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THREE LINES OF DITCHES AND EMBANKMENTS, AND INSIDE A VOID: RESULTS OF ARCHAEOLOGICAL RESEARCH AT THE EARLY IRON AGE SITE IN KOŚCIUKI (PODLASKIE VOIVODESHIP, NORTH-EASTERN POLAND)

ABSTRACT

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Airborne LiDAR surveys have identified 27 Late Bronze and Early Iron Age fortified sites in the valleys of the Biebrza and Narew rivers in northern Podlasie, sharing similar locations, forms, and dimensions. In 2019, interdisciplinary geomagnetic and ground-penetrating radar (GPR) surveys, followed by excavations, were carried out on the site in Kościuki (Białystok district).

The site lies on a sandy elevation near a peat bog and consists of three concentric embankments and ditches about 100 m in diameter, enclosing a central area of only 20 m. Excavations revealed traces of palisade-topped ramparts and well-preserved wooden elements between the ramparts. Radiocarbon dates of the timbers indicate construction between the 7th and late 5th centuries BC.

No structural remains or artefacts indicating habitation were found within the enclosure, only a few ceramic sherds in the ditch fills. The monumental scale and inward-sloping palisades suggest a non-defensive role, perhaps as a permanent ritual or ceremonial centre rather than a military fortification.

Keywords: North-Eastern Poland, Podlaskie voivodeship, Kościuki site, fortified site, Early Iron Age
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INTRODUCTION

One of the current issues in the prehistory of north-eastern Poland is the functioning of defensive structures dating to the Late Bronze and Early Iron Ages. In Warmia, Masuria, and the East Baltic Lakeland, the earliest defensive structures dating to the Early Iron Age are relatively well understood and conform to the general models of local cultural development (Okulicz 1981; Łapo 1998; Kobyliński 2017; Welc *et al.* 2018). In contrast, the defensive structures of a slightly different construction, located at the bottoms of the Narew and Biebrza valleys, the main watercourses of the North Masovian and North Podlasie Lowlands, remain a new and widely discussed subject.

These structures have become the subject of separate studies – for example, the sites at Podosie (Miastkowo commune, Łomża district, Podlaskie voivodeship) and Jednaczewo (Łomża commune, Łomża district, Podlaskie voivodeship), located in the Narew River valley (Ościłowski 2015a; 2015b; Grabowski and Muzolf 2016), or the comprehensively recognised site at Jatwieź Duża (Suchowola commune, Mońki district, Podlaskie voivodeship) already located in the Biebrza River basin (Żurek *et al.* 2022a; 2022b), the state of our knowledge of them is far from sufficient. This is evidenced by the multiplicity of theses and interpretations indicated in the synthetic study entitled 'Settlement pattern of Lusatian culture in Podlasie (NE Poland) and man-environment interaction' (Żurek *et al.* 2022b).

While the first research results were difficult to interpret unambiguously (Ościłowski 2015a; 2015b; Grabowski and Muzolf 2016), the interdisciplinary study of the site at Jatwieź Duża provided complementary and reliable data. The chronology, cultural attribution and structural features of the site were identified. However, the study's results did not provide a clear answer about the function of this type of site (Żurek *et al.* 2022b, 220-222). At this stage of the research, the actual defensive value of the ring-shaped system of embankments and ditches surrounding the central square was called into question. Among the more convincing interpretations is the identification of these sites as specific ceremonial or administrative-social centres (Żurek *et al.* 2022b, 222) – analogous to Neolithic rondels (*cf.*, Řídký *et al.* 2019). This assumption, which is extremely attractive for its broad interpretation of the socio-economic transformations of Podlasie's Late Bronze Age and Early Iron Age communities, needed to be verified against data from other sites of this type.

Taking the above into account, one of the largest and most complex sites, located near the village of Kościuki (Białystok district, Podlaskie voivodeship), was selected for detailed archaeological investigation (Fig. 1: A, B, C). The choice of this site was selected based on the analysis of airborne laser scanning (ALS) data and the resulting digital elevation models (DEM) (Banaszek 2014) that allow for the identification of faint anthropogenic structures in the landscape, both in forested areas (Devereux *et al.* 2005; Crow *et al.* 2008; Stereńczak *et al.* 2020) and in difficult-to-access river valleys.

