

Rediscovery of a known site The results of magnetic and field-walking survey at the Roman period pottery production site in Wrzępia, Lesser Poland

Znovuobjevení známé lokality

Výsledky magnetometrického a povrchového průzkumu
hrnčířského centra z doby římské: Wrzępia, Malopolsko

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This article presents the results of the latest surface and geophysical surveys at the Przeworsk culture site 13 in Wrzępia, Lesser Poland Province. According to the results of magnetic prospection, more than 130 anomalies typical for kilns are present here. Based on the results of surface survey, their interpretation as pottery kilns is most likely. The pottery center specialised mostly in the production of Krausengefässe type of storage vessels. This is confirmed by the presence of almost exclusively of this pottery type on the site's surface. The results of prospections shed a new light on pottery production in the region.

field walking survey – geophysical prospection – pottery production – storage vessels – *Krausengefässe* type – Roman period

Článek představuje výsledky nejnovějších povrchových a geofyzikálních výzkumů v lokalitě przeworské kultury Wrzępia 13 v Malopolském vojvodství. Výsledky těchto výzkumů umožnily identifikovat dosud druhé největší centrum výroby římské keramiky ve středoevropském barbariku. Na základě výsledků magnetického průzkumu se odhaduje existence více než 130 pozůstatků hrnčířských pecí. Téměř výhradní přítomnost zlomků keramiky typu Krausengefässe na povrchu lokality vrhá nové světlo na hrnčířskou produkci v regionu.

povrchový sběr – geofyzikální průzkum – hrnčířství – zásobnice – typ *Krausengefässe* – doba římská

Introduction

The extensive site no. 13 in Wrzępia, Brzesko district, Lesser Poland Province, is located within the settlement microregion of the Przeworsk culture, occupying area east of the lower reaches of the Raba River, in south-eastern Poland (*Cetera – Okoński 1994; Kordecki – Okoński 1999; 2001; Okoński 1999–2000*). Archaeological sites within the aforementioned microregion are located in the area of the alluvial fan of the Raba (*Gębica 1995; Dobrzańska – Kalicki 2015; 2018*). These can be found along watercourses, mainly at the Gróbka River and its smaller tributaries (*fig. 1*). Based on fragments of vessels discovered here, which were mainly made on a potter's wheel, the identified sites are dated primarily to the Younger and Late Roman period and possibly also Early Migration period (approx. from the end of 2nd to the half of 5th century AD). The published results of field works conducted in the microregion include surface surveys and excavations on nine

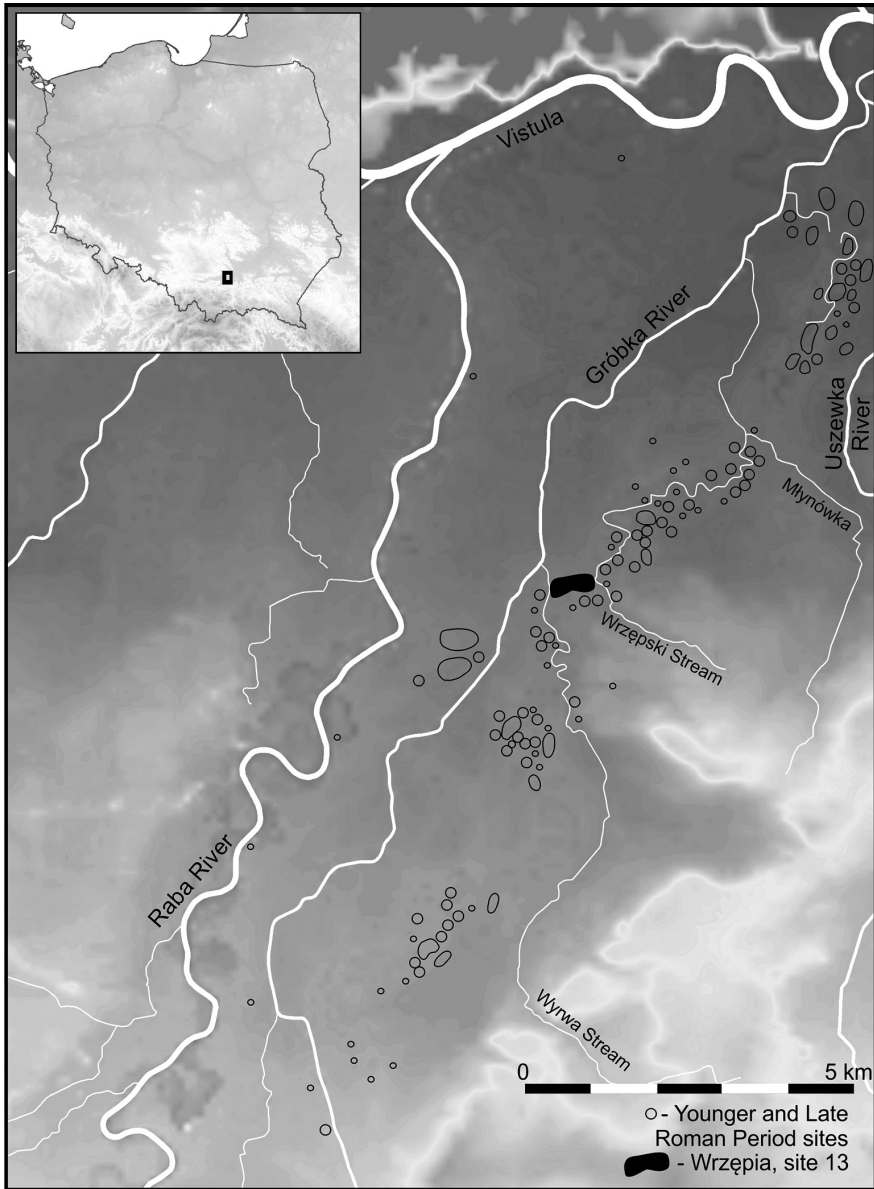


Fig. 1. The map of the microregion located on the east of the Raba River. Sites dated to the phase C of the Roman period (after *Cetera – Okoński 1994*, map 2).

sites (see above; *Okoński 2012; Okoński et al. 2000*). The choice of the site for excavations was in most cases dictated by the observation of destroyed archaeological features on the surface. For this reason, pottery kilns were mostly examined here, which manifested themselves by the presence of large fragments of construction daub, and numerous fragments of pottery.

