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Institute of Archaeology
Rzeszów University

FUNDACJA RZESZOWSKIEGO OŚRODKA ARCHEOLOGICZNEGO

NON-INVASIVE METHODS IN ARCHAEOLOGY

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NON-INVASIVE METHODS IN ARCHAEOLOGY

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Beata Kizowska-Lepiejza, Miłka Stępień and Authors

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Institute of Archaeology Rzeszów University
Moniuszki 10 Street, 35-015 Rzeszów, Poland
e-mail: iarch@univ.rzeszow.pl
Home page: www.archeologia.rzeszow.pl

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Editor's note

We are pleased to present the 12th volume of the Analecta Archaeologica Ressoviensia journal. The previous issue, presenting studies into the Bronze Age and the Early Iron Age, was dedicated to Professor Sylwester Czopek on the 35th anniversary of his academic career. Since the 4th volume, it has been the Editing Board's objective to publish articles that are thematically consistent and situated within the scope of archaeological interests. The articles included in the present publication focus on issues linked to broadly-termed non-invasive studies in archaeology. The included texts discuss the use of the ground-penetrating radar, the magnetometer, aerial prospection or the interpretation of data acquired during aerial scanning. Our other objective involves the preservation of the journal's format, due to which much of the publication consists of reviews, polemical articles, conference reports and memoirs. This volume also introduces the principle of publishing articles in congress languages. We hope that this volume will meet your expectations and contribute to the further promotion of non-invasive methods in archaeology, which – in any case – are already the current standard research procedure.

We hope you enjoy our publication!

ARTICLES

ANALECTA ARCHAEOLOGICA RESSOVIENSIA
VOLUME 12 RZESZÓW 2017

DOI: 10.15584/anarres.2017.12.2

Thomas Saile*, Martin Posselt**

Zur Erkundung einer bandkeramischen Siedlung bei Hollenstedt (Niedersachsen)

ZUSAMMENFASSUNG

Saile T., Posselt M. 2017. Zur Erkundung einer bandkeramischen Siedlung bei Hollenstedt (Niedersachsen). *Analecta Archaeologica Ressoviensia* 12, 13–38

Auf der in den späten Zwanzigerjahren des letzten Jahrhunderts entdeckten bandkeramischen Siedlungsstelle Hollenstedt, „Salzberg", wurde im Rahmen einer geophysikalischen Prospektion ein altneolithisches Erdwerk festgestellt. Es besteht aus einem halbkreisförmigen, breiten Graben und einem auf der Innenseite parallel verlaufenden mutmaßlichen Palisadengräbchen; die Lage eines Walles ist zu erschließen. Vier Standorte bandkeramischer Häuser sind in der vom Dorfgraben umschlossenen Innenfläche durch Pfostenstandspuren erkennbar, acht weitere lassen sich durch mutmaßliche Längsgruben wahrscheinlich machen. Aus dem südlichen Niedersachsen sind mittlerweile neun bandkeramische Erdwerke bekannt, die in formaler Hinsicht bemerkenswerte Unterschiede aufweisen und einst offenbar verschiedene Funktionen erfüllten.

Schlagworte: Linienbandkeramik (LBK), Niedersachsen, Erdwerk, Magnetprospektion, Siedlungsarchäologie

Erhalten: 13.09.2017; **Überarbeitet:** 03.12.2017; **Angenommen:** 12.12.2017

Einleitung

Die Marburger Dissertation von Werner Buttler (1931) über die Bandkeramik in ihrem nordwestlichen Verbreitungsgebiet erschloss das frühe Neolithikum des Weser-Harz-Raumes der wissenschaftlichen Diskussion (Abb. 1). In der Folgezeit wurde der Kenntnisstand zur Jungsteinzeit im nördlichen Leine-Ilme-Graben durch die Aufnahme des Altkreises Einbeck (Geschwendt 1954) und die Zusammenstellung von Reinhard Maier (1976) im Rahmen der Historisch-Landeskundlichen Exkursionskarte wesentlich erweitert. Für Hollenstedt und seine weitere Umgebung sollten sich die Flurbegehungen des nachmaligen Göttinger Kreisarchäologen Klaus Grote (1975) und von Hans-Jürgen Dracklé (Dracklé, Merl 1977) als besonders bedeutsam erweisen (vgl. auch: Lönne 2003, 424 f. Nr. 153).

* Lehrstuhl für Vor- und Frühgeschichte, Institut für Geschichte, Universität Regensburg, 93040 Regensburg; thomas.saile@ur.de

** Lehrstuhl für Vor- und Frühgeschichte, Institut für Geschichte, Universität Regensburg, 93040 Regensburg; Martin.Posselt@ur.de

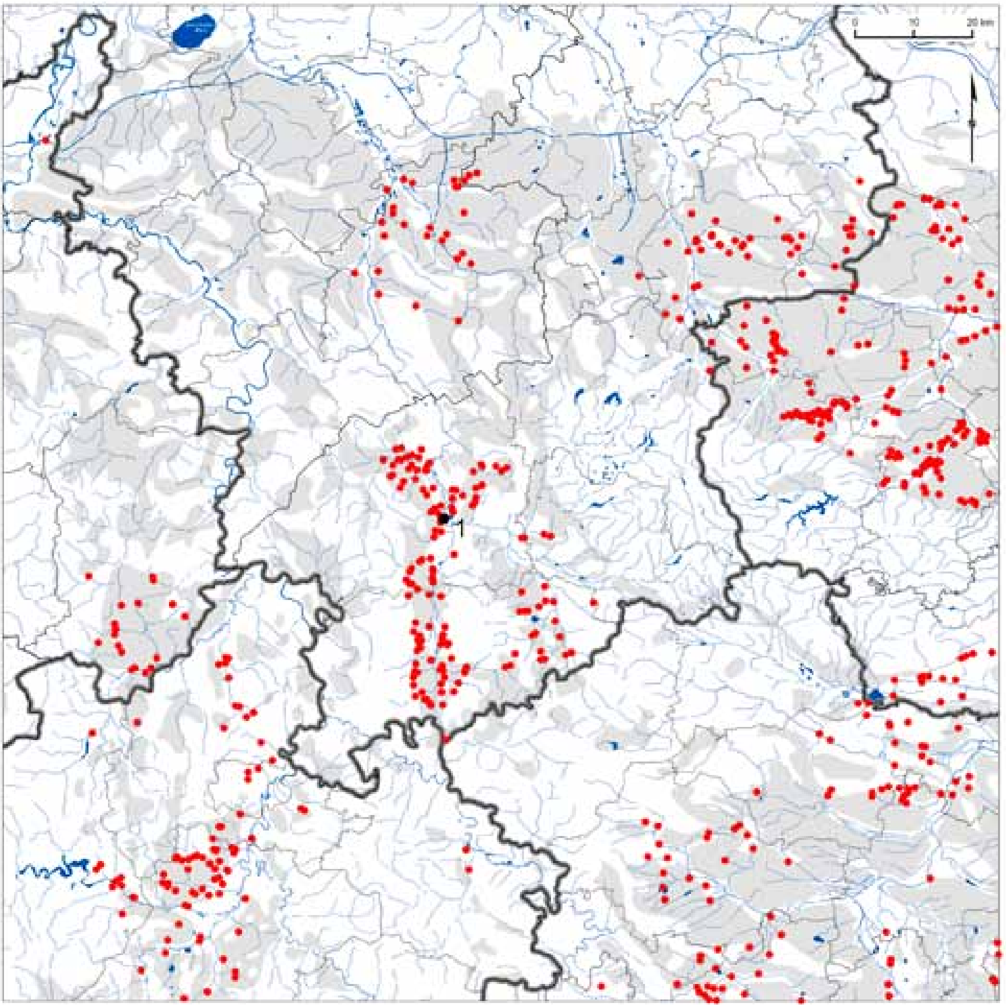

Abb. 1. Siedlungen der mittleren bis späten Linienbandkeramik des Weser-Harz-Raumes in Niedersachsen, Sachsen-Anhalt, Thüringen, Hessen und Nordrhein-Westfalen. Kartengrundlage abgeleitet aus BÜK 1000 und DTK 500 (aus: Saile 2007). Grau = Löss, 1 Hollenstedt (HO 2)

Zu Beginn unserer Geländearbeiten im Jahre 2012 waren in der Umgebung von Hollenstedt mehrere Siedlungen der Linienbandkeramik (LBK) bekannt (Abb. 2). Ihre exakte räumliche Ausdehnung und feinchronologische Zeitstellung ist aber gegenwärtig nur ungenau zu bestimmen. Lediglich auf dem Fundplatz Hollenstedt 2, „Vor dem Salzberg", ermöglichte die detaillierte räumliche Kartierung von Lesefunden

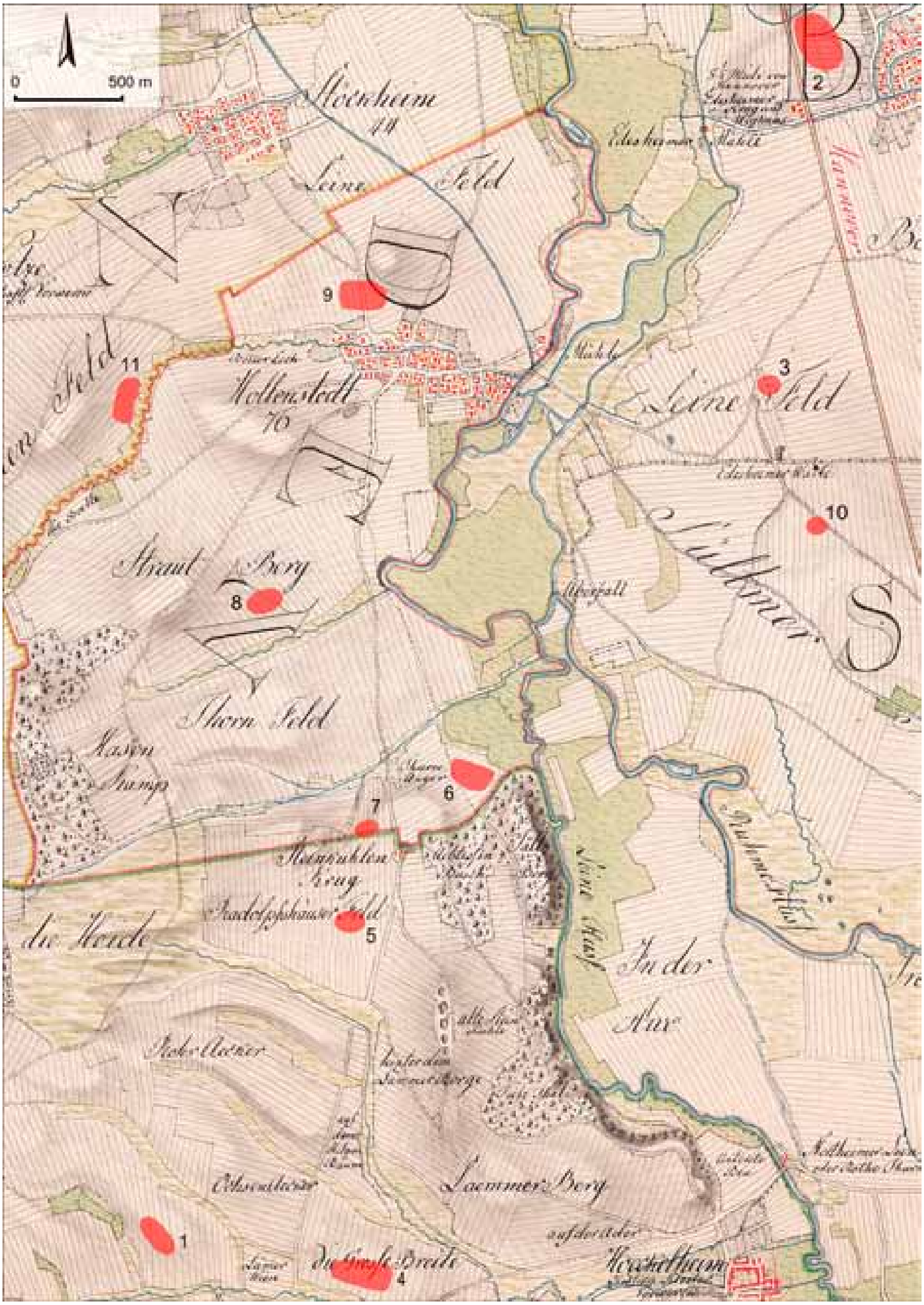

Abb. 2. Linienbandkeramische Siedlungen in der Umgebung von Hollenstedt. 1 Berwartshausen, 2–3 Edesheim, 4–5 Höckelheim, 6–9 Hollenstedt, 10 Northeim, 11 Stöckheim (vgl. Liste 1). Kartengrundlage: Kurhannoversche Landesaufnahme, Blatt 142 Northeim (1783)

durch Klaus Grote (1975, 17 Abb. 9) eine hinreichend konkrete Vorstellung über die räumliche Erstreckung einer im Wesentlichen mittel- bis spätbandkeramischen sowie einer spätlatène- bis kaiserzeitlichen Siedlungsstelle. Während der Feldbegehungen seit den späten Zwanzigerjahren des letzten Jahrhunderts konnte sehr umfangreiches Fundmaterial aufgesammelt und den regionalen Museen übergeben werden (Fahlbusch 1929, 55 ff.). In der westlichen, vorwiegend bandkeramisch geprägten Fundzone herrschen größere dunkle, teils längliche Gruben vor; „die eisenzeitlichen Siedlungsspuren konzentrieren sich im östlichen Bereich und weisen sich durch relativ kleine dunkle Grubenverfärbungen von nur wenigen Metern Durchmesser aus" (Grote 1975, 17).

Der Fundplatz liegt etwa 120 m über dem Meeresspiegel auf einer nach NNO geneigten, schwach ausgeprägten Bodenwelle am nordwestlichen, zur Leineniederung ausstreichenden, lössbedeckten Unterhang des 155 m hohen Salzberges (Abb. 3). Aus der Tiefenlinie südöstlich des besiedelten Areals ist eine Quelle bekannt, östlich des Salzberges sind Solquellen verzeichnet. Die Leine fließt 300 m östlich der Siedlung in einem über einen Kilometer breiten Tal. Weitläufige Auenbereiche und verlandete Altarme reichen nahe an die bandkeramische Fundstelle heran (Abb. 2). Etwa 750 m nordnordöstlich mündet heute die Rhume in die Leine; ihre Zuflüsse werden teilweise aus dem südwestlichen Harz gespeist. Jeweils wenige hundert Meter entfernt befinden sich die LBK-Siedlungen Hollenstedt, „Steinkuhle", und Höckelheim, „Südlich Steinkuhle".

Magnetprospektion

Die Magnetprospektion des Siedlungsgeländes und seiner näheren Umgebung wurde bis 2014 in mehreren Etappen durchgeführt und erstreckt sich über eine Fläche von knapp sieben Hektar (Abb. 4–5). Hervorstechendes Merkmal des Magnetbildes ist eine bogenförmige, etwa 300 m lange Struktur. Sie wird als Graben gedeutet und von Ost nach West zunehmend breiter, wobei nach etwa einem Drittel der erhaltenen Strecke ein auffälliger Versatz zu beobachten ist. Im östlichen Drittel schwankt die Grabenbreite zwischen drei bis vier, im Westen zwischen sechs und sieben Metern. Die unterschiedliche Grabenbreite könnte als Hinweis auf ein während des Baus verändertes architektonisches Konzept verstanden werden beziehungsweise auf verschiedene Arbeitsgrup-

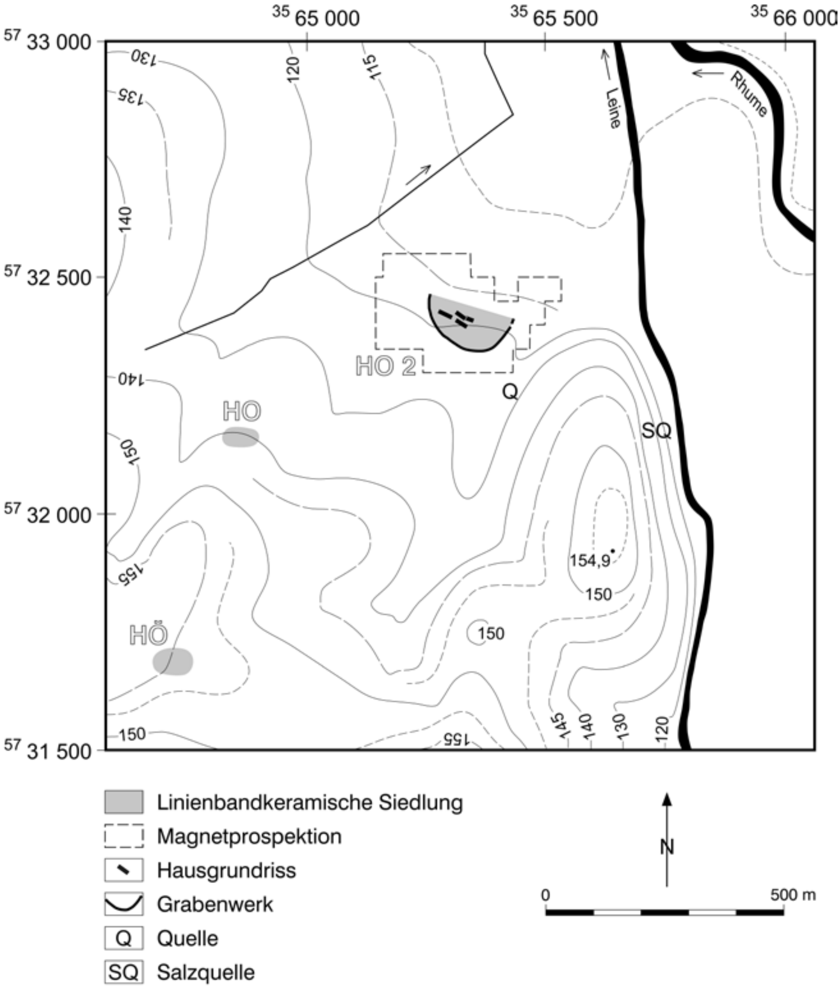

Abb. 3. Lageskizze der bandkeramischen Siedlungsstellen südlich von Hollenstedt. HO 2 Hollenstedt 2, „Vor dem Salzberg", HO Hollenstedt, „Steinkuhle", HÖ Höckelheim, „Südlich Steinkuhle"

pen hindeuten. Eine 4,5 m breite Erdbrücke unterbricht den Graben im Nordosten; es handelt sich um den einzigen noch feststellbaren Zugang in das Innere der Anlage. Die Beobachtung verschiedener Bauabschnitte ist im bandkeramischen Erdwerksbau keine Seltenheit (Haack 2015, 319 ff.); Anhaltspunkte für ein Pseudo-Grabensystem vom Typ Rosheim (Lefranc *et. al.* 2017) ergaben sich in Hollenstedt nicht.

Auffällig ist weiterhin eine auf der Innenseite des breiten Grabens in einem Abstand von 10–15 m weitgehend parallel verlaufende line-

Abb. 4. Hollenstedt, FStNr. 2 (Stadt Northeim, Niedersachsen). Magnetogramm (Fluxgate-Gradiometer Förster Ferex 4.032 DLG 4-fach CON650, Raster 0,5×0,2 m; Dynamik der Messwerte: -4/+4 nT/m; Skala: 256 Graustufen linear). M. 1:2000

are, etwa 0,5 m breite Struktur; möglicherweise ein Palisadengräbchen. Im Westen der besiedelten Fläche wird besonders deutlich, dass dieser schmale Graben einst zahlreiche der übrigen archäologischen Anomalien umschloss. Zwischen beiden Gräben tritt ein überwiegend befundfreier Streifen hervor, der zur Vermutung Anlass gibt, dass sich hier ehemals ein Wall befunden hat. Die im östlichen Bereich zwischen Graben und Palisadengräbchen nachgewiesenen Befunde sind meist relativ kleine Gruben mit einem um zwei Meter schwankenden Durchmesser. Nach den Beobachtungen der Flurbegehungen dürften sie im Wesentlichen dem spätlatène- bis kaiserzeitlichen Siedlungshorizont angehören. Demnach begrenzte die Grabenanlage einst ein bandkeramisches Siedlungsareal. Ihre defensive Funktion als Dorfgraben gibt zugleich einen ersten wichtigen Hinweis auf die allgemein altneolithische Zeitstellung der Einhegung.

Die dokumentierte bandkeramische Siedlungsfläche einschließlich der Gräben erstreckt sich über etwa 1,5 ha (Abb. 6, rot); der lichte Abstand zwischen den Grabenenden beträgt 175 m. Der vom Palisaden-

Abb. 5. Hollenstedt, FStNr. 2 (Stadt Northeim, Niedersachsen). Interpretative Umzeichnung. Schwarz = Bandkeramik, Dunkelgrau = weitere archäologische Befunde, Hellgrau = natürliche Strukturen, Weiß = rezente Störungen. M. 1:2000

graben umschlossene Innenbereich umfasst lediglich 0,8 ha. Im Osten wird das bandkeramische Areal auf einer Fläche von 0,7 ha durch überwiegend spätlatène- bis kaiserzeitliche Befunde überlagert (Abb. 6, braun), deren von der Prospektion erfasste Ausdehnung bei 1,2 ha liegt (Abb. 6, grün). Insgesamt erstrecken sich die vorgeschichtlichen Besiedlungsspuren des Fundplatzes über 2,0 ha, wobei der spätlatène- bis kaiserzeitliche Siedlungsbereich vor allem im Süden nicht vollständig erfasst werden konnte. Offensichtlich stellten in den Jahrhunderten um Christi Geburt die einstigen bandkeramischen Graben- und Wallstrukturen kein Hindernis mehr für eine Besiedlung dar; vermutlich waren sie obertägig nicht einmal mehr zu erkennen.

Vollständige bandkeramische Hausgrundrisse ließen sich im Inneren des Grabenwerkes nicht feststellen. Im Westen sind aufgrund der zahlreichen, sich überlagernden Befunde nur vier hinreichend gesicherte Standorte von Gebäuden anhand ihrer Pfostenspuren zu erkennen. Acht weitere Hausstandorte mit teils leicht abweichender Ausrichtung deuten sich durch die Lage mutmaßlicher Längsgruben an (Abb. 5).

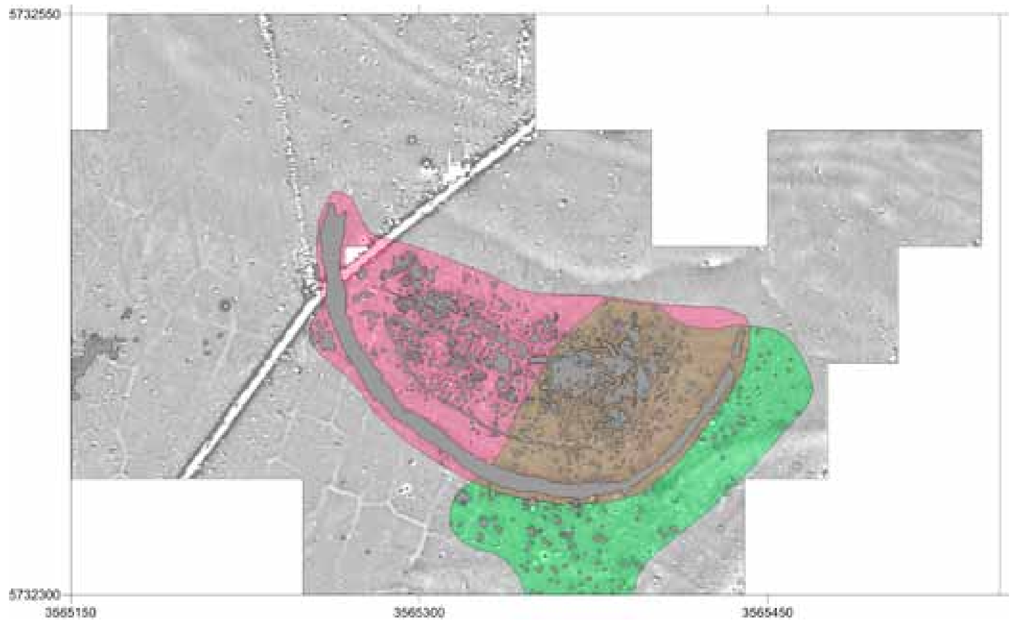

Abb. 6. Hollenstedt, FStNr. 2 (Stadt Northeim, Niedersachsen). Ausdehnung der bandkeramischen (Rot) und der spätlatène- bis kaiserzeitlichen (Grün) Siedlungsareale. M. 1:2000

Insbesondere im Osten der vom Grabenwerk umschlossenen Innenfläche ist die gegenseitige Überdeckung beziehungsweise Unterlagerung archäologischer Strukturen sehr stark ausgeprägt. Insofern ist mit weiteren bandkeramischen Hausbefunden zu rechnen, die sich aber im Magnetbild nicht hinreichend ausdifferenzieren; ein wichtiger Hinweis auf die längerfristige Besiedlung des Geländes im Altneolithikum.

Zu Haus 1 gehören fünf Pfostenspuren und das 8,9 m lange nördliche Wandgräbchen des Nordwestteiles (Abb. 7). Drei Dreierpfostenriegel sind jeweils 2,3 m voneinander entfernt, die Pfostenabstände betragen 1,7 m. Die Breite des Hauses lag wohl knapp unter sieben Metern. Das Gebäude war WNW-OSO ausgerichtet (331°). Auf seiner südlichen Längsseite wurde es durch eine im Magnetbild deutlich erkennbare Längsgrube (L. 18,7 m) begleitet. Gegenüberliegend, mit einem lichten Abstand von etwa neun Metern, sind zwei kürzere Längsgrubenfragmente erkennbar. Unter Berücksichtigung der Ausdehnung von Nordwestteil und Längsgrube betrug die Länge des Großbaues einst mindestens 27,8 m.

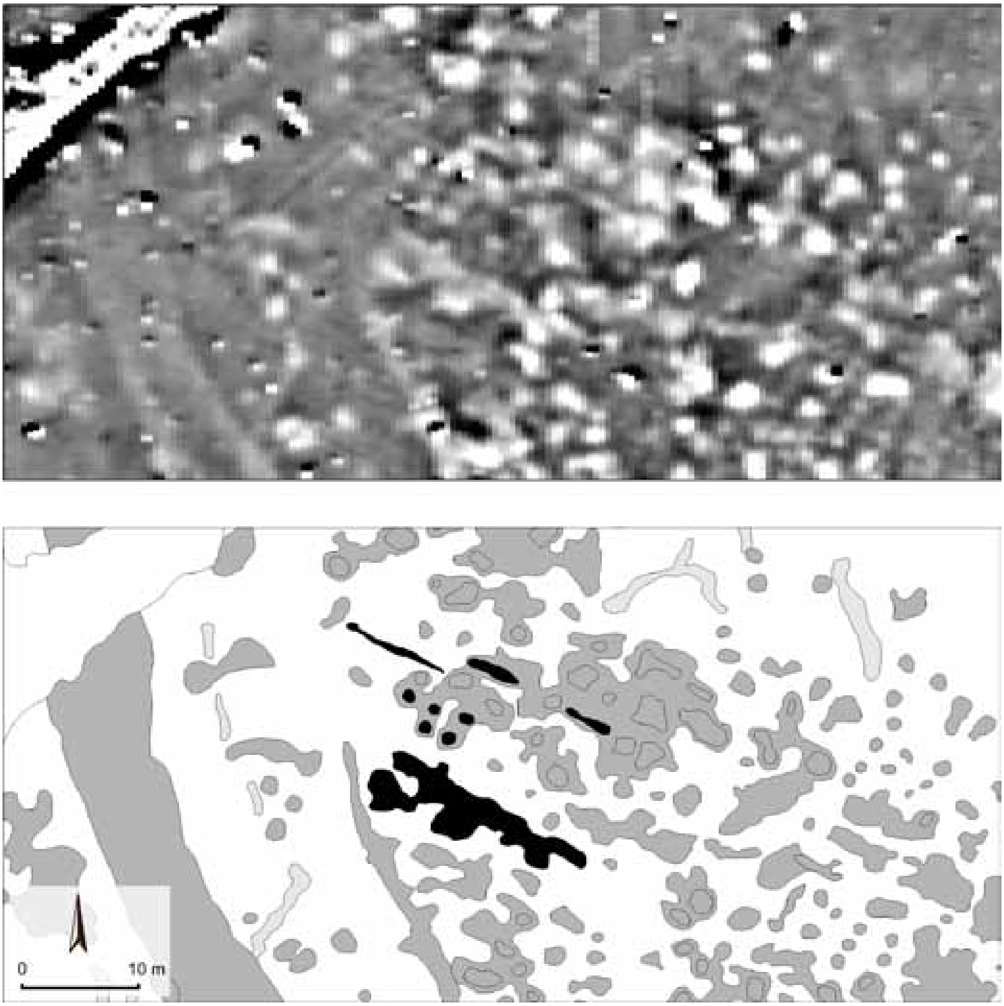

Abb. 7. Hollenstedt, FStNr. 2 (Stadt Northeim, Niedersachsen). Ausschnittvergrößerung des Magnetbildes und interpretative Umzeichnung. Schwarz = Haus 1, Dunkelgrau = weitere archäologische Befunde, Hellgrau = natürliche Strukturen, Weiß = rezente Störungen. M. 1:500

Die räumliche Nähe zwischen den im Magnetbild erkennbaren westlichen Konstruktionselementen des Langhauses und dem Palisadengräbchen ist auffällig. Möglicherweise nahm der Graben auf das Haus Rücksicht und endete dort. In Falle einer Befundüberschneidung dürfte das Wall-Graben-System ein jüngeres Element der bandkeramischen Besiedlung darstellen, denn Teile der Hauskonstruktion hätten in

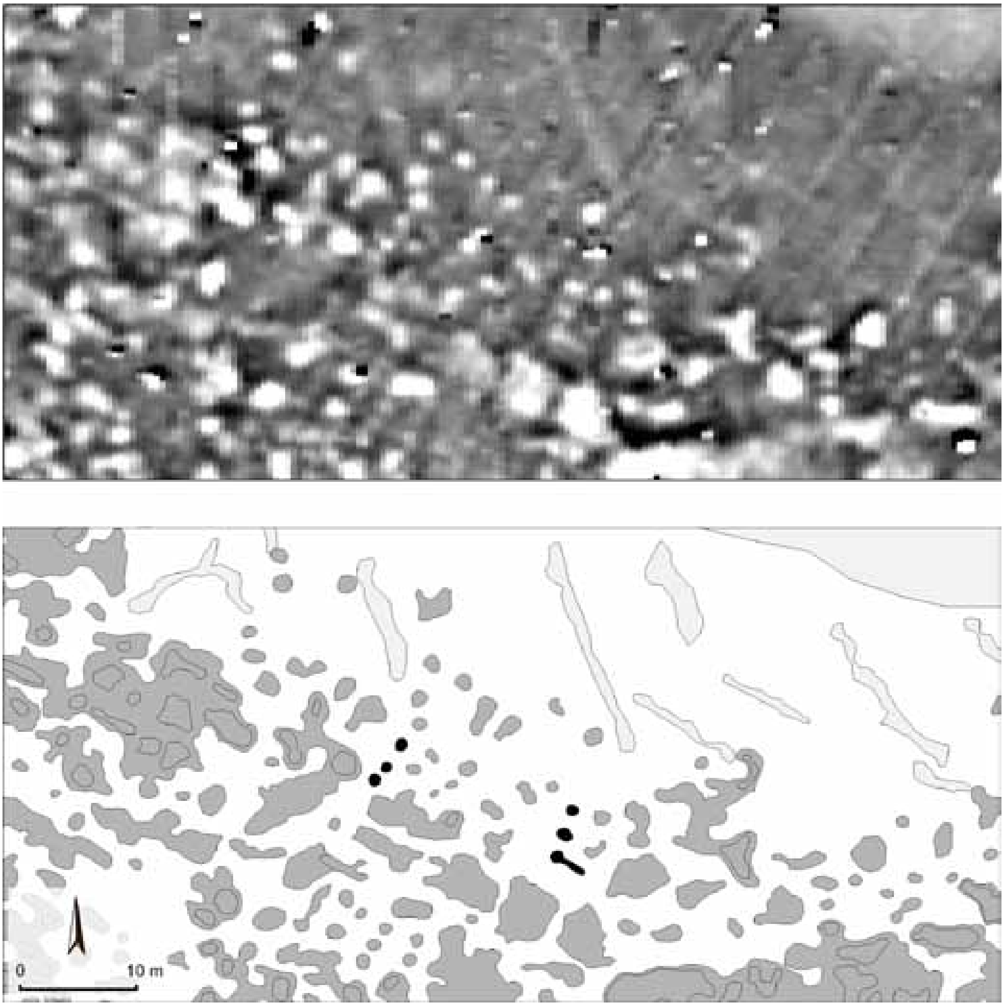

Abb. 8. Hollenstedt, FStNr. 2 (Stadt Northeim, Niedersachsen). Ausschnittvergrößerung des Magnetbildes und interpretative Umzeichnung. Schwarz = Haus 2 (links) und Haus 3 (rechts), Dunkelgrau = weitere archäologische Befunde, Hellgrau = natürliche Strukturen, Weiß = rezente Störungen. M. 1:500

einem verfüllten Graben wohl kaum genügend Stabilität gefunden. Insofern ergibt sich für das Ausheben des Grabens ein Datum *post quem*.

Im 25 km südlich gelegenen Diemarden zeigt sich im Magnetogramm eine ähnliche Befundsituation (Saile, Posselt 2007, 58 f. Abb. 2–3. Saile 2009, 48 Abb. 3). Ein jüngerbandkeramisches Grabenwerk, das ältere Hausgrundrisse schneidet, konnte auch im ca. 70 km

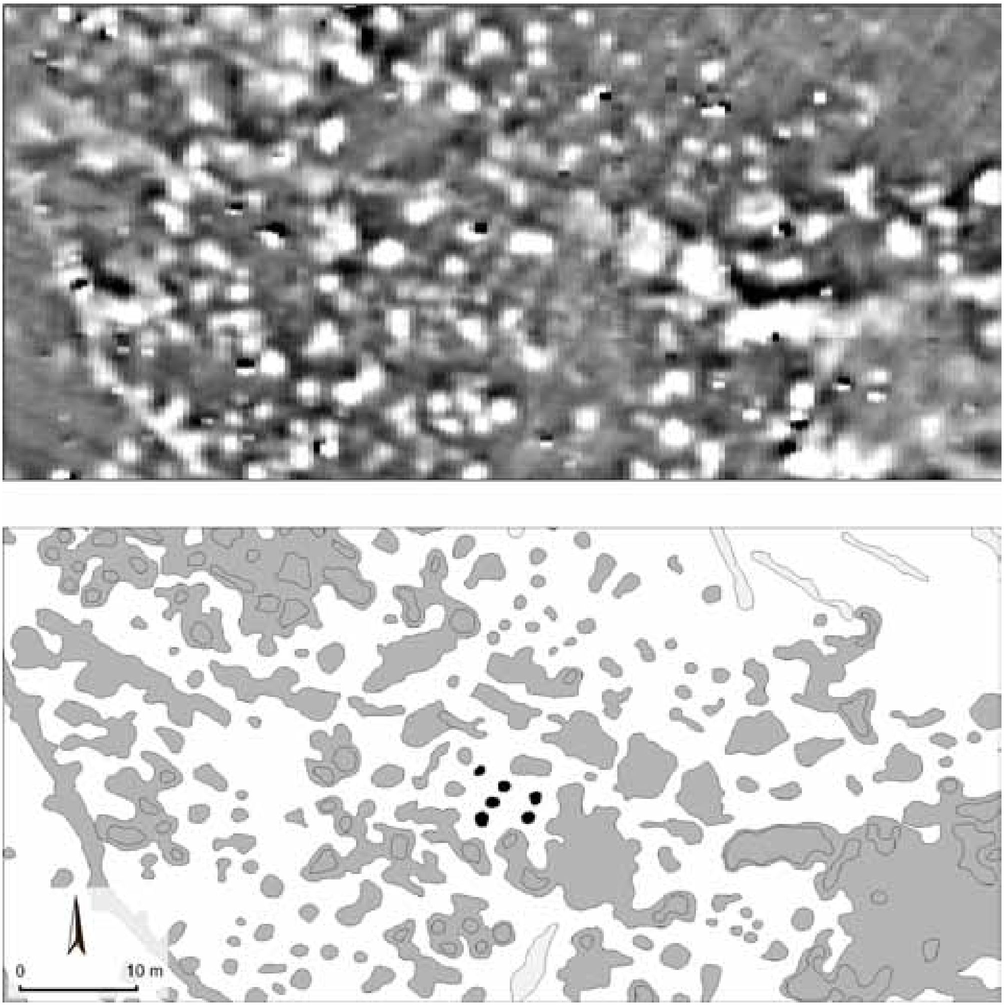

Abb. 9. Hollenstedt, FStNr. 2 (Stadt Northeim, Niedersachsen). Ausschnittvergrößerung des Magnetbildes und interpretative Umzeichnung. Schwarz = Haus 4, Dunkelgrau = weitere archäologische Befunde, Hellgrau = natürliche Strukturen, Weiß = rezente Störungen. M. 1:500

südsüdwestlich in der Fritzlarer Börde gelegenen Maden dokumentiert werden (Kettlitz 2008a; 2008b. Thiedmann 2015). Vergleichbare Beobachtungen wurden an der im mittleren Neckarraum gelegenen, flombornzeitlichen Grabenanlage von Vaihingen an der Enz gemacht (Bogaard *et. al.* 2017, 11 Abb. 9). Im altbekannten Brachter „Schutzgraben" (O. Uenze) schneiden allerdings ein nordwestliches Hausgräbchen und Hauspfosten das Zaungräbchen (Hüser 2006, 75 Abb. 1). Das Zaungräbchen ist somit älter als das Haus und beide sind älter als der Erdwerksgraben, der in seinem oberen Bereich eisenzeitlich verfüllt ist.

Östlich von Haus 1 sind zahlreiche mutmaßliche Pfostenspuren erkennbar (Abb. 8). Aus diesem Grubenfeld heben sich zwei, um 15,5 m voneinander entfernte Dreierpfostenriegel deutlicher heraus. Im westlichen Riegel betragen die Pfostenabstände 1,5 und 2,3 m, im östlichen jeweils 2,1 m. Da die Pfostenriegel zudem nur ungefähr auf einer WNW-OSO ausgerichteten Achse liegen, ist von den Überesten zweier Gebäude auszugehen.

Südlich des Pfostengrubenfeldes liegt das Grundrissfragment 4 (Abb. 9). Es besteht aus sechs in drei Riegeln angeordneten Pfosten. Die Abstände zwischen den Pfostenriegeln betragen 2,4 und 2,8 m, die Abstände der Pfosten untereinander jeweils 1,7 m. Das Gebäude war WNW-OSO ausgerichtet (334°).

Am westlichen Rand des Magnetbildes, etwa 80 m vom äußeren Graben entfernt, konnten weitere vorgeschichtliche Siedlungsbefunde, darunter ein großer nordost-südwest ausgerichteter Grubenkomplex, festgestellt werden. Zudem sind weite Bereiche im Südwesten der prospektierten Fläche von einem Eiskeilnetz durchzogen. Im Norden zeigen sich die durch fluviale Prozesse beeinflussten Strukturen des Leinetales. Besonders deutlich treten die unterschiedlichen Materialien des modernen Wegebaus hervor.

Grabenprofile

Zur Beurteilung der im Magnetbild erkennbaren Anomalien wurden 2012 unter Leitung von Reinhold Schoon zwei Sondageschnitte im Südosten des Grabenwerkes angelegt (Abb. 10). In Abhängigkeit von der Zugänglichkeit der Flächen erfolgte eine ausschnitthafte Untersuchung des äußeren Grabens in seinem schmaleren, östlichen Verlauf (Schnitt 1). Entsprechend wurde mit dem inneren Graben verfahren (Schnitt 2).

Der äußere Graben besitzt unter dem Pflughorizont eine erhaltene Breite von 5,4 m und ist – von der Geländeoberfläche gemessen – 2,5 m tief; sein Querschnitt ist mit einer minimalen Breite von 0,7 m sohlgrabenförmig (Abb. 11–12). Diese noch heute beachtlichen Dimensionen sind durch einen erheblichen Bodenabtrag verkürzt, auf den beispielsweise der geringmächtige Bt-Horizont hinweist. In

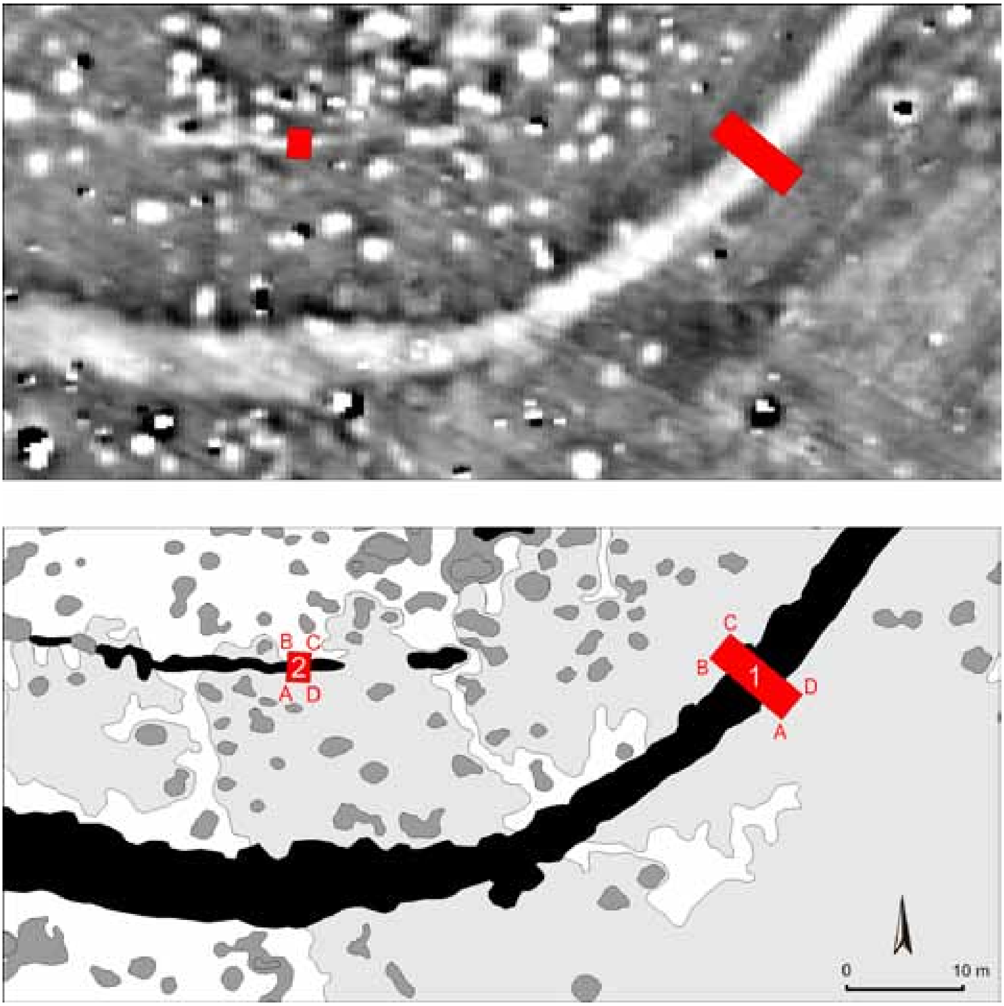

Abb. 10. Hollenstedt, FStNr. 2 (Stadt Northeim, Niedersachsen). Lageplan der Grabungsschnitte. M. 1:500

der Grabenverfüllung lassen sich tiefere Bereiche mit einer mehr oder weniger intensiven Wechsellagerung aus dunkleren, fleckig-braunen und helleren, ocker-gelblichen Lössbändern von überlagernden Zonen mit einem homogeneren, gelb- bis rotbraunen Substrat trennen. Insofern liegt hier offenbar eine bis zu einem Meter mächtige Zone rascher Einschwemmungs- und Versturzverfüllung unter einem Bereich langsameren kolluvialen, teils anthropogen bedingten

Abb. 11. Hollenstedt, FStNr. 2 (Stadt Northeim, Niedersachsen). Schnitt 1, Profil A–B

Abb. 12. Hollenstedt, FStNr. 2 (Stadt Northeim, Niedersachsen). Schnitt 1, Profil C–D

Abb. 13. Hollenstedt, FStNr. 2 (Stadt Northeim, Niedersachsen). Schnitt 2, Profil A–B

Sedimenteintrages. Die höher gelegenen Bereiche der Grabenverfüllung sind zudem durch langsam nach unten fortschreitende bodenbildende Prozesse der letzten sieben Jahrtausende unterschiedlich stark überprägt. Außerhalb des archäologischen Befundes sind an den Profilwänden farblich deutlich abgesetzte Zonen mit aus der Grabenverfüllung ausgewaschener verlagerter Bodensubstanz zu erkennen. Bemerkenswert ist zudem die starke Bänderung des anstehenden Lösses, die mit Ausfällungen im Bereich von Sickerwasserfronten zu erklären ist.

