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CULTURE TRANSFORMATION IN THE TARGOWISKO MICROREGION. TRENDS OF CHANGES AMONG DANUBIAN FARMERS

ABSTRACT

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The aim of this article is to deepen the discussion on the nature and mechanisms of culture change based on the analysis of newly acquired materials from the Targowisko settlement region. Three groups of materials were acquired (from narrow time horizons) related to the single-phase relics of Linienbandkeramik (Brzezie, site 40 and Targowisko, site 16) and Malice culture houses (Targowisko, site 14-15). The absolute chronology of the beginning of the late phase (III) LBK was established to be 5100-5000 BC, and the classic phase (Ib) of MC was dated to 4650-4550 BC. Selected threads of the cultural tradition (in the field of ceramic-making technology and ornamentation and flint-blade production technology) were passed on among families living in individual houses. Settlement analysis showed the relative instability of microregions, the increased mobility of small groups of people, and risky colonization attempts in Targowisko region. No evidence of direct, contemporaneous contact between the LBK and MC populations was found.

Keywords: LBK, Malice culture, early Neolithic, culture change, Targowisko settlement region
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INTRODUCTION

The *Linienbandkeramik* (hereafter: LBK) spread to the areas located north and north-east of the Carpathians in its pre-music-note phase (I) (the Biňa and the Milanovce phases in south-western Slovakia; cf. Pavúk 2004; Kulczycka-Leciejewiczowa 1983; Czekaj-Zastawny *et al.* 2020; Dębiec 2015; Saile 2020). The earliest Neolithic farmers migrated here from south-western Slovakia and Moravia through the Moravian Gate (Kozłowski *et al.* 2015, 39).

In some regions during the music-note phase (II), the LBK population gradually increased, reaching its peak in the Źeliezovce phase (III; cf. Kadrow 2020a, 97-98); however, some researchers believe the maximum demographic development occurred in phase II throughout south-eastern Poland (Czekaj-Zastawny 2008, 116). It is assumed that during the evolution of the LBK, the inner rhythm of cultural change was the same throughout almost the entirety of south-eastern Poland and in south-western Slovakia.

However, more and more arguments speak for the simultaneous duration of phases I and II. The recently acquired series of radiocarbon dates from site 2 in Gwoździec suggests a temporal overlap of these phases in the period from 5350/5300 to 5100/5000 BC (Czekaj-Zastawny *et al.* 2020, fig. 16). The ¹⁴C dates in Samborzec corroborate this (Kulczycka-Leciejewiczowa 2008). The beginning of the neolithization of south-eastern Poland should also be shifted from 5600/5500 BC to around 5350 BC (Czekaj-Zastawny *et al.* 2020).

There are also reasons to believe that in some regions north of Carpathians, there was not, as it might seem, that they happened in sequential order of phases II (music-note) and III (Źeliezovce). Rather, as in Moldova and in the Dniester basin in Ukraine (Kozłowski 1985), phase II continued until the end of the LBK in this region (Kadrow 2020b, 149, 150; fig. 8; Saile 2020, fig. 5).

Some researchers insist that there was no continuation of the LBK in the Malice culture (hereafter: MC). They argue that contacts between south-eastern Poland and the northern part of the Carpathian Basin ceased abruptly with the end of the LBK and the Bükk culture (Kozłowski *et al.* 2014, 41). Post-Linear settlers, *i.e.*, MC communities, presumably came from the Carpathian Basin, across the mountains (Kaczanowska 1990; Kamińska and Kozłowski 1990; Kozłowski 2004, 11).

Other archaeologists prefer the model of a gradual but profound process of change within the LBK community in its late phase (III) (Kulczycka-Leciejewiczowa 2004, 21). They maintain that this change caused the transformation of the LBK into the MC (Kadrow 2005, 26-27; Kadrow 2020a, 96-101).

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The aim of this article is to deepen the discussion on the nature and mechanisms of culture change based on the analysis of newly acquired materials from the vicinity of Targowisko.

SPATIAL AND CHRONOLOGICAL RANGE OF THE STUDY

Research on the early Neolithic culture transformation is conducted in the area of one of a few early Neolithic settlement regions of south-eastern Poland. It is located south-east of Kraków, between the Vistula and Raba rivers (the so-called “Targowisko” region – *cf.* Czerniak 2013; or “Brzezie” region, *cf.* Czekaj-Zastawny 2017, fig. 12).

The areas densely inhabited by the LBK and MC populations stretched from site 2 in Zagórze in the west to site 10-11 in Targowisko in the east (Fig. 1). The distance between both sites is approx. 8 km in a straight line. There were 6 more sites between them. This entire settlement agglomeration was discovered thanks to rescue excavations on the A-4 motorway (Czekaj-Zastawny 2014; Czerniak *et al.* 2007; Czerniak 2013; Grabowska and Zastawny 2014; Kadrow *et al.* 2020; Zastawny and Grabowska 2014). Therefore, we do not know how far north and south from its course this settlement cluster reached.

The studied agglomeration is located in southern Poland, on the border of the Western Carpathinas and the Outer Western Carpathians (Kondracki 2002). Its western part (sites:

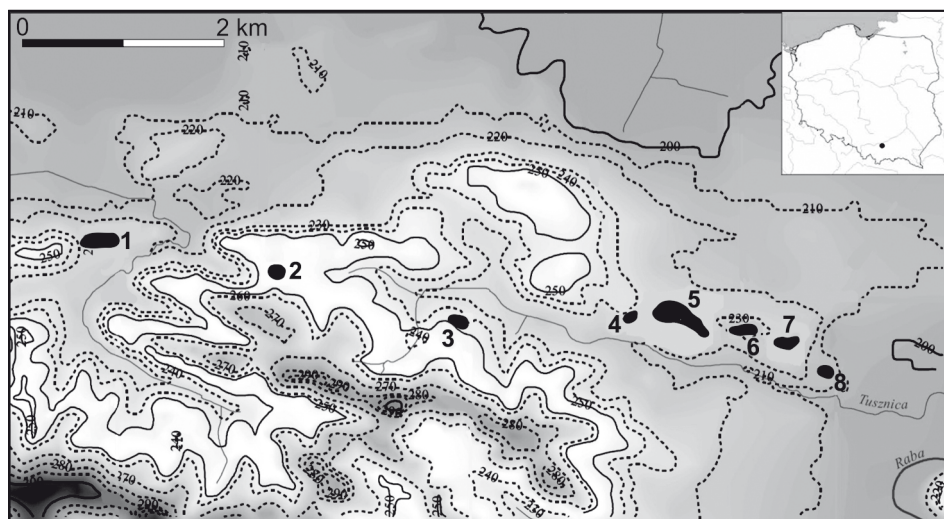


Fig. 1. Targowisko settlement region. Early Neolithic sites with relics of houses: 1 – Zagórze 2, 2 – Brzezie 17, 3 – Brzezie 40, 4 – Szarów 9, 5 – Targowisko 16, 6 – Targowisko 14-15, 7 – Targowisko 12-13, 8 – Targowisko 10-11 (in part acc. to Czekaj-Zastawny 2014)

Zagórze 2, Brzezcie 17 and 40) belongs to the macroregion of the Western Beskids Foothills and the mesoregion of the Wieliczka Foothills, while the lower sites in the eastern part (sites: Szarów 9 and Targowisko 10-11, 12-13, 14-15 and 16) are located in the macroregion of the Sandomierz Basin and the Bochnia Foothills mesoregion (cf. Forysiak *et al.* 2021).

