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Internal Construction in the Early Middle Age Stronghold in Dakowy Mokre

The Character and Function of a Stronghold in the Light of New Geophysical Research

Abstract

The results of non-invasive research conducted using the GPR and magnetic methods in Dakowy Mokre (woj. wielkopolskie/PL) revealed the existence of a previously unknown ditch with a low embankment, located in the central part of the stronghold. This discovery raises new questions about the function of this space, and at the same time the entire stronghold, as well as the mutual connections between the two structures and their chronological relationship. Analogies at early medieval hillforts in Lubusz Land, Lower Silesia and Pomerania indicate their connotations with the cult or sepulchral sphere. Some of the strongholds mentioned in the text have been excavated, revealing interesting archaeological material in the fillings of ditches and embankments, indicating cyclical non-utilitarian activities. The newly discovered structure in Dakowy Mokre will undergo the same verification, which we hope will open up new interpretative possibilities.*

Keywords

Poland / Dakowy Mokre / early medieval / stronghold / geophysical survey / Ground-penetrating Radar (GPR) / magnetometry

The pre-Piast strongholds, chronologically older and preceding the formation of the Piast State, are concentrated in Greater Poland, mainly in the southern and northwestern areas[1]. The former became an area of research interest primarily to Zofia Hilczerówna (1960a; 1960b; 1967a; 1967b) and researchers continuing her work (Zamelska 1995; Teske 2003; Brzostowicz 2002; 2003; 2016; Kara/Krąpiec 2000; Kara 2005; Kara et al. 2006), conducting surface and excavation studies that allowed not only the recognition of individual fortified objects, but also a broader view of the fortified network. These sites manifest features of the oldest strongholds, among which are the well-known and repeatedly described Bonikowo,

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1 In the eastern and southeastern parts, there are single stronghold sites, including Giecz, Nowa Górka near Pobiedziska, Moraczewo, Spławie, Raszewy, Ląd and Samarzewo (all sites: woj. wielkopolskie/PL), with most of them established as early as the beginning of the 10th cent. (Kara 2009, 253-257).

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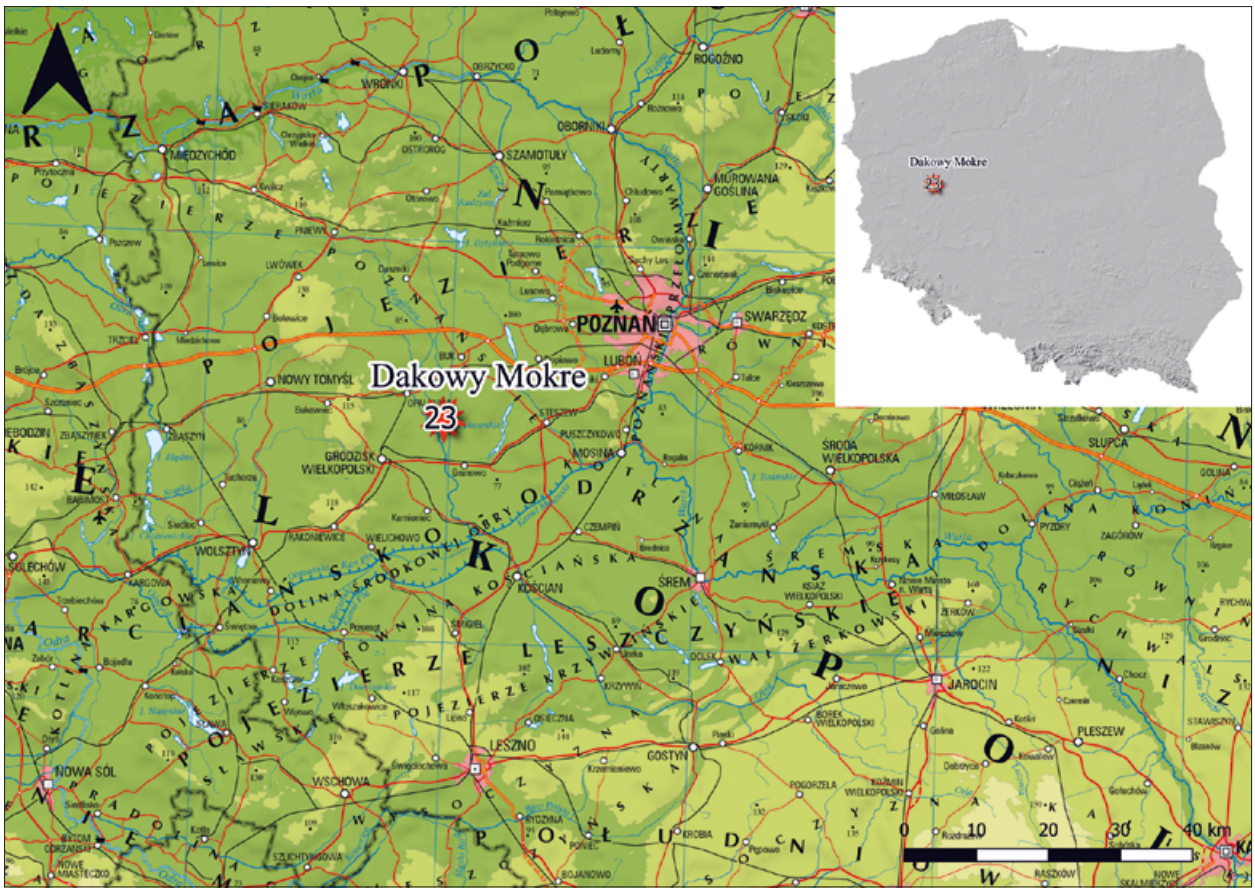

Fig. 1 Location of the site in Dakowy Mokre. – (Prepared by J. Mizerka-Urbaniak; basemap: www.geoportal.gov.pl).

Kamieniec, Białcz Stary, Siemowo, Łęki Wielkie, but also younger fortified settlements such as Bruszczewo, Kurza Góra Nowa, Poniec (all sites: woj. wielkopolskie/PL; Hilczerówna 1960a; 1960b; 1967a; 1967b; Kara 2009; Brzostowicz 2002; 2003; Zamelska 1995). Despite the long time that has passed since the monograph »The Upper and Middle Obra River Basin from the 6th to the beginning of the 11th century« was published, no other monograph has appeared that would significantly change the hypotheses made at that time[2] (Hilczerówna 1967a).

Consequently, the southern part of Wielkopolska remains the most well-studied area, providing a litmus test, so to speak, of archaeological-historical phenomena or chronological determinations. In contrast, the northwestern part of Wielkopolska has been studied in a limited, fairly punctual way. In the 1980s, they were included in an extensive research program led by Zofia Kurnatowska and Alina Łosińska, which aimed to verify the fortified settlements in the Wielkopolska area by conducting reconnaissance surveys of some of them[3] (Kurnatowska/Łosińska 1983, 25–27; Kirschke/Prinke 1995, 9). This research made it possible to distinguish early medieval strongholds from all recorded sites, and then to select those whose formation was not directly associated with the establishment of the Piast State. In the following years, these fortified settlements, about 30 in total in the described area, provided different types of information (Michalski et al. 2016, 219–222 tab. 1). From the point of view of both the scale of the research, as well as the methods and modern analyses used, the most important object became the fortified settlement in Dąbrówka stan. 1 (woj. wielkopolskie/PL; Pawlak/Pawlak 2019a; 2019b; 2019c) (**fig. 2, 1**). Among the other sites included in the survey were those located in: Dakowy Mokre (**fig. 1**), Jastrowie-Ostrolesie, Nojewo, Pierwoszewo[4], Ostroróg, Rudki,

2 Excluding chronological issues, which have changed over the past few decades. For more on this topic, see Dzieduszycki 1990; Kara 2009; Michalski et al. 2016.

3 These were small-scale surveys, usually measuring 0.3 m × 0.3/0.7 m - often taking advantage of the circumstances, such as conducting the survey in a hole left by a tree or other uncoverings. They contributed basic stratigraphic and chronological information.

4 Some of the mentioned strongholds have been excavated twice. This applies to the site at Pierwoszewo (Cnotliwy 1989, 188. 229) or at Ostroróg (both sites: woj. wielkopolskie/PL) (Pietrzak 2003, 66).

