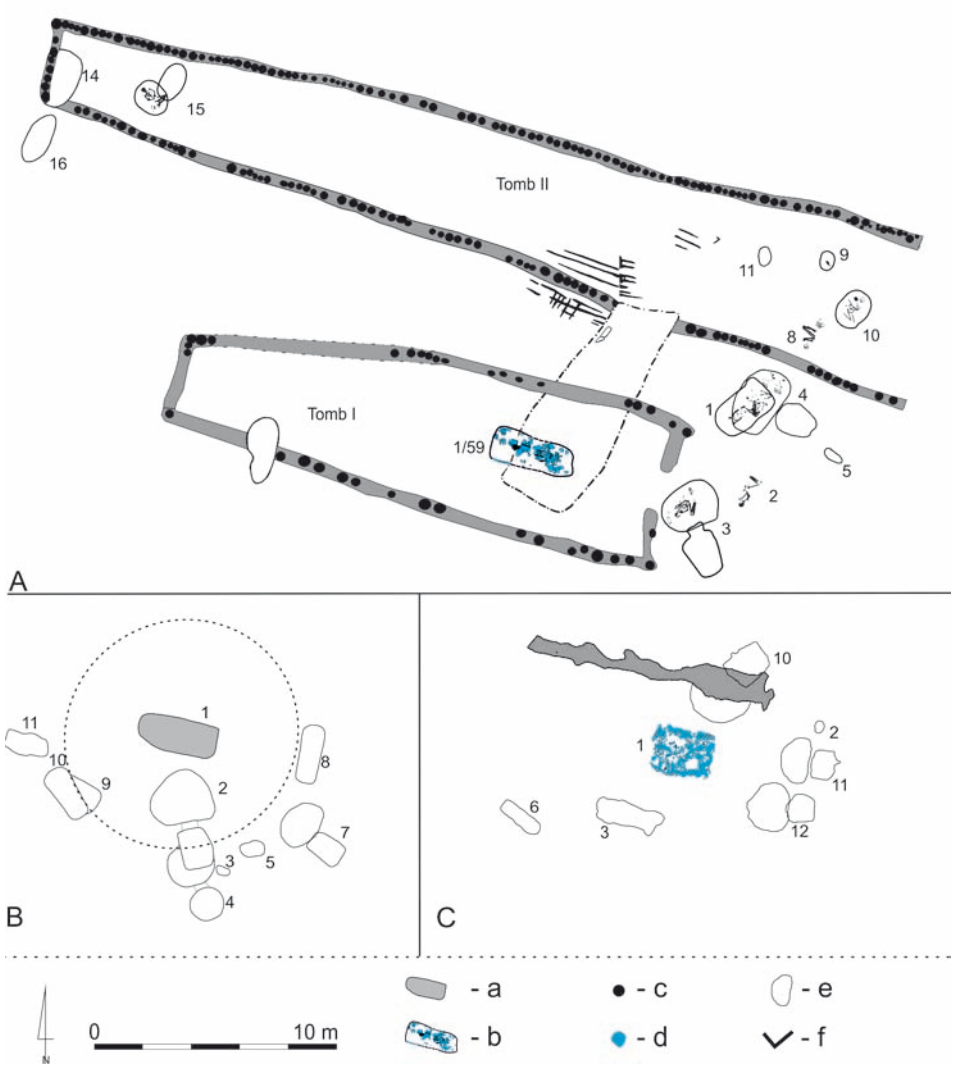

Fig. 2. Tombs of the FBC: A – Zagaje Stradowskie, "Mogiła Stradowska" site, B – Malżyce, site 30, tomb 1, C – Malżyce, site 30, tomb 2. Illustration P. Jarosz

Legend to Figures 2 and 3: a – features of the FBC, b – stone constructions of FBC graves, c – postholes, d – stones, e – graves of other cultures (Final Eneolithic/Early Bronze Age), f – limit of excavated area

posts tightly abutting each other were recorded in the foundation trench. No grave was found within the structure – it was most likely originally located in the damaged front part of the tomb (Fig. 2: A).

2.2. Malżyce, site 30

Tomb I

The tomb had the form of a round mound. The mound has been completely damaged by ploughing, and its original shape was detectable as a circular patch of darker soil. Indirectly, this is also confirmed by the spatial distribution of nearby features linked with the CWC and Mierzanowice cultures, which formed arch-like arrangements from the west, south, and east (Fig. 2: B).

The construction of the tomb uncovered under the alleged, damaged mound was atypical. It resembled a rectangle with the longer side along a W-E axis (Fig. 2: B), with the western, shorter side clearly curved. On the walls of the pit and beneath its bottom, a thin layer of light-orange or dark-yellow loess was recorded, indicative of fire. In the western part of the pit, two ceramic vessels and a flint insert were discovered at the bottom (Tunia and Włodarczak 2011). No human bones were recorded in the pit.

Tomb II

All that survived from the structural elements of tomb II was a shallow trench running along the N-W, to the north of the grave pit (Fig. 2: C). The trench was not very regular in shape, and a few pieces of limestone were found in its fill. If the trench originally surrounded the mound, the latter would have been elongated – most likely trapezoidal in plan – with the longer axis oriented W-E. The same is suggested by the position of grave 3 in relation to the trench, with the surviving fragment marking the southern margin of the tomb. The grave pit was discovered approx. 3 m to the east of CWC graves (nos. 11 and 12; Fig. 2: C), which were certainly situated by the front side of the tomb, even if its remains have not survived. The orientation of the grave pit followed that of the tomb, and it held the remains of two individuals buried with their heads to the west. In the southern part lay the remains of individual I (female, aged *Adultus*; Szczepanek 2009), and to the north those of individual II (*Adultus*, undetermined sex). In the western part of the pit, a macrolithic blade was found, which was the only furnishing of the grave.

Tombs 3/I and 3/II

These two adjoining tombs had similar, most likely trapezium, shapes (Fig. 3: A). In the southern part of the explored area, portions of a trench running NW-SE were discovered (feature 5), with single blocks of limestone in its fill. The trench may have marked the southern wall of tomb 3/I. Approximately 10 m further to the north, a poorly discernible elongated feature was recorded, being the remains of the northern wall of tomb

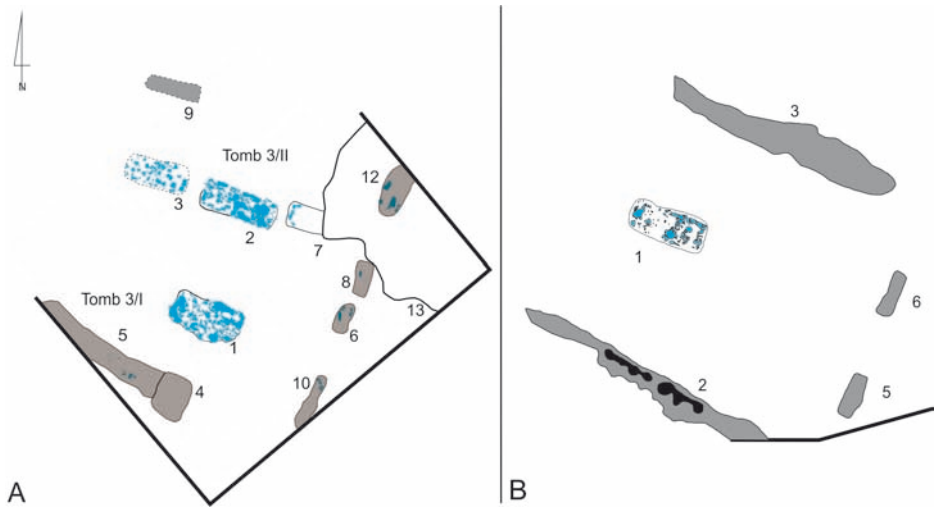

Fig. 3. Tombs of FBC: A – Malżyce, site 30, tombs 3/I and 3/II; B - Malżyce, site 31. Illustration P. Jarosz. Legend: see Fig. 2

3/II (feature 9). The front (eastern) walls of the tombs were marked by four rectangular features: short (from 2.5 to 3.1 m in length) sections of deep trenches in a linear arrangement (features 6 and 10 connected with tomb 3/I, and features 8 and 12 with tomb 3/II). The distances between the features were 200 cm (between features 6 and 10, and 8 and 12) and 50 cm (between features 6 and 8, which at the same time means between tombs 3/I and 3/II). The front walls of both tombs can each be assessed as being 5.75 m in length. The four trenches were similar in terms of shape, nature of the fill, and depth (90-100 cm beneath the present-day ground surface). Each of them contained a few limestone blocks. The trenches were rectangular in section and had flat bottoms. Within tomb 3/II (northern), three rectangular graves with stone boxes were discovered arranged in a line – features 2, 3, and 7 (Fig. 3: A). All were oriented along a W-E axis. In tomb 3/I only one feature was discovered (feature 1). Human bones survived only in grave 1, where a man of the *Maturus/Senilis* age-class was buried (unpublished report by A. Szczepanek). A furnishing, in the form of an end-scraper on a blade made from Volhynian flint, was recorded in grave 2 (Jarosz *et al.* 2013a).

2.3. Malżyce, site 31

The tomb was recorded as two foundation trenches running NW-SE (uncovered over a length of 10-11 m), marking the southern and northern margins of the tomb (features 2 and 3). In the southern trench, traces of wooden posts stabilised with single limestone

blocks survived. The slightly wider trench 3 marked the northern boundary of the megalith. Here, no traces of additional structural elements survived. The eastern, front wall of the tomb was marked by two features (nos 5 and 6), approximately 2.5 m from each other. They were rectangular in plan and section, and their depth reached 40 cm. They were similar to analogical rectangular features forming the front wall of tomb 3 at Malżyce, site 30. A grave, in a stone setting, was discovered approx. 7.5 m from the tomb's front, and its orientation followed that of the tomb. The grave held remains of an individual of undetermined sex in the *Maturus* age-class, buried with the head to the NW (Jarosz *et al.* 2013b).

2.4. Zagaje Stradowskie, information about damaged graves

In the course of excavations of the "Stradów Tomb," the researchers learned about at least five FBC graves in the nearby area, damaged already by ploughing. One of them was allegedly situated to the northwest of Zagaje Stradowskie, in the fields between the village and the Chroberz forest. From this area (designated by B. Burchard as "zone C") comes a fully preserved collared flask – a gift from the owner of the land (Fig. 4: 2). Its preservation suggests it originates from a grave. In the vicinity, about 400 m east of zone C, on the field of Stanisław Pytel, K. Tunia found traces of a few features during a field survey in 2004, as well as concentrations of limestone fragments – probably remains of destroyed graves.

North of Zagaje Stradowskie village ("zone A" according to B. Burchard), Antoni Kałuża (the owner of the field) dug up a grave with a stone pavement and setting in the 1990s. Within the construction, he found human bones and a small cup decorated with incised strokes on the body (Fig. 4: 1). Local people also provided information about another grave discovered nearby (no details available). Excavations carried out by B. Burchard in 1995 to verify this information unfortunately did not produce any more information.

Another grave was discovered in 1982 on the field of Feliks Dobaj, situated to the west of the village, in so-called zone B of the aforementioned area. The farmer brought out of the ground a large cup with an *ansa lunata* handle (Fig. 4: 3) and 13 human teeth. He also noticed the presence of finely crushed limestone – probably structural elements of a grave.

The discoveries presented above suggest the presence of a zone of FBC funerary activity, which can be regarded as a westward extension of the sepulchral complex situated in Malżyce (sites 30 and 31) and Zagaje Stradowskie (site 1). In addition, numerous surface finds are known from fields situated north of the buildings of Zagaje Stradowskie village, indicative of the presence of FBC settlements. On the other hand, no traces indicative of the presence of monumental tombs has – so far – been recorded from this area. This, however, may stem from the patchy nature of the sources.

Fig. 4. Zagaje Stradowskie. Ceramic from destroyed graves. 1, 3 – zone A; 2 – zone C. Illustration E. Włodarczak

3. CHARACTERISTICS OF SEPULCHRAL FEATURES

Among the structures discussed above, the tombs from Zagaje Stradowskie reveal features typical of chamberless tombs from the western part of the Lesser Poland upland (Fig. 2: A). Analogical structures are known from Niedźwiedź (Burchard 1973, fig. 3), Słonowice, Kazimierza Wielka district (Przybyła and Tunia 2013, 141, fig. 2), Karwin and Rudno Górne, Kraków district (unpublished research by K. Tunia), and Pielgrzymowice, Kraków district (site 15; unpublished research by M. M. Przybyła). Their boundaries were delineated by foundation trenches into which a wooden palisade was fixed, on the plan of a trapezium. What was interesting in the context of the tombs from Zagaje Stradowskie was the discovery of discernible negatives of posts within the trenches, and the recording of traces of ploughing which, according to B. Burchard, were connected with agricultural activity predating the construction of the tomb (Burchard 1998, 152-153). Her opinion was based on the analysis of phytoliths (Polcyn *et al.* 2001).

The structures discovered in Malżyce at sites 30 (tombs 2, 3/1, and 3/2) and 31 were most likely built on a plan resembling an elongated trapezium (Figs. 2: C; 3). At the moment of its discovery, the construction of the front wall, consisting of two rectangular features, had no direct parallels in other FBC tombs. Analogical construction was later recorded in tombs discovered in Słonowice (tombs IX and X: Przybyła and Tunia 2013, 141, fig. 2), Ostrów, Proszowice district (unpublished research by P. Jarosz, J. Libera, and A. Szczepanek), Czaple Wielkie, Miechów district (site 14: two tombs), and Giebułtów, Miechów district (site 15; unpublished research by M. M. Przybyła). In the lowlands, feature D150 from Jastrzębiec, Gorzów Wielkopolski district is an example of a chamberless tomb with two elongated pits at the front is (Rzepecki 2011, 33, fig. 18). Of particular importance from a chronological perspective is the case of Słonowice, where tomb X was raised partly over tomb V, the latter being a trapezium-shaped structure with trenches at the sides and at the front (Przybyła and Tunia 2013, 141, fig. 2). This suggests that tombs with structural elements limited to two elongated pits at the front are younger. Moreover, the Słonowice tombs confirm beyond any doubt the existence of constructional differences among elongated chamberless tombs from western Lesser Poland. In light of the data acquired from this site, the reduced structures of the Malżyce tombs do not stem from the state of preservation alone. In tombs of that type, deep foundation trenches were no longer dug along the sides of the tomb, as was the case in tombs I and II from Zagaje Stradowskie.