In the zone described above, traces of LBK settlement from the oldest (I) to the youngest (III) phases have been documented (cf. Czerniak *et al.* 2006; Czerniak 2013; Kadrow and Okoński 2008; Kadrow *et al.* 2020; Włodarczak 2006; Zastawny and Grabowska 2014). Moreover, relics of the early and classical MC phases have been discovered there (Czekaj-Zastawny *et al.* 2002; Czekaj-Zastawny *et al.* 2007; Czerniak *et al.* 2007; Grabowska and Zastawny 2014; Kadrow *et al.* 2020). Despite the insufficient and unclear results of radiocarbon dating of LBK relics (Milisauskas 1986; Czekaj-Zastawny 2008; Kadrow *et al.* 2020), this culture has been dated, until recently, from 5600/5000 to 4800 BC. Now its beginning is set at 5350 BC (Czekaj-Zastawny *et al.* 2020). The MC, deprived of ^{14}C dates, has been dated from 4800 to 4500 BC (cf. Kadrow 2020a, 89, 90).

GEOMAGNETIC PROSPECTION

Geomagnetic survey on the investigated area (30 ha; Fig. 2) was made by Posselt & Zickgraf – Archäologisch-geophysikalische Prospektionen GbR from Germany. Magnetometer survey, the most common geophysical method for archaeological purposes, was used. The survey was done with the Fluxgate-Gradiometer Förster Ferex 4.032.01, 4 chan-

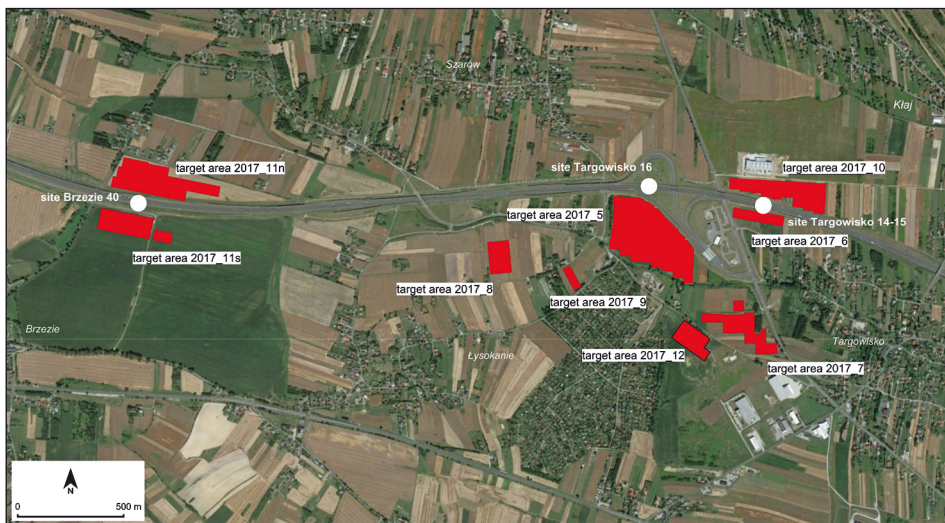


Fig. 2. Targowisko settlement region. Map of geomagnetic survey divided into target areas (red) with locations of excavated houses (white circles); (prepared by M. Posselt, cf. Golański *et al.* 2019)

nels (each pair of Fluxgate probes was used in a gradiometer array, with a vertical distance of 0.65 m between each channel), maximum resolution 0.1 nT. (Golański *et al.* 2019, 9-11).

The purpose of the surveying programme, including geomagnetic prospection, was to obtain assemblages of artefacts and ecofacts related to a period of time that would be as short as possible, *i.e.*, to the existence of a single family living in one house, representing a single cultural tradition, without any older or younger materials (Golański *et al.* 2019, 7, 8). It was assumed that this objective could only be achieved on the boundaries of settlements inhabited over longer periods of time (*cf.* Grygiel 1986, 273, fig. 3).

Thus, the geomagnetic prospection was carried out in selected target areas covering the northern or southern edges of large settlements of the LBK and MC, which had already been thoroughly surveyed as part of rescue excavations at the early-Neolithic settlement complex of the Targowisko region, in connection with the construction of highway A-4 (Fig. 2).

The results of the geomagnetic survey made it possible to demarcate zones (each having an area of 1 are) at three sites for the purpose of confirming the validity of the planned research strategy. The test excavations at sites 16 and 14-15 in Targowisko and at site 40 in Brzezie (Fig. 2) met the expectations, yielding assemblages of artefacts from narrow time horizons (Golański *et al.* 2019, 12-18).

RESULTS OF EXCAVATIONS

Brzezie 40

At the northern edge of site 40 in Brzezie, geomagnetic prospecting revealed the relics of one long LBK house, clearly separated from other traces of building structures (*cf.* Golański *et al.* 2019, fig. 12-15). In an excavation unit with an area of one are, the remains of long building pits with no traces of post-holes have been discovered (Fig. 3). The absence of post-holes was not the result of destructive post-depositional processes. Rather, it is a peculiarity of the construction of this house. Similar houses were discovered in the central part of the site in question (*e.g.*, houses No. 14 and 16; *cf.* Czerniak 2019, fig. 2). However, some researchers continue to assert that the absence of post-holes in this case is an effect of erosion processes.

In pits near the house and in the so-called cultural layer, 604 pieces of LBK pottery were discovered. The vast majority of these were very small sherds. Only 15% of them represent characteristic fragments, *i.e.*, ornamented fragments or parts of the upper rims or bottoms of pottery. The ceramics are divided into delicate vessels, ornamented by engraved lines (Fig. 4: 2, 4, 5, 8, 9), and kitchen vessels, composed of hemispherical cups and vessels with a neck, decorated with plastic elements and fingernail imprints (Fig. 4: 1, 3, 6, 7). The presence of notches crossing the engraved lines (Fig. 4: 2, 5) enables this set of pottery to be dated to the beginning of the Želiezovce (III) phase (Kadrow 1990, 72, 73, fig. 28;

2020b, fig. 7). A characteristic feature of this set of material is the relatively high proportion of parallel, closely-spaced engraved lines in the ornamentation (Fig. 4: 4, 5, 8, 9).

The collection of flint artifacts includes 122 relics and comes almost exclusively from the fill of features. As many as 96% of the specimens (including the burned ones) were made of Jurassic Cracovian flint. The rest, *i.e.*, 5 items (4%), were made of obsidian. The most numerous group in the inventory includes products related to flake exploitation (78 items in total). Products related to blade exploitation (26 items; Fig. 5: 1, 5-7) are less numerous. The remaining part of the inventory consists of specimens identified as flint crumbs (9 items). Microdebitage in the form of 8 chips was also identified. A total of 29 tools were documented (approximately 24% of the flint inventory). In total, 22 retouched specimens were distinguished, among which blade forms predominate: end-scrapers (7 pieces; Fig. 5: 7), truncated blades (2 pieces; Fig. 5: 5), micro-retouched blades (4 pieces; Fig. 5: 6) and a perforator (1 piece). Flake forms are represented by 7 amorphous retouched specimens. The second group of tools are the so-called utility forms, *i.e.*, flakes and blades with traces of use-wear in the form of so-called utility retouch and utility refining (7 items in total).

The inventory from Brzezcie 40 contains mostly elements typical for many other LBK sites in Małopolska.