Although pottery production could not be the only branch of economy developed here, it had to play an important role. Traces of pottery production were discovered in Bessów site 3 (one kiln and a pottery workshop), in Strzelce Małe site 13 (five pottery kilns and a workshop; magnetic prospection confirmed the presence of other kilns on the site), Okulice site 18 (one poorly preserved pottery kiln), and in Ostrów Szlachcecki site 2 (one kiln, probably used for pottery firing). In Wrzępia site 13, a pit was discovered. This was interpreted as being related to pottery production (Kordecki – Okoński 1999, 211). In 2021, trial trench excavation was conducted: two untypical kilns, interpreted as used for pottery firing, a settlement pit, and 17 pit holes were unearthed. A characteristic feature of the local pottery workshop east of the Raba is the presence of ceramic with easily abrasive surfaces. The archaeometric analyses of pottery from Bessów, located a few kilometers from Wrzępia, and sites from other regions proved that the abrasion of pottery is related to the raw material used for ceramics making (Okońska et al. 2018, with add. refs.). The issue of local pottery production in this area has been taken up again in recent years. There are arguments about worse environmental conditions for pottery production on the area of the alluvial fan of the Raba, in comparison to the area of the western Lesser Poland loess upland north of the Vistula (Dobrzańska 2015; Dobrzańska – Kalicki 2015, 111; 2018, 137; Okońska-Bulas et al. in press, with add. refs.).

Site 13 in Wrzępia – research status and results of field walking survey

The described site in Wrzępia was identified during surface surveys in 1992. Almost exclusively, fragments of *Krausengefässe* type storage vessels were discovered (Cetera – Okoński 1994, 38, 40, tab. 7). The range of the site in Wrzępia is limited from the south, east and west by small watercourses. There are no natural boundaries of the site to the north (fig. 1, 2). The entire area of the site is characterized by slight height differences. The place of the greatest concentration of materials is located on a slight, about 2-meter high elevation (~185 m a.s.l.) above the lowest point, located nearby in the Gróbkka River valley (~183 m a.s.l.). The size of the site in question was estimated at approximately 15 hectares. In its immediate vicinity, numerous but poorly examined settlement-sites are registered, dated between the second half of the 2nd and the beginning of the 5th centuries AD (fig. 2).

In 1995 trial trench with an area of 24 square meters was carried out in the south part of the site. As a result of the excavation a small pit was discovered which was interpreted as related to the pottery production that was to take place there (Kordecki – Okoński 1999, 211). At that time, a collection of 2341 pottery fragments was obtained (from the surface of the site, the arable layer and the fill of the feature). Among them, as many as 94 % were distinctive fragments of storage vessels.

Repeated verification surveys on the site were carried out in 2019 and 2020. They included several field walking surveys in various conditions of land availability, also with the use of metal detectors. Moreover, observations and aerial photos as well as geophysical surveys were performed. Due to the concentration of material in the eastern part of the site, this area was designated for research. As a result of the field work, almost exclusively fragments of storage vessels, were observed. Due to the numerous occurrence of material, it was decided to collect for further study only distinctive fragments (rims, bases and ornamented fragments of bellies). At the same time, in order to obtain a picture of the range of

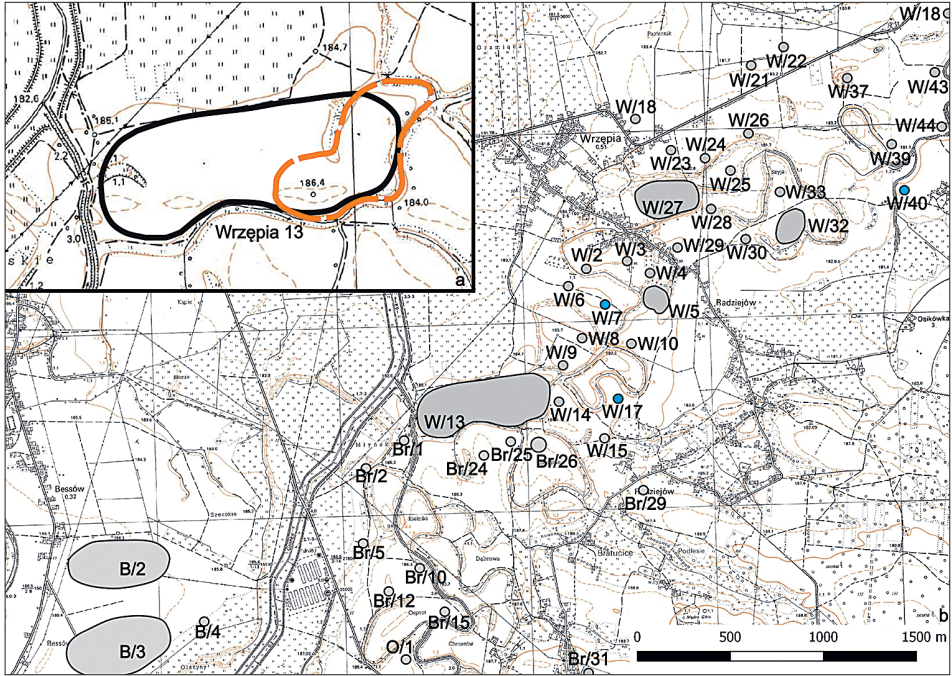


Fig. 2. Settlements in the close vicinity of site 13 in Wrzępia, based on Polish Archaeological Record (black line – borders of the site; orange line – dispersion of pottery material on the surface; blue colour – settlement dated to the phase B; grey colour – settlement dated to the phase C; sites: W – Wrzępia, Br – Bratucice, B – Bessów).

occurrence of ceramic material on the surface, in the places where all visible parts of storage vessels appeared, they were documented three-dimensionally using GPS devices (fig. 3). In addition, some fragments of orange and grey-burnt structural daub were also discovered, including those with features characteristic of fragments of pottery kilns (presumed perforated clay floors). A very large concentration of ceramic material, observations of destroyed structures, manifested as layer of orange-burnt soil, as well as the presence of construction elements of pottery kilns on the site surface, indicate the existence of a pottery production center in that place, where storage vessels were mainly produced. However, only magnetic survey allowed for the actual determination of the site scale and its unique character. Another element of the prospection was aerial photography using a drone. As a result, an orthophotomap of the site was made, which revealed traces of plowed out features location largely correlating with the results of magnetic surveys. In the photos taken, the places of the destroyed kiln structures are clearly visible, manifested as a darker layer.