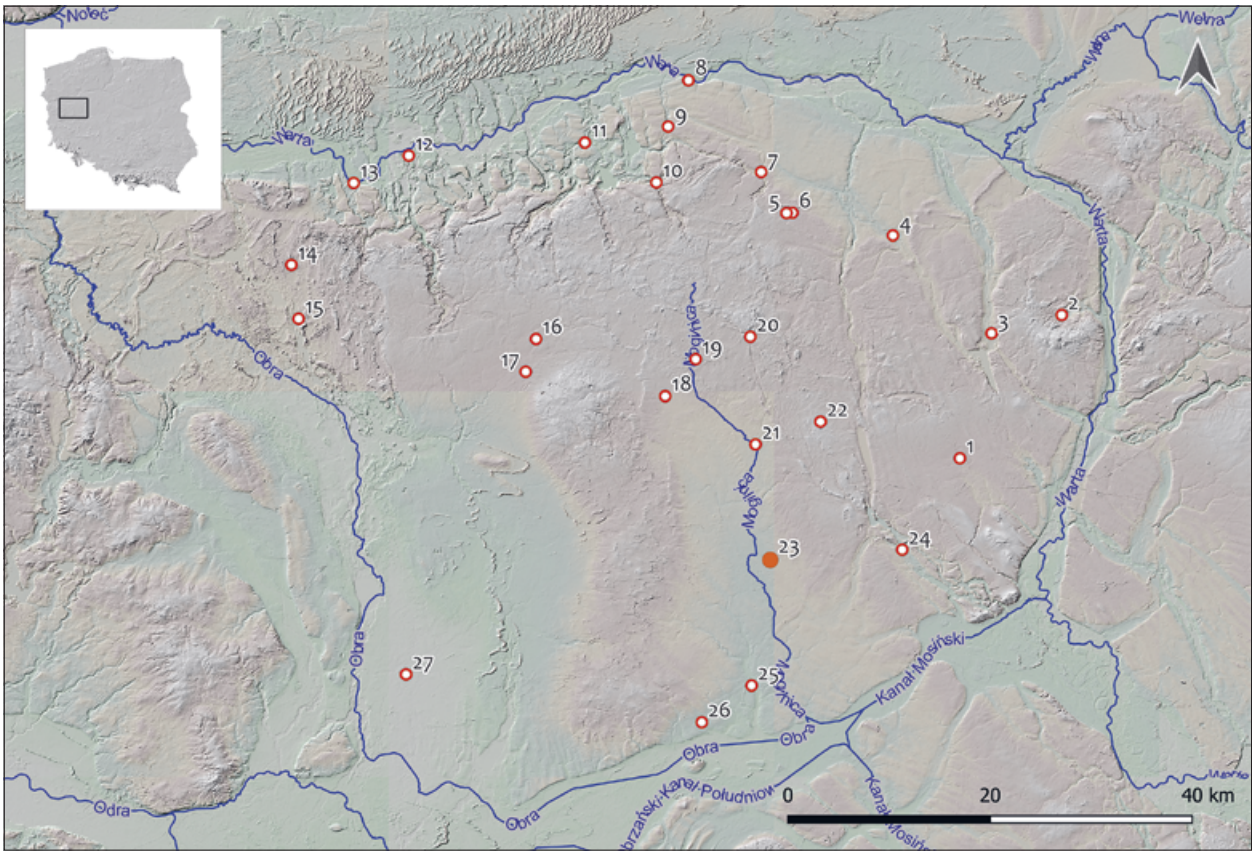

Fig. 2 Location of the strongholds functioning in the older phases of the early Middle Ages in western Greater Poland: **1** Dąbrówka, dis. Dopiewo. – **2** Glinno, dis. Suchy Las. – **3** Pawłowice, dis. Rokietnica. – **4** Kąsinowo-Baborówko, dis. Szmotuły. – **5** Rudki, dis. Szamotuły. – **6** Jastrowie-Ostrolesie, dis. Szamotuły. – **7** Ostroróg, dis. Loco. – **8** Pierwoszewo, dis. Wronki. – **9** Wróblewo, dis. Wronki. – **10** Nojewo, dis. Pniewy. – **11** Ryżyn, dis. Chrzypsko Wielkie. – **12** Aleksandrowo, dis. Międzychód. – **13** Muchocin, dis. Międzychód. – **14** Pszczew, dis. Loco. – **15** Pszczew, półwysep Katarzyna. – **16** Linie-Wymyślanka, dis. Lwówek. – **17** Grońsko-Komorowo, dis. Lwówek. – **18** Bródki, dis. Lwówek. – **19** Niewierz, dis. Duszniki. – **20** Wilczyna-Młynkowo, dis. Duszniki. – **21** Sędzinko-Zalesie, dis. Duszniki. – **22** Brzoza, dis. Duszniki. – **23** Dakowy Mokre, dis. Opalenica. – **24** Nowa Wieś-Krąplewo, dis. Stęszew. – **25** Kamieniec, dis. Loco. – **26** Trzcinica, dis. Loco. – **27** Karna, dis. Siedlec. – (Prepared by J. Mizerka-Urbaniak; basemap: www.geoportal.gov.pl, based on Pawlak 2021; Michalski et al. 2016).

Ryżyn and Wróblewo (Śmigielski 1974a; Pietrzak 2003)[5] (all sites: woj. wielkopolskie/PL) (**fig. 2, 5-11. 23**). The information gathered so far does not allow the verification of the hypotheses put forward regarding the character of these fortified settlements, the reasons for its disappearance, or the alleged depopulation of these areas in the 10th century (Wędzki 1996, 71; Kurnatowska/Kurnatowski 1997, 69; Kurnatowska/Kara 2008, 161).

The Site at Dakowy Mokre

The decision to include the fortified settlement in Dakowy Mokre (see **fig. 1**) in the study was determined by the results of probing the site and its distinctive metric features. A review of other fortified settlements made it apparent that the site stands out due to its considerable area compared to many neighbouring fortified settlements (Hilczerówna 1967b, 150; Chrzan 2018, 267). The area of the maidan in Dakowy Mokre, determined by reconstructing the course of the ramparts, was probably about

5 During this work, it was also planned to identify a fortified settlement in Kąsinowo-Baborówko (woj. wielkopolskie/PL), whose ramparts were levelled in the 1970s. Due to its inaccurate location and the resulting problems of delineating it in the field, two test trenches were excavated at a prominent terrain elevation. Following the work, it turned out that the excavations had uncovered an early medieval settlement, while the stronghold was probably located on a neighbouring elevation (Pietrzak 2003, 64).

0.7–0.8 ha. A stronghold in Rudki[6] 45 km away, in Dąbrówka[7], in Siemowo[8] and possibly a site in Pawłowice[9] , and Kamieniec[10] are considered similarly significant. Other fortified settlements have areas of maidans not exceeding 0.5 ha – including Grońsko (0.1 ha), Sędzinko (0.25 ha), Niewierz (0.1 ha), Bródki (> 0.1 ha), Ostrolesie (> 0.1 ha) (all sites: woj. wielkopolskie/PL).

The site's location in Dakowy Mokre, between the northwestern and southern parts of Greater Poland, also seems interesting (see **fig. 1**). Some researchers point unequivocally to its »affinity« towards the Middle Obra region (Wędzki 1996, 70). New light will undoubtedly be shed on this issue by the question of the chronology of the stronghold – whether it relates to the oldest stronghold systems in southern Wielkopolska, as well as in-depth studies of material remains showing influences or inspirations in manufacturing, not only ceramic[11].

Currently, the stronghold is located outside the village buildings, on the left-hand side of the road leading to Uścięcice. It is separated from the Mogilnica riverbed by a distance of about 1.5 km, while a small, nameless tributary[12] located about 90 m north of the fortified settlement was a direct source of water for the inhabitants of the settlement[13]. The tendency to locate fortified settlements in valley bottoms during the older phases of the early Middle Ages[14] is also evident at this site. It occupies a slight, sandy elevation in wet meadows, formerly periodically flooded or heavily marshy. Despite extensive damage, it remains well-legible in the field due to tall trees and shrubs growing over the ramparts (**fig. 3B**).

The eastern arm of the rampart is the best preserved, which still impresses more than 4 m in height. The northern and southern parts were levelled, most likely in the late 19th century[15]. This was probably dictated by the need to obtain materials for constructing a road to the neighbouring village[16]. The western part has also been significantly transformed, and today, its course is marked by bushes, overgrowing small elevations, not exceeding 0.2–0.3 m – the remains of the rampart. The visualisations of ALS data[17] indicate that the rampart was originally surrounded by a circular ditch, visible in the northern and western parts (**fig. 3**). In addition, the shading analysis from multiple directions and local dominance (**figs 3C-D**) marked the obesity of the circular outline of the structure in the central part of the stronghold.

The stronghold, as mentioned above, aroused the curiosity of local amateur history enthusiasts, who, in addition to collecting surface materials, also conducted excavations on the ramparts and within the central part of the stronghold (Kaczmarek et al. 2013, 186. 200–201. 206). As a result, archaeological objects were obtained, mainly ceramics, as well as other artefacts such as a spindle support, an iron knife, and

6 The area of the stronghold is more than 1 ha, with dimensions of 140 m × 120 m (Pawlak/Pawlak 2019c, 664).

7 The area of the stronghold is estimated at 0.75 ha, with a length on the N-S axis of 85 m and E-W of 120 m (Pawlak/Pawlak 2019a, 70).

8 It is difficult to precisely provide precise dimensions of the fortified settlement itself since the site has been almost completely levelled; the embankment in the eastern part is now only preserved in a vestigial form. According to the description of Z. Hilczerówna, the fortress covered an area of about 1.06 ha, while the »basin« itself covered 0.47 ha (Hilczerówna 1967b, 134).

9 The site has been completely levelled. Quite clearly distinguishable remains of the stronghold in the form of a dark-coloured circle allow us to determine its measurements, amounting to at least about 80 m × 80 m (source: www.geoportal.gov.pl).

10 The stronghold in Kamieniec is preserved residually, as only in the western course is a fragment of the rampart preserved. The small embankment in the southeastern part, visible in the field, may also be part of the rampart, although its state of preservation in the form of a small fragment, as well as not being shown on 19th and 20th century-maps, dictates some caution in such a conclusion. However, if it were considered part of the rampart, the reconstructed size of the maypole would be about 0.6 ha.

11 Studies are currently being carried out on ceramics from the 1974 survey. Ceramics with northern connections are evident in the collection, such as fragments of ceramics attributable to the Menkendorf type (Schuldt 1956; type family D according to W. Łosiński [Łosiński/Rogosz 1983]), the Feldberg type (Schuldt 1956; type family C according to W. Łosiński), and the Woldegk type (Schuldt 1956; type family E according to W. Łosiński). There are also forms with southern stylistics, such as the Bruszczewo-Obiszów type and zone-decorated pottery. This issue is all the more difficult because at the current stage of research, a mingling of northern (Mecklenburg), southern or Lusatian-Odra influences is already evident (Tornow type ceramics, Hermann 1966, 65).