Fig. 3. Brzezcie, site 40. Remains of the LBK house (photo by A. Golański)

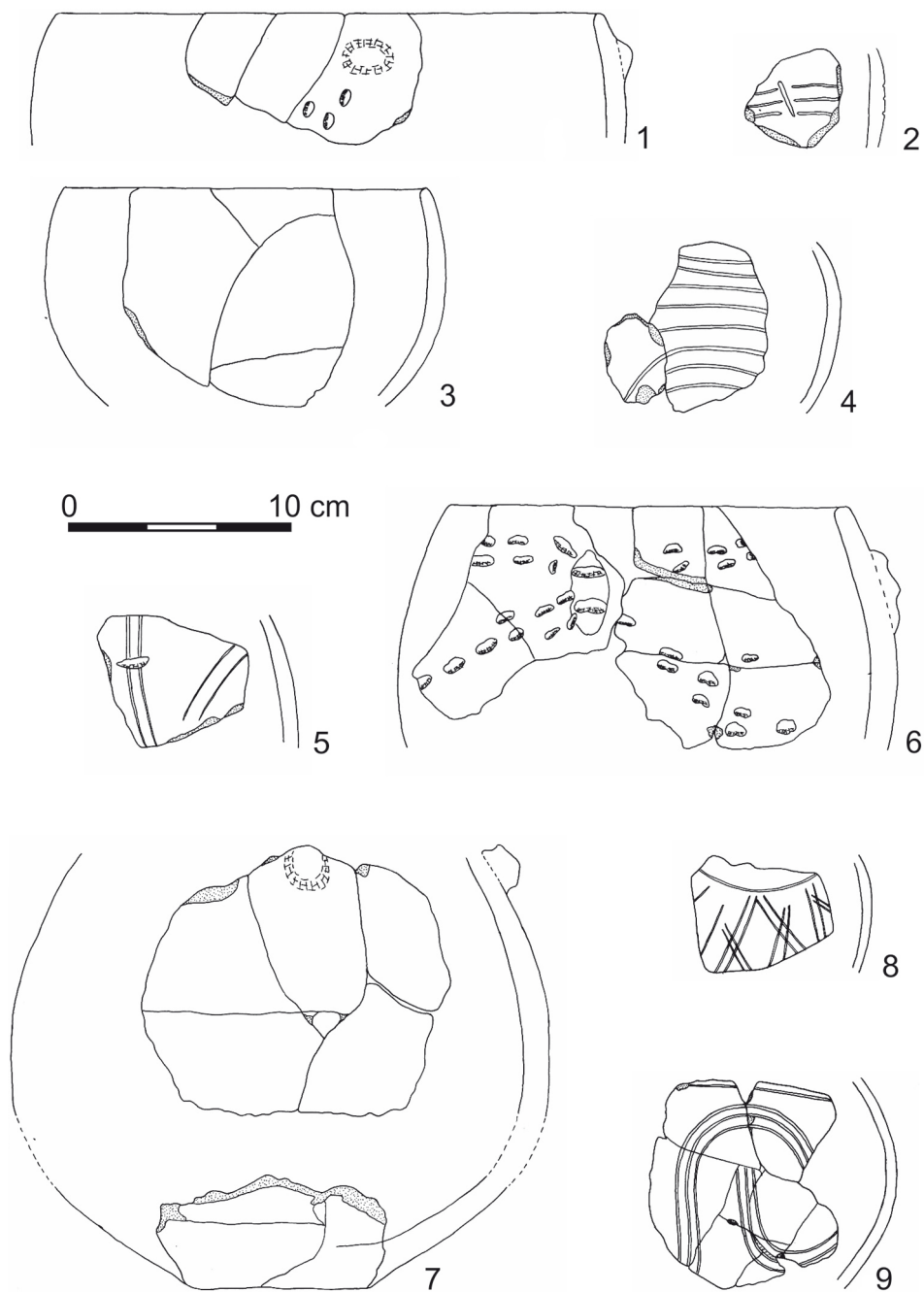


Fig. 4. Brzezie, site 40. Selection of LBK pottery (1-7) from excavated house (illustration by M. Golańska and A. Krzywda)

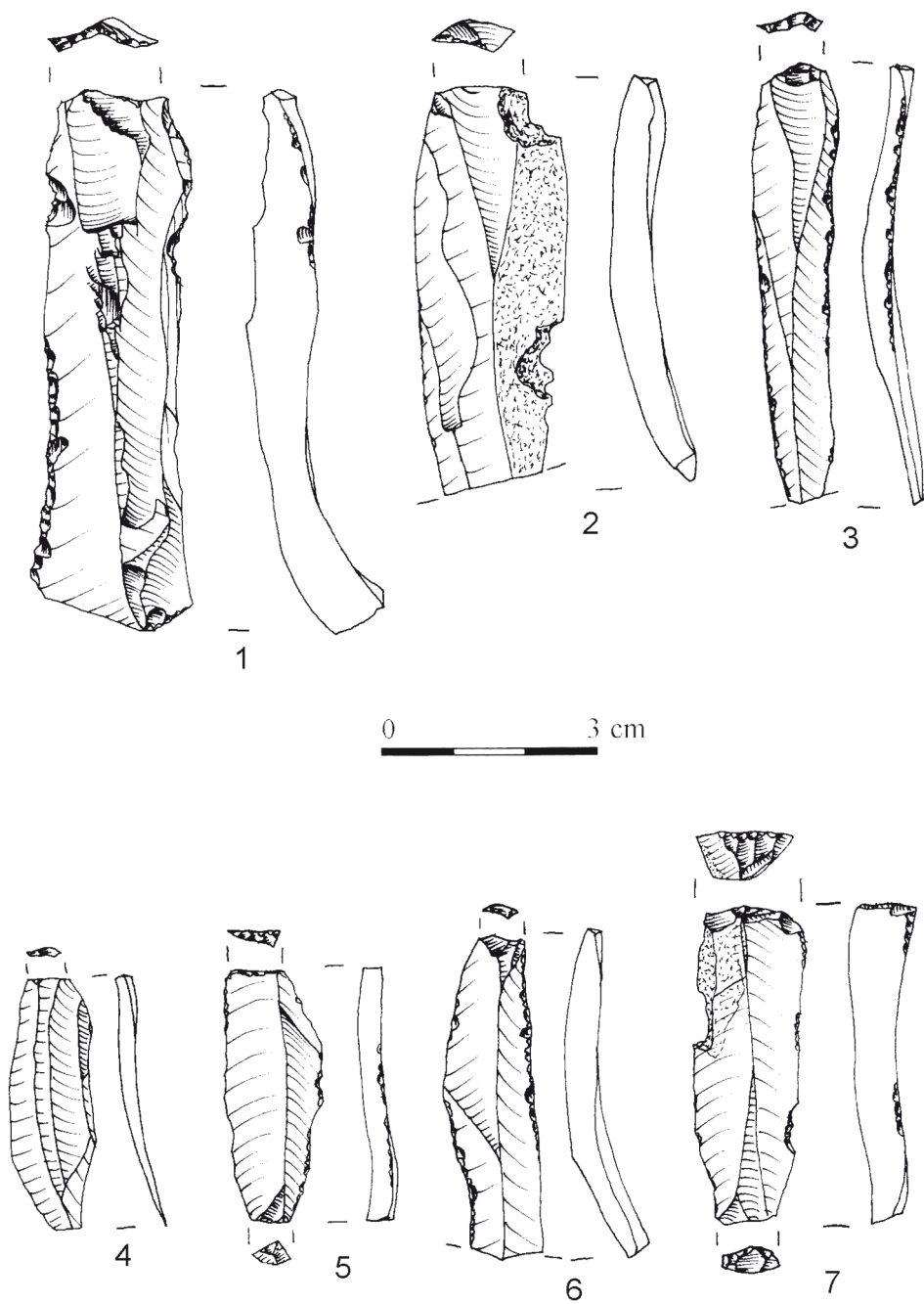


Fig. 5. Stone artefacts from excavated LBK houses at Brzezcie, site 40 (1, 5-7), and Targowisko, site 16 (2-4), made of Jurassic flint (1-3, 5-7) and obsidian (4) (illustration by M. Wąs)