Results of geophysical surveys

The magnetic method was selected to identify the spatial organization of the site, especially the location and number of kilns for firing ceramics. Magnetic measurements were

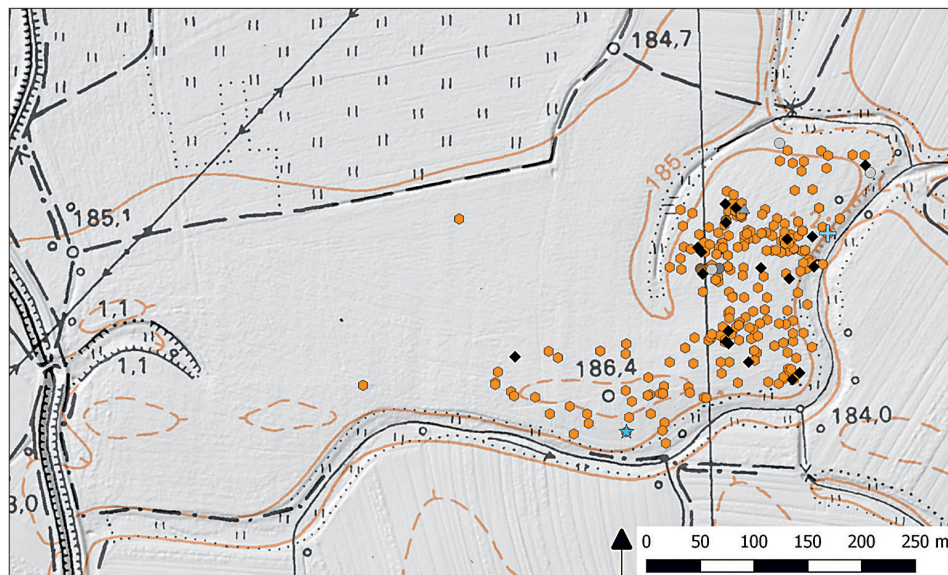


Fig. 3. Wrzepia, site 13. Dispersion of pottery material on the surface of the site (grey dots, bronze dots, gray triangles – fine ware; dark grey dots – coarse ware; orange points – storage vessels; black rombs – daub and pieces of chamber floors; star – stone tool; plus sign – iron axe).

made using a transducer magnetometer-gradientometer (fluxgate; *Misiewicz 2006*, 74–98) 4.032 DLG by Foerster Ferrex measuring the gradient of the vertical component of the magnetic field, equipped with two probes with a resolution of 0.2 nT. During the research, the measurement lines were spaced 1 m apart. The number of measurements per 1 square meter was 10. Data was collected in a bidirectional mode. Measurements were made in a system of grids (research rectangles) with dimensions of 50 × 50 m. They covered a total area of 5.25 ha (*fig. 4*).

Several hundred anomalies were discovered, the source of which are archaeological features. They are depicted in greyscale magnetic maps developed in the Terra Surveyor program (*fig. 5*). The largest amount and most legible of them are thermoremanent anomalies, related to the relics of ceramic firing kilns. All of them are characterized by good readability of both poles (positive and negative), and significant values of the magnetic gradient (in the range from -20 to 140 nT). The size of the anomalies on the magnetic maps, which undoubtedly exceeds the actual dimensions of the kilns. On the other hand, in many cases the “droplet” shape of the anomaly is visible, reflecting the shape of the kilns (*fig. 6*). This mainly applies to individual kilns. In most cases, when the kilns occur in clusters, the anomalies caused by them combine with each other. This makes it difficult to indicate their exact boundaries, and in some cases even the number of kilns. The waste pits are completely unreadable, even though they also contain highly magnetic material. This is probably due to very high values and large sizes of anomalies related to the kilns, which mask weaker neighbouring anomalies. It is difficult to determine the total number of kilns due to the aforementioned merging of anomalies. In some cases, it is also uncertain whether the observed anomaly is related to the kiln, or to another feature (for example the

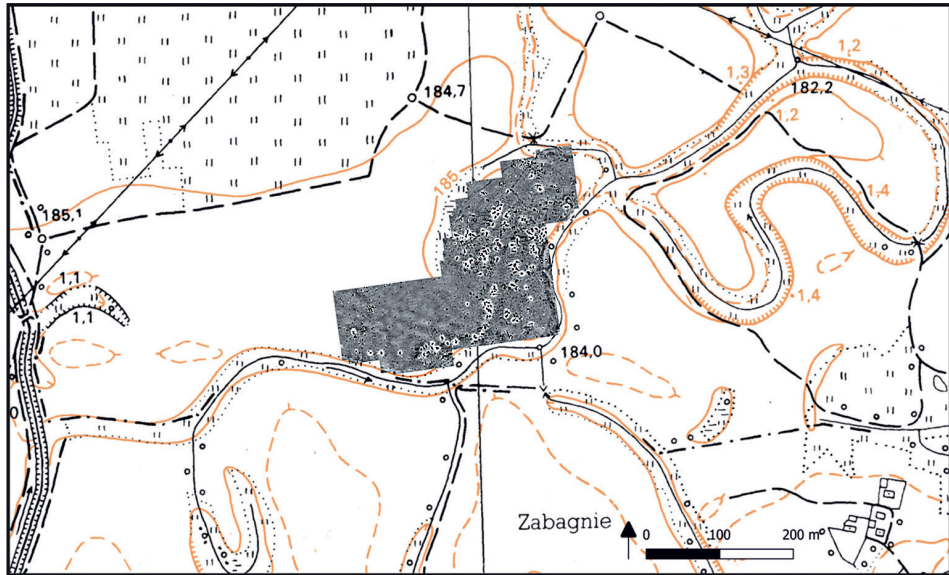


Fig. 4. Wrzępia, site 13. Location of the magnetic prospection area.

type of hearth), or to an iron item. This includes several anomalies of smaller sizes and values. Nevertheless, the number of kilns discovered on the site can be at least 130 or more (fig. 7: green dots).

Anomalies of a similar nature to those discussed above are known from numerous archaeological sites from different chronological periods (e.g. *Fassbinder 2015*, 87; *Smekalova et al. 2008*, 39). However, the best analogies, both in terms of the nature of the anomaly and the chronology of the studied features, are provided by the wheel-thrown pottery production site in Medieșu Aurit in NE Romania. This site has been excavated since 1964 (*Dumitrașcu – Bader 1967*). The scale of pottery production at the site was observed thanks to magnetic surveys; in recent years, ten of them have been excavated (*Gindele 2018*, 263–266, 272, fig. 1, 2, 8a–b), which allows for anomalies of this type to be interpreted for certain as pottery kilns. Anomalies of a similar nature are also known from the pottery production site 13 in Strzelce Małe (*Okońska-Bulas et al. in press*).