Auffällig war die geringe Menge geborgener Funde, bei denen es sich im Wesentlichen um einige Keramikscherben handelt. Im Sohlenbereich des nordöstlichen Profils C–D konnte ein Tierknochenfragment geborgen werden. An diesem Material wurde im ^{14}C-Labor der Universität Posen eine Radiokohlenstoffdatierung gewonnen. Sie bestätigt mit einer Datierung in das 52./51. Jh. v. Chr. die vermutete späterbandkeramische Zeitstellung der Grabenverfüllung.

Abb. 14. Hollenstedt, FStNr. 2 (Stadt Northeim, Niedersachsen). Schnitt 2, Profil C–D

Außerdem zeigte sich in der nordöstlichen Profilwand von Schnitt 1 eine Kegelstumpfgrube (Abb. 12); einige geborgene Keramikfragmente sind in die mittlere bis späte Latènezeit zu datieren. Die Grube hat eine Tiefe von 1,0 m unter Geländeoberfläche und eine maximale Breite von 0,9 m. Der Befund ist scharf abgegrenzt und schneidet den bandkeramischen Graben an seiner Innenseite. Dies darf als Nachweis für eine vollständige Einebnung der bandkeramischen Wall-Graben-Struktur bis in die Mitte des letzten vorchristlichen Jahrtausends verstanden werden. Dabei ist eine vollständige Verfüllung bandkeramischer Hohlformen in vorgeschichtlicher Zeit keineswegs selbstverständlich; vielmehr waren manche noch in der Eisenzeit sichtbare Elemente der Landschaftsgestaltung (Beek: van de Velde *et. al.* 2009. – Bracht: Hüser 2006).

Der innere Graben weist eine Breite von 0,6 m auf und ist noch bis 1,1 m unter Geländeoberfläche erhalten (Abb. 13–15). Auch hier sind die Auswirkungen des Bodenabtrags deutlich erkennbar. Die Verfül-

Abb. 15. Hollenstedt, FStNr. 2 (Stadt Northeim, Niedersachsen). Schnitt 2, Planum 2

lung ist durch eine Wechsellagerung dunklerer und hellerer Lössbänder charakterisiert. Pfostenstellungen waren in den Profilen nicht zu erkennen. In Planum 2 zeigten sich allerdings zwei runde Verfärbungen, die als Pfostenspuren angesprochen werden könnten. Sie messen um 0,25 m im Durchmesser und sind etwa 0,65 m voneinander entfernt (Abb. 15). Insofern erscheint eine Deutung des Befundes als Palisadengraben nicht abwegig.

Zur Ausdehnung der Siedlung im Altneolithikum

Möglicherweise erstreckte sich die bandkeramische Siedlung einst über eine erheblich größere Fläche als die heute noch nachweisbaren 1,5 ha. Der Graben könnte den gesamten Siedlungsbereich als rundlich-ovaler Dorfgraben umschlossen haben. Dann wäre mit einer bebauten Fläche von mehr als 3 ha und weiteren Erdbrücken zu rechnen. Zu einem späteren Zeitpunkt wäre der Norden des besiedelten Areals durch fluviale Prozesse und eine damit einhergehende rückschreitende Bodenerosion zerstört worden. Eine entsprechende Situation wurde im hessischen Dalheim beobachtet (Schäfer 2003): Hier lag ein geschlossener bandkeramischer Grabenring in einer ehemaligen Lahnbiegung und wurde durch Erosion in weiten Teilen zerstört.

Allerdings erscheint es auch denkbar, dass die Aue der Leine bereits in bandkeramischer Zeit ungefähr ihre heutige Ausdehnung erreicht hatte. Dann wären Siedlung und halbkreisförmiger Graben im Magnetbild nahezu vollständig erfasst; einen Zugang gab es nur am östlichen Siedlungsrand. Die mehr oder weniger gleichbleibende Form des Grabenprofils sollte bis zu seinem abrupten Ende am Übergang zur Niederung feststellbar sein. Ein kräftig ausgestalteter Grabenabschluss wurde beispielsweise in Niederurff vor dem Abfall des Geländes zur Schwalmaue beobachtet (Kneipp 2006, 89. Kneipp, Posselt 2006, 33 Abb. 4–5).

Von den Beobachtungen aufgrund einer Reihe von Rammkernbohrungen wurden Argumente für oder gegen die Annahme einer einstmals deutlich größeren Siedlung erwartet: Zunächst wurde unter Leitung von Christian Tinapp im ungestörten Gelände westlich des im Altneolithikum besiedelten Areals eine von Süd nach Nord verlaufende Hangcatena angelegt, nachfolgend in der Tiefenlinie des westlichen Grabenendes gebohrt.

Danach ergab sich, dass die bandkeramische Siedlung auf einer mehrere Meter mächtigen Lössdecke angelegt worden war. Auf der Kuppe konnte eine Parabraunerde mit erhaltenem Al-Horizont, im Mittelhangbereich ein Kolluvium über Bt-Horizont und im Unterhangbereich ein Kolluvium über einer mächtigen Lössunterlage festgestellt werden. Nach Norden nimmt die Mächtigkeit der Bodenhorizonte der Parabraunerde bis zu ihrer vollständigen Abtragung stetig ab. Es ist mit einem nach Norden fortschreitenden Gesamtbodenabtrag von mindestens einem Meter zu rechnen. Im Auenbereich zeigen sich im Gelände deutliche Altlaufstrukturen.

Um zu prüfen, ob der Graben im Norden unvermittelt ohne jeden Übergang endet oder sich nach Norden fortschreitend langsam verflacht, wurden in der Tiefenlinie des westlichen Grabenendes Rammkernbohrungen niedergebracht. Dabei zeigte sich, dass die erhaltene Grabenverfüllung zunächst noch über 1,5 m mächtig war, dann noch bis 1,3 m unter Geländeoberfläche nachgewiesen werden konnte und schließlich nur noch 0,8 m betrug. Unterlagert wurde die Grubenverfüllung von kalkfreiem, in tieferen Lagen kalkhaltigem Löss. Die letzte Bohrung in Fortsetzung der Tiefenlinie jenseits des Magnetbefundes erbrachte umgelagerten Löss mit Holzkohlepartikeln. Dies deutet auf holozäne Sedimentverlagerungen am Hang hin, die vor allem durch fluviale Prozesse ausgelöst wurden. Lockere Sedimente am Unterhang rutschten im Verlauf von Hochwasserereignissen ab und in der Folge kam es zu rückschreitender Erosion im Bereich der westlichen Talflanke der Leine.

Somit ist die heutige Form des Grabenendes das Resultat der Bodenerosion und entspricht nicht der ursprünglichen Baukonzeption. Die Anlage war einst größer und die Gräben setzten sich zumindest noch einige Meter fort. Offenbleiben muss, ob die Grabenflanken einst miteinander verbunden waren und einen oval-kreisförmigen Dorfgraben bildeten.

Ausblick

Erdwerke sind nur aus dem westlichen Verbreitungsgebiet der Bandkeramik bekannt. Dabei zeigen sich bemerkenswerte Konzentrationen im Nordwesten im belgischen Haspengau, in der Niederrheinischen Bucht, im südlichen Niedersachsen und in Niederhessen sowie in Mitteldeutschland, aber auch weiter im Süden am mittleren Neckar, in Niederbayern sowie in Niederösterreich und Mähren. Dieses Verteilungsmuster der knapp 100 Anlagen deckt sich nur teilweise mit der Bedeutung der bandkeramischen Siedlungsgebiete und dem jeweiligen regionalen Forschungsstand. Im Verhältnis zur Anzahl bandkeramischer Siedlungen sind Grabenwerke im Elsass, in Franken sowie in Sachsen und Böhmen unterrepräsentiert. Im südlichen Niedersachsen sind sie jedoch vergleichsweise zahlreich; hier kommen auf lediglich 141 bekannte Siedlungen bislang neun Erdwerke.

Im südlichen Niedersachsen und in Niederhessen wurde der Nachweis bandkeramischer Grabenwerke im Wesentlichen durch großflächige Magnetprospektionen erbracht. Von Nord nach Süd handelt es sich in Niedersachsen um Einhegungen auf den bandkeramischen Siedlungen von Kalefeld (Saile, Lorz 2003, 135 Nr. 83), Dassensen (Saile, Lorz 2003, 134 Nr. 9–10), Sülbeck (Saile, Lorz 2003, 135 Nr. 131), Hollenstedt (Saile, Lorz 2003, 135 Nr. 71), Gladebeck (Saile, Lorz 2003, 134 Nr. 43), Klein-Lengden (Saile, Lorz 2003, 135 Nr. 85), Diemarden (Saile, Lorz 2003, 134 Nr. 12) und Niedernjesa (Saile, Lorz 2003, 135 Nr. 105). Hinzu kommen in Niederhessen die Anlagen von Maden (Thiedmann 2015), Niederurff (Kneipp, Posselt 2006) und Wernswig (Kneipp 2006). Dabei ist die Vielgestaltigkeit der Erdwerke ein hervorstechendes Merkmal: neben unterschiedlichen Formen der Grabenprofile stehen verschiedenartige Gesamtpläne der Anlagen (Saile, Posselt 2004. Saile 2009).

Bedenkt man die Innenfläche des Hollenstedter Grabenwerkes, die mögliche Anzahl gleichzeitiger Häuser samt Aktivitätszonen sowie daraus ableitbare begründete Schätzungen zur ungefähren Einwohnerzahl, so wird deutlich, dass die Errichtung des Erdwerkes eine erhebliche Anstrengung erforderte (vgl. Haack 2015, 347 ff.). Da die kleine Dorfgemeinschaft kaum wesentlich mehr als 100 Personen umfasst haben dürfte, wurde die eindrucksvolle Anlage möglicherweise unter Mitwirkung von Bewohnern benachbarter Siedlungen fertiggestellt. In jedem Falle handelte es sich bei der Einhegung um ein die Gruppenidentität über wechselseitiges soziales und weltanschauliches Handeln stärkendes Gemeinschaftswerk.

Für künftige Magnetprospektionen in geringer Entfernung von Hollenstedt 2 eignen sich vor allem die LBK-Siedlungen Berwartshausen (Abb. 2,1), Hollenstedt 5, „Helleberg“ (Abb. 2,8), Hollenstedt 6, „Waseberg“ (Abb. 2,9) sowie Stöckheim 3, „Böllefeld“ (Grote 1975, 33 Nr. 13. Saile, Lorz 2003, 135 Nr. 127) und Stöckheim 10, „Oelligäcker“ (Abb. 2,11). Die Erkundung von Größe und Struktur bandkeramischer Siedlungen einer ganzen Kleinlandschaft durch Magnetprospektionen erscheint angesichts ihrer grundsätzlichen Gefährdung in der offenen Agrarlandschaft, des allgemein unzureichenden Kenntnisstandes zur Bandkeramik im südlichen Niedersachsen und der geringen Wahrscheinlichkeit großflächiger Grabungen in absehbarer Zukunft ein sinnvoller Kompromiss auf mittlerer Maßstabsebene.

Liste 1
Linienbandkeramische Siedlungen in der Umgebung von Hollenstedt

1. Berwartshausen. NOM (4225: 35 63 900 / 57 30 300). – Bandkeramische Siedlung (Keramik, Felsgesteingeräte, Rotlehm). – Müller 1982, Nr. 63.
2. Edesheim. „Zwischen Dorf, Wegkrug, Bahnhof und Wehberg“, NOM (4225: 35 66 850 ± 150 / 57 35 850 ± 250). – Bandkeramische Siedlung („Große Siedlung“, Grube. Keramik [„ältere Spiralkeramik”], Felsgesteingeräte, Silices, Mahlsteinbruchstücke). – Crome 1924, 64; 1930. B. Crome, in: Germania 13, 1929, 211 f. Buttler 1931, 63 f. Maier 1964, 18 Abb. 3–4.7.13; 1976, 12 f. Grote 1975, 33 Nr. 17. Müller 1982, Nr. 74. Steinmetz 1985, 311 Nr. 206. – Siedlung erstreckt sich auch auf das Gebiet der Gemarkung „Hohnstedt“.
3. Edesheim. „Kiesgrube südwestlich des Dorfes“, NOM (4225: 35 66 700 / 57 34 180). – Bandkeramische Siedlung. – Maier 1976, 12.
4. Höckelheim. „Anschlußstelle Northeim-West“, NOM (4225: 35 64 865 ± 165 / 57 30 125 ± 25). – Bandkeramische Siedlung (Keramik, Silices, Schuhleistenkeile, Mahlsteinfragmente, Hüttenlehm). – Müller 1982, Nr. 82. Dracklé, Merl 1985. Steinmetz 1985, 311 Nr. 210.
5. Höckelheim. „Südlich Steinkuhle“, „nordwestlich Lämmerberg“, NOM (4225: 35 64 775 ± 75 / 57 31 750 ± 50). – Bandkeramische Siedlung (Verfärbungen. Keramik, Felsgesteingeräte, Silices). – Müller 1982, Nr. 83–84.
6. Hollenstedt. FStNr. 2, „Vor dem Salzberg“ bzw. „nordöstlich Steinkuhle“, NOM (4225: 35 65 350 ± 90 / 57 32 400 ± 60). – Bandkeramische Siedlung (Erdwerk, Hausgrundrisse. „Sehr große Mengen von verzierten und unverzierten Scherben“, Felsgesteingeräte, Silices, Mahlsteinfragmente, Rotlehm). – Fahlbusch 1929, 55 ff. Taf. 1,7. Buttler 1931, 68 Abb. 9,3–6. Geschwendt 1954, 19 Abb. 10; 56 Abb. 36; 90 ff. Nr. 1. Grote 1975, 16 ff. Abb. 9–16; 33 Nr. 15. Maier 1976, 14. Dracklé, Merl 1977. Müller 1982, Nr. 94. Steinmetz 1985, 311 Nr. 211.
7. Hollenstedt. „Steinkuhle“, NOM (4225: 35 64 850 / 57 32 120). – Bandkeramische Siedlung (Keramik, Silices, Felsgesteingeräte, Mahlsteinbruchstücke). – Müller 1982, Nr. 85 (unter „Höckelheim“).
8. Hollenstedt. FStNr. 5, „Helleberg“, NOM (4225: 35 64 400 / 57 33 200).

– Bandkeramische Siedlung (Dunkle Verfärbungen. Keramik [„ältere und jüngere LBK"], Silices, Felsgesteingeräte, Mahlsteinbruchstücke, Rotlehm). – Grote 1975, 33 Nr. 14. Müller 1982, Nr. 92. Steinmetz 1985, 311 Nr. 212.

9. Hollenstedt. FStNr. 6, „Waseberg", NOM (4225: 35 64 850 / 57 34 600). – Bandkeramische Siedlung (3–4 dunkle Verfärbungen. Keramik [„ältere und jüngere LBK"], Felsgesteingeräte, Silices). – Fahlbusch 1929, 55. Grote 1975, 33 Nr. 11. Maier 1976, 14. Müller 1982, Nr. 93. Steinmetz 1985, 311 Nr. 213.
10. Northeim. NOM (4225: 35 66 920 / 57 33 550). – Bandkeramische Siedlung (2 Gruben. Keramik, Silices, Mahlsteinfragmente, Knochen, Holzkohle). – Merl 1986.
11. Stöckheim. FStNr. 10, „Oelligäcker", NOM (4225: 35 63 800 / 57 34 100). – Bandkeramische Siedlung (Dunkle Verfärbungen. Keramik [„ältere und jüngere LBK"], Silices, Felsgesteingeräte, Mahlsteinfragmente). – Fahlbusch 1929, 55 f. (unter „Hollenstedt"). Buttler 1931, 67 Abb. 9,1–2 (unter „Hollenstedt"). Grote 1975, 33 Nr. 12 (unter „Hollenstedt"). Maier 1976, 14 (unter „Hollenstedt"). Müller 1982, Nr. 91 (unter „Hollenstedt"). Steinmetz 1985, 312 Nr. 214 (unter „Hollenstedt").

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Mateusz Cwaliński[1]*, Jakub Niebieszczański**,
Dariusz Król***

The Middle, Late Neolithic and Early Bronze Age Cemetery in Skołoszów, site 7, Dist. Jarosław, in the Light of the Results of Non-invasive Archaeological Survey in 2016

ABSTRACT

Cwaliński M., Niebieszczański J., Król D. 2017. The Middle, Late Neolithic and Early Bronze Age Cemetery in Skołoszów, site 7, Dist. Jarosław, in the Light of the Results of Non-invasive Archaeological Survey in 2016. *Analecta Archaeologica Ressoviensia* 12, 39–48

In the autumn of 2016 a geomagnetic survey was conducted in Skołoszów, site. 7, Dist Jarosław. The magnetic prospection took place on a low hill spanning 2.12 ha in total. Distribution of the anomalies, as visible on a map depicting obtained data, reflects numerous structures related to human activity in the area during the prehistory and historic times. Among them are two features interpreted as residues of funerary rituals taking place at the site. One of them pertains to Middle Neolithic earthen long barrow, whereas the second by its shape resembles Late Neolithic/Early Bronze Age tumuli. Apart from the latter, one can discern numerous anomalies potentially related to pits and ditches. Interpretation of the geophysical imagery was based upon the results of excavations conducted in 2010 in the nearby section of Skołoszów, site 7. In the process, funeral structures in the types of earthen long barrow and a presumable tumulus were recorded. Thus, it is possible to confront observations inferred from the results of non-invasive, magnetometric survey, with data obtained by means of more direct exploratory methods. Besides the prehistoric record, our investigation resulted in reconstruction of the trenches most probably dating to the First World War.

Key words: Funnel Beaker culture, Corded Ware culture, Mierzanowice culture, tumuli, long barrows, geomagnetic, non-invasive survey

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Introduction

Multicultural site 7 in Skołoszów, Dist Jarosław undoubtedly offers considerable cognitive potential for the studies of the Middle and Late

[1] Mateusz Cwaliński is a scholarship holder of the Foundation for Polish Science (FNP).

* Institute of Archaeology, Adam Mickiewicz University, Umultowska 89D Street, 61-614 Poznań, Poland; mateuszcwalinski@gmail.com
** Institute of Archaeology, Adam Mickiewicz University, Umultowska 89D Street, 61-614 Poznań, Poland; jakubniebieszczanski@gmail.com
*** Institute of Archaeology, University of Rzeszów, Moniuszki 10 Street, 35-015 Rzeszów, Poland; kroldrk@gmail.com

Neolithic, as well as the Early Bronze Age in the Carpathian loess area (Rybicka 2011, 46–51; Król *et al.* 2012; 2014). It is located in the eastern part of Rzeszów Foothills (latitude: 49°54'40,29 N; longitude: 22°48'24,56" S), on the south-eastern edge of the Rada Valley, approximately 400 m from its trough, 20 m above its bottom and up to 215 m above sea level. Site 7 was discovered in 1993 during the Polish Archaeological Record field survey (in polish: Archeologiczne Zdjęcie Polski – AZP). In 2010 it was thoroughly excavated in the course of a rescue "motorway" research. As an outcome, a long barrow attributed to the Funnel Beaker culture (FBC), as well as various types of burials affiliated with the Corded Ware (CWC) and Mierzanowice (MC) cultures were recognized (Król *et al.* 2012; 2014). Their distribution suggests that more funeral objects can be expected in previously not excavated vicinity of the motorway. In order to investigate the latter space, a magnetometric survey was conducted in the autumn of 2016[2].

Study area

The area of the magnetometric survey comprised the northern part of Skołoszów, site 7 (Fig. 1:a) and covered an area of 2.12 ha, characterized by relative heights up to 13 m and inclinations within an range of 8.7–17.6%. The eastern part comprises a relatively flat terrain elevated up to 214 m a.s.l. (Fig. 1:b). The entire zone covered with non-invasive prospection did not contain any regular features in land relief that could suggest presence of archaeological remains.

Methods

Non-invasive archaeological survey at Skołoszów utilised the magnetometric method performed by means of Bartington fluxgate magnetometer, equipped in a single probe containing two sensors with a vertical spacing of 1 m. The applied measurement accuracy was 0.1 nT [nano Tesla]. Adopted grid size had dimensions of 20×20 m, whereas the entire framework was composed in total of 3 grids. The measurements were taken approximately 20 cm above the ground, every 25 cm along transects, the latter spaced from each other by 1 m distance. Transects were oriented approximately along the geographic north-south axis, with the

[2] This survey was possible thanks to a grant from the Ministry of Culture and National Heritage of Poland awarded to Małgorzata Rybicka (1788/16/FPK/NID).

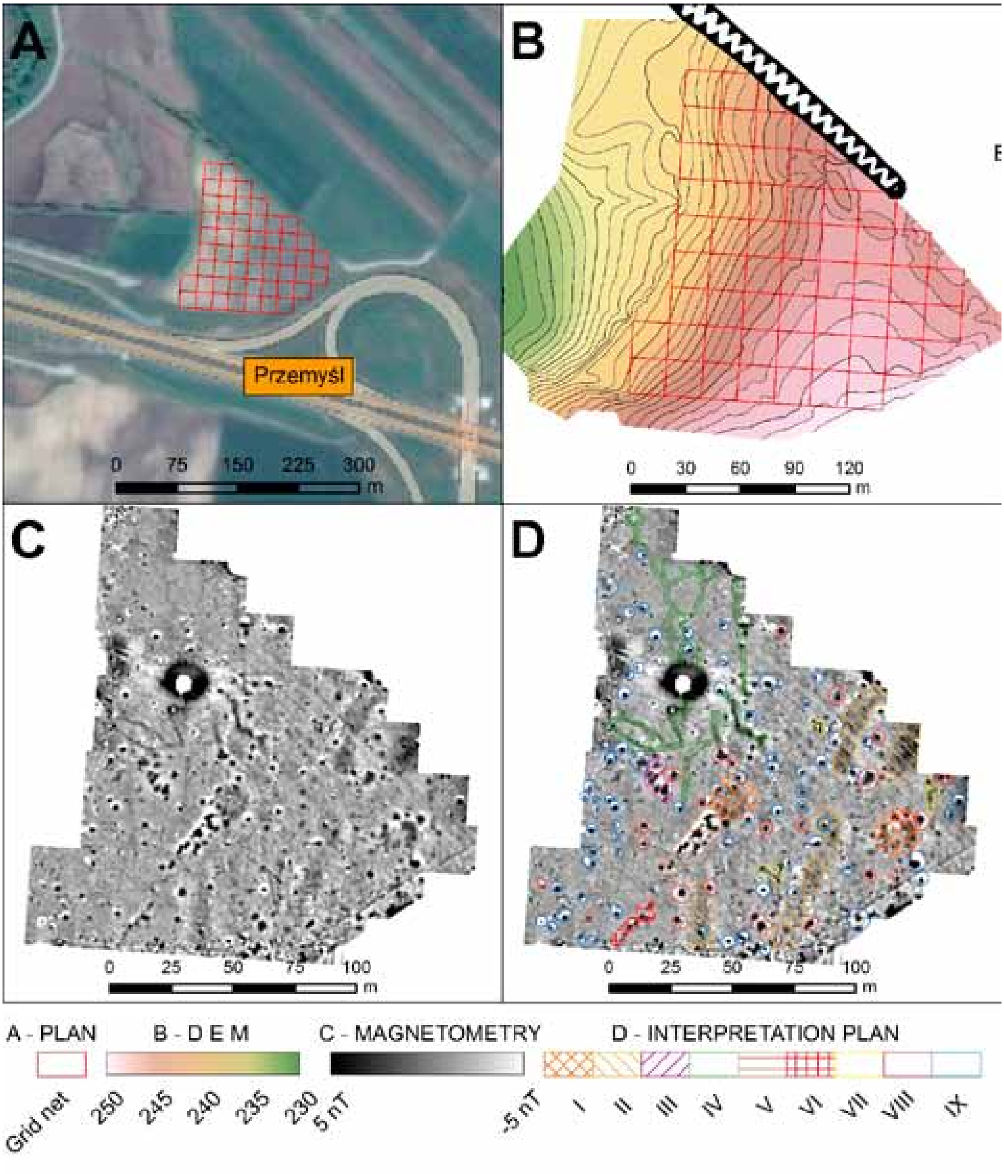

Fig. 1. Skołoszów, site 7, dist. Jarosław. Non-invasive research. A – aerial view of the site (basemap: geoportal.gov.pl); B – digital elevation model and grid net of the magnetometric survey; C – clear magnetometric view of the site; D – interpretation of magnetometric results: I – round barrows, II – ditches, III – group of triangular objects, IV – I World War trench lines, V – long barrow, VI – lines of singular pits, VII – postholes, VIII – singular pits, IX – metal waste or ferromagnetic stones

probe always heading north. The visualization of magnetometric survey was carried out in a Geoplot 3.0 software using various interpolation techniques and raster processing (shaded relief plot, zero mean grid, zero mean traverse, despite, clip, low/high pass filter and interpolate). For better visualization of discussed anomalies, on all attached figures presenting the results of the prospection the actual values of the magnetic field have been compressed to a range of +5 to -5 nT, which corresponds to the accompanying greyscales. Therefore, all the readings of +5 nT or higher and -5 nT or lower have been marked respectively with black and white color. In some cases, when -5/+5 range was insufficient to reveal the contrast between anomalies, compression of the values to a smaller range was applied. In order to supplement the results with local topography, a digital elevation model (DEM) was elaborated by the means of RTK receiver in the appropriate geodetic coordinate system.

Results

The resultant image of geomagnetic studies at the site in Skołoszów is characterized by high complexity in terms of the gradient of changes in magnetic field as well as the spatial structure and distribution of anomalies. The mean values of the magnetic field gradient recorded within the study area oscillated between 5 and 10 nT, which shows that the surface of the site itself has a slightly increased magnetic susceptibility. These values, reduced to the gradient used (-5–5 nT), correspond to a level of approximately 0 nT, characteristic of the larger part of the image. It forms a background for the anomalies dispersed on almost the entire surface, with magnetization deviating to a greater or lesser extent from the level of 0 nT. Due to the data processing, it was possible to distinguish nine types of anomalies characterized by different size, shape and level of magnetization (Fig. 1:c).

Type I (Fig. 1:d) comprised two oval anomalies of higher magnetic values. The first was located in the central part of the area, while the second latter was situated in the easternmost part of the surveyed grid. They can be seen as extensive patches of circular outline with a diameter of up to 20 meters, revealing a higher magnetization with respect to the background (the values around 1–2 nT). On the outside, they are surrounded by the envelope of negative readings, especially prominent on their north side, and in places at their circumference there are also small but stronger signals. Spatial structure and intensity prompts to classify these anomalies as effects of inductive magnetization, while their regularity suggests anthropogenic character. Basing on their appearance and magnetic properties, these objects possibly represent barrows denudated due to plowing, as indicated by the similarity of magnetization in relation to the mounds examined by the team in Ukraine and Poland (Makarowicz *et al.* 2016b).

Type II (Fig. 1): Anomalies assigned to this type appeared in the southern and eastern part of the measurement area. They have an irregularly oval, elongated form, and their maximum sizes are up to 30 m in length and 20 m in width. They are characterized by a positive magnetization value, reaching in places up to the maximum gradient level (5 nT). Usually, however, readings oscillate around 1–2 nT. The planes with increased magnetization value are surrounded by belts of reduced susceptibility, especially visible in the case of anomalies from the eastern sector. Again, this suggests inductive magnetization. The spatial layout of the discussed anomalies gives the impression of double, wide bands separated by a gap of around 20 m in the narrowest place. What's more, the anomalies from the eastern part seem to be „moving towards each other", thus surrounding an approximately oval patch of land with significantly weaker magnetization. Perhaps, together they form a system of wide ditches, closing from the eastern side a certain space (settlement?), already located outside the research area. Despite the most likely anthropogenic nature of these anomalies, it is impossible to make far-reaching conclusions about their sources.

Type III (Fig. 1): Anomaly of this type was identified in a single case in the central-west part of the site. With its outline it resembles a crescent with an irregular contour, bent to the east. The approximate dimensions of this anomaly are 20 m in length and 5 m in width. A closer look at this place allows to distinguish several separate signals, nevertheless located close enough to each other. Each of them has an approximately triangular shape and consists of a maximum positive (5 nT), surrounded by a negative maximum.

Type IV: Anomalies classified this type are the least clear on the resultant image of magnetometry. They appear as a network of narrow (2–3 m wide) streaks with slightly increased magnetization relative to the environment (generally about 1nT). For the most part they are stretched over a distance of about 100 m along the N-S axis, and three main branches can be distinguished, at the southern end of the route, changing direction to the

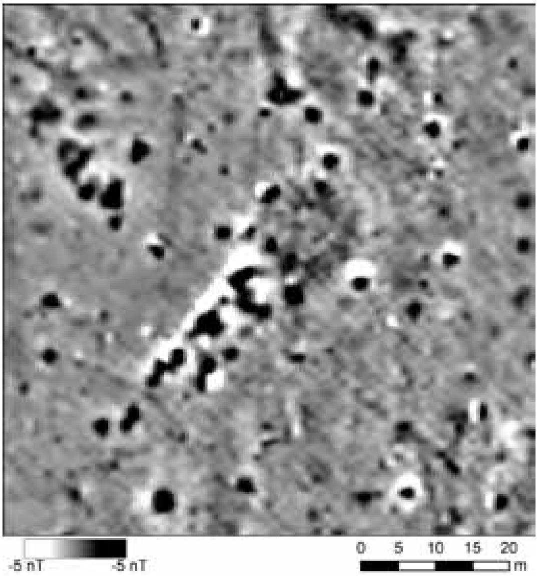

Fig. 2. Magnetometric view of the funeral structures recorded as types I and V (according to Fig. 2:c).

west or east. In some places, they are interconnected by transverse strands, and in other sections they are broken by several-meter wide gaps. The spatial layout of the discussed anomalies, as well as the degree of magnetization, suggests that they are shallow depressions in the form of ditches, with the in-filling slightly different in terms of magnetic properties from the soil in their context.

Type V: (Fig. 1 and 2): Anomaly of this type was observed only once within the whole measuring plane. It is characterized by a series of very high readings with negative and positive maxima reaching the extreme values of the gradient. These signals differ in their shape as well as the spatial extent, but it is important that together they form a structure resembling a trapezoidal outline elongated on the NE–SW axis, tapering towards the SW (approximate dimensions: 25×10 m). Particularly clear are its northern and eastern edges, while western and southern ones are less clear. The whole feature significantly differs from any other anomalies observed in its vicinity, therefore, most probably, it should be considered as an anthropogenic object. The formation of such an intense anomaly can be explained by combustion of organic material, caused intentionally or accidentally, as a result of which processes of chemical transformation and magnetism excitation of ferromagnetic and paramagnetic minerals took place, which significantly increased the magnetic susceptibility of soil. Through its trapezoidal outline, the feature is reminiscent of Neolithic long barrows known from southern Poland, and referred to as 'megaksylons'. It seems that the walls of the trapezium close the empty space in the middle, from all sides except the south-west. The latter seems to be „not closed", which suggests the extension of the building's wall further south-westerly. Remains of this type of funeral facilities were found in the site during the excavation tests preceding the motorway construction. The fact that these tombs were erected from wood corresponds well to the increased magnetic susceptibility in the described place and makes the previously suggested interpretation of the anomaly's origins plausible.

Furthermore, the magnetization distribution of the prospected area consists of numerous anomalies, which does not allow any further interpretation. These are most certainly the remains of human activity, however their exact interpretation is highly restricted to the general indices. One of such features is type VI recorded in the south-central part of the area and it could be a prolongation of a trapezoid structure (type V). The anomalies of types VII and VIII occurred widely in the grid net, in form of a respectively singular spots and linear groups of spots, both characterized by higher magnetic values. They are most certainly the infillings of pits or posts which differs from the magnetic background noise. The last type of distinguished anomalies were classified as type IX. These were the singular spots of bipolar anomalies characterized by occurrence of adjoining extremely high and low values, thus indicating presence of metal objects.

Interpretation and discussion

Magnetometric prospection in Skołoszów, site 7 revealed numerous remains of human activity pertaining both to prehistoric as well as historic times. Regarding the latter period, the most obvious are thin, interconnected, linear anomalies (type IV), interpreted as trenches related to military struggles in the area during the First World War (the Battle of Radymno 1915 AD) (Moszumański 2007, 63–71).

In terms of prehistoric remains, it seems plausible to determine the anomalies classified as type I and V, as originating from the Neolithic. As it was mentioned before, type V comprised of a trapezoidal arrangement of anomalies, which is highly similar in its shape to the FBC long barrows. However, one should be aware that the area of Skołoszów is covered with thick loess layer, devoid of stones containing minerals prone to remnant magnetization. Hence, discussed structures should not be interpreted as stone enclosures such as in long barrow recorded, for example, in northern Poland. The anomalies are more likely related to the rotten or burnt wooden constructions, consequently acquiring induced type of magnetization (Pospieszny 2011, 72). The assumption of the presence of FBC long barrow without stones seems to be supported by the results of excavations in the nearby section of the site (see Król *et al.* 2012; 2014).

The newly registered structure discussed above is situated a little over 150 m north of the long barrow no. 1, which was discovered in 2010. Both of these structures are separated by vast and empty zone. They also have different orientation: the long barrow no. 1 is aligned E–W with slight deviation towards NE–SW (Król *et al.* 2012; 2014), whereas tentatively labelled long barrow no. 2 is, apparently, oriented exactly along NE–SW axis. It is worth noting that the different orientations of FBC long barrows in cemeteries were also identified in the Polish Lowland (e.g.: Leśniczówka, site 1; Obałki, site 1; Sarnowo, site 1; Jażdżewski 1936; Chmielewski 1952; Wierzbicki 1991; 1992; 1994) as well as in the loess areas in the south-eastern Poland (e.g. Pawłów, site 3; Słonowice, site 5; Bargieł, Florek 2006; Tunia 2006). However, in the second case, these differences are less noticeable. When it comes to the aforementioned empty space, it seems that the following two scenarios are worth consideration. Such relations are quite rare in the FBC, but this may be the result of incomplete examination of cemeteries. However, such examples have been identified in Kuyavia, e.g. in Sarnowo, state. 1 and in Obałki, site 1 (Chmielewski 1952). At the first of these sites, the distance between the long barrows no. 8 and no. 9 is about 70 m. If we consider the poor state of preservation of long barrow no. 1 in Skołoszów, it cannot be ruled out that the discussed empty zone could have been originally used by FBC people.

One should also consider a possible continuation of funeral landscape in the vicinity of Skołoszów during the Early Bronze Age. Adjoining northwards to the FBC long barrow is the circular anomaly type I, which was interpreted by means of its shape and magnetic properties, as remains of denudated round barrow (conf. Czebreszuk *et al.* 2013; Makarowicz *et al.* 2016). Therefore, it should be considered if these two objects are homogenous in terms of chronology, or if the round barrow was erected afterwards, when the communities of the CWC and MC were inhabiting this area (Król *et al.* 2012). Moreover, between these two structures, a line of singular anomalies was recorded and consequently classified as the type VII. Their origins could be related with possible infillings of the pits or post holes as well as the hearths. Potentially these anomalies present an evidence of specific kind of mortuary practices, such as constructing and subsequent deliberate burning of tombs made of wood (houses of the dead?). However, it should be stressed that the magnetometric method shows only the horizontal distribution of anomalies and, as such, it disallows any stratigraphic interpretations.

Nevertheless, the data acquired during the archaeological excavation in close proximity to the site, suggest possible interference of the CWC or MC funeral structures with the FBC long barrow erected much earlier. In 2010, a trench opened southwards revealed a presence of the CWC and MC graves, established on a margin of the wider width edge of the FBC long barrow no. 1 (Król *et al.* 2012; 2014).

Besides the funerary remains, the anomalies of type II resemble a probable ditch-like structures in the western part of the research area. Their spatial arrangement as well as dimensions might suggests that we deal with enclosures in form of a ditches, which could delineate the settlement.

Final remarks

As a summary, it is worth noting that geomagnetic survey at the site in Skołoszów provided interesting results revealing the cognitive potential of this place. The abundance of various types of anomalies discernible with the help of a magnetometer allows us to think that we are dealing with a place with a rich and complex history of human activity from the earliest times to the present. Although geomagnetic surveys alone do not allow unambiguous identification of sources of anomalies, structural similarity of the latter to objects found as a result of excavations in the southern part of the site allows them to be considered as residues of various types of structures, sometimes with a distinct landscape form (eg tumuli, megaksylons, ditches). The final verification of the proposed interpretation requires to the scope of research to be continued and broadened to include other methods, both non-invasive – geophysical and invasive – drilling and excavations.

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Marcin M. Przybyła*, Ghenadie Sîrbu**, Małgorzata Rybicka***, Dariusz Król****, Livia Sîrbu*****

Some Results of the Geophysical Investigation at the Late Eneolithic Settlement of Gordineşti II-*Stînca goală*, Edineţ District, Republic of Moldova

ABSTRACT

Przybyła M. Marcin, Sîrbu Ghenadie, Rybicka Małgorzata, Król Dariusz, Sîrbu Livia. 2017. Some Results of the Geophysical Investigation at the Late Eneolithic Settlement of Gordinești II-*Stînca goală*, Edineț District, Republic of Moldova. *Analecta Archaeologica Ressoviensia* 12, 49–58

The aim of this article is to present the latest results of geophysical researches executed in April 2017 at the site Gordinești II-*Stînca goală* in northern part of the Republic of Moldova. Based on very intriguing discoveries (i.e. remains of a dwelling, part of a clay platform and one pit) during the excavations carried out in 2016 and earlier, it was decided to investigate a larger area using non-invasive geophysical method. As a result, a few types of anomalies of different shapes were identified. It seems that these anomalies indicate the occurrence of remains of the dwellings as well as hypothetical main square between them in the centre of this fortified settlement[1].

Key words: geophysical methods, non-invasive survey, Gordinești group, Late Eneolithic, dwellings, ditch

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Introduction

The Late Eneolithic settlement of Gordinești II-*Stînca goală* is located in the Prut-Dniester interfluve in the northern part of the Republic of Moldova (geographic coordinates: 48°08’24.25” N; 27°09’34.58” E). It is nowadays situated about 1 km south from the village Gordinești on an elongated limestone promontory shaped by meander of the Racovăț

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* Firma Archeologiczna Pryncypat; Serkowskiego 8/3 Street, 30-512 Kraków; megzyk@poczta.onet.pl

** Center of Archaeology, Institute of Cultural Heritage, Academy of Science of Moldova Bl. Stefan cel Mare si Sfant 1, Moldova; ghena.sirbu2014@gmail.com

*** Institute of Archaeology, University of Rzeszów, Moniuszki 10 Street, 35-015 Rzeszów, Poland; mrybicka@interia.eu

**** Institute of Archaeology, University of Rzeszów, Moniuszki 10 Street, 35-015 Rzeszów, Poland; kroldrk@gmail.com

***** Center of Archaeology, Institute of Cultural Heritage, Academy of Science of Moldova Bl. Stefan cel Mare si Sfant 1, Moldova; livermur@yahoo.com

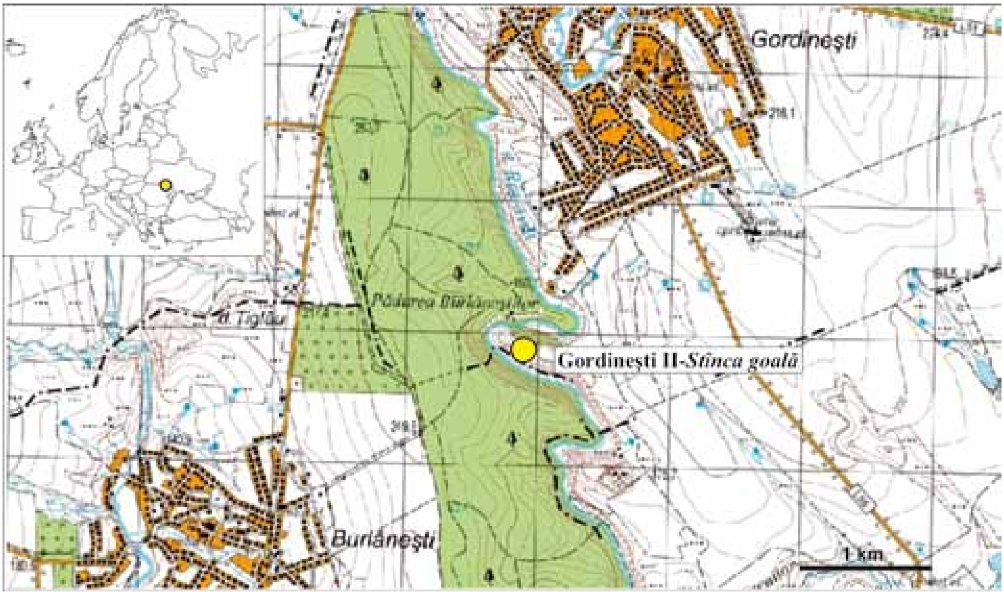

Fig. 1. Gordineşti II-*Stînca goală,* Dist. Edineț. Location of the site

river, left tributary of the Prut river (Fig. 1). The remains of the Late Eneolithic settlement occur on the *plateau* (500 m lenght and 100–120 m width) in the west area of promontory up to 80 m above the currently level of Racovăț river.