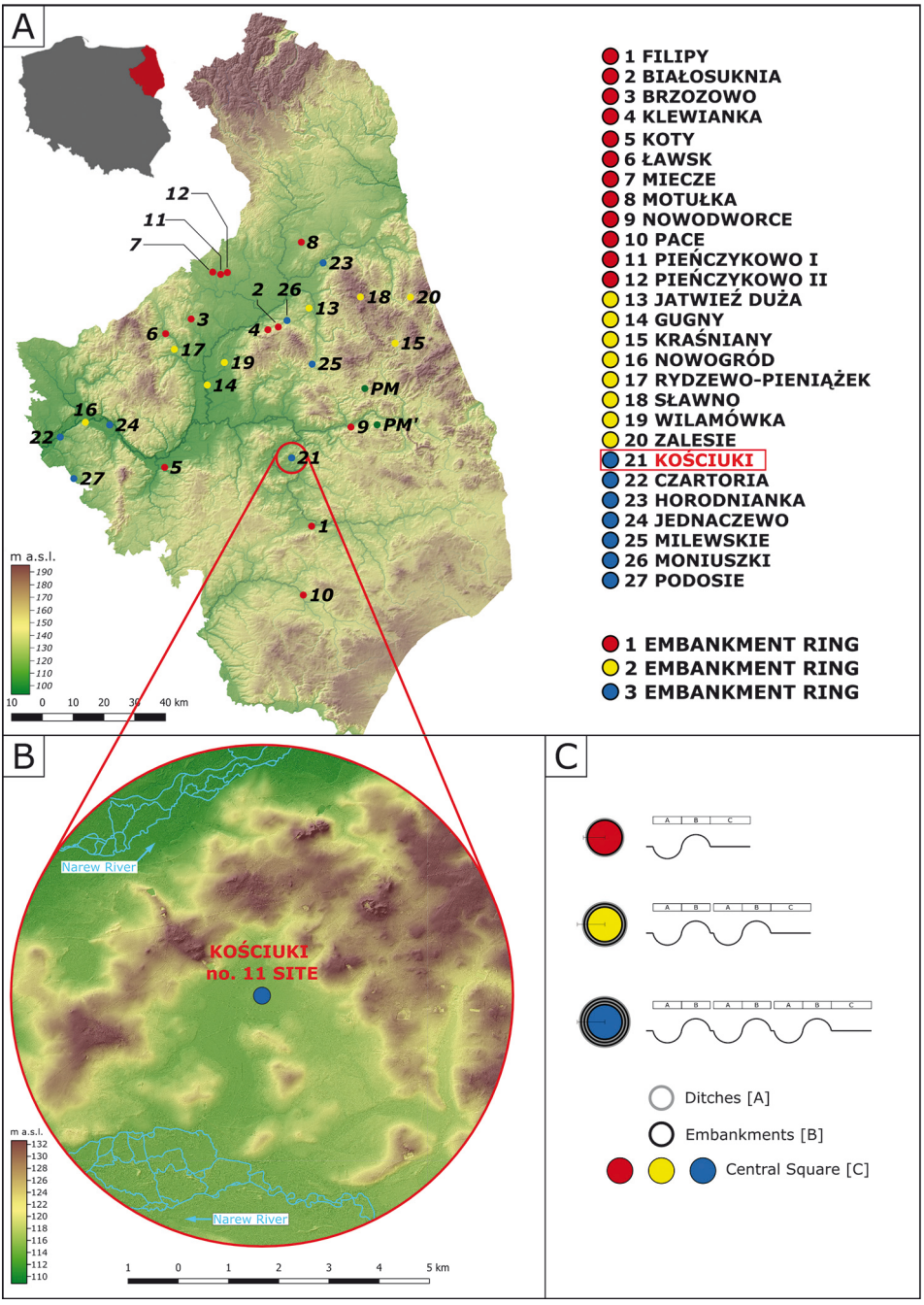

Fig. 1. Location of Late Bronze Age/Early Iron Age (NE Poland) ring enclosures inventoried in Podlaskie Voivodeship (A); location of Kościuki Site 11 (B); schematic plan of ring enclosure. GUGiK data

MATERIALS AND METHODS

Archaeological Site No. 11 in Kościuki (φ = 53°06'19.6" N, λ = 22°54'48.4" E) is located in the Upper Narew Valley, a part of the North Podlasie Lowland, which belongs to the Masovian-Podlasie Lowland macroregion (Kondracki 2002). The site is situated (Fig. 1: B) in a kettlehole filled with peat (Butrymowicz 2013), surrounded on three sides (north, east, and west) by moraine uplands of the Białystok Upland (Kondracki 2002). To the south, this area borders the Narew River valley, whose sinuous, S-shaped course also encloses the upland from the west and north (Banaszuk and Banaszuk 2010; Banaszuk *et al.* 2015).

Geologically, the area surrounding the site is characterised by a complex mosaic of Pleistocene and Holocene deposits. The area is dominated by glaciofluvial gravels and sands, which in some places have been transformed by wind into aeolian and cover sands. Among them, in the form of 'islands', there are glacial tills and kame deposits. A characteristic feature of this area is the kettlehole, which is currently filled with Holocene organic sediments. In the central part of such, the largest of the depressions, the investigated site in Kościuki is located.

At present, the site's morphological structure is barely visible (Fig. 2: A). It was only by correlating field observations with publicly available relief imagery that it was possible to delineate a circular structure about 100 metres in diameter consisting of three concentric rings of potential embankments and moats (Fig. 2: B).

To limit interference with the site's structure, a set of complementary non-invasive methods was used. The extent of the excavations was reduced to the minimum necessary to identify the site's structural elements and determine its chronology and function.

The first step was to develop a digital terrain model (DEM) of the site and its closest surroundings within a 5 km radius (Fig. 1: B; 2: B). LIDAR data in ASCII format, obtained from the resources of the Main Office of Geodesy and Cartography, were used for this purpose. The elevation points were distributed in a regular grid with a 1 m resolution and a maximum measurement error of 0.2 m. The data analysis was carried out using Global Mapper, QGIS, and RVT software. In addition, a series of aerial photographs were taken in 2019 that documented the site's appearance at different times of the year and under varying hydrological conditions (Fig. 3). Based on the results obtained in this phase of work, further field investigations were planned, focusing on the acquisition of geophysical data that would enable the identification of possible structures hidden beneath the ground surface.

A geomagnetic survey was carried out over an area of approximately 0.5 hectares, covering as much of the site and its surroundings as possible (Fig. 4: A). A significant part of the site was excluded from the works, including the centre of the site, where contemporary infrastructure elements, such as the paved causeway of a modern dirt road, a drainage ditch, and its accompanying culvert, are located. Measurements were made using a Bartington Grad 601 transducer magnetometer, recording the vertical magnetic field gradient

to the nearest 0.1 nT (nanoTesla), in a 0.25 m mesh grid along parallel traverses of 20 m length spaced north-south at 0.5 m intervals. The data were processed in GeoPlot 3.0, creating maps of magnetic anomalies with raster visualisation ranging from -100/100 nT to -1/1 nT. To analyse the distribution of anomalies, the generated images were converted into shapefile polygons, which were then verified and categorised according to magnetic parameters, shape, and spatial distribution (Niebieszczański and Bahyrycz 2019).

To verify the geomagnetic imaging, a series of GPR surveys was conducted (Fig. 4: B). The 40 × 20 m survey polygon was located in the south-eastern part of the site, where