Regardless of the type of construction, elongated chamberless structures from Malżyce and Zagaje Stradowskie were oriented along an E-W, or less often a SE-NW axis, with the front facing the east (Table 1). Such an orientation is standard in the southeastern group of the FBC (Rzepecki 2011, 104, 105, table 2).

In terms of construction, tomb 1 from Malżyce, site 30, stands out against the structures discussed above. It had the form of a small, circular mound (barrow), erected over

Fig. 5. Malżyce, site 30. Graves of the FBC: A – tomb 1, grave 1; B – tomb 2, grave 1; C – tomb 3/II, grave 2. Photo P. Włodarczak

a single pit-grave. The mound has been fully removed by ploughing, and its borders were indicated by a patch of distinctly darker soil on the surface of the site. The circular outline of the mound was additionally corroborated by the spatial arrangement of graves associated with the CWC and Mierzanowice cultures, which formed an arch surrounding the central grave from the west, south, and east (Fig. 2: B). This is the first fully-confirmed round FBC barrow in southeastern Poland. In Central Europe, round and oval mounds occur as early as the Baalberg phase of the FBC development, and continue until the Boleráz period (*e.g.* Fischer 1956; Šmíd 2006). The genetic and chronological relation of the tomb from Malżyce to circular mounds located at the cemetery in Obałki, in the lowland zone, is difficult to determine (Tetzlaff 1961, 44)

The construction of the central grave in tomb 1 was atypical as well. It resembled a rectangle in shape, oriented along a W-E axis (Fig. 5: A), with the western, shorter side distinctly curved. A thin layer of light-orange or dark-yellow loess was recorded on the walls of the pit and on its bottom indicative of fires being burned. No traces of human remains were found, only grave goods consisting of two ceramic vessels and a flint insert. The absence of stone constructions is a feature rarely observed in graves covered with mounds, while it is more common in flat cemeteries, *e.g.* in Bronocice (Kruk and Milisauskas 1981,

Table 1. Tombs of the Funnel Beaker culture at Malżyce and Zagaje Stradowskie

site	tomb	shape	orientation	length [m]	width [m]	graves of other cultures
Malżyce, site 30	1	round		(diameter) 10		X
Malżyce, site 30	2	trapezoidal?	E-W	?	~8	X
Malżyce, site 30	3/I	trapezoidal?	E-W	?	5.75	
Malżyce, site 30	3/2	trapezoidal?		?	5.75	
Malżyce, site 31	1	trapezoidal?	SE-NW	?	~10-11	
Zagaje Stradowskie	I	trapezoidal	SE-NW	21	7	X
Zagaje Stradowskie	II	trapezoidal	SE-NW	<38	~7-8	X

75), or in the context of megalithic structures, *e.g*. in Pawłów, Sandomierz district (Bargieł and Florek 2006, 387, fig. 2) and Słonowice (Przybyła and Tunia 2013, 146, fig. 7).

The remaining sepulchral features discovered in Malżyce and Zagaje Stradowskie had typical stone structures, with regular, rectangular stone settings. Their walls were built from narrow blocks, filled in with smaller stones, and the bottom was paved with tight-fitting slabs (Fig. 5: B, C). Boxes were built primarily from calcareous limestone. In cemeteries of the southeastern group of the FBC, analogical stone structures are known both from central graves and graves situated near tombs, as well as from flat graves.

Grave pits were oriented along a W-E or, alternatively, a NW-SE axis (Table 1). They were rectangular in plan, with their length varying from 270 to 360 cm, and their width from 120 to 180 cm. Grave 1 from tomb 2 in Malżyce, site 30, was noticeably wider than the rest, resembling a square in its plan (Table 1). Such proportions stemmed from the burial of two individuals in this grave (Fig. 5: B). All pits were situated in the eastern, frontal part of the tombs, although always at a considerable distance (of a few metres) from the front wall. Within tomb 3/I at Malżyce, site 30, the graves were arranged in a line, in a manner resembling that recorded in Słonowice, in tomb VI (Przybyła and Tunia 2013, 141, fig. 2).

Human bones are preserved very poorly in all the graves. In the double grave from tomb II in Malżyce 30, a female of the *Adultus* age-class was buried in the southern part (individual I), while in the northern part, an individual of undetermined sex, also of the *Adultus* age-class, was buried (individual II). They were placed in the grave in supine position, with the head to the west. Other graves in which human remains survived held single burials. All the deceased were buried with the head to the west (Table 1). This position and orientation of the body was typical of the ritual observed in the southeastern group of the

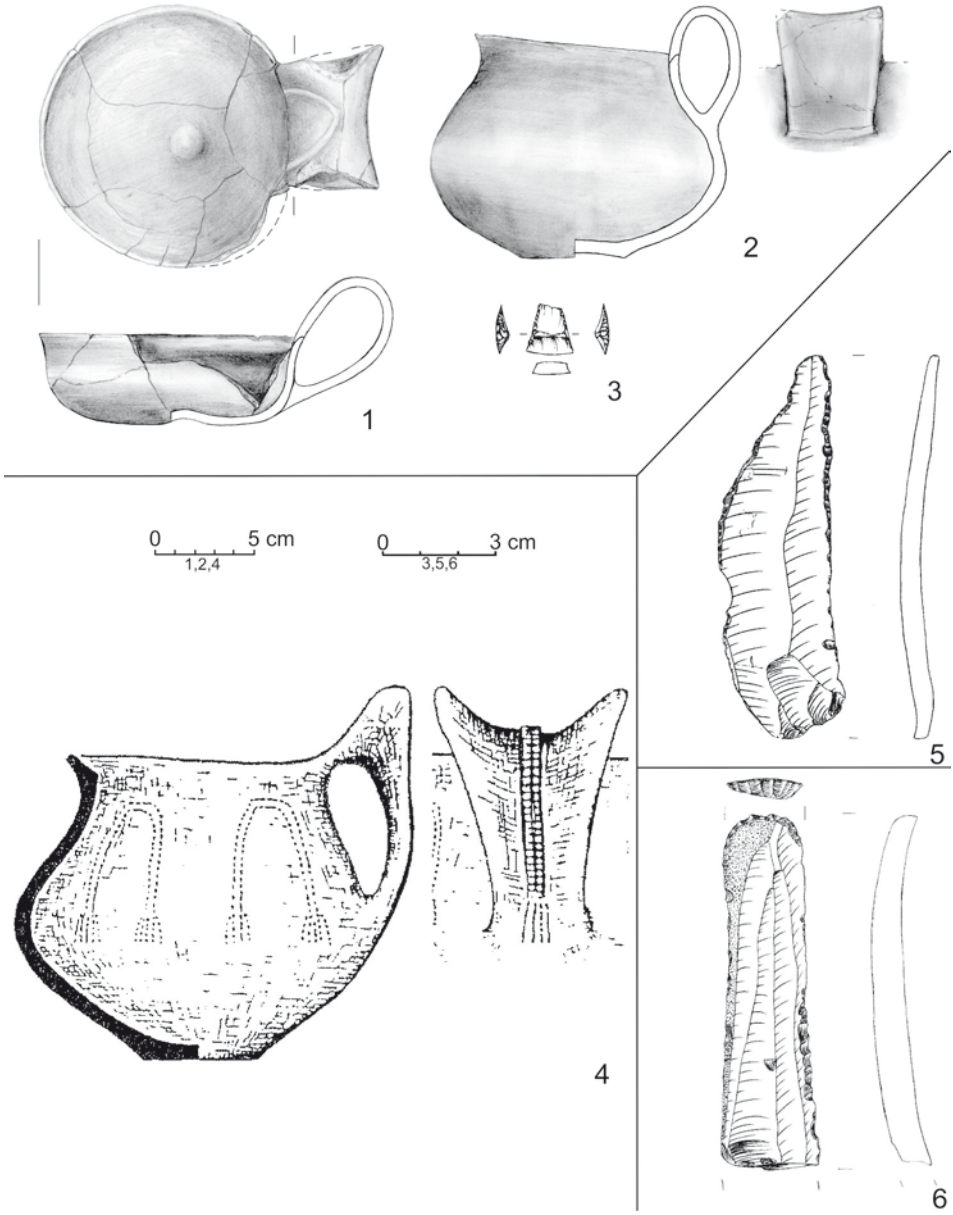

Fig. 6. Inventories of FBC graves:
1-3 – Malżyce, site 30, tomb 1, grave 1; 4 – Zagaje Stradowskie, "Mogiła Stradowska" site, tomb I, grave 1/59; 5 – Malżyce, site 30, tomb 2, grave 1; 6 – Malżyce, site 30, tomb 3/II, grave 2.
Illustration A. Kosik, A. Kukułka

FBC in chamberless tombs (Nowak 2009, 469; Król 2011, 111-113, table 5). Where it proved possible, it was determined that the remains belonged to individuals whose ages-at-death fell into the *Adultus*, *Maturus,* or *Maturus/Senilis* age-classes (Table 1).

Graves from the discussed region were poorly furnished. In the western part of grave 1 in barrow 1 at Malżyce 30, two ceramic vessels and one flint trapeze were found (Fig. 6: 1-3). The shapes of the vessels, the technology of their manufacture, and the micromorphological traits (*e.g.* a circular hollow in the centre of one vessel's base) find analogies in other sites attributed to the southeastern group of the FBC. A distinct trait of the vessels from Malżyce is the shape of their handles, which differ from the most widespread *ansa lunata* handles. The flat, ribbon-like handles of the Malżyce vessels protrude clearly above the rim, and their edges are slightly raised in the upper part. This may indicate chronological proximity to finds from layers C2-C1 in the "Starý Zámek" site in Jevišovice, okr. Znojmo (Medunová-Benešová 1981), and at the same time to the early Boleráz horizon in southwestern Slovakia. Many similar vessels were found, for example, in Hlinsko, okr. Přerov, where they correlated with the above-mentioned chronological frameworks (Pavelčik 1995, 135, fig. 4). They can be dated to around the middle of the 4th millennium BC. Also worthy of note is the relation of the Malżyce inventory to FBC cemeteries in Moravia. The inventory in question finds analogies among materials of the Drahanovice phase – in other words, the horizon of tombs surrounded with stone settings (Šmíd 2003, 104-107). The analogies linking the Malżyce inventory with this phase outnumber those linking it with the later phase of Ohrozim (Šmíd 2003, 114). As for today, the set of vessels from grave 1 at Malżyce, site 30, has no direct parallels in other cemeteries of the southeastern group of the FBC. The discovery of two cups in one grave inventory is unique in itself. Such vessels were typically discovered singly or accompanied by other ceramic forms (most often slender double-handled amphorae and collared flasks).

In grave 1 in Zagaje Stradowskie, offerings in the form of a cup with an *ansa lunata* handle were placed in the western part of the pit (Fig. 6: 4). This vessel type is known from other FBC graves, including Słonowice, tomb VII, grave 54 (Przybyła and Tunia 2013, 143, fig. 4: 3), Pawłów, grave 6 (Bargieł and Florek 2006, 393, fig. 8), Grzybów, Staszów district, tomb II (Garbacz 2006, 320, fig. 17: 1), and Lublin-Sławinek (Jastrzębski and Ślusarska 1985, 195, fig. 6: c). Such cups most likely do not appear before about 3650 BC (Włodarczak 2006, 45).

The offerings discovered in three graves from site 30 in Malżyce included flint tools. Two of them were flint blade tools (Table 1). In grave 1 from tomb 2, a retouched blade was found, and in grave 2 from tomb 3/II, an end-scraper made on a long blade was discovered (Fig. 6: 5, 6). The blades were made from Cretaceous Volhynian flint, a raw material often used for making such artefacts (Libera and Zakościelna 2006, 156). In grave 1, tomb 1, from Malżyce 30, a microlithic trapeze was found, made from chocolate flint. Microliths are rare finds in graves of the southeastern group of the FBC: trapezes were only discovered in grave 14 from site XIV at Klementowice (Libera and Zakościelna 2006, 161) and

in grave 135 from tomb IX in Słonowice (Przybyła and Tunia 2013, 151, fig. 11: 3). As with the ceramic vessels, all the flint artefacts were found in the western parts of grave pits.

Three vessels originate from the above-mentioned damaged graves, discovered near Zagaje Stradowskie village. The large cup with the *ansa lunata* handle (Fig. 4: 3) resembles the vessel from grave 1/59 in the "Stradów Tomb", but it is undecorated. The collared flask with a handle (Fig. 4: 2) is also a vessel typical of the "classic stage" of the FBC, with a close analogy in an artefact from grave 54/2005 in Słonowice (Przybyła and Tunia 2013, 143, fig. 4). On the other hand, the cup with the protruding handle (Fig. 4: 1) is a unique specimen, finding no direct analogies in graves of the southeastern group of the FBC. The vessel is decorated with a pattern of hatched triangles, which makes it similar to vessels known from pit 2/1969 in Bronocice (Burchard 1975, 73, fig. 5: a; Kruk and Milisauskas 2018, Ill. 42: 3) and from the Niedźwiedź settlement (Burchard 1973b, fig. 1: j). This is a rare decoration among western Lesser Poland materials, and one characteristic of the Boleráz horizon (Burchard 1975, 72, 74). The cup from Zagaje Stradowskie originated from a damaged grave with a stone structure. This suggests the cemetery still remained in use in the late phase of the FBC, at the beginning of the second half of the 4th millennium BC.

