SPRAWOZDANIA ARCHEOLOGICZNE 72/1, 2020
PL ISSN 0081-3834
DOI: 10.23858/SA72.2020.015

Danuta Żurkiewicz*, Jakub Niebieszczański**, Cezary Bahyrycz***

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
Received: 01.04.2020; Revised: 10.05.2020; Accepted: 15.06.2020

* Adam Mickiewicz Univeristy, Faculty of Archeology, Uniwersytetu Poznańskiego st. 7, 61-614 Poznań, Poland; danuta.zurkiewicz@gmail.com
** Adam Mickiewicz Univeristy, Faculty of Archeology, Uniwersytetu Poznańskiego st. 7, 61-614 Poznań, Poland; jakubniebieszczanski@gmail.com
*** Adam Mickiewicz Univeristy, Faculty of Archeology, Uniwersytetu Poznańskiego st. 7, 61-614 Poznań, Poland; cezary.bahyrycz@gmail.com

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,

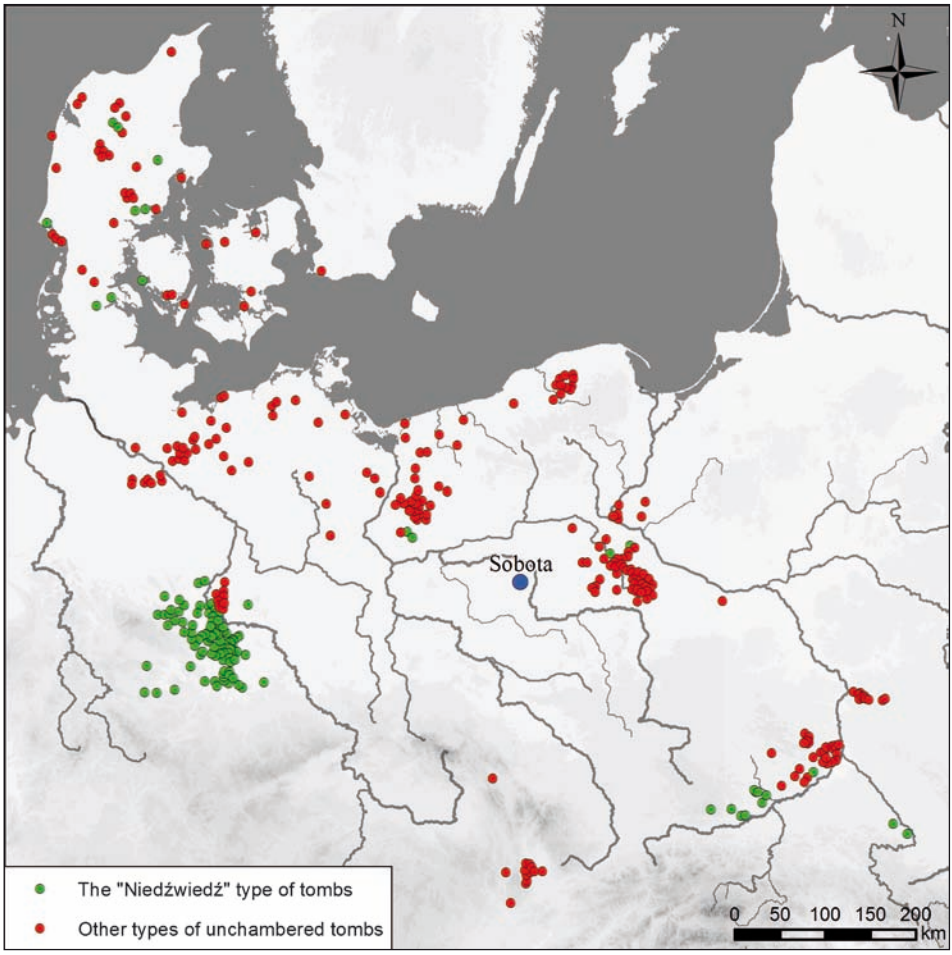

Fig. 1. Distribution of FBC long barrows in Central Europe
(after Rzepecki 2011, and redrawn)