12 Currently it is a regulated ditch, but the visible landforms indicate its natural genesis.

13 We intentionally avoid the statement about »inhabitants of the stronghold«. The recognition of this structure does not give unquestionable evidence of the inhabitation of this object and its possible character (periodic or perhaps permanent?). The situation is different in the case of eight settlements (Dakowy Mokre sites 52, 55, 56, 58, 59; Uścięcice sites 42, 43, 36), which were identified within a radius of 1.5 km from the stronghold. Six of these are in the immediate vicinity of the stronghold, some of which may be apparent; for example, the accumulation of archaeological materials is related to the devastation of the ramparts and the ploughing of the maidan (this ploughing took place in the 1970s according to the owner of the parcel). None of the settlements have so far been the object of excavations.

14 Chronology of the older phases of the early Middle Ages after W. Dzieduszycki (1990) with additions by M. Kara (2009; 2016).

15 R. Virchow and W. Schwartz, who visited the fortified settlement in 1877, mention the destruction of part of the settlement, i. e. in the southeastern part (a depression of the terrain is still visible both in the field and on contour plans, and appears to be the remains of a large uproot) (Virchow 1877, 249-251).

16 Information derived from Śmigielski 1974a.

17 The authors are grateful to dr Michał Jakubczak (Institute of Archaeology and Ethnology, Polish Academy of Sciences; hereinafter referred to as IAE PAS) for preparing and compiling the LIDAR data.

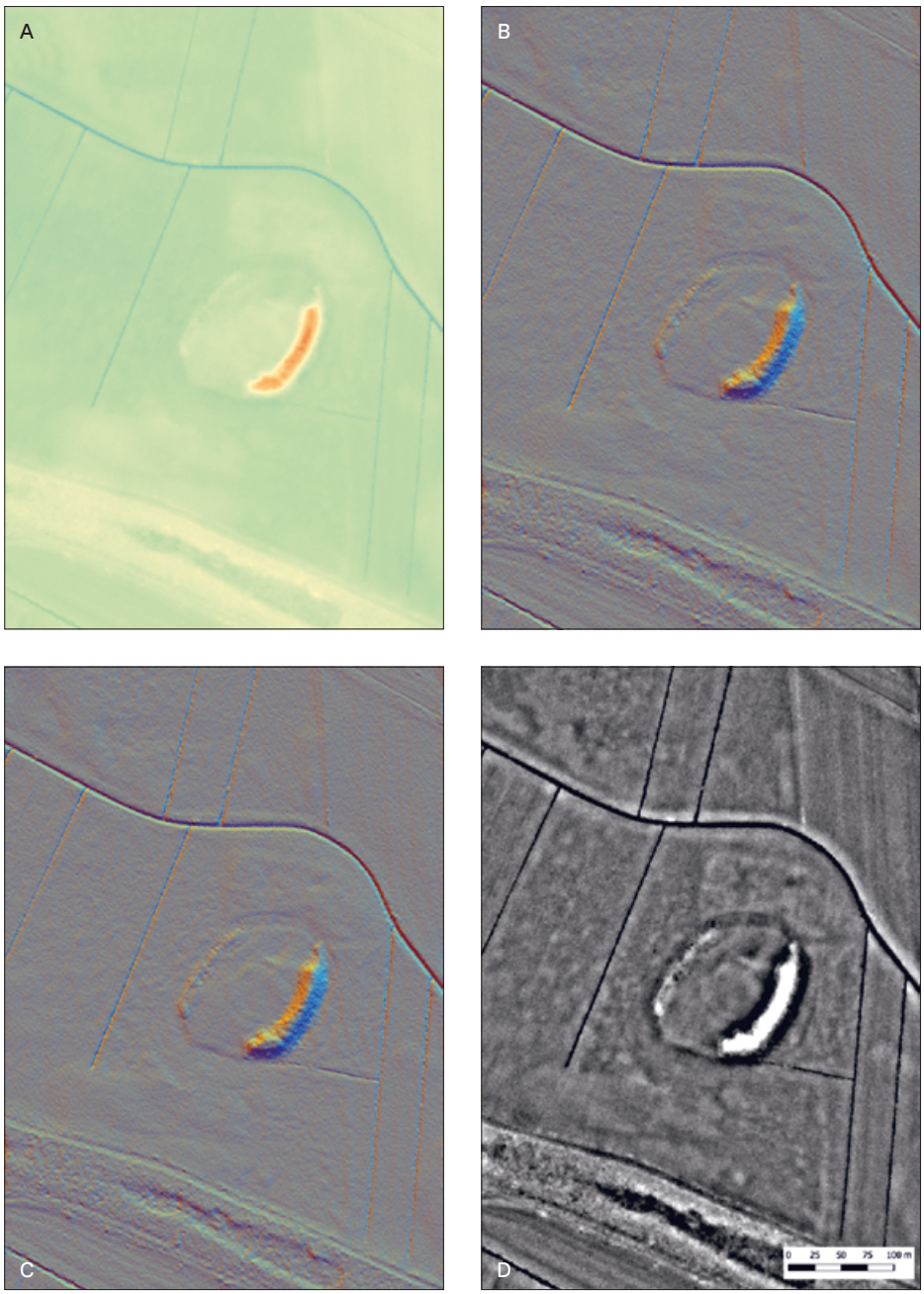

Fig. 3 Dakowy Mokre. ALS data visualisations: **A** numerical terrain model. – **B** aerial photograph. – **C** hillshading from multiple directions. – **D** local dominance. – (Prepared by M. Jakubczak/J. Mizerka-Urbaniak; basemap: www.geoportal.gov.pl).

bone artefacts[18]. The first and the only archaeological survey was carried out at the stronghold by Wojciech Śmigielski of IAE PAS (formerly: Institute of the History of Material Culture [IKHM PAN] in Poznań) in 1974 to determine the chronology of the site, which at the time was thought to be of Lusatian culture (Śmigielski 1974a). Two excavations on a common northwest-southeast axis were delineated, covering the western part of the rampart and the maidan, with a total area of about 140 m²[19]. As a result, part of the destroyed rampart[20], a remarkably well-preserved wooden structure (the presumed embankment road), a corner part of a building with accompanying pits, as well as a post structure with an object, most likely serving as a storage facility, were uncovered. A short text was recently devoted to the latter, considering possible interpretations as consisting of several structures with an unspecified function (residential or agricultural?) or as a single structure with an above-average area functionally related to the hall buildings (Mizerka 2024). The results of the geophysical survey also shed new light on the site.

18 These artefacts are stored in the Archaeological Museum in Poznań under inv. nos 1878; 1882; 1886:48; 1886:49; 1886:52.

19 The results of these investigations have not yet been published.

20 In the trench in the place of the embankment and nearby structures, the level of natural layers was not reached, caused by heavy rainfall and standing water in the trench.

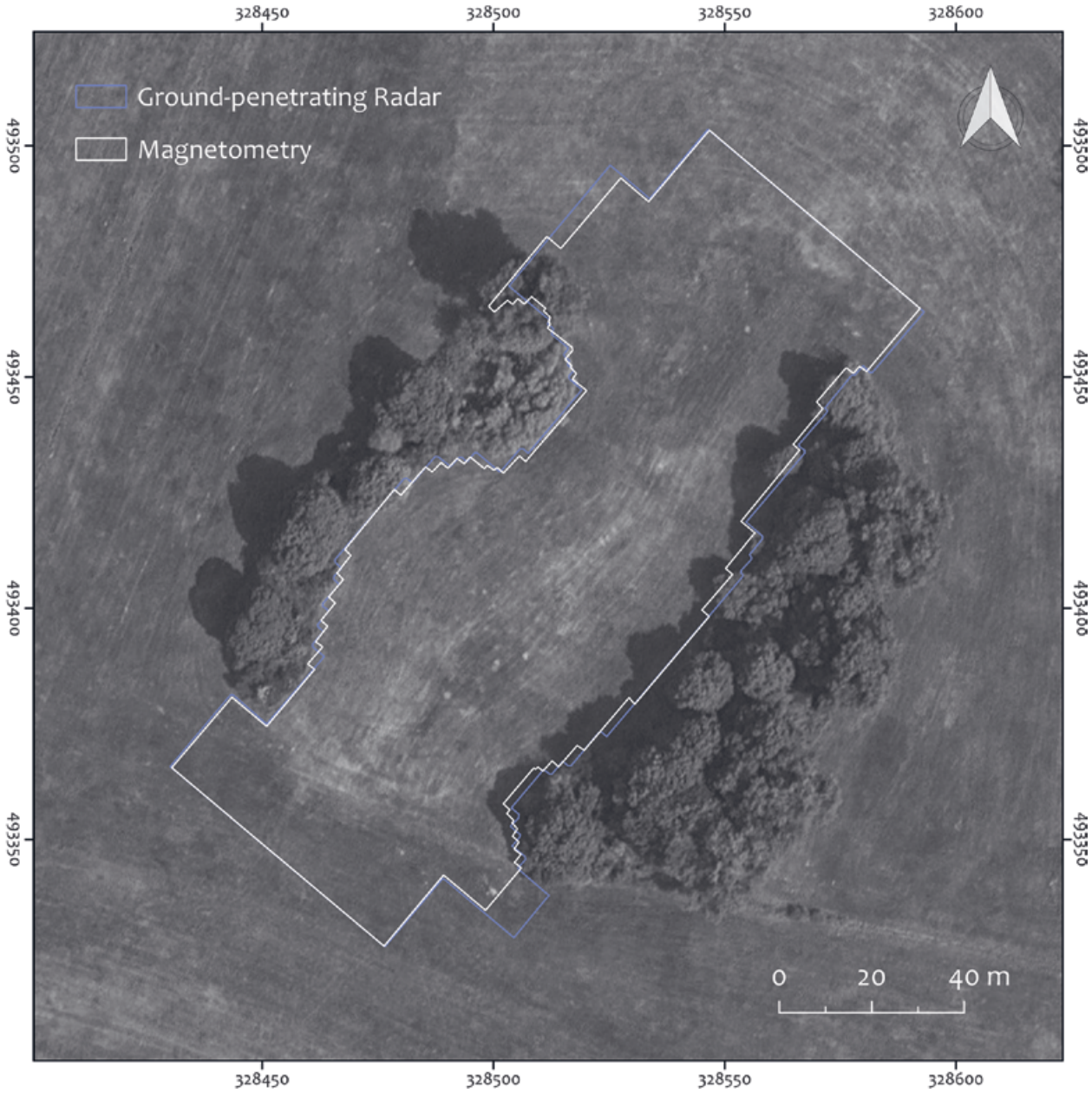

Fig. 4 Dakowy Mokre. The extent of the geophysical surveys. – (Graphics R. Ryndziewicz; basemap: www.geoportal.gov.pl).