This site was discovered and first excavated in 1971 by Valentin Dergacev. During this precursory campaign two trenches covering a total area of 147 square m were explored. As a result of this investigation, no archaeological features were identified (Dergachev 1973, 90–100). However, during this research a large amount of ceramics was registered, not only in two mentioned trenches, but also on the surface of the site. Due to a number of unique decorative elements, this ceramics was consequently referred to as the Gordinești type (*памятники Гординештского типа* in Russian) (Dergachev 1973, 90–100; Dergachev 1980).

In the following years, the field campaigns was not continued. It was not until May 2016 that the next archaeological campaign in a form of systematic excavations with other methods were carried out there (see footnote 1). Concerning the results of the archaeological investigations in the Section III (divided into A–E sub-sections), total surface area of 90 square m has been recognized (Fig. 2: I–II). In such limited area

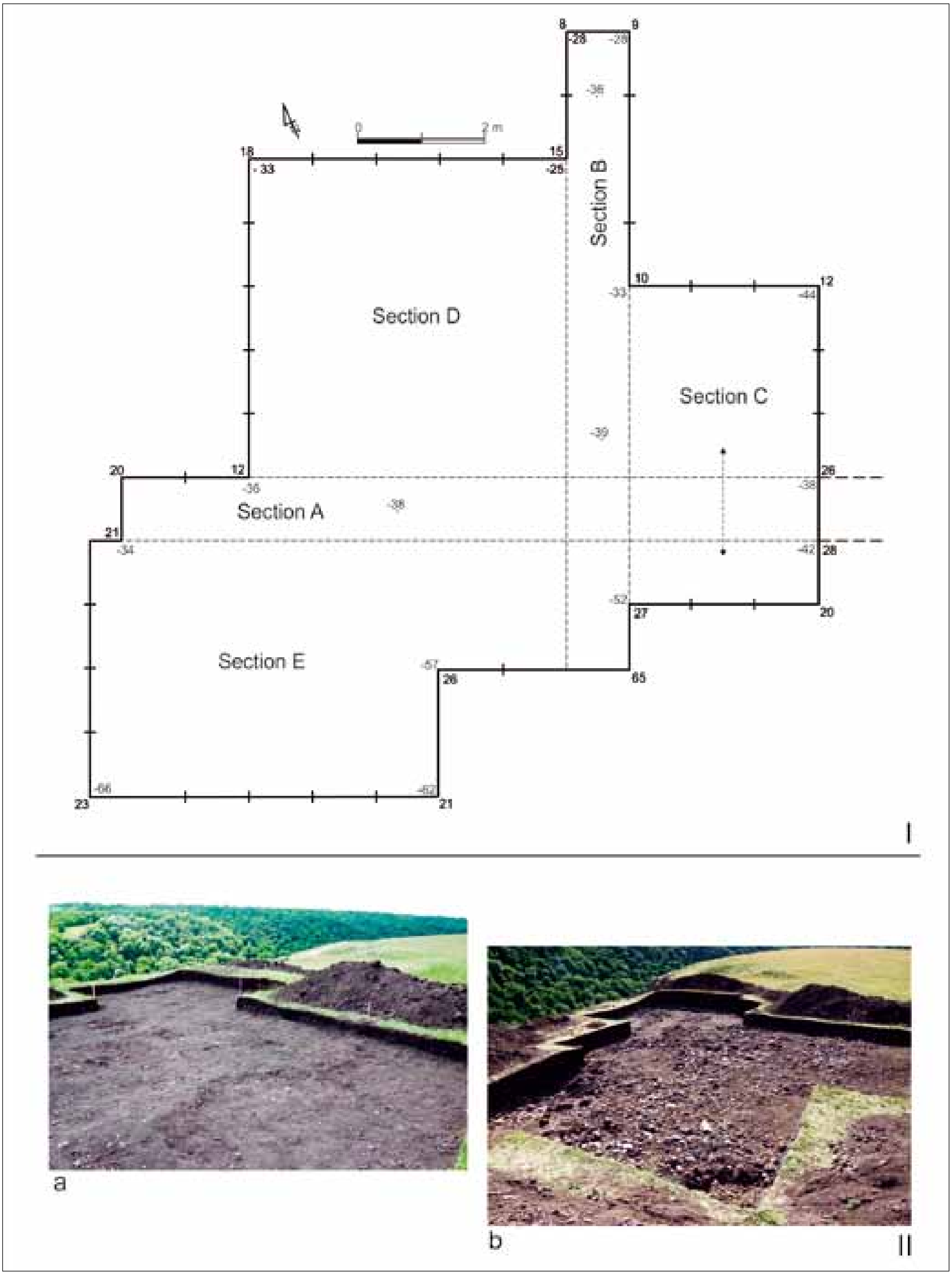

Fig. 2. Gordineşti II-*Stînca goală,* Dist. Edineț. I – the schematic plan of the Section III; II a – situation after first layer exploration (view from the east); II b – situation after second layer exploration (view from the east)

discovered several interesting features, mainly the remains of one dwelling, part of a clay platform as well as one pit. In the context of mentioned features a very rich collection of artefacts was recovered such as vast amount of ceramics, as well as other finds made from clay (spindles, circular weights from the loom), flint (axes, blades), bone, antler, and also stone (Sîrbu *et al.*, 2017a: fig. 1A; Sîrbu *et al.*, 2017b). Moreover, a series of organic samples (i.e. wheat grain and charcoals) were also taken. In consequence of specialized radiocarbon analyzes of these samples, three absolute dates were obtained. Based on its values the age of discovered and identified remains of the Late Eneolithic settlement in Gordineşti II-*Stînca goală* should be seen in the range of 3350–3000/2950 calBC.

The success of new excavation contributed to decision to carry out an extensive geomagnetic investigation of the area of Gordineşti II-*Stînca goală*. Non-invasive researches were conducted by Marcin M. Przybyła and Michał Podsiadło in April 2017.

Applied methods

For the geophysical survey at the Late Eneolithic Gordineşti II-*Stînca goală* settlement, we have decided to use magnetic prospection. This method is one of the most efficient when it comes to covering an area of a substantial size. A magnetometer detects anomalies characterized by increased or decreased magnetic field intensity, caused by various human activities. Distinctive anomalies (anomaly points or linear anomalies of increased magnetic field intensity) are formed as a result of occurrence of sunken features, such as pits, ditches or pithouses. Specific high-amplitude anomalies are characteristic for furnaces, fireplaces, as well as other objects exposed to high temperature, for example burnt houses. The presence of ferrous metal objects produces N–S oriented dipolar anomalies, while large, zonal ones may be interpreted as signs of economic human activities. On the other hand, using magnetic prospection to detect inhumation graves may be very difficult. Physical attributes of their fills usually do not differ significantly from surrounding subsoil, therefore they do not cause detectable magnetic anomalies (David *et al.* 2008, 20–21; Misiewicz 2006, 78). Concluding, the magnetic method allows comprehensive prospection of an archaeological site in a relatively short time. One of its weaknesses is rather little depth of penetration, barely exceeding 1 meter (David *et al.* 2008, 16).

Magnetic measurements in Gordineşti II-*Stînca goală* were conducted using 4.032 DLG Foerster Ferrex fluxgate magnetometer (Misiewicz 2006, 74–98) with two sensors of a measurement sensitivity of 0,2 nT. A fluxgate magnetometer measures a vertical gradient of a local magnetic field. The surveyed area was divided into a 1×1 m grid, while measurements were obtained along every 10 cm. Data were collected in a bidirectional manner. Results of the prospection were visualized on magnetic maps (Fig. 3–5) created using the program Terra Surveyor 3.0.29.3.

Results

Grass-covered surface of the promontory on which the site is located was easy accessible for prospection. In Gordineşti II-*Stînca goală*, the thickness of the humus layer does not exceed 50 cm, and directly below it residues the limestone bedrock. Sometimes, especially in the western part of *plateau*, the humus layer is severely damaged by erosion, and, as a result, the bedrock is exposed on the surface.

The magnetic survey was conducted in the area of 2,7 ha, measuring 300 m along the NW–SE axis, with 115 m along the SW–NE axis. Edges of precipitous slopes of the promontory marked northern and

Fig. 3. Gordineşti II-*Stînca goală,* Dist. Edineţ. Magnetic map in the range of -5/5 nT in the grayscale imposed on the satellite image (source: geoportal.md)

Fig. 4. Gordineşti II-*Stînca goală,* Dist. Edineţ. Magnetic map in the range of -5/5 nT in the colour scale imposed on the satellite image. The highest values are highlighted

southern limits of the prospected zone, while its eastern border was established about 30 m beyond a ditch, still visible in the field, which was originally enclosing the settlement from this side. Lastly, on the west the prospection was carried until it reached the area of the limestone outcrops mentioned above.

Sadly, an exploitation of the territory of the archaeological site in the modern times affected significantly the results of the recent magnetic investigations. In the 2nd half of the XX century, a forest was planted on the hilltop of the promontory. The area was deforested back again some time later, resulting in numerous oval holes after tree removal covering all over the territory of the site. They are close to each other and arranged in regular rows, which is clearly visible on satellite images (Fig. 6).

Those holes produced numerous, very distinctive magnetic anomalies. On the contrary, archaeological features excavated on the site so far were either shallow, sunken pits, or remains of burnt buildings in the form of clay debris. It seems that planting and then cutting down trees resulted in damaging at least upper parts of those features. As a result of the forestry activities, construction clay from dwellings was

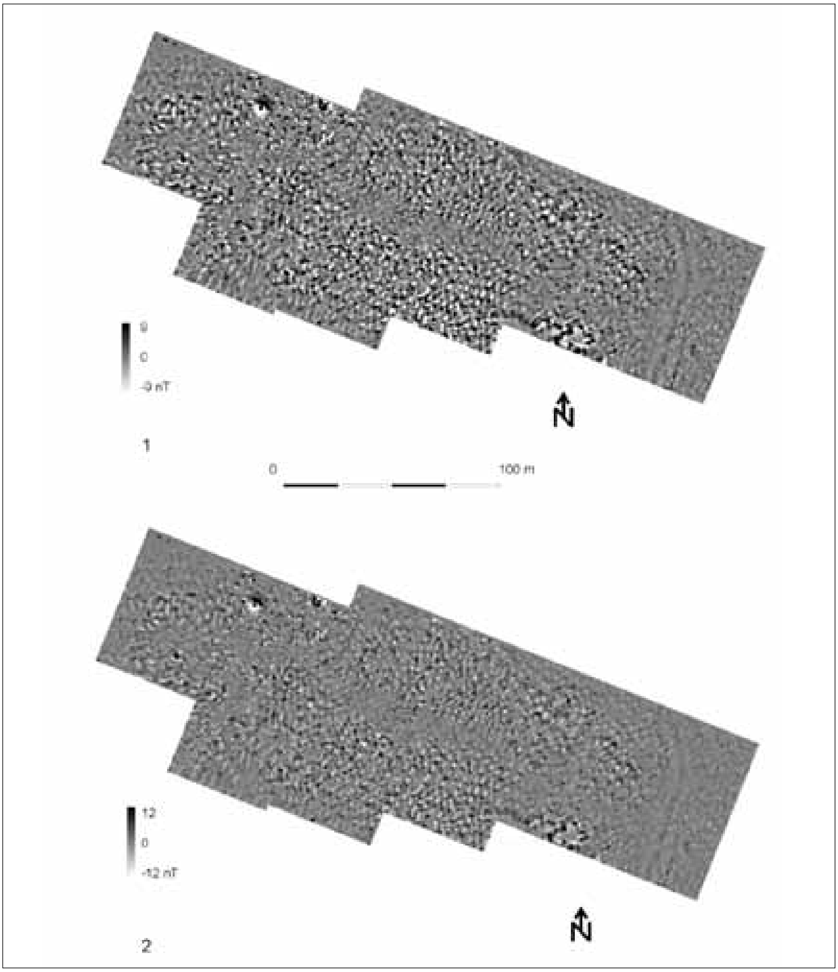

Fig. 5. Gordineşti II-*Stînca goală,* Dist. Edineţ. Magnetic maps in the grayscale. 1 – in the range -9/9 nT; 2 – in the range -12/12 nT

deposited in fills of the holes after removed trees. For that reason, the holes on the territory occupied by remains of Late Eneolithic buildings produce distinctive dipolar anomalies, characterized by higher values (in the range of -5/15 nT) as well as significantly greater amplitudes of pole values than ones beyond the limits of the settlement. Despite substantial difficulties in interpretation of the results of the magnetic survey, based on this observation it is possible to give a general account of the layout of the site.

Fig. 6. Gordineşti II-*Stînca goală,* Dist. Edineţ. Satellite image of the site (source: Google Earth) with visible holes after tree removal

The one clearly distinguishable anomaly caused undoubtedly by an archaeological feature is a positive linear anomaly marking the ditch enclosing the settlement from the east (Fig. 7: 1). Judging from the shape of the anomaly, the trench connected two very steep edges of the promontory (northern and southern), therefore separating its western, higher part, on which the settlement was erected. There were no additional defensive structures in the rest of the surveyed area. It seems that the ditch, guarding the only gentle slope of the promontory, was enough to successfully secure the settlement. Examples of similar trenches are known from many fortified Late Eneolithic sites.

The magnetic prospection revealed that beyond the ditch there was a zone lacking the characteristic dipolar anomalies caused by construction clay. Such anomalies cumulate westward from the trench, in an oval-shaped space of diameters of 250×115 m. It seems that this area should be regarded as a main part of the settlement (Fig. 7: 3). Unfortunately, observable rectangular or linear formations of some of anomalies were produced rather by regularly planted trees (Fig. 6) than archaeological features (in this case: walls of buildings). Along the longer axis of the discussed oval-shaped space lies a zone of scarce or even lack of the dipolar anomalies. We can deduce that in the core of the settlement there was an area with no buildings, used possibly as a main

Fig. 7. Gordineşti II-*Stînca goală,* Dist. Edineț. Magnetic map imposed on the satellite image with marked anomalies discussed in the text. 1 – positive linear anomaly caused by the ditch; 2, 2a, 2b – area without dipolar anomalies, interpreted as main communication tract of the settlement and hypothetical internal squares; 3, 3a – area with dipolar anomalies caused by construction clay; 4 – anomalies caused by an archaeological trench

communication tract, or an internal square (squares?). The layout of anomalies suggests that a square may have existed in the eastern (Fig. 7: 2b), and, perhaps, also in the central part of the settlement (Fig. 7: 2a). Inside the area of scarce dipolar anomalies it was identified a single place, where anomalies seem to cluster (Fig. 7: 3a). If the anomalies were not produced by forestry activities, then we might expect that some building (buildings?) could have been located also in the innermost part of the settlement. It is worth mentioning that those structures must have been positioned opposingly to the remaining settlement dwellings, fashioned in a clear radial layout. Observable reduction of number of the characteristic dipolar anomalies in the western part of the surveyed area indicates that a boundary of the settlement has been recorded. Based on lack of such dipolar anomalies beyond the ditch, we can deduce that houses were built only within the fortified space.

To conclude the results of the magnetic prospection at the Late Eneolithic Gordineşti II-*Stînca goală* settlement, Edineț district, we have to stress that modern forestry activities on the territory of the archaeological site made the survey very difficult. In consequence, it was nearly impossible to distinguish single anomalies caused by specific archaeological features. Despite the hard conditions, the main layout of the eneolithic settlement was reconstructed. Houses were most likely arranged radially, forming an oval shape adapted to local topography. In the central part of the settlement there was located an oblong-shape zone without any dwellings. As an exception, the single accumulation of anomalies within this area was documented, suggesting that some building (or buildings) may have functioned there. Houses occupied whole space between the edges of the promontory and the central square (squares?) as well as hypothetical main communication tract of the settlement. The site was fortified only from its eastern side.

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Przemysław Makarowicz*, Mateusz Cwaliński**[1],
Jakub Niebieszczański***, Jan Romaniszyn****

Barrows from the Late Neolithic and Bronze Age in the Upper Dniester River Basin in Ukraine. Geophysical Research and Archaeological Verification[2]

ABSTRACT

Makarowicz P., Cwaliński M., Niebieszczański J., Romaniszyn J. 2017. Barrows from the Late Neolithic and Bronze Age in the Upper Dniester River Basin in Ukraine. Geophisical Research and Archaeological Verification. *Analecta Archaeologica Ressoviensia* 12, 59–74

This article evaluates the potential of magnetometry to establish the internal structure of three mounds in the barrow cemetery of Bukivna in the Upper Dniester River Basin in Ukraine. We also evaluate the effects of geomorphological processes on the magnetometric results. The three-stage research method we applied comprises the preparation of a digital elevation model of the mounds, conducting geomagnetic surveys and, finally, targeted excavations, the latter enabling the verification of previously detected magnetic anomalies.

In effect our studies show exceptionally complex geophysical anomalies, difficult to interpret with any certainty. In the peculiar case of the barrows 6 and 7 in group I, partly connected by an earthen mantle, the overlapping magnetic fields did not allow the two mounds to be distinguished from each other; it was possible to achieve only through subsequent excavations. In both barrows, a series of ritual and sepulchral structures were discovered that provided clear magnetic signals. The arrangement of the anomalies in the mound 1, group II, potentially reflects various aspects of the barrow's structure and its state of preservation, beginning with postdepositional processes related to erosion or to the run-off of material down the slope, and ending with the mound's stratigraphy, formed over the course of two phases. In turn, in the case of mounds 6 and 7, it can be assumed that the effects of these processes have been

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* Institute of Archaeology, Adam Mickiewicz University in Poznań, Umultowska 89D Street, 61-614 Poznań, Poland; przemom@amu.edu.pl

** Institute of Archaeology, Adam Mickiewicz University in Poznań, Umultowska 89D Street, 61-614 Poznań, Poland; mateuszcwalinski@gmail.com

*** Institute of Archaeology, Adam Mickiewicz University in Poznań, Umultowska 89D Street, 61-614 Poznań, Poland; jakubniebieszczanski@ gmail.com

**** Institute of Archaeology, Adam Mickiewicz University in Poznań, Umultowska 89D Street, 61-614 Poznań, Poland; janrom89@wp.pl

somewhat "suppressed" in the magnetometric image, due to the strong impact of the burnt wooden structures located underneath the features

Key words: barrow, mound, magnetometric survey, stratigraphy, Komarów culture, Corded Ware culture, magnetic anomalies, slope processes, burnt structures

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Introduction

The presented article is one of the results of two Polish-Ukrainian research projects focusing on Middle Bronze Age barrow cemeteries in the Upper

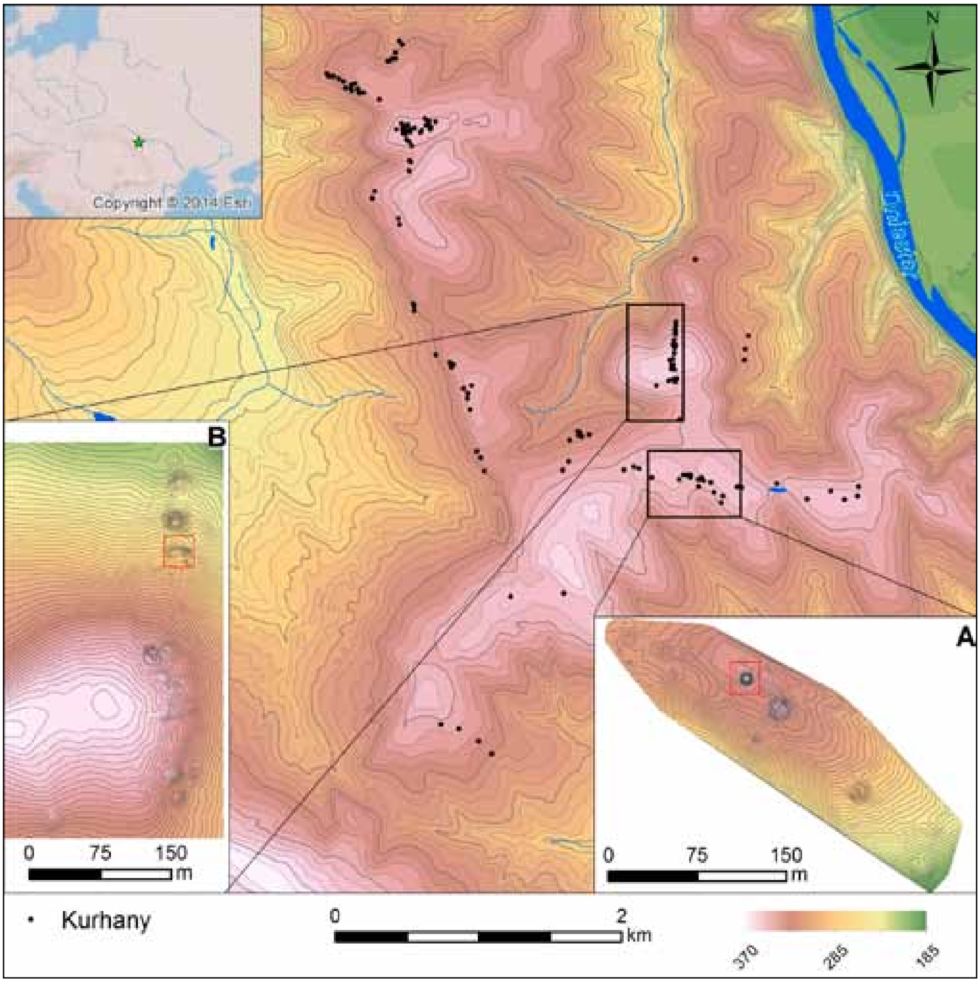

Fig. 1. The cemetery complex in Bukivna and Milovania (Western Ukraine). A – Research grid I; B – Research grid II

Dniester River Basin. One of the objectives in common for both projects involved preparing records of the discussed sites and characterising the Corded Ware and Komarów cultural landscape shaped by the barrows (Makarowicz *et al.* 2013a; 2013b; Lysenko *et al.* 2015; Makarowicz *et al.* 2016a; 2016b). About 700 mounds were documented at 17 sites in the course of our research. Non-invasive surveys were conducted at several dozen barrows, while five were studied by excavation. Simultaneously, an analysis of the cultural landscape was undertaken using geographical information system (GIS) tools, in order to understand – among other things – how the cemeteries were organized and which geomorphological preferences conditioned their location. Duplicated linear system or group-linear arrangements of mounds have been observed at all of the cemeteries situated on the plateaus of major watersheds, therefore can be regarded as typical for the Dniester River Basin (Makarowicz *et al.* 2016a).

In this article, we will evaluate the potential of magnetometry for identifying the internal structure of the barrows at the cemetery in Bukivna. Among the 19 prospected mounds, three were later explored by excavation, making it possible to verify the results of the non-invasive surveys. Observations in this regard provide the basis for interpretation of geophysical anomalies as a reflection of certain features in the barrows' structure and the effects of geomorphological processes occurring within the mounds. The three mounds discussed here are: Komarów culture barrows nos. 6 and 7 from group I and the Corded Ware culture mound no. 1 from group II, located within two survey grids respectively (Fig. 1; Makarowicz *et al.* 2016a).

The aim of this contribution is therefore to evoke a discussion concerning the issue of using non-invasive methods in the studies of barrows – archaeological features with distinctive landscape form. Simultaneously, the text highlights the need for a multifaceted verification of the results of such activities.

1. Research methodology

1.1. Magnetometric surveys

Magnetometry, which measures the variability of the Earth's magnetic field, has been applied in the course of geophysical research at the cemetery of Bukivna (cf. e.g. Weymouth, Huggins 1985; Kvamme 2006;

Schmidt 2007; Pospieszny 2011). To this end, the Bartington FluxGate Grad 601 gradiometer was used, equipped with a single probe containing two sensors. The measurements were carried out manually due to the density of forest coverage in the analysed area (a dense beech forest). The measuring accuracy was set by the technical parameters of the gradiometer model and oscillated at the level of 0.1 nT [nanotesla]. The survey was conducted within the framework of two areas (measurement surfaces) delimited by geodetic instruments (a tachimeter and GNSS RTK). In the case of both research areas, a 10×10 m grid was set up. The measurements were effected using the parallel transect method, with transects spaced at a distance of 0.5 m from each other, oriented on the north–south magnetic axis. Along both transects, readings of the magnetic field's gradient were taken every 0.25 m. The acquired data were processed using Geoplot 3.0 software with the application of the interpolation function, noise reduction and the limitation of the scope of values displayed in the image within the range from -5 to 5 nT, in order to restrict the effect of extreme values linked, for example, to metal waste.

1.1.1. Geodetic documentation and the creation of elevation models

An important aspect of the interpretation of magnetometric images involved juxtaposition of mapped anomalies on digital elevation models previously prepared for the studied barrows (Makarowicz *et al.* 2016a, 25ff.). The elevation measurements intended to make these models were taken using Leica TCR407 laser total stations. On average, the measurement density amounted to four points per m^2. Afterwards, recorded elevation data was interpolated into a model in the ESRI ArcInfo software, with the use of the *TopoToRaster* function.

1.1.2. Verification methods – excavations

The excavations provided some insight into the structure and stratigraphy of the mounds, including architectural elements located underneath the earthen mantle (various types of sepulchral features). The barrows were divided into quarters and explored in artificial spits, each documented graphically (Makarowicz *et al.* 2013a; 2013b; Lysenko *et al.* 2015). In addition, a total station survey was also conducted in order to register distribution (planography) of the finds in the mounds' layers, including the original ground level on which the barrows were heaped up. In this way, it was possible to display the created plans within the same geodetic coordinate system, in respect to which the elevation and magnetometric measurements were also taken.

1.1.3. Geographical information systems and data synthesis

The final step involved integration of the acquired information on magnetic field variability, elevation, the distribution of archaeological finds and features in the internal structure of the barrows into the data 'geobase' using ArcInfo software. The integration of all the available information into one display and information processing platform made it possible to conduct comparative analyses of the individual research stages.

2. The results

2.1. Research grid I

The research grid encompassing barrow 1 from group II measured 35×16 m, i.e. 560 m^2 (Fig. 2). This section was part of a larger area subjected to magnetometric prospection in the scope of the aforementioned barrow group; this method allowed for the identification of six mounds (Makarowicz *et al.* 2016a; Fig. IV.285 & IV.286). Barrow 1 had the shape of a truncated cone measuring ca. 2.5 m in height and 12 m in diameter. The gradient of the mound's slopes was irregular. A fundamental difference was observed in the N–S section, in which the southern slopes are gentler than the ones on the opposite side. In addition, in the E–W section the western boundary between slope and terrain is located at a lower absolute height than the eastern one. This can be observed in the elevation of the barrow on sloping terrain, which dips gradually to the west.

The magnetometric image of the discussed barrow indicates the significant variability of the magnetic field induction within it. It is possible to distinguish a few successive magnetisation zones, beginning from the peak, through the slopes and down to the barrow's immediate surroundings. The peak has extremely high values (following compression to fit the range -5–5 nT), forming an irregularly outlined concentration that encompasses the entire plateau. A concentric belt of negative readings extends from just beneath the threshold of the flat area down to the lowest parts of the slope. This ring-like (in terms of its arrangement)

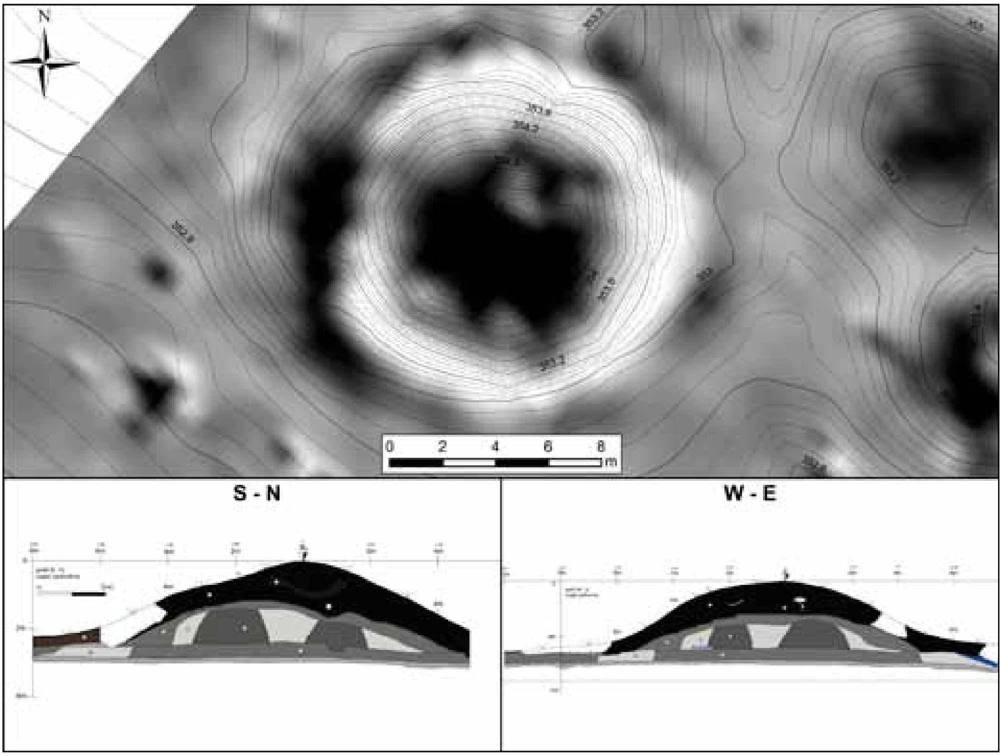

Fig. 2. Results of non-invasive surveys and excavations of barrow 1 from group II at the cemetery in Bukivna. In the upper part of the illustration, the magnetometric prospection results have been placed onto a hypsometric plan. The stratigraphic sections of the excavated part of the barrow are included in the left and right bottom corners (Lysenko *et al.*2015, for explanation of layers, see: Makarowicz *et al*. 2016a)

anomaly differs in width depending on the section of the slope. In the western part of the barrow it clearly narrows to 1.5 m, which differs from the remaining course of the signal, generally measuring from 2.5 up to 4 m in diameter. Where the lower parts of the slope merge into the flat surrounding area, yet another concentric anomaly was registered, reminiscent of a ring, but this time with a positive magnetisation level. This structure is also asymmetrical. The most visible and widest section is the ca. two-metre long belt situated on the western side of the barrow. In turn, its width amounts to only a dozen or so centimetres on the northern, southern and eastern sides. In places, the anomaly disappears, taking on the value of the magnetic background at 0 nT.

The excavations of barrow 1 have provided some information about its stratigraphy and lithology. In light of these results, it can be stated that the mound consisted of two layers – construction horizons (Fig. 2). The stratigraphically older one was built from organic material, most probably cut turf pieces arranged with the growth side facing downwards (Makarowicz *et al.* 2013a; Lysenko *et al.* 2015). It was built at the time of the Corded Ware culture, as the radiocarbon dates point to the second half of the 3rd millennium cal BC (Makarowicz *et al.* 2016b, Tab. 2). The second, overlying layer was built up from much thicker loess deposits, up to 1.5 m thick in the accumulation zone at the base of the slope. This layer was also clearly younger than the one below, with numerous modern vessel sherds discovered within. It should be noted that the grave pit was dug directly into the natural soil, beneath the original humus layer.

2.2. Research grid II

Within barrow group I at the cemetery in Bukivna, a "double mound" was identified, consisting of two mounds connected by an earthen mantle, with a kidney-shaped outline and two peaks (Fig. 3). This funerary structure has the following dimensions: ca. 30 m along the W–E axis and 14 m along the N–S axis. The average height of the barrows amounted to 1.5 m; however, it should be emphasized that the western peak was a few centimetres higher. There was a small plateau located between the two peaks, which was an element shared by both mounds.

The geophysical prospection undertaken within the framework of this project covers a rectangular area measuring 28×18 m. It is part of a larger magnetometric plan prepared for group I (Makarowicz *et al.* 2016a, 168–172). The magnetometric image does not enable a clear separation of the two barrows. It distinctly shows a complex of anomalies, an element of which was a strip of negative readings with a kidney-shaped outline, surrounding an area characterised by considerable gradient variability, with positive values predominant on the southern side of the elevation (Fig. 3).

The magnetometric imaging shows an extensive anomaly with an oval contour, consisting of an internal maximum positive and external negative, located at the western edge of mound 6 (Fig. 3). At the opposite side of the elevation, a strongly polarized anomaly is visible, probably caused by an object made of iron. Due to the presence of trees overgrowing both mounds, it was impossible to take measurements in certain spots – these are marked as white strips in the westernmost part of the area (Fig. 3).

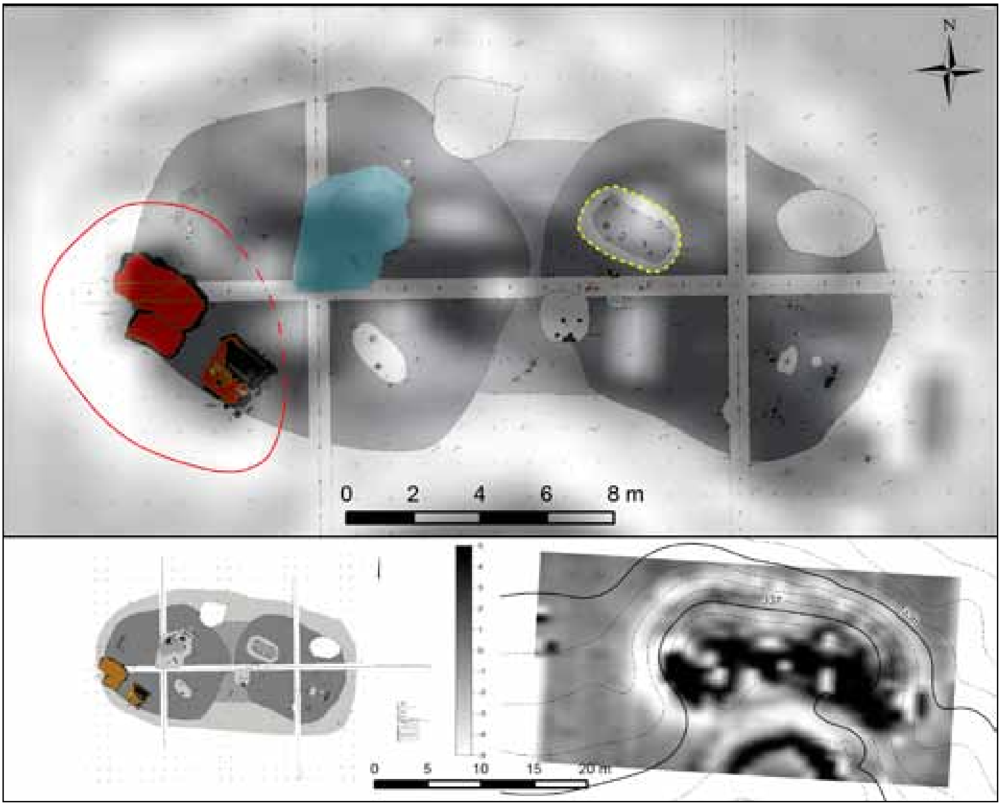

Fig. 3. The results of non-invasive surveys and excavations of barrows 6 and 7 from group I. In the upper part of the illustration, the magnetometric results are superimposed onto the horizontal projection of the explored layers. The bottom left illustration shows the generalized planography. The structures marked in brown represent wooden chambers of the "mortuary house" type. The magnetometric image is placed in the bottom right corner of the figure, along with a hypsometric model (Makarowicz *et al.* 2016a)

At the southern foot of the elevation, a pronounced and complicated anomaly was observed with a semi-circular outline, formed by concentric, adjacent rings of magnetisation: outer negative and inner positive (Fig. 3). In the course of excavation, it turned out that they belong to yet another, smaller barrow (Makarowicz *et al.* [eds] 2018).

After completion of geophysical survey, barrows 6 and 7 were excavated. The methodology was adapted to their specific spatial arrangement. The research area was divided into six parts or "quarters" (Fig. 3). The upstanding remains enabled us to distinguish two separate mounds, with a distinct stratigraphy and planography, constructed from turf layers covered by thin loess deposits. Several structures and features were encountered within the barrows. In barrow 6, two graves of the "mortuary house" type, i.e. funerary wood-daub structures, were documented in the western part (Fig. 3), while mound no. 7 contained two cenotaphs consisting of fired wooden elements and stone enclosures. Both barrows also yielded abundant deposits of vessels and other items. The absolute dates indicate that the two mounds were not erected at the same time. Barrow 7 is older, while barrow 6 younger (Makarowicz *et al.* 2016b). Nonetheless, they can both be attributed to the Komarów culture (Makarowicz *et al.* [eds] 2018).

3. Discussion

In light of the results presented here, we would like to draw attention to the differences in the shape and construction of the barrows located in the discussed survey grids, as these factors clearly influence the results of the magnetometric prospection. When interpreting the results, it is necessary to determine the natural lithography of the research area, i.e. the peripheries of the Podolian Upland and Subcarpathia. The sediments that formed the watershed on which the barrows in Bukivna are concentrated primarily consist of silt fractions, deposited here in the Pleistocene due to the effects of weathering processes in the Carpathian Mountains (Matoshko 2004; Łańczot *et al.* 2002). As a result of aeolian accumulations, lithologically homogeneous layers of loess cover were formed, which make up the uppermost stratum within the studied area. In consequence, we can expect uniform magnetic background readings in the resulting images. Even though the use of a gradiometer did not make it possible to read the absolute values of the magnetic field strength of these sediments, in each case it was expressed as a constant zone of neutral values approximately amounting to 0 nT m^{-1} (the relative value adopted during instrument calibration). In consequence, it is possible to show that the natural stratigraphy in the cemetery area in Bukivna is uniform, especially within the area of research grids I and II.

In the case of barrow 1 from group II (grid I), a comparison of the magnetometric, hypsometric and excavation results (Fig. 1) allows for an in-depth discussion and consideration of the coherence of the results provided by the individual methods. Still, the unique layout of the magnetic anomalies does not allow for an unambiguous explanation in reference to terrain morphology or the stratigraphy documented during excavations.

The observed anomalies take a form of concentric ring-like signals with alternating degree of magnetisation, covering the entire mound and its immediate vicinity. The magnetisation values reach the positive maximum of the scale at the mound's flattened top, then decrease below 0 nT near the slopes, and become positive again in the flat areas adjoining the slopes. One possible explanation would be the geomorphology of this funerary structure. Assuming that the arrangement of the anomalies corresponds to or reflects the morphology of the terrain, the effects of denudation processes should also be taken into account. In this context, we can distinguish three zones roughly coinciding with abovementioned distribution of the anomalies: a – the flattened barrow top (a relatively stable zone), b – the slopes (where erosion processes are clearly observable), and c – the foot of the barrow (the accumulation zone). This interpretation is justified if we assume an originally higher magnetic susceptibility of the barrow (resulting from the use of turf as a building material) in relation to the subsurface layers in its vicinity. In this way, the denudation processes would over time contribute to the mineral depletion (of ferrous compounds) of the slopes compared to the foot of the barrow, while the top remains intact. This hypothesis is very probable, especially if we look at the mound's morphological profile. The westernmost part of the barrow and its base have an increased magnetisation value. This corresponds to the main direction in which the area slopes. As already mentioned, the barrow was constructed on terrain that gently dips towards the west, as a result of which the largest accumulation of material should be located at that side of the mound.

Yet another idea concerning the specific layout of the anomalies has been put forward based on the comparison of the magnetometric image with the results of the archaeological excavations. It can be assumed that the distribution of the anomalies reflects the conical arrangement of the layers forming the barrow, taking into account the high level of ferromagnetic minerals which increase the magnetic susceptibility of the lowest layer (turf blocks) in relation to the secondary layer (loess). This difference contributed to the creation of a characteristic dipolar anomaly with a positive maximum in the spot with the highest concentration of material (the peak zone) and the negative maximum around it (the slopes). In this case, the centre of the anomaly would correspond to the original feature made of turf, and the external one to the secondary loess cover. However, the question remains whether the magnetic field anomaly generated by this layering of material (turf blocks) is strong enough for the magnetometer to register, despite the presence of the overlying layers of loess which are between 0.7 and 1.4 m thick.

Considering the magnetisation of the material forming the body of the barrows, it should be noted that the turf mantel could have constituted a distinct layer of reduced permeability. At this stratigraphic level, magnetically susceptible iron or manganese minerals would accumulate from the water run-off, thus contributing to the increase magnetisation degree of the layer. In an alternative approach, it could be assumed that the ring-like signals showing positive or negative values are parts a single normally-polarized, dipolar anomaly resulting from induced magnetization including both the secondary and original layers.

In the case of research grid I, the specific features of the area should also be noted that possibly affected the final outcome of the research. First and foremost, the identified barrow was relatively high (2.5 m) – a factor which in combination with dense forest overgrowing the site hindered the conduct of magnetometric survey. The steep slopes of the barrow caused that the probe had to be raised and carried at the varying height above the ground level while ascending and descending, which in turn contributed to possible sampling irregularity. As the mound flattened out towards the top, the probe was lowered again and the regularity of the measurements was regained. In comparison with magnetically positive peak, the barrow's slopes provided lower values, thus it would be interesting to consider whether observed spatial structure of magnetisation is indirectly also an effect of applied methodology.

All of the presented hypotheses concerning the interpretation of the magnetometric results regarding the structure of the barrow and the morphology of the terrain require thorough verification in the course of further research. Until more data is collected, an indication of the most probable explanation of observed anomalies is impossible.

The magnetometric image from the second research grid, encompassing barrows 6 and 7 in group I, was no less complicated. The first important observation was the lack of an anomaly suggesting the run-off of material rich in ferromagnetic minerals, despite the fact that the mound has quite a significant height (ca. 1.4 m). The second observation is that certain archaeological structures overlapped with the anomalies registered in the magnetometric survey.

To propose an explanation for the complicated distribution of magnetic anomalies, we should consider the stratigraphy of both monuments. The barrows were covered by a layer of modern humus up to 0.2 m thick, underneath which there was a layer of light grey loess ca. 0.2–0.25 m thick. The original body of the mounds, formed by layers of turf arranged with the vegetation facing downward, was present at a depth of 0.4 m from the mound tops. It consisted of two levels that differed in colour. The original humus, dark brown or black in colour, was located at a depth of 1.5–1.6 m and was ca. 0.25–0.3 m thick, while the natural (i.e. light grey loess characteristic for the region) lay beneath the humus. It is therefore possible that the accumulation of turf rich in iron compounds contributed to raising the magnetic susceptibility of the barrows in relation to the soil in their vicinity. This is probably the reason behind the increased magnetisation of the mound surfaces (the peak and the slopes), which are reminiscent in shape of a normally polarised dipolar anomaly with a positive maximum on the southern side of the slopes and a negative on the northern one.