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

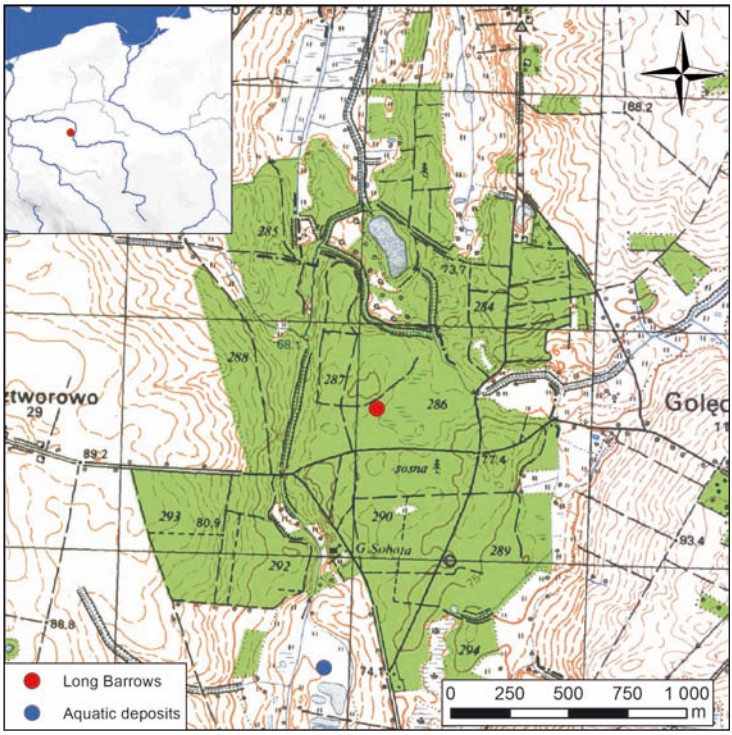

Fig. 2. Location of the long barrows at Sobota, site 52, and the aquatic deposits from Sobota, site 3

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

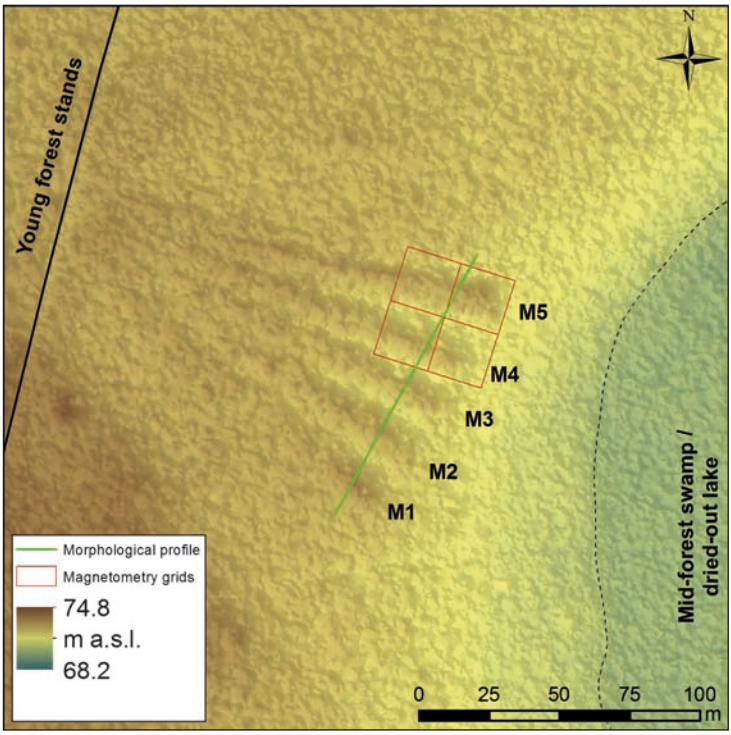

Fig. 3. Digital elevation model (based on ISOK data) of the cemetery in Sobota, site 52