4. RADIOCARBON DATING

Radiocarbon dates were obtained for three graves from the Malżyce cemeteries (Table 2).

Human bone samples from grave 1, tomb 2, at site 30 and grave 1 at site 31 produced dates of 3622-3377 BC and 3635-3523 BC, respectively (Table 2; 68.2% probability; OxCal v4.3.2, see Bronk Ramsey 2009). This correlates with phase Br II at the site of Bronocice,

Table 2. Characteristic of grave pits of FBC from Malżyce and Zagaje Stradowskie

site	tomb/ grave	length and width [cm]	orientation	age and sex	head	inventory
Malżyce, site 30	1/1	325x145	E-W			2 x cup + flint trapezium
Malżyce, site 30	2/1	265x220	E-W	*Adultus* ?	W	flint retouched blade
				Adultus ♀	W	
Malżyce, site 30	3/I/1	300x180	E-W	*Maturus-Senilis* ♂	W	
Malżyce, site 30	3/II/2	330x120	E-W			flint retouched blade
Malżyce, site 30	3/II/3	270x120	E-W			
Malżyce, site 30	3/II/7	150x100	E-W			
Malżyce, site 31	1	330x140	SE-NW	*Maturus*	W	
Zagaje Stradowskie	I/1	360x140	SE-NW	?	W	cup

Table 3. Radiocarbon dating of FBC graves from Malżyce funerary complex

site	tomb/ grave	dated material	lab. no.	BP	BC cal. (68.2% probability)*
30	1/1	charcoal	Poz-34682	4750±40	3634-3387
30	1/1	charcoal	Poz-34736	4700±40	3622-3377
30	2/1	human bone	Poz-27989	4700±40	3622-3377
31	1/1	human bone	Poz-48428	4765±35	3635-3523

* Acc. to OxCal v4.3.2 program of C. Bronk Ramsey from 2017

Pińczów district (Kruk and Milisauskas 1983, 267-273; 1990, 223, 224; 1991, 174; Kruk *et al.* 2018), and at the same time with the age of the nearby settlement at Zawarża, Pińczów district. The latter is linked with the older stage of the classic phase (i.a. Burchard 1981, 226-228; Burchard *et al.* 1991, 99, fig. 2; Kulczycka-Leciejewiczowa 2002, 90-92), which is confirmed by a single radiocarbon date obtained for feature 67 at this site (Kruk *et al.* 2018, 39, table 9).

Two similar results were obtained for charcoal samples collected from the central grave in barrow no. 1 at site 30 (Table 2). The mean age (R_Combine function in OxCal) corresponds to the years 3628-3586, 3531-3510, and 3425-3382 BC (68.2% probability), with the oldest and youngest of these ranges equally probable. The youngest range should be synchronised with phase Br III at the Bronocice settlement, which means the stage when Proto-Baden influences become clearly discernible (Boleráz). Such a chronological position of grave 1 from tomb 1 at Malżyce, site 30, seems possible given the Pre-Baden stylistic traits revealed by the vessels from that grave (*cf.* Zastawny 2018). This would make the round barrow from Malżyce the yongest tomb among the FBC funerary structures explored so far in western Lesser Poland.

No absolute age determinations have as yet been obtained for classic trapezium-shaped structures of the Niedźwiedź type (known as megaxylons), such as tombs I and II from the "Stradów Tomb" in Zagaje Stradowskie. It would be very interesting to verify the hypothesis positing their chronological position as earlier than the Malżyce type tombs. At present, it cannot be ruled out that they represent the earliest type of megalithic structures in western Lesser Poland.

5. CONCLUSIONS

Eight Eneolithic funerary structures have so far been identified in the loess hills between Malżyce and Zagaje Stradowskie, of which six have been explored (Fig. 7). The earliest phase of their functioning is marked by tombs erected by an FBC population in the 4th millennium BC. These tombs probably created a sacral area, which later attracted other

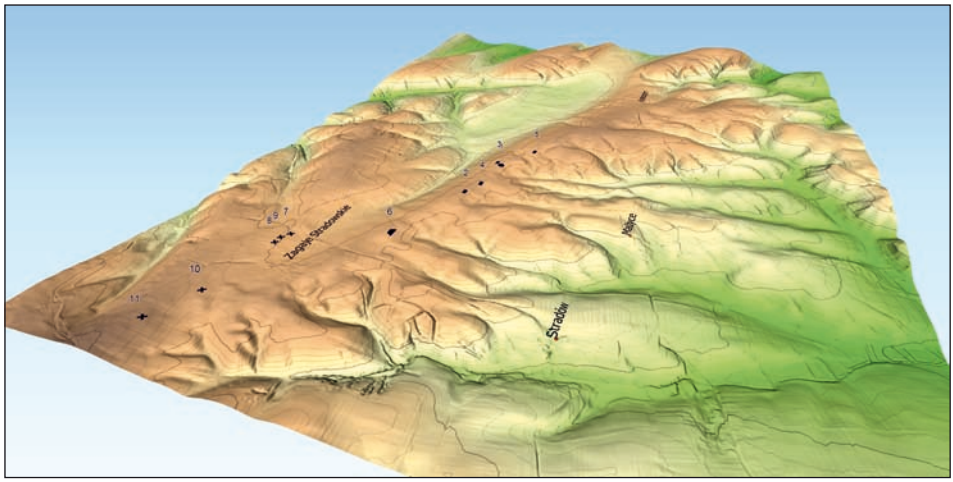

Fig. 7. Location of FBC sites in Malżyce and Zagaje Stradowskie. Numbers of sites: see fig. 1. Illustration R. Skrzyniecki

communities to bury their dead there. In this way, at the turn of the Eneolithic and the Bronze Age, cemeteries of the CWC and Mierzanowice cultures were established next to the Zagaje Stradowskie tombs and next to tombs 1 and 2 at Malżyce, site 30. The "Stradów Tomb" was also used for sepulchral purposes in the Early Middle Ages. A successive usage of FBC tombs for funerary purposes by Final Eneolithic and Early Bronze Age populations has been documented in other cemeteries in Lesser Poland as well (Włodarczak 2006, 48-50), with examples known from nearby sites of Kolosy, Kazimierza Wielka district (Kempisty 1978; Włodarczak 2008) and Pełczyska, Pińczów district (Rudnicki 2004; Rudnicki and Włodarczak 2007).

The information produced by the excavations points towards the considerable diversity of the megalithic burial rite in western Lesser Poland. Apart from the classic tombs of the Niedźwiedź type discovered in Zagaje Stradowskie (Fig. 2: A), a round barrow covering a centrally-placed grave pit was discovered for the first time in Poland. Original constructions were also recorded at sites 30 and 31 at Malżyce (tombs 2, 3/I, and 3/II) in which, while the plan of an elongated trapezium was maintained, the tombs were no longer outlined by a narrow palisade trench running around the entire perimeter, as was common in the Niedźwiedź-type tombs (Rzepecki 2011, 13). Instead, the sides were only partly confined by irregular trenches (Jarosz *et al*. 2009, 178, fig. 3; 2013a, 124, obr. 11).

Rectangular pits are another characteristic element, forming parts of the front wall (site 31 and site 30, tomb 3; Fig. 3: A, B). A similar "reduced construction" was recorded in the lowest-lying part of the Słonowice site (Przybyła and Tunia 2013). This allows for the assumption that tombs of the "Malżyce" type were built parallel with the younger phase of

the Słonowice cemetery. The type of construction recorded in Malżyce soon after its discovery found good analogies in a few other sites in western Lesser Poland (*e.g.* Czaple Wielkie, Giebułtów, and Ostrów). The radiocarbon dating of tombs from the younger phase, which were dug next to the tombs in Słonowice, is close to the absolute age determinations obtained for Malżyce (Przybyła and Tunia 2013, 157, table 1). In light of new discoveries, chamberless tombs from Malżyce have come to be seen as structures typical of FBC cemeteries in western Lesser Poland, reflecting a trend characteristic of the late "classic" stage of this culture.

The change in the FBC burial rituals, consisting in Niedźwiedź-type tombs being phased out by structures of other types, seems evident also in the cemetery at Pawłów (Bargieł and Florek 2006). At that site, as in Słonowice, a large, trapezium-shaped stone-and-timber structure inspired the establishment of a complex of tombs of different construction to the south of it.

The data from the sites discussed here, and the stratigraphic evidence from Pawłów and Słonowice, seem to indicate the possibility of a chronological differentiation of FBC tombs from western Lesser Poland. The older horizon would be marked by timber megaxylons (tombs of the Niedźwiedź type), and the younger one by tombs of the "Malżyce" type and round mounds.

The available age determinations allow for a conclusion that the sepulchral complex in Malżyce and Zagaje Stradowskie was established within the range of approx. 3650-3350 BC. This range overlaps nearly exactly with the dating of the "classic phase" of FBC development in loess uplands of southeastern Poland, or, referring to the periodisation developed for Bronocice, with phases Br II and Br III (Kruk and Milisauskas 1983; 1990; Kruk *et al.* 2018, 71, 77; also see Nowak 2009, 325-344).

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THE FIRST MEGALITHIC LONG BARROWS OF THE FUNNEL BEAKER CULTURE IN CENTRAL GREATER POLAND IN SOBOTA

ABSTRACT

Żurkiewicz D., Niebieszczański J. and Bahyrycz C. 2020. The First Megalithic Long Barrows of the Funnel Beaker culture in Central Greater Poland in Sobota. *Sprawozdania Archeologiczne* 72/1, 333-354.

The aim of the following paper is to present the verification of probable megalithic long barrows of the Funnel Beaker culture, detected on LIDAR models. The location and characteristic shape of the structures seem to support such a hypothesis. In order to define their actual function and chronology, a magnetometric prospection was conducted with subsequent geological drillings. Also, an archival study of the vicinity was provided to establish the barrows within the regional cultural context. As a result of the research, the anthropogenic origin of these structures was confirmed and connected to the Funnel Beaker culture. This discovery allows for the incorporation of central Greater Poland into the discussion on megalithic funerary activity, which, until now, has been impossible due to the lack of data.

Keywords: Megalithic tombs, Long barrows, Funnel Beaker culture, Non-invasive research, Neolithic
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1. INTRODUCTION

Monumental funerary architecture is the essential component of the Funnel Beaker culture (further FBC). The present state of knowledge concerning Greater Poland in the Neolithic generally has not allowed for the incorporation of this region into the wider discussion on the megalithic phenomenon. This has resulted in a confusing picture, in which more than 3000 sites of the FBC are known, but without recognized megalithic cemeteries like in the adjacent regions (Rzepecki 2011, 67; *i.e.* Kuyavia, western and central Pomerania, Lower Silesia, Lesser Poland or northeastern Germany; see Fig. 1). Therefore,

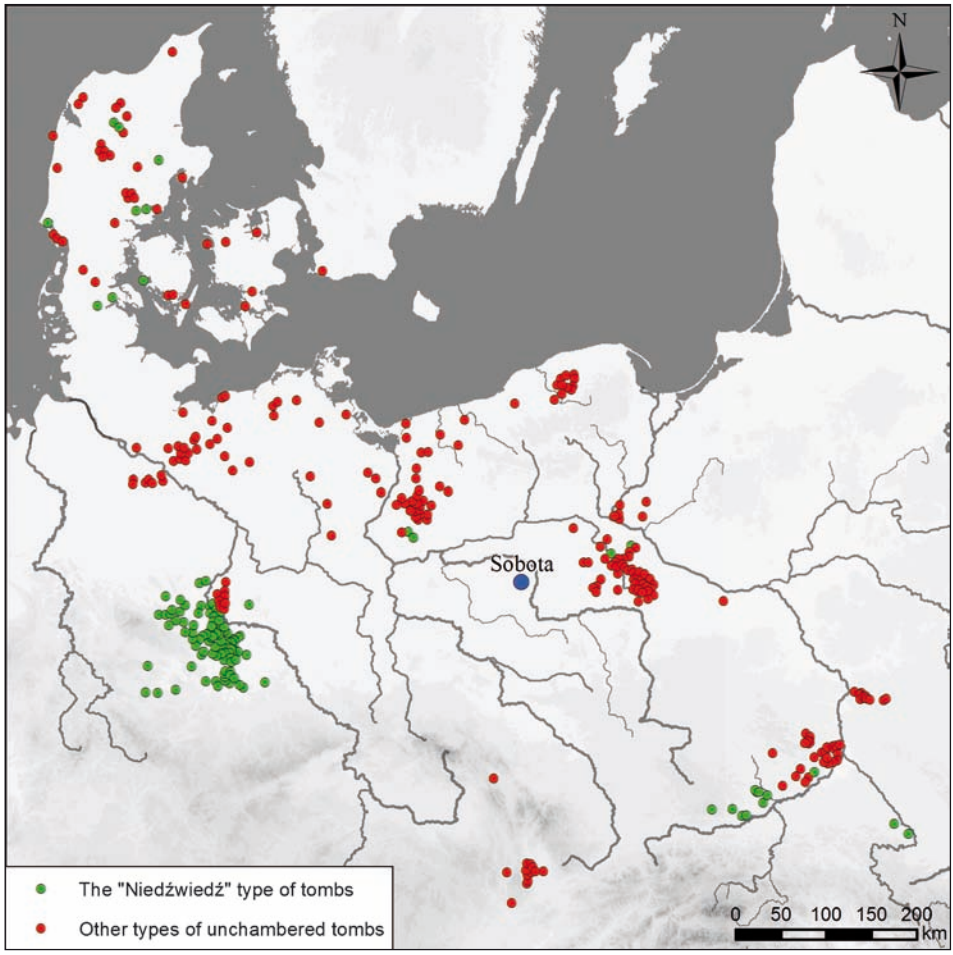

Fig. 1. Distribution of FBC long barrows in Central Europe
(after Rzepecki 2011, and redrawn)

a certain gap in the distribution map can be observed in Greater Poland. The aim of this discussion is to determine whether this is an actual gap in the occurrence of megalithic structures, or simply a gap in our knowledge.