In addition, in the western part of barrow 6 (the western one), graves of the "mortuary house" type were discovered, constructed from wood, clay and earth (Fig. 3). An analysis of the features' stratigraphy has revealed that they were built before the construction of the mound, at a depth of about 0.9–1.3 m from the top of the barrow, on the original ground. One of the structures was made from oak trunks, of which part was hewn horizontally and cut vertically, while the other – also built from oak – consisted of wooden framing that gave it a chamber-like appearance. Both features were hardened using clay, applied with great precision to the crevices between the tree trunks. Before the structures were fully covered with earth, they were ritually burned, as a consequence of which a distinct anomaly is emitted in this sector. As an effect of high-temperature combustion, the soil took on an orange or brick-red colour, and acquired new magnetic properties. The increased magnetic susceptibility of the burnt organic material or overheated mineral sediments is a frequently observed phenomenon, explained as the Le Borgne effect (Le Borgne 1955; 1960; Schmidt 2007). In both mounds, other structures, including cenotaphs, small wooden buildings and vessel deposits, were situated in the original humus strata or virgin soil strata (up to a depth of 1.8 m). Even though these features consisted of fragments of burnt wood, charcoal and overheated soil (signs of the intentional use of fire at those spots), they did not form a single, planographically legible, consistent anomaly in the magnetometric image. These structures did not produce any distinctive signals as in the case of the "mortuary houses" (probably due to the depth at which they were located); nonetheless, the spots where they are present always indicate a positive gradient value.

In contrast to barrow 1 from group II, where magnetisation structure is a consequence of mound morphology (namely its height, steepness and thickness of the layers) and denudation processes on the slopes, the geophysical survey of the barrows 6 and 7 from group I managed to partially reveal inner features conceived under topsoil. A number of structures and graves with magnetically strong and clearly discernible signals has been discovered in the latter mounds, whereas they were not attested in the case of barrow 1 from group II. Due to intense anomalies originating from these features, it can be presumed that any effects of natural pedological processes occurring in the barrows 6 and 7 that could alter original magnetic susceptibility of the soil were somewhat "suppressed" on the magnetometric image. Nonetheless, one should pay attention to kidney-shaped streak consisting of negative values at the circumference of the "double mound", possibly a residue of denudation on the slopes.

Conclusions

Our research has allowed us to observe some exceptionally complex magnetisation structures, the nature of which cannot be determined with complete certainty. The overlapping magnetic fields of the adjacent barrows 6 and 7 from group I, together forming the so-called "double mound", made it impossible to separate them solely on the basis of magnetometric imagery. Only subsequent excavations allowed to distinguish the two individual mounds from each other. In the case of the mound 1 from group II, the arrangement of the anomalies potentially reflects a number of different aspects related to the mound's stratigraphy and state of preservation, beginning with postdepositional processes connected to erosion and the run-off of material down the slope, and ending with the two stages of the mound's development. Barrows 6 and 7, partly connected by earthen mantle, are a special case due to the accumulations of burnt organic material with strong magnetic properties. On the other hand, the considerable size of barrow 1 from group II, which is higher than most of the mounds at the cemetery, arguably had some influence on the results of magnetometric survey. This in turn draws attention to the problems facing application of geophysical methods in the studies of archaeological features of distinctive landscape form.

The main conclusion stemming from presented research is the need for a multifaceted consideration of potential sources of magnetic anomalies occurring within the prehistoric earthen mounds, in the light of available data collected i.a. on the cemetery in Bukivna. Due to the possibility that residues of various processes (both natural and anthropogenic) end up being superimposed onto the two-dimensional magnetometric image, in each case the results of interdisciplinary studies have to be verified and subjected to comparative analysis. Recommended methodology to achieve this goal could be the three-stage approach as applied at Bukivna, involving the following steps: preparation of a digital elevation model of the site, conducting geophysical survey e.g. using magnetometry, and verification of the results with direct exploration techniques of a varying degree of invasiveness, e.g. drillings, test trenches or full-scope excavations, depending on the circumstances. Nevertheless, it has to be kept in mind that due to the structural heterogeneity of barrows and variety of postdepositional processes affecting them, establishing the general conditions governing the occurrence of magnetic anomalies in this regard might be impossible. Hence, every case should be considered individually with respect to observations and experiences hitherto gathered during similar surveys.

A research perspective that would enable a more precise determination of the nature of the geomagnetic anomalies, as well as providing a reliable interpretation of this phenomenon, would require further interdisciplinary work and discussion. One promising step seem to be laboratory tests determining the magnetic susceptibility of samples taken from the sediments in various zones of the barrows affected by erosion. In addition, it would be useful to develop a database containing information on magnetometric prospections at other sites with distinctive landscape form – in particular other barrows – and their verification through excavations (or drilling). The authors have already carried out a number of geophysical surveys of mounds within the scope of the project devoted to cataloguing barrow cemeteries in the Upper Dniester River Basin (Makarowicz *et al.* 2016a), while at present they are conducting comparative analyses focusing on explaining the nature of the anomalies detected within the barrows.

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Victor Sava*, Florin Gogâltan**

The Bronze Age Fortifications in Munar "Wolfsberg", Arad County. The 2014 and 2017 Archaeological Researches

ABSTRACT

Sava V., Gogâltan F. 2017. The Bronze Age Fortifications in Munar "Wolfsberg", Arad County. The 2014 and 2017 Archaeological Researches. *Analecta Archaeologica Ressoviensia* 12, 75–100

In spite that the Bronze Age site Munar "Wolfsberg" has been depicted on the Josephine topographic survey (late 18th century), the first scientific data focusing on this site occurs at the beginning of the 20th century. As "Wolfsberg" did not have the dimensions of the nearby prehistoric fortifications at Sântana and Corneşti, the site was not targeted by archaeological investigations and it has only been occasionally mentioned in the secondary literature so far. During the year 2014 a team of researchers have started the investigations with the site's topographic survey, followed by a systematic ground survey, geophysical measurements, as well as aerial photographs. Three years later, a small test trench was excavated in order to attempt dating the Middle Bronze Age tell in terms of the absolute chronology.

Key words: Lower Mureş Basin, Munar, Bronze Age, tell, fortifications

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Introduction

Until recently, the lack of systematic excavations on prehistoric objectives in the Lower Mureş Basin has distorted historical knowledge. In spite that towards the end of the 19th century there were several attempts to study important sites such as Pecica "Şanţul Mare" (Dömötör 1901; Dömötör 1902; Roska 1912) and Periam "Movila Şanului" (Roska 1911; Roska 1913; Roska 1914; Roska 1923), investigation of prehistoric eras was not a research goal in itself. Some of the more "attractive" sites, that were tested during the middle of the 20th century, were the tells of the Bronze Age (Popescu 1956, 5–50; 65–114; Crișan 1978; Soroceanu 1991).

The limited number of existing publications provided an anachronistic picture of the region in question. The few poorly investigated sites could not truly illustrate the complexity of this archaeological phenomenon.

* Museum of Arad, George Enescu Square, no. 1, 310131 Arad, Romania; sava_vic@yahoo.com
** Institute of Archaeology and Art History Cluj-Napoca, Mihail Kogălniceanu Street, no. 12–14, 400084, Cluj-Napoca, Romania; gogaltan@yahoo.com

Contrary to what was known from the archaeological literature, the recent systematic excavations in the Lower Mureş Basin led to radical changes in the historical perspective. Knowledge on the Bronze Age (for Neolithic and Eneolithic see Sava 2015), was enriched by the discovery of several settlements such as Şagu "Sit A1_1" (Sava *et al.* 2011; Sava *et al.* 2012; Sava 2014; Urák *et al.* 2015), Pecica "Situl 15" (Marta *et al.* 2012), and the cemetery Pecica "Situl 14" (Sava, Andreica 2013; Sava, Ignat 2014), the reopening of excavations in the tell at Pecica "Şanţul Mare" (O'Shea *et al.* 2005; O'Shea *et al.* 2006; O'Shea *et al.* 2011; Nicodemus 2011; Nicodemus *et al.* 2015; Nicodemus, O'Shea 2015) and in the fortifications at Sântana "Cetatea Veche" (Gogâltan, Sava 2010) and Corneşti "Iarcuri" (Szentmiklosi *et al.* 2011).

In order to enlarge the horizon of the investigations numerous non-invasive investigations were also initiated on the major Bronze Age objectives. Specialists managed to place all the tells as well as the major Bronze Age sites on the map of the Arad county. One of the highly interesting discoveries, little known to specialists, is the site at Munar "Wolfsberg".

In spite that the prehistoric fortification at "Wolfsberg" has been depicted on the Josephine topographic survey at the end of the 18th century, the first scientific data focusing on this site occurs at the beginning of the 20th century in B. Milleker's works (Milleker 1906a, 97; Milleker 1906b, 53–54). As "Wolfsberg" did not have the dimensions of the fortifications at Sântana and Corneşti, the site was not targeted by archaeological investigations and it has only been occasionally mentioned in the secondary literature so far.

The beginning of the project entitled *Living in the Bronze Age Tell Settlements. A Study of Settlement Archaeology at the Eastern Frontier of the Carpathian Basin* has led to a reevaluation of the site's scientific importance. The existence of a tell dated to the Middle Bronze Age, doubled by at least one fortification from the Late Bronze Age, offered us the possibility to study an ideal situation. There were preserved two stages in the chronological development. The fact that the site was only 15 ha large made it suitable for non-invasive investigations. This could provide a base for a coherent picture of the entire archaeological objective.

During the year 2014 the investigations have started with the site's topographic survey, followed by a systematic ground research, geophysical measurements, as well as aerial photographs. Three years later, a small test trench was excavated in order to attempt dating the tell.

Until now, the site at Munar "Wolfsberg" has been the subject of several archaeological notes and it was also mentioned sometimes in studies dealing with various issues concerning the Bronze Age in the area. The goal of the present article is to present a complete history of the few performed investigations. The text is accompanied by a rich illustrative material meant to help the reader understand better the described archaeological discoveries.

Site location

The village of Munar is located ca. 30 km west from the city of Arad (Fig. 1), at the border between Arancăi and Vingăi plains (Fig. 2). Named "Wolfsberg" in the secondary literature the site may be easily identified on the field as it is located in the close proximity

Fig. 1. Administrative map of Romania with the location of the site at Munar "Wolfsberg"

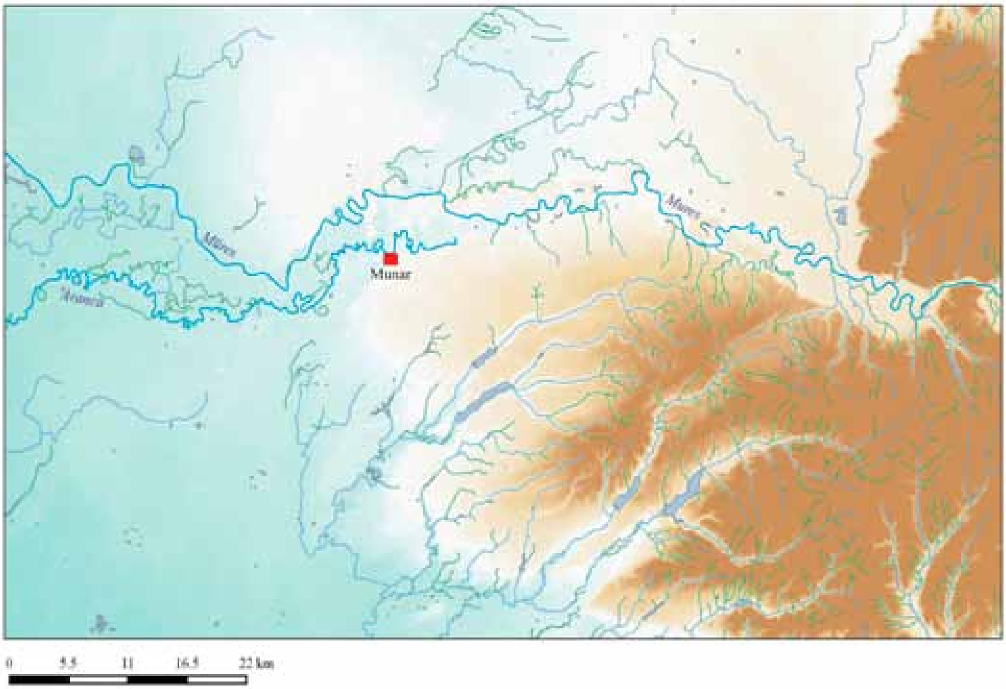

Fig. 2. The Lower Mureş Basin with the location of the site at Munar "Wolfsberg" (map adapted after Gogâltan 2016)

of the county road 682 connecting Arad and Sânicolau Mare. The Bronze Age tell and fortification may be observed between the settlements of Sânpetru German and Munar, on the right side of the above mentioned road.

The site is very well located, on the high terrace of the River Mureş. One should also mention that the small river called Aranca, flowing into the Tisa, still runs today at the base of this terrace. The site's location was very advantageous; it provided a good defensive position on the northern side and was safe from flooding. One may easily notice (Fig. 7), that the level difference between the bed of the river Aranca, and the edge of the terrace is quite high, measuring 10 m. To the north, the prehistoric settlement was somewhat protected by the considerable height of the terrace, and to the west the situation was similar. There the site was separated from the rest of the terrace by the bed of a formed water course that communicates with Mureşului Meadow. One may note that the level difference to the west reaches almost 8 m. At the

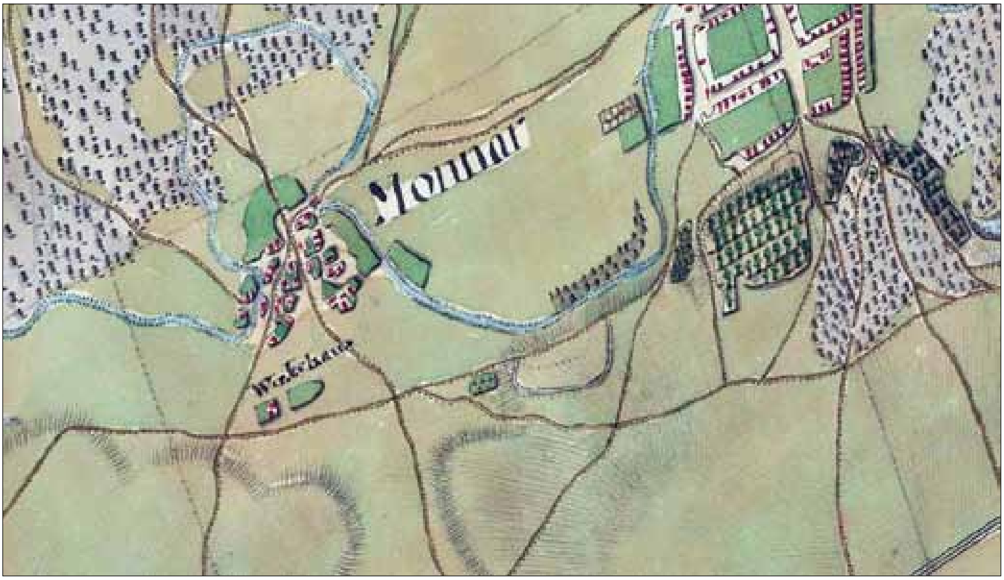

Fig. 3. The First Josephine Topographic Survey (1769–1772) with the depiction of the site at Munar "Wolfsberg" (source: www.mapire.eu)

same time, the proximity of the River Mureş' braches, that formed a true delta during Prehistory, provided important food sources and easy access to drinking water.

History of the researches

The fortified enclosure at Munar was illustrated on the First Josephine Military Topographic Survey (1769–1772) (Fig. 3). There, the site was rendered with two concentric fortifications, irregular in shape, depicted without interruptions. One may notice that the enclosures in question started from the edge of the high Mureş terrace. The outer fortification was clearly rendered with a well stressed line, while the inner one was depicted with a dotted line. The river Aranca appears at the base of the high terrace and a small cemetery was rendered on the western side, outside the fortification. At that time the prehistoric fortification was crossed by three roads: one leading from Felnac to Secusigiu; the second from Sânpetru German to Variaş; and another road that connected the first two. The second road is located right on the edge of the high terrace of the Mureş river. At the same time, a dry water

Fig. 4. The Second Josephine Topographic Survey (1819–1869) with the depiction of the site at Munar "Wolfsberg" (source: www.mapire.eu)

course may be seen on the map in the western side of the site, starting from the bed of Aranca and entering deeply into the terrace.

The fortification was also depicted on the Second Josephine Topographic Survey (1819–1869) (Fig. 4). However, on this map only the south-eastern sector of the outer fortification was represented. Although the landscape was rendered in detail, the inner fortification that could be seen on the First Josephine Survey, and the western sector of the outer fortification, no longer occurred. It is important to notice that at that time the land where the site was located was used for agriculture, being divided in several plots. The roads crossing the site or located in its vicinity also appear clearly depicted. The road connecting Arad and Sânnicolau Mare was moved in the southern edge of the site and it is still there today. One of the country roads on the map crosses the entire surface of the site from north to south, connecting the monastery of Bezdin and the road leading from Sânpetru German to Gelu. An access way that connected the main road and the Mureș meadow was in use on the eastern side of the site. Another road began from this access way, crossed the fortification from east to west and connected

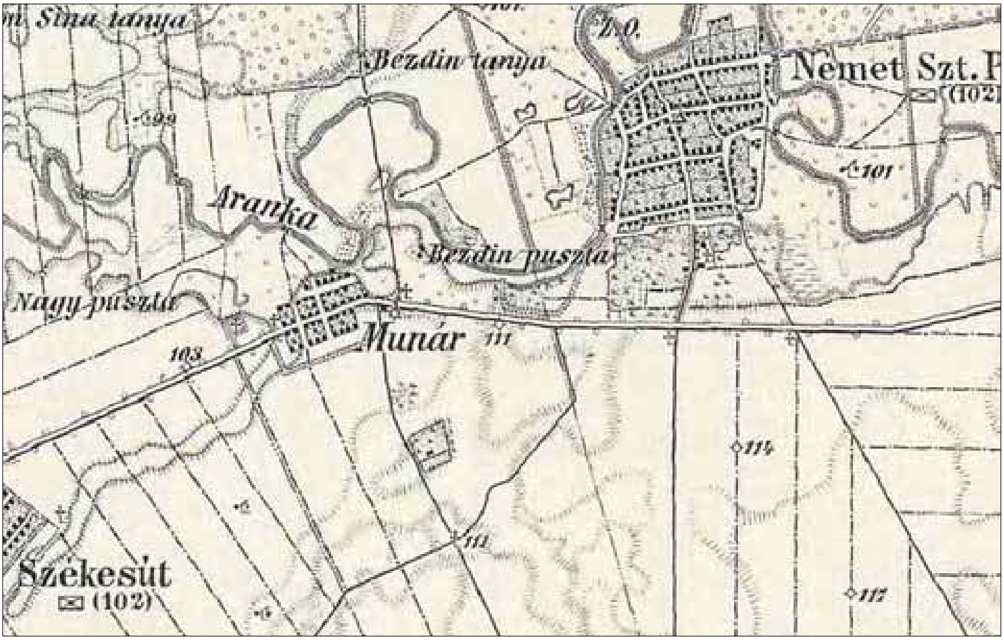

Fig. 5. The Third Josephine Topographic Survey (1869–1887) with the depiction of the site at Munar "Wolfsberg" (source: www.mapire.eu)

the agricultural plots. These roads may be easily identified on site today and they are visible in the following figures: Fig. 6–7, 13–17.

The complete contour of the outer fortification and two segments of roads crossing the surface of the site are visible on the Third Josephine Topographic Survey (1/25 000) created between 1869 and 1887 (Fig. 5).

In spite that the Austrian authorities knew about the site's existence already in the 18th century, as attested by its depiction on the First Josephine Survey, the first historical-archaeological information became available only at the beginning of the 20th century. In his archaeological repertory, as well as in a brief note, B. Milleker shortly discussed the site at "Wolfsberg" (Milleker 1906a, 97; Milleker 1906b, 53–54). Although the existing data at that time did not help readers have a coherent understanding of the site, the author's short descriptions and mentioning of clear landmarks represented a novelty in the history of researches. Milleker informed his readers on the site's exact location ("trapezoidal earth mound") and estimated its surface at 25 jugera (approx. 14.4 ha), very accurately for that era. He also mentioned certain topographic

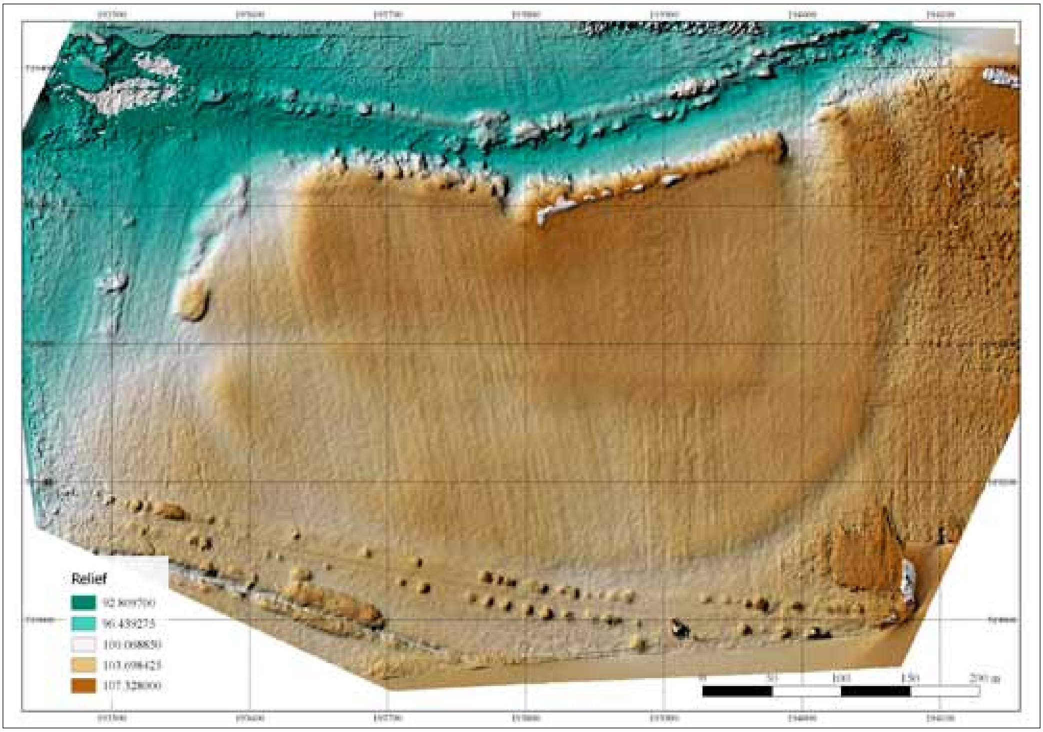

Fig. 6. Digital model of the terrain in Stereo 1970 coordinates

landmarks, writing that "the eastern part of the village of Munar is called Bezdin Weingärden, while the earth mound located to the south, towards Sâmpetru German, is called Wolfsberg". The author provided details on the fortification systems' state of preservation and mentioned the existence of some modern constructions inside the site (See in Gogâltan, Sava 2010, 58–59 a Romanian translation of Milleker's text). One is also informed that in 1904 a tax inspector discovered clay pots decorated with prominences on Jost Ivan's land (located towards the village of Sânpetru German) and even that one of the pots preserved bronze objects inside.

At the beginning of the 20th century, several authors mentioned the site at Munar, but only in passing. One of them is V.G. Childe who included Munar in his enumeration of the sites belonging to the Vatina Culture in his work entitled *The Danube in Prehistory* (Childe 1929, 287). A similar mention is I. Ghenadie's brief note on *Cetatea de la Munar* [The

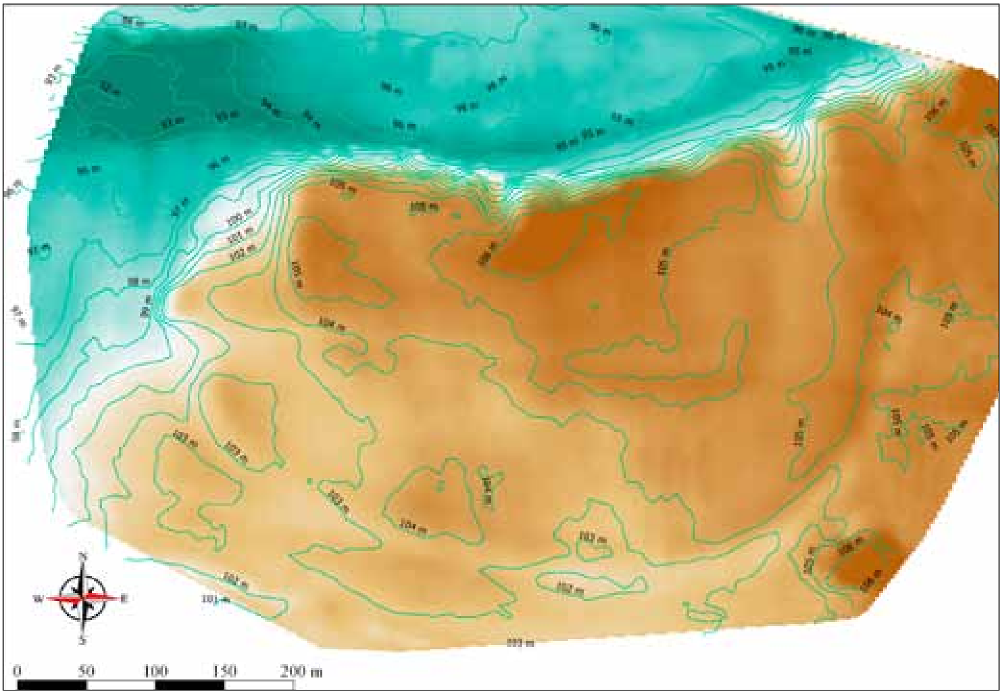

Fig. 7. Digital model of the terrain with the relief curves at 1 m

Fortification at Munar] (Ghenadie 1931) and G. Lotreanu's mentions in *Monografia Banatului* [Monography of Banat] (Lotreanu 1935, 286). Interesting to note is that I. Lotreanu believed the fortification to be an Avar ring. One may easily observe that the author was relying on old interpretations spread during the second part of the 19th century. Back then, the great fortifications built during the Bronze Age, such as the ones at Cornești "Iarcuri" (Pech 1877) and Sântana "Cetatea Veche" (Márki 1882; Márki 1884), were dated to the Migration Period and were called Avar rings.

Later on, the site of Munar "Wolfsberg" was often mentioned in scientific works, such as repertories (Roska 1942, 185, no. 270; Milojčić 1953, 275, Abb. 42; Moga 1964, 296; Medeleț, Bugilan, 1987, 149–150; Vasiliev, Hügel 1999; Luca 2005, 254, nr. 532d; Luca 2006, 117, nr. 385b, 230, nr. 532d; Luca 2010, 175, nr. 385b, 231, nr. 532.3d) and studies focusing on Bronze Age issues in the adjacent area (Horedt 1974, 223, nr. 14; Micle *et al.* 2006, 296; Gogâltan *et al.* 2013, 51; Sava, Andreica

Fig. 8. The network of magnetometric grids and systematic field research grids (pink polygons) – location and structuring in relation to the site's ortho-photo plan (UAV)

2013, 72; Sava 2014, 127; Sava, Ignat 2014, 21, 24; Sava, Ignat 2016, 191, 195, Fig. 15/Nr. 16, Fig. 16/nr. 10). Worth mentioning are two recent contributions that present the site's entire problematic, known at the time of the publication (Gogâltan, Sava 2010, 57–61; Sava, Gogâltan 2014).

An issue that has already been mentioned before (Gogâltan, Sava 2010, 60; Sava, Gogâltan 2014, 124, 25) concerns the archaeological excavations performed by M. Moga on the place called "Mănăstirea Bezdin". As we have previously emphasized, the site at "Wolfsberg" was known in literature under several names (see a discussion of the topic in Sava, Gogâltan 2014, 125). This fact has generated a series of confusions. For example, in 1948 M. Moga performed some archaeological excavations in the area of the village Sâmpetru German. According to E. Dörner, on that occasion certain archaeological objectives were tested, including the site "Fântâna Vacilor". The excavation was noted on an archaeological map preserved in the collection of the Arad Museum

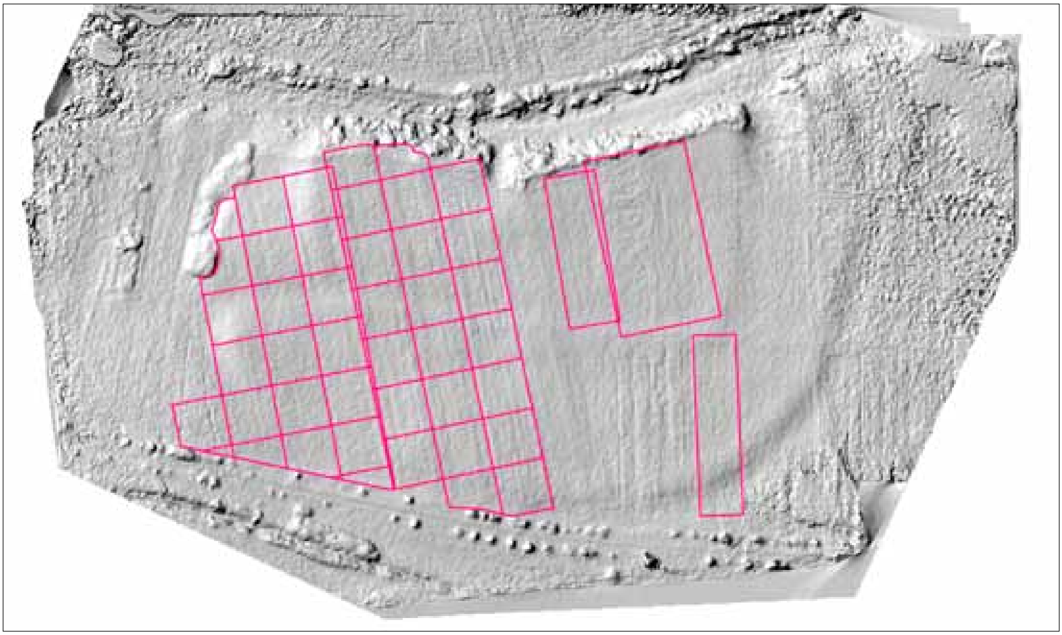

Fig. 9. The network of magnetometric measurements (pink polygons) – location and structuring in relation to the digital model of the terrain surface represented as *hillshade*

Complex. Besides this objective, Moga has also performed another test at "Mănăstirea Bezdin". He discovered there pottery fragments from the Bronze Age. The available information suggests that M. Moga's excavation was more than probable located on the site at "Wolfsberg".

This brief history of researches indicates that the archaeological objective at Munar "Wolfsberg" is not only little known to specialists but also insufficiently investigated.

The 2014 researches

Precisely in order to fill this scientific gap we have decided to perform a series of non-intrusive investigations at Munar "Wolfsberg", as part of the project entitled *Living in the Bronze Age Tell Settlements. A Study of Settlement Archaeology at the Eastern Frontier of the Carpathian Basin* (some of the results of the researches performed during 2014 have been published in Gogâltan 2016, 90–94). These were completed by archaeological test excavations in order to establish the relative and

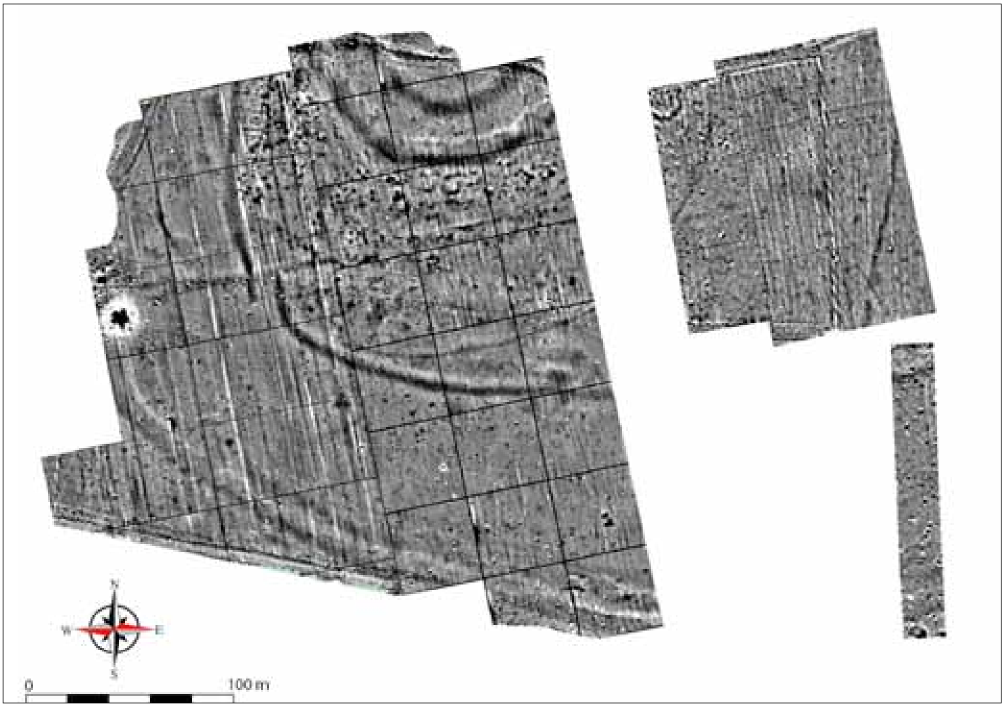

Fig. 10. Results of the magnetometric measurements

absolute chronology of the entire site. Excavationswere only initiated during 2017.

Performed during the winter of 2014, the first investigation focused on the topographic survey of the entire site (Fig. 6–7). On that occasion we have noted that the outer fortification reached the size of about 15 ha. The south-eastern and eastern sides of the outer fortification systems were visibly better preserved. The western side was poorly preserved, affected by some constructions from the modern and contemporary eras. The northern side displayed two, obviously man-made inlets into the river bed of Aranca. The terrace was probably cut during the Modern Era, when the already mentioned network of roads, also visible on the topographic survey, started to be used.

Subsequently, during the spring of the same year, we initiated the systematic field research. Our main goal was to establish, as much as possible, the relative chronology of the entire site. We also tried to identify the dispersion of the archaeological material. In order

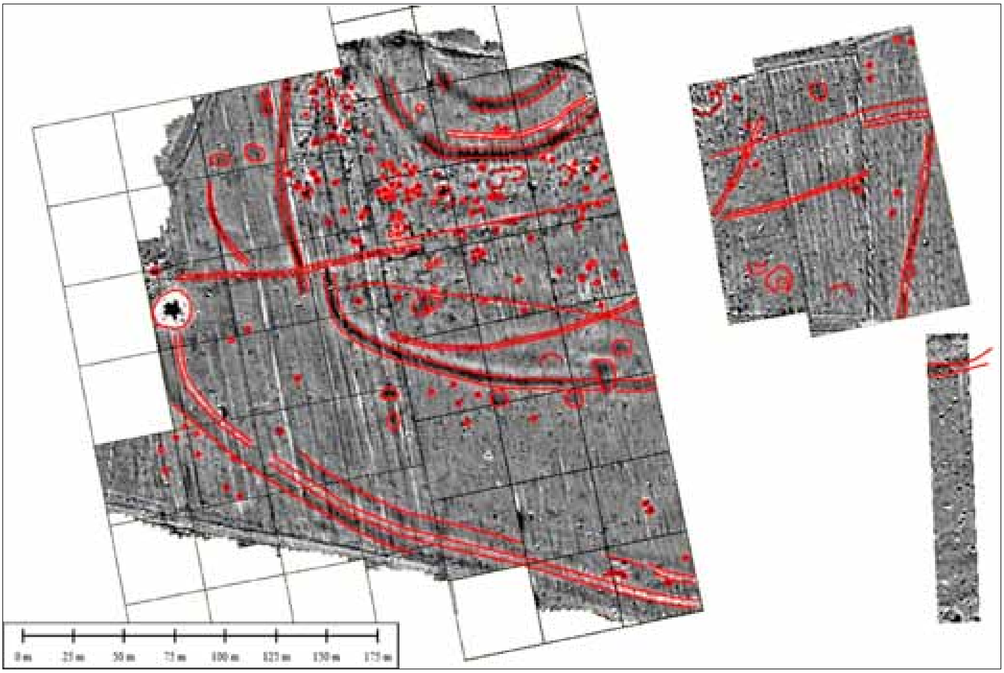

Fig. 11. Results of the magnetometric measurements with the anomalies

to achieve these goals we selected an area of 4 ha, located on the western side of the site. The reasons behind this choice were related to both the owner's consent and the structures' location on the site. The Bronze Age tell is also situated on the western side. Thus, the most numerous artifacts could be collected in that area, as the majority of the structures were there.

Starting from the 40×40 m grids required by the magnetometric measurements, the chosen surface was divided into grids of 4×4 m (Fig. 8–9). All the archaeological materials found at ground level (pottery, bones, stones, adobe) were collected. Each grid was allotted a technical record, filled in on site. It contained a series of fields for recording all data available during this type of research.

Despite that the results of the field research are not completed yet, one may sketch the site's chronological development. Certain hypotheses may be formulated regarding the dispersion of the material according to the chronological stages of its development. To the entire team's surprise, the earliest identified pottery fragments belonged to the Late

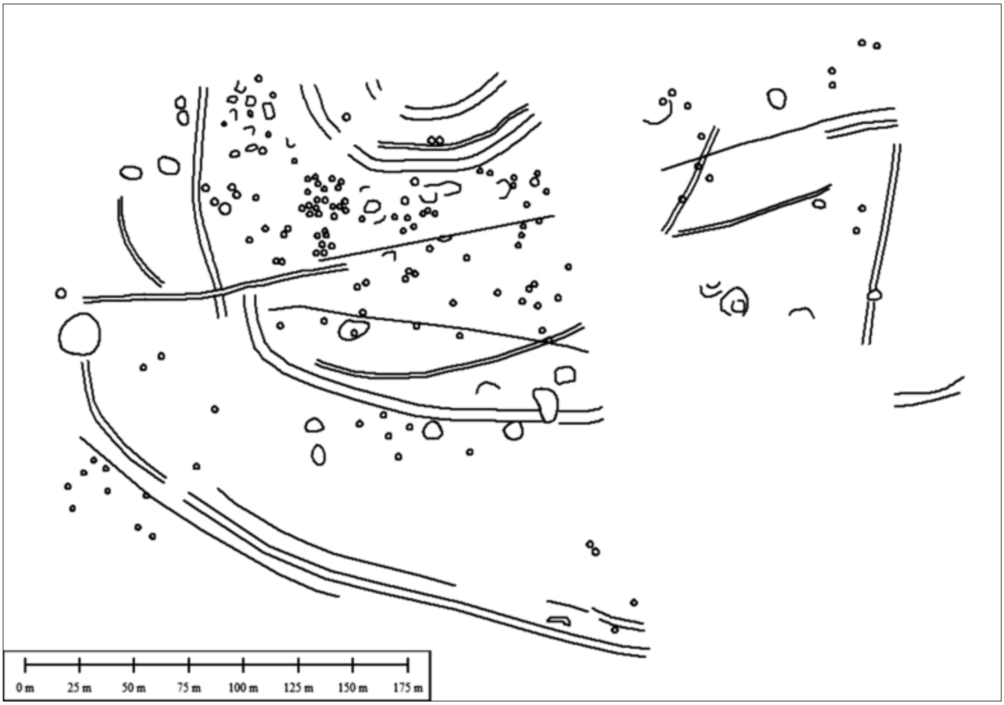

Fig. 12. Sketch of the magnetic anomalies

Eneolithic Era. The dotted and grooved decoration belonged, beyond doubt, to the Baden pottery style. From the point of view of the number of fragments, the Eneolithic pottery forms a restricted lot. The subsequent chronological horizon may be placed during the Middle Bronze Era. Ever since the first field researches performed during 2007 we were able to note the existence of this chronological horizon. The pottery fragments in question were decorated with typical Cornești-Crvenka motifs. The artifacts of this period form the largest lot by far. They are mainly concentrated in the north-western side of the site. Although it was quite clear from the very beginning, the Middle Bronze Age pottery and the majority of the adobe pieces were concentrated on the surface of the tell. Rather numerous pottery fragments, decorated with wide grooves in the style of the Late Bronze Age, were discovered in the western and south-western parts of the researched area. Several fragments dated to the Second Iron Age, tempered with graphite, were also found, scattered. The final habitation horizon, identified during the

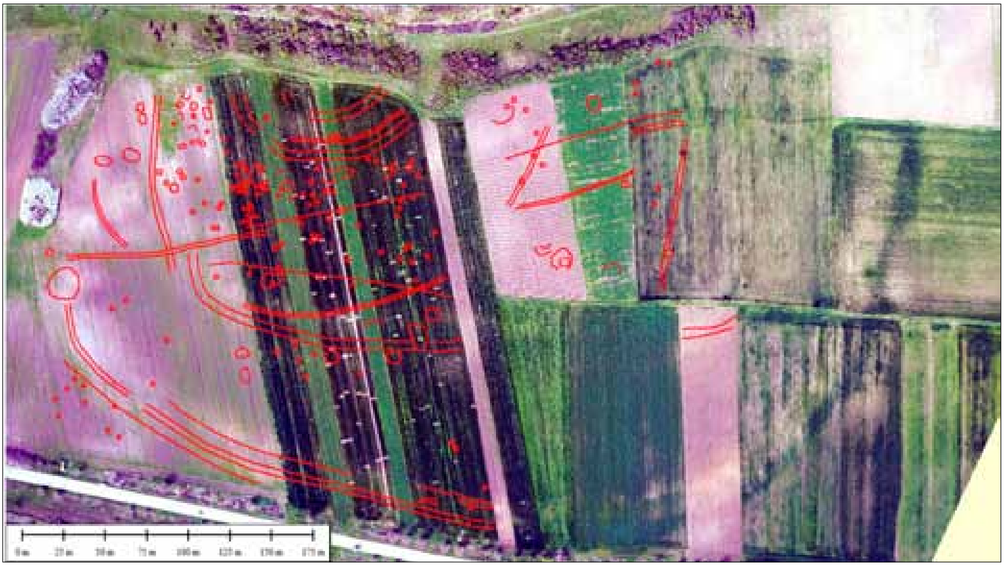

Fig. 13. Overlap of the interpretation of the magnetic map onto the ortho-photo plan (UAV)

field research, may be dated to the 18th–19th and even the 20th century. As we were able to note, the modern pottery fragments and the numerous bricks discovered confirm Milleker's statements regarding the existence of a keeper's house. Numerous pieces of evidence for the existence of a modern building were identified in the north-western and western corners of the fortification.