Apart from the discussed anomalies caused by the relics of pottery kilns, numerous other anomalies related to human activity, probably caused by features contemporary to the kilns were discovered on the site. They are dominated by point positive anomalies caused by the presence of features such as pits or hearths (in the case of anomalies with higher values). A clearly separated cluster of 30–40 point positive anomalies with high values is visible in the northern part of the studied area (fig. 7: 1). This cluster is oval in shape, about 50×15 m in size. It seems that there is a cluster of rectangular hearths, which are sometimes located on the outskirts of the Przeworsk culture settlements (cf. *Gindele 2015*). They group from several dozen to even several hundred objects. Such systems are known, for example, from Siemiechów, Łask district (*Michałowski 2003*, fig. 83), Strobina, Wieluń district (*Michałowski 2003*, fig. 91) and from Modlniczka, Kraków district (*Byrska-Fudali – Przybyła 2012*, 542).

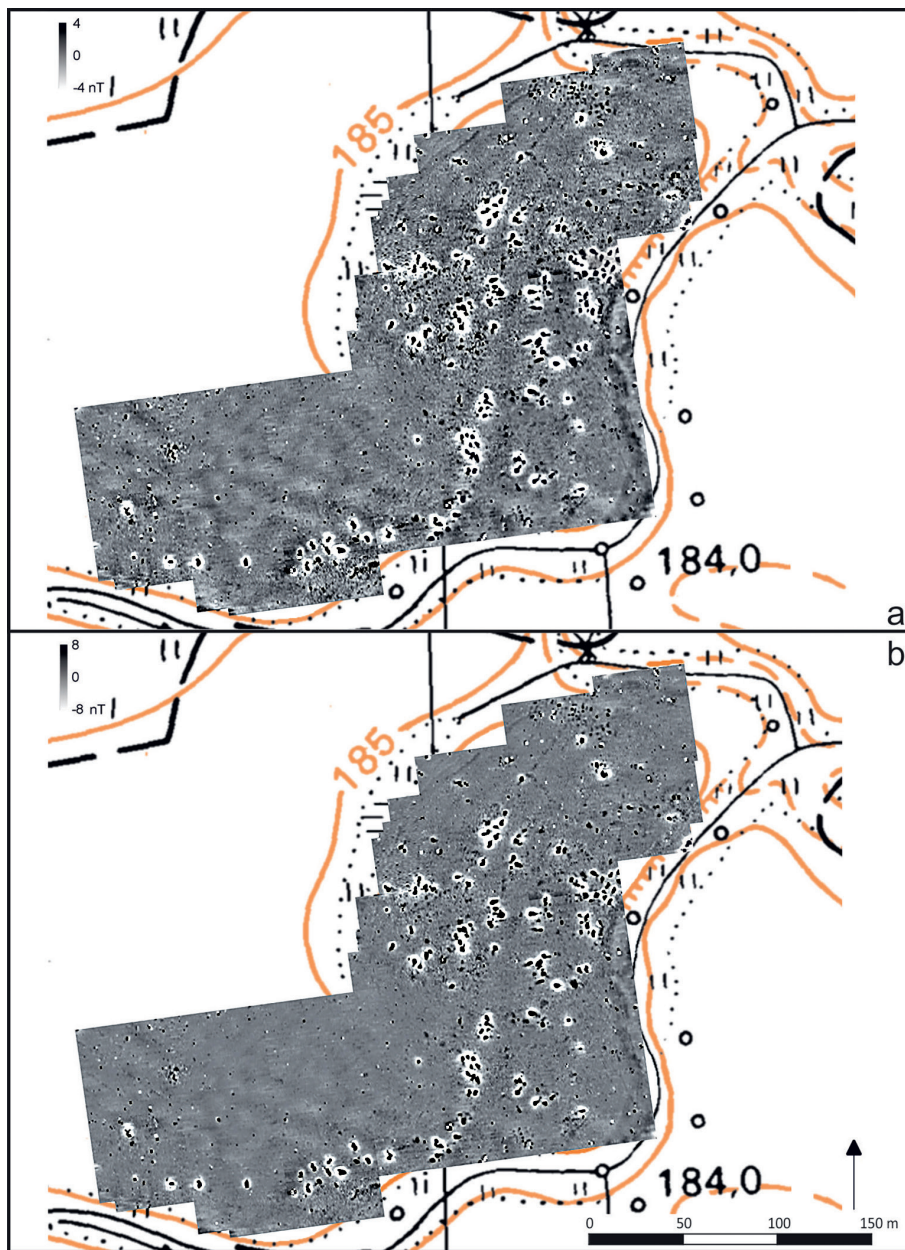


Fig. 5. Wrzëpia, site 13. Magnetic map in greyscale, a) in range -4/4 nT; b) in range -8/8 nT.

A large number of point positive anomalies are located in the central part of the studied area. They often accompany kilns or clusters of kilns. Their source are features such as pits or hearths. Some of them, distinguished by small sizes and not very high values, may be related to postholes. A dozen or so of them form a suggestive, oval arrangement,