Up to now, only two structures in central Greater Poland mentioned in the literature are related to the megalithic phenomenon of the FBC. The first is located in Ocieszyn, nearby Oborniki Wielkopolskie, only 8 km in a straight line to the north of the Sobota site. However, this was an accidental find, not thoroughly verified, and therefore, there are some doubts about its chronology, as it is highly probable that the tomb was erected by the Globular Amphora culture (Prinke and Przybył 2005). The second construction is known only from a surface survey in Chełmsko, near Międzyrzecz – about 80 km west of Sobota. As such, the Sobota site could be seen as the first verified and thoroughly investigated cemetery in the area of Greater Poland. Its discovery is associated with the works of T. Wiktorzak from the *Łupawa Megaliths Society*, who shared the results of his LIDAR reconnaissance with the authors.

2. MATERIALS

The discussed structures are located within a small forest on the lower terrace of the Samica Kierska River – a right-bank tributary of the Warta River. In this area, the valley of the Samica Kierska River has a longitudinal orientation, and its width reaches 2.5 km. The site lies about 20 m below the plain above the valley (Fig. 2), on a small hummock about 320 m east of the river. The tombs are oriented with their "tails" towards the river, while their frontal sides are exposed to a small peat bog (Fig. 3).

The LIDAR digital elevation models derived from the ISOK program enabled 5 structures in the shape of long barrows to be distinguished. They are arranged in a radial manner (Fig. 3), growing fan-like from their "tails" in the WNW to their fronts in the ESE. The length of the structures varies between 132 and 145.5 m, while the width of their frontal parts measures between 10 and 14 m (Table 1). Based on the field reconnaissance, the structures seem to present an earthen type of construction, although some stones were observed in the outlines as well. The latter, however, did not form any organized alignments visible on the ground.

Table 1. Dimensions of the megalithic tombs in Sobota, site 52

Tomb no.	Length	Width (frontal part)
M1	145,5	14
M2	132	12,2
M3	142	10,3
M4	140	10
M5	145	13

Fig. 2. Location of the long barrows at Sobota, site 52, and the aquatic deposits from Sobota, site 3

The preliminary study including the LIDAR imagery analysis showed that both the shapes of the constructions, as well as their dimensions and orientation, strongly point to the FBC type of earthen long barrows. Such tombs, including those with stone enclosures, were often associated with individual graves. They belong to the oldest monumental structures with a funerary function in this part of Europe. Similar long barrows of an oblong or trapezoidal form are well known in Poland, from the territories of both the eastern and south-eastern groups of the FBC. The emergence of this funerary horizon is dated to approximately 4000/3900 BC (Król 2018).

3. METHODS

In order to recognize the function and internal structure of the objects in Sobota we have used a non- or minimally-invasive set of methods including magnetometry and geological coring. Moreover, historical cartography was provided for the area to look for any indications of the megaliths on older maps.

3.1. Magnetometry

In the case of Sobota's earthen long barrows, supposedly with additional stone encirclements, the magnetic prospection was of great importance to the verification of these structures. The stones with ferri- and ferro-magnetic minerals, burnt wooden structures, daub and ceramic concentrations, as well as general differences in lithology of the tombs, could provoke the occurrence of anomalies detectable by this method (Schmidt 2007).

The prospection covered an area of 0.13 ha, including the frontal part of the M4 tomb and the southern part of the front of barrow M5 (Fig. 3). The choice of this part of the cemetery was based on the dense pine and spruce cover in the rest of the area. Therefore, only this part was suitable for prospection, and it might have resulted in the detection of archaeological features that usually occur in the frontal parts of the long barrows.

The survey was conducted using the Bartington Fluxgate magnetometer, model Grad601. The equipment consisted of one probe (suitable for prospection in a forested area) which had 2 sensors separated by a 1 m vertical interval. The precision of measurements was set to 0,1 nanoTeslas (nT), while the range of measurements was held between -3,000 and

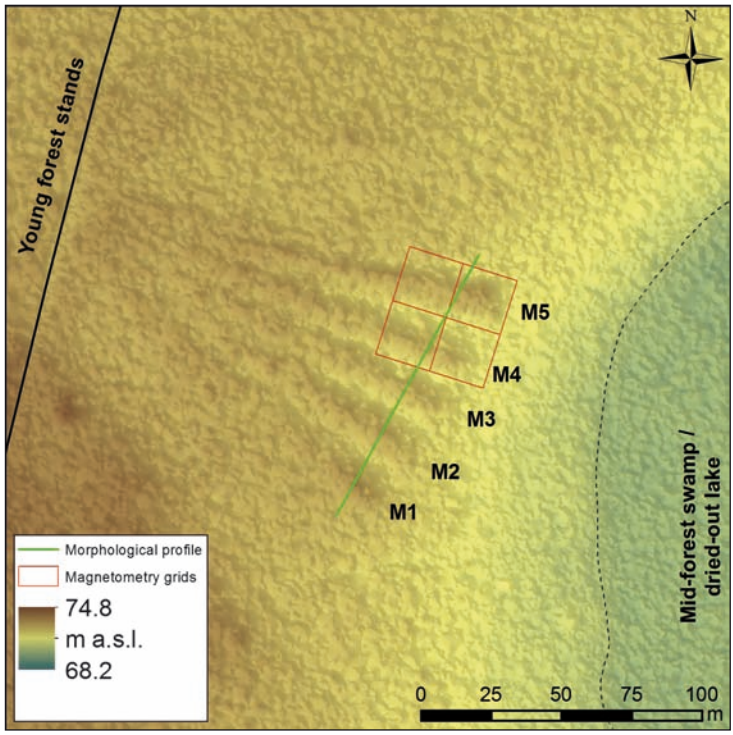

Fig. 3. Digital elevation model (based on ISOK data) of the cemetery in Sobota, site 52

3,000 nT. The overall prospection took place within two grids (20 x 20 m each) and two partial ones. The latter of these embraced the southern part of the M5 tomb. The area to the north of the margins was overgrown by bushes and young spruces; therefore, it was impossible to conduct the survey there. The traverse interval was set to 50 cm, while the measurements were each 0.25 m along the traverse and, taken in parallel mode (northwards).

The visualization of the survey data was conducted in the Geoplot 3.0 software. Various filters were set to avoid any measurement artifacts, such as: *Zero Mean Grid*, *Zero Mean Traverse*, *High Pass Filter* and *Interpolation*. The derived imagery was then exported to a *.grd* file and again converted to a point feature in the ESRI ArcGIS software. In this way, all of the error artifacts were deleted, allowing in the next step for the interpolation of a "clean" dataset.

3.2. Drillings

In order to verify the magnetometric results and to reveal the nature of the anomalies, a set of drillings was conducted. During the fieldwork, a hand-operated open auger was used to probe the sediments and to reveal the stratigraphy. Each auger of 25 cm was documented macroscopically in terms of the lithology and stratigraphy of layers. The drillings were taken from the natural background, which, in the case of Sobota, was comprised of glacifluvial sands.

3.3. Historical mapping

Before making any essential interpretations of the fieldwork, a cartographic analysis was provided for the discussed structures. Despite the numerous series of maps available for the area, there were no indications or topographical markers related to the long barrows (like Ger. *Hügelgraber* or *Schwendeschanze*). Therefore, the focus was given to the cemetery's context and land-use based on the historical mapping, in order to answer whether the structures were the effects of agricultural works, such as deposits of stones removed from fields or waste deposits in the 19th century.

4. RESULTS

4.1. Results of the magnetometry prospection

The obtained imagery (Fig. 4) presents a complex distribution of magnetic anomalies and their characteristics (shapes, sizes and locations). The maximum values recorded on the site, after the deletion of error artifacts, were approximately 40nT, while the minimal value was about -47 nT. The minimum – maximum range of values represented on the magnetic plan resulted in the detection of anomalies resembling stones abundant in ferri-

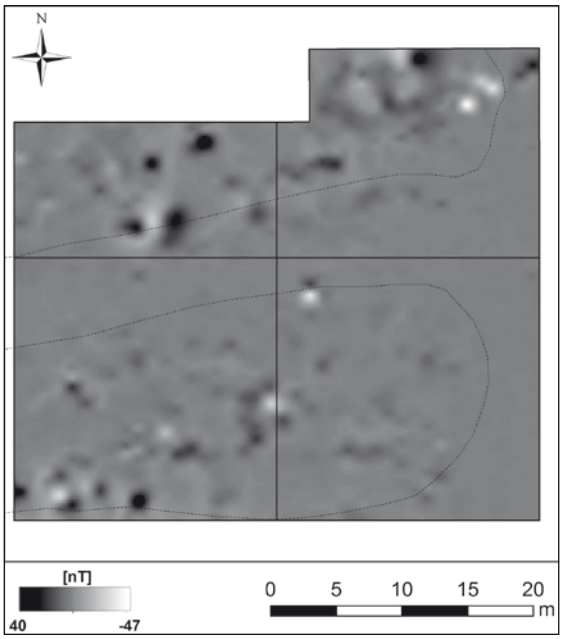

Fig. 4. Results of magnetometry prospection at the site of Sobota. For location of the grid net, see Fig. 3

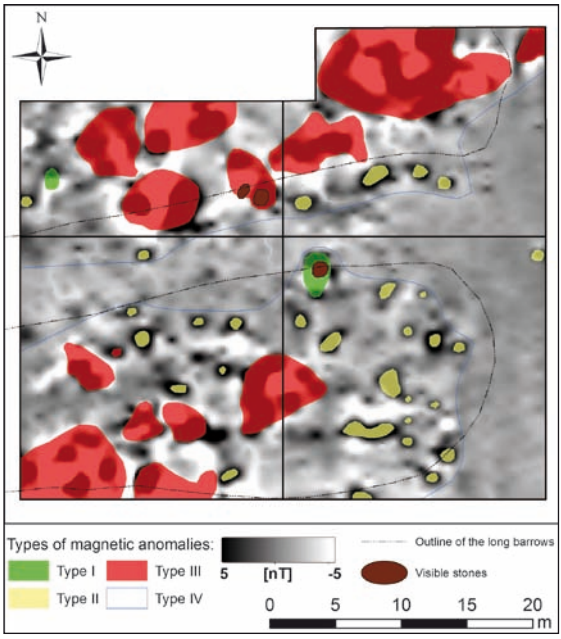

Fig. 5. Interpretation of magnetometry results at Sobota, site 52. For location of the grid net, see Fig. 3

and ferromagnetic minerals. To support the interpretation, a topographical survey was conducted, which revealed the distribution of stones visible on the ground and allowed comparison with the magnetic plan (Fig. 5). In order to interpret the anomalies reflecting lithological differences (*e.g.* earthen mound, pit backfill, grave chambers, etc.) a narrower range of values was applied (5 / -5 nT).

The general appearance of the resulting image shows that the distribution of anomalies is concentrated mostly within the extent of the prospected long barrows (Fig. 4, 5). This was the first argument for considering these structures as anthropogenic features. However, due to the fact that the discussed anomalies differed in terms of their magnetic properties and positions, it was decided to describe them separately, and they were divided into 4 types (Fig. 5).

Type I

The first type of anomalies consisted of two larger features located in the central and northwestern parts of the prospected area. These were bipolar anomalies with a north – south orientation of polarity. Usually, such magnetic features are interpreted as metal objects; however, in this example, it is highly probable that they indicate the presence of stones with high magnetic properties. A supporting argument for this interpretation is the position of a stone, noted during the survey, in the same spot as the occurrence of the central anomaly of type 1 (Fig. 5).

Type II

The numerous anomalies (a total number of 31) of a unipolar character were classified as type II. This class comprises both the positive and negative signals. The distribution of these anomalies indicates two concentrations, reflecting the extent of the two investigated long barrows. There was only one anomaly of this type recorded outside the tombs – in the eastern part of the study area. While the oval shaped anomalies might also represent stones, like type I, the features with irregular outlines could reflect lithological differences in the subsoil, perhaps also related to archaeological origins.

Type III

Type III consists of 13 anomalies, which resemble type I in regard to the presence of both positive and negative signals. The difference lies in the regularity of the field orientation and the extent of the anomalies. In the case of type III, the poles are highly disturbed by the effect of overlapping magnetic fields. This might suggest that the features emitting signals are not single objects, but, most probably, are the effects of a concentration of, for example, organic sediments, burnt structures or stone prisms. The latter seems to be the

reason for the anomaly recorded on top of tomb M5, where in the same location, two stones were registered during the survey. In the case of barrow M4, the anomaly was verified through drilling, which revealed that a larger stone was located in the subsurface layers. Also within the core some charcoals were noted, which also might be the reason for the occurrence of this anomaly.

Type IV

Type IV consists of most of the above anomalies. This class represents the clusters of anomalies that correspond with the morphological outlines of the surveyed tomb. Also, the spaces in between the anomalies and within the extent of the tomb differ slightly from the magnetic background representative of the "geological background" of glacifluvial and non-magnetic sands. This might suggest the occurrence of lithological differences between the long-barrow structures and their context.

The discussed structures, seen in light of the results of the magnetometry survey, should be considered, with high probability, as anthropogenic features. The presence of anomalies reflecting the concentrations of stones indicates that the elongated mounds might be interpreted as the remnants of FBC funerary activity. Also, it cannot be excluded that some of the anomalies (especially type III) may be a reflection of burnt or mixed material, abundant in organics, characteristic for anthropogenic sediments.