Targowisko 16

On the western edge of site 16 in Targowisko, thanks to the geomagnetic prospection, traces of three long LBK houses, located at fairly large distances from each other, were recorded (Golański *et al.* 2019, fig. 4-7). It was decided to excavate the northernmost house (Fig. 6).

A house consisting of 5 rows of post-holes was unveiled. Long pits have been explored on both sides of the house (Fig. 6).

In domestic pits and in the so-called cultural layer, 618 pieces of LBK pottery were discovered, mostly of small size. Only 14% of the pottery sherds represent the category of characteristic ceramics, *i.e.*, they have an ornament or are part of a rim or bottom.

Among the delicate ceramics, cups decorated with engraved lines, which are sometimes cut with notches, predominate (Fig. 7: 1-3, 6). Kitchen ceramics, including hemispherical and necked dishes, are decorated with plastic ornaments and fingerprints (Fig. 7: 7, 9-13). The large share of notches in engraved ornamentation suggests a slightly younger position in the Želiezovce (III) phase (Kadrow 2020b, fig. 7) than the pottery set from Brzezie 40.

The entire flint inventory (64 specimens) from this site comes from the fill of 4 domestic features. Most of the artifacts (including the burned ones) were made of local Jurassic Cracovian flint (83%). As much as 17% (11 products) were made of obsidian (Fig. 5: 4). In the technological and typological structure of the inventory, the most numerous group includes products related to the exploitation of flakes (30 items in total). Flakes (19 items), the technologically related flake core (1 specimen), and tools made of flakes (10 items) constitute nearly half of the entire inventory. Products related to blade exploitation (26 items; Fig. 5: 2-4) are slightly less numerous. The most numerous objects in this group are blades (10 items), but the group also includes a blade core (1 piece) and 15 tools made of blades. In addition, there were 3 flint crumbs and one chip.

As many as 25 tools have been identified. The typological tools include truncated blades (7 items), micro-retouched blades (3 items; Fig. 5: 3) and a perforator (1 item). Five amorphous retouched flakes were also recorded. The utility tools include flakes and blades with traces of use-wear in the form of the utility retouch and utility displays (9 items in total).

While the inventory from Targowisko 16 has many analogies in other LBK sites from western Małopolska in terms of raw materials and tool structure, some differences are visible in the aspect of production. Blade technology production is relatively difficult to ascertain here. Of note is not only the lack of cores, but most of all the lack of characteristic production waste, such as crested blades, platform rejuvenation flakes, etc.

Targowisko 14-15

In the northern part of site 14-15 in Targowisko, traces of five MC houses were documented thanks to geomagnetic prospection (Golański *et al.* 2019, fig. 8-11). House no. 3 was selected for excavation (see Golański *et al.* 2019, fig. 11). Relics of a 12-meter-long MC

house, typical for western Małopolska, were discovered. These consisted of a single row of post-holes on the perimeter of a rectangular structure and one row of post-holes separating the vestibule (see Kadrow 2015, fig. 2-4). The house is accompanied by a construction (clay) pit (Fig. 8) to the north-west.

A total of 653 fragments of MC ceramics were discovered, of which only 92 were characteristic sherds (14%). These include pear-shaped vessels decorated with a stroked ornament in the form of horizontal lines below the rim and sliding triangles on the upper part of the belly (Fig. 9: 11), along with small cups (Fig. 9: 8), bowls (Fig. 9: 1), bowls on hollow pedestals (Fig. 9: 5), other vessels on feet (Fig. 9: 9), amphorae with anthropomorphic images (Fig. 9: 6; cf. Grabowska and Zastawny 2007, fig. 4, 5), pouch-like vessels (Fig. 8: 3, 4) and large biconical vessels. The forms of these vessels and their ornamentation are typical for the classic MC phase (Kadrow 2006, 63-69).

The stone inventory consists of 97 products, 42 of which are made of chocolate flint, 41 of the Jurassic Cracovian flint and 3 of obsidian. The degree of charring of 11 artifacts prevents their raw material identification. In the technological and typological structure, the most numerous group includes products related to flake exploitation (55 items in total).



Fig. 6. Targowisko, site 16. Remains of the LBK house (photo by A. Golański)