Magnetometric measurements and systematic field researches were performed at the same time. The first covered an area of 8.7 ha and overlapped the grid of the field research (Fig. 9). The measurements have led to the identification of numerous anomalies (Fig. 10–13). Though we are aware of the limits of this type of research, the results of the magnetometric measurements were relevant for establishing the main characteristics of the site. At the same time, the site's planimetric development and its structure were more than obvious. The most visible of the anomalies consisted of six ditches and one rampart that enclosed different areas of the site. Starting from north to south we have identified the existence of five enclosures that were in almost concentric succession. Among the most visible anomalies, revealed on the magnetometric ground plan, were two concentric ditches,

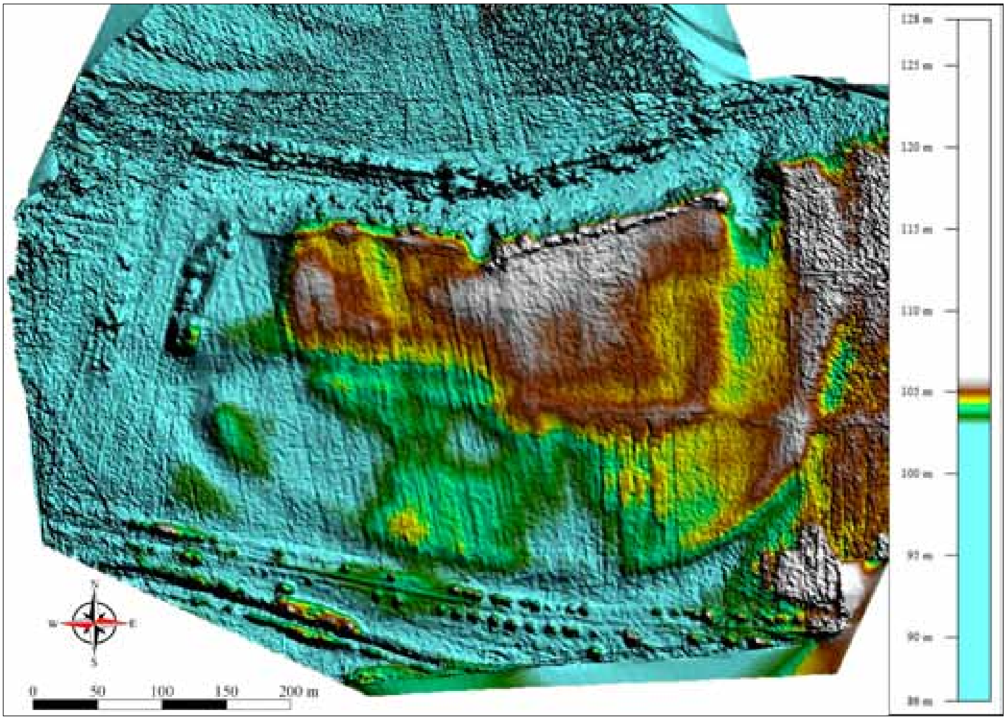

Fig. 14. Digital model of the surface

semicircular in shape. They were dug starting from the edge of the terrace. The first ditch enclosed an area of 70×40 m (0.28 ha) and very small anomalies could be seen inside this enclosed space. The second ditch, located 20–22 m south of the first, enclosed an area measuring 110×60 m (0.66 ha). Only four significant anomalies could be observed in the area between the two ditches. Among them was a narrow ditch located at a small distance behind the second ditch, doubling it. It is possible that the empty area, of approx. 5 m, located on the south-western side of both enclosures, marked an entrance.

Although the first two enclosures were in close proximity of what we have labeled as the "center" of the tell (its highest part), we have noted surprisingly few anomalies. We initially believed that the absence of structures was due to modern agricultural works and the erosion affecting the edge of the terrace. At the same time, the northern side of the site showed traces of military trenches. Subsequently, the 2017 test excavation came to contradict the hypothesis of erosion, confirming

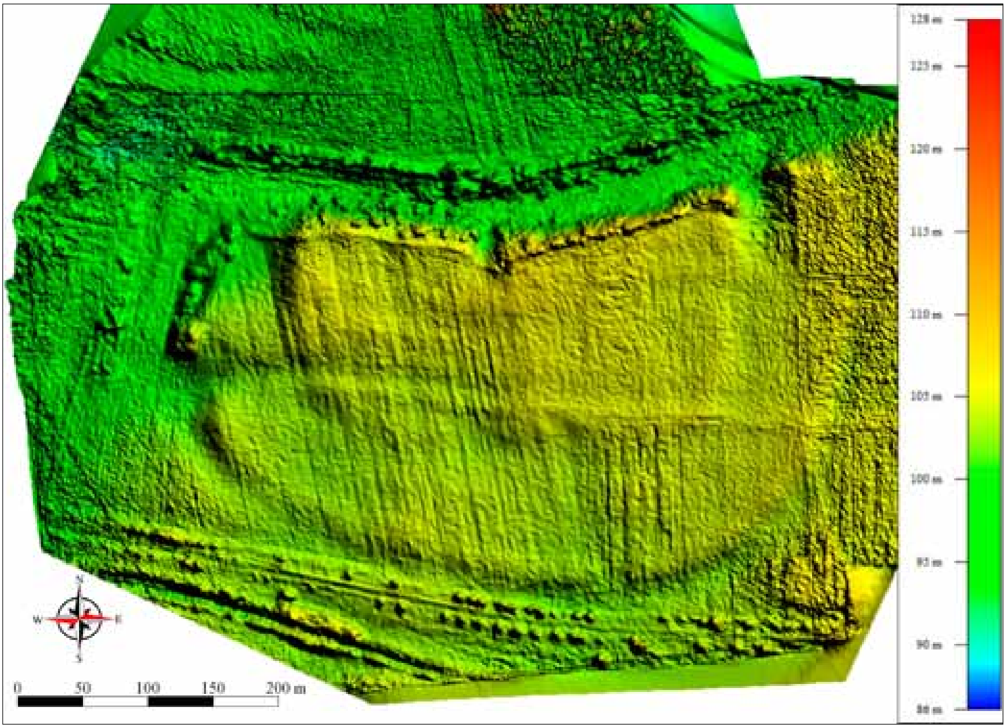

Fig. 15. Digital model of the terrain's surface (including the level of the vegetation in the beginning of April 2014), obtained through photogrammetric means on the basis of images obtained with the UAV

that the absence of features must be explained through the continuous exploitation of space ever since the Middle Bronze Age.

Also visible was a third ditch, narrower than the others, but enclosing a larger area. One could easily observe that, towards west, the ditch was interrupted over a considerable distance by a fourth ditch, much better stressed. The third enclosure housed the largest concentration of anomalies. The overlapping of the magnetometric plan and the aerial photographs indicated that this space clearly set apart the depositions of the Middle Bronze Age tell from the rest of the site.

As already mentioned, the third ditch was overlapped by another, more visible one. The latter measures 3–4 m in width and encloses an area of ca. 8 hectares. The chosen shape of the western entrance is novel, as the access way is "tangent".

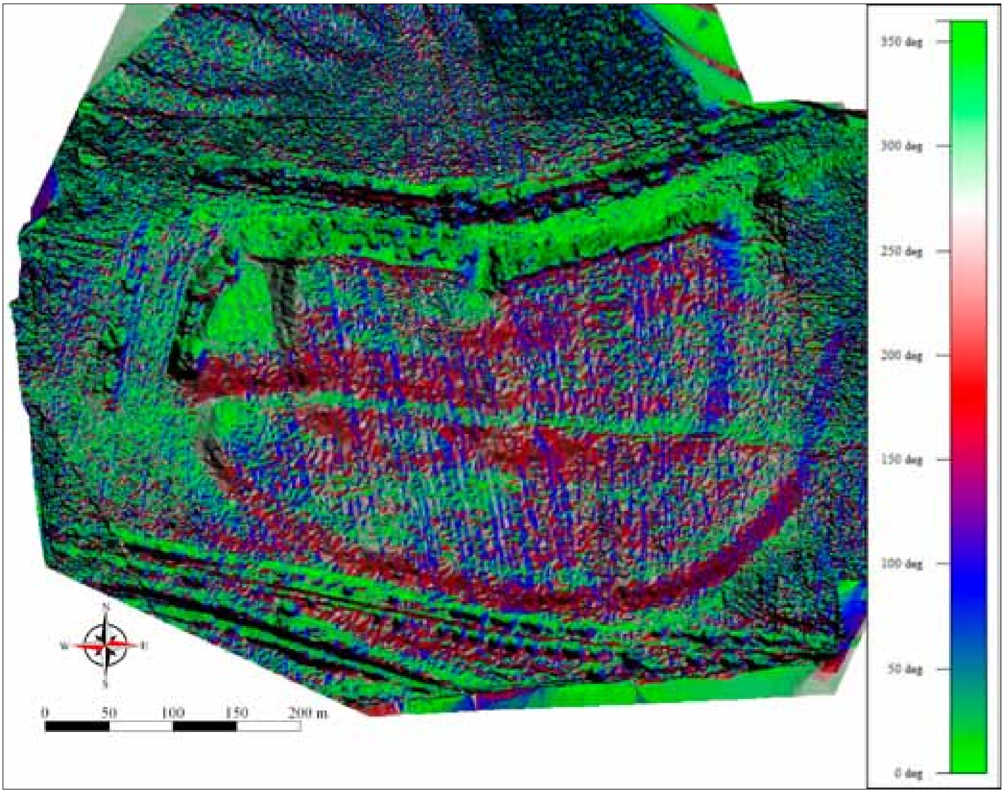

Fig. 16. Digital model of the surface – slope exposure

The fifth system of fortification consisted of a rampart and a ditch that enclosed an area of about 15 hectares. Like in the case of other contemporary fortifications in the Lower Mureş Basin, behind the rampart one may notice a ditch obtained when the earth for the rampart was excavated. The rampart measures 1.5 m in height and 15 m in width. In some areas there are traces of firing of the palisade that once stood on the crest of this structure. At the same time, on the magnetometric map one may follow the network of modern roads that cross the site from east to west.

Besides the non-invasive investigations mentioned above, we have also obtained aerial photographs shot from a drone. Based on these photos and the topographic survey we have generated the digital model of the surface including the exposition of the slopes, an image of the level curves at an interval of 0.5 m generated on the basis of the digital

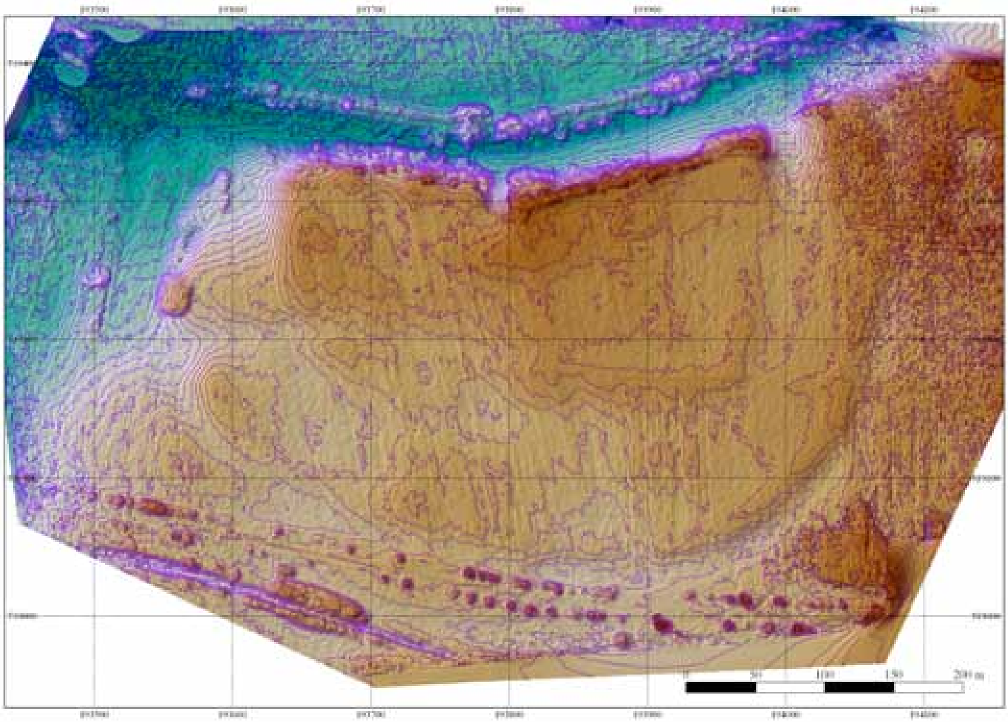

Fig. 17. Level curves at 0.5 m intervals generated on the basis of the digital model of the surface (including the vegetation)

model of the surface (including the vegetation) and the digital model of the terrain's surface (including the level of the vegetation in the beginning of April 2014) (Fig. 14–17).

The 2017 researches

A test trench was performed in May 2017 in order to verify the stratigraphy in the tell's northern area and to collect relevant samples for radiocarbon dating. Studying the magnetometric results we have chosen to set the small test trench inside the first enclosure. The optimal area was selected approximately 20 m away from the tell's "center". There, the land was not cultivated and the consistent archaeological depositions seemed ideal to the purpose.

Fig. 18. Southern profile of section S1/2017

Measuring 3×2 m the test trench was labeled section S1. It was located in the northern margin of the terrace and, as mentioned above, inside the first enclosure.

In the excavated area, the stratigraphy was simple (Fig. 18): the first layer between 0–10 cm was the vegetal layer, gray in color, not very compact. Fragments of pottery that could be dated to the Middle Bronze Age, the Second Iron Age and the Modern Era were discovered in the fill. The second layer was outline between 10–50 cm, its soil was light gray in color, pigmented with adobe, and the same type of artifacts as in the first layer were discovered over its entire thickness. A layer of dark gray clayish soil became apparent between 50–80 cm and a fragment of a modern roof tile and pottery fragments from the Middle Bronze Age were identified at its base. The fourth layer developed between 80 cm – 1.30 m, the soil was very dark gray, rather granulose in consistency, and contained pottery from the Middle Bronze Age. A gray-yellow soil pigmented with pieces of adobe became apparent between 1.30 m and 2 m and this layer contained pottery fragments from the Middle Bronze Age.

In the test trench opened in the spring of 2017 we have noted the complete absence of structures or other archaeological features. Relatively few archaeological materials were discovered in the five identified layers.

Taking into consideration the absence of archaeological features, the few artifacts and the absence of organic materials that would allow for radiocarbon dating, we were able to presume that the sector tested through section S1 was not an area used for habitation. Soil samples were collected for chemical analyses that might help us understand the use of the part of the site delimited by the first two enclosures.

Conclusions

The investigations performed on the site of Munar "Wolfsberg" were far from providing a coagulated perspective. The small test trench that did not lead to the expected results and the non-intrusive investigations presented a rather narrow spectrum of what the site really was. The entire complexity of the archaeological objective may only be proven by systematic excavations.

Although the type of performed researches does not allow for detailed analyses, one may certainly state that the site under discussion here is a good benchmark in the understanding of the Middle and Late Bronze Age in the Lower Mureş Basin. We should underline that the most numerous artifacts recovered during the systematic field research belong to the Middle and Late Bronze periods and the five fortifications certainly belong to these eras.

On the basis of available data alone one cannot establish in all certainty the chronology, the development, and the function of the five enclosures. For now, we believe there were at least two major chronological moments in the evolution of the Bronze Age settlements. It is possible that the first three, possibly the first four enclosures were in close connection to the Middle Bronze Age tell. One should note that these fortifications were only delimited by ditches. The fifth fortification system, that enclosed the largest surface, was built differently; it was massive, provided with a rampart and a ditch that are still visible today. A burnt palisade was identified on the rampart's crest and another ditch, excavated when the rampart was erected, was found behind the impressive rampart. This construction system has good analogies among the Late Bronze fortifications at Sântana and Corneşti.

Besides the Bronze Age artifacts and structures, the systematic field research has also led to the identification of certain artifacts that belong to other chronological segments. The few Baden pottery fragments and those dated to the Second Iron Age might indicate the existence of not too ample and not too dense settlements. For the Second Iron Age one cannot eliminate the possible existence of funerary traces. Supporting this hypothesis one may notice in Fig. 10–13 certain magnetic anomalies that can be interpreted as ring graves. Some written data are also available for the remains that can be dated to the 18^{th}–20^{th}, maybe even to the 20^{th} century. One knows, for example, from B. Milleker's account, that at the Bezdin monastery the keeper's house was built on the site's surface, though the existence of other buildings cannot be excluded. It is obvious that these statements may not be considered certain in the absence of archaeological excavations.

Analyzing the inner structure of the site it is noticeable that the most consistent traces of anthropic activity are concentrated inside the third enclosure. This corresponds to the Middle Bronze Age tell. A somewhat novel aspect of the tell is the absence of structures in the area outlind by the first two ditches, a fact also verified by the 2017 test excavation. One can presume that this space fulfilled a different function than the rest of the tell.

Following the recently performed investigations we are in the classical situation in which we have more questions than answers. The lack of radiocarbon dates prevents us from establishing the absolute chronological connections between the Middle Bronze Age tell and the fortification dated to the late stage of the same era. We also cannot stress the chronological connections with contemporary sites such as Pecica "Șanțul Mare", Satu Mare, or Sântana "Cetatea Veche". Also, at the current state of research, one cannot explain why Cornești-Crvenka pottery was almost exclusively used in Munar while almost 7 km to the north, in the tell at Pecica "Șanțul Mare", people used pottery characteristic to the Mureș pottery style.

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Alexandru Popa*

Recent Magnetometric Researches at Zoltan, Covasna County. Some Observations Regarding the Limits and Inner Structure of the Noua Settlement in the Place Called "Nisipărie"

ABSTRACT

Popa A. 2017. Recent Magnetometric Researches at Zoltan, Covasna County. Some Observations Regarding the Limits and Inner Structure of the Noua Settlement in the Place called "Nisipărie". *Analecta Archaeologica Ressoviensia* 12, 101–108

Previous field researches in the location called Zoltan-"Nisipărie" revealed a settlement with several different cultural layers, among which those of the Noua Culture seem to be dominant. Along the past years researchers have conducted both systematic archaeological diggings as well as geophysical researches. Through the scientific research presented in the following report we set out to highlight the limits and structure of the settlement with the help of magnetometry. The results we obtained allow us to outline the eastern limit of the intensely inhabited settlement. Judging by the magnetic anomalies we identified, we can speak about a large number of pits that stand at the basis of the archaeological structures found in the Noua settlement at Zoltan "Nisipărie".

Key words: Transylvania, Bronze age, Noua culture, settlement, magnetometry

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Introduction

The archaeological site found in the place called "Nisipărie"[1] has become known in the 1960s, when locals gathered and handed over to Székely Zoltán different archaeological artefacts, mainly ceramic fragments and animal bones, found when they were exploiting sand in the area. After conducting a digging campaign, Székely identified a Late Bronze Age settlement on the left bank of the Olt River (towards the east)[2]. Researches conducted back then covered a small number of complexes, among which a so-called "ash agglomeration" belonging

[1] Zoltan locality, Ghidfalău Commune, Covasna County.

[2] The site's code in the Romanian National Archaeological Repertory (ran.cimec.ro) is 64381.01.

* National Museum of Eastern Carpathians, Str. Áron Gabór 16, CP 520008, Sf. Gheorghe, jud. Covasna, Romania; alex.popa@mncr.ro;
Lehrstuhl für Vor- und Frühgeschichte Universität Regensburg, Universitätsstr. 31 D-93053 Regensburg, Deutschland; alexandru.popa@ur.de

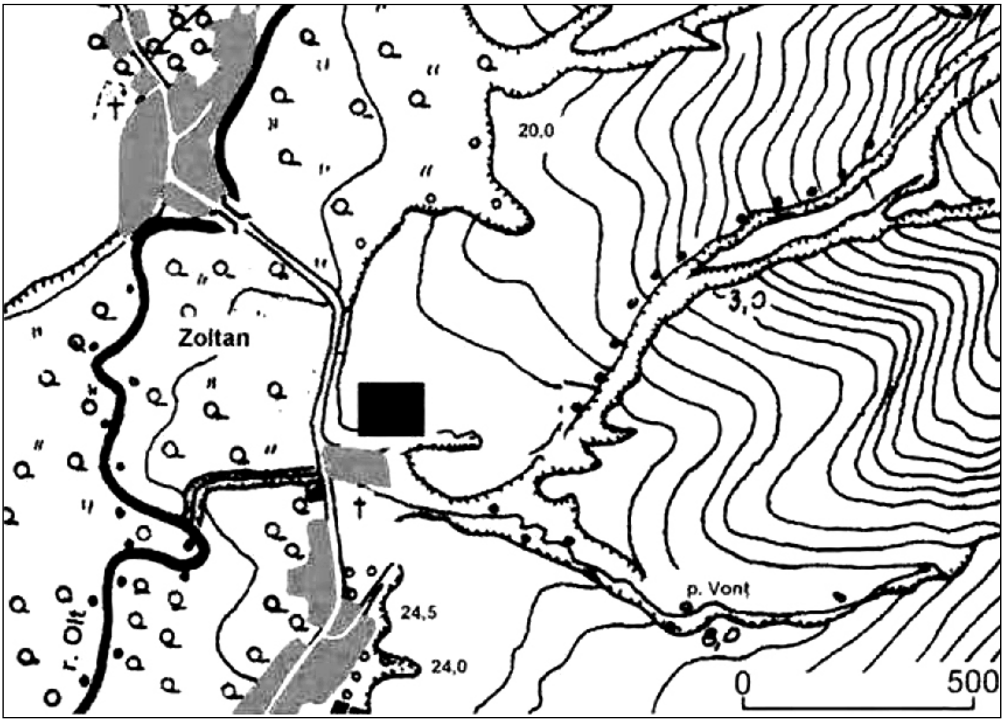

Fig. 1. The topographic position of the settlement at Zoltan (*after Cavruc 2003*)

to the Noua Culture (Székely 1976–1977, 26–27). Large scale researches were conducted during 1996–2001, by a team coordinated by Valeriu Cavruc (fig. 1)[3]. As a result of these researches (fig. 2. C1) there were identified traces of habitation dated in the late Eneolithic (Coțofeni Culture), the end of the Early Bronze Age (the Iernut – Zoltan Group), the Middle Bronze Age (Zoltan Group, mixing elements of the Monteoru, Costișa, Tei and Wietenberg cultures), as well as in the Late Bronze Age (Noua Culture, with Wietenberg elements). The research team is currently preparing the monographic report. This is the context in which, led by the need to document as thorough as possible the site, we conducted a series of interdisciplinary researches, including geophysical ones.

In the last decades the site at Zoltan became one of the most representative Late Bronze Age sites in Transylvania. Thus, the archaeo-

[3] For the bibliography until year 1998, see Cavruc *et al.* 1998, 86–89. For subsequent researches see Cavruc 2003.

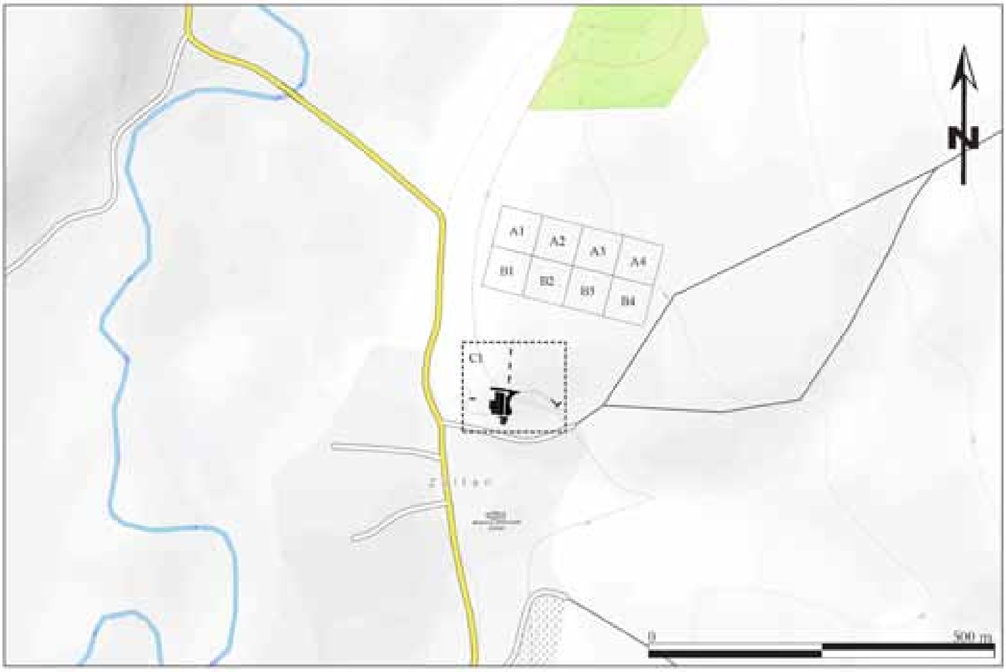

Fig. 2. The location in the field of the previously researched surfaces by archaeological diggings (C1) and the perimeters in which the vertical gradient of the terrestrial magnetic field has been measured (A1-4, B1-4)

logical monograph of the site that is soon to be published will become an important benchmark in getting closer to knowing and understanding the Late Bronze Age in Romania (Cavruc 2003, 95–96). Despite its importance, there was no possibility to continue the archaeological diggings at the site, the more so as a private investor has built an animal farm on a surface covering its northern part, previously delimited only by traces at the surface. Thus, it became more than necessary to conduct non-invasive researches in order to answer some of the most important questions related to the limits of the site and its inner subdivision. Taking into consideration the positive evolution of the magnetometric applications, developed during the last few years within our non-invasive research projects[4], we have conducted such a research during May 2017 within the Late Bronze Age site at Zoltan "Nisipărie".

[4] See, for example, Popa 2015.

The research method

In order to map the magnetic anomalies in the Zoltan site we have used an installation with five "Fluxgate" cores, aimed at measuring the vertical gradient of the terrestrial magnetic field. The cores were installed on a non-magnetic mobile support. The distance between the cores was of 0,50 metres, thus the measurements were conducted in 2,50 metres wide strips. The distance between the points measured by each core was of 0,05 metres. This type of magnetometric cores measure the vertical component of the magnetic field with a margin of error of about 0,1–0,5 nT. The measurements were made in rectangular perimeters, which were georeferenced with the help of a geodesic GPS. Using the ROMPOS real-time correction system we were able to get a precision of 0,02–0,04 metres. The topographic data acquired were saved using the Romanian national projection system "Stereo 70". The data acquired with the help of the magnetometer was interpolated following the "bi-linear quadrangle" algorithm and later on adjusted through the median filter. The results of the data interpolation were presented in the shape of a greyscale plan. The small values, corresponding to a lower magnetisation of the researched surface, are presented in lighter shades of grey, while the highest are presented in a darker shade.

In order to achieve our goals we have investigated at Zoltan eight rectangular perimeters with the dimension of 60×60 metres each (fig. 2. A1–4, B1–4). These were mapped in two rows, covering a total surface of about 28 800 square metres. Their positioning within the filed was determined by the limits of the animal farm (marked by fences) towards the north and by the limits of the geophysical researches previously conducted by a team coordinated by our colleague, Dan Ștefan, towards the south.

Results

The data processing led to putting together magnetometric maps for each perimeter we have investigated. These were later put altogether in a general plan, using a GIS application[5].

By looking at the general plan we can easily observe at least two major areas of interest, which are different from each other, based on the differences of the anomalies they present (fig. 3).

[5] We have used Global Mapper, version 17.2.

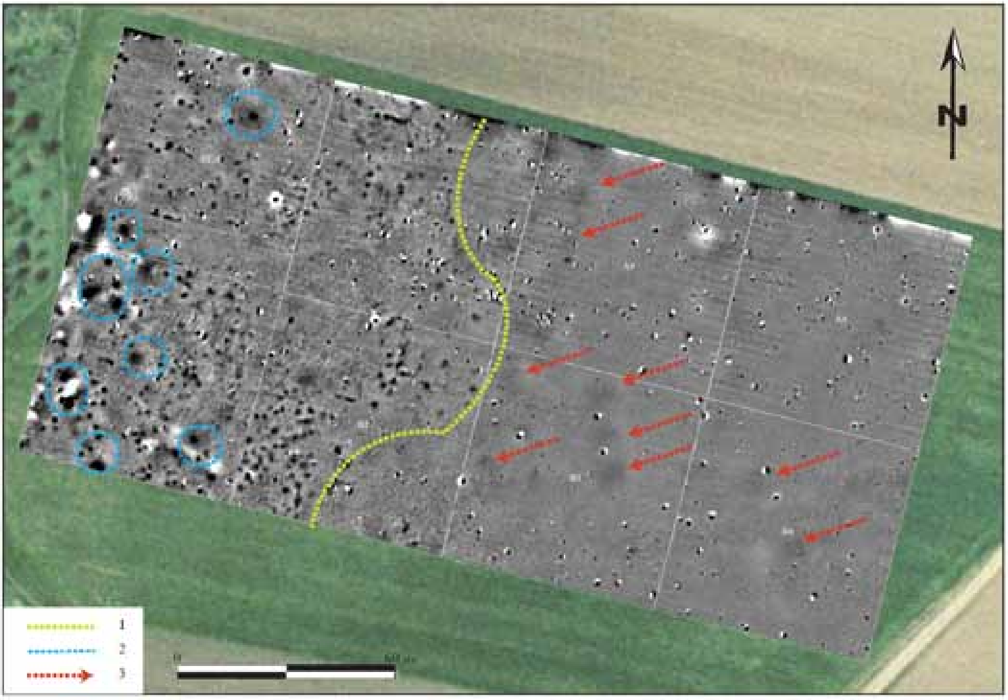

Fig. 3. The results of the magnetometric research in the Late Bronze Age settlement at Zoltan "Nisipărie", superposed on the orthophoto drawn up in 2007

In the eastern part of the researched area, mainly in the A3–4 and B3–4 perimeters, we identified a series of bi-polar magnetic anomalies that prove to be, most of the times, metallic wastes with high magnetic properties. The dimension on the magnetometric map of each of these anomalies is determined by the objects' dimension, as well as by the depth at which they are found. Another category of anomalies in the area shows a less pronounced dynamism of their magnetic values. The magnetic anomalies have an irregular shape that varies from case to case (fig. 3.3). Some of them could represent possible archaeological structures, while others seem to be traces of geological activities.

The western part of the researched area is structured differently. We refer mostly to the A1–2 and B1–2 perimeters. Here we could observe predominantly round-shaped magnetic anomalies that are sometimes grouped in larger structures. We can also observe here some large magnetic anomalies that have high positive values, and immediately next to them and around them several smaller ones (fig. 3.2).

Another specificity of the magnetic maps resulted after measuring the vertical gradient of the terrestrial magnetic field at Zoltan is the existence of some empty spaces between the agglomerations of magnetic anomalies, agglomerations which could be identified as traces of archaeological complexes. Among these we mention especially the empty space found at the intersection of the A1, A2, B1 and B2 perimeters that extends towards the southern half of the A2 perimeter.

Conclusions

The researches presented above were based on the method of measuring the vertical gradient of the terrestrial magnetic field, bringing some new elements to understanding the Late Bronze Age settlement at Zoltan "Nisipărie". First of all we can mention the dimension of the site itself. Analysing the magnetometric maps we were able to establish that the settlement's eastern limit is found at about 120–130 meters away from the western limit of the Olt River's left bank. We can associate the settlement's limit with the contact line between the two areas where the magnetic anomalies are agglomerated, mentioned above. We were not able to reach the settlement's northern limit. According to all probabilities, the archaeological complexes we identified through the magnetic anomalies in A1 and A2 perimeters continue towards the north, under the surface on which today we can find the recently built animal farm. In the future we plan to further investigate the site, especially towards the north, behind the animal farm, if we have proper access to the surface.

Regarding the inner subdivision of the site's researched surface, we can estimate that the settlement had some very well delimited, intensively inhabited areas, separated by areas free of buildings (empty spaces). The more intensively inhabited areas are concentrated towards the settlement's western limit whilst towards the other direction the level of inhabitancy decreases. The character of the magnetic anomalies, and thus of the archaeological complexes changes, so based on this observation we can assume that this space has been used differently than the one close to the limit of the Olt River's terrace. These observations could be verified in the future through punctual, small scale archaeological diggings.

Acknowledgements

I thank all my colleagues from the National Museum of Eastern Carpathians for their support given throughout the researches of this site. Special thanks go to Valeriu Cavruc, Dan Buzea and Dan Ştefan, whom have significantly contributed to carrying out this research. I am also very grateful to Mr. Jan Lapöck from the University of Regensburg, who joined me during the field researches.

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Agnieszka Půlpánová-Reszczyńska*,
Marek Půlpán**, Roman Křivánek ***

Geophysical Survey and Archaeological Excavations at the Roman Period Cemetery in Nezabylice (Chomutov District, Northwest Bohemia)

ABSTRACT

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This article presents the results of geophysical surveys, which were carried out during the period between 2011 and 2016 at the Roman period cemetery in Nezabylice (Chomutov district, Ústí Region, NW Bohemia). Thanks to these non-destructive surveys, the unusually large scale and signs of the inner structure of the cemetery have been unveiled. On this basis, long-term systematic archaeological research has been carried out, so far uncovering a number of urn graves with military equipment, pit cremation graves, an elite inhumation grave, and several regular structures from Roman period. The results of the comprehensive research suggest that it is the largest and richest cemetery of the Roman period in northwest Bohemia. However, the site is gradually being devastated not only by cyclical agrarian activities but also by the impact of illegal plundering. Therefore, an important aspect of non-destructive surveys is the recording of the current state of the burial ground, the information value of which is gradually degrading.

Key words: northwest Bohemia – geophysical survey – Roman period – cemetery – cremation graves – inhumation grave

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1. Introduction

For the early Roman period in Bohemia, besides the poor state of knowledge of the settlements, the rather unsatisfactory state of research of chronologically contemporary burial grounds is also mentioned (Droberjar 2008, 11–14; Droberjar, Vích 2011, 23). A substantial part of the larger sites was explored at the turn of the 19th century, and other

* Institute of Archaeology, University of Rzeszów, Moniuszki 10 Street, 35-015 Rzeszów, Poland; areszczynska@archeologia.rzeszow.pl

** Institute for Preservation of Archaeological Heritage of north-western Bohemia in Most, Jana Žižky 835 Street, 434-01 Most, Czech Republic; pulpan@uappmost.cz

*** Institute of Archaeology of the CAS, Prague, Letenská 4 Street, 118-01 Prague 1, Czech Republic; krivanek@arup.cas.cz

cemeteries research was carried out by the middle of the last century (e.g. Břeň 1953; Droberjar 2011; Motyková-Šneidrová 1963; 1967; Lichardus 1984; Preidel 1930; Zápotocký 1969). Discoveries of new burial places have occurred quite rarely not only in Bohemia, but also in Moravia in recent decades (Droberjar 2015, 103–125; Droberjar, Vích 2011, 23–38; Droberjar, Vojtěchovská 2000, 217–218; Droberjar, Waldhauser 2012; Hornik, Bláha 2015; Vachůtová, Vlach 2011, 58–59). One of the rare exceptions in this respect is the recently discovered cemetery at Nezabylice locality in northwest Bohemia (Blažek *et al.* 2014; ibid. 2015; 2016; in print; Půlpánová-Reszczyńska *et al.* 2017). The objective of the article is to present the current results of detailed geophysical surveys, thanks to which the scale and internal structure of the burial grounds were partially recognized on this site. On the basis of these measurements, the archaeological excavation showed a typologically diverse spectrum of funerary features that greatly enrich and extend the knowledge of the burial rite of the Roman period. The research has also highlighted one major problem, namely damage caused by existing human activities that cause gradual devastation of the site. For these reasons, the Roman period cemeteries currently represent some of the most endangered archaeological relics in Bohemia, which besides protection require complex and systematic research (cf. Vachůtová, Vlach 2011, 57).

2. Location and natural environment of the site

The archaeological site is situated in northwest Bohemia less than 2 km south-east of Nezabylice (Chomutov district, Ústí Region) and, in the same direction, about 7 km from the centre of Chomutov. The burial ground is located at an altitude of about 320 m on the highest river terrace forming an elongated plateau. The exposed landscape position provides good visual control of the surrounding area. The Ore and The Doupov Mountains, Džbán Uplands and the volcanic hills of the Central Bohemian Highlands are in the viewing distance of the locality (Fig. 1).

Considering the geomorphological division of the Czech Republic, the Nezabylice locality lies in the "Podkrušnohorská oblast" region, in the sub-region of "Mostecká pánev", in the area of "Žatecká pánev" and in the "Blažimská plošina" district. It is a rugged upland formed by erosion-

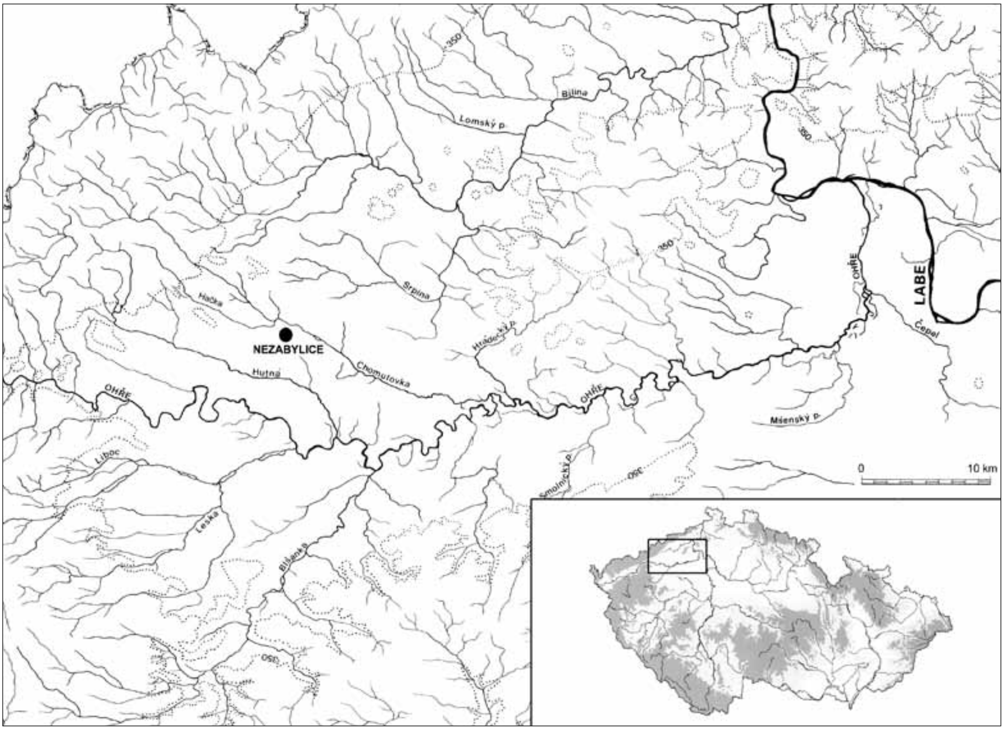

Fig. 1. Location of Nezabylice, Chomutov district, Ústí nad Labem Region, north-west Bohemia (*map modification M. Sýkora*)

accumulation processes of the Eger River and its left tributaries (Bína, Demek 2012, 121–123; Demek, Mackovčin 2006, 72; Lorber 1998, 18–28). The nearest water source of higher order is the Chomutovka River, which flows about 1200 m north of the site. In the Nezabylice municipality the left-side tributary of the Hačka stream flows into it. Another nearby water source is the Hutná River (Lorber 1998, 21, 184–188).

The predominant local rocks form quaternary eolic loess and ochre clay loam, to a lesser extent also clays, sands and sandy clays (http://mapy.geology.cz/geocr_50/). According to field observations, the subsoil at the site of the site consists of compact dense orange-ochre clay with black veins. The topsoil has a thickness of about 30 cm. With regard to pedological conditions, the local soil species are among the heavy soil type from brown to black ground (Kol. aut. 1954, mapa 5, 6). The area falls between the beech-oak and oak-beech vegetation stages with the occurrence of thermophilous plant species. With regard to the climatic conditions, it is a warm area with low summer precipitation (Demek, Mackovčin 2006, 17–18, 72; Kol. aut. 1954, map 10–12, 17; Lorber 1998, 26, 29, Annex 3). Since the middle of the last century, the agricultural fields have mainly been used for beet and barley cultivation (Kol. aut. 1954, map 7).

3. Finding and research circumstances

The cemetery of the Roman period at Nezabylice was discovered by two amateurs in October 2010, during an illegal survey with metal detectors. At the beginning of November, several tens of metal objects were brought to the Regional Museum in Chomutov: iron swords, spears, fragments of shields, spurs, bronze vessels and their handles, brooches etc. (Blažek *et al.* 2014, 801). In 2011 rescue excavations were carried out. Since 2012 systematic archaeological research has been running on the basis of an international agreement between the Czech and Polish archaeological institutions, represented by the Regional Museum in Chomutov, the Institute for Preservation of Archaeological Heritage of north-western Bohemia in Most and the Institute of Archaeology Rzeszów University[1].

4. Determining total area of the cemetery

Before commencing archaeological research in 2011[2], we faced the task of effectively determining the overall extent and course of the burial site. Based on the GPS coordinates of targeted detector findings projected onto the geodetic plan, the approximate range of the site was estimated in the first phase, i.e. we determined its part with excavated metal findings originating from disturbed graves. Based on the spatial distribution of the findings and the given terrain situation, a square mesh of 50×50 m was set on the area, the orientation of which was adapted to the course of

[1] Regular research is possible not only thanks to the agreement with the landowners (AGRA Droužkovice s.r.o.), but also thanks to the financial contribution from the Department of Culture and Conservation of the Regional Authority in Ústí nad Labem. The authors of the research are grateful to all interested persons and institutions for their contributions.

[2] In addition to geophysical surveys, other non-destructive methods are used in each research season. Detailed geodetic surveys, field metal detector surveys and systematic surface surveys are carried out.

the terrain edge. The network was further broken down into sectors of 1 are and further into squares measuring 5×5 m. In this area a detailed systematic survey using a five-channel magnetometer DLM-98-ARCH on a wheeled chassis (Sensys, Germany) was performed using five flux-gate gradiometers with FMG650B probes in a 0.25×0.1 m network[3]. Measurements showed that defined anomalies are not located only near the features picked up in the previous year by the detector surveyors, but on a substantially larger area. The total area measured in 2011 was ca 3.1 ha. Throughout all this space, a large amount (tens to hundreds) of small anomalies with high amplitudes of measured magnetic field intensity gradient (Fig. 2), i.e. smaller buried features, graves or individual metal artefacts, was documented (Křivánek 2012, 17).