4.2. Results of geological drillings

A total number of 13 drillings were performed in order to reveal the stratigraphy of the site, and to verify the interpretation of the magnetometry survey. As there were two aims of this procedure, it was decided to present the results in two sections – verification and stratigraphical drillings.

4.2.1. Verification drillings

Borehole 1/01 was established in the foreground of the M4 tomb to reveal the natural stratigraphy, and to recognize what lies behind the neutral magnetic signal in the geophysical plan. Three main lithological units were encountered in the drilling. The first was the 6-cm-thick topsoil layer, comprised of highly organic material abundant in roots. The matrix of this unit was defined as silty sands. Below, down to 40 cm below ground level (b.g.l.), a dark yellowish layer of silty sands was registered. The lowermost unit consisted of fluvioglacial sands with the occurrence of fine gravels, which continued down to 90 cm b.g.l., where the drilling was stopped.

Drilling 1/02 was characterized by the same lithology and stratigraphy as described above. The aim of this borehole was to counter-verify the geological background record and the neutral magnetic signal.

Drilling 1/03 was located in the frontal part of tomb M4, within the oval anomaly recorded on the magnetic map. The main reason for obtaining this core was to verify the occurrence and explain the nature of the anomaly, but also to reveal the stratigraphy of this part of the mound. The topsoil layer was 9 cm thick and consisted of blackish sediments with numerous plant roots. Below, down to 20 cm b.g.l., organic sediments were recorded with a dominant proportion of silty sands. From 20 to 60 cm b.g.l., a layer of dark yellowish sands, with some addition of silts, occurred. At a depth of 38 cm b.g.l., in the wall of the borehole, a larger stone (not precisely defined in terms of size) was indicated by the metal friction of the auger. Another large stone at a depth of 60 cm b.g.l. prevented further drilling. Its size must be considerable, as it was not possible to "move it" with the special auger for coarser sediments. The stratigraphy of this core allows us ascertain that the anomaly was a result of the presence of a stone (or both stones).

The 1/04 core was taken from the area of occurrence of an intense, bipolar anomaly located in the frontal part of tomb M4. The first encountered layer consisted of only 3-5 cm of soil, similar to the one recorded in drilling 1/03. Below, highly-mixed, dark-greyish, sandy silts continued to a depth of 75 cm b.g.l. Moreover, some levels (from 40 to 75 cm b.g.l.) of this part of the profile included the addition of a significant share of clay. This entire stratigraphical unit should be interpreted as an anthropogenic layer, due to the non-homogenous structure and texture of sediments. At a depth of 75 cm b.g.l., a stone was encountered. Luckily, it was possible to push it towards the borehole wall, and the drilling could continue. From 75 to 100 cm b.g.l., yellowish, silty sands were noted, which were composed of some fine gravels, with the addition of one charcoal particle (95 cm b.g.l.). Below the 100 cm level, glacifluvial sands marked the natural stage of the profile's stratigraphy.

4.2.2. Stratigraphy drillings

Drilling 2/01 was set in the frontal part of tomb M1. The very top of the profile consisted of a 5-cm-thick layer of soil, while the second unit was composed of greyish, silty sands, about 10 cm thick. From 15 to 30 cm b.g.l., a lighter, greyish-yellow layer of mixed sands with organics was registered. Below, down to 60 cm b.g.l., a similar unit was encountered, but it consisted of more homogenous sediments. Another unit in the profile, down to 90 cm b.g.l., was created by highly-mixed, fine sands with dark organic spots. At a depth of 65 cm b.g.l., a layer of charcoal was recorded. The share of the organic matter in this part of the profile gradually increased towards the bottom. Beneath, a 25 cm layer of dark, organic, silty sands was documented, which may well be the decomposed and partially mineralized peat bog material from the adjacent swamp. Within this unit, a considerable amount of mollusk shell fragments were recorded, which again supports the interpretation of re-deposited peat bog material brought here during the construction of the monument (Fig. 6). The lowermost layer, beginning at 95 cm b.g.l., was composed of glacifluvial sands.

Fig. 6. Sediments within drilling 2/01, located in the frontal part of tomb M1. Horizontal levels from 50 to 120 cm b.g.l., with clearly visible organic-rich layers

The drilling of tomb M4 was located in its frontal part and numbered 2/04. The forest soil layer was 5 cm thick, and below that, down to 40 cm b.g.l., was a layer of dark-greyish, fine sands with the addition of some organic matter. From 40 cm down to 150 cm b.g.l., the profile resembled glacifluvial sands, but this part was not homogenous enough to describe it as such. At some depths – especially at 65 and 95 cm b.g.l. – clearly visible laminations of iron oxides emerged, which might suggest the presence of lithological boundaries, perhaps related to the pre-monument soil levels.

The borehole 2/06 was made in the most prominent part of the front of tomb M3. The topsoil was 9 cm thick, while below, down to 20 cm b.g.l., dark yellow, fine sands occurred. Another unit was composed of a small intercalation (5 cm thick) of light-greyish sands. From 25 cm down to the very end of the profile at 140 cm b.g.l., fine sands were encountered, similar to the ones from the context of the long barrows. Like in the previous drilling, this unit did not resemble glacifluvial sands due to its inhomogeneity. At the level of 100 cm b.g.l., a clear intercalation of iron oxides was recorded, thus indicating the transition to the definite glacifluvial material, which continued to the end of the profile.

Drilling 2/07 was made in the frontal part of tomb M5. The first unit consisted of 5 cm of topsoil, under which lay a 10-cm-thick layer of grey, silty sands. From 15 down to 30 cm b.g.l., the auger encountered fine sands of a yellowish color. In the middle part of this unit, a larger rock was also recorded. The next layer (30-90 cm b.g.l.) was composed of yellowish, fine sands with spots of organic matter. Within this layer, at a depth of 50 cm b.g.l., a few horizontal layers of iron oxides were documented. Another unit was registered from a depth of 90 down to 100 cm b.g.l., and consisted of yellowish, fine sands. Below, sands heavily mixed with organic matter (a possible palaeosurface layer) were encountered down to a depth of 125 cm b.g.l., under which began the glacifluvial sands.

In the flat area between the frontal parts of the long barrows, a series of drillings were conducted (a total of 4 drillings), in order to reveal the stratigraphy of the direct context.

In general, they resembled exactly the same stratigraphy and lithological properties as drillings 1/01 and 1/02. The upper parts of the profiles were comprised of forest soil. Beneath lay the dark-yellowish unit of silty sands, while the lowermost part was composed of glacifluvial sands with a considerable amount of fine gravel.

4.2.3. Synthetic profile of the cemetery

As a result of the drillings some stratigraphical issues can be discussed, concerning (among other things) the most probable method of construction of the burial mounds (Fig. 7). In light of this research, the geological context is composed of a material deposited here during the last glaciation, in the foreground of the glacier by the melting waters. The dominant fraction here is sand, fine or medium grained, with some addition of fine gravel. A similar description of the subsurface geology in the area was given by Skompski (1993), who was the author of the Detailed Geological Map of Poland – the Oborniki Wielkopolskie Sheet. Outside the long barrows, the uppermost level of this sand occurred at a depth of 30 to 40 cm b.g.l. Above, the layer of silty sand occurred with a distinctively darker color, due to active soil processes. Usually the A-horizon of the soil occupied the range between 7-15 cm b.g.l. in the context of the cemetery.

A rather different stratigraphy was documented within the earthen long barrows. The difference can be observed not only between the tombs and the context, but also between each of the mounds. The only similar feature among all investigated structures was the soil layer, though significantly shallower than the one recorded in the background. This may suggest a shorter time for topsoil development. The last similarity lies in the lowermost, non-anthropogenic parts of the corings; all of the long barrows were erected on the same geological surface as the one recorded in the contextual boreholes.

The units registered in each of the mounds – especially their stratigraphy – presented different pictures, probably related to their construction methods. The most complicated stratigraphy was observed in the case of tomb M1. It was built from at least significantly different geological units. The lowermost level was composed of a dark organic material, resembling peat-bog material with an abundance of shells (possibly obtained from the direct vicinity of the cemetery – the swamp), while the upper part consisted of highly mixed, silty sands with numerous spots of organic matter. Therefore, it should be considered that there were two phases of the emergence of this particular long barrow, or at least that the material was obtained from different parts of the adjacent area. The neighboring barrow M2 lacked the organic-rich deposits and presented a rather monotonous stratigraphy. Only the layers of iron oxides might represent the palaeosurface or particular stages of construction, while the anthropogenic nature of the mound can be seen in the slight inhomogeneity of the sands. Tomb M3 was characterized by the most homogenous stratigraphy sequence. The mound differed from the geological background only by its slightly darker color and considerably higher proportion of silt. Like in barrow M2, iron oxide layers

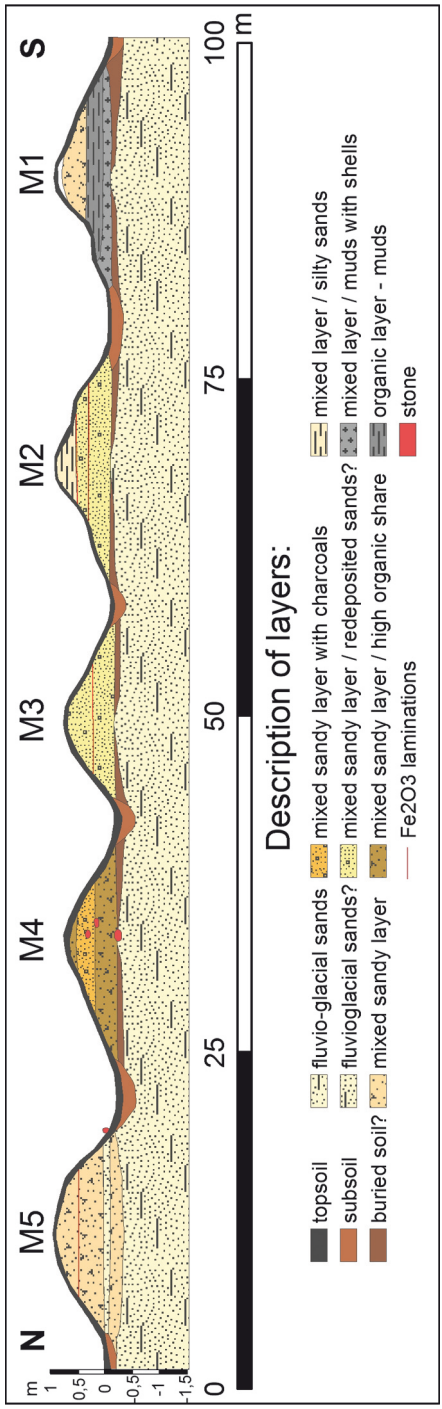

Fig. 7. Synthetic geological profile of the site in Sobota. The profile corresponds to the one marked in Fig. 3

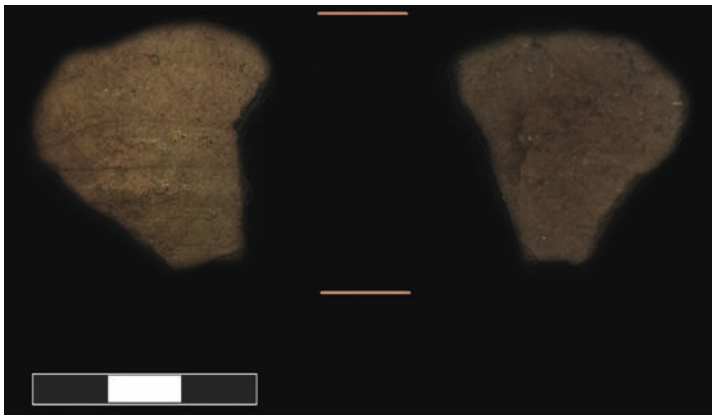

Fig. 8. A Neolithic sherd retrieved from the animal burrow in long barrow M5

were recorded, perhaps also reflecting the surface level from the time preceding the construction of the tomb. In contrast to the latter, the M4 mound consisted of clearly mixed sediments with organic matter, in which some charcoals were also detected. In terms of lithology, the profile consisted of at least two units of mixed sediments, which can be divided on the basis of varying organic matter content. The last of the tombs (M5) also presented two main units of mixed sands. However, in the lowermost part, a thin layer of re-deposited glacifluvial sands was encountered, below which the anthropogenic layers still occurred. Additionally, at a depth of 50 cm b.g.l., some horizontal laminations of iron oxides were registered, suggesting (as above) perhaps a two-staged process of mound erection. It seems that, in the first step, this barrow was constructed from mixed soil, then from a shallow layer of glacifluvial sands, and after that again from mixed soil of two types (based on the difference in the organic matter content).

At this point it is essential to notice that during the fieldwork, in the place of an animal burrow in M5 mound, a potsherd was discovered (Fig. 8). In technological terms, this artifact should be considered as a final Neolithic, Epi-FBC type of production.

4.3. A review of historical maps

The earliest cartographic materials for the site are the Prussian *Kartes Des Deutschen Reich* from 1830, *Topographische Karte, Blatt Wargowo* from 1857, *Agronimisches Bohrungen, Blatt Wargowo* from 1898 and the *Topographische Karte Blatt Wargowo* made in 1940. Based on these maps, it appears that the entire area of the cemetery was part of a forest since at least the first half of the 19th century (Fig. 9). Thus, it suggests that for more than 190 years, no agricultural activity was present there, nor were any infrastructural construction sites.