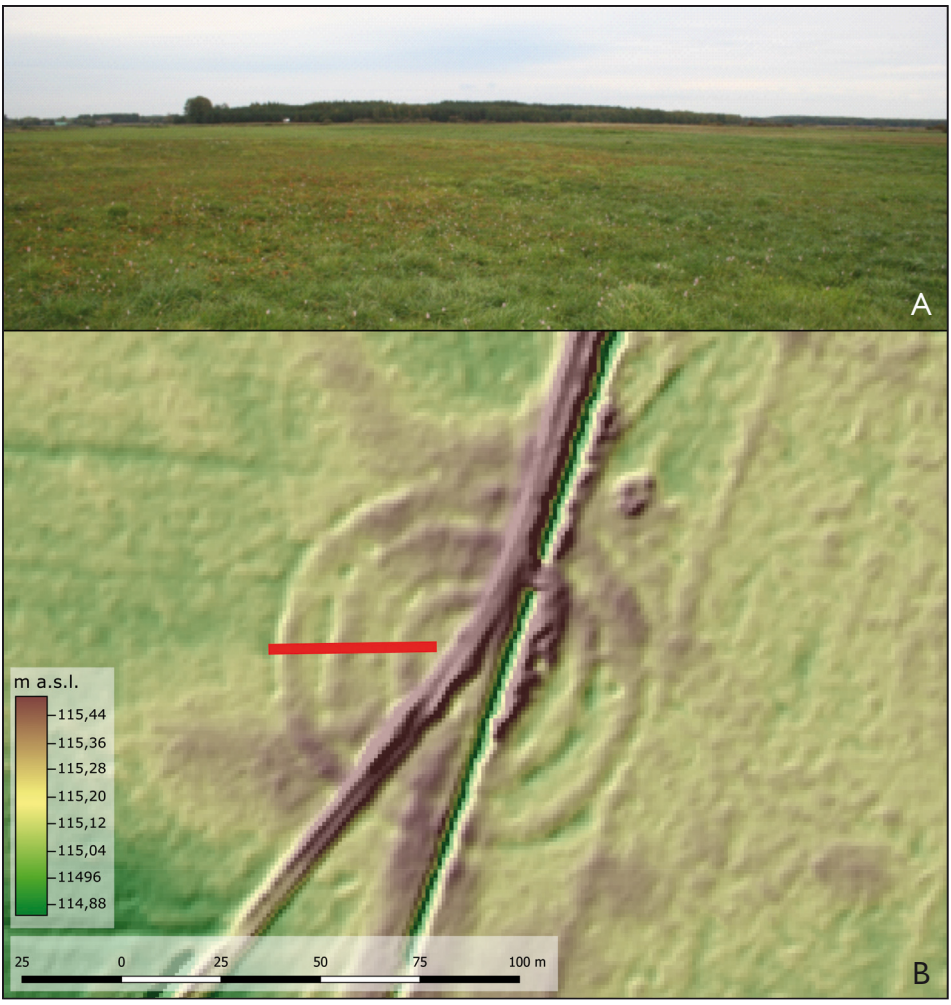

Fig. 2. Kościuki, Site 11, Białystok district, Podlaskie voivodeship. Photo of modern ground surface (A) and digital elevation model with location of archaeological excavation (B)

relatively prominent structures had been recorded during the geomagnetic survey. Within it, radar profiles were made at 0.3 m intervals. For the GPR survey, the Mala GeoScience ProEx (Professional Explorer) system was used – a two-channel radar with a 200 kHz pulse rate and a shielded 500 MHz antenna. The geophysical results were compared with excavation data, allowing them to be cross-checked and the structure of the investigated site to be identified (Kalicki *et al*. 2019).

An archaeological excavation verified the inconclusive data obtained by non-invasive methods. An archaeological excavation measuring 42 × 1.3 m was located in the western part of the site, along the E-W axis. It crossed all visible elements of the site's structure in the relief, from the flat central space to the edge of the outer ditch. Cultural and geological layers were examined manually, in 10-centimetre-thick increments. Drawn and photographic documentation of each level was prepared. The artefacts found were documented using the microlithographic method by recording their location on the plans of each exploration level. Macroscopic analyses of the artefacts were carried out to determine their relative chronology and cultural attribution.

Fig. 3. Kościuki, Site 11, Białystok district, Podlaskie voivodeship. Aerial photos with a positive vegetation index. Summer 2019. Photo by A. Nikonowicz

Radiocarbon dating was carried out on selected samples of organic matter. Dating was done at the Laboratory of Absolute Dating in Kraków. The results were calibrated using the OxCal v4.4.2 programme (Walanus and Goslar 2009).

RESULTS

Based on the DEM analyses, the site at Kościuki has a circular form with a diameter of approximately 98 m (Fig. 2: B). The site's structure consists of three concentric rings of depressions, with the ground level reaching approximately 114.9 m a.s.l., and gently outlined rings of elevations reaching approximately 115.3 m a.s.l. on the inner side. At the centre of the site is a flat elevation with a diameter of approximately 30 metres, whose surface reaches 115.2 m a.s.l. Today, the site has been cut along an axis running from NNE to SSW by a drainage ditch and a parallel road on an embankment, which, in the area of the site's centre, changes direction from NNE to SW (Fig. 2: B).

Similar results were obtained from the analysed aerial photographs (Fig. 3). During the late summer 2019 drought, vegetation markers became visible. Composed of greener grass, these formed three concentric circles which overlap with the depressions identified on the DEM. On their inside was the drier outline of rings – probable embankments. Apart from the indicated elements, the vegetation features did not identify any other potential archaeological features.

The results of the geomagnetic surveys conducted in Kościuki reveal a complex picture of the recorded anomalies. Interpretation difficulties are particularly posed by the proximity of the road, which interferes with the magnetic field. The magnetically strong bipolar anomalies located in its vicinity probably document the presence of modern anthropogenic waste deposited on the ground surface and just below it (Fig. 4: A). Accordingly, only those anomalies that form coherent, linear sequences capable of being a true reflection of prehistoric structures were considered significant. Their characteristic feature is a relatively low disturbance gradient – the signals are exclusively positive. In the northern and south-eastern parts of the site, a series of linear structures, showing a curved course corresponding to the profile of the embankments visible on the DEM (Fig. 2: B; 4: A). A similar relationship was observed in the western part, where a series of anomalies indicates the presence of an internal embankment line. The genesis of these anomalies remains incompletely elucidated. It is the lack of clear continuity in these systems that suggests they are unrelated to the clear ditches in the area's morphology (see Kittel *et al.* 2018; Niebieszczański *et al.* 2018; 2019). Their association with the presence of erratic boulders – elements of embankment construction, and/or the remains of burnt wooden structures, *e.g.*, palisades – should be considered the most probable. The second type, polygon-shaped anomalies, occurs both outside the main site area and in various parts of the site located between the embankment system. This distribution suggests the possibility of pits, but

could equally well be due to lithological differences in the sediments or indicate the natural presence of erratic boulders lying beneath the ground surface (Niebieszczański and Bahyrycz 2019).