During later measurements and research in 2012–2015, we assumed that the northern edge of the burial ground is likely to be at the top of the terrain edge (see Blažek *et al.* 2014, 807). This assumption, however, was refuted in the supplementary magnetometric survey in 2016, when an area of 0.256625 ha was measured along the assumed edge of the burial ground (Křivánek in print). The five-channel magnetometer DLM-98-ARCH on the two-wheeled chassis with flux-gate probe FMG650B was used for the measurement as well; a measurement density of 0.25×0.1 m. Surprisingly large number of other anomalies were found, where we cannot exclude the remains of buried graves or metal artefacts (Křivánek in print).

Based on current measurements, it is certain that the burial site did not end at the top of the terrain, but on the contrary, it could continue too much lower slopes that gradually descend towards the valley of the Chomutovka River. Under the existing conditions, it is only possible to speculate on the extent of the burial ground. It is likely that research has so far concentrated more on the central parts of the cemetery. The archaeological surveys have approached near to the western border, while in the northern, southern and eastern

[3] Geophysical surveys were conducted in Nezabylice between 2011 and 2016 in cooperation with the Institute of Archaeology of the Czech Academy of Sciences. Measurements in 2011 were carried out within the institutional support of the Institute of Archaeology of the Czech Academy of Sciences (RVO: no. 67985912). Surveys in 2015 and 2016 were carried out within the framework of the Regional Cooperation Project of the Academy of Sciences of the Czech Republic "Non-destructive geophysical research of significant and endangered archaeological sites in the Ústí Region" (no. R300021421, Křivánek 2014–2016).

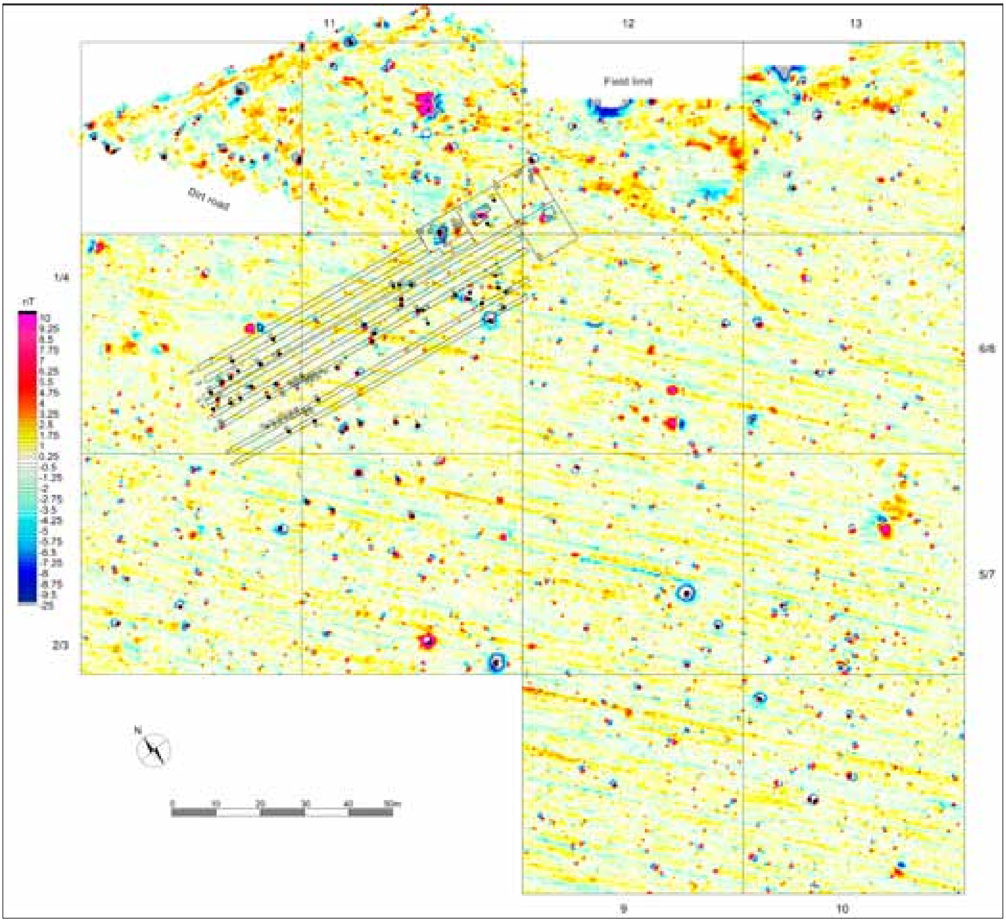

Fig. 2. Nezabylice, Chomutov district. The total results of geophysical surveys carried out by R. Křivánek in the years 2011–2016 on an area of ca 3.3 hectares, which showed dozens of bounded anomalies with high amplitudes of measured magnetic field intensity gradient

direction the burial grounds most certainly continue. With partial overlapping of the areas from 2011 and 2016, the total area investigated by magnetometers is about 3.3 ha (Fig. 2). Nowadays, we assume that the funeral complex is more or less all over this vast area, or it is formed by several small groups of graves on it. Only further systematic archaeological research can contribute to the unequivocal resolution of this question. Nevertheless, we are now working with a hypothesis that it is most likely the most extensive cemetery of the early Roman period in northwest Bohemia.

5. Detection, identification and verification of burial substructures

In the following paragraphs, we will focus on the identification of particular structures of the cemetery in Nezabylice. So far, based on measured geophysical anomalies, archaeological research has been able to verify and distinguish several types of features: 1) urn graves; 2) larger pit cremation graves; 3) metal artefacts; 4) regular structures; 5) inhumation grave from the Roman period; 6) prehistoric inhumation graves.

5.1. Urn graves

Due to the predominant funeral rite and the typical content of graves from Roman period (e.g. burnt anthropological material, ceramic urns, iron and bronze artefacts), we assumed that the graves would have to manifest as distinctly different magnetic anomalies over the measured area. This prediction was confirmed in the resulting magnetogram by a number of tightly bounded concentrations of smaller isometric and often dipole magnetic anomalies with high amplitudes of the measured magnetic field intensity gradient. Their number counts to several dozen[4] (Fig. 2). The dimensioning of the fixed square mesh, along with the magnetometer results, allowed a near-perfect verification of these anomalies in field research. The accuracy of their localization in the 5-meter sectors was surprising, as it fluctuated with a maximum deviation of several decimetres (up to 50 cm). In previous archaeological research, it has been confirmed that the vast majority of minor anomalies are urn graves from the Roman period, almost 50 of which were examined by the year 2017 (Fig. 3). Among them, the richly equipped („warrior" graves) predominate, with weapons and other equipment. There are seven different groups of graves with various combinations of weapons and other furnishing. There are three basic ways of placing goods in the graves: either in the urn, next to the urn or under the urn (see Blažek *et al.* 2014, 804–805;

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[4] The high positive values of nT can be attributed to the presence of ferromagnetic minerals, in this case represented mainly by numerous metallic artefacts (including swords, spears, shield elements, spurs). Other high positive values of nT could also be attributed to locally concentrated materials with a higher degree of burning and a characteristic so-called thermoremament magnetization (e.g. cremation in graves, burned ceramics or burned clay, daub etc.).

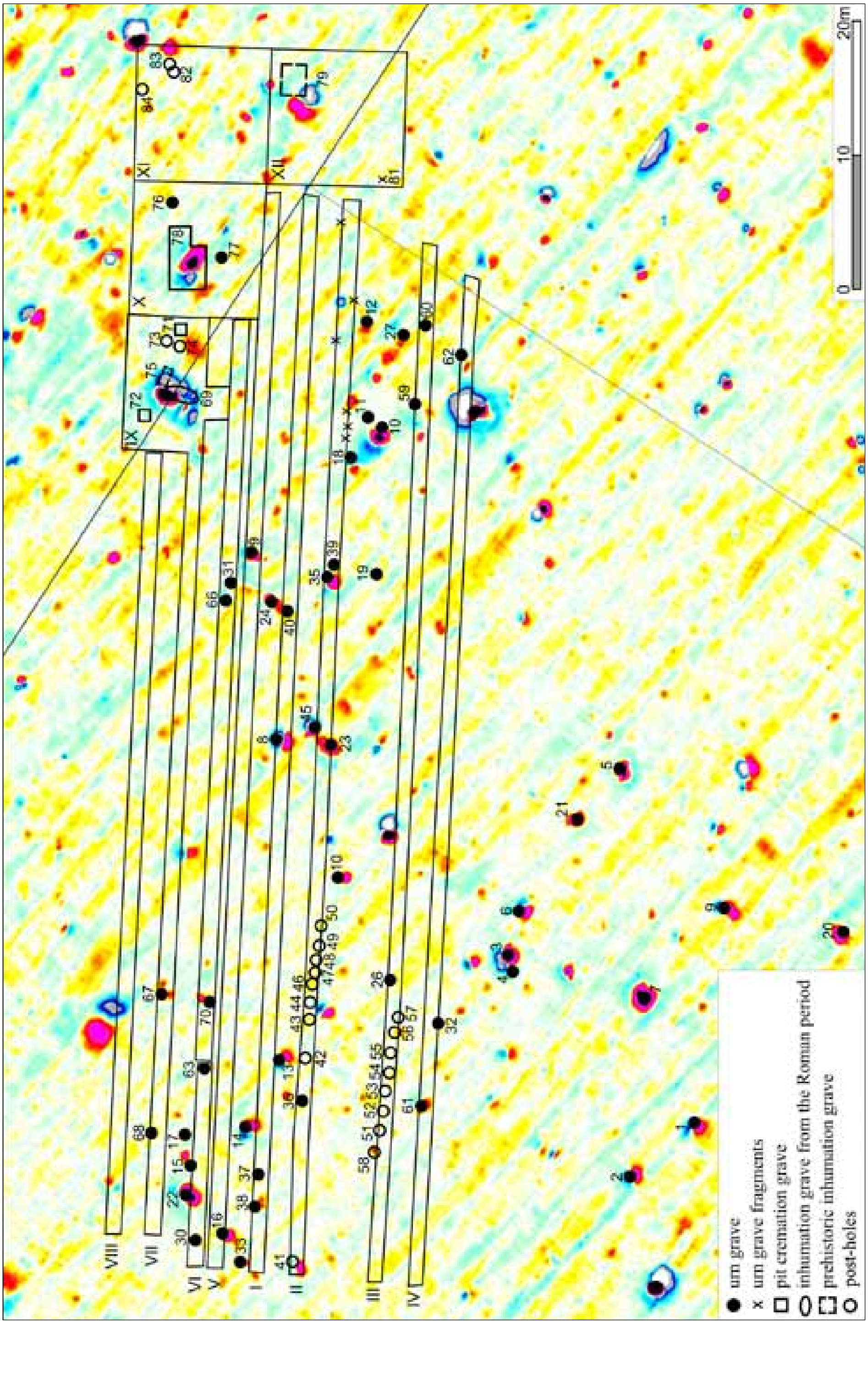

Fig. 3. Nezabylice, Chomutov district. Detail of the magnetometric measurement, on the basis of which an archaeological trenches I–XII was carried out in 2011–2017. On the area of the burial ground have been explored 84 archaeological features dated predominantly to the Roman period (*compiled by J. Šálý*)

cf. Droberjar 2002, 390). The most interesting is undoubtedly the third way in which a ceramic urn with cremation was found in the uppermost layers (mostly in the topsoil). Substantial parts of the grave equipment were located below the urn, forming an extremely concentrated cluster of metal artefacts. In a few cases, iron spears, fragments of shields (bosses, grips) or iron swords bent several times were found in these piles. Quite unusual was the positioning of some spears, whose heads were facing down into the ground, either in slant or perpendicular direction. A similar way is evidenced for shield bosses that are sometimes also buried with spikes facing down. Somewhat unclear remains the way these features were placed into the ground – they were located deep in compact underground clay without any apparent interference (Blažek *et al.* 2014, 805). The absence of visible grave-pits presents one of the major problems in the search for urn graves. Objectively, without the precise geophysical results, we would probably have no idea about the presence of most small features. It can be summarized that the magnetometric measurement is clearly the most efficient method of prospection of urn graves and the success of their detection depends mainly on the subsurface status of the graves conservation in situ[5].

5.2. Larger pit cremation graves

Very interesting type of features, found at the burial grounds in 2015 and 2016, are three larger pit graves with cremations. Two of them (feature 71, 72) were made up of smaller oval pits with a length of 140–160 cm and a depth of 75 cm or 125 cm from the current surface. In their fillings there was a compact layering of fractional ceramic material and burnt human remains probably from several individuals. The most interesting representative is undoubtedly feature 78 in the X trench (Fig. 3, 5). After its uncovering, it was found to be a regular square with rounded corners measuring 336×285 cm, with a 160×150 cm protrusion in the NE corner. The feature was oriented in the direction E–W, with its north wall reaching almost 5 m. From the level of – 40 cm, a stone structure with a width of 30 to 50 cm

5 The only minor problem proved to be the prospection of poorly equipped urn graves without grave goods and damaged grave fragments that were not recorded by geophysical or detector surveys. These graves were recorded only after a systematic archaeological excavation.

reminiscent of the staircase was recorded along the southern and western walls of the structure. Larger and smaller stones have been stacked in this space so that they closely fit together to form a compact and relatively horizontal surface. The maximum depth of the feature was up to – 170 cm.

From the filling of the structure comes a fascinating set of material culture of Roman period. Cremation remains from several human individuals with a total weight of more than 10.3 kg were obtained. No less arresting is a ceramic set of 5480 fragments. In addition, we can mention more than 100 tiny bronze and several iron artefacts, 30 fragments of bone combs, as well as fragments of glass objects and clay spindles. For the time being, it seems to be a rather unusual type of mass grave that points to the upcoming transformations and new tendencies in the burial rite in the B2 phase of the early Roman period (Blažek *et al.* in print). The varied and rich collection of these finds (mostly burned remains, concentrated fragments of ceramics and small metal artefacts) and partly also massive stone lining are probably the cause of this grave projecting as a large and distinct anomaly in the intensity gradient of the magnetic field (Fig. 3). Other similar magnetic anomalies (i.e. potential larger buried features, perhaps pit graves) are also present in previously unexplored parts of the burial ground: e.g. north of trenches VIII–XI or south and south-east of the existing trench group in square 6 (Fig. 4).

5.3. Metal artefacts

A systematic detector survey is carried out before each field research. Every year that yields a lot of metal objects from Roman period, which today lack specific archaeological context. Their largest number was recorded in 2011, but each subsequent season brings many other artefacts (e.g. fibulae)[6]. Only minor bronze and iron artefacts placed in the topsoil at maximum depths of up to 20 cm are excavated in detector

6 Predominant category were recent objects, mainly iron parts of agricultural machinery and tools, as well as various sheets, nails, screws, cartridges, etc. The largest amount of them was found in the first season in 2011, when more than 20 kg of scrap metal was collected. Positive impact of this activity was that in other magnetometric measurements in the following years there was no longer any negative interference caused by their presence. Nevertheless, every year at the beginning of the research, other (especially iron) objects connected mainly with modern agricultural or hunting activities are found.

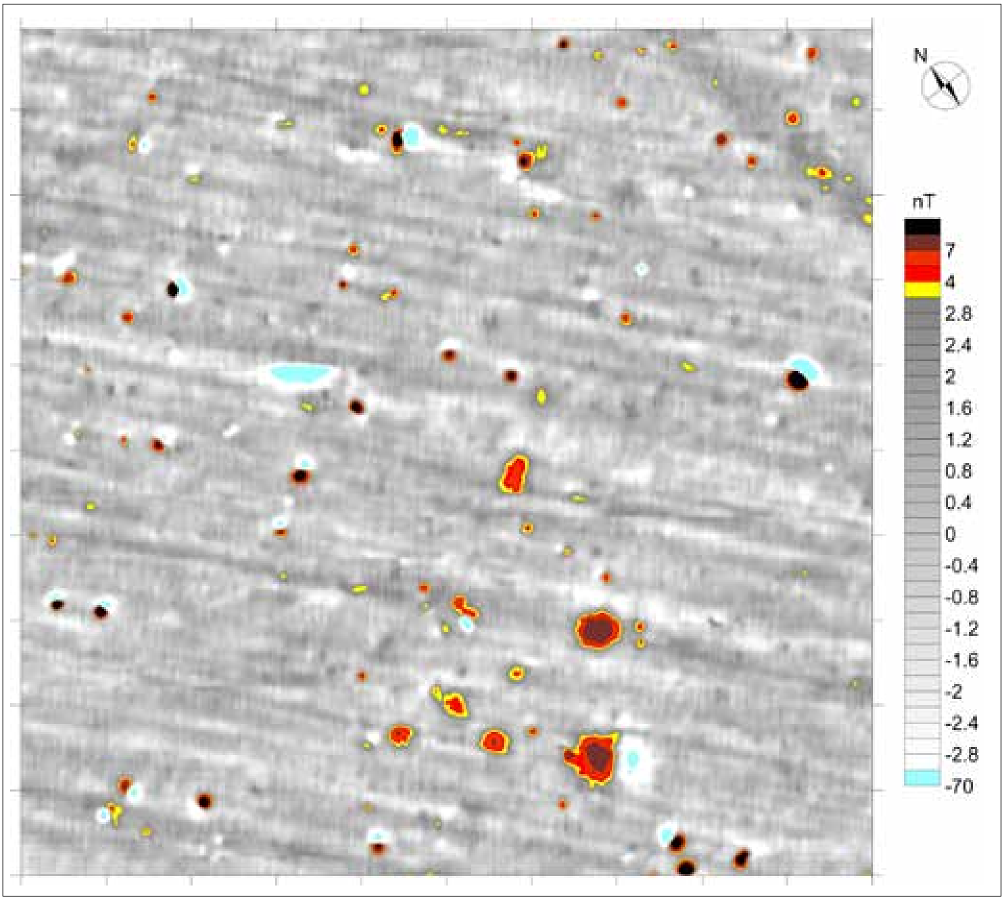

Fig. 4. Nezabylice, Chomutov district. Example of sub-result of magnetometric measurement in square 6. Determination of the most significant magnetic anomalies of various dimensions locally forming obvious groups (*measured by R. Křivánek in 2011*)

surveys. The localization of the findings is precisely geodetic focus. We assume that the majority of these artefacts were originally deposited in shallowly buried urn graves, and their transfer occurred during cyclical and intensive agricultural activities followed also by erosion and slope soil transfer. Metal artefacts appear on the magnetometer as small spot magnetic anomalies (oval or circular shape, red colour range, ca in the range of +4 to +10 nT depending on their size, depth and orientation). Their number can be estimated at several hundred in the area of the burial grounds (Fig. 2), while only the smaller part of them, namely several dozen, has been identified and verified.

5.4. Regular structures

Paradoxically, the largest spatial structure that has been archaeologically explored at the burial site had virtually no effect on the magnetogram, which we consider to be a very interesting circumstance. It was a large square trench covering about 8×8 m and about 50 cm wide. The entire course of the trench formation was actually found only because it was in two places in the superposition with cremation graves, which were examined by magnetometer. A similar situation occurred with two parallel rows of small post-holes with a diameter of up to 50 cm, which were revealed in the research only thanks to the system of narrow long trenches. In the magnetometric measurement, individual post-holes also showed only on a minimal scale (Fig. 3). This situation can be explained by the fact that, while small urn graves contain concentrations of highly magnetic material (cremation, ceramics and metals); these structures do not have similar materials in their fillings[7]. The filling of these features was probably not sufficiently magnetically different from its surroundings and subsoil, and therefore it may not appear at least in the final magnetogram.

5.5. Inhumation grave from the early Roman period

Until 2014, only urn graves had been identified at the burial site. The fundamental breakthrough occurred in the 2015 season, when the first grave with inhumation rite was explored (feature 69, trench IX). In an elongated grave-pit with dimensions of 320×100 cm, oriented in the N–S direction, an individual was buried at a depth of 1 m in the extended position on the back with his head facing north (Fig. 5). The grave dated to the B1 phase of the Roman period was equipped with a ceramic bowl and three bronze objects – pan type E 131, a belt buckle and a fibula. The individual was anthropologically pre-identified as an adult male with relatively distinctive musculature and an unusual body height of over 180 cm[8]. The inner space of the grave could have been either a wood-lined chamber or a wooden coffin. It is also impossible to exclude partial secondary damage (probably robbery). The grave's

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[7] The gutter contained only a few tiny ceramic fragments, the post-holes were mostly without any findings.

[8] The anthropological assessment of the skeleton in situ was made by Jana Kuljavceva Hlavová from Institute for Preservation of Archaeological Heritage of north-western Bohemia in Most.

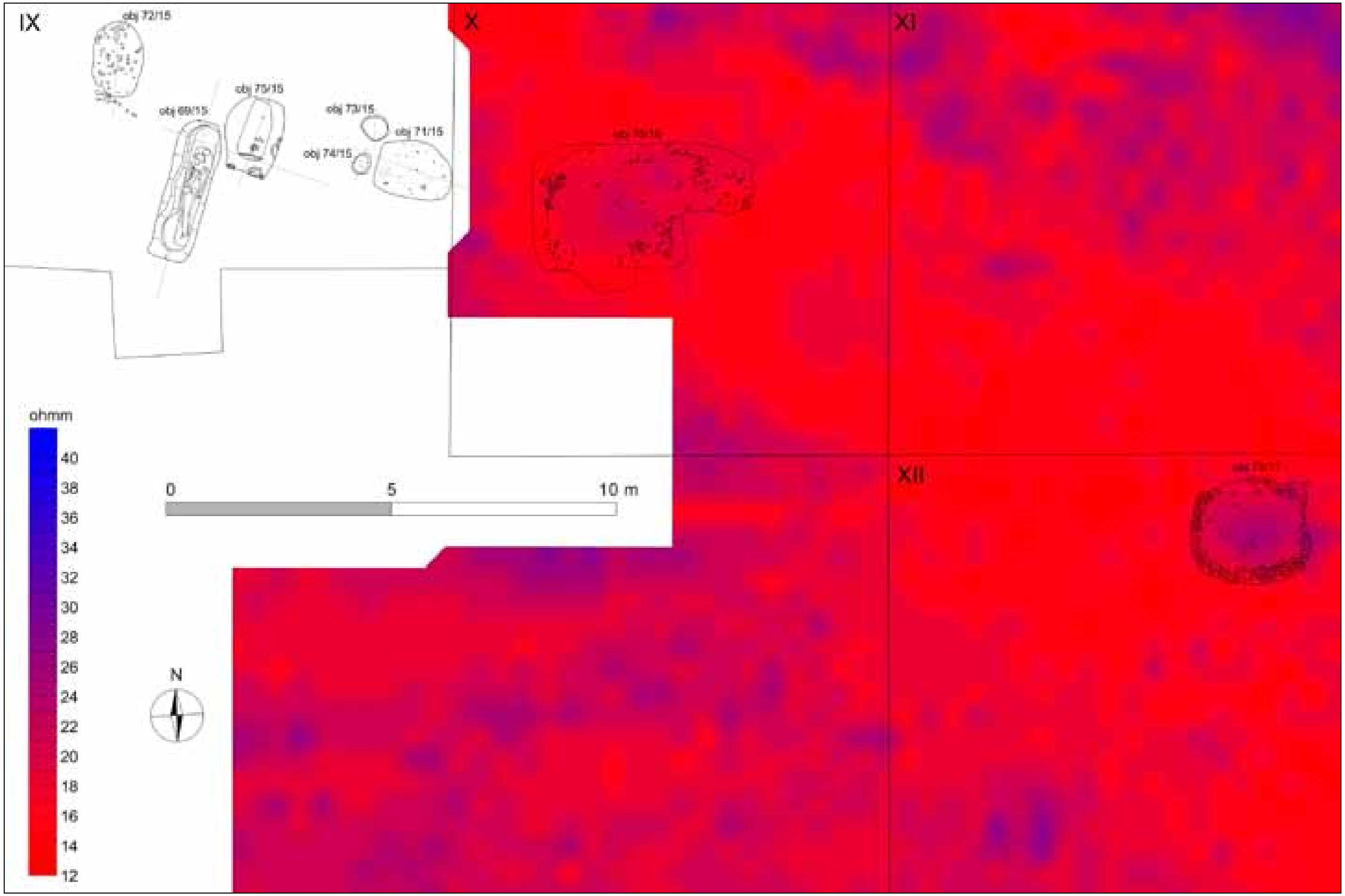

Fig. 5. Nezabylice, Chomutov district. Partial results of geoelectric resistance measurement (*measured by R. Křivánek in 2015*) and spatial distribution of graves on a part of the burial ground. Visible anomalies over the cremation pit grave of the Roman period in trench X and over the inhumation grave of the Corded Ware Culture in trench XII (*compiled by J. Šály*)

most important structural element was a massive and compact stone lining which was continuously deposited from the surface to the bottom (see Blažek *et al.* 2016, 24). The lining was predominantly quartz, rarely orthogneiss or basalt[9]. Probably due to the abundant presence of neovulcanic rocks and bronze objects, the grave was manifested as a distinct, large and irregular anomaly with different values of the magnetic field intensity gradient, indicating the presence of several nearby strong magnetic sources (Fig. 3).

It has been mentioned in literature several times that in the large cremation burial grounds there is no clear evidence of inhumation graves chronologically contemporary to B1 phase (after Droberjar 2006, 650; 2014, 431). In this context, the added benefit of the discovery is unprecedented and casts a whole new light on the burial customs. The undeniable significance of the find is already illustrated by the fact, that it is the first modern excavated grave from the Roman period in north-western Bohemia. A similar finding had not been made in the given area for the last almost 100 years (cf. Břeň 1953; Droberjar 2006, 650–652; 2011; 2014, 428–433; Lichardus 1984; Motyková-Šneidrová 1963; 1967).

5.6. Prehistoric inhumation graves (Corded Ware culture, Middle Bronze Age)

The results of geophysical measurements, of course, have their full use and justification even for features from earlier prehistoric periods, as confirmed by two inhumation graves. In a close spatial contact with the Roman period grave, an inhumation grave of the Middle Bronze Age was explored within the IX/2015 trench (Fig. 3, 5). Grave 75 was equipped with an inner stone receptacle, made up of massive flat plates of heavily weathered paragneiss. The burial belonged to a child and was equipped with a ceramic cup (Blažek *et al.* 2016, 23–24).

In 2015, an additional survey of geoelectric resistance measurements was carried out in the north and east of trench IX, while the main task was to determine the possible presence of other skeletal graves with stone structures (Křivánek 2016, 11). The measured area was 0.2743 ha. The measurements were made using RM-15 (Geoscan Research – U. K.), measuring density 1×1 m. Measurements were found to indicate rock

[9] Geological assessment was prepared by Miroslav Radoň, Regional Museum of Teplice.

aggregation in the topsoil or local influence of the changes of the eroded and sand-gravel terraces, including potential archaeological situations. The archaeological verification of the situations so far has shown not only the Roman period cremation pit grave 78, but also the inhumation grave of Corded Ware culture (feature 79) in trench XII (Fig. 5). In many respects, this was a very exceptional feature. Not only the unusually large dimensions (ca 260×230 cm), the depth (116 cm), but above all the interior arrangement, which consisted of a precisely crafted stone box (something like a "sarcophagus"). Until the findings in Nezabylice, similarly modified graves of Corded Ware culture were practically unknown in Bohemia (cf. Neustupný 2008, 131).

The remaining area measured by geoelectric measurements has not yet been archaeologically verified, but we assume that in its southern part there may be either a disturbed mound embankment or a partially damaged grave fill. Incidentally, in the presence of an older mound, we see one of the possible reasons why a large Roman period cemetery was established near Nezabylice. It is also possible to suppose observations made at other burial grounds, namely that the Elbe Germans could place their graves in older mounds (see Beljak, Kolník 2006, 58; Vachůtová, Vlach 2011, 58–59). Nor is it possible to exclude the possibility of Germanic tribes disturbing or occasionally robbing older graves in the mistaken belief that they are richly equipped graves of their contemporaries or recent ancestors. Although research is primarily focused on funerary monuments from Roman period, it is necessary to be aware that in the future we may come across a large number of graves from prehistoric times.

6. The contribution of geophysical surveys

Research in Nezabylice has shown that for the detection and identification of graves from the Roman period, magnetometric measurements represent a very effective and precise prospecting method, which is especially valuable considering complicated local pedological-geological conditions. The subsoil on the site is very dense compact clay, which, together with the local river sand-gravel terrace, does not constitute ideal conditions for a good geophysical record. The most positive finding is undoubtedly the presence of dozens of small and shallow urn graves that could hardly be traced without the use of magnetometer in archaeological research. Moreover, it was shown that the magnetometric survey indicated mainly the features fillings of which contained a large number of significant findings. The quality of the indication of the individual anomalies in the site depends, of course, on the size, depth, type and filling of the feature, but in the case of urn graves with metal artefacts it depends mainly on their content and the state of subsurface conservation. If there are strong magnetic materials (cremation, burned ceramics, ferrous and non-ferrous metals etc.), or if there is a large number of stones containing magnetic minerals in the structure, the quality of the indication of the measured anomaly is increased. This claim is confirmed by a spatially distinct feature (square trench), in which no similar materials were found, and which, therefore, showed on a magnetogram only marginally. The connection and the direct relation between the contents of the structure, its differences to the surrounding environment and the quality of the anomalies seem to be evident in this case.

No burial site from the Roman period had been discovered in the north-western Bohemia for the last 50 years. In the case of Nezabylice, therefore, it is the region's first cemetery studied in modern way, where non-destructive methods were used in the research for the first time. The significance and benefits of exploring this site are therefore indisputable and absolutely crucial. We suppose only the combination of non-destructive research and archaeological research brings a truly comprehensive range of information that we unfortunately miss in previous burial grounds research. At the same time, however, we must objectively state that even in newly discovered burial grounds, the transformation and post-deposition processes lead to the continuous and gradual devastation of graves. We will focus on this issue in the following chapter.

7. The issue of degradation and devastation of cemetery

One of the essential circumstances, which are fully manifested in the exploration of burial grounds not only of Roman period, is the preserved state of individual graves. The various post-deposition and transformation processes – that take place since the archaeological situation occurrence until its removal from the context during field research – have a major impact on it. Besides the pedological, hydrological and climatic conditions or the activities of flora and fauna, it is the human influence in the prehistory or in the recent past has the greatest influence on the preservation of archaeological situations (cf. Kruťová 2003; Neustupný 2010; Půlpán, Reszczyńska 2013, 190–192). Given that the burial ground is located on an agricultural land; human activities have the most powerful effect in this area. The local fields have been cyclically managed for at least 70 years, ploughed several times per year, then sown, several times chemically treated and eventually harvested while using heavy farming machinery (Blažek *et al.* 2014, 807)[10]. Traces of recent ploughing activity are well visible on the site, showing parallel line structures leading roughly in the NNW–SSE direction (Fig. 2, 3). In addition, ploughing has a natural effect on erosion-accumulation processes, where the topmost soil layers together with artefacts are transported to lower slopes[11]. The consequences of ploughing and erosion of archaeological features can be observed in the results of surface geophysical (mainly magnetometric) measurements of agricultural areas (cf. Křivánek 2015; ibid. 2017). Most of these transformation processes are primarily related to shallowly buried urn graves[12], whose damage is evidenced not only in the form of damaged ceramic urns, but also other grave equipment. Spatial redistribution of artefacts reaches several metres and includes dozens of pieces that are freely scattered on a large area of the burial ground. There is no doubt that these scattered objects originally formed parts of a complete sets of grave goods, but to determine their belonging to particular graves, constitutes an almost insoluble problem[13]. Fortunately, due to the friendly attitude of the landowners,

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[10] Long-term chemical treatment of land by aggressive agents (pesticides, herbicides, etc.) is reflected in the absence of objects from organic materials (wood, textile, leather etc.), decomposition level of skeleton remains, but also in a very poor state of preservation of metal artefacts. In spite of all the efforts the restorers and conservators did not succeed in stopping or at least significantly slowing down the corrosion process, and unfortunately, most artefacts continue to degrade. Therefore the finds are documented not only by drawing and photograph, but their X-ray imaging and 3D scanning are also planned.

[11] It must be added that the typical bad habit of Czech farmers is ploughing in a direction that does not follow natural terrain edges and contours, but are quite incomprehensibly perpendicular to the slope, which unfortunately accelerates the erosion of archaeological features.

[12] Besides, the problem is also the destruction of any potential mounds that have been erected over prehistoric graves (cf. Půlpán, Reszczyńska 2013, 191–192).

[13] Spatial redistribution of artefacts represents a rather serious problem, especially in the complex typological-chronological analysis of the burial grounds.

at least they agreed that part of the field, which will be examined next season, will not be subjected to agricultural activities. It is not a systemic measure that addresses the whole problem, because the remaining parts of the fields will be further cultivated, but in the given situation it is the only solution to ensure successful progress of research. At the same time, it is an attempt to correct – at least to a certain extent – the loss of other valuable contextual information about the burial ground (Blažek *et al.* 2014, 807)[14].

The second very negative factor is attributed to organized groups of „treasure hunters" who have been visiting the site with metal detectors, even though the Czech law expressly prohibits it. These amateurs repeatedly devastate individual graves and cause further irreversible damage to the site, leading to loss of significant information. At present, we have already recorded some completely destroyed graves, including exceptional findings (e.g. bronze bucket type E 28), about which we are no longer able to find any more details (cf. Půlpánová-Reszczyńska *et al.* 2017, 347).

The existing situation has a causal connection not only with the character of the then burial rite (predominantly shallowly buried urn graves), but also with location of the site. Most of the Roman period cemeteries today, similarly to Nezabylice, are frequently found on mild slopes in the deforested and agriculturally exploited landscape, which is most exposed to strong erosion (cf. Vachůtová, Vlach 2011, 43). Regularly cultivated and freely accessible agricultural land has an attractive potential for amateur surveyors. In this respect, Nezabylice unfortunately belongs to other typical threatened localities, which are experiencing repeated devastation and gradual degradation of the graves, and thus irreplaceable loss of information potential. At the conclusion of the analysis, we must state that at present, the Roman period cemeteries constitute one of the most endangered archaeological monuments in Bohemia, which in addition to effective protection require complex and systematic research in the future (cf. Vachůtová, Vlach 2011, 57). Also from this perspective, the future deployment of detailed magnetic field exploration in the other non-monitored parts of the burial ground appears to be a necessity.

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[14] In case of endangered and damaged sites, geophysical measurements represent one of the forms of permanent digital recording, on which archaeological research can be based not only in the nearest but also in more distant future.

8. Conclusions

Based on the results of geophysical surveys conducted between 2011 and 2016 in the locality of Nezabylice (Chomutov district, Ústí Region) in northwest Bohemia, the extent of the burial ground from Roman period was for the time being determined to about 3.3 ha. The archaeologically researched area by 2017 is about 11 ares, roughly 3% of the estimated area of the whole cemetery. During archaeological research, 84 funerary features have been explored so far, the vast majority of which are dated to the early Roman period (see Blažek *et al.* 2014; ibid. 2015; 2016; in print; Půlpánová-Reszczyńska *et al.* 2017). Among them are well-documented urn graves, very often richly equipped with weapons. Another type of features is represented by cremation pit-graves, among which there is an unknown type of mass grave with cremation remains of many individuals, which are stored in layers together with artefacts (Blažek *et al.* in print). A very exceptional finding is the first grave of the B1 phase of the Roman period, which has been found at a chronologically contemporary cremation burial ground (Blažek *et al.* 2016, 24; cf. Droberjar 2006, 650; 2014, 431). Based on the concentration of portable objects and features, it can be concluded that in the case of Nezabylice it was most likely a very important supra-regional cemetery of the micro-region[15], which was used by several generations for at least several decades during the B1–B2 phases of the early Roman period. Recent research also shows that long before the Germanic cemetery was founded, the site was used for funeral activities in prehistoric times (Corded Ware culture, Middle Bronze Age). In this respect, the research brings several interesting clues to the issue of the internal and external form of graves at that time.

In the case of Nezabylice, the first discovered and modern studied cemetery from the Roman period in the NW Bohemia, in the last 50 years, was the first to be researched using non-destructive methods. The benefits of these surveys are therefore absolutely crucial and their combination with field archaeological excavations brings a quantum of completely new and often unexpected findings. The need for comprehensive research is all the more urgent in a situation where

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[15] The supra-regional significance of the burial ground is confirmed by the presence of imported and prestigious artefacts (cf. Půlpánová-Reszczyńska *et al.* 2017, 357).

the site is constantly threatened and damaged by contemporary human activities (by farmers and amateur metals detectorists). For these reasons, the Roman period cemeteries may be considered to be some of the most endangered localities in Bohemia, and the need for their effective conservation and ongoing comprehensive research will probably not be disputed.

Although the archaeologically researched area is a tiny fraction of the total area of the cemetery in Nezabylice, there has already been a fundamental enrichment to the study of the Roman period. The vast potential of the site is manifested not only in the diversity of material culture or typological spectrum of graves, but also in the complexity of burial ceremonies. The results of non-destructive surveys and archaeological researches show that in the case of Nezabylice, we are dealing with one of the largest and most important Germanic burial grounds in northwest Bohemia, which brings new insights into funeral rite, chronology, culture, social structure and many other aspects of the past society.

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Sebastian Messal*, Bartłomiej Rogalski**

Frühe Slawen im Pyritzer Land. Deutsch-polnisches Forschungsprojekt 2010–2013

ZUSAMMENFASSUNG

Messal S., Rogalski B. 2017. Frühe Slawen im Pyritzer Land. Deutsch-polnisches Forschungsprojekt 2010–2013. *Analecta Archaeologica Ressoviensia* 12, 133–168

Im Frühling 2010 wurden die folgenden Fundstellen für geomagnetische Prospektionen ausgewählt: Dziedzice, Kr. Myślibórz, Fndst. 4; Strąpie, Kr. Myślibórz, Fndst. 4; Moskorzyn, Kr. Stargard, Fndst. 16; Dobropole Pyrzyckie, Kr. Stargard, Fndst. 10 und 12; Suchań, Kr. Stargard, Fndst. 18 und Derczewo, Kr. Myślibórz, Fndst. 3. Alle Fundstellen, mit Ausnahme von Suchań, sind in der Dokumentation als frühslawische Siedlungen charakterisiert. Aus Suchań stammen dagegen sehr interessante Funde der Völkerwanderungszeit, u.a. ein Goldschatz mit mehreren Brakteaten vom Typ C. Ein Ziel des deutsch-polnischen Projektes *Frühe Slawen im Pyritzer Land* war eine absolute Datierung der beiden Besiedlungsphasen in der Region. Aufgrund der Ergebnisse der geomagnetischen Prospektionen in Dobropole Pyrzyckie Fpl. 12 sollten die erfassten Anomalien durch archäologische Untersuchungen verifiziert werden, um Erhaltungszustand, Datierung und vor allem Ansprache ausgewählter, im Magnetogramm erkennbarer Anomalien zu klären. Die Ausgrabung (zwei Schnitte: 50×10 m und 5×5 m) erbrachten insgesamt 37 archäologische Befunde. Die erste Siedlungsphase der Fundstelle wird durch zwei Wohngruben der Pommerschen Kultur (Phase HaD) charakterisiert. Der Großteil der untersuchten Objekte (u.a. Wohn- und Speichergruben) kann der slawischen Besiedlung zugeordnet werden. Die in der Siedlung dominierenden unverzierten und handgemachten Gefäße entsprechen den frühslawischen Typen Sukow und Dziedzice.

Schlagworte: frühe Slawen, Pyritzer Land, Typen Sukow-Dziedzice, geomagnetische Prospektion, Siedlungen

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Einleitung

Ein grundlegender Schwerpunkt der slawischen Archäologie liegt seit langem auf der Datierung und der Verbreitung der slawischen Landnahme im südlichen Ostseeraum. Unterschiedliche Forschungsstände und teilweise entgegengesetzte Ansichten in der deutschen und polnischen Forschung führten dabei zu unterschiedlichen Interpretationen der vorhandenen Daten (zusammenfassend Messal, Rogalski

* Deutsches Archäologisches Institut, Kulturgüterschutz, Podbielskialle 69-71, D-14195 Berlin; sebastian.messal@dainst.de
** Dział Archeologii Muzeum Narodowego w Szczecinie, Staromłyńska 27 Street, 70-561 Szczecin; b.rogalski@muzeum.szczecin.pl

2012); die in den letzten Jahren gewonnenen absoluten Datierungen aus frühslawischen Siedlungskomplexen weisen jedoch auf den Beginn der slawischen Landnahme im späten 7. und frühen 8. Jahrhundert hin. Der Prozess der „Slawisierung“ und die Frage nach mutmaßlichen Kontakten zu einer germanischen Restbevölkerung konnten hingegen erst in Ansätzen beleuchtet werden.

Aus diesen Gründen sind interdisziplinäre Untersuchungen von Siedlungskammern mit spätgermanischen und frühslawischen Siedlungen erforderlich, um neue Erkenntnisse zur Siedlungsgeschichte zwischen dem 5./6. und 9. Jahrhundert zu gewinnen. Diese Untersuchungen sind vor allem auch notwendig, da systematische Untersuchungen von klar abgegrenzten frühslawischen Siedlungsräumen bislang kaum stattgefunden haben. Kleinräumige Entwicklungen, insbesondere Siedlungsverlagerungen oder auch Zu- und Abwanderungen von Bevölkerungsgruppen können deshalb auf der Grundlage der vorhandenen Quellen nicht herausgearbeitet werden, da zwar einzelne Ereignisse erkennbar werden, die besiedlungsgeschichtlichen Prozesse jedoch meist unbekannt bleiben. Darüber hinaus stehen naturwissenschaftlich abgesicherte, absolutchronologische Daten nicht immer zur Verfügung; eine exakte Datierung von Besiedlungsvorgängen ist somit nicht möglich.

Frühe Slawen im Pyritzer Land

Besonders günstige Voraussetzungen für die Erforschung der „frühslawischen Kultur“ ergeben sich für das Pyritzer Land südöstlich von Stettin. Diese Region ist für eine besiedlungsgeschichtliche Studie sehr gut geeignet, da dort spätgermanische Fundstellen des 5. und 6. Jahrhunderts und mehrere unbefestigte, teilweise bereits umfassend untersuchte Siedlungsplätze der frühslawischen Bevölkerungsgruppen (Dziedzice, Derczewo) in unmittelbarer Nachbarschaft bekannt sind.