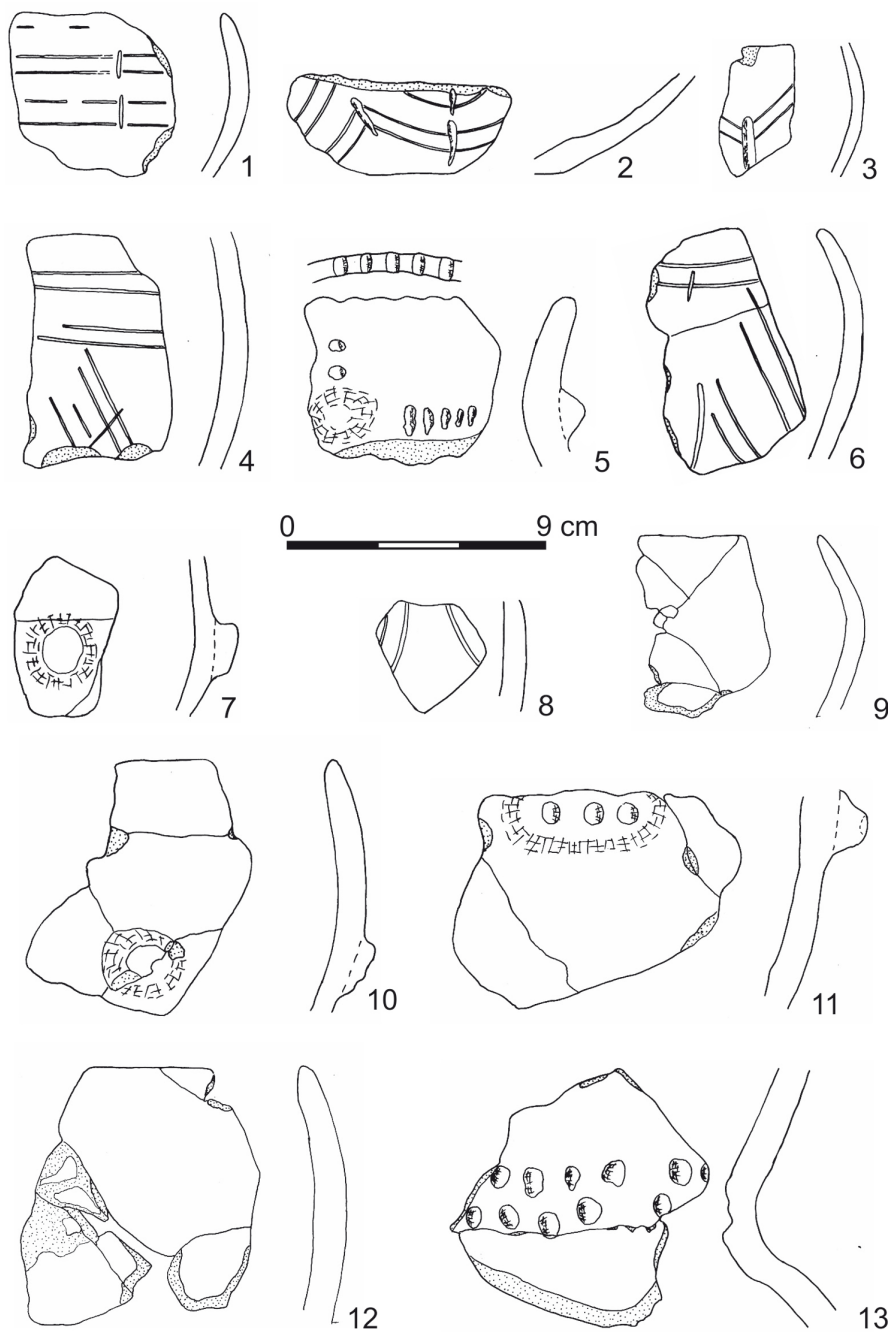


Fig. 7. Targowisko, site 16. Selection of LBK pottery (1-13) from excavated house (illustration by M. Golańska and A. Krzywda)

The products associated with blade exploitation (35 items; Fig. 10: 1, 2) are slightly less numerous. The rest of the inventory consists of specimens identified as flint crumbs (5 items) and microdebitage in the form of two chips. As many as 31 tools were identified, accounting for over 30% of the total inventory. Sixteen retouched specimens were identified, among which blade forms predominate: truncated blades (6 items, including 2 single and 4 double; Fig. 10: 4, 7, 8), end-scrapers (2 items), micro-retouched blades (6 items; Fig. 10: 3, 5, 6) and 2 retouched flakes. Moreover, utility tools (15 items) with retouching or utility displays were distinguished

CHRONOLOGY AND SETTLEMENT PROCESS DYNAMICS OF THE TARGOWISKO REGION

In addition to the results of the excavations described above, a series of radiocarbon dates were also obtained, precisely defining the absolute age of the beginning of the late (III) LBK phase and the classic (Ib) MC phase (Fig. 11; Table 1). As samples for age determination, macroremains of plants were used, which were collected from the bottom levels of construction pits accompanying the excavated houses at the sites of Brzezie 40 and Tar-



Fig. 8. Targowisko, site 14-15. Remains of MC house (photo by A. Golański)

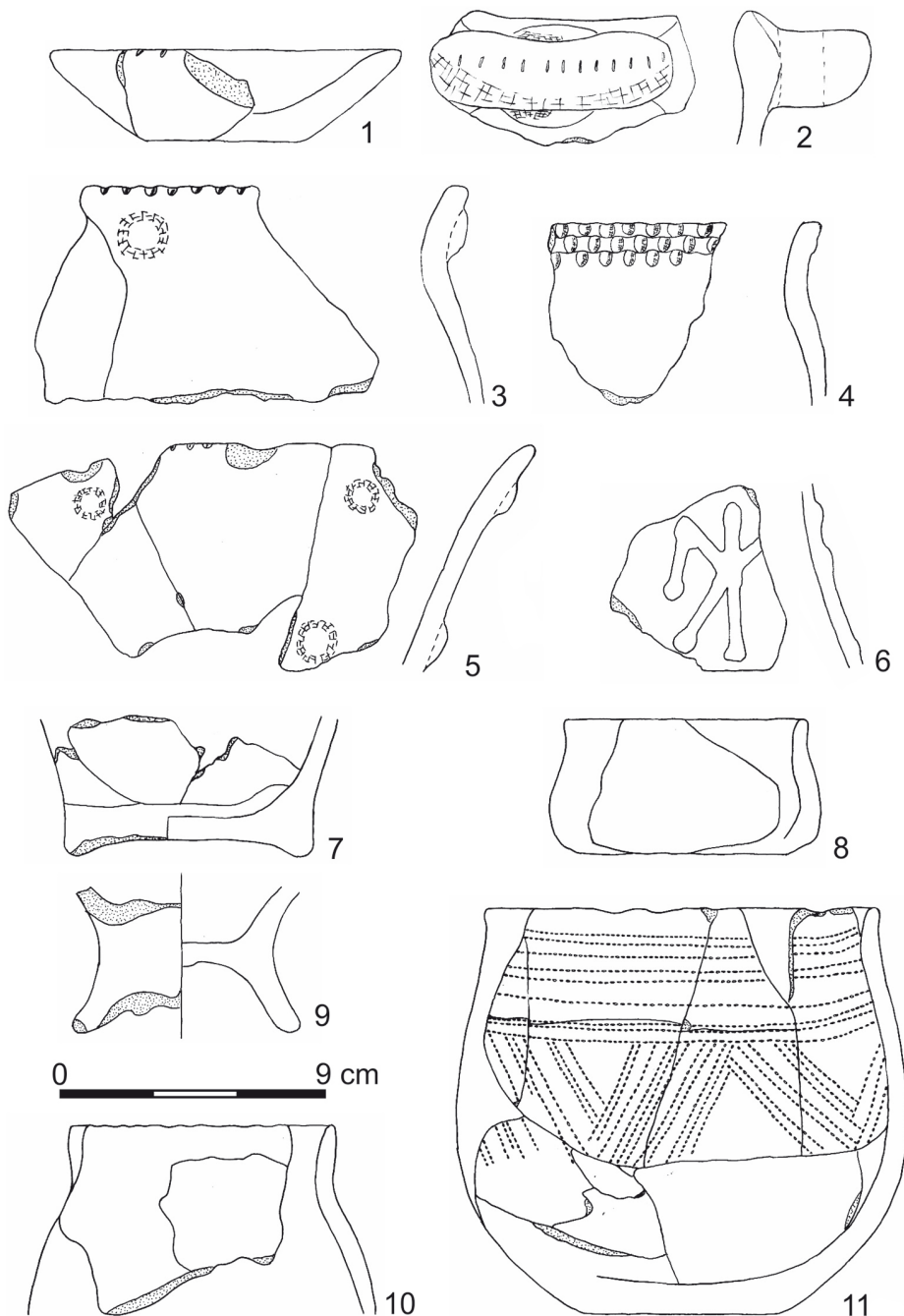


Fig. 9. Targowisko, site 14-15. Selection of MC pottery (1-11) from excavated house (illustration by M. Golańska and A. Krzywdą)