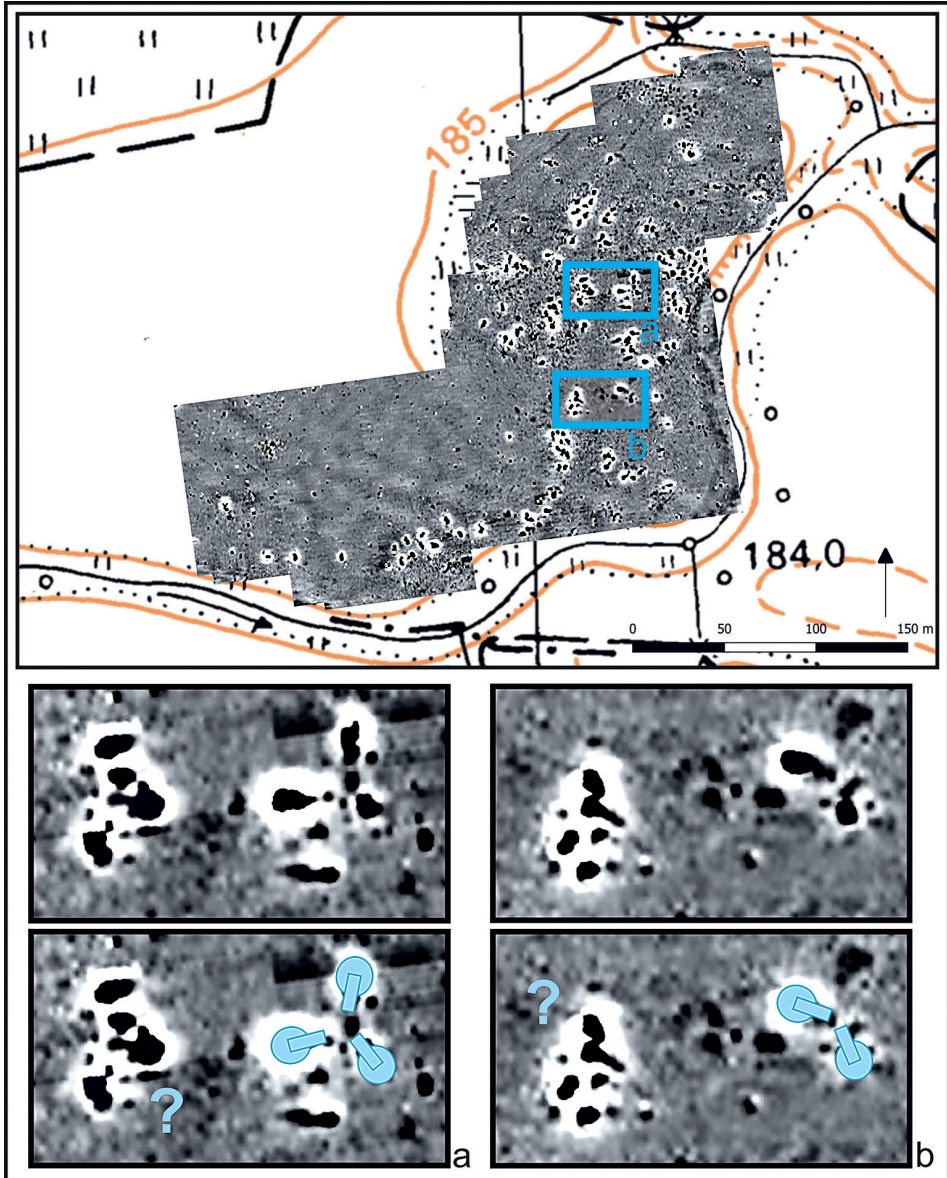


Fig. 6. Wrzępia, site 13. An attempt to interpret selected features visible as magnetic anomalies.

in the centre of which is an anomaly probably related to a kiln (*fig. 7: 2*). The possible interpretation is that there was a roof covering a kiln, supported on poles. Dozens of similar, minor point anomalies form two parallel linear arrangements (*fig. 7: 3–4*). They can be associated with structures such as fences with post construction. In the northern part of the studied area, two distinct, linear positive anomalies are visible. The first has an arched shape, running parallel to the watercourse shore (*fig. 7: 5*). Its source may be a path trodden

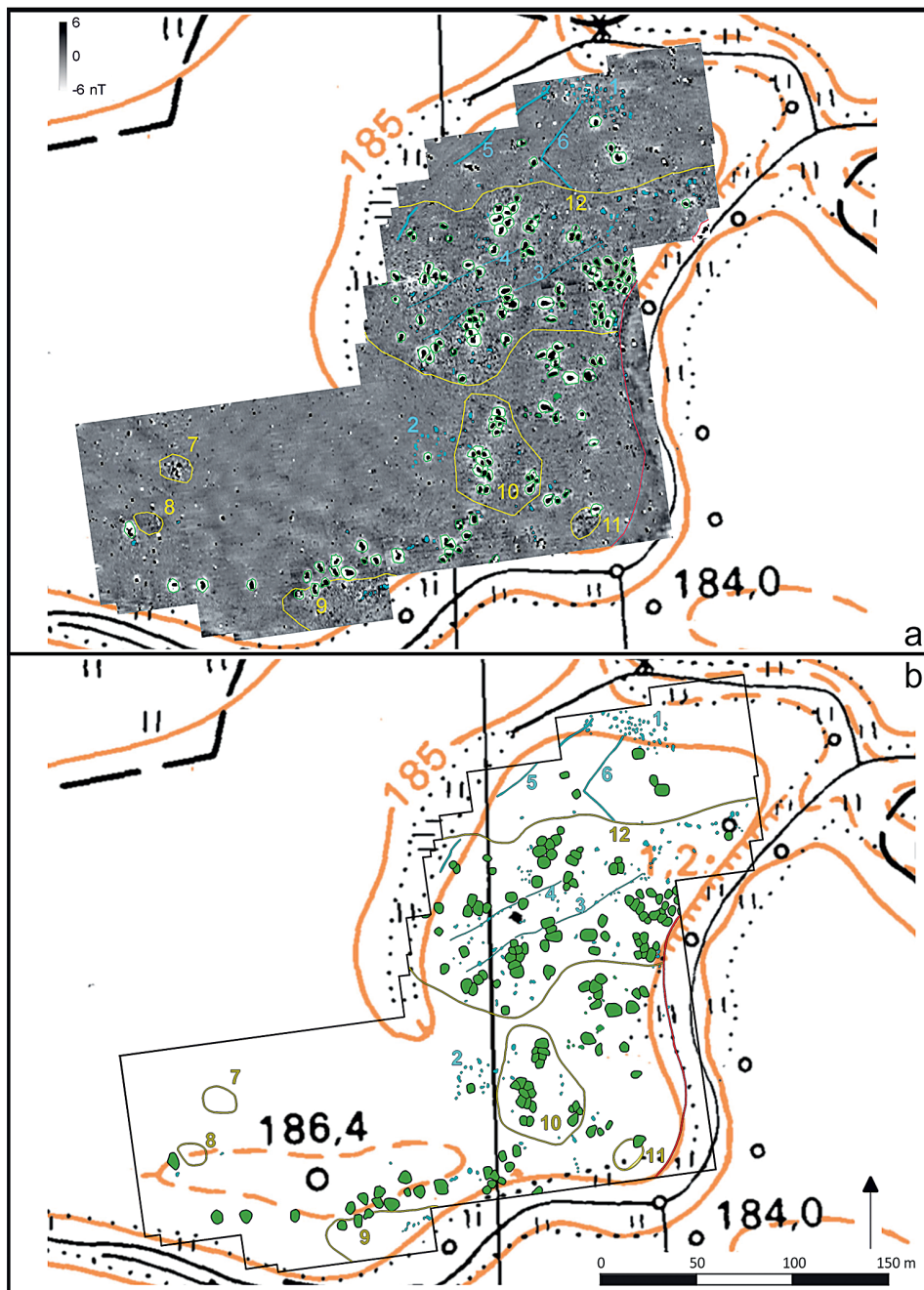


Fig. 7. Wrzępia, site 13. Interpretation of magnetic prospection results: a) magnetic map with anomalies outlined in the text; b) results of magnetic prospection on a topographic map (green color – anomalies associated with pottery kilns and the other archaeological features; blue color – anomalies associated with the other archaeological features; yellow color – zones of increased magnetic susceptibility; red color – anomalies related to the stream bed; The anomalies discussed in the text are marked with numbers).

along the shore. The other anomaly consists of two straight lines that connect almost at right angles (*fig. 7: 6*). It seems that in this case also the relics of a fence or palisade could be the source of the anomaly.