Fehlende absolute Datierungen zur Rekonstruktion der Siedlungsentwicklung im Pyritzer Land bei ansonsten recht vielversprechenden Befunden und Funden führten zur Idee, sowohl den Quellenbestand als auch den Kenntnisstand zur Siedlungsgeschichte des frühen und hohen Mittelalters (6. bis 9. Jahrhundert) durch neue interdisziplinäre Untersuchungen zu verbessern. Dieses durch das Nationalmuseum Stettin und das Deutsche Archäologische Institut Berlin durchgeführ-

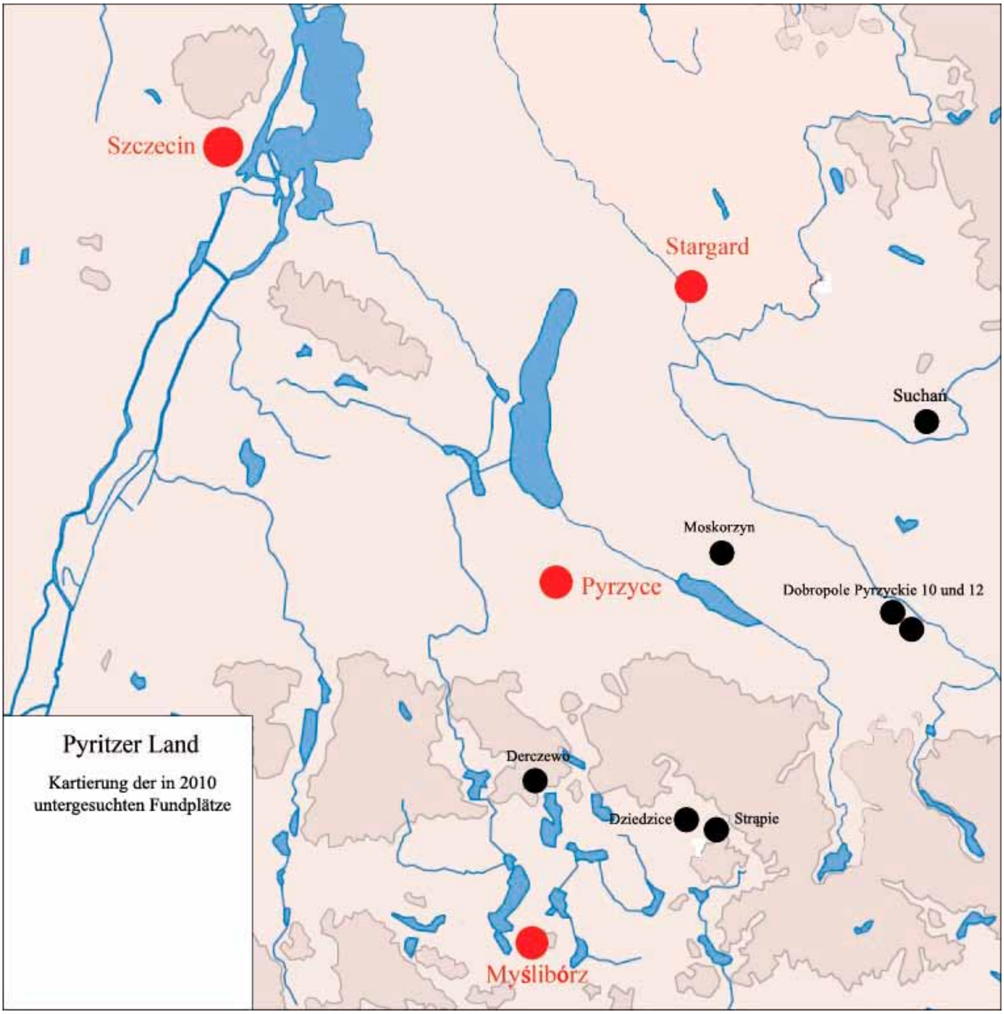

Abb. 1. Pyritzer Land. Kartierung der 2010 untersuchten Fundstellen (*S. Messal*)

te Vorhaben hatte zum Ziel, neue Erkenntnisse zum Zeitpunkt und zu den Ursachen des Siedlungsrückganges in spätgermanischer Zeit sowie Zeitpunkt und Voraussetzungen der slawischen Besiedlung zu gewinnen.

Vor allem die Untersuchungen in Dziedzice und Derczewo kennzeichnen bis heute den Forschungsstand zur frühslawischen Kultur im Arbeitsgebiet maßgeblich. Problematisch bleibt allerdings der Umstand, dass beide Siedlungen bislang nicht vollständig, sondern nur in

Vorberichten publiziert vorliegen. Die dortigen Angaben, insbesondere die Datierung der Siedlungen anhand der Keramik, sind somit nur begrenzt nachvollziehbar und kritisch zu betrachten.

Die auf einer spornartigen Moränenhöhe am Nordufer eines heute verlandeten Sees gelegene Siedlung von Dziedzice wurde zwischen 1968 und 1972 sowie 1974 umfassend durch A. Porzeziński untersucht (Porzeziński 1969; 1975b; 1980). Dabei konnten 126 Befunde freigelegt werden, darunter 49 ovale Gruben, die als Reste eingetiefter Wohnbauten interpretiert wurden. Das geborgene Keramikmaterial besteht überwiegend aus vollständig handgemachten, unverzierten Gefäßen; seltener treten nachgedrehte und verzierte Gefäße auf (Dulinicz 2006, 314; Köhler 1980). Seinerzeit wurde eine Datierung der handgemachten Keramik und somit auch der Siedlung in das 6. und 7. Jahrhundert vorgeschlagen (Porzeziński 1980, 124), die von M. Dulinicz bezweifelt wurde (Dulinicz 2006, 314). Er datiert die Siedlung deutlich jünger, weist sie aber dem ältesten slawischen Siedlungshorizont in Pommern zu. Nach Angaben von A. Porzeziński wurde die Siedlung vollständig ausgegraben (freundliche Mitteilung A. Porzeziński).

Die Siedlung von Derczewo lag auf einer von Seen und Niederung umgebenen länglichen Moränenhöhe; sie wurde im Rahmen der 1971 und 1973 durchgeführten Ausgrabungen vollständig untersucht (freundliche Mitteilung A. Porzeziński; vgl. Porzeziński 1972; 1975a; 1980). Die Grabungen erbrachten 20 frühmittelalterliche Befunde, darunter fünf Hausgruben, sowie weitere urgeschichtliche Befunde, u.a. eine Grube der Lausitzer Kultur. Das aus den frühmittelalterlichen Befunden geborgene Keramikmaterial entspricht dem aus Dziedzice weitgehend und führte zu einer Datierung der Siedlung in das 6.–8. Jahrhundert. Auch M. Dulinicz ordnet die Siedlung von Derczewo der frühesten slawischen Besiedlung Pommerns zu, allerdings datiert er sie in das 8. Jahrhundert (Dulinicz 2006, 312).

Weitere Siedlungsplätze mit frühslawischem Keramikmaterial wurden seinerzeit im Rahmen von Begehungen des Nationalmuseums Stettin bei Dobropole Pyrzyckie an der kleinen Ihna (2 Fundplätze) und bei Golenice nordwestlich von Myślibórz entdeckt (Porzeziński 1980, 138 Abb. 6.30). In den letzten Jahren wurden zudem im Rahmen der archäologischen Landesaufnahme (*Archeologiczne Zdjęcie Polski* – AZP) frühslawische Siedlungen bei Strąpie und Moskorzyn lokalisiert. Das keramische Material dieser Fundstellen ist mit dem aus Dziedzice identisch, so dass auch sie dem ältesten slawischen Siedlungshorizont zugeordnet werden können. Archäologische Untersuchungen fanden an diesen Plätzen bisher nicht statt.

Geomagnetische Untersuchungen

Im Frühling 2010 wurden erste Archivstudien im Nationalmuseum Stettin durchgeführt, auf deren Basis die folgenden schon oben erwähnten Fundstellen für geomagnetische Prospektionen ausgewählt wurden (Abb. 1; vgl. Messal, Rogalski 2013, 207–210): Dziedzice, Kr. Myślibórz, Fndst. 4 (AZP 39-10/50; Abb. 2); Strąpie, Kr. Myślibórz, Fndst. 4 (AZP 39-11/2; Abb. 3); Moskorzyn, Kr. Stargard, Fndst. 16 (AZP 35-10/40; Abb. 4); Dobropole Pyrzyckie, Kr. Stargard, Fndst. 10 und 12 (AZP 36-12/85 i 82; Abb. 5 und 6); Suchań, Kr. Stargard, Fndst. 18 (AZP 33-13/32; Abb. 7) und Derczewo, Kr. Myślibórz, Fndst. 3 (AZP 39-08/4). Die Geländearbeiten fanden im Zeitraum vom 15.–31. März 2010 statt. Alle Fundstellen, mit Ausnahme von Suchań, sind in der Dokumentation als frühslawische Siedlungen charakterisiert. Aus der Gegend von Suchań stammen dagegen sehr interessante Funde der Völkerwanderungszeit, u.a. ein Goldschatz mit mehreren Brakteaten vom Typ C und Anhängern (Bursche 2014). Ein Ziel des Projektes *Frühe Slawen im Pyritzer Land* war eine absolute Datierung der beiden Besiedlungsphasen in der Region. Ausgrabungen in Suchań erfolgten 2013–2014 im Rahmen des Forschungsprojektes „Migration Period between Oder and Vistula". Die Untersuchungen konnten eine völkerwanderungszeitliche Besiedlung des Fundplatzes jedoch nicht bestätigen (Bursche 2014; Bursche, Rogalski 2015; Bursche, Kowalski, Rogalski eds. 2017). Der in die 2. Hälfte des 5. Jahrhunderts datierte Schatz aus Suchań bestand aus mindestens sieben Goldobjekten: drei Anhänger dreifachen Perlendrahtring, ein massiver Ring und zwei skandinavische Brakteaten Typs C. Ein dritter Brakteat wurde wahrscheinlich in den 1990er Jahren auf dem gleichen Grundstück gefunden (Bursche, Kowalski, Rogalski eds. 2017, s. 111). Die Brakteaten wurden wahrscheinlich in Sorte Muld oder in Schonen hergestellt. Außer den goldenen Funden stammen von der gleichen Fundstelle zwei bronzene Fibeln (ohne Kontext aus Pflugschicht) – eine skandinavische Kreuzfibel und eine thüringische Fibel mit Kerbschnittornamentik und zoomorphischer Verzierung auf dem Bügel. Die Funde aus Suchań sind als weitere Beweise für die Migration von skandinavischen Gesellschaften

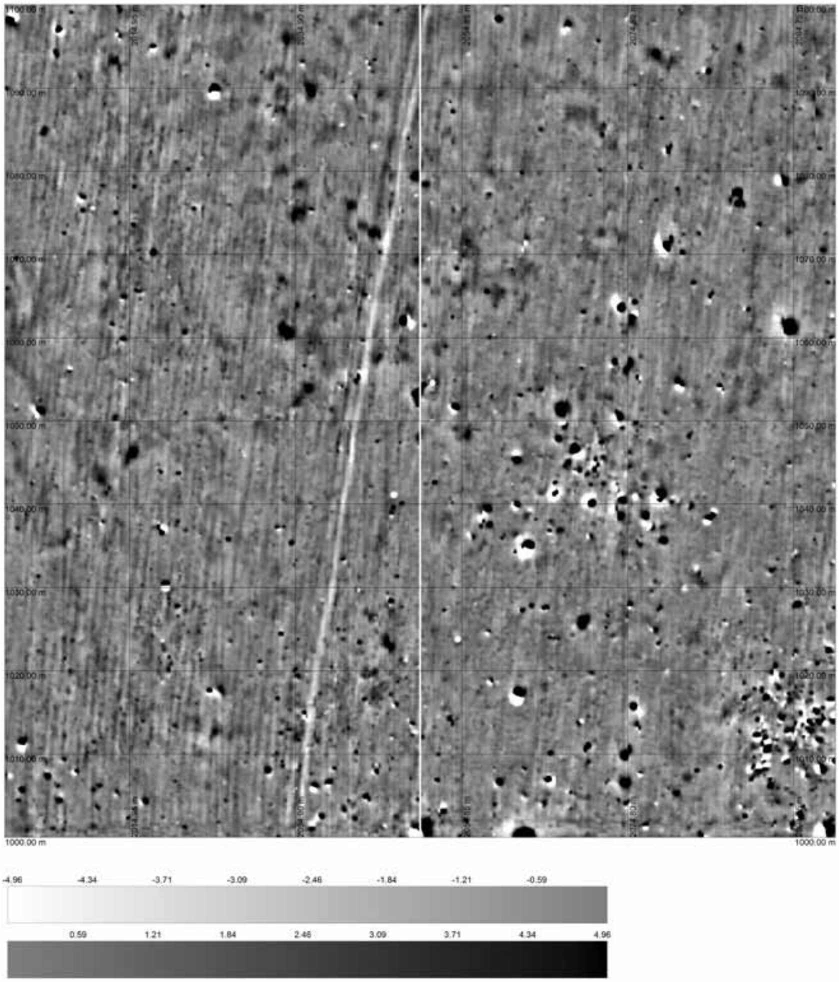

Abb. 2. Dziedzice, Kr. Myślibórz, Fndst. 4. Geomagnetische Untersuchungen, Verteilung der Anomalien (*S. Messal*)

nach Pommern in der VWZ zu verstehen. Die Ausgrabungen erbrachten leider keine weiteren Ergebnisse – die goldenen Funde aus Suchań sind daher als einzelnes Depot anzusprechen.

Die Fundstellen wurden von einem deutsch-polnischen Forschungsteam (Deutsches Archäologisches Institut und Nationalmuseum Stettin) geomagnetisch untergesucht, zudem wurden auch traditionelle Oberflächenprospektionen durchgeführt. Auf die magnetische Prospektion der Fundstelle 3 in Derczewo wurde verzichtet, da auf-

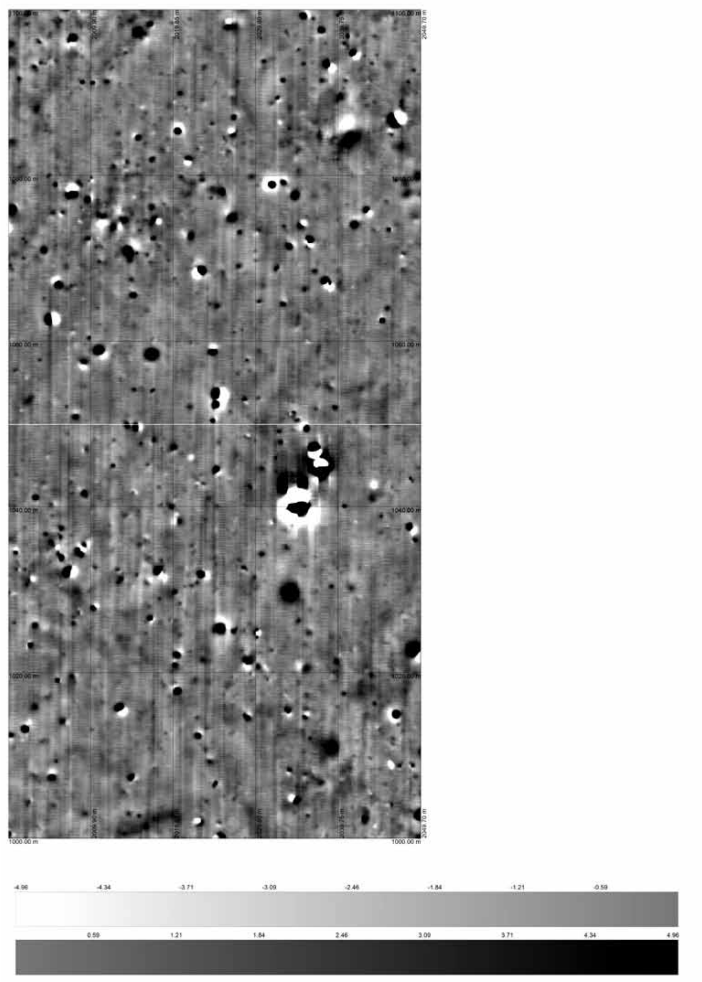

Abb. 3. Strąpie, Kr. Myślibórz, Fndst. 4. Geomagnetische Untersuchungen, Verteilung der Anomalien (*S. Messal*)

grund der vollständigen Ausgrabung der Siedlung keine neuen Ergebnisse zu erwarten waren. Die Untersuchungen der beiden Fundstellen in Dobropole Pyrzyckie erbrachten dagegen so interessante Ergebnisse (Abb. 5 und 6), daβ die Projektkoordinatoren sich entschieden, den Fokus der Prospektionen auf diese Fundstellen zu legen. Auf beiden Fundplätzen wurde ein reiches Inventar an Keramik der frühslawischen Typen Sukow-Dziedzice und Feldberg (Fndst. 10: 62 Fragmente; Fndst. 12: 31 Fragmente), aber auch interessante Funde der Lausitzer

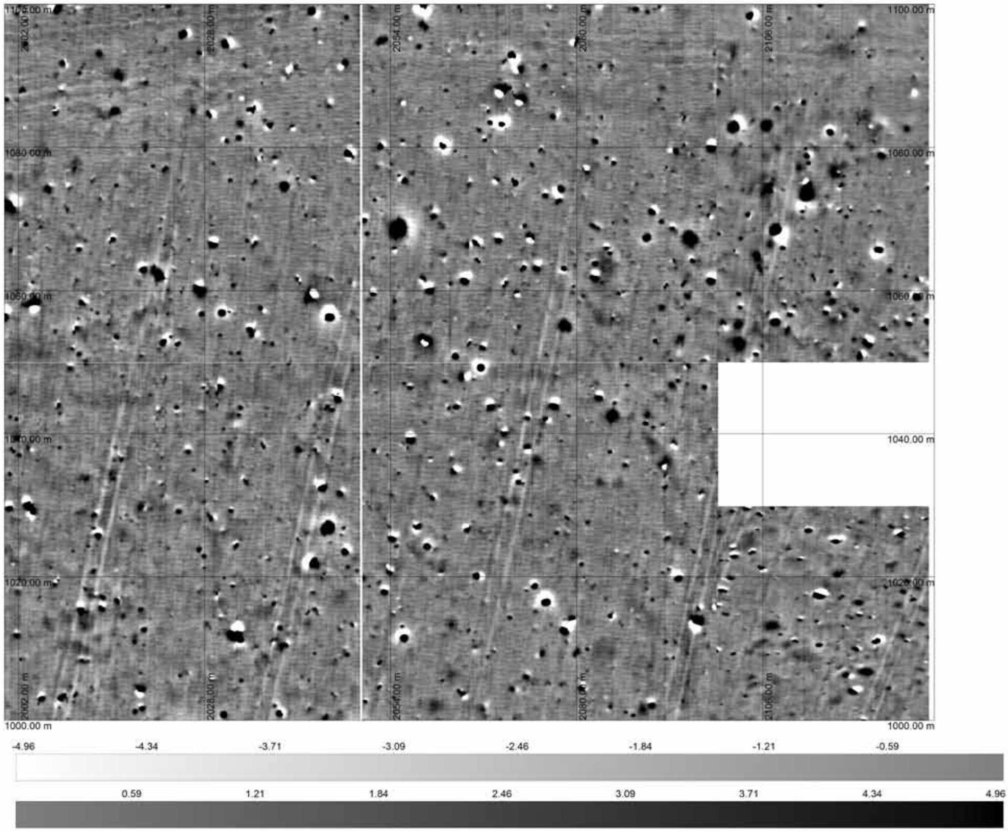

Abb. 4. Moskorzyn, Kr. Stargard, Fndst. 16. Geomagnetische Untersuchungen, Verteilung der Anomalien (*S. Messal*)

Kultur und aus der Römischen Kaiserzeit aufgelesen, die die intensive Besiedlung der Region dokumentieren.

Die übrigen Fundstellen erbrachten weniger aussagekräftige Ergebnisse. In Moskorzyn, Fndst. 16 (AZP 39–10/40; Abb. 4), überwiegt Keramik der Lausitzer Kultur; in Strąpie, Kr. Myślibórz, Fndst. 4 (AZP 39-11/2; Abb. 3), wurde nur eine Scherbe gefunden, die man nur generell in das Mittelalter datieren kann. Die in Dziedzice, Kr. Myślibórz, Fndst. 4 (AZP 39-10/50; Abb. 2), durchgeführte Prospektion hat die Existenz der frühslawische Siedlung verifiziert, das Fundmaterial dieser Fundstelle wurde bereits von A. Porzeziński vorgelegt. Nach Auswertung der aufgelesenen Keramik und geomagnetischen Daten wurde schließlich die Fundstelle 12 in Dobropole Pyrzyckie als zukünftiger Grabungsplatz ausgewählt.

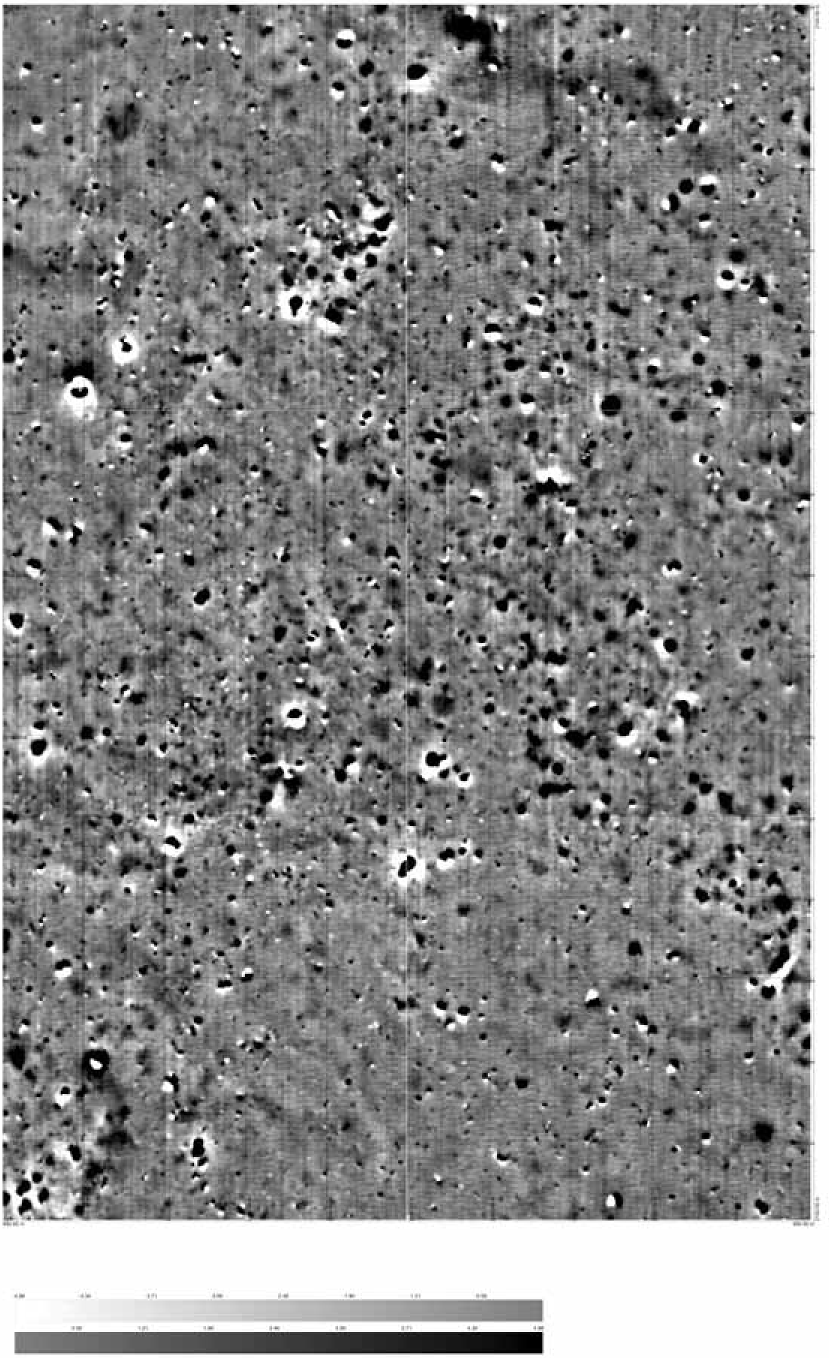

Abb. 5. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 10. Geomagnetische Untersuchungen, Verteilung der Anomalien (*S. Messal*)

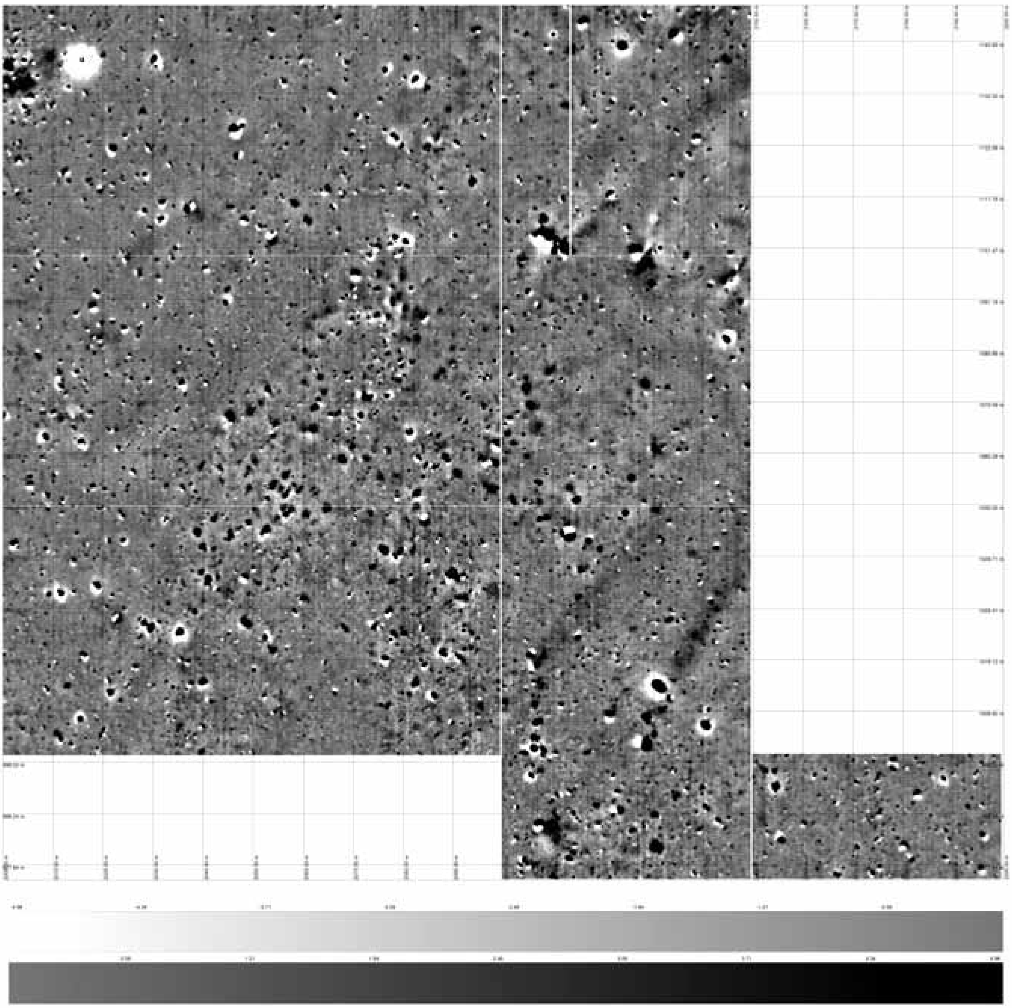

Abb. 6. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Geomagnetische Untersuchungen, Verteilung der Anomalien (*S. Messal*)

Ausgrabungen in Dobropole Pyrzyckie

Aufgrund der ausgezeichneten Ergebnisse der geomagnetischen Prospektionen in Dobropole Pyrzyckie Fpl. 12 sollten die erfassten und als frühslawische Siedlungsspuren interpretierten Anomalien durch archäologische Untersuchungen verifiziert werden (Abb. 8). Dazu erfolgten archäologische Testgrabungen im Bereich des Fund-

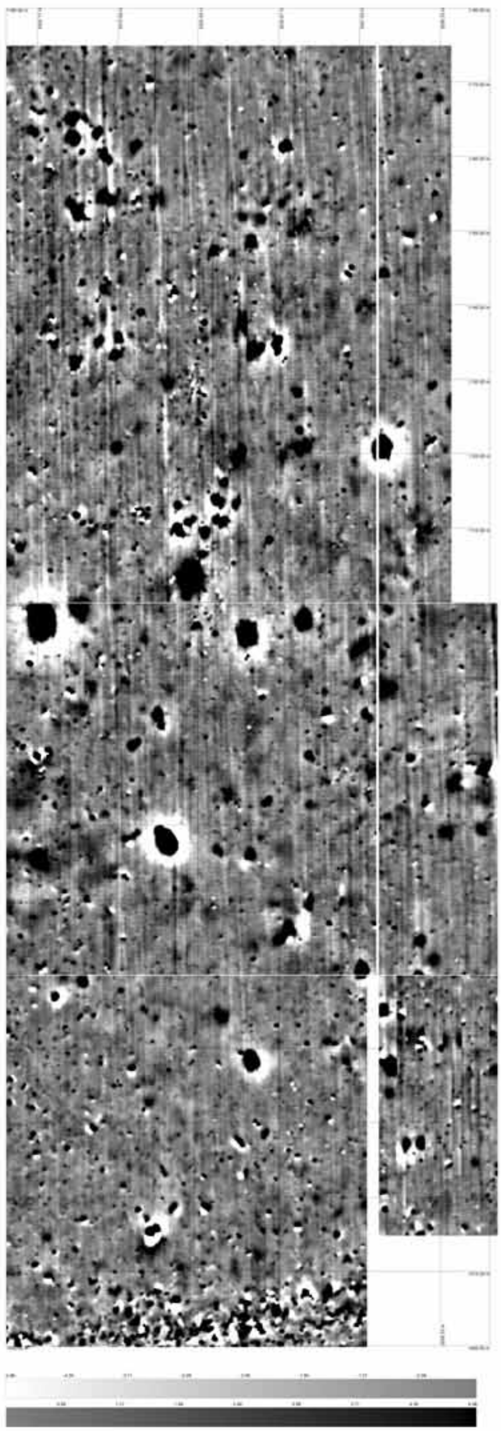

Abb. 7. Suchań, Kr. Stargard, Fndst. 18. Geomagnetische Untersuchungen, Verteilung der Anomalien (*S. Messal*)

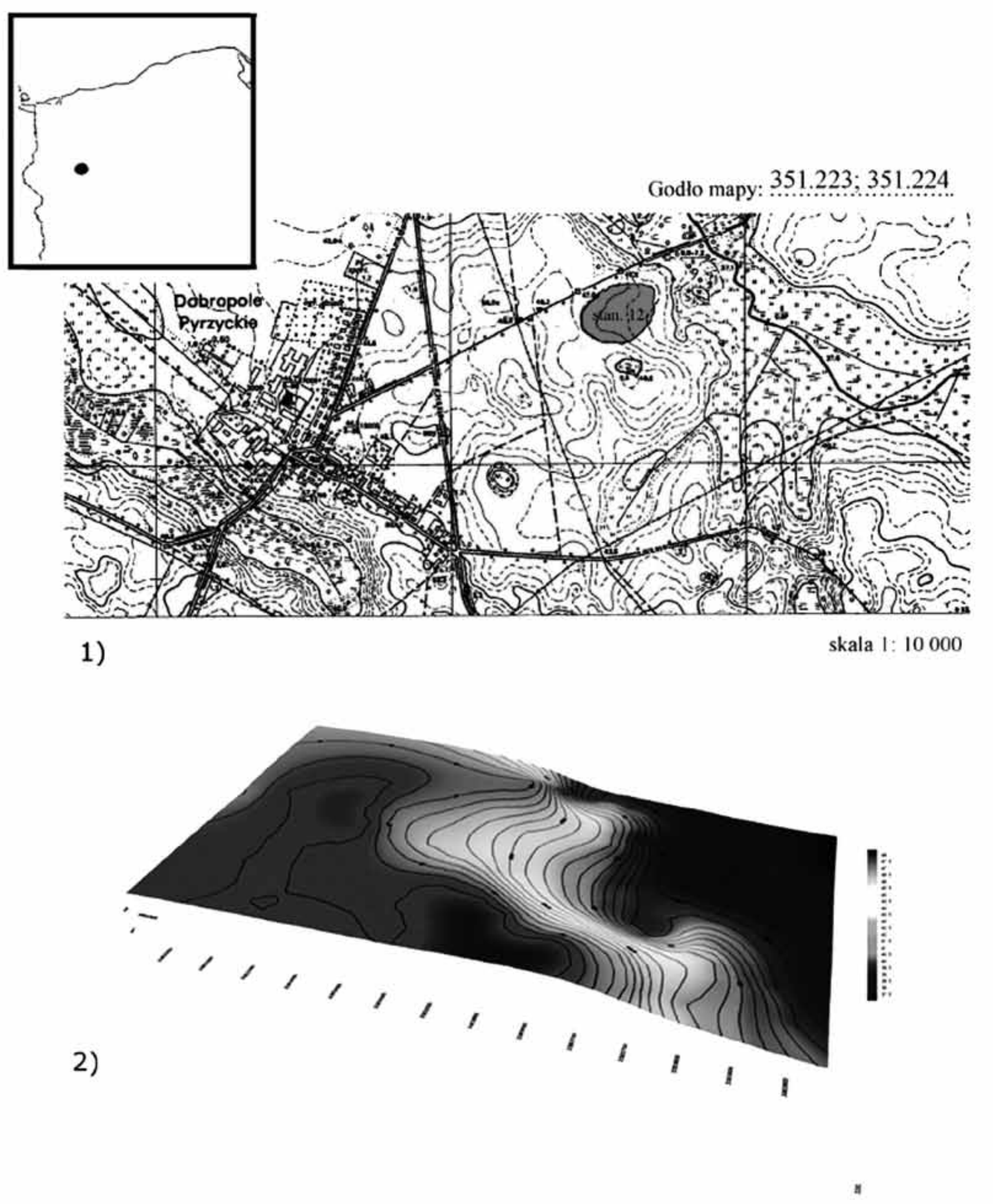

Abb. 8. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Lage, Größe und Höhenplan der Fundstelle (*S. Messal; B. Rogalski*)

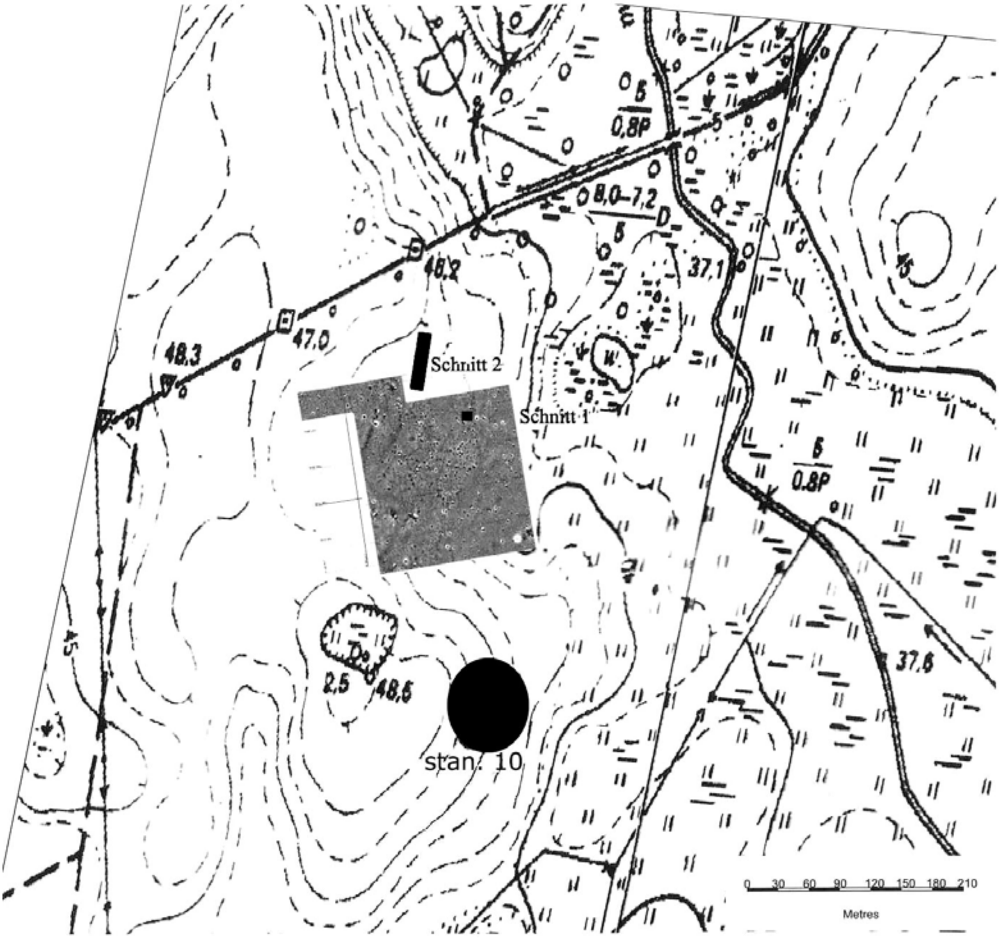

Abb. 9. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Geländearbeiten 2010: Lage der Schnitte 1 und 2 (schwarz) im Bezug zu den geomagnetischen Prospektionen (*S. Messal, B. Rogalski*)

platzes (Abb. 9). Die Ausgrabungen dienten dazu, Erhaltungszustand, Datierung und vor allem Ansprache ausgewählter, im Magnetogramm erkennbarer Anomalien zu klären und auf dieser Grundlage eine Strategie für großflächige, interdisziplinär angelegte Untersuchungen zu entwickeln. Bedingt durch die späte Getreideernte konnte der geplante Testschnitt nicht wie vorgesehen im geomagnetisch prospektieren Areal, sondern nur unmittelbar nördlich der Prospektionsfläche angelegt werden (Schnitt 1, 50×10 m). Nach der Ernte erfolgte noch eine Dia-

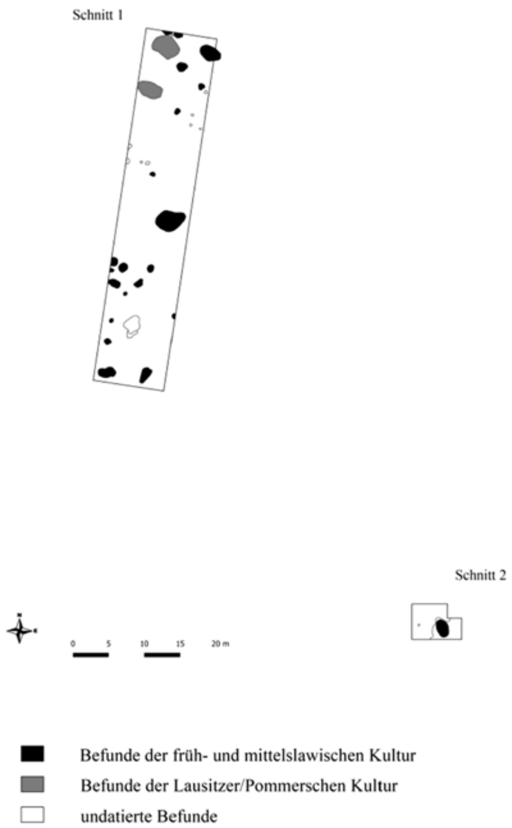

Abb. 10. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Grabungsplan der Schnitte 1 und 2; die Kulturschicht im Schnitt 2 ist ebenfalls frühslawisch (*S. Messal, B. Rogalski*)

gnostische Untersuchung einer ausgewählten, am Rande des mutmaßlichen Siedlungsareals gelegenen Anomalie (Schnitt 2, 5×5 m; Abb. 9).

Die Ausgrabung erbrachten insgesamt 37 archäologische Befunde (Abb. 10). Es handelt sich bei den erfassten Befunden in erster Linie um Gruben unterschiedlicher Funktion (21 Befunde) sowie um Pfostengruben (8 Befunde; Abb. 16: 3–7) und Feuerstellen (5 Befunde; Abb. 16: 1–2). Zudem konnten Reste von Kulturschichten sowie Scherben- bzw. Knochenkonzentrationen erkannt werden.

Der Großteil der untersuchten Befunde lässt sich der slawischen Besiedlung des Platzes zuordnen, einzelne Befunde können darüber hinaus in die vorrömische Eisenzeit (Lausitzer bzw. Pommersche Kultur) datiert werden.