The GPR surveys enabled detailed imaging of dielectric field disturbances in horizontal and vertical cross-sections (Fig. 4: B). The GPR survey grid revealed a linear arrangement of anomalies characterised by a uniform medium density across all surveyed depths. This arrangement is clearly visible at depths of approximately 1.0 m. Within the linear anomaly system, there is a set of parallel, arc-shaped disturbances of comparable density at a given depth – these disturbances mainly occur at levels of 1.0 to 1.5 m and most probably correspond to structural embankment reinforcements. Parallel anomaly lines were recorded in the southern part of the grid, facing towards the central part of the site; their interpretation remains unclear (Kalicki *et al.* 2019).

The excavations not only verified the geophysical data but also accurately determined the site's stratigraphy, chronology, and construction. Several segments of the site were documented during the work (Fig. 5).

In the central part of the site, over a length of 4 m, beneath a modern layer approximately 0.2 m thick, a humus horizon composed of fine-grained sands containing a significant amount of mineralised organic matter was identified. Below this, only sandy geological

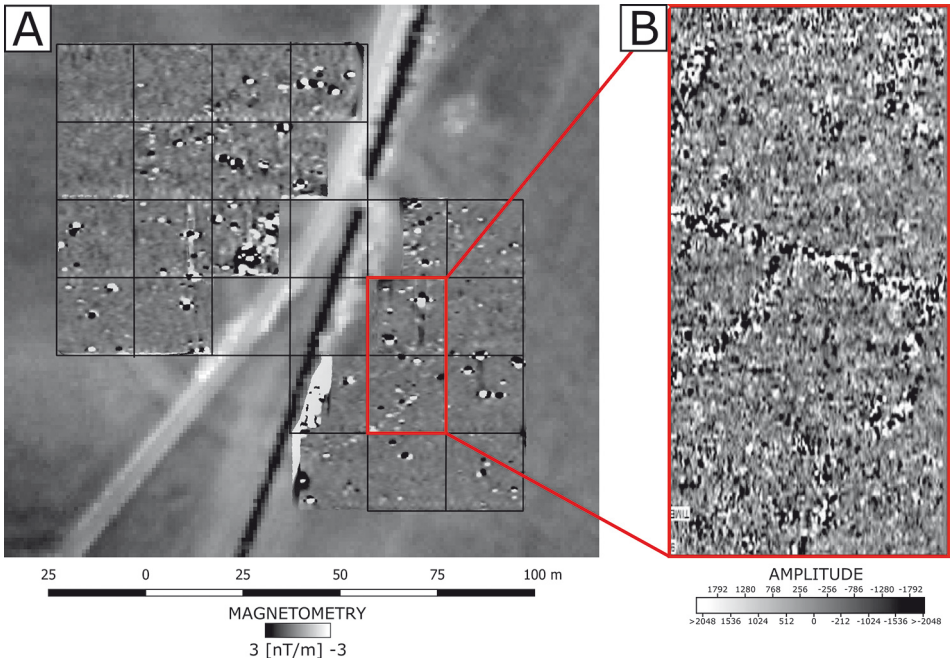

Fig. 4. Kosciuki, Site 11, Białystok district, Podlaskie voivodeship. Results of magnetometric (A) and GPR survey (B). Based on: Kalicki *et al.* 2019; Niebieszczański and Bahyrycz 2019

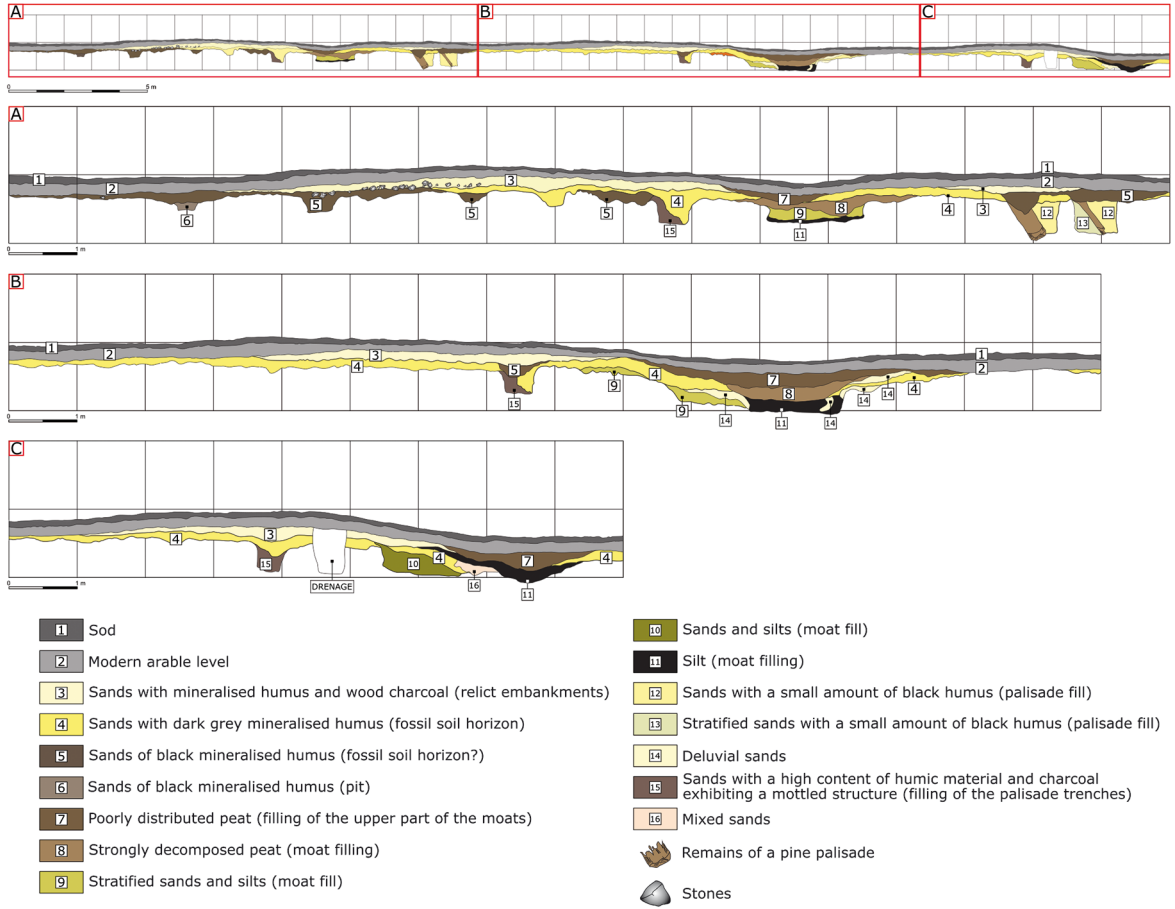

Fig. 5. Kościuki, Site 11, Białystok district, Podlaskie voivodeship. Southern cross-section through the archaeological excavation area