As such, the five structures in Sobota should be treated as originating before the main stage of the intensification of agricultural works in Greater Poland, which might have created some characteristic forms like the stone prisms or waste deposits (Jaeger *et al.* 2014). The presence of the forest might have also contributed to the excellent preservation

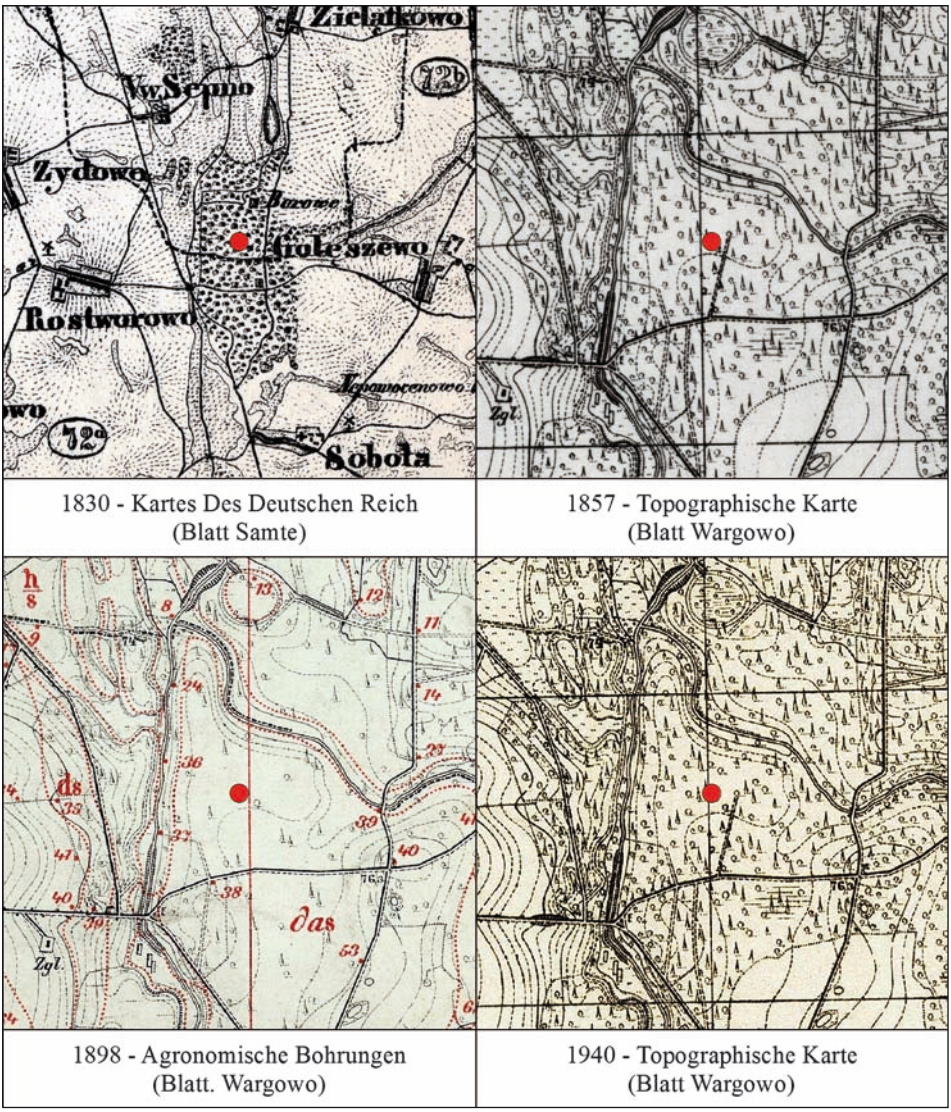

Fig. 9. Archival cartographic materials of the forest area in the vicinity of the Sobota site. Red dot indicates the position of the megaliths. Source: Archiwum Map Polski Zachodniej (www.amzp.pl)

of the long barrows, which is an essential issue in the discussion on the conservation of heritage monuments in forested areas and nature reserves. In fact, the barrows in Sobota lie within the *Nature 2000* enviromental protection area (PLB 300013 – The Valley of Samica Kierska) and the Pawłowice-Sobota Area of Protected Landscape.

4.4. Archaeological context and other sites in the Sobota's area

Archaeologically, the immediate surroundings of the cemetery in Sobota display the awe-inspiring cultural context of this discovery. From the same village territory, approximately 1.3 km to the south of the long barrows, an accidental find was made during peat exploitation on the floor of the Samica Kierska Valley (Śmigielski 1958, 45). The exploitation trench revealed a nearly entirely preserved vessel of the FBC – a double-handled amphora and a stone grinder (Fig. 10). The amphora was characterized by an oval shape and funnel-like neck, and can be dated to the second stage of FBC development – the Sarnowo phase – (perhaps its younger stage – IIA). A year after the discovery of the amphora in Sobota, a partially complete skeleton of a deer was excavated in the same spot. The unique discoveries in this area are moreover supplemented by the incidental find of a double-bladed stone axe (Åberg's type B) made from diabase (length 15.8 cm) of a hexagonal cross-section (Jażdżewski 1936, 111, fig. 966; Prinke and Skoczylas 1980, cat. No. 1075) (Fig. 10).

Fig. 10. Finds from Sobota, site no. 3 – a double-handled amphora and an axe (phot. P. Silska). Collection of the Archaeolgical Museum in Poznań

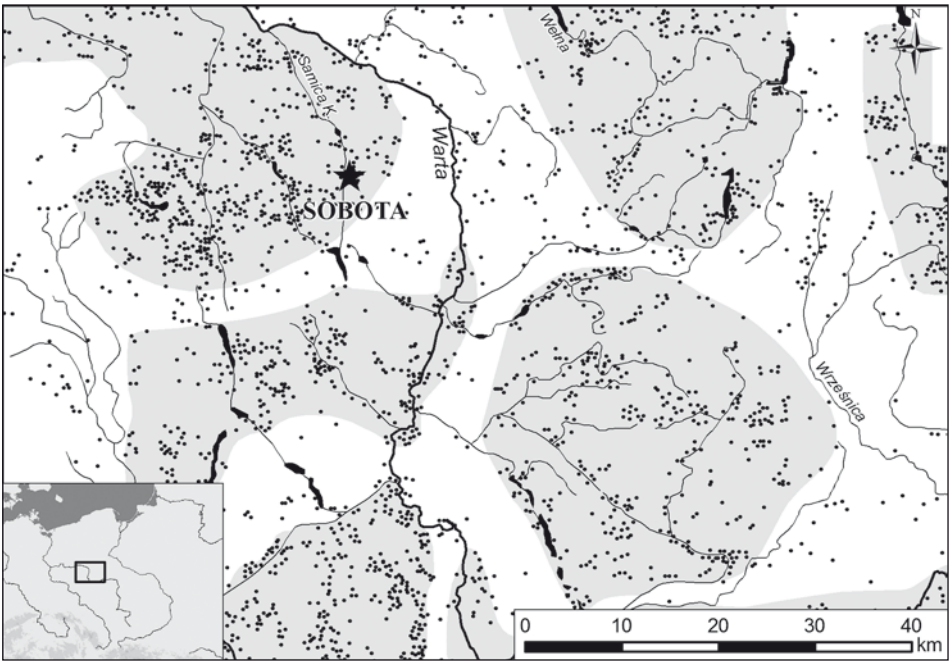

Fig. 11. Sites of the FBC in the middle catchment area of the Warta River, and settlement agglomerations (after Wierzbicki 2013 and redrawn)

Prospection of the Polish Archaeological Record was held in this area since at least 1955 by J. Kostrzewski, and was also conducted under the auspices of later projects (Collections of the Scientific Archives of the Poznań Archaeological Museum). These activities uncovered the considerable amount of FBC sites that create the settlement context of Sobota. Based on the latest discussion by J. Wierzbicki (2013), it seems that the long barrows in Sobota should lie on the border of a large FBC settlement concentration (the *Bytyń anthropo-mesoregion*; after J. Wierzbicki 2013; Szmyt 2018) (Fig. 11), embracing nearly 900 km^2 and comprising 629 sites, including at least 29 related to the earlier phases of the FBC, when the megalithic structures were erected.

The locations of the discussed archival artifacts and their contexts seem to correspond to the wider phenomenon of aquatic deposits, reflecting the ritual sphere of the FBC people. In the vast area of the FBC ecumene, and also in southern Scandinavia, swamps and shallow lakes were the preferred places for depositing ceramic vessels, axes and numerous other items. Some of the finds indicate that, besides the material culture inventory, sacrifices of people and animals were also practiced. This phenomenon, as well as the construction of megalithic structures, is strictly related to the earlier phases of the FBC.

5. DISCUSSION

The earthen long barrows in Sobota have numerous analogies, in terms of their morphology and topographic position, with those from the well-documented sites in Kuyavia and Pomerania. The most commonly shared property is the position of the barrows in the landscape, which in the case of Sobota is the lower part of the Samica Kierska valley. There is a general tendency in the FBC to choose an exposed and prominent location in the landscape for the establishment of megalithic cemeteries (Chmielewski 1952, 19). The position of the barrows in Sobota is in contrast to this tendency, as its low-lying location lacks the typical exposure effect. However, assuming that the river valleys constituted essential routes of communication and transportation, it was impossible not to notice these tombs. The long barrows are bordered to the east by a swamp (perhaps earlier by a pond), while their "tail" parts were oriented towards the river, about 320 m away. Such an orientation and position is known from other sites of the FBC. A similar situation was observed in some cemeteries of the Łupawa group of the FBC (see, *e.g.*, the megalithic tombs in Malczewo or Gogolewo; Wierzbicki 2006, 93). Some of the Kuyavian megaliths also present similar topographic settings; however, the situation here might also be explained by the relatively monotonous landscape and the characteristic feature of Kuyavian tombs to be located near to water reservoirs (running or stagnant).

In Sobota, the frontal sides of the megalithic tombs are adjacent to the wetland, while their "tails" are in a considerable distance from the Samica Kierska river. This arrangement resembles the topography of the sites at Wietrzychowice (Papiernik *et al.* 2018, 213, fig. 9) (Fig. 12). In the latter, the "tails" of the tombs are turned towards the small watercourse. In Sarnowo, the entire cluster of long barrows is oriented with their frontal parts towards the river (Fig. 12). The closest to the watercourse is tomb no. 7 (48 m), while the most distant is no. 9 (142 m) (Gabałówna 1968). In Gaj, the front of the megalith faces Długie Lake, and its narrower end points towards the small watercourse (located approximately 400 m from the long barrow) (Papiernik *et al.* 2018). Exactly the same arrangement can be seen in a newly discovered cemetery of 56 megalithic tombs in Płoszczewo (Gorczyca *et al.* 2019). It is composed of 11 clusters (sites), each of which is located no more than 500 m from the nearest watercourse or lake (the mean distance can be estimated to 235 m). An identical arrangement can be observed at the site of Przyjezierze, located a few kilometers from Płoszczewo (Fig. 12). The orientation of the "tail" parts of the megaliths towards the river has also been documented in Łojewo (Pospieszny *et al.* 2018) (Fig. 12).

The very specific arrangement of long barrows in Sobota also needs further discussion. They are aligned in a fan-like manner, where the tails are spreading radially from nearly the same spot. A very similar phenomenon can be seen at Sarnowo (long barrow nos. 4, 5 and 6; Fig. 12), Leśniczówka (nos. 1, 2 and 3) and Obałki (nos. 3 and 4).

The synthetic geological profile of Sobota long barrows made for this study indicates that particular structures were erected from different materials and using different tech-

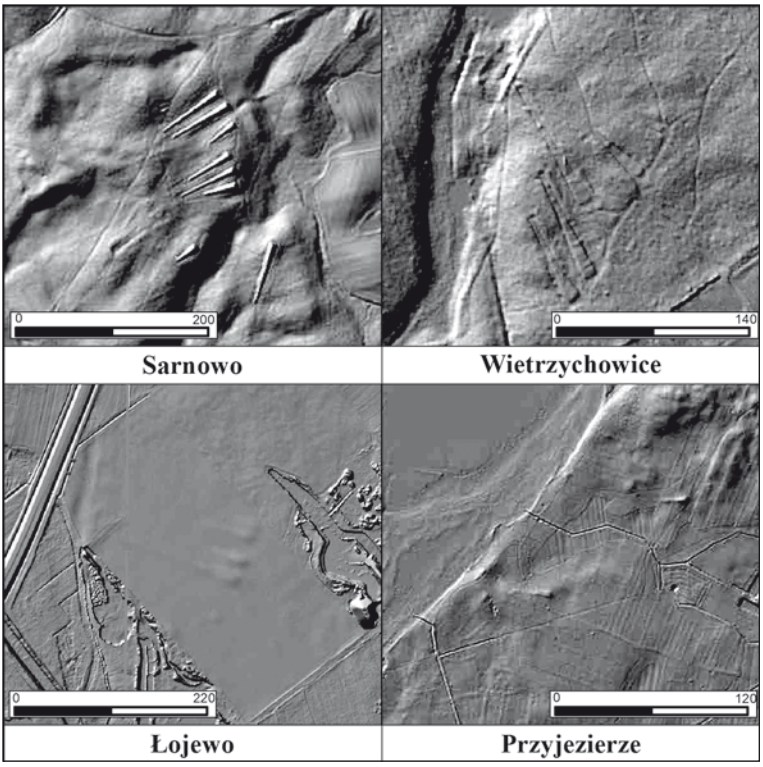

Fig. 12. Examples of other megalithic sites with similar orientation as in the Sobota site. The LIDAR imagery obtained from geoportal.gov.pl

niques, thus pointing perhaps to multi-phase stages of construction. Moreover, the detection of several iron-oxide layers might suggest the existence of palaeosurfaces, which may well be a result of the long-lasting process of erecting the megaliths. Similar multilayered long barrows are known from Wietrzychowice (tombs 1, 2 and 5; Jadczykowa 1970), where layers of "limonites" were also noticed. Such features were also present in tombs 1 and 4 in Sarnowo (Chmielewski 1952, 54, 60).