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-

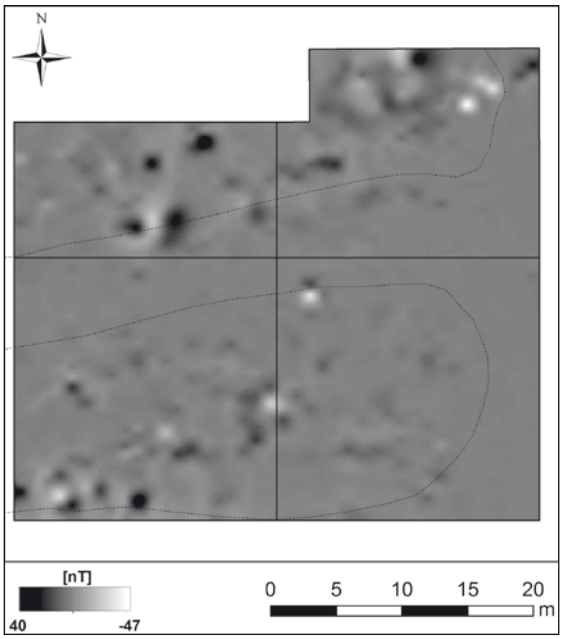

Fig. 4. Results of magnetometry prospection at the site of Sobota. For location of the grid net, see Fig. 3

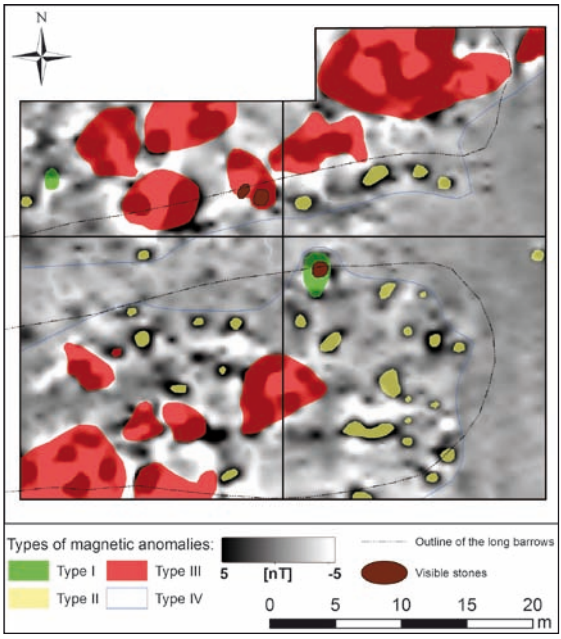

Fig. 5. Interpretation of magnetometry results at Sobota, site 52. For location of the grid net, see Fig. 3

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

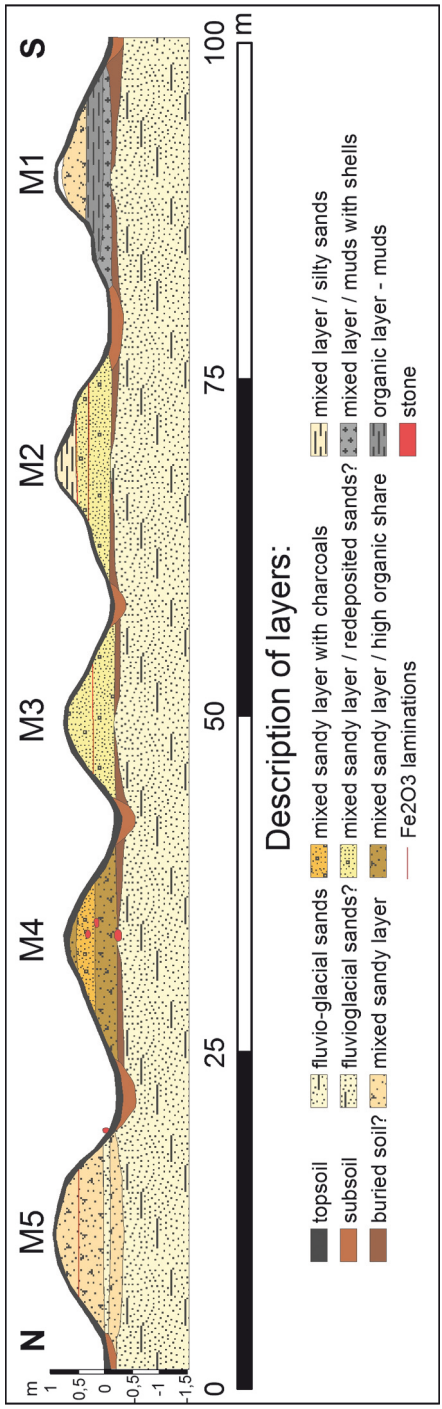

Fig. 7. Synthetic geological profile of the site in Sobota. The profile corresponds to the one marked in Fig. 3