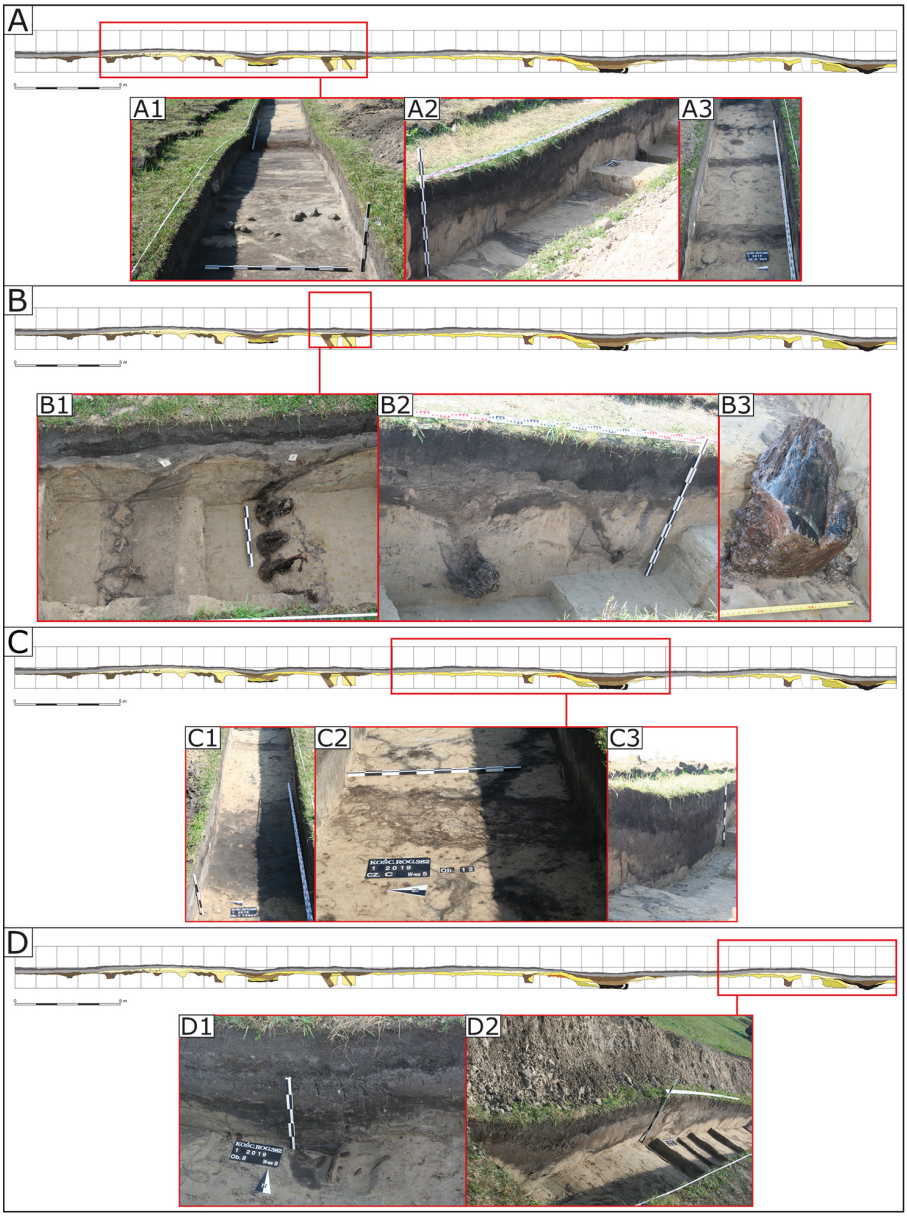

Fig. 6. Kościuki, Site 11, Białystok district, Podlaskie voivodeship. Southern cross-section through the archaeological excavation area with inner ring of fortifications (A) – remains of the stone structure of the embankment (A1); outline of the inner ditch (A2); outline of palisade slots (A3); inner diagonal palisadę (B) – outline of palisade slots (B1); wooden elements of the palisade (B2); traces of cuts on one of the palisade elements (B3); middle ring of fortifications (C) – outline of the middle ditch (C1); outline of the palisade slot (C2); profile of the middle ditch (C3); outer ring of fortifications (D) – wooden fragments at the bottom of the ditch (D1); outline of the outer ditch (D2)

subsoil was encountered, with no traces of human activity (Fig. 5: A). Spot disturbances within it were interpreted as the result of natural factors, such as animal burrows or the remains of tree root systems. No artefacts were recorded in this part of the site.

The central area was surrounded by a first ring of fortifications about 10 m wide, consisting of a stone-and-earth embankment and an accompanying ditch (Fig. 5: A; 6: A). The heavily denuded embankment was about 6 m wide at the time of the survey. In the central part, the upper face of the embankments was most probably reinforced with a stone pavement composed of erratic stones with a diameter not exceeding 0.3 m (Fig. 6: A1). The presence of this structural element was revealed at a depth of approximately 0.1 m below the modern turf. Below the earth embankment, with a preserved maximum thickness of about 0.3 m, two parallel trenches, about 0.4 m wide, were discovered, spaced 1.5 m apart (Fig. 6: A3). At deeper levels of exploration, the outlines of fully mineralised posts with a diameter of about 0.3 m were revealed. On the outside of the embankments, a clearly visible depression of the ditch surrounding it was distinguished – most likely a moat with a reverse trapezoidal profile, a flat bottom and a depth of only 0.5 m (Fig. 6: A2). Its width measured at the upper edge was 2.1 m, and the flattened bottom was 1.6 m (Fig. 6: A3). The depression was filled with organic sediments (peat) and, in the eastern part, adjacent to the earth embankment structure, with mineral material probably originating from the eroded embankment structure. No artefacts were recorded within this segment of the site.