One of the most interesting architectural elements of the barrows at Sobota is the layer of peat. Such material was also used in the construction of megalithic tombs at the most well known sites of chamberless megaliths; for example, in tomb no. 8 at Sarnowno, where the burials in the central part of the long barrow were covered with peat (Niesiołowska-Śreniowska 1986). Also, in tomb no. 4, on top of the primary surface in the central part of the tomb, a "load of peat" was deposited (Chmielewski 1952, 60). Another similarity between Sarnowno and Sobota is the appearance of mollusk shells, which occurred in the "swampy soil layer" covering the burial of a woman (Wiklak 1986, 12). Aside from Sarnowno, the cemetery at Gaj also revealed a few dozen Duck Mussel shells (Chmielewski 1952, 92).

The cemetery at Sobota, as stated earlier, lies at the periphery of the settlement centre of the *Bytyń anthropo-meso-region* (after J. Wierzbicki 2013; see Fig. 11). Megalithic constructions often mark the territorial borders of particular groups of the FBC (Wierzbicki 1999, 205), as in the case of the Łupawa group of the FBC, whose center was indicated by the settlements and cemeteries at its borders. An identical pattern is suggested for the Stryczowice microregion, where the megalithic tombs are grouped at the very margins of settlement clusters (Iwaniszewski 2006). The same can be seen in the area of the Kleczew microregion of the FBC, where the documented long barrows are considered to be border markers of the peripheries of the FBC (Gorczyca 2005).

6. CONCLUSIONS

In the light of the research conducted at the Sobota site, it seems plausible that we are dealing here with anthropogenic structures. A review of cartographic materials shows that these structures should not be treated as the remains of agricultural activities during the 19th and 20th centuries, as the area was then overgrown by forest. The location of the long barrows near to a swamp (or earlier – a shallow lake) suggests the intentional choice of this area for establishing the cemetery. The magnetic prospection revealed anomalies that indicate, among other things, the presence of stone structures, perhaps in the form of an encirclement. Also, some of the anomalies might reflect the presence of burnt layers. These assumptions were verified through the drillings, which moreover revealed the stratigraphy of the barrows and the ways in which they differed in lithology from the geological background.

All of this suggests that the structures in Sobota are funerary constructions indeed, which, in terms of analogical features from other sites, might be classified as tombs of the megalithic type. This, however, requires further studies, supported by excavations and high-precision dating, in order to definitively correlate the tombs with an exact phase of the FBC.

Acknowledgments

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REVIEWS AND SHORT REVIEW NOTES

Anna Zakościelna*

(Review) Aleksandr Diachenko, Małgorzata Rybicka (eds), *Between the East and the West. Dynamic of Social Changes from the Eastern Carpathians to the Dnieper in 4th – beginning of 3rd Millennium BC (Preliminary study).* Rzeszów 2019: Wydawnictwo Uniwersytetu Rzeszowskiego, 262 pp.

Małgorzata Rybicka, co-editor of the reviewed volume, has been conducting intensive archaeological research on the Eneolithic of the borderland of south-eastern Poland and western Ukraine for several years, successfully establishing cooperation with the local researchers representing both central archaeological institutions (Institute of Archaeology of the National Academy of Sciences, Kyiv, Ukraine), as well as regional museums. The activity of the research team conscripted by M. Rybicka has already resulted in numerous publications, primarily of a descriptive nature (*i. a.* Hawinskyj *et al.* 2013; Hawinskyj *et al.* 2015), but also including synthesizing works. These include collective publications (*i.a.* Diaczenko *et al.* 2016; Pozikhovskiy *et al.* 2013), as well as M. Rybicka's book about relations between the Tripolye culture and the Funnel Beaker culture communities (Rybicka 2017). Recently, the range of this research has been extended to Moldova, as reflected in the scientific project *Between the East and the West. Dynamic of Social Changes from the Eastern Carpathians to the Dnieper in 4th – beginning of 3rd Millennium BC* (NCN Opus 8 UMO 2014/15/B/HS3/02486), implemented in 2015-2019 by the international research team headed by M. Rybicka. The reviewed volume is the first, preliminary summary of the research conducted under this project. It consists of 16 studies developed by over a dozen specialists: archaeologists, ceramic specialists, use-wear experts and bioarchaeologists, representing Polish, Ukrainian and Moldovan scientific institutions.

The goals of the project and the reviewed publication include an attempt to explain the intercultural relations between populations of the three main Eneolithic formations occupying Central and Eastern Europe: the Funnel Beaker culture, the Cucuteni-Tripolye culture and the Baden culture. The basis for tracking these relationships was the spread of

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ceramic imports and stylistic innovations on a micro-regional and regional scale. The catalogue of research tasks also includes the creation of a demographic model and the reconstruction of settlement and socio-economic changes in the middle 4th millennium BC, at the dawn of the Cucuteni-Tripolye culture.

In the course of research, old, "rediscovered" sources were used, and new excavations were carried out at several Ukrainian (Vynnyky-Lisivka, Vynnyky-Zhupan, Lvov district) and Moldovan (Gordineşti II-Stînca goală, Edineț district) sites. In addition, a non-invasive geomagnetic study of one of the Tripolye culture settlements (Myrohoshcha, Dubno district), which revealed the presence of earth fortifications, was carried out. The sources and information obtained, as well as the observations made during the field research were subjected to multi-faceted archaeological, ceramological, archaeobotanical and use-wear analyses. The work was carried out not only with the use of traditional archaeological methods of source studies, but also specialist analyses, significantly enriching the possibilities of inference. Mathematical analysis methods were used to reconstruct the spatial and demographic systems, while the whole study was supplemented with high-quality illustrations.

Most of the articles included in the volume present the results of field research and the development of acquired sources. Particularly worth attention are informative articles by Dmytro Verteletsky on ceramics from Vynnyky-Zhupan and Zvenyachyn (*Pottery of Gordineşti group of the Tripolye culture from Vynnyky-Zhupan. Preliminary study*; *Pottery of Gordineşti group of the Tripolye culture from Zvenyachyn. Preliminary study*), as well as studies on flint materials from the Vynnyki-Lisivka site by Iwona Sobkowiak-Tabaka (*Flint knapping industry of the Funnel Beaker culture population from the site Vynnyky-Lisivka, Lviv district, excavation season 2016*) and a typological and functional (use-wear) study on bone and antler products originating from several sites by Valentin Pankovsky – (*The Late Tripolie and the Funnel Beaker Industries of Bone and Antler from Volhynia to Galicia: The UPTE Contribution*). Articles presenting the results of specialist analyses of particular materials (ceramic – Anna Rauba-Bukowska; botanical – Agata Sady, and use-wear – Jolanta Małecka-Kukawka) are extremely important; in the last case, it is regrettable that such a modest number of tools was subjected to functional analyses.

Some articles also discuss general issues related to the chronology and development of Cucuteni-Trypole and Funnel Beaker culture settlement in western Volhynia, eastern Roztocze and northern Moldova, the complex interactions between these groups, and the impact of the Baden environment on the ceramic style and cultural face of these formations (*e.g.* A. Diachenko, A. Hawinskyj, D. Król, M. Rybicka, G. Širbu, *New excavations in Vynnyky and the issue of the Funnel Beaker culture – Tripolye frontier*; G. Sîrbu, M. Rybicka, A. Diachenko, D. Król, L. Sîrbu, V. Burlacu, *Preliminary results of archaeological investigations at the Gordineşti II-Stînca goală settlement. The 2016 campaign*).

Some articles undertake broader, generic issues, *e.g.* regional networks in the context of Volhynian flint distribution (A. Diachenko, M. Rybicka, *Volhynian flint and the trans-regional networks of the Funnel Beaker populations*), the settlement of Funnel Beaker

and Tripolye cultures on the studied area (D. Król, *Eneolithic settlements of the Funnel Beaker culture and the Late Tripolye culture of the Western Ukraine and Northern Moldova in the topo-hydrological contexts. A comparative study*), settlement and socio-economic strategies in the context of climate change, and centre-periphery relations at the twilight of the Tripolye culture (*A. Diachenko, The Late Tripolye: Spatio-demographic frames for culture change*).

This is an extremely interesting and valuable publication, which fills a crucial source and interpretation gap. Thanks to this work, researchers dealing with the Eneolithic of Central and Eastern Europe obtain a package of new sources and explanations, hypotheses, and – especially – research questions, determining the directions of further studies, for which the reviewed work is – as indicated in the introduction – a prologue. One can expect an explanation of the nature of cultural change in the borderland of the Cucuteni-Tripolye and Funnel Beaker cultures from the aforementioned main work, which summarizes the results of research conducted under the project, as well as the answer to the question as to the role played by the Baden culture community in this process: was the Tripolye culture "Badenised" as the Funnel Beaker culture community in the area of western Lesser Poland (Kruk, Milisauskas 1999).

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Table 1. Książnice Wielkie, site 1, Proszowice district. Characteristic features of axes (whole axes, fragments > approx. 30% preserved of axe), the core on the axe with approx. 70% preserved axe and the chisel

Order No.		**A1**	**A2**	**A3**	**A4**	**A5**	**A6**[1]	**A7**[2]	**A8**	**A9**
Generally quantity of preservation state (approx.)		100%	100%	100%	100%	80%	70%	100%	30%	100%
Inventory No.		MAK/6399	MAK/6622	MAK/6637	MAK/6660	MAK/6576	MAK/6369	MAK/6369	MAK/6637	MAK/7235
Figure No.		Fig. 4.2	Fig. 2.2	Fig. 2.1	Fig. 5.1	Fig. 3.1	Fig. 5.2	Fig. 4.1	Fig. 7.1	Fig. 3.2
Dimensions[3] (mm); Fig. 1:2	total lenght	67	123	120	91	78	83	68	41	87
	width in the upper part of the ax	25	32	28	33	24	34	21	27	29
	butt width	18	23	20	24	18	24	13	20	22
	butt thickness	7	10	10	18	10	21	71	12	13
	width in the ½ of the specimen lenght	30	42	42	39	35	41	21	○	38
	cutting edge width	40	53	59	39	○	○	24	○	50
	maximum thickness	11	27	20	21	13	29	12	15	18
	thickness in the ½ of the specimen lenght	11	27	20	20	13	28	11	○	17
Raw material	Jurassic G	•	•	•	•	•	•	•	•	•
Transverse section	tetrahedral	•	•	•	•	•	•		•	•
	trihedral							•		
Longitudinal section	wedge-shaped	•			•	•				•
	lentiform		•	•				•		
Part of the axe with maximum thickness	a half of length (medial part)			•		•	•			
	1/3 of length from the cutting edge (a part at cutting edge cross in medial part)	•	•							
	2/3 of length from the cutting edge (part at butt)				•			•		•
Shape of the cutting edge with surfaces at cutting edge	wedge-shaped							•		
	rectangular				•					
	trapezoid	•	•	•						•
shape of the cutting edge	symmetrical, slightly arched		•	•						•
	asymmetrical	•								
	stright				•			•		
Butt	irregular		•							
	oval									
	hemispherical				•					
	rectangular	•		•			•			
	rectangular, angular									•
	quarter of an ellipse								•	
	triangular							•		
	regular	•			•		•		•	•
	narrow thinned		•	•				•		
preparation of a butt	Formed	•			•					
	thinned from surface of a butt in the direct of cutting edge		•	•	•			•		•
	trimmed		•	•			•	•	•	•
	trimming of edge is joint with trimming of a butt		•				•	•	•	
Preparation of sides	parallel blows							•		
	parallel blows from opposed surfaces (one side from first main surface, a second side from second main surface)	•				•			•	
	sides trimmed for centripetal blows (from two main surfaces)		•	•	•					•
	one side trimmed by one direction blows (from one main surface) and a second side trimmed from two main surfaces						•			
course of lateral edges	moderately coinciding to direction of a butt		•							
	coinciding quite strongly to direction of a butt	•		•		•				•
	parallel, coinciding in butt part				•			•		
Shape of an axe	regular, trapezoid	•	•	•						•
	chisel-shaped							•		
	wedge-shaped				•					
Grinding	main surfaces		•			•	•			•
Smoothing	sides		•	•			•			•
	butt						•			•
	surfaces at cutting edge					•	•			•
	main surfaces		•	•						
	total	•			•			•	•	
Polishing	cutting edge	•	•		•	•		•		•
	surfaces at cutting edge	•	•		•					
Damage	cutting edge	•	•		•	•		•	•	
	side				•	•				•
	butt					•	•			•
	lack of medial part and part at cutting edge								•	
Thermal cracking						•			•	
Patina							•			
Breakage	butt				•		•			
Repair	cutting edge			•			•			•
	side			•						•
	butt					•				
Feature No.		28	63	stray find	stray find	58	14a		stray find	„*feature No 41, humus*", probably from the upper destroyed part of the pit (Zabłocki, Żurowski 1934:2, 17, Ryc.19)
Pottery		Lack of pottery	Lack of pottery			FB-B WG	mainly "pure" FBC pottery			

[1] formal core on the axe
[2] chisel made on a blade
[3] Fig. 1

Table 2. Książnice Wielkie, site 1, Proszowice district. Characteristic features of the other remains related to the use, repair and processing of an axe: flakes, blades, blade-flakes