Methodology and Results of the Geophysical Surveys

The geophysical surveys[21] were carried out using Ground-penetrating Radar (GPR) (Conyers 2013) and magnetometry (Aspinall et al. 2008; Fassbinder 2016), which allowed us to obtain two complementary, high-resolution datasets. The measurements covered the entire available area of the maidan and the area of levelled ramparts in the northern and southern parts (**fig. 4**). The preserved fragments of the eastern and western ramparts were not included in the prospecting due to their difficult availability (overgrown with trees and dense shrubs).

We conducted reflection profiling of the subsurface using a Malå GX HDR system with a shielded antenna with a central frequency of 450 MHz. The profiling involved taking measurements at 3 cm intervals within parallel lines spaced 0.5 m apart, covering a total area of about 1.15 ha. GPR data filtering was carried out using Wave 1.15.2 software by

21 The authors are grateful to Jarosław Majewski (Subgeo Wilczyce) for enabling the use of the Wave software and to Dariusz Krasnodębski (IAE PAS) for his help in carrying out the field measurements.

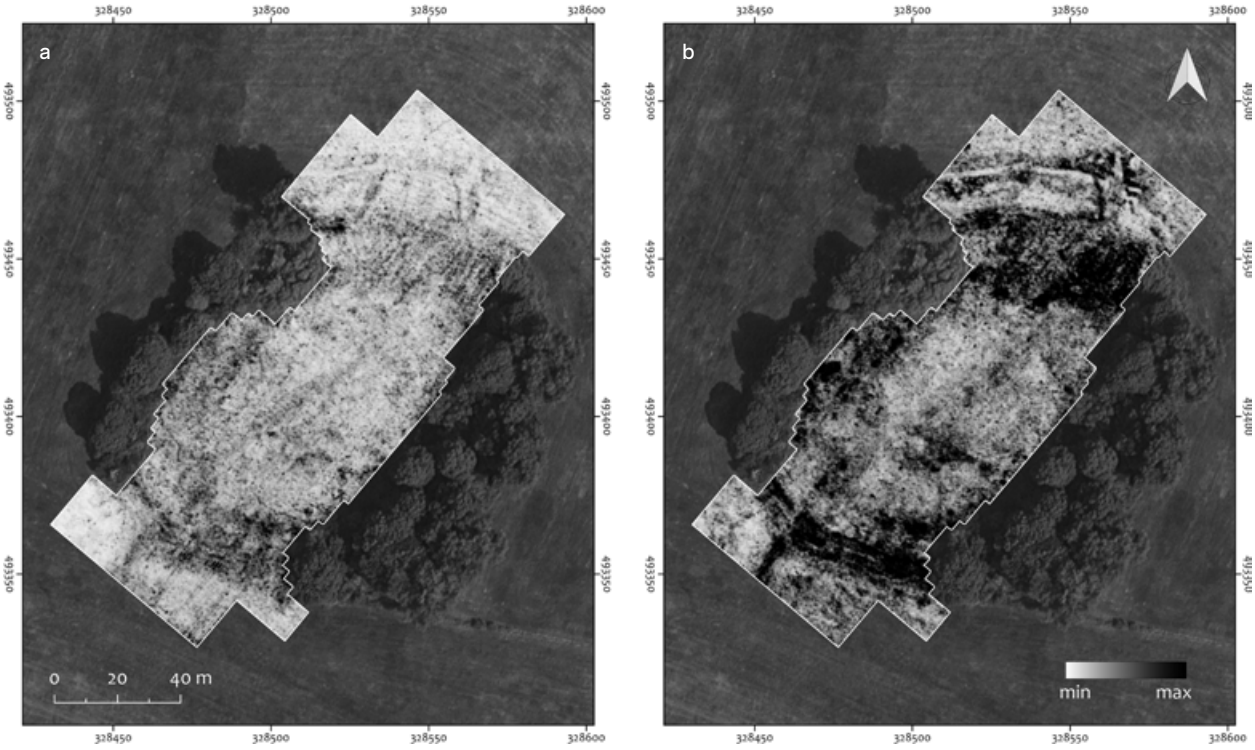

Fig. 5 Dakowy Mokre. GPR depth-slices: **a** 20–40 cm. – **b** 40–60 cm. – (Processing R. Ryndziewicz; basemap: www.geoportal.gov.pl).

Subgeo. Depth-slices were then calculated from the 2D data and visualised in greyscale (low-reflective areas as light tones, high-reflective areas as dark tones). Magnetometry was performed over an area of about 1.1 ha with a Bartington GRAD 601-2 fluxgate gradiometer in a 0.5 × 0.25 grid and a resolution of 0.1 nT. Magnetic data were processed with Geoscan Research Geoplot 4.0 software. Magnetic maps were visualised in greyscale. Georeferencing to the ETRF2000-PL / CS92 coordinate system (EPSG: 2180), further processing and the interpretation of geophysical data was carried out using QGIS 3.34.

As a matter of principle, the GPR data provides information on electromagnetic wave propagation in the ground. The processed data can be analysed in the form of horizontal time-depth cross-sections. It allows us to visualise the location, depth, size, and shape of underground features that cause changes in the amplitude of the reflected electromagnetic wave. On this basis, it is possible to infer various types of archaeological remains located underground and analyse their structure and spatial relationships (Goodman et al. 1995).

Interpreting the acquired GPR data made it possible to identify several features with a relatively high degree of detail. In the shallowest parts of the studied object (**fig. 5a**), the GPR data did not provide much information on archaeological relics, likely due to the state of preservation of the stronghold and the past ploughing of its surface. In the 40–60 cm depth-range (**fig. 5b**), the electromagnetic wave reflections associated with the remains of the embankments are evident. The different characteristics of the reflections in the southern and northern parts of the stronghold testify to the different state of preservation and perhaps different construction solutions of these parts of the ramparts. In the northern part, it was possible to distinguish curved areas of strong electromagnetic wave absorption, corresponding to the course of ramparts. This may indirectly indicate the existence of a ditch adjacent to the outer side of the embankment, as well as the far-reaching destruction of the northern section of the embankment and the state of preservation of any potential construction remains. The situation was different for the southern section of the levelled rampart. Extensive high-amplitude reflections, among which three parallel lines were distinguished, testified to the well-preserved remains of the structure, containing material that strongly reflects electromagnetic waves, such as stone elements.

The visualisation of the distribution of electromagnetic wave reflections in the ground, particularly in the range of 60–80 cm below the ground surface (**fig. 6a**), provided a remarkably complex set of information, both on the construction of the ramparts and how the maidan was developed. Attention was attracted by anomalies inside the

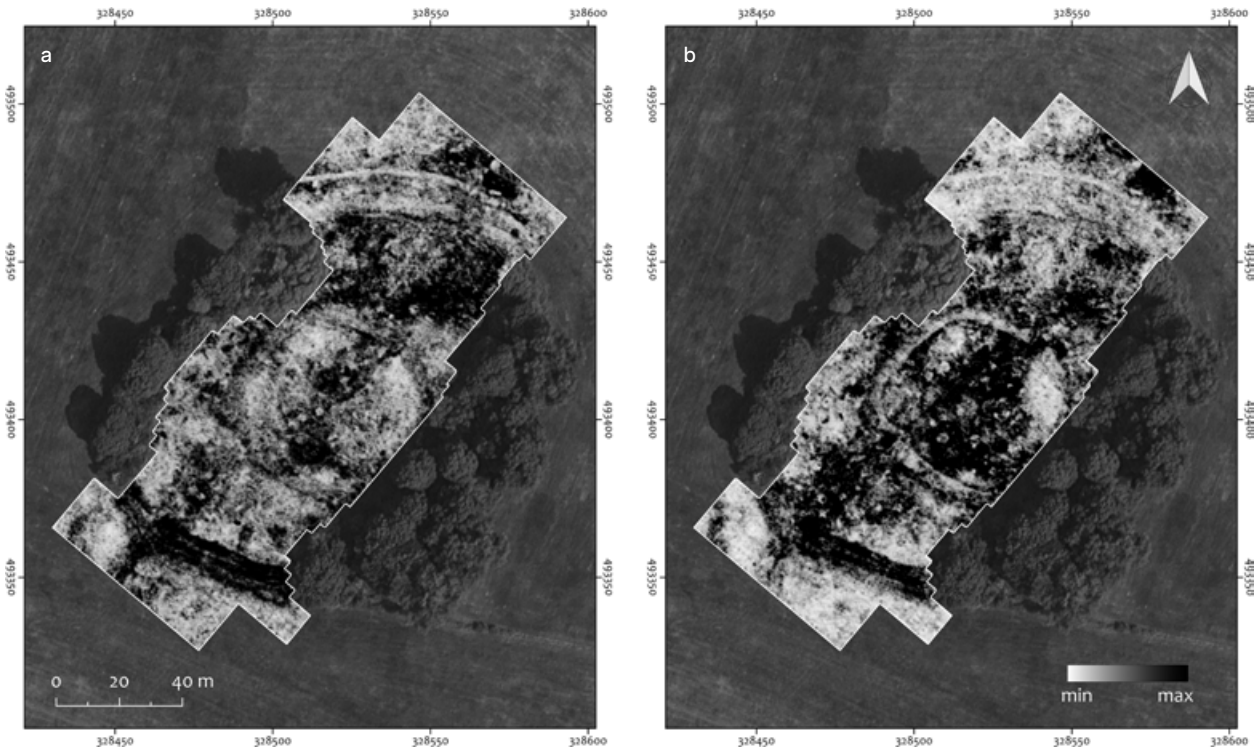

Fig. 6 Dakowy Mokre. GPR depth-slices: **a** 60–80 cm. – **b** 80–100 cm. – (Processing R. Ryndziewicz; basemap: www.geoportal.gov.pl).