The central segment of the fortifications was approximately 17 m wide. It consisted of three main elements separated by empty spaces (Fig. 5). Approximately 3 m to the west of the edge of the inner moat, within the flattening of the space between the inner and middle segments of the embankment, two parallel palisade trenches were revealed (Fig. 6: B). Their width at the upper edge level was approximately 0.6 m. The distance between them was approximately 0.5 m. During their exploration, well-preserved pine logs measuring about 0.35 m in diameter were discovered. Their upper parts underwent partial mineralisation – only the more decay-resistant inner portions and resinous knots have been preserved (Fig. 6: B1). Lower down, in the damp sands, they were preserved in their full circumference, and at their ends, one could see the negative impressions of cuts made with a sharp, probably metal tool (Fig. 6: B3). The wooden logs, a remains of a double palisade, were set pointing diagonally towards the interior of the structure at approximately 45 degrees (Fig. 6: B1, B2). Radiocarbon dating of a sample of the outer ring of rings of one of the preserved logs gave a result of 2440 ± 35BP (MKL-4709), which, after calibration taking into account the probability level of 68.2% is determined in the ranges of 733-690, 661-650, 545-428, 423-416 BC. In the bottom part of one of the palisade slots, two small fragments of a small vessel decorated with holes were noted, which were located under the rim of the spout (Fig. 7, Table 1).

The image of the central segment of the fortifications is completed by a low earth embankment with a preserved height of about 0.3 m and a width of 7 m (Fig. 6: C). Also, in

Table 1. Kościuki, Site 11, Białystok district, Podlaskie voivodeship. ^{14}C dating table

Kościuki no. 11 Site						
No	Age	Cal. BC/AD (1σ) 68.3%	Cal. BC/AD (1σ) 95.4%	Lab number	Material	Context
1	2360 ±50 BP	515-385 BC (68.2%)	750-684 BC (26.8%) 668-639 BC (10.5%) 590-577 BC (0.6%) 570-358 BC (28.0%) 277-258 BC (1.0%)	MKL-4710	Wood	The bottom of the filling of the outer moat
2	2440±35 BP	733-690 BC (16.7%) 661-650 BC (4.3%) 545-428 BC (45.1%) 423-416 BC (2.2%)	754-681 BC (23.0%) 670-610 BC (12.8%) 594-407 BC (59.6%)	MKL-4709	Wood	Diagonal palisade between the embankments

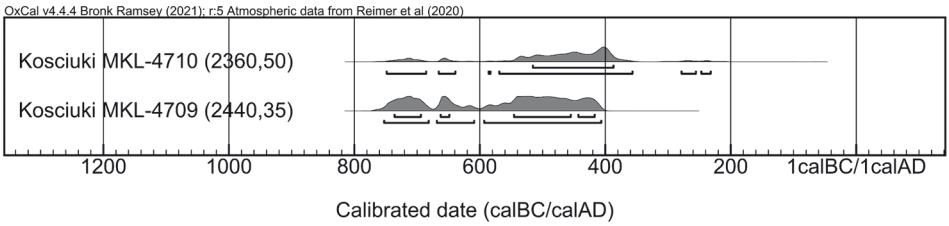

Fig. 7. Kościuki, Site 11, Białystok district, Podlaskie voivodeship. ^{14}C dating calibration

this case, below the now-eroded and transformed embankment, a single palisade slot, this time about 0.4 m wide, was revealed (Fig. 6: C1, C2). At its bottom, mineralised traces of posts have been preserved, most likely remains of a palisade. The entire ring of the middle segment of the fortifications was closed by a ditch with an inverted trapezoidal cross-section and a width of approximately 3 m (Fig. 6: C3). The original depth of the ditch can be estimated at 0.7 m. The filling also consisted of organic sediments and mineral layers derived from embankment erosion. In the bottom part of the ditch, two small fragments of pottery were noted.

The outer segment of the Kościuki fortifications has a structure similar to that of the inner segment, consisting of an earth embankment and a ditch adjacent to its inner edge (Fig. 6: D). The probable axis of the now-eroded earth embankment was approximately 16 m from the edge of the central moat. Its width, recorded in the archaeological excavation profiles, was about 6 m, undoubtedly the result of slope erosion and not reflecting its original state (Fig. 6: D2). Below the eroded embankment, as in other cases, a single palisade slot was observed, with preserved negative impressions of the mineralised palisade structure. The outer edge of the facility was marked by a relatively shallow ditch adjacent to the embankment. Its form and dimensions were similar to those observed in previous cases. The preserved depth was about 0.5 m with a width of 3 m. Characteristic flattening of the ditch

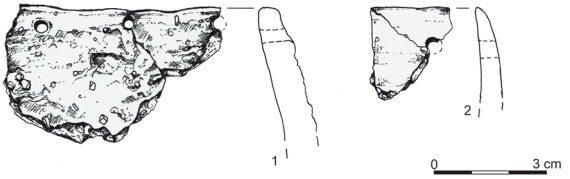

Fig. 8. Kościuki, Site 11, Białystok district, Podlaskie voivodeship. Selection of pottery finds

bottom was also noted, which is currently filled with organic sediments and mineral matter originating from the erosion of the adjacent embankment. Several small sticks were discovered at the bottom of the ditch, which probably found their way there by accident when the structure was in use (Fig. 6: D1). One of them was subjected to radiocarbon analysis, yielding a result of 2360 ± 50 BP (MKL-4710), which, after calibration with a 68.2% probability, falls within 515-385 years BC (Fig. 7; Table 1).

During archaeological research, a highly modest collection of artefacts was obtained. It consists of seven small pottery fragments, most of which lack stylistic features. The exceptions are three rim fragments from two small, thin, and medium-walled vessels with a barrel-shaped profile and a non-separated neck. Beneath the rim, they feature a single row of perforations. The outer surfaces of the pottery were coated with a clay slip containing a coarse mineral temper. No finger impressions were recorded. All ceramic fragments are consistent in terms of technological characteristics and can be dated to the Early Iron Age (Fig. 8: 1, 2).