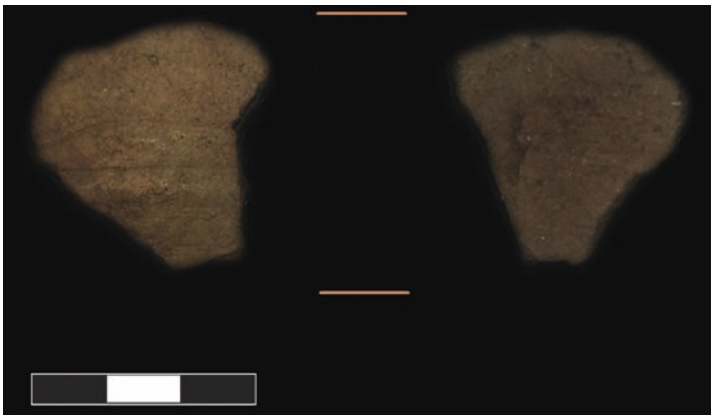

Fig. 8. A Neolithic sherd retrieved from the animal burrow in long barrow M5

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

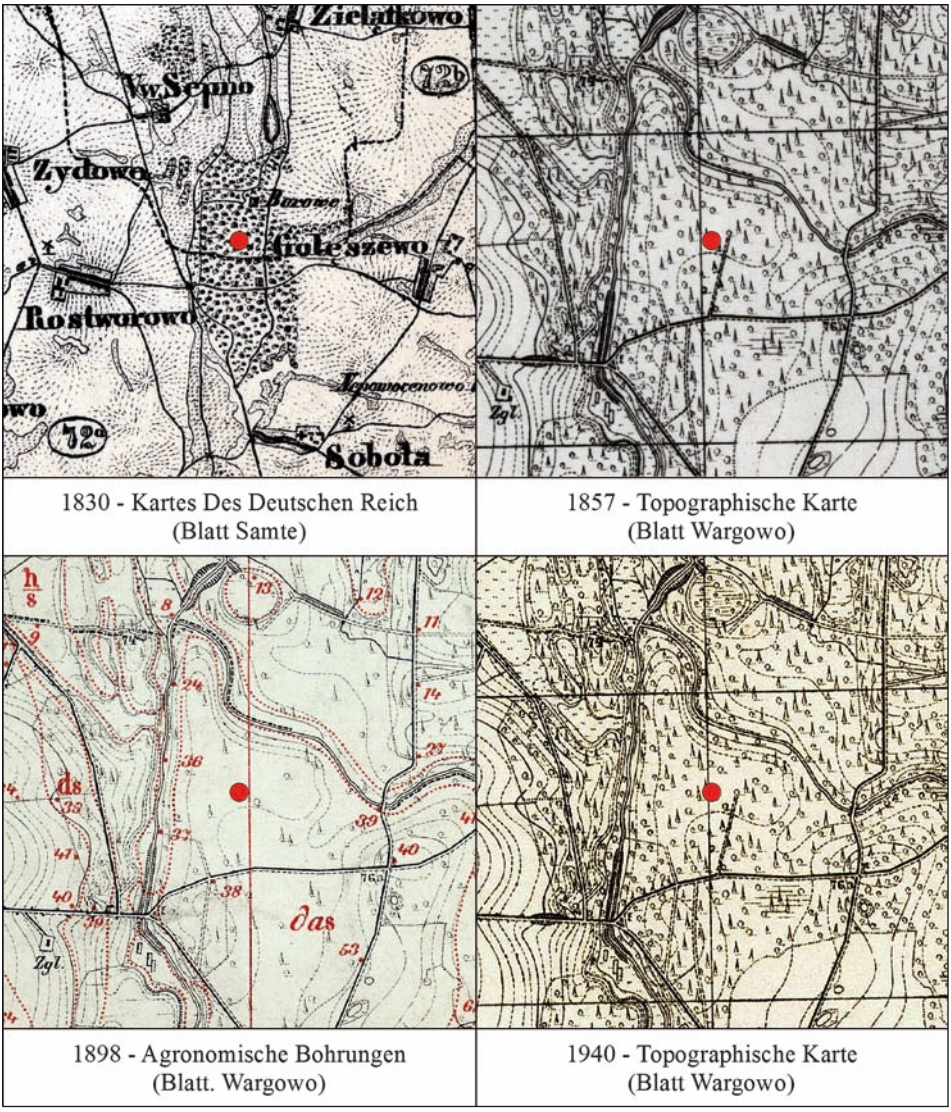

Fig. 9. Archival cartographic materials of the forest area in the vicinity of the Sobota site. Red dot indicates the position of the megaliths. Source: Archiwum Map Polski Zachodniej (www.amzp.pl)