In a large part of the studied area, zones characterized by increased magnetic susceptibility can be identified. In these zones there is a significant accumulation of very small positive, negative and dipole anomalies. The largest such zone is in the northern part of the centre of the studied area (*fig. 7: 12*). Two more in the southern part (*fig. 7: 9–10*). Small, local zones are also found in the eastern and western parts (*fig. 7: 7, 8, 11*). These zones correspond to the places of concentration of traces of human activity in the form of ash, charcoal, fragments of daub, fragments of pottery for example. They all accompany clusters of kilns and even single kilns.

In the eastern part of the studied area, a positive linear anomaly is visible, running along the shore of the watercourse (*fig. 7: 13*). Its origin is probably natural, related to the river bed fill with an increased value of magnetic susceptibility. In the same zone, only partially identified strong dipole or thermoremanent anomaly was found. It is already located close to the bottom of the stream bed (*fig. 7: 14*). It seems that its presence may indicate the presence of burnt material accumulation in the bottom part of the bed. These are probably kiln wall elements, coals and daub that got to the bottom of the stream due to erosive processes. In addition, not many dipole anomalies caused by the presence of iron items, were discovered in the entire geophysically identified area. The survey with metal detectors carried out at the site did not bring many contemporary finds, but it led to the discovery of an iron axe from the Roman period. In this situation it can be assumed that at least some of the visible dipole anomalies are caused by the presence of iron artefacts.

Discovered archaeological material

The recently conducted surface surveys brought almost exclusively fragments of *Krausen-gefässe*-type storage vessels, characteristic of the Przeworsk culture (*fig. 8, 9*). Among 113 newly discovered fragments, most of them are burnt orange, with single-coloured fractures, or fractures with a grey core and orange edges. They have characteristically thickened, large rims in various varieties and shapes, most of them with edges either horizontal or inclined towards the inside of the vessel. Decoration visible on some of the sherds is characteristic of this type of vessels and includes plastic ornamentation in the form of ribs (alternating plastic strips and wide depressions between them) and engraved ornamentation, mainly single or multiple wavy lines. The ornament in the form of garlands or other engraved motifs is less common.

The technology of discovered vessels is typical of ceramic materials known from the microregion on east of the Raba. Some of the fragments have a surface slightly susceptible to abrasion, which is related to the local clay deposits. However, the location of the clay deposits used in the production of pottery in Wrzępia remains undetermined (see *Okońska et al. 2018*, 120–122). On individual sherds, there are also traces of surface preparation in the form of engobes or an additional thin layer of abrasion-resistant clay (*fig. 8: 2–3*), which is also a technological feature characteristic of workshops operating in this region. Among the fragments from surface surveys and excavations in 1995, individual ones show signs of damage, such as overfiring or deformation (*fig. 8: 13–14; 9: 1*).

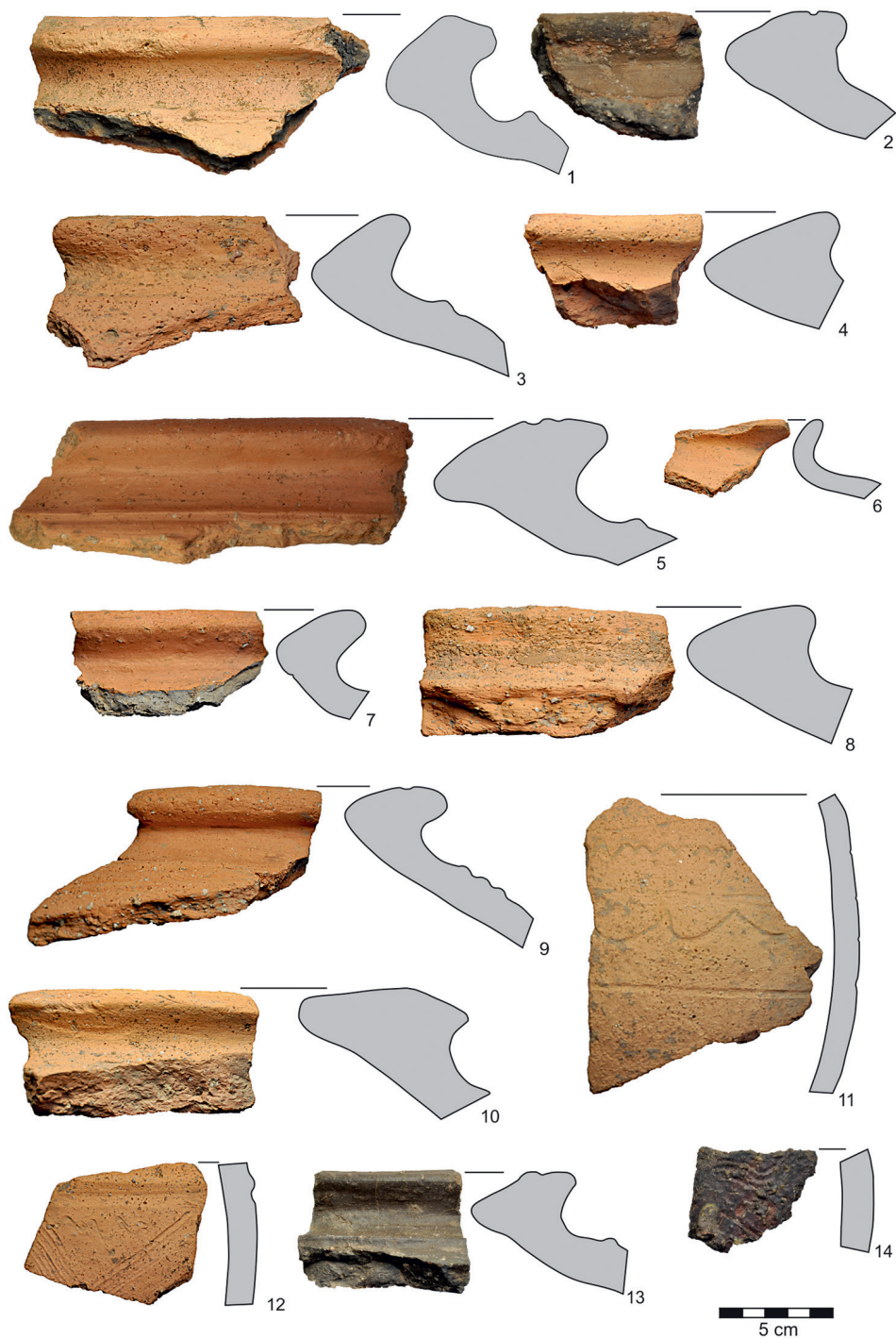


Fig. 8. Wrzēpia, site 13. Pottery fragments from the field walking survey.