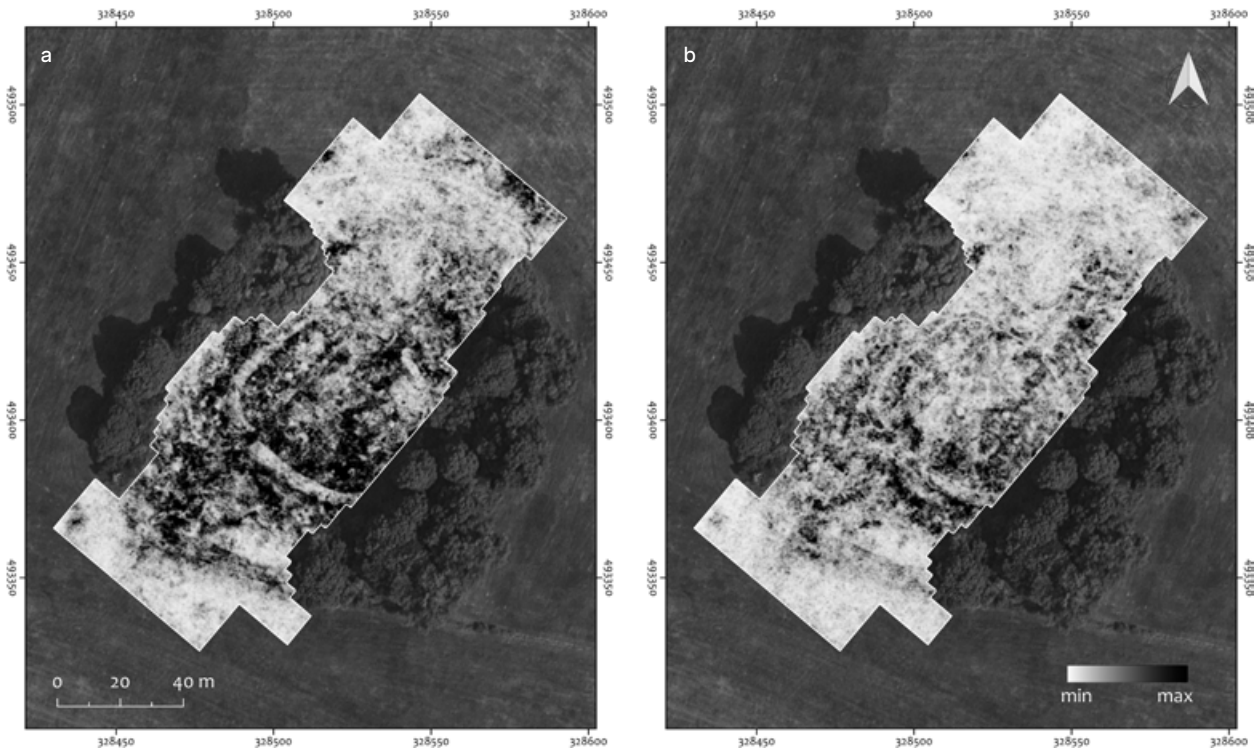

Fig. 7 Dakowy Mokre. GPR depth-slices: **a** 100–120 cm. – **b** 120–140 cm. – (Processing R. Ryndziewicz; basemap: www.geoportal.gov.pl).

stronghold with a shape similar to a circle and a diameter of about 58 m. At the same time, within the maidan, it is possible to distinguish numerous areas where the electromagnetic wave underwent strong absorption and scattering, visible on the data as numerous bright areas spot shaped with an average diameter of about 2 m (from 0.7 m to more than 3 m), which can be interpreted as the remains of pits. Among the numerous, extensive areas of high-amplitude reflections, anomaly clusters form-

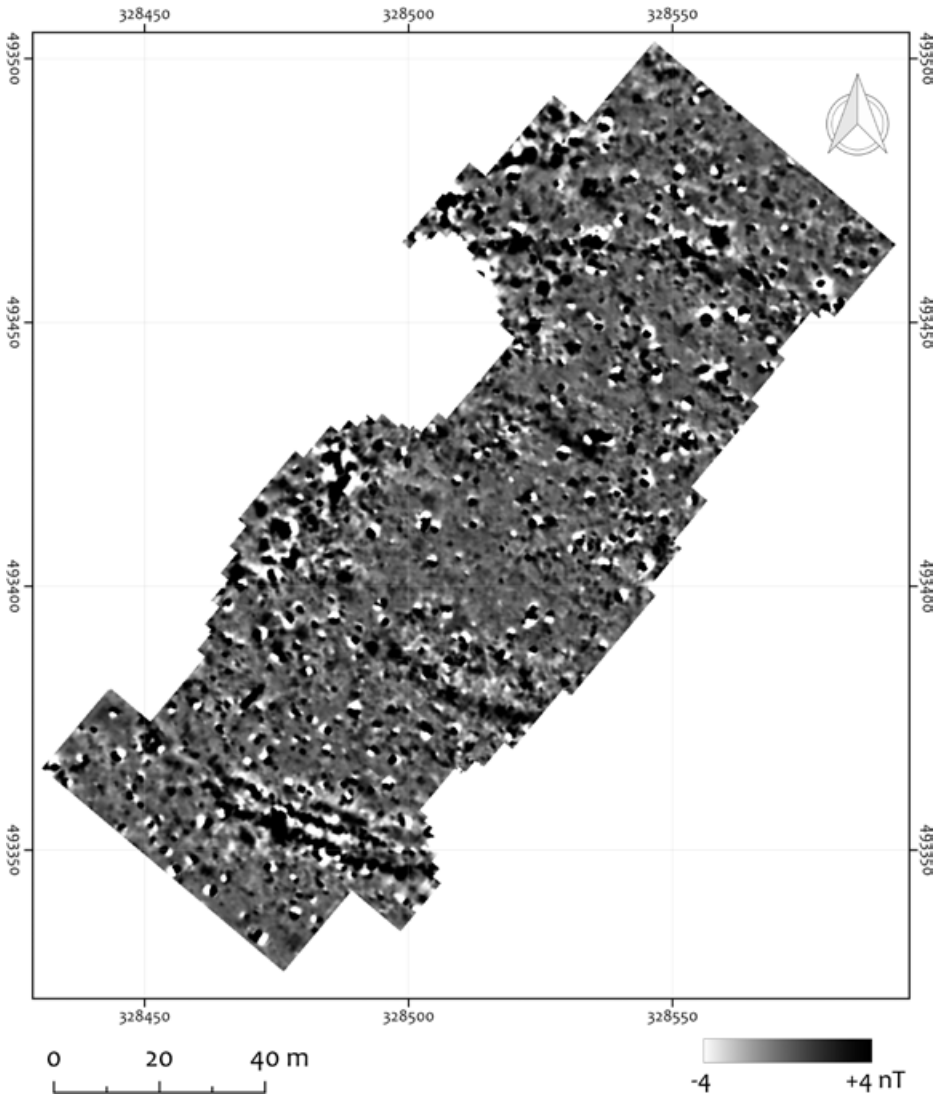

Fig. 8 Dakowy Mokre. Magnetic map. Dynamics: -4/+4 nT. – (Processing R. Ryndziewicz).

ing rectangular outlines perpendicular to the line of the rampart were distinguished along the inner edge of the southern section of the rampart, which can be interpreted as the remains of buildings. Visualising the data at a depth of 80–100 cm (**fig. 6b**) completes the interpretation from the 60–80 cm level. An extensive set of anomalies on a circular plan in the centre of the maidan can be interpreted as a ditch with an average width of 3.6–4 m, filled with material that strongly absorbs electromagnetic waves. Apparent gaps were visible in the northeastern and southwestern parts of this ditch, which can be interpreted as passages leading to its interior. The varied and highly complex set of adjacent and intermingled areas of highly reflective and absorbent electromagnetic waves, recorded over almost the entire surface of the maidan, probably indicates the intensive exploitation of the central part of the stronghold. High-amplitude linear anomalies indicate traces of structures, while numerous point-like areas of electromagnetic wave absorption are most likely the remains of pits or dug-outs. Complexes of anomalies within the ramparts were still well-readable. From a depth of about 100 cm (**fig. 7a**), the geophysical data still provide information about the stronghold's central part, but the geophysical signature of the ramparts is unclear. From a depth of 120–140 cm (**fig. 7b**), the electromagnetic wave became increasingly attenuated and dispersed, and the resource of possible archaeological information declined. Magnetic data, showing the distribution of changes in the vertical vector gradient of the Earth's magnetic field (**fig. 8**), supplemented the data obtained through the GPR. High-intensity magnetic anomalies within the southern section of the rampart indicate the existence of layers of burnt clay or other material that underwent thermoremanent magnetisation. The circular-plan structure inside the maidan manifested itself in the magnetic data as low-intensity anomalies indicating enhanced magnetization. On the northern section of the rampart, very weak anomalies with an arched course