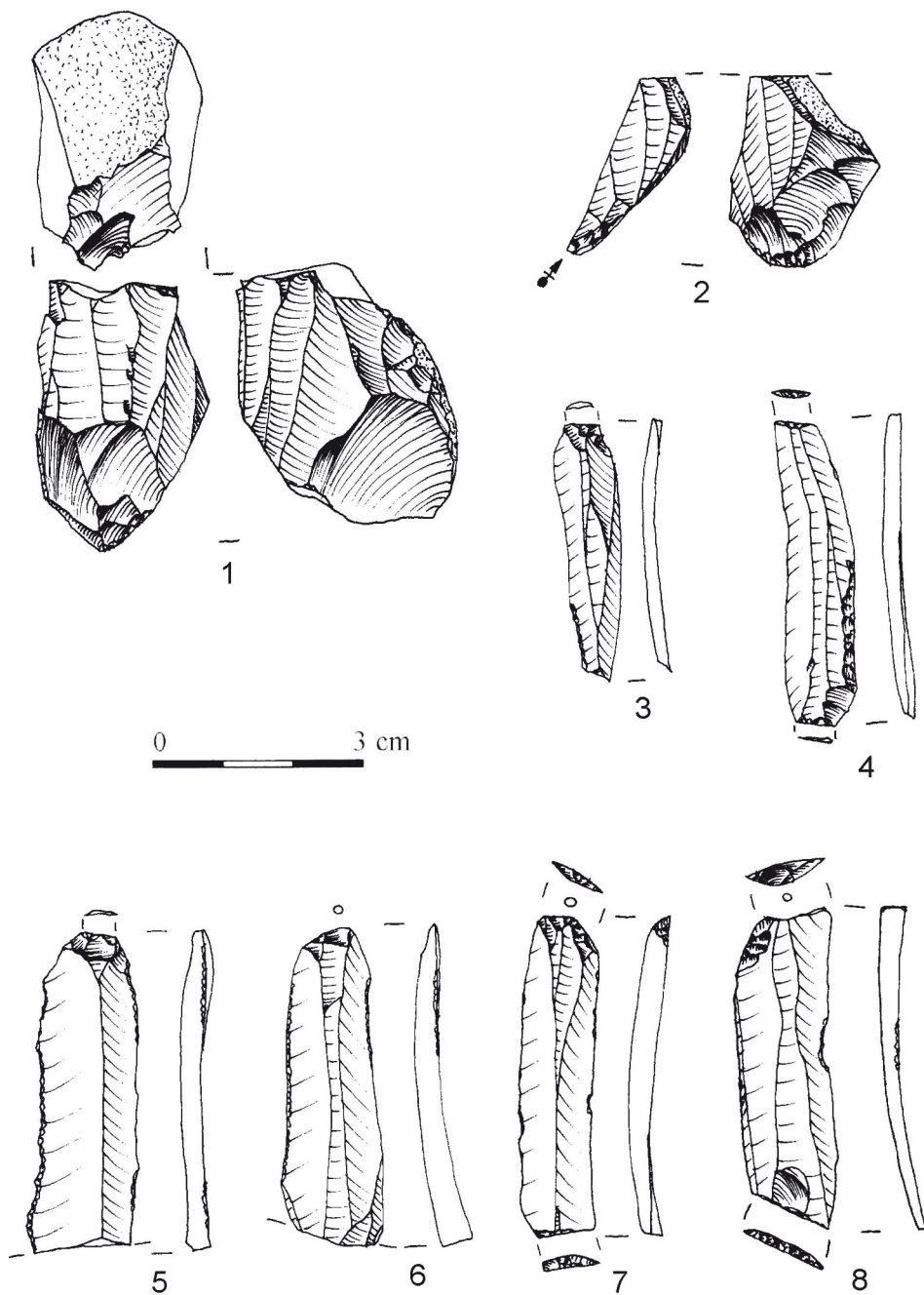


Fig. 10. Targowisko, site 14-15. Selection of stone artefacts from excavated MC house, made of Jurassic (1, 4, 5) and chocolate (2, 3, 6-8) flint (illustration by M. Wąs)

gowisko 14-15 and 16 (Abramów 2021). At the same time, the assumption about the single-phase nature of the explored parts of the sites, as well as the origins of all artifacts and ecofacts obtained from narrow time intervals therein, were confirmed.

The sigma 1 intervals of the probability distributions of six ¹⁴C dates from Brzezcie 40 and Targowisko 16, whose ceramics stylistically and typologically related to the beginning of the late LBK phase, take maximum values from 5200 to 4950 BC (Table 1). A concentration of probabilities is associated with a narrower time period, *i.e.*, 5100-5000 BC. The probability distributions of the seven ¹⁴C dates in the sigma 1 range associated with the classic phase MC house relics are located between 4700 and 4450 BC. The concentration of probabilities is limited to a narrower range of 4650-4550 BC (Table 1).

In the opinion of Agnieszka Czekał-Zastawny, researcher of site 17 in Brzezcie – which is dominated by relics from the music-note phase (II) of the LBK – this phase should be dated to the period between 5300-5100 BC (Czekał-Zastawny 2014, 94). As it turned out recently, the traces of the early phase (I) of the LBK in Gwoździec are dated to the same period (*cf.* Czekał-Zastawny *et al.* 2020, fig. 16). The presence of the settlement of the older (I) LBK phase at site 10-11 in Targowisko, and the dating of the impact of its inhabitants on the environment to the period 5300-5100 (MKL-4491 6270 ± 80 BP), readable in the TRG core at a depth of 280 cm and slightly higher (Forysiak *et al.* 2021, table 1), confirms this diagnosis. The sequence of stages, beginning with a large settlement from the older (I) phase of the LBK, followed by subsequent settlement phases at site 2 in Zagórze (Kadrow *et al.* 2020), does not contradict this.

There are still no radiocarbon dates for the older (Ia) MC phase. However, thanks to the dates published in this article and the definition of the chronology of the younger (III) LBK phase and the classical (Ib) MC phase (Fig. 11; Table 1), we know that this phase should fall between them, *i.e.*, between 4950 and 4700 BC. Confirming such dating is the chronology of the environmental impact of the inhabitants of the settlement at site 10-11 in Targowisko, visible in the layers of the TRG core at a depth of 257-256 cm (MKL-4183 5960 ± 80 BP, *i.e.*, 4950-4800 BC; *cf.* Forysiak *et al.* 2021).

The new arrangements of the absolute chronology presented above and the reanalysis of the chronology of the settlement phases at the site of Zagórze 2 (Kadrow *et al.* 2020) allow for some modifications of the model of the chronology of settlement in the Targowisko region, reconstructed by Czekał-Zastawny (2014, 97-100, fig. 58). Now, we can also attempt to reconstruct the dynamics of settlement processes in this region (Fig. 1, 12).

At about 5300 BC at the western end of the region, at the Zagórze 2 site, a group of prospectors with ceramics from the older phase (I) of the LBK in the Gniechowice style appeared. The action of permanent settlement (construction of long houses) began a little later, but still during the older phase of the LBK (Zofipole style ceramics) on the western (Zagórze 2; see Kadrow *et al.* 2020) and eastern edges of the region (Targowisko 10-11; see Zastawny and Grabowska 2014). In the former, there were at least 13 houses from that time, while at Targowisko there were 8 houses spanning two building phases.