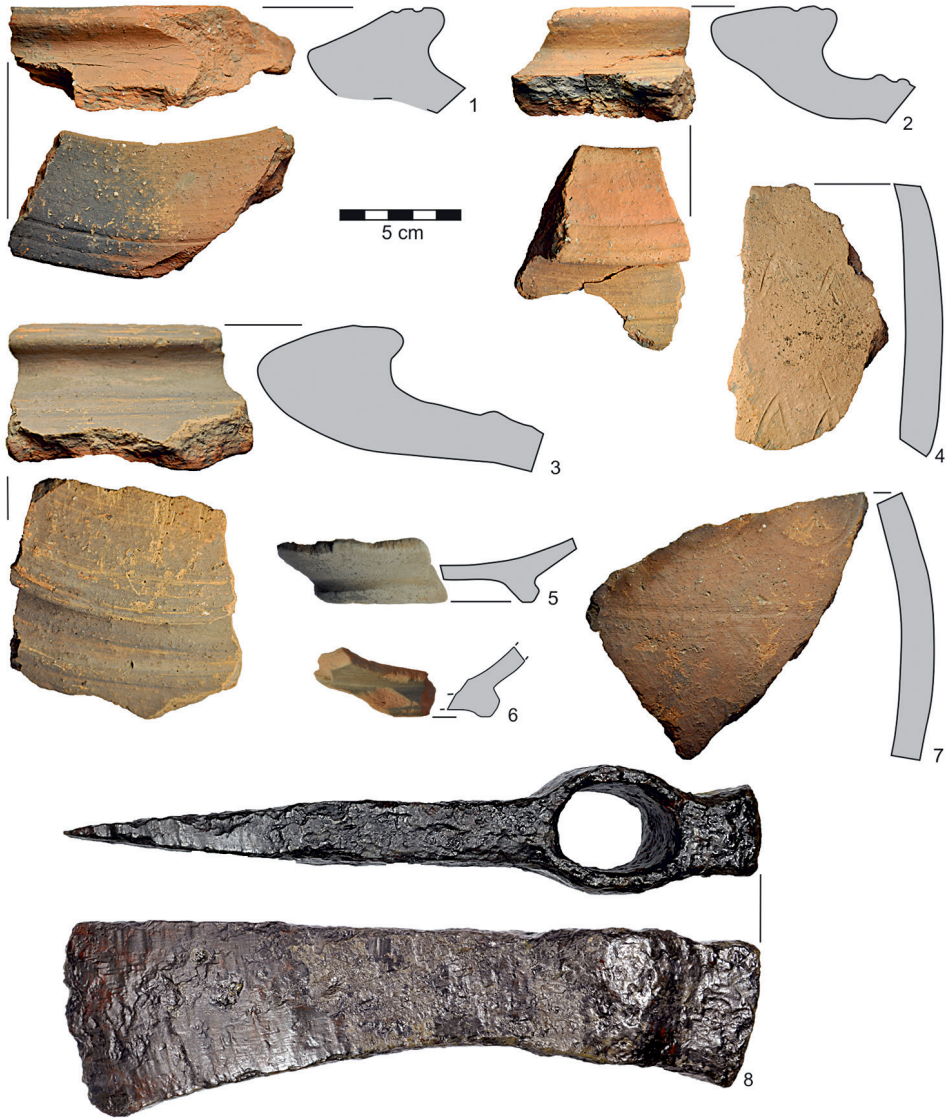


Fig. 9. Wrzępia, site 13. Pottery fragments and iron axe from the field walking survey.

Storage vessels of the *Krausengefässe* type are characteristic pottery of the Przeworsk culture and have been included in numerous studies of wheel-made ceramics (cf. *Dobrzańska 1990a*, 87, fig. 13; *1990b*, 45–46, 80–81; *Glanc-Kwaśny 1997*, 52; *Rodzińska-Nowak 2006*, 132; *Okońska 2018*, 361–362). They occur in many settlements of the Przeworsk culture, especially in southern and south-eastern Poland. A wide set of vessels with analogous forms from the area of south-eastern Poland is included in the work of *M. Wilk (2005)*. Fragments of this type of vessels are numerous in the area of the described microregion, especially in Wrzępia and in the nearby site 2 in Bessów (*Kordecki – Okoński 1999*, 184).

In older publications it was suggested that *Krausengefässe*-type vessels occurred in the Przeworsk culture only in phase D, but more recent analyses show that these vessels appear in Lesser Poland at the end of the 2nd and in the 3rd century AD (*Rodzińska-Nowak 2006*, 135, 136, with refs.). According to the current state of research, this type of storage vessels is therefore dated to the Younger and Late Roman period and the early stage of the Migration period. This applies to most of the wheel-made pottery of the Przeworsk culture (*Rodzińska-Nowak 2011*). At the moment, there is no basis for distinguishing chronologically distinctive stylistic features of storage vessels. The observed differences result mainly from regional differences.

Both the excavations in 1995 and surface surveys carried out in Wrzępia brought a small collection of fragments of tableware and kitchenware made on a potter's wheel. Among newly discovered sherds there were only, 9 such pieces (*fig. 9: 5–6*). There were also a few fragments of pottery formed in hand. In addition to pottery, fragments of burned daub, which are elements of pottery kilns, were also discovered at the site. Individual fragments of the daub have imprints of wooden structure elements. Also, some of the daub elements have a vitrified greenish layer related to the high temperature. The described fragments of pottery kilns were discovered in almost the entire studied area (*fig. 3*).

A massive, iron axe with an elongated, asymmetrical blade, separated from the handle, was also discovered in Wrzępia (*fig. 9: 8*). It had dimensions of 25 cm in length and a width of 7.3 cm, and an oval hole measuring 4.2×3.3 cm. The described type is similar to that of Leśnica-type by Kieferling. Specimens of this form are dated in the Przeworsk culture area between the C2 and D1 phases (*Kieferling 1994*, 341, 339; *Michałowski 2011*, 43, tab. 5).

At site 13 in Wrzępia during the field-walking survey and metal detector prospection, only traces of pottery production were discovered so far, with no direct evidence suggesting typical settlement, habitational activities. It is confirmed by the presence of pottery fragments, including overfiring and deformed ones, as well as parts of the construction elements of kilns. On the site surface, numerous traces of plowed-up orange layers of burnt soil with pottery and clay are visible, which are characteristic for pottery kilns. At the same time, there are no traces of other branches of production, like traces of iron processing or metallurgy. Moreover, it should be underlined that in Wrzępia traces of habitation zone were not recognized. All these observations, also based on the obtained results of magnetic prospection, allow for an interpretation of the site as a place of pottery production. Taking into account dense habitation of the region and numerous Przeworsk culture sites discovered in the vicinity of the site 13 in Wrzępia, it is probable that one or few of those sites are in fact settlements used by the potters working on the described site.