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

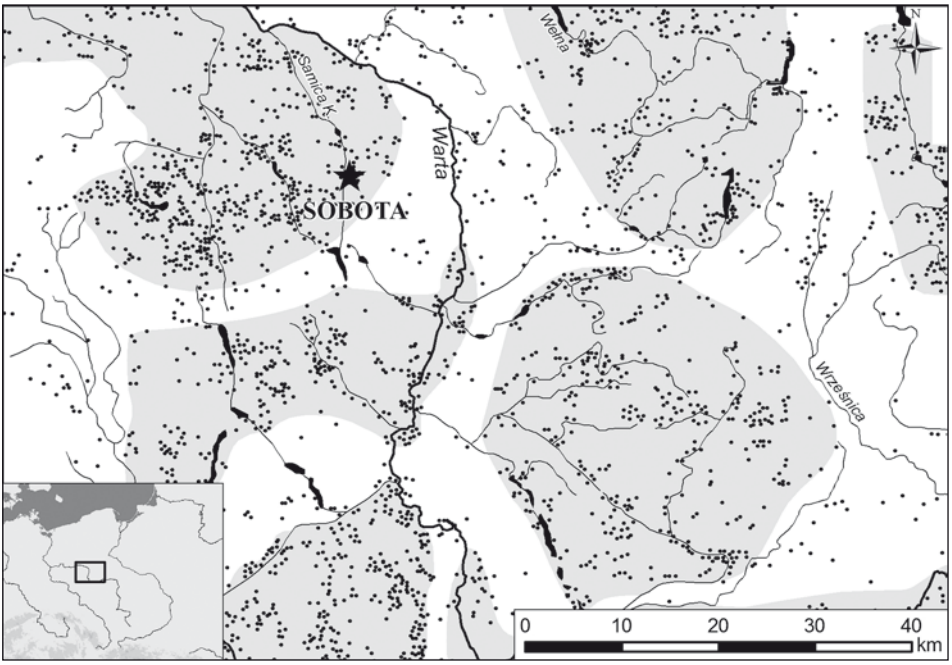

Fig. 11. Sites of the FBC in the middle catchment area of the Warta River, and settlement agglomerations (after Wierzbicki 2013 and redrawn)

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-

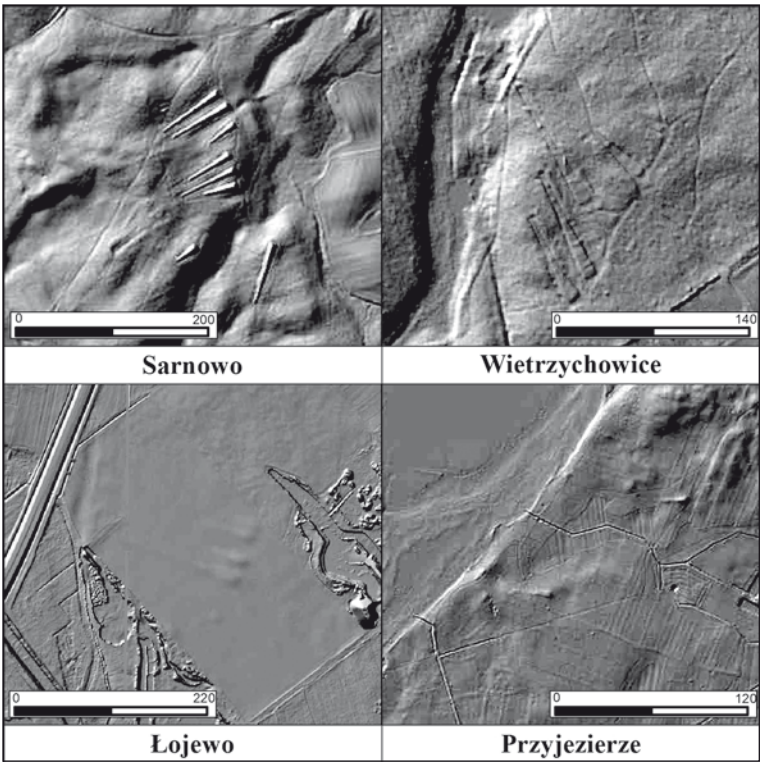

Fig. 12. Examples of other megalithic sites with similar orientation as in the Sobota site. The LIDAR imagery obtained from geoportal.gov.pl