Order No.		F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
No. of inventory		MAK/6302	MAK/6353	MAK/6369	MAK/6369	MAK/6370	MAK/6370	MAK/6381	MAK/6402	MAK/6402	MAK/6402	MAK/6402	MAK/6402	MAK/6402
Figure No.		Fig. 7.8	-	Fig. 7.5	-	Fig. 7.10	-	-	-	-	-	-	-	-
Dimensions (mm)	length	48	23	29	35	58	42	30	34	31	27	22	17	15
	width	18	15	38	38	24	21	13	20	22	17	13	33	17
	thickness	8	8	6	8	11	10	16	3	3	2	4	6	6
Metrical type	flake		•	•	•				•	•	•		•	•
	blade-flake											•		
	blade	•				•	•							
Flake from splintered piece														
Chunk								•						
Using retouch														
Raw material	Jurassic G	•	•	•	•	•	•			•	•	•	•	•
	undetermined (burnt)							•	•					
Flake type	fan-shaped flake			•	•									
Part of axe	butt					•								
	surface at cutting edge		•							•		•		
	cutting edge		•											
	side	•		•		•	•	•	•				•	
	sides													
	main surface	•		•	•		•	•	•		•		•	•
	medial and/or at cutting edge surface													
	both main surfaces							•						
	unidentified													
	surface at butt					•								
Transverse section of the axe	tetrahedral or trihedral	•	•	•		•	•	•	•				•	
	tetrahedral													
	unidentified				•					•	•	•		•
Transverse section of a blade	triangular	•				•	•							
State of preservation	good	•	•	•	•	•	•			•	•	•	•	•
	burnt							•	•					
	cracked													
	patina													
	bruised													
Stage of preservation	whole	•	•	•		•			•	•	•		•	•
	lack of proximal part						•					•		
	proximal part													
	fractured in a distal part								•					
	fractured in several part				•									
	lateral fractured													
	fractured of proximal and distal part													
Share of a cortex surface	lack	•	•	•	•	•	•	•	•	•	•	•		•
	vestigial on a side												•	
Longitudinal section	bent to inner face			•		•	•		•	•		•	•	•
	straight		•		•						•			
	bent to upper face													
	curved													
	convoluted	•										•		
Butt	punctated													
	lisse	•		•	•	•					•		•	
	formed													
	trimmed								•	•				•
	damaged													
	edge		•											
	linear													
Butt altitude	flat	•		•		•			•	•	•		•	•
	concave				•									
	convex													
Butt shape	rhombus													
	lenticular			•										
	semicircular				•				•		•			
	triangular					•				•				
	elliptical													
	semi-elliptical													
	asymmetrical													
	trapezoidal	•												
Angle of a butt	straight	•		•					•	•	•			
	obtuse				•								•	•
	acute		•			•								
Butt thickness	thick			•						•				
	slight	•												
	regular				•	•			•		•		•	•
Bulb	damaged			•									•	
	convex	•							•					
	spilt				•	•				•	•			
	occlusive													
	invisible		•											
	concave													•
Scars on a dorsal side	blade					•	•		•	•				•
	flake	•			•	•	•		•		•		•	•
	Blade-flake	•			•							•		
	scaled blade													
	scaled flake													
Scars arrangement	centripetal													
	two-way													
	centrifugal													
	opposite										•			
	parallel with slanted or transverse	•		•	•	•			•					
	parallel with opposite													
	parallel									•		•	•	
	slanted/transverse						•							•
Grinded	main surface	•					•	•	•		•			•
	surface at cutting edge		•											
	surface at butt													
	surface of a butt/edge										•			
	side													
Smoothed	side	•		•		•	•	•	•				•	
	main surface			•		•		•					•	
	surface at cutting edge		•							•				
	surface at butt					•								
	butt					•								
Polished	surface at cutting edge											•		

Table 3. Książnice Wielkie, site 1, Proszowice district. Characteristic features of the other remains related to the use, repair and processing of an axe: flakes, blades, blade-flakes

Order No.		F14	F15	F16	F17	F18	F19	F20	F21	F22	F23
No. of inventory		MAK/6402	MAK/6402	MAK/6402	MAK/6402	MAK/6407	MAK/6407	MAK/6407	MAK/6407	MAK/6437	MAK/6437
Figure No.		-	-	-	-	-	-	-	Fig. 7.7	Fig. 7.4	Fig. 7.6
Dimensions (mm)	length	19	19	11	19	41	23	24	25	48	27
	width	20	35	16	26	23	28	21	28	47	29
	thickness	5	3	4	6	6	8	5	6	7	11
Metrical type	flake	•	•	•	•		•	•	•	•	•
	blade-flake					•					
	blade										
Flake from splintered piece		•		•							
Using retouch											
Raw material	Jurassic G	•	•	•	•	•	•	•	•	•	•
	undetermined (burnt)										
Flake type	fan-shaped flake		•		•						
Part of axe	butt					•			•		
	surface at cutting edge							•			•
	cutting edge										
	side		•		•	•				•	
	sides										
	main surface	•		•	•	•	•			•	
	both main surfaces										
	unidentified										
	surface at butt								•		
Transverse section of the axe	tetrahedral or trihedral									•	
	tetrahedral										
	unidentified	•	•	•	•	•	•	•	•		•
Transverse section of a blade	triangular										
State of preservation	good	•	•	•	•	•	•	•	•	•	•
	burnt										
	cracked										
	patina										
	bruised										
Stage of preservation	whole		•		•		•	•	•	•	•
	lack of proximal part	•									
	proximal part			•							
	fractured in a distal part					•					
	fractured in several part										
	lateral fractured								•		
	Fractured of proximal and distal part										
Share of a cortex surface	lack	•	•	•	•	•	•	•	•	•	•
	vestigial on a side										
Longitudinal section	bent to inner face		•			•					
	straight	•						•	•	•	
	bent to upper face				•		•				•
	bent to upper face										
	curved										
	convulted										
Butt	punctated									•	
	lisse				•			•			
	formed								•		
	trimmed		•	•		•					•
	damaged					•	•				
	edge										
	linear										
Butt altitude	flat			•		•		•		•	•
	concave				•				•		
	convex		•				•				
Butt shape	rhombus										
	lenticular										
	semicircular				•					•	
	triangular			•				•			
	elliptical										
	semi-elliptical					•					
	asymmetrical		•								•
	trapezoidal								•		
Angle of a butt	straight		•		•		•	•		•	•
	obtuse			•					•		
	acute										
Butt thickness	thick		•		•				•		
	regular			•		•	•				
	slight							•		•	•
Bulb	damaged			•	•				•		
	convex		•				•				
	spilt		•				•				
	occlusive					•					
	invisible							•		•	•
	concave										
Scars on a dorsal side	blade	•			•			•			
	flake	•	•	•	•	•	•		•	•	•
	blade-flake						•				
	scaled blade										
	scaled flake										
Scars arrangement	centripetal										
	two-way										
	centrifugal										
	opposite										
	parallel with slanted or transverse				•		•	•			
	parallel with opposite		•								
	parallel										
	slanted/transverse	•		•		•			•		•
Grinded	main surface			•				•		•	
	surface at cutting edge							•			
	surface at butt								•		
	Surface of a butt/edge										
	side										
Smoothed	side					•				•	
	main surface	•				•	•			•	
	surface at cutting edge							•			•
	surface at butt								•		
	butt								•		
Polished	surface at cutting edge										
Feature No.		30				31				39	

Table 4. Książnice Wielkie, site 1, Proszowice district. Characteristic features of the other remains related to the use, repair and processing of an axe: flakes, blades, blade-flakes

Order No.		F24	F25	F26	F27	F28	F29	F30	F31	F32	F33
No. of inventory		MAK/6463	MAK/6467	MAK/6467	MAK/6489	MAK/6494	MAK/6533	MAK/6534	MAK/6534	MAK/6573	MAK/6573
Figure No.		-	Fig. 7.9	-	Fig. 7.3	-	-	-	-	-	-
Dimensions (mm)	length	34	42	29	46	25	39	32	24	45	40
	width	26	32	30	36	19	30	41	28	24	31
	thickness	16	13	16	14	7	15	7	6	4	7
Metrical type	flake	•	•	•	•	•	•	•	•	•	•
	blade-flake										
	blade										
Flake from splintered piece										•	
Chunk											
Using retouch											•
Raw material	Jurassic G	•	•		•	•	•	•	•	•	•
	undetermined (burnt)			•							
Flake type	fan-shaped flake							•	•		
Part of axe	butt	•				•	•				
	surface at cutting edge		•	•	•						
	cutting edge		•	•	•						
	side	•	•	•	•	•		•	•		•
	sides						•				
	main surface							•	•		•
	medial and/or at cutting edge surface										
	both main surfaces		•	•	•		•				
	unidentified										
	surface at butt	•				•	•			•	
Transverse section of the axe	tetrahedral or trihedral	•	•	•	•	•		•	•		•
	tetrahedral						•				
	unidenftified									•	
Transverse section of a blade	triangular										
State of preservation	good		•		•	•	•	•	•	•	•
	burnt			•							
	cracked				•						
	patina	•									
	bruised										
Stage of preservation	whole	•		•	•	•		•	•	•	•
	lack of proximal part		•								
	proximal part										
	fractured in a distal part										
	fractured in several part										
	lateral fractured										
	fractured of proximal and distal part										
Share of a cortex surface	lack	•	•	•	•	•	•	•	•	•	•
	vestigial on a side										
Longitudinal section	bent to inner face				•			•			
	straight	•	•			•			•	•	•
	bent to upper face										
	curved										
	convoluted										
Butt	punctated										
	lisse	•						•	•		•
	formed									•	
	trimmed				•	•					
	damaged										
	edge										
	linear										
Butt altitude	flat	•			•	•		•	•	•	
	concave										•
	convex										
Butt shape	rhombus										
	lenticular										
	semicircular										
	triangular	•				•				•	
	elliptical										
	semi-elliptical										
	asymmetrical							•	•		
	trapezoidal				•						•
Angle of a butt	straight	•			•			•			
	obtuse					•			•	•	
	acute										•
Butt thickness	thick					•		•	•	•	•
	slight	•									
	regular				•						
Bulb	damaged								•	•	
	convex							•			
	spilt				•						
	occlusive	•									•
	invisible					•				•	
	concave										•
Scars on a dorsal side	blade				•						
	flake	•	•		•	•		•	•	•	•
	Blade-flake										
	scaled blade					•					
	scaled flake										
Scars arrangement	centripetal								•		
	two-way										
	centrifugal										
	opposite										
	parallel with slanted or transverse					•		•			•
	parallel with opposite										
	parallel		•								
	slanted/transverse	•			•				•	•	
Grinded	main surface							•	•		•
	surface at cutting edge		•	•							
	surface at butt	•								•	
	surface of a butt/edge										
	side										•
Smoothed	side	•	•		•	•		•	•		
	main surface				•		•		•		
	surface at cutting edge		•	•	•						
	surface at butt					•					
	butt	•				•				•	
Polished	surface at cutting edge			•							
Feature No.		41	42		49		54			58	

Table 5. Książnice Wielkie, site 1, Proszowice district. Characteristic features of the other remains related to the use, repair and processing of an axe: flakes, blades, blade-flakes

Order No.		F34	F35	F36	F37	F38	F39	F40	F41	F42	F43	F44
No. of inventory		MAK/6573	MAK/6573	MAK/6573	MAK/6573	MAK/6588	MAK/6588	MAK/6588	MAK/6623	MAK/6629	MAK/6654	MAK/6653
Figure No.		-	-	-	-	-	-	-	Fig. 7.2	-	-	
Dimensions (mm)	length	45	20	22	66	31	19	33	38	61	19	40
	width	19	21	19	33	33	28	40	35	36	32	29
	thickness	12	3	3	15	8	6	10	8	15	4	9
Metrical type	flake		•	•	•	•	•	•	•	•	•	•
	blade-flake											
	blade	•										
Flake from splintered piece												•
Chunk												
Technical blade - burin spall												
Using retouch		•									•	
Raw material	Jurassic G	•	•	•		•	•	•	•		•	•
	undetermined (burnt)				•					•		
Flake type	fan-shaped flake						•					
Part of axe	butt											
	surface at cutting edge		•									
	cutting edge											
	side			•		•	•	•	•	•		
	sides				•							
	main surface			•		•	•	•	•	•	•	•
	medial and/or at cutting edge surface	•										
	both main surfaces				•							
	unidentified											
	surface at butt											
Transverse section of the axe	tetrahedral or trihedral	•				•	•	•	•	•		
	tetrahedral				•							
	unidenftified		•	•							•	•
Transverse section of a blade	triangular											
State of preservation	good	•	•	•	•	•	•	•	•		•	•
	burnt									•		
	cracked											
	patina											
	bruised								•	•		
Stage of preservation	whole	•	•		•	•	•	•	•		•	•
	lack of proximal part											
	proximal part											
	fractured in a distal part											
	fractured in several part											
	lateral fractured											
	fractured of proximal and distal part			•								
Share of a cortex surface	lack	•	•	•	•	•	•	•	•	•	•	•
	vestigial on a side											
Longitudinal section	bent to inner face										•	•
	straight	•	•	•					•			
	bent to upper face											
	curved											
	convoluted					•	•	•				
Butt	punctated											
	lisse	•	•				•	•	•			
	formed											
	trimmed					•						
	damaged											
	edge										•	
	linear											•
Butt altitude	flat	•	•			•	•	•				•
	concave											
	convex											
Butt shape	rhombus					•						
	lenticular											
	semicircular											
	triangular	•	•								•	
	elliptical							•				•
	semi-elliptical						•					
	asymmetrical								•			
Angle of a butt	straight	•	•			•	•				•	•
	obtuse							•	•			
	acute											
Butt thickness	thick											
	slight											
	regular	•	•			•	•					
Bulb	damaged						•		•			
	convex							•				
	spilt							•				
	occlusive								•			
	invisible	•	•			•						
	concave											
Scars on a dorsal side	blade	•		•				•		•		
	flake		•				•	•	•	•		
	Blade-flake											
	scaled blade											
	scaled flake										•	•
Scars arrangement	centripetal											
	two-way											
	centrifugal											
	opposite											
	parallel with slanted or transverse		•		•	•		•				
	parallel with opposite							•				
	parallel	•								•	•	•
	slanted/transverse			•			•		•			
Grinded	main surface	•		•	•	•		•	•	•	•	•
	surface at cutting edge											
	surface at butt											
	surface of a butt/edge											
	side	•		•	•			•				
Smoothed	side				•	•	•		•	•		
	main surface	•					•		•			
	surface at cutting edge	•	•									
	surface at butt											
	butt											
Polished	surface at cutting edge		•									
Feature No.		58							65	stray finds		