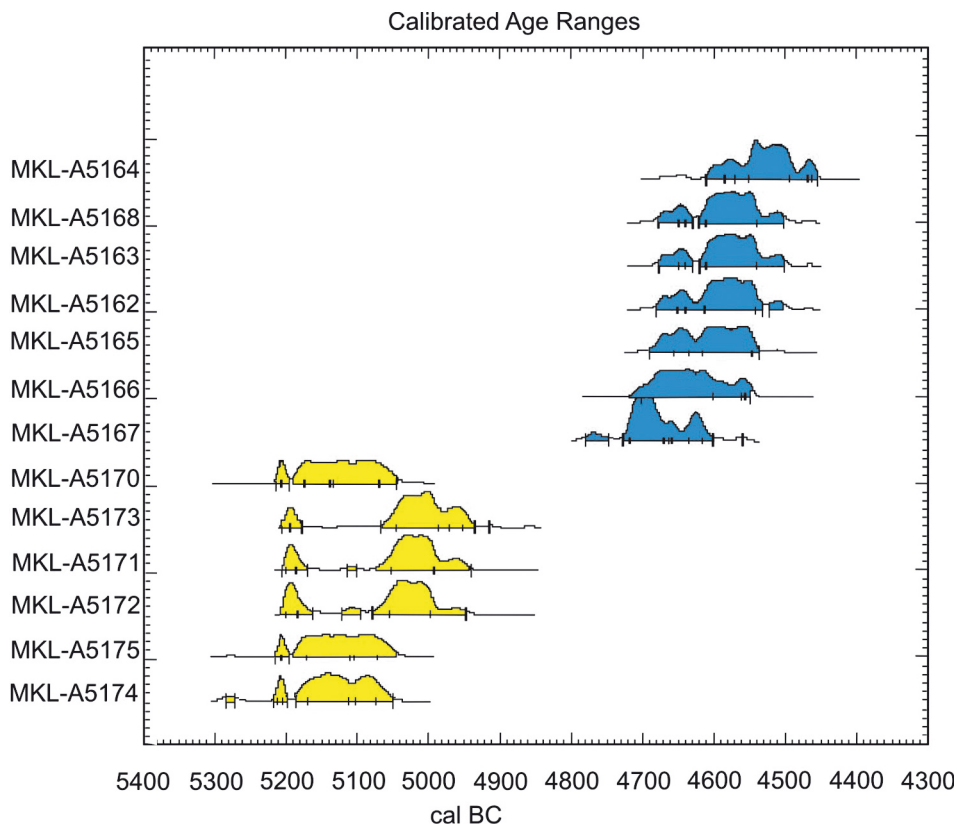


Fig. 11. Radiocarbon chronology of LBK (Brzezie 40 and Targowisko 16) and MC (Targowisko 14-15) houses (calibration after Calib Rev 8.1.0)

In the next, music-note phase (II) of the LBK, permanent settlement from the above-mentioned locations moves to the sites located in the interior of the region, *i.e.*, to the Brzezie 17 site (east of Zagórze 2) and to the complex of sites 12-16 in Targowisko (west of Targowisko 10-11). Twenty-six long houses from that period were discovered in Brzezie, and 30 houses in Targowisko (Czekaj-Zastawny 2014, 98).

In the late phase (III) of the LBK, the settlers showed an even greater tendency to colonize the central parts of the region. At that time, settlements were established at the site of Brzezie 40 and Szarów 9. The settlement of sites 12-13 and 16 in Targowisko was continued. From that time, 52 long houses were documented in the above-mentioned sites (Czekaj-Zastawny 2014, 98), *i.e.*, slightly less than in the previous phase.

So far, there is no evidence of contemporaneous contact between the population of this phase of LBK and the inhabitants representing the oldest MC phase in the region. Research on the question of contact is possible thanks to site 12-13 in Targowisko, where the

Table 1. List of radiocarbon dates from LBK settlements at Brzezie site 40 and Targowisko site 16 and from MC settlement at Targowisko site 14-15. Calibration after Calib Rev 8.1.0

L.p.	Site	Lab	BP	BC – 68,3% probability	BC – 95,4% probability
1	Targowisko 14-15, ob. 10	MKL-A5164	5705±24	4585 (8,9%) 4569 4553 (56,6%) 4493 4469 (2,7%) 4464	4611 (95,4%) 4456
2	Targowisko 14-15, ob. 1	MKL-A5168	5737±23	4650 (4,7%) 4641 4613 (63,6%) 4540	4678 (18,0%) 4631 4621 (77,5%) 4501
3	Targowisko 14-15, ob. 1c	MKL-A5163	5737±23	4650 (4,7%) 4641 4613 (63,6%) 4540	4678 (18,0%) 4631 4621 (77,5%) 4501
4	Targowisko 14-15, ob. 1	MKL-A5162	5741±23	4652 (6,5%) 4640 4613 (61,8%) 4542	4681 (90,2%) 4531 4526 (5,2%) 4502
5	Targowisko 14-15, ob. 1	MKL-A5165	5755±23	4658 (15,0%) 4636 4616 (53,3%) 4548	4691 (95,4%) 4536
6	Targowisko 14-15, ob. 1A	MKL-A5166	5779±24	4686 (65,0%) 4602 4562 (3,3%) 4556	4703 (95,4%) 4549
7	Targowisko 14-15, ob. 1	MKL-A5167	5821±23	4604 (57,0%) 4534 4520 (11,3%) 4504	4674 (7,6%) 4636 4616 (85,9%) 4492 4472 (1,9%) 4461
8	Targowisko 16, ob. 44b	MKL-A5170	6182±23	5176 (24,4%) 5140 5132 (43,9%) 5071	5214 (95,4%) 5046
9	Brzezie 40, ob. 7	MKL-A5173	6096±24	5197 (2,0%) 5193 5046 (55,5%) 4986 4971 (10,7) 4954	5206 (9,9%) 5176 5069 (85,3%) 4935 4917 (0,3%) 4913
10	Brzezie 40, ob. 10A	MKL-A5171	6108±24	5201 (11,1%) 5185 5054 (57,2%) 4992	5207 (16,2%) 5168 5116 (1,6%) 5100 5073 (77,6%) 4941
11	Brzezie 40, ob. 7	MKL-A5172	6118±23	5202 (14,5%) 5184 5056 (53,5%) 4998	5208 (21,9%) 5162 5121 (3,7%) 5096 5079 (69,8%) 4949
12	Brzezie 40, ob. 10A	MKL-A5175	6187±24	5173 (68,3%) 5073	5215 (95,4%) 5046
13	Brzezie 40, ob. 7	MKL-A5174	6200±23	5212 (4,1%) 5206 5171 (43,2%) 5114 5103 (21,0%) 5074	5283 (1,3%) 5274 5218 (8,5%) 5199 5187 (85,7%) 5051

youngest phase (III) LBK ceramics with red painting were registered (Czerniak *et al.* 2006, fig. 6), as well as ceramics with anthropomorphic representations from the older (Ia) MC phase (Czerniak *et al.* 2006, fig. 17).

The settlement strategy seen in this region during the beginning of the LBK is partially repeated in the early stages of MC settlement. The oldest settlements of this culture reappear at extreme locations: Zagórze 2 in the west, and Targowisko 10-11 in the east (Fig. 1, 12). At both sites, the presence of 4 houses was documented, with a structure similar to the house recently discovered at site 14-15 in Targowisko (Fig. 8, *cf.* also Kadrow 2015, 299-

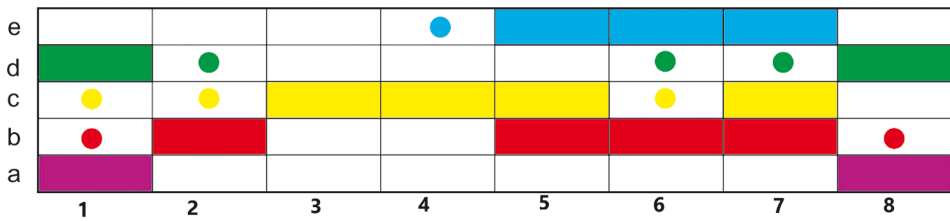


Fig. 12. Targowisko settlement region.