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

This article, as well as the entire research programme in Sobota, would not have been possible without the discovery of the site by Tomasz Wiktorzak, an independent archaeologist, who provided us with the location of the long barrows. Simultaneously, the tombs were also noticed on the DEM models by Ł. Pospieszny and M. Jakubczak, as it appeared later.

The authors would also like to express their gratitude to all of the people involved in this research – Prof. Aleksander Kośko and Prof. Janusz Czebreszuk, who visited this site and shared our first impressions of the funerary character of these structures. Special thanks should be given to Agnieszka Krawczewska and Agata Karwecka from the Heritage service for their help in organizing the research and obtaining permissions.

This study was partially funded by the internal projects support of the Faculty of Archaeology at Adam Mickiewicz University in Poznań, by grant no. UAM DEC-7/WA/2020.

References

Chmielewski W. 1952. *Zagadnienie grobowców kujawskich w świetle ostatnich badań*. Łódź: Biblioteka Muzeum Archeologicznego w Łodzi.

Gabałówna L. 1968. Sprawozdanie z prac wykopaliskowych w Sarnowie, pow. Włocławek, przeprowadzonych w r. 1967 na stanowiskach 1 i 1A. *Prace i Materiały Muzeum Archeologicznego i Etnograficznego w Łodzi. Seria Archeologiczna* 15, 135-147.

Gorczyca K. 2005. Kleczewska enklawa grobowców kujawskich. Zarys problemu. *Folia Praehistorica Posnaniensia* 13/14, 117-132.

Gorczyca K., Schellner E. and Schellner K. 2019. Grobowce kujawskie na rubieży powiatów konińskiego i mogileńskiego. In M. Szmyt, P. Chachlikowski, J. Czebreszuk, M. Ignaczak and P. Makarowicz (eds), *Vir Bimaris. Od kujawskiego matecznika do stepów nadczarnomorskich. Studia z dziejów międzymorza bałtycko-pontyjskiego ofiarowane Profesorowi Aleksandrowi Kośko* (= *Archaeologia Bimaris. Dyskusje* 5). Poznań: Instytut Archeologii UAM, 51-70.

Iwaniszewski S. 2006. Megalityczny obrządek pogrzebowy i neolityczny krajobraz w mikroregionie stryczowickim na Wyżynie Sandomiersko-opatowskiej. In J. Libera and K. Tunia (eds), *Idea megalityczna w obrządku pogrzebowym kultury pucharów lejkowatych*. Lublin, Kraków: Instytut Archeologii UMCS, Instytut Archeologii i Etnologii PAN, 259-269.

Jadczykowa I. 1970. Sprawozdanie z badań prowadzonych w latach 1967 i 1968 na stanowisku 1 w Wietrzychowicach, pow. Koło. *Prace i Materiały Muzeum Archeologicznego i Etnograficznego w Łodzi. Seria Archeologiczna* 17, 125-143.

Jaeger M., Niebieszczański J., Czebreszuk J., Cwaliński M., Pospieszny Ł. and Stróżyk M. 2014. Badania nad krajobrazem kulturowym z epoki brązu na pograniczu śląsko-wielkopolskim. In B. Frydryczak (ed.), *Krajobrazy i ogrody, ujęcie interdyscyplinarne*. Poznań: Poznańskie Towarzystwo Przyjaciół Nauk, 169-182.

Jażdżewski K. 1936. *Kultura puharów lejkowatych w Polsce zachodniej i środkowej*. Poznań: Polskie Towarzystwo Prehistoryczne. Bibljoteka Prehistoryczna.

Król D. 2018. When, where and how long? A discussion around the questions on the chronology and origin of the TRB unchambered tombs in the Polish Lowlands. *Prace i Materiały Muzeum Archeologicznego i Etnograficznego w Łodzi. Seria Archeologiczna* 47, 421-442.