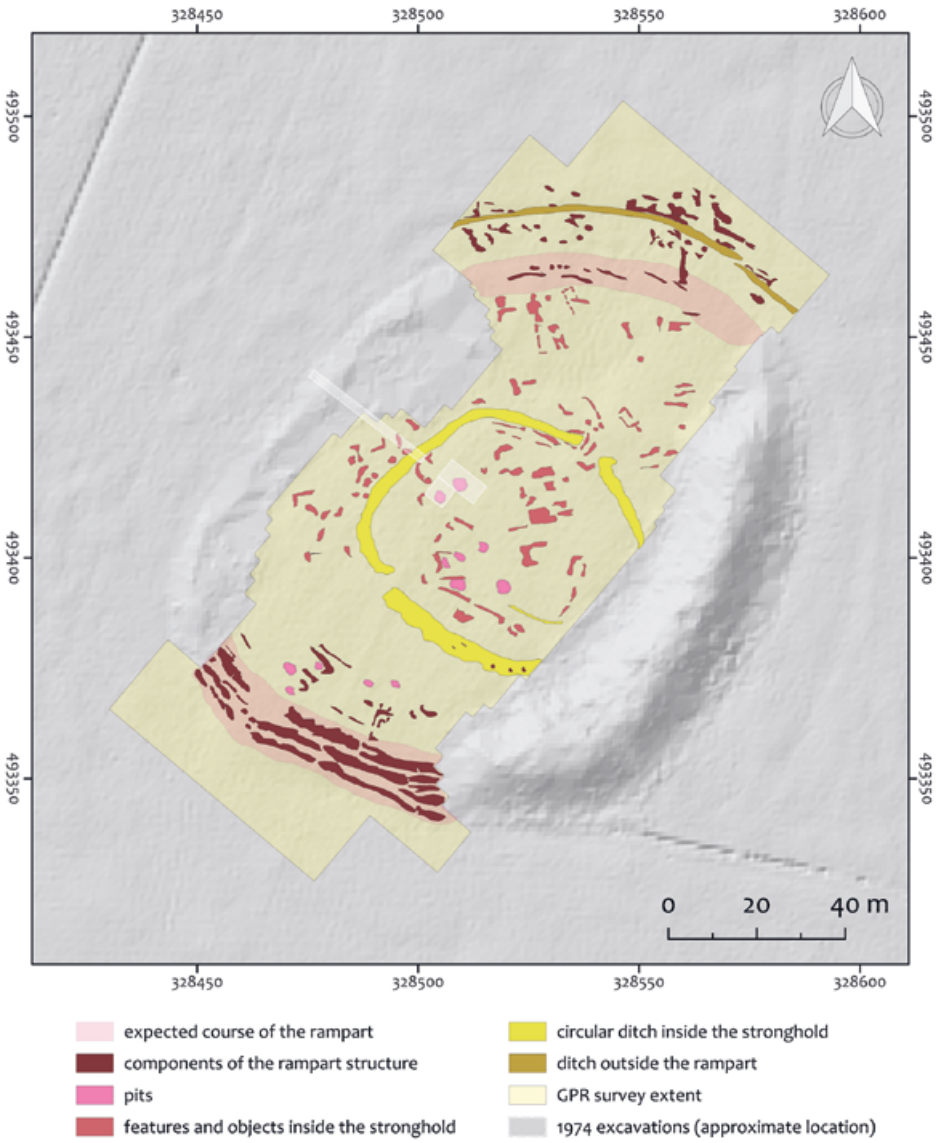

Fig. 9 Dakowy Mokre. Interpretation of the geophysical survey results with superimposed excavations from 1974. – (Prepared by R. Ryndziewicz/J. Mizerka-Urbaniak; basemap: www.geoportal.gov.pl).

were registered, which correspond to the course of the destroyed rampart. Throughout the entire study area, abundant disturbances were recorded related to small, ferromagnetic objects (probably modern iron rubbish), which are visible on the resulting maps as minor dipole anomalies of high intensity.

A graphic interpretation of the geophysical data collected from the stronghold in Dakowy Mokre, focusing on the identification of potential objects and layers of archaeological character, is presented in figure 9. Noteworthy is the identification of elements of the rampart structure on the southern side, indicating its preservation in this section. Significant damage to the embankment on the northern side was also confirmed, and a ditch was identified adjacent to the embankment which emerged episodically in the field. The GPR data indicate that stone or other highly reflective material was used to construct the embankment (at least its southern section). The magnetic data, on the other hand, indicate that the southern section of the embankment was subjected to intense fire, as evidenced by strong anomalies caused by thermoremanent magnetisation. An extensive circular-plan structure in the central part of the maidan seems extremely interesting. Given the geophysical data, it seems legitimate to interpret it as a massive ditch several meters wide. However, to understand its function and chronological relations with the rest of the structure, the research needs to be expanded to include other methods. Based on the spatial distribution of anomalies interpreted as pits and remains of constructions within the maidan, it can be concluded that it was intensively used. It is difficult to determine whether all recorded archaeological features are contemporaneous. Notably, geophysical surveys failed to locate the old trench in the western section of the stronghold (Śmigielski 1974a; 1974b).

Discussion

The discovery of an additional stronghold »structure« delicately outlined in the field, while perfectly noticeable in geophysical prospecting, consists of two circular elements: a low land elevation[22] and a wide ditch surrounding it. The current state of research on early medieval strongholds allows us to compare Dakowy Mokre with several sites in Greater Poland, the Lubusz region, Silesia and Pomerania, which may provide some reference as to the character and purpose of this demarcated space, but do not constitute direct analogies. To determine the degree of similarity, it would be necessary to verify the structure and contents of the embankment and the ditch, as well as the character and function of the objects recorded inside the »structure«.

The first discovery worth discussing was made at the stronghold in Klenica (woj. lubuskie/PL) 70 km west of Dakowy Mokre. It was located on the right bank of the Oder River, on a small hill directly connected with the bottom of the Oder Valley. The history of research on the site is rich and detailed in the literature (Gruszka et al. 2020; Gruszka 2022). The first excavations were carried out by Ernst Petersen in 1936, establishing a trench through the maidan and the southern part of the stronghold, with a total length of 81 m (Gruszka 2022, 27–28). Another reconnaissance took place 70 years later when, in 2007, a team led by Felix Biermann set up two trenches to obtain samples for dendrochronological analyses (Biermann et al. 2008; 2011). At that time, it was established that the chronology of the described site falls within the period from the first half of the 9th century to the beginning of the 10th century (Kieseler 2016, 243–258). In the case of Klenica, the geophysical surveys using the magnetic method, which covered the currently levelled remains of the stronghold, also provided a new quality of data. In addition to the information about the relics of the embankment, the gate entrance or internal buildings, they revealed the existence of an unusual oval structure measuring 28 m × 21 m and 3–4 m wide, located in the south-eastern part of the maidan (**fig. 10A**). After correlating the results of the geophysical surveys with the plans of previous excavations, it was determined that the structure had been cut by a trench from 1936. Petersen saw the rampart of an older fortified settlement in the layers of charcoal, ash and burnt clay with sand discovered at the time. Since then, Klenica has been included in various models on the transformation and development of strongholds. The Czech researcher Miloš Šolle provided an example in support of the hypothesis that smaller fortified strongholds were established earlier and expanded over time (Šolle 1961, 523), while according to Hilczerówna's assumptions, it was the reverse process. The smaller stronghold was to be separated from the space of the larger and older stronghold structure over time (Hilczerówna 1967a, 190). In 2007, based on the results of a new field reconnaissance (Biermann et al. 2008; 2011), the previous assumption of the existence of a second (younger or older) stronghold was abandoned. A new theory was constructed according to which the mounds were assigned the role of waste mounds accompanying domestic buildings, which was supposed to explain their fairly regular placement (mounds measuring 3 m × 4 m in size, 1.25 m high). This hypothesis was supported by material from the mounds, i. e. mainly fragmented pottery, animal bones and individual artefacts. However, in light of the latest data from non-invasive surveys, this structure appears to assume a completely different function. According to the study's authors, the embankment visible in the magnetics results would consist of about 20 separate and smaller mounds (Gruszka et al. 2020). In this hypothesis, these mounds would most likely be the remnants of repeatedly used hearths. Their layered nature would have been associated with their repeated use and, most likely, the re-depositing of clean sand on individual layers after a certain stage of use. This interpretation is strongly associated with using the space for cultic or magical purposes and is characterised by specific and repeated activities over a period of time. When considering the function of these mounds, the authors pointed to the delimitation of a specific space, which would have been used for ritual feasts (indirectly indicated by the two fragments of cups found), during which animal sacrifices would have been made (e. g. within the discovered hearths)[23].

The characteristics of mounds deserve mention in relation to an important discovery in an early medieval stronghold in Ryczyn (woj. dolnośląskie/PL). The unusual find, which researchers encountered on the maidan of the old fortification, were mounds about 0.8 m thick, consisting of layers of burnt ash and sand, while containing burnt human and animal bones, as well as numerous artefacts (**fig. 10D**). This meets the definition of a barrow. However, they were differentiated from standard barrows by the charac-

22 This embankment is weakly visible in the field, but stands out in the LIDAR data.

23 A few human bones appeared in the oldest layers discovered, near embankment 15a. A fragment of a skull calotte was found near the basis of the embankment.