A graphic model of the sequence of settlement phases of LBK and MC settlements at the sites: 1 – Zagórze 2, 2 – Brzezie 17, 3 – Brzezie 40, 4 – Szarów 9, 5 – Targowisko 16, 6 – Targowisko 14-15, 7 – Targowisko 12-13, 8 – Targowisko 10-11 (colored rectangles – stable settlements with house remains; colored rings – settlement without the remains of houses; a – LBK phase I (Zofipole style), b – LBK phase II, c – LBK phase III, d – MC phase Ia, e – MC phase Ib; in part acc. to Czekań-Zastawny 2014)

301; fig. 2, 4). It is not yet known whether some of the remains of houses, including those of larger sizes, and the circular cult construction (“pseudo-ditch” enclosure) at site 12-13 in Targowisko (Czerniak *et al.* 2007, fig. 7) are related to this period. At the site of this cult construction, imported ceramics from the Oborin II culture of eastern Slovakia and from the Stroked Ornamented Pottery culture of Bohemia were discovered (Czerniak *et al.* 2007, fig. 4, 6). It is known, however, that stable forms of settlement in the classical phase (Ib) of the MC are less frequent at the sites on the edge of the region (Zagórze 2 and Targowisko 10-11) and are concentrated in the interior at other sites in Targowisko (12-16; Fig. 1, 12).

While in the times of the LBK it is difficult to identify the central settlement for the entire region or for some part of it, in the MC period this function was most likely played by site 12-13 in Targowisko for the eastern part of the region (Fig. 12). The central settlement for the western part – but only in the early phase (Ia) – was probably site 2 in Zagórze. For some reason – perhaps the arrival of settlers of the Lengyel culture (hereafter: LC – Pleszów-Modlnica group; *cf.* Kadrow *et al.* 2020) – this microregion did not undergo further development in later phases.

During the LBK and MC period (5300-4500 BC) in the Targowisko settlement region (Fig. 1, 12), the population did not form typical, stable settlement microregions with one founding central settlement (*e.g.*, Pyzel 2019, 338), inhabited continuously from the beginning until the end of the LBK or even until the end of the classic phase of the MC classic (*e.g.*, Rzeszów, site 16; see Kadrow 2020a). As in many newly analyzed regions, *e.g.*, on the upper Danube, the relative instability of microregions is visible, along with increased mobility of small groups of people and attempts at risky colonization of other locations (*e.g.*, Pechtl 2020).

CULTURE CHANGE

The most visible evidence of cultural transformation was the change in the style (ornamentation and forms) of the ceramics at the transition between the LBK and the MC. A radical stylistic breakthrough was marked on this level of ceramics analysis. The stylistics of the beginning of the *Żeliezovce* phase (*ŽI*) from the Brzezie 40 site (Fig. 4) and the turn of the early and middle section of this phase (*ŽI/ŽIIa*) from site 16 in Targowisko (Fig. 7) do not have any continuation in the ceramics of the classic MC phase (Fig. 9) from site 14-15 in Targowisko. Nor are any elements of the LBK style to be found in the rich collections of the early MC phase from the Targowisko 10-11 site (Grabowska and Zastawny 2014) or from the Zagórze 2 site (Kadrow *et al.* 2020) from the same settlement region (Fig. 1). The high proportion of decorative themes in the form of a meander in the pottery of the older phase of MC could indicate the participation of the Sandomierz-Opatów group of the LC in the genesis of the MC.

The issue of technological activities during the production of ceramics is somewhat different. LBK ceramics from Targowisko 16 are similar in terms of ceramic mass to MC materials from Targowisko 14-15. Similar technology is indicated by similar raw material sources (Miocene clays) and a significant proportion of ceramic material that includes grog. The LBK ceramics from the Brzezie 40 site show a different character in terms of raw materials and admixtures (*cf.* Rauba-Bukowska 2021).

The LBK flint inventories from the Brzezie 40 and Targowisko 16 sites contain typological and technological elements typical of this culture in south-eastern Poland. They are dominated by Jurassic Cracovian flint with a small share of obsidian. The MC inventory from site 14-15 in Targowisko has a different raw material structure, where chocolate flint plays a significant part. Part of the MC blade material from Targowisko 14-15, made of chocolate flint, is associated with a different technology of exploitation and perhaps also with the use of different blade production techniques than in the LBK. On the other hand, some MC blades from Jurassic Cracovian flint have features analogous to forms known from the LBK inventories (*cf.* Wąs 2021). The share of chocolate flint in the raw material structure of the MC flint inventory, as well as certain peculiarities of the blade exploitation technology from site 14-15 in Targowisko, confirm the participation of the Sandomierz-Opatów group in the genesis of the MC.

In terms of the basic means of subsistence of the LBK and MC populations in the Targowisko region, evidence of the continuation of agricultural activities prevails. At all three sites, remains of grain crops were recorded. Two sites (Targowisko 14-15 and Targowisko 16) contained the remains of emmer wheat (*T. dicoccum*), and in the case of the MC site Targowisko 14-15, also einkorn (*T. monococcum*). At the LBK site of Brzezie 40, one grain fragment identified as wheat (*Triticum* sp.) and several other fragments of cereal grains (*Cerealia* indet.) were recorded. The presence of emmer wheat grains and a small share of einkorn wheat reflect the known picture of Neolithic crops thus far. Emmer

heat was not grown as an independent crop. It always appeared in the company of an ein-korn which is much better represented in archaeobotanical materials (*cf.* Abramów 2021).

The information collected as a result of the analysis of the TRG core indicates that in its section, which was formed at the time of the settlement of the older LBK phase in Targowisko 10/11, a weak change (split between two episodes) in the composition of pollen was recorded. A slight increase in the share of plant species associated with arable farming is contemporary with the settlement of the older MC phase. The low impact of the early Neolithic population on the environment could have been due to the nature of farming at that time. People were using small mid-forest clearings. Differences in the degree of human impact on the environment are not recorded at the time when site 10-11 in the Targowisko site was inhabited by the populations of the LBK and MC phases (see Forysiak *et al.* 2021).

CONCLUSIONS

Thanks to the series of new ¹⁴C dates (Fig. 11), the absolute chronology of the beginnings of the late phase (III) of the LBK and the classical phase (Ib) of the MC was established. Indirectly, thanks to the synchronization of the dated layers in the TRG core with the impacts on the natural environment of the inhabitants of settlements at site 10-11 in Targowisko (*cf.* Forysiak *et al.* 2011), we also know the absolute chronology of the older phase (I) of the LBK and the older MC phase (Ia) in the analyzed region.

The exact chronology of the sequence of settlement episodes (Fig. 12) at all sites in the Targowisko settlement region (Fig. 1), along with the settlement analysis, enabled us to establish that the population did not form typical, stable settlement microregions with one central founding settlement. Conversely, the relative instability of microregions is visible, along with the increased mobility of small groups of people, settling various sites inside the Targowisko region (Fig. 1, 12).

At the turn of the LBK and MC, there are signs of continuity at the level of settlement strategies and basics of subsistence, and no continuity in terms of symbolic products, *e.g.* the form and ornamentation of ceramics, nor in the construction and size of houses.

Impulses from various cultural environments contributed to the formation of the MC, which proves its heterogeneous character and the complicated course of its genesis.

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