Niesiołowska-Śreniowska E. 1986. Osada z fazy AB kultury pucharów lejkowatych na stanowisku 1A w Sarnowie, województwo włocławskie, w świetle materiałów krzemiennych i niektóre problemy z nią związane. *Prace i Materiały Muzeum Archeologicznego i Etnograficznego w Łodzi. Seria Archeologiczna* 30 (1983), 201-265.

Papiernik P., Kittel P., Płaza D. K. and Wicha J. 2018. The settlement of the Funnel Beaker culture in the region of Wietrzychowice (district of Izbica Kujawska, province of Kuyavia-Pomerania) in the light of the research carried out from 2009 to 2016. *Prace i Materiały Muzeum Archeologicznego i Etnograficznego w Łodzi. Seria Archeologiczna* 47, 203-219.

Pospieszny Ł., Kiarszys G. and Niebieszczański J. 2018. Neolityczne cmentarzysko z Łojewa na Kujawach: długie grobowce ziemne na krawędzi zagłady. In M. Wiewióra and T. Herbich (eds), *Metody Geofizyczne w Archeologii Polskiej. Spotkanie V. 21-23 listopada 2018 r.* Toruń: Institute of Archaeology. Nicolaus Copernicus University, 73-73.

Prinke A. and Skoczylas J. 1980. *Neolityczne surowce kamienne w Polsce środkowo-zachodniej. Studium archeologiczno-petrograficzne* (= *BFAP* 5). Warszawa, Poznań: Muzeum Archeologiczne w Poznaniu.

Prinke D. and Przybył A. 2005. Osadnictwo najstarszych mieszkańców powiatu obornickiego: społeczności z epoki kamienia (od ok. 11050-9950 do ok. 2300 przed Chr.). In T. Skorupka (ed.), *Archeologia powiatu obornickiego*. Oborniki, Rogoźno, Ryczywół, Poznań: Muzeum Archeologiczne w Poznaniu, Oddział Poznański Stowarzyszenia Naukowego Archeologów Polskich, 11-124.

Rzepecki S. 2011. *U źródeł megalityzmu w kulturze pucharów lejkowatych*. Łódź: Instytut Archeologii Uniwersytetu Łódzkiego, Fundacja Uniwersytetu Łódzkiego.

Schmidt A. 2007. Archaeology, Magnetic Methods. In D. Gubbins and E. Herrero-Bervera (eds), *Encyclopedia of geomagnetism and paleomagnetism*. Dordrecht: Springer, 23–30.

Szmyt M. 2018. Podsumowanie: Późny neolit nad środkową Wartą. Osada na stanowisku 3 w Mrowinie, 3300-3150 p. Chr. In M. Szmyt (ed.), *Mrowino, stanowisko 3. Późny neolit nad środkową Wartą* (= *BFAP* 5). Poznań: Muzeum Archeologiczne w Poznaniu, 549-556.

Skompski S. 1993. *Objaśnienia do szczegółowej mapy geologicznej Polski 1: 50 000. Arkusz Oborniki Wielkopolskie (433)*. Warszawa: Państwowy Instytut Geologiczny.

Śmigielski W. 1958. Wykaz nabytków Muzeum Archeologicznego w Poznaniu w roku 1955. *Fontes Archaeologici Posnanienses* 8/9 (1957–1958), 448-463.

Wierzbicki J. 1999. *Łupawski mikroregion osadniczy ludności kultury pucharów lejkowatych*. Poznań: Wydawnictwo Naukowe UAM.

Wierzbicki J. 2006. Megality kultury pucharów lejkowatych — czy tylko grobowce. In J. Libera and K. Tunia (eds), *Idea megalityczna w obrządku pogrzebowym kultury pucharów lejkowatych*. Lublin, Kraków: Instytut Archeologii UMCS, Instytut Archeologii i Etnologii PAN, 87-101.

Wierzbicki J. 2013. *Wielka kolonizacja. Społeczności kultury pucharów lejkowatych w dorzeczu środkowej Warty*. Poznań: Stowarzyszenie Naukowe Archeologów Polskich.

Wiklak H. 1986. Podsumowanie wyników badań wykopaliskowych w obrębie grobowca 9 w Sarnowie, województwo włocławskie. *Prace i Materiały Muzeum Archeologicznego i Etnograficznego w Łodzi. Seria Archeologiczna* 33, 5-23.