Site 13 in Wrzępia compared to other pottery production sites

The Przeworsk culture settlements with a large number of pottery kilns are identified rarely. Up to date only several sites with the number of kilns exceeding 10 are known (*Dobrzańska 2008; 2011; Okońska-Bulas et al. in press*). However, it should be emphasized that other sites has not been fully explored, and only on a few of them geophysical surveys were carried out on a larger scale. Notwithstanding, in the context of previous research, the number of approximately 130 or more kilns on the site is unique. This statement, which is important to underline, is based on the results and analysis of magnetic

survey. Establishing the actual number of pottery kilns in Wrzępiał will only be possible after carrying out excavations.

According to the current state of knowledge, the production site in Wrzępiał can be the largest in terms of the number of known kilns in the Przeworsk culture. Until now, the site in Zofipole, where 57 kilns were identified, was considered to be the largest kiln-site of the mentioned archaeological culture (*Dobrzańska 2011, 264–272*). Wrzępiał seems to be also the second largest production centre in Central European *Barbaricum*. The unique site in this context is the production settlement in Medieșu Aurit (NW Romania). According to the author's interpretation, approximately 260 pottery kilns have been identified based on magnetic survey until now (*Gindele 2018, 273*).

In Medieșu Aurit and in Wrzępiał fragments of storage vessels are the most frequent, so probably there were sites specialized mostly in the production of this type of pottery (*Gindele – Istvánovits 2011, 86; Gindele 2018, 273*). However, specimens produced in Medieșu Aurit represent storage vessels with smooth surfaces made of clay with no added mineral temper, typical of the Dacian environment, while in Wrzępiał storage vessels with coarse, orange surfaces were produced. Another production activity at both sites cannot be eliminated, especially in the context of the discovery of other types of anomalies as a result of magnetic prospection, such as pits and hearths. However, as was mentioned above, during field walking in Wrzępiał, traces of other non-agricultural activities were not discovered. For example, also in Zofipole, where numerous kilns are recognized, traces of bronze and gold manufacture are confirmed in the vicinity of pottery production (*Dobrzańska 2011, 272*).

The sites in question show both differences and similarities related to the size and organization of the clusters of kilns themselves. Based on the current state of research, the production settlement in Medieșu Aurit covered an area of 18 ha (*Gindele 2018, 273*), while the zone with kilns in Wrzępiał was estimated at ca. 4,5 ha. It should be noted that in the both cases size of the site can change, and may be limited by the scale of research and magnetic prospection. In Medieșu Aurit, the kilns are arranged linearly in two rows. According to R. Gindele, the linear arrangement of the kilns reflects the chronological development of the settlement (*Gindele 2018, 263*). In Wrzępiał, one can observe a row arrangement of the kilns in the southern part of the site, and a less orderly arrangement in the north-eastern part. Kilns in Zofipole are located at or near the edge of loess terrace of the Vistula River (*Dobrzańska 2011, fig. 6, 271*).

Conclusions

Based on the research carried out so far, and in accordance with the current state of knowledge on the chronology of storage vessels, it should be emphasized that there are currently no data allowing for a precise dating of the site in Wrzępiał. For this reason, its functioning should be placed between phase C1a and phase D of Roman period and Early Migration period (end of the 2nd to the middle of 5th century AD). The described production centre was probably used for a longer period of time. This can be seen at most sites where a large number of pottery kilns were discovered (cf. *Dobrzańska 2008; 2011; Okońska-Bulas et al. in press*), but it cannot be confirmed without obtaining datable finds. It is also difficult to clearly assess the scale of simultaneous production at the site in Wrzępiał. At the present

stage of the research, it is impossible to exclude a periodic increase in production and the parallel operation of several or even several dozen kilns in shorter time horizons.

Production in Wrzępia must have resulted from two main reasons. Firstly, from the demand for manufactured products. Secondly, from sufficient environmental conditions and access to raw materials necessary to conduct organized, possibly long-term pottery production. In line with this fact, it is needful to pay attention to the above mentioned voice in the literature claiming poor quality of the local clay in the microregion east of the Raba, confirmed by paleogeographic data. On the other hand, location among numerous oxbow lakes potentially provided easy access to raw materials like wood and water, necessary for pottery production (*Dobrzańska – Kalicki 2018*, 135, 137). It seems that potters thanks to the use of a special technique of pottery surface treating and the ability to build pottery kilns of various design solutions were able to cope with the inconveniences caused by environmental conditions. One should also pay attention to the large amount of work and resources required for this activity. This remark is even more important in the case of sites such as Wrzępia, where mostly storage vessels requiring large amounts of clay material were produced. Even despite the presence of raw material of worse quality for the ceramics production (see *Dobrzańska – Kalicki 2018*, 134–137), numerous attempts of pottery making were undertaken in the region. The discovery in Wrzępia indicates that despite the difficulties encountered by local potters, intense or long-term pottery production has been undertaken here. It had to mean that local raw material combined with the skill of potters was considered sufficient for development of this branch of craftsmanship. It is difficult to accept the thesis that any prehistoric community would decide to carry out such a large amount of work, if the effect of these works would not be cost-efficient. However, the question of the organization and social conditions that had to be met in order to organize this production site remains open. Also, the lack of datable finds does not allow precise dating of the development of settlements in the region. It should be strongly emphasized, that state of archaeological recognition of the presented microregion is still insufficient.

The nature of specialization of the production site in Wrzępia also seems to be of certain importance. The intensification of pottery production aimed at the production of storage vessels must have coincided with the demand for this type of products. This may indirectly indicate intensive agricultural production, requiring the production of containers for storing agricultural products or other food products (*Rodzińska-Nowak 2012*, 134–135). At the same time, also taking into account possible worse environmental conditions related to lower agricultural work efficiency in the floodplains. It can be assumed that the vessels were produced at this location on a larger scale, than just for local use, but at the moment it is not possible to determine the extent of their distribution. It appears that the cost of transporting of such vessels over long distances could outweigh the potential gains. It should be remembered that, due to their weight and size, storage vessels were a product difficult to distribute. The same reflection arises even if we consider such vessels as containers used in long-distance transport. In the Roman Empire, long-distance transport of larger and heavier loads was possible due to the developed system of sea and river transport, which was not confirmed on such a scale outside of the Roman border.

It should be emphasized that only excavation and verification of at least a few kiln anomalies will allow to confirm this interpretation. It cannot be excluded that some of the recognized kilns had other functions. However, based on the obtained results of the surface survey, their interpretation as pottery kilns is most likely.

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