DISCUSSION

The correlation of terrain morphology analysis, aerial imagery, and geophysical prospection with observations made during excavations provides a coherent picture of the site. It enables the reconstruction of the general layout of the original settlement at Kościuki. The feature is a circular structure with an overall diameter of 98 m. At its centre lies a circular, flat, open area approximately 20 m in diameter. No material traces of structures or economic use were identified within this space. These observations are further supported by the absence of any movable artefacts – such as pottery fragments, flint objects, or osteological remains – that would typically indicate settlement activity.

This relatively small central area was surrounded by an exceptionally complex system of timber-and-earth fortifications, composed of three concentric rings of embankments accompanied by ditches. The innermost ring, initially the most developed, consisted of a shallow ditch and an earthen embankment built from soil extracted during ditch excavation. The ditch was no more than 0.5 m deep and slightly over 2 m wide. The rampart itself was likely somewhat higher and appears to have been constructed within a space defined

by two concentric palisade lines. This is suggested by the stratigraphically lowest position of the palisade trenches, whose outlines were entirely covered by the eroded rampart deposits. Probably, the top of the embankment was further reinforced with small pebbles, possibly to protect it against erosion or to stabilise a walkway.

Between the inner and middle lines of embankments and ditches, a double palisade ring was constructed. It was formed by setting pine trunks, approximately 0.3-0.4 m in diameter, into previously excavated parallel trenches. The palisade itself was arranged at an angle of about 45 degrees, leaning inward toward the centre of the structure. Its original height is currently difficult to estimate.

Both the middle and outer segments of the fortifications featured a very similar construction. On their outer side, relatively shallow ditches were excavated, approximately 3 m wide and no more than 0.5 m deep. The soil obtained from these excavations was used to build low ramparts, which were probably supported by a previously installed wooden palisade. Currently, there is no evidence that these structural elements were reinforced in any other way, such as with stone paving.

There is considerable evidence that during the construction and use of the site at Kościuki, the ditches were filled with stagnant water. This is indicated both by the composition of their fill, peaty silt deposits accumulated through decantation, and by the presence of well-preserved organic matter still visible at the bottom of the ditches. There is, however, no evidence of water flow, such as erosional channels, that would suggest running water.

A natural question arises about the possible locations of entrances or gateways into the site's interior. No such features were observed in the terrain's microtopography or in aerial imagery. Nor did the results of geophysical surveys provide a definitive answer, as they revealed only part of the site's complex construction. Magnetometric surveys only partially registered circular structural elements (Fig. 4: A). This is likely because the magnetic characteristics of the ditch fill closely resemble those of the surrounding geological background, despite the clearly observable differentiation, documented in the excavations, between the mineral base and the organic fill of the ditches.

It also remains unclear whether the detected concentric-ring segments represent the remains of stone constructions or burned remnants of wooden structures, such as palisades. In the former case, small stones were confirmed only in the construction of the inner embankments, while anomalies were observed in the middle and outer rings. Excavations did not confirm the burning of wooden structural elements, though localised burning, limited to small sections of the fortifications, detected in the geomagnetic imagery, cannot be ruled out. GPR results likewise fail to provide clear answers. The ditches were visible as curving linear anomalies. However, gaps in these anomalies were also recorded, which are currently difficult to interpret. Although they could hypothetically represent entrances or gateways, this interpretation is contradicted by the site's microtopographic layout (Fig. 2: B; 4: B). Another unclear feature is a linear GPR anomaly running perpendicular

to the site's layout. It most probably represents a modern drainage system, parts of which were also uncovered during archaeological excavation.

The chronological relationship between the uncovered structural elements also warrants comment. Current evidence suggests that these features were constructed during a single, coherent building phase, and that the site was intended from the outset to assume a deliberately monumental form, a central area enclosed by three rings of ditches and ramparts, along with six concentric palisade lines. This interpretation is supported by the mutual consistency of the structural elements and the absence of any signs of rebuilding or repair. No evidence of fire or other catastrophic events was identified to explain the need for repairs or expansion of the structure.

The chronology of the material recovered from Kościuki is internally consistent. The homogeneous collection of artefacts can be dated to the beginning of the Iron Age, corresponding in absolute terms to the mid-1st millennium BC. This is consistent with the radiocarbon dating results (Fig. 7). A wood sample from one of the posts of the inward-leaning inner palisade yielded a date of 2440 ± 35 BP, which falls within the plateau phase of the calibration curve (Walanus and Goslar 2009), covering a broad range from the mid-8th to the late 5th century BC. A slightly later date was obtained from a wood sample deposited at the bottom of the outer ditch. Its age is between the 6th and early 4th centuries BC (2360 ± 50 BP). This is not surprising: the first date marks the actual construction phase of the site, while the second sample is associated with its use. Nevertheless, considering the likely contemporaneity of the entire site layout and the physical properties of the construction materials – namely, wood – it would be impossible for the site to have remained in use for over three centuries. Therefore, the actual functional chronology of the site can be narrowed to the 6th-5th centuries BC, a period supported by both radiocarbon dates.

The chronology of the Kościuki site aligns with similar three-ring constructions at Podosie and Jednaczewo. This is confirmed by the dating of structural elements from those sites, which place their construction between the early 8th and the end of the 5th century BC (Ościłowski 2015a; 2015b; Grabowski and Muzolf 2016). It appears that large, triple-ringed sites approximately 100 m in diameter emerged somewhat later than smaller, though morphologically similar, double-ringed constructions identified in the Biebrza River basin. This is supported by an extensive series of radiocarbon dates from the Horodnianka site (Suchowola commune, Mońki district). There, a series of ^{14}C analyses correlated with dendrochronological data enabled the determination of the construction time to the 10th-9th centuries BC (Krąpiec *et al.* 2012). The construction of a similar site from Jatwież Duża is also dated to the early 9th century BC (Żurek *et al.* 2022b, 218).