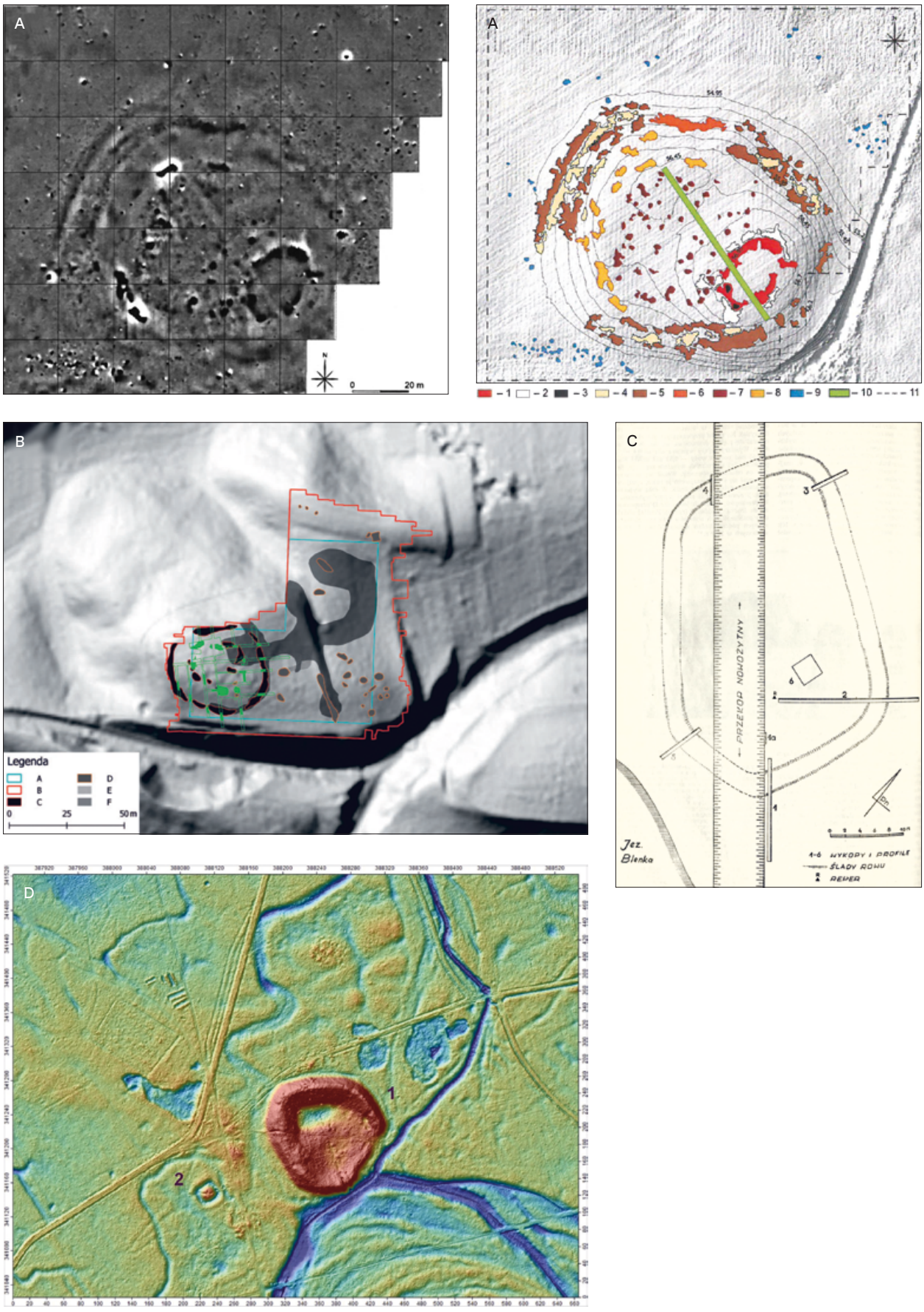

Fig. 10 A compilation of anomalies and structures with analogies to those discovered at Dakowy Mokre: **A** stronghold in Klenica, woj. lubuskie/PL. – **B** site in Gostyń, woj. dolnośląskie/PL. – **C** site in Gorzycko, woj. wielkopolskie/PL. – **D** stronghold in Bystrzyca (Ryczyn), woj. dolnośląskie/PL. – (Compiled by J. Mizerka-Urbaniak; after Gruszka et al. 2020; Chrzan et al. 2019; Jasnosz 1969; http://atlasgrodzisk.pl/?view=details&location=11 [6.6.2024]).

ter of the mounds, which included layers of clay and sand devoid of the described archaeological materials (Moździoch/Przysiężna-Pizarska 2008, 239). Combined with the observation that the artefacts were not burnt, the text's authors could hypothetically reconstruct the events. Well, they believe that a vessel filled with ash and bones was smashed and the contents were sprinkled with a layer of barren sand or clay, repeating this pattern at some stretch. A ditch was identified between one of the mounds and the rampart of the stronghold, filled with burnt ash, fragments of burnt bones, as well as deposits of animal skulls, stone structures and fragments of wooden planks. The study's authors suggested that the above-described finds were related to an unknown burial rite in the 80s of the 10th century (Moździoch/Przysiężna-Pizarska 2008, 243. 250). The above-mentioned characteristics of the barrows distinguish them from »traditional« burials, in which we do not find traces of layering or smaller size. The analogy with Dakowy Mokre is the existence of a ditch surrounding the mounds. The layout of the discovered mounds remains unclear – their exact number is unknown (three have been confirmed by excavation, which makes it difficult to talk about the layout). The mounds are located in the western part of the former stronghold.

Most likely, these are not the only examples of strongholds with mounds on the maidans, as several similar ones are found in Pomerania (Kajkowski 2018). Among them are strongholds in Runowo (woj. pomorskie/PL), dated to the mid 11th century to the first half of the 12th century, in Kurowo (woj. pomorskie/PL), dating to the 8th–10th centuries (Kajkowski 2019, 114–115), and in Rarwino (woj. zachodniopomorskie/PL), dated to the 9th/10th century (Kajkowski 2018, 137)[24].

Another site worth noting is the one in Gostyń (woj. dolnośląskie/PL). The site, known as Kowalowa Góra (*Schmiedeberg*), has been the spot of attention of researchers for almost 100 years. It has been largely recognised by excavation in 1938, 1966 and 1995–1996, as well as by survey (archaeological drilling) and non-invasive methods (magnetic and geoelectric prospecting). The last method, combined with the results of previous excavations, has had the greatest impact on reformulating views of the site's function[25]. In light of the in-depth analysis of the uncovered layers and objects, and the specifications of their fills and finds, it seems that the site had a ritual, cultic, and perhaps sepulchral function. Located on a natural hill, it is regularly exposed to erosion processes, which are responsible for reducing its area compared to its state during the early medieval period. Non-invasive studies have revealed the existence of a ditch that surrounded the hill around its entire perimeter, with parameters corresponding to the ditch in Dakowy Mokre: a width of about 3–4 m and a depth of up to 2 m, with an accompanying probable embankment[26] (**fig. 10B**). This ditch had »more than one gap«, permitting entry into the centre (Chrzan et al. 2019, 87). The lower part of its fill consisted of burnt clay, stones, and burnt material indicative of fire burning. Inside this space surrounded by a ditch, the outlines of about 8–10 oval pits have been discovered so far, whose features, including burnt human bones, unburnt human skeletons, and overburnt remains (e. g. a skull), as well as the stratigraphy, have allowed the site to be considered a ritual and cult site (Moździoch 2000, 158–175; 2019, 84–112). Sławomir Moździoch, seeking a hypothesis about the site's function, points to the insufficiently well-recognised burial rites in the older phases of the early Middle Ages, the similarity of the Gostyn pits to Alt Käbelich-type graves[27], and the cult centre's common features with gorodišče-svjatiliščе-type sites[28] found in the territory of Eastern Slavic lands (Słupecki 1994, 133; Olczak/Krasnodębski 2002). The noticeable similarity of these forms, which characterise eastern Slavic areas, may indirectly indicate a common »trend« in Slavic beliefs and rituals. The outlined common features relate to a ditch surrounding the embankment and an inner square[29] with a small thickness (or completely lacking) layer, formed as a result of use this space, with individual pits. The ditch mentioned above is usually filled with burnt material and archaeological findings, primarily pottery fragments and animal bones.

24 The dating of the strongholds in Runowo and Rarwin was based on survey results. The chronology of the site in Kurowo was based on surface materials.

25 For more on the non-use of the phrase »stronghold«, see Moździoch 2019, 85.

26 The character of this »embankment« was accurately described by S. Moździoch (Chrzan et al. 2019, 87). This characterisation accurately describes the situation recorded in Dakowy Mokre: »the embankment was for the ditch, not the ditch for the embankment«.

27 In the second half of the 20th century, distinctive graves were discovered at the eponymous site of Alt Käbelich (Lkr. Mecklenburgische Seenplatte/DE) (Schmidt 1984). These were objects sunk into the ground, of various shapes, containing burnt human bones. They are believed to be the remains of »houses of the dead«. The burials are characterised by rather poor furnishings. Cemeteries of this type are recorded in West Slavic areas. The chronology of these graves ranges from the 8th to the 12th century (Łosiński 1993; Kajkowski 2019, 132).

28 Gorodišče-svjatiliščе sites are found in Eastern Slavic lands. They consist of a centrally located bailey surrounded by a ditch and a rampart. The ditch contains burnt remains, stone cobblestones, and fragments of pottery and bone, while the interior of the site lacks a cultural layer. These sites are interpreted as pagan places of worship (Olczak/Krasnodębski 2002, 152-153).

29 These maidans typically range from 7 to 20 m in diameter. The space in Klenica has similar dimensions. Significantly different from them is the diameter of the structure in Dakowy Mokre measuring approximately 50 m.