The site from Kościuki is to some extent representative of the phenomenon, as are 27 similar sites located in the valleys of northern Podlasie and eastern Masovia (Żurek *et al.* 2022a; 2022b). Although it was not the first to be recognised by excavation (*cf.,* Ościłowski, 2015a; 2015b; Grabowski and Muzolf 2016; Żurek *et al.* 2022a; 2022b), the observations obtained here make it possible both to clarify the chronology of the phenomenon itself and

to enter into a discussion of the role of ring-shaped structures of a defensive nature in the settlement-social system of the local late Bronze Age and early Iron Age groupings. While in the case of smaller, two-ring sites of this type, the numerous series of radiocarbon determinations (Krąpiec *et al.* 2012; Żurek *et al.* 2022b) and the homogeneous nature of the acquired sources (Żurek *et al.* 2022b) made it possible to determine the chronology unquestionably, the situation was somewhat different for large three-ring sites, among which the one from Kościuki should be grouped. An example of ambiguity can be found in the feature from Jednaczewo, where the presence of fragments of early medieval vessels was documented, which led the authors to erroneous chronological conclusions (Grabowski and Muzolf 2016). Ring-shaped Bronze Age and Iron Age sites share many characteristics, from similar topographical location to construction (Żurek *et al.* 2022a). The differences relate to the materials used in the construction of the embankments and the material traces of the use of the internal space. An example is the site in Jatwieź Duża, where stone structures on the embankment were documented, but no traces of wooden elements were found (Żurek *et al.* 2022b, 217). The opposite is the situation at Kościuki, as well as analogous structures from Jednaczewo and Podosie. Wooden palisades were also present in the structure in Horodnianka (Krąpiec *et al.* 2012). There, however, there was no evidence of any embankments or wide ditches surrounding the whole establishment.

Differences also become apparent in the use of the central space. At Kościuki, the proportionally small central area shows no material traces of settlement-related activity. A similar situation is observed at Podosie (Ościłowski 2015a; 2015b) and Jednaczewo (Grabowski and Muzolf 2016). In contrast, the site at Jatwieź Duża presents a different picture: within its central area, storage pits were documented and interpreted as evidence of food surplus storage and later redistribution (Tymowski 2012; Żurek *et al.* 2022b). This phenomenon has been linked to the period of abrupt climatic cooling and ecosystem instability marked by a series of extreme events, the so-called Iron Age Cold Epoch (Starkel 1977; Kalicki 2006).

Such an interpretation is difficult to apply to the site at Kościuki. If food storage or the sheltering of livestock had indeed taken place within the central area, one would expect to find corresponding material evidence, such as a cultural layer or at least eco- or artefacts. Furthermore, the spatial proportions between the central area and the fortified zone, with three concentric ditches and embankments as well as six rings of palisades, also argue against such a function. The contrast is striking: the central area covers approximately 315 m^2, while the entire fortified space exceeds 7000 m^2. The investment of time and resources required to construct such an extensive fortification system appears disproportionate to the relatively limited area potentially available for storage or livestock containment.

Many doubts also arise regarding the site's potential defensive function. These are again primarily rooted in the pronounced asymmetry, outlined above, between the theo-

retically protected central space and the constituent elements of the so-called fortification system. It is questionable whether such shallow ditches and low embankments could have realistically fulfilled a defensive role. Likewise, the defensive efficacy of the double palisade, inclined at a 45-degree angle toward the interior of the enclosure, must be called into question. This configuration suggests a greater intent to restrict movement out of the inner space than to prevent access from the outside.

The defensive potential of the site is further diminished by its placement on the flat topography of a peat plain, in the middle of which the Kościuki site is located. While similarly situated fortified settlements are known from roughly the same period in central and southeastern Belarus as well as northern Ukraine (belonging to the Milograd culture), the ratio between the protected area that contained traces of domestic structures and the space occupied by fortifications was markedly different in those cases (Loshenkov 2011). Whereas the flat relief of the Polesian region determined the locations of defensive settlements, the older-glacial, varied topography of northeastern Poland offered a far wider range of locations, including numerous elevations with clearly superior defensive advantages. Such topographic preferences are evident, for example, in the siting of Milograd defensive enclosures established outside the densely settled plains of Polesia (Kukharenko 1961).

It can be assumed that the establishment of structures such as Kościuki is connected to the influence of the Scythian Cultural Circle. However, the fortified structures associated with the latter, such as Chotyniec in the Jarosław district (Czopek 2019), differ significantly in terms of topographical location, size, and construction. There is no clear evidence here, especially given the limited archaeological material recovered from the Kościuki site or the cited Jatwież Duza site.

In light of the observations outlined above, the most plausible interpretation of the Kościuki site is that it functioned as a kind of ceremonial-ritual or socio-administrative centre, conceptually akin to the Neolithic and early Bronze Age rondels (*cf.*, Řídký *et al.* 2018; Spatzier 2019). Such an explanation could account for the absence of material traces of domestic or economic activity in the central area, which may have been deliberately reserved for deities or ritual specialists. Their cultic practices or ceremonies may have consisted primarily of intangible actions, such as prayer, song, or other performative expressions, leaving little or no archaeological signature.

If this assumption is accepted, the complex system of concentric embankments, ditches, and palisades may be understood as a deliberate demarcation and durable separation of two realms in the worldview of the time: the sacred, enclosed within the interior of the enclosure, and the profane, occupying the surrounding space. The emergence of such elaborate spatial configurations may also materially exemplify the rise, consolidation, and operation of highly organised and hierarchical social structures, probably based on a system of chiefdoms (Tabaczyński 2012).

CONCLUSIONS

The results of the multi-faceted archaeological investigations allow for a reconstruction of both the structural characteristics and the chronology of the Kościuki site. The complex, spatially segregated enclosure, demarcated from its surroundings by three concentric embankments and ditches, and further enclosed by six rings of palisades, was most probably constructed between the 6th and 5th centuries BC. It thus ranks among the latest and largest of such enclosures known in north-eastern Poland.

Together with at least 27 comparable structures, the Kościuki site probably constitutes tangible evidence of both socio-ritual and demographic developments among local communities. These groups were, for the first time in this region, engaged in establishing stable settlement systems sustained by agrarian economies. This interpretation is independently supported by palynological studies indicating that the Late Bronze and Early Iron Ages were marked by the first clear signs of anthropogenic pressure and proxies of extensive grazing and cultivation (Kupryjanowicz 2005).

It appears increasingly likely that ringed enclosures such as the one at Kościuki represented distinct and spatially isolated zones of the sacrum – ceremonial centres or symbolic focal points for local groups inhabiting more or less stable satellite settlements or campsites dispersed throughout the surrounding landscape.

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