One of the sites assigned a cult or religious role is the site examined by Stanislaw Jasnosz in Gorzycko (woj. wielkopolskie/PL) (Jasnosz 1968). It occupies a peninsula measuring 70 m × 55 m, elevated above the water level of the Młyńskie Lake and the Blenka Lake, currently forming one reservoir of the Great Lake. Several surveys made it possible to determine that the site was surrounded by a ditch around its perimeter in the early Middle Ages (**fig. 10C**). At the bottom of this ditch, remnants of wood were found, which were interpreted as the remains of a palisade, as well as burnt stones, laid at the inner edge of the moat (Jasnosz 1968, 227). No cultural layer was discovered in the inner part of the site, but single fragments of pottery and a few artefacts were found. The location of the site, the presence of a fence, and the scant remnants of human presence caused it to be considered a special site (cult) (Kara 2009, 108).

Among the other recognised Wielkopolska sites associated with the magical-ritual sphere is the well-known stronghold in Bonikowo (woj. wielkopolskie/PL). Excavations have revealed an unfortified cult site, which was later incorporated into the stronghold. Layer IV, identified during the excavations and interpreted as remnants of rituals conducted at the site, predates the foundation of the stronghold, as it went under the so-called embankment I (Kara 2009, 106–108). In addition, the extent of this layer was bounded by two types of equipment: on the eastern side by a ditch about 2.2 m wide and 0.2–0.4 m deep, while on the western side, it was most likely bounded by posts probably forming a kind of fence (?).

Studies on Slavic rituals in the early Middle Ages indicate that the delimitation of a specific space was achieved by marking its boundaries, cutting it off from the rest, and then giving it a different meaning or function (Kowalewski 1997, 114–115). Archaeological sites with »cultic« connotations are usually characterised by natural or anthropogenic delimitations, using watercourses, landforms, embankments, and ditches/moats (Kajkowski 2019, 317). With their help, a space was set aside for the performance of a specific cult, but also to separate and keep out a group of »ordinary mortals« (Słupecki 2000, 44; Chudziak 2014, 27). The results of research conducted by religious scholars on the criteria that spaces considered sacred should meet are presented, among others, in the work of Kamil Kajkowski (2019, 315–317). The aforementioned author, in his study of early medieval period sanctuaries from Pomerania, pointed out that the most important evidence for the realisation of specific sites into places of cult observable in archaeological material is »traces of delimitation, relics of stone structures/arrangements, hearths, bridges and buildings« (Kajkowski 2019, 20). The occurrence of delimitation elements is also associated with traces of ritual activities, such as fire-burning or offering sacrifices, which archaeology records in the form of charcoals, burnt earth, ashes, fragments of broken vessels, human and animal bones. In light of these findings, we can conclude that the low embankment in Dakowy Mokre, which is visible in the field, was created by digging a ditch, and the whole structure was an expression of intentional separation of space.

Conclusion

The geophysical surveys revealed a hitherto unknown structure occupying a large area of the maidan (about 35–40 %[30]) while providing data of new quality; information provided by geophysical prospecting would have been impossible to obtain using the excavation method and classical surface surveys. They have contributed to a change in the perception of the character and function of the former stronghold in Dakowy Mokre.

Geophysical surveys did not indicate the location of former trenches. This was made possible by a precisely executed contour map with trenches marked on it, which was fitted into the current Digital Terrain Model studies. The superimposed plans, compiled with the results of geophysical prospecting, which are subject to a rather small margin of error, indicate that the 1974 excavation was located inside the area surrounded by a ditch (**fig. 9**). However, in light of current information, trench I cut across the ditch. In addition to the plans, this is confirmed by the fact that in the last 2-3 metres of the trench, the presence of »light grey soil partially mixed with humus topsoil« was recorded rather quickly, initially interpreted as natural soil. However, the vertical cross-section shows that this layer differed from the clean, yellow sand and constituted a mixed layer. In addition, it lay diagonally across the profile, over a width of approximately 1.1 m, with its total thickness not exposed as indicated by the profile documentation (**fig. 11**). The exploration was completed at a depth of 60-70 cm.

30 The area of the stronghold's maidan, determined on the basis of the reconstruction of the course of the embankment and also the results of geophysical prospecting is approximately 0.7-0.8 ha. The area of the inner structure, which is determined by the extent of the ditch, was about 0.28 ha.

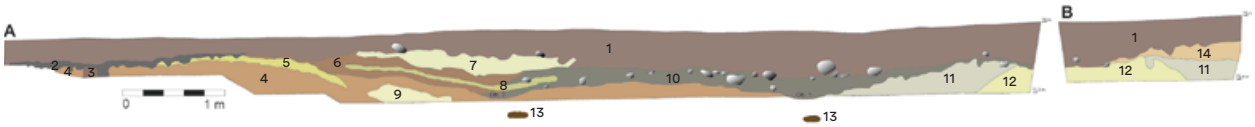

Fig. 11 Dakowy Mokre. Vertical cross-sections of the trench 1 from 1974: **A** profile N. – **B** profile E. – **1** brown sand layer; **2** dark grey layer with burn marks; **3** brown layer; **4** hardpan, calec; **5** yellow layer; **6** light grayish-brown layer; **7** light yellow-grey sand; **8** grey-yellow layer; **9** yellow sand, natural layer; **10** grey layer with burn marks; **11** yellow-grey layer; **12** yellow sand, natural layer; **13** wood; **14** yellow-orange layer; black and white shading marks the stones. – (Drawing A. Wawrzyński; edited by J. Mizerka-Urbaniak).

The survey report also noted that while deepening the excavation near the eastern profile, an »underlay of wood« was noted in the northern part, the nature of which could not be discerned due to the presence of water[31]. It is difficult in this situation to prejudge what the said wood could have been, as well as the layout, extent, and nature of which are unknown. At the current research stage, we can assume that the layers identified in trench I perhaps indicate some kind of development related to the ditch that was located in this trench. It seems that this issue can be resolved by the excavations planned for this site, which will allow for a re-examination of the ditch.

The structure of the ditch itself, the embankment, and the inner maidan require further research to determine the chronology and more importantly, the elements of construction, fill, and the function of the objects. At the current research stage, convergent features can be identified with the abovementioned objects. All of them have connotations of a cultic or sepulchral-cultic function. The discovery at Dakowy Mokry is of capital importance and potential to shed new light on a more complete understanding of the nature of this object, but also on the genesis, character or development of the strongholds from the older, as well as the turn of the older and younger phases of the early Middle Ages in Greater Poland. At the current research stage, these often remain in the realm of conjecture and working research hypotheses, which require further study and verification. Data from the recent non-invasive investigations on the Dakowy Mokre and Klenica strongholds may indicate that similar structures may remain unrecognised in other strongholds.

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31 This information comes from the fieldwork diary, kept at IAE PAS in Poznań.

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Zusammenfassung
Résumé

Zusätzliche Struktur im Inneren der mittelalterlichen Burganlage in Dakowy Mokre. Der Charakter und die Funktion einer Festung im Lichte neuer geophysikalischer Forschungen

Die Ergebnisse nicht-invasiver Untersuchungen mittels GPR- und magnetischer Methoden in Dakowy Mokre (woj. wielkopolskie/PL) haben einen bisher unbekannten Graben mit niedriger Böschung im zentralen Teil der Festung offenbart. Diese Entdeckung wirft neue Fragen zur Funktion dieses Raums und der gesamten Burganlage sowie zu den gegenseitigen Verbindungen zwischen den beiden Strukturen und ihre chronologische Beziehung auf. Analogien bei frühmittelalterlichen Hügelfestungen im Lebuser Land, in Niederschlesien und Pommern deuten auf eine Verbindung mit kultischen oder sepulkralen Vorgängen hin. Einige der im Text erwähnten Festungen wurden ausgegraben und brachten interessantes archäologisches Material in den Füllungen von Gräben und Böschungen zum Vorschein, das auf zyklische nicht-utilitaristische Aktivitäten hinweist. Die neu entdeckte Struktur in Dakowy Mokre soll der gleichen Überprüfung unterzogen werden, was hoffentlich neue Interpretationsmöglichkeiten eröffnen wird.

Construction intérieure de la forteresse de Dakowy Mokre datant du haut Moyen Âge. Le caractère et la fonction d'une place forte à la lumière des nouvelles recherches géophysiques

Les résultats des recherches non invasives menées à Dakowy Mokre (woj. wielkopolskie/PL) à l'aide du GPR et des méthodes magnétiques ont révélé l'existence d'un fossé inconnu jusqu'à présent, avec un talus bas, situé dans la partie centrale de la forteresse. Cette découverte soulève de nouvelles questions sur la fonction de cet espace, et en même temps de l'ensemble de la forteresse, ainsi que sur les liens mutuels entre les deux structures et leur relation chronologique. Les analogies avec les forteresses du haut Moyen Âge dans le Pays de Lubusz, en Basse-Silésie et en Poméranie indiquent leurs connotations avec la sphère cultuelle ou sépulcrale. Certaines des forteresses mentionnées dans le texte ont été fouillées, révélant un matériel archéologique intéressant dans le remplissage des fossés et des talus, ce qui indique des activités cycliques non utilitaires. La structure récemment découverte à Dakowy Mokre fera l'objet de la même vérification qui, nous l'espérons, ouvrira de nouvelles possibilités d'interprétation.

Schlüsselwörter
Mots-clés

Polen / Dakowy Mokre / Frühmittelalter / Festung / geophysikalische Untersuchung / Georadar (GPR) / Magnetometrie
Pologne / Dakowy Mokre / haut Moyen Âge / forteresse / étude géophysique / géoradar (GPR) / magnétométrie