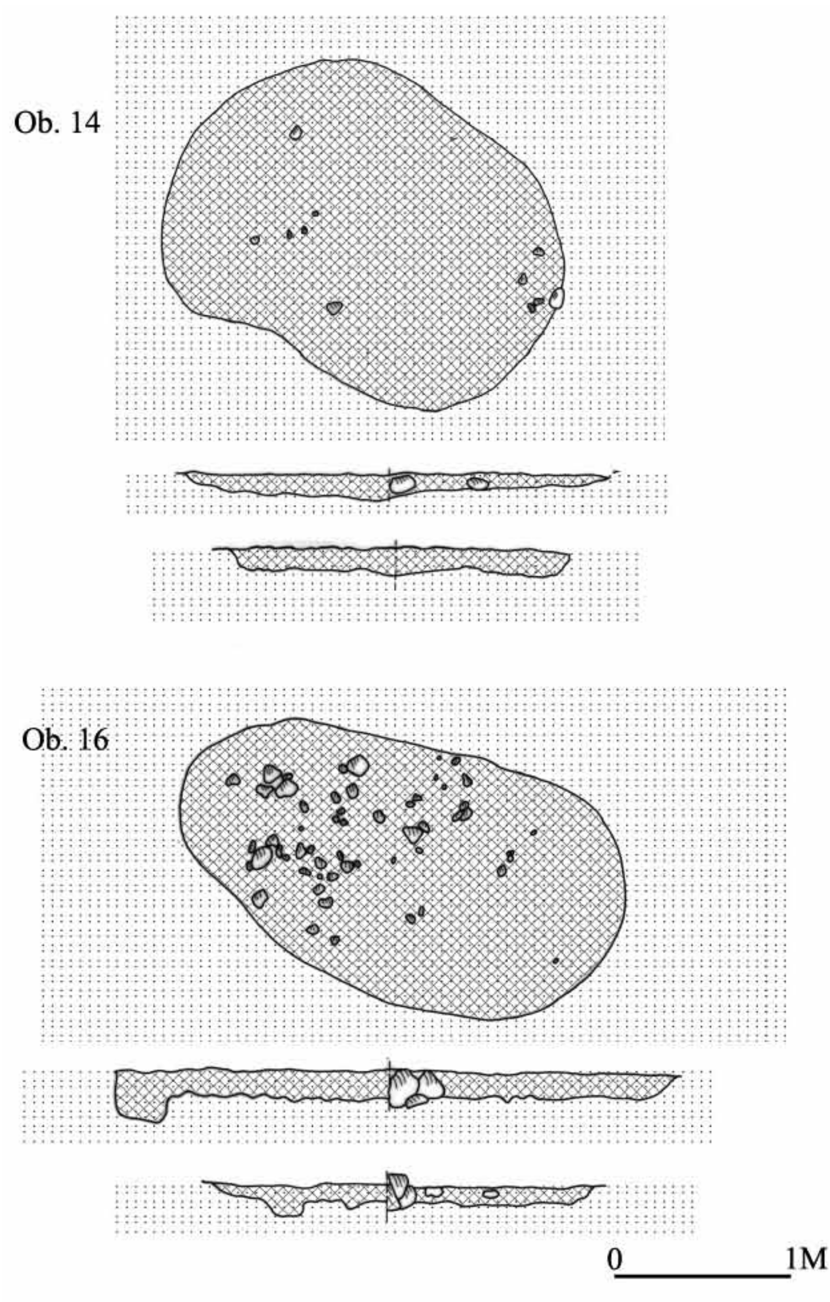

Abb. 11. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Objekte 14 und 16: Wohngruben der Lausitzer/Pommerschen Kultur (*A. Ryś*)

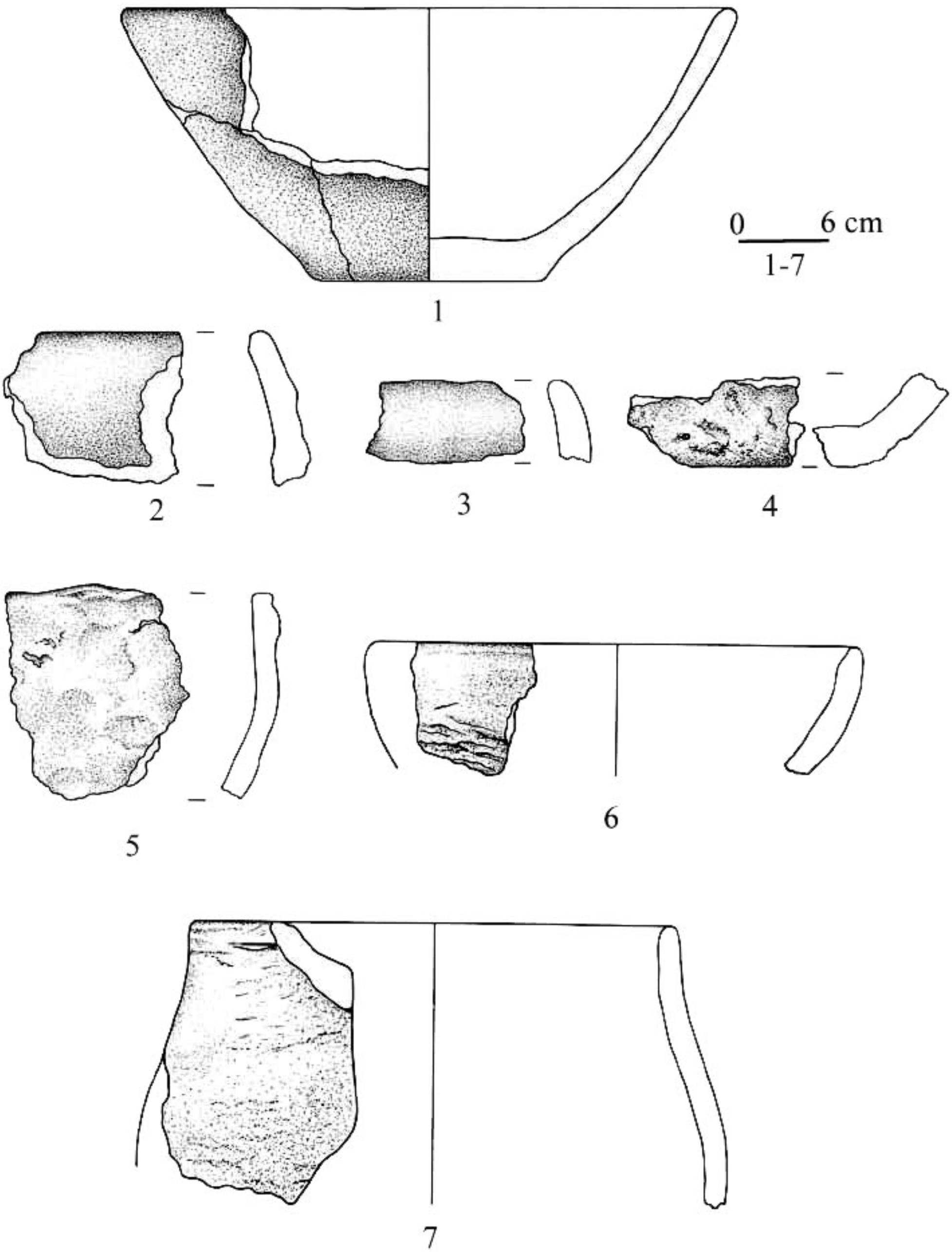

Abb. 12. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Keramik der Lausitzer/Pommerschen Kultur: 1–4: Objekt 14; 5–7: Objekt 16 (*A. Ryś*)

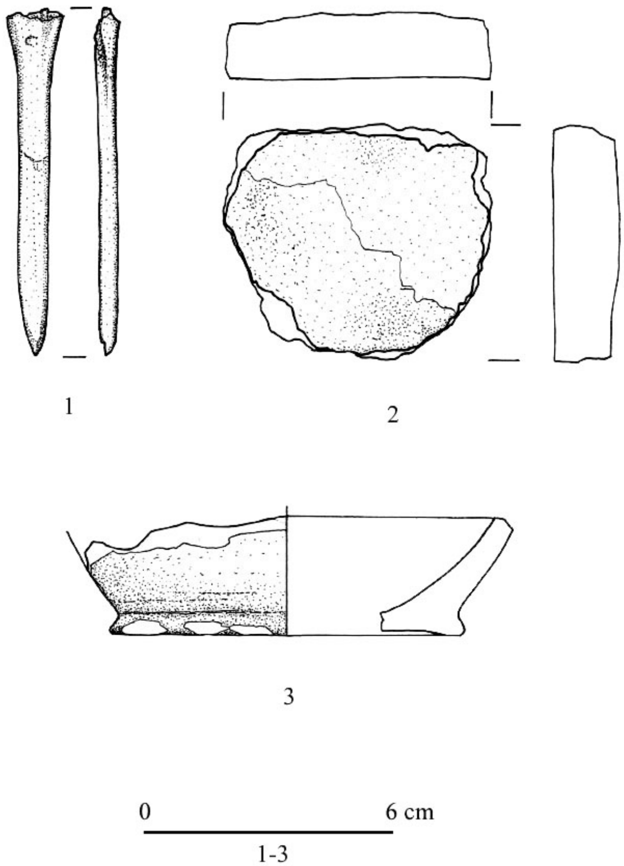

Abb. 13. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Fundmaterial: 1 – Knochennadel; 2 – Tonscheibe 3 – Drehscheibenkeramik (*A. Ryś*)

Die Siedlung der Lausitzer und Pommerschen Kultur

Die erste fassbare Siedlungsphase der Fundstelle 12 in Dobropole Pyrzyckie wird durch zwei Wohngruben (Befunden Nr. 14 und 16; Abb. 10–11; Foto. 1) charakterisiert, die man generell der Lausitzer bzw. Pommerschen Kultur zuordnen kann. Diese Objekte wurden an anderer Stelle publiziert (Messal, Rogalski 2013, 211–212; 2013, 140–146), so dass eine Zusammenfassung an dieser Stelle genügt. Die Wohngruben hatten eine Größe von 360×300 cm bzw. 300×200 cm und erbrachten zusammen 292 Keramikfragmente (Abb. 11–12). Die Keramik entspricht dabei folgenden Formen: einfache, eiförmige und

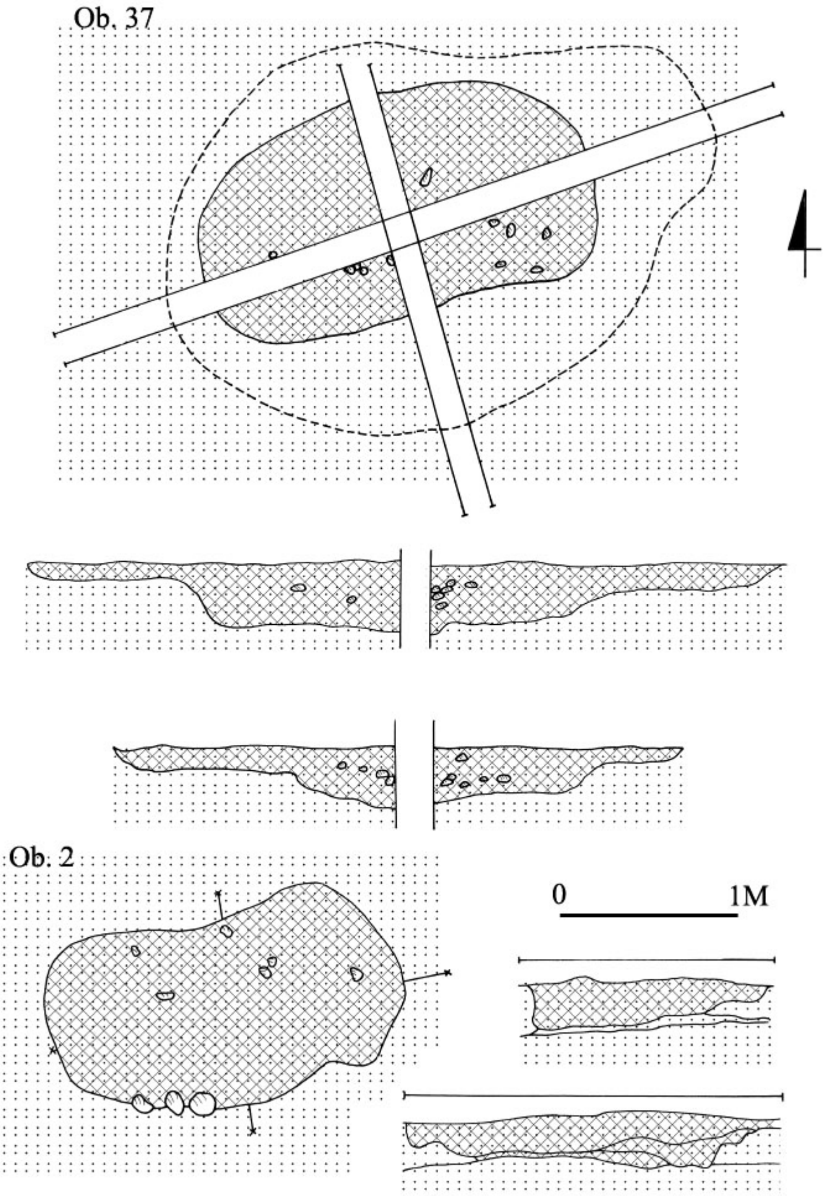

Abb. 14. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Ob. 2 und 37: frühslawische Hausgruben (*A. Ryś*)

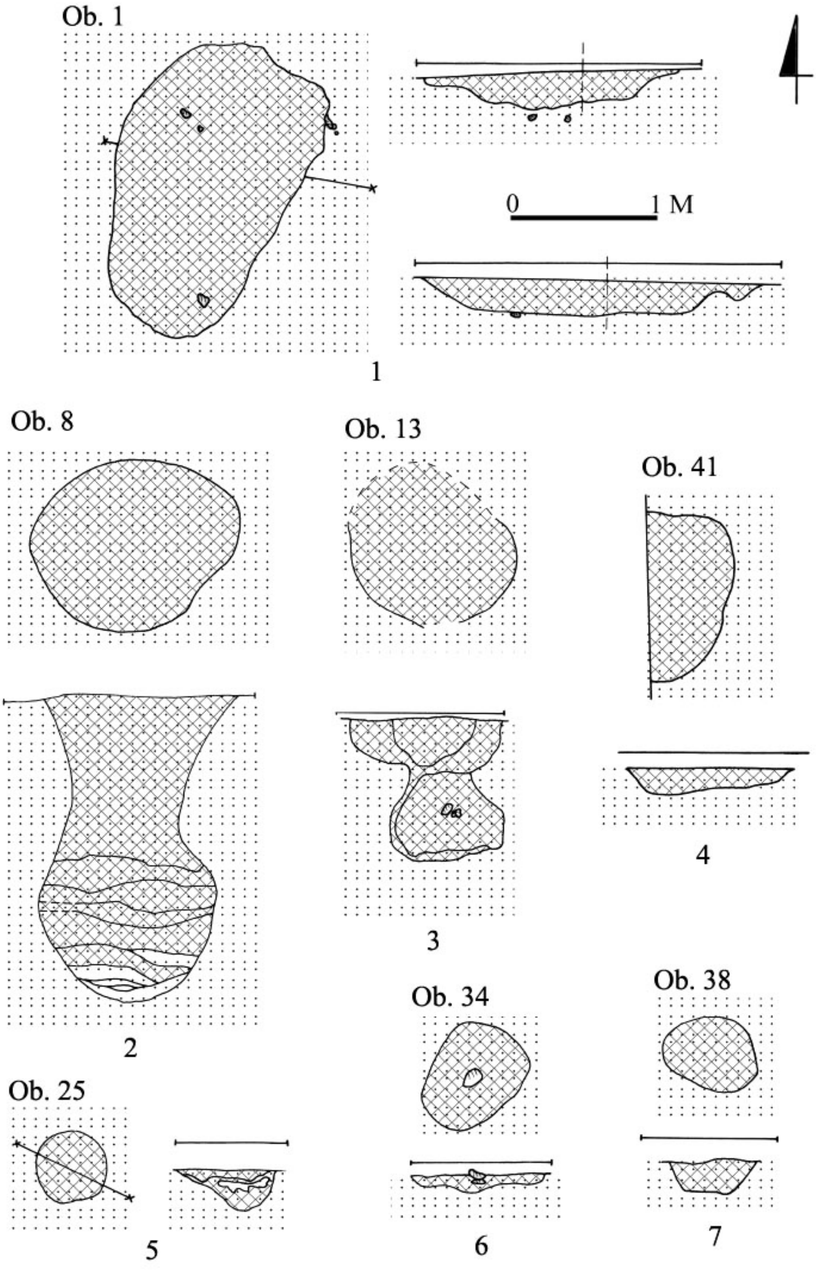

Abb. 15. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Speicher- (2–3) und sonstige Gruben (1, 4–7) (*A. Ryś*)

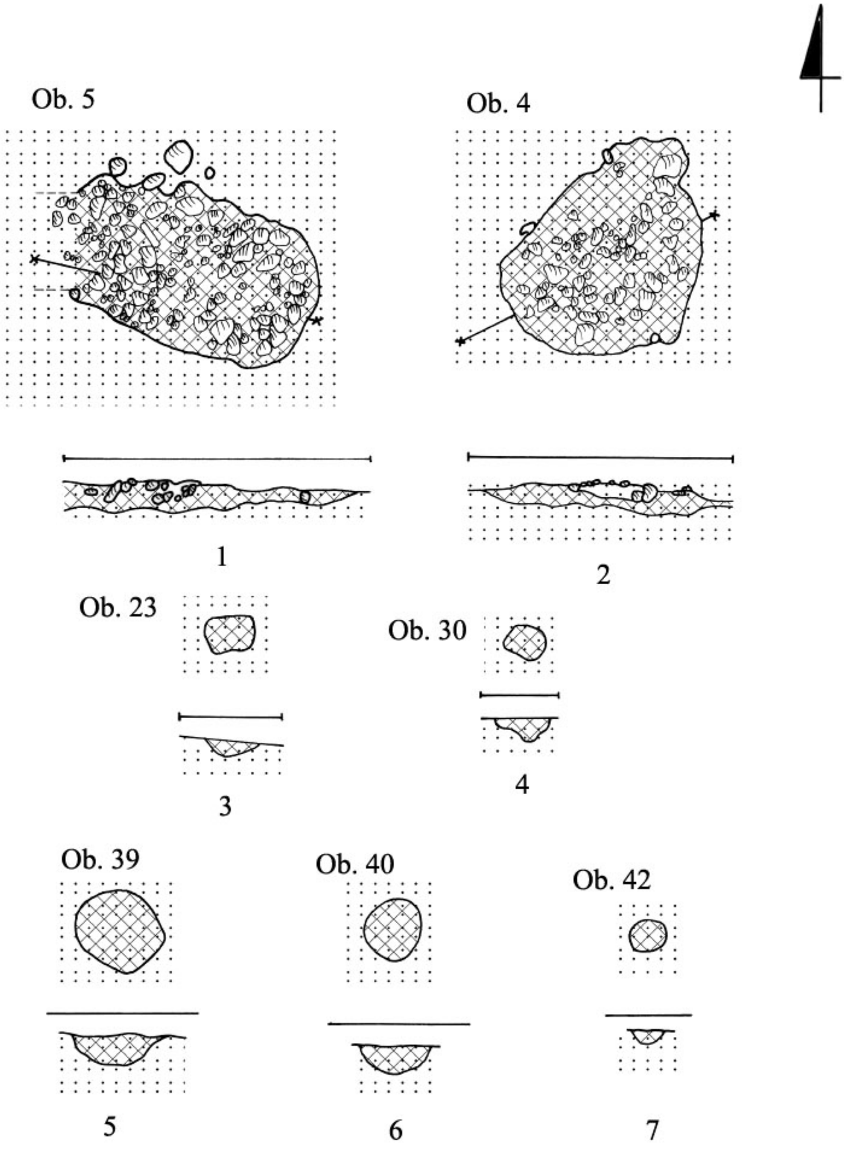

Abb. 16. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Feuerstellen (1–2) und Pfostenlöcher (3–7) (*A. Ryś*)

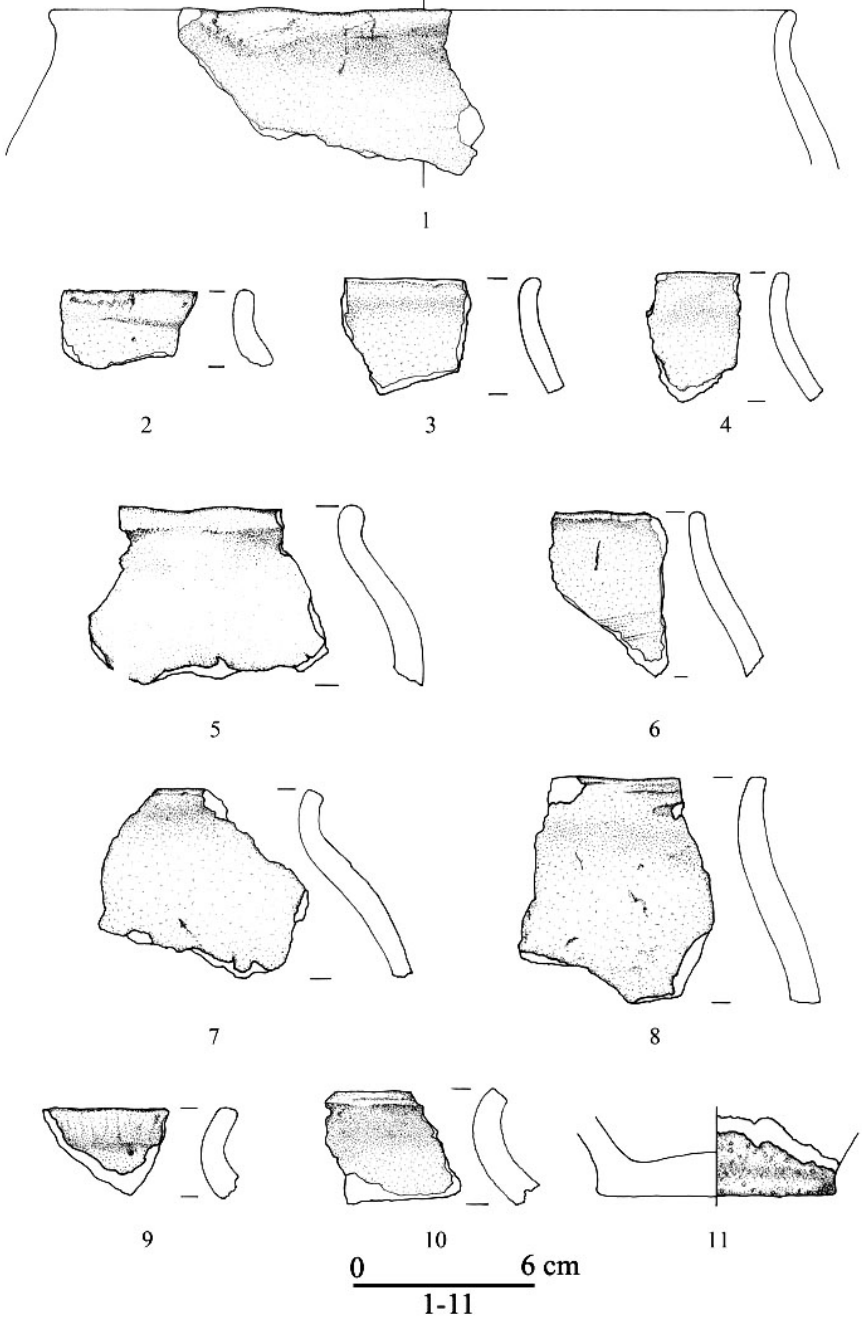

Abb. 17. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Keramik aus der Hausgrube Ob. 6 (1–11) (*A. Ryś*)

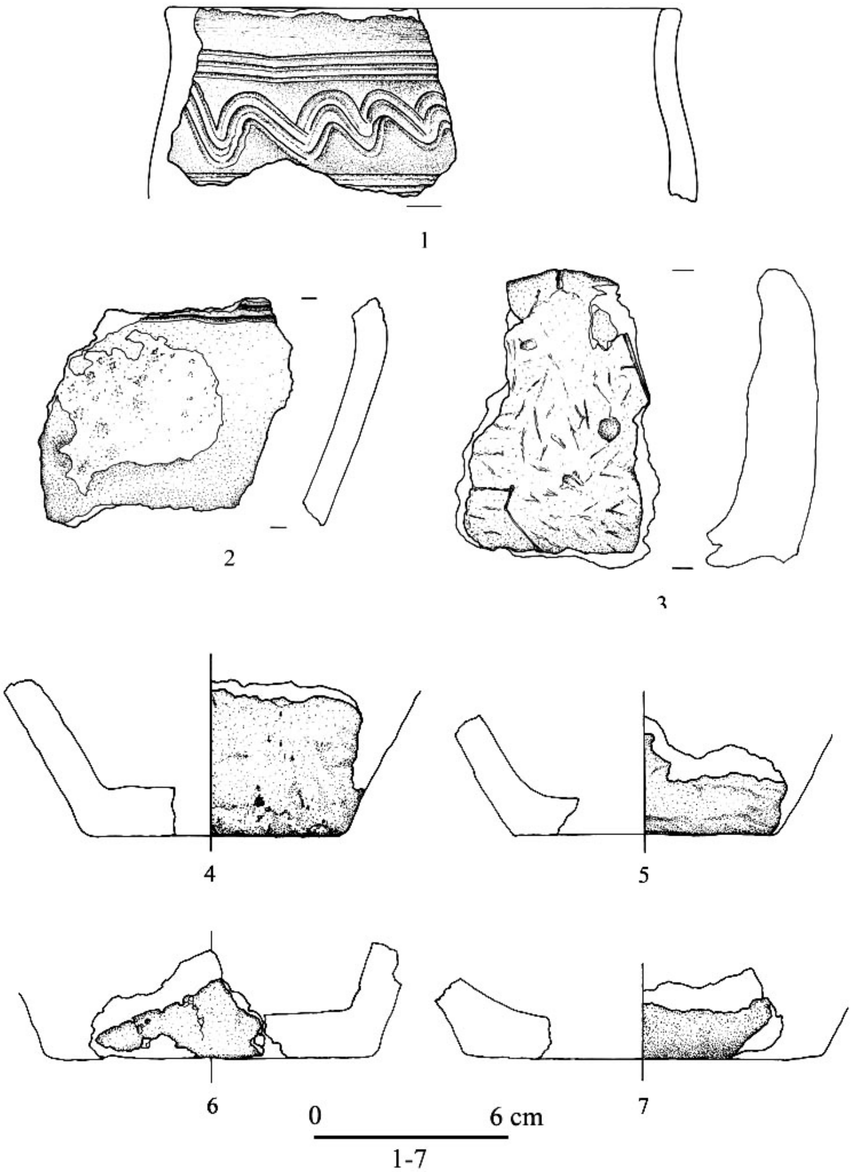

Abb. 18. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Keramik aus der Hausgrube Ob.37 (1–7) (*A. Ryś*)

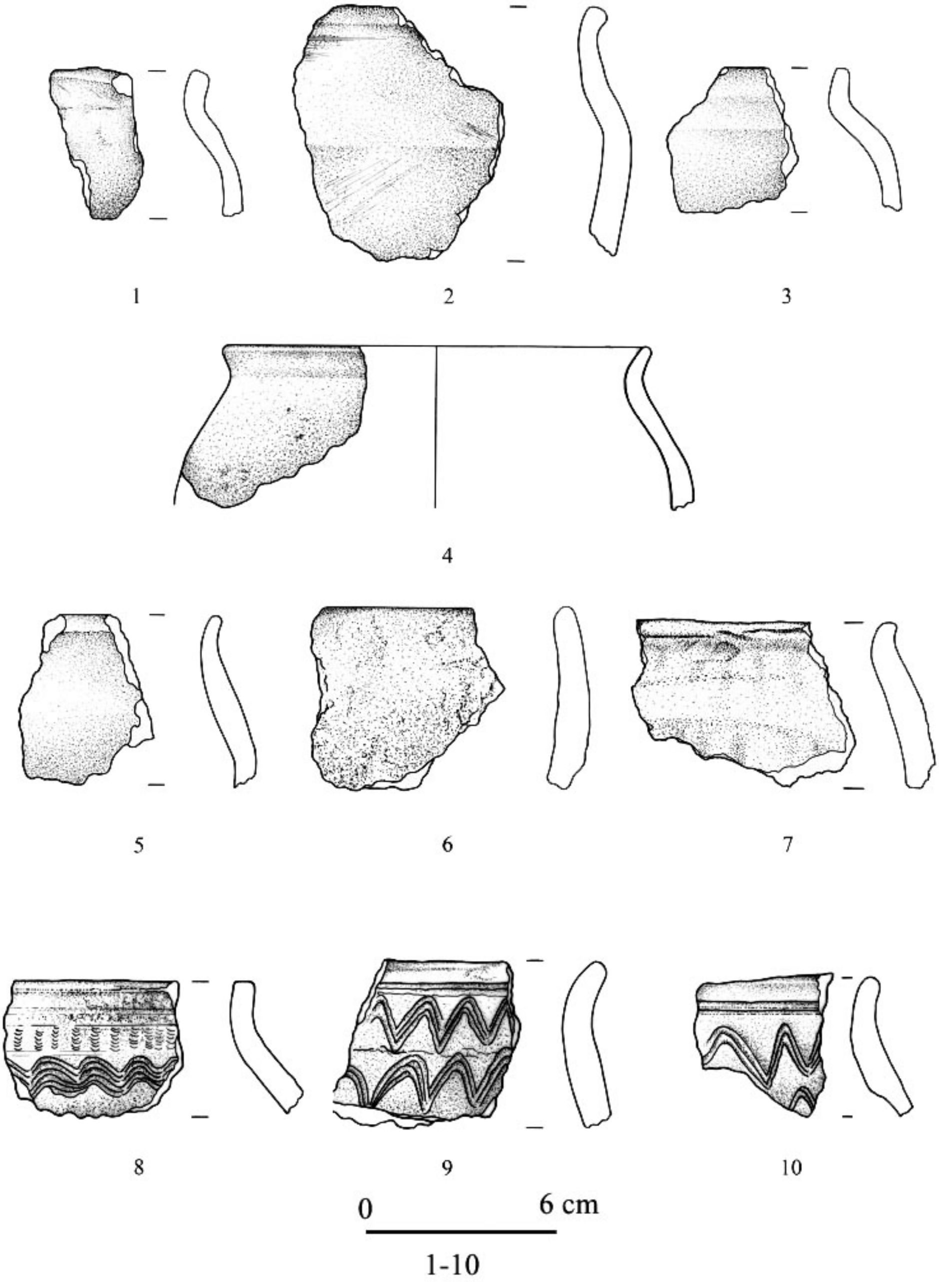

Abb. 19. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Keramik aus der Grube Ob. 4 (1–3), Speichergrube Ob. 13 (8–10) sowie Oberflächenfunde (4–7) (*A. Ryś*)

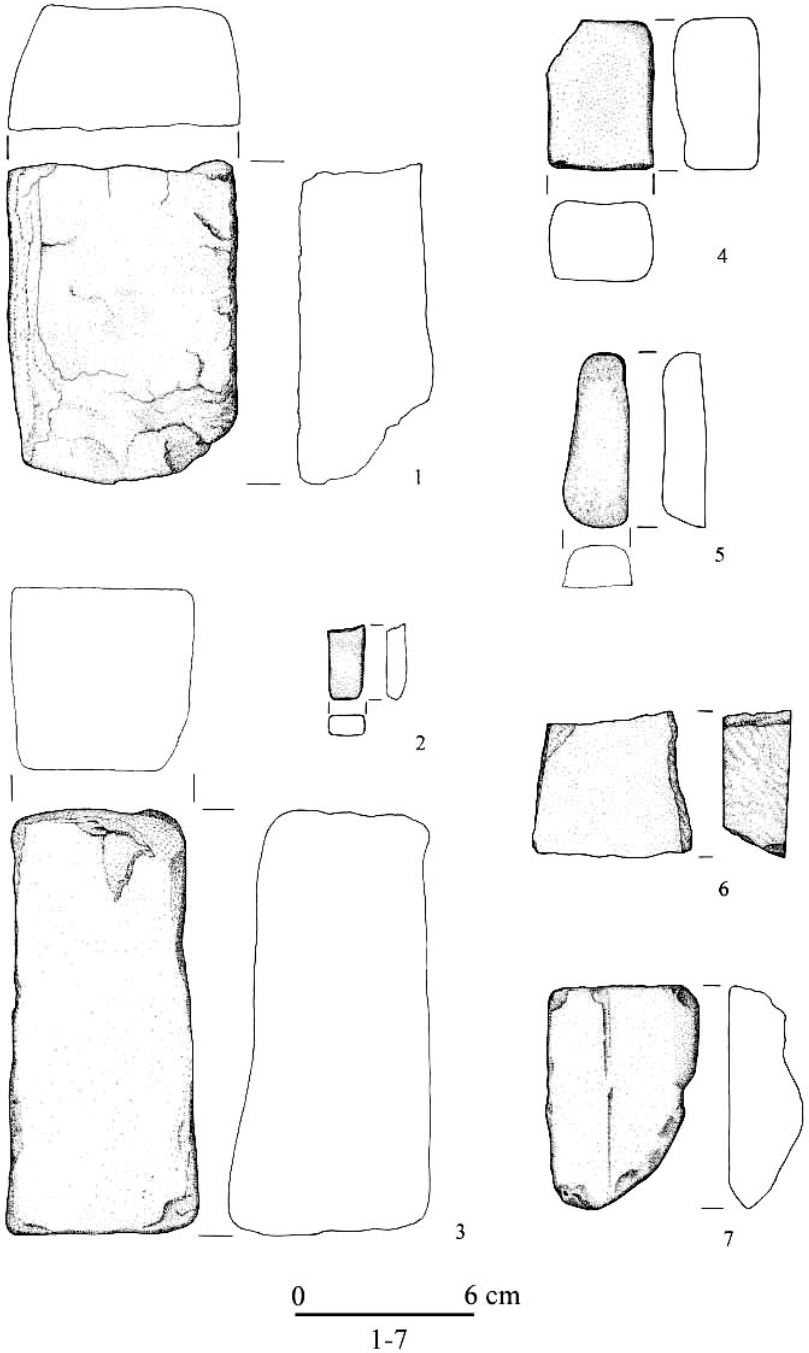

Abb. 20. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Schleif- und Wetzsteine (1–7) (*A. Ryś*)

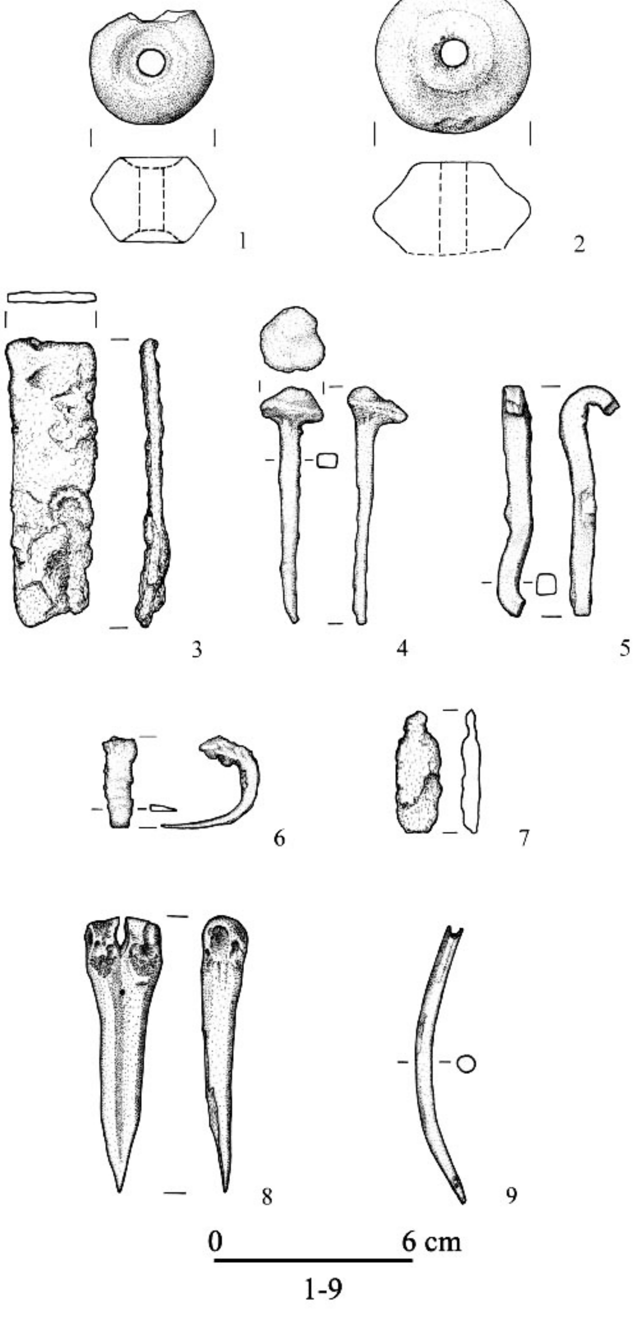

Abb. 21. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Kleinfunde: 1–2 – Spinnwirtel (1–2); Eisenobjekte (3–7); Knochenpfriem (8); Bronzenadel (9) (*A. Ryś*)

Foto. 1. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Ob. 16, Wohngrube der Lausitzer/Pommerschen Kultur (*B. Rogalski*)

S- förmige Töpfe (Abb. 12: 2, 3, 5, 7); kugelförmige Schalen (Abb. 12: 6) und blumentopfartige Gefäße (Abb. 12: 1). Außer der makromorphologischen Typologie erlauben auch die technologischen Eigenschaften Hinweise auf die chronologische Einordnung der Keramik. Die geglätteten, schwarzen Scherben mit sehr feiner Magerung haben Parallelen in Fundstellen, die mit der Pommerschen oder späten Lausitzer Kultur der Phase HaD in Verbindung gebracht werden können (u.a. Kabaciński *et al.* 1998, 328, 344; Krzyszowski, Szamałek 1998, 303, 312).

Eine eindeutige Zuweisung der späthallstattzeitlichen Siedlungskeramik aus der gleichen Fundstelle zur Lausitzer oder Pommerschen Kultur ist beim heutigen Forschungsstand häufig unmöglich (Kaczmarek 2002, 63–64; Rogalski 2011, 88, 90–91). Die beiden Befunde können als Spuren einer Siedlung interpretiert werden, auch wenn Wohngruben im Vergleich zu anderen Befundgattungen der Pommer-

Foto. 2. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Ob. 4, frühslawische Feuerstelle (*B. Rogalski*)

schen/Lausitzer Kultur relativ selten auftreten. Am häufigsten finden sich wenige (2–3) Wohngruben zusammen mit kleineren Objekten, vorwiegend Pfostengruben. Die Wohngruben bilden dabei meistens den Schwerpunkt der Raumorganisation (Baron 2005, Abb. 2–3, 24–27; Messal, Rogalski 2013, 140–142; Rogalski 2011, 92–94). Interessant ist, dass kleinere Wirtschaftsbefunde wie Feuerstellen in Dobropole Pyrzyckie fehlen. Die Siedlungsstruktur lässt sich aufgrund der kleinen Grabungsfläche gegenwärtig leider noch nicht bestimmen. Die Siedlung hat nur zwei Kleinfunde geliefert: eine Knochennadel und eine Tonscheibe (Abb. 13: 1–2).

Zusammenfassend muss man sagen, dass, obwohl das Fundmaterial der Lausitzer/Pommerschen Kultur in Dobropole Pyrzyckie 12 nicht sehr umfangreich ist, die Funde die begrenzte Quellenbasis beider Kulturen in Westpommern ergänzen.

Die Materialen der römischen Kaiserzeit

Der einzige kaiserzeitliche Fund aus Dobropole Pyrzyckie ist ein Fragment der Drehscheibenkeramik aus der Pflugschicht (Abb. 13: 3). Die geborgene Keramik ist dennoch eine wichtige Quelle, da Drehscheibenkeramik in Westpommern sehr selten vorkommt (Domański 2008, 154, Abb. 6; Machajewski 1998, 135). Im archäologisch untersuchten Areal der Fundstelle fehlen leider Objekte der römischen Kaiserzeit (Messal, Rogalski 2013, 146); es ist derzeit nicht möglich, eine kaiserzeitliche Siedlungsphase in Dobropole Pyrzyckie zu definieren.

Die früh- und mittelslawische Siedlung

Der Großteil der untersuchten Objekte kann der slawischen Besiedlung des Platzes zugeordnet werden. Die Ausgrabungen erbrachten umfangreiche Spuren einer slawischen Siedlung, die sich vermutlich bis in das partiell im Magnetogramm erfasste früh- bis mittelslawische Siedlungsareal im Nordwesten der Prospektionsfläche erstreckte (Abb. 8–10). Im Bereich der mutmaßlichen frühslawischen Siedlung wurde dagegen nur eine am Rand des Siedlungskernes gelegene Anomalie untersucht (Abb. 9). Die aufgedeckten Befunde umfassen vorrangig Gruben unterschiedlicher Funktion, einzelne Pfostengruben und Feuerstellen (Foto. 2–3) können ebenfalls der slawischen Bebauung zugewiesen werden.

Für den überwiegenden Teil der Gruben aus Dobropole lässt sich keine Zweckbestimmung ermitteln (Abb. 15: 1, 4–7; Foto. 4). Sie wurden vermutlich aus vielfältigen Gründen angelegt, die aus dem archäologischen Befund jedoch nicht mehr erschlossen werden können. Neben der Nutzung zur Materialentnahme dürften die Gruben aber hauptsächlich als Herdgruben und Erdspeicher sowie in sekundärer Funktion als Abfallgruben gedient haben. Einzelne Gruben können ausgehend von ihrer Größe (max. 300×200 cm) und ihrem langovalem Umriss als Reste ehemaliger Wohnbauten interpretiert werden (Abb. 14). Diese Hausgruben sind für das Siedlungswesen im nördlichen westslawischen Raum charakteristisch (vgl. Biermann 2000, 143–144; 2005, 138–139; 2006, 78–87; 2007/2008, 246–255; Brather 2001, 103; Donat 1980, 46; Dulinicz 2006, 163–164; Schoknecht 1975, 167; 1998, 66, 77 Taf. 3; Szymański 1967, 153–155) und auch aus den unweit gelegenen Siedlungen von Dziedzice und Derczewo in großer Zahl bekannt (Porzeziński 1969, 71–73; 1972, 142–144; vgl. auch Dulinicz

Foto. 3. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Ob. 5, frühslawische Feuerstelle (*B. Rogalski*)

2006, 311–312 [Derczewo]; 314 [Dziedzice]). Zahlreiche im Bereich der Grubensohle freigelegte Steine mit Brandeinwirkung weisen dabei auf ursprünglich zentral angelegte Feuerstellen oder flächige Feuerstellenhorizonte in den Häusern hin.

Zur Aufbewahrung von Saatgetreide dienten vorrangig Speichergruben (Foto. 5), die charakteristisch für slawische Siedlungen sind und dementsprechend häufig auftreten (Biermann 2000, 159–160; Biermann *et al.* 2008, 39; Donat 1980, 80–81; Dulinicz 2006, 207–208; Forler 2005, 167–168; Schoknecht 1975a, 174–176; Pleinerová 2000, 211–213; Wetzel 1985, 41–42). Drei Speichergruben konnten nachgewiesen werden (Abb. 15: 2–3); sie weisen bis zu 210 cm tiefe, beutelförmige Profile mit schmalen Mittelteil auf. Mehrere Verfüllhorizonte dürften auf eine längere Nutzungsdauer hinweisen, eine Speichergrube wurde mutmaßlich durch eine massive Steinpackung vorsätzlich verschlossen.

Foto. 4. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Ob. 1, frühslawische Grube (*B. Rogalski*)

Das Fundmaterial umfasst in erster Linie Keramik. Es treten ausnahmslos handgemachte Gefäße auf, vornehmlich bauchig profilierte Töpfe mit schwach bis mittel ausgebogenen Rändern, weniger häufig Kümpfe und Tonnen mit eingebogenem oder senkrecht stehendem Rand (Abb. 17–19). Mit einem Anteil von nahezu 98 Prozent dominiert unverzierte Keramik, lediglich neun Randscherben weisen Verzierungen in Form von einfachen Kammstrich- (acht Exemplare) und Buckelverzierungen (ein Exemplar) auf. Dieser Anteil entspricht vergleichbaren Fundkomplexen mit ausschließlich oder mehrheitlich unverzierter Keramik aus frühslawischen Siedlungen Westpommerns (u.a. Dziedzice und Derczewo), die unlängst von M. Dulinicz zusammengefasst wurden (Dulinicz 2006, 81).

Die in Dobropole Pyrzyckie geborgene Keramik belegt damit eindeutig den frühen Horizont slawischer Siedlungstätigkeiten in

Foto. 5. Dobropole Pyrzyckie, Kr. Stargard, Fndst. 12. Ob. 8, frühslawische Speichergrube (*B. Rogalski*)

Westpommern. Die in der Siedlung dominierenden unverzierten und handgemachten Gefäße entsprechen den frühslawischen Typen Sukow und Dziedzice (zu den Typen vgl. Biermann 2002, 235; Dulinicz 2006, 71–73; Kempke 2001, 234–235; Łosiński 1972; Wietrzichowski 1989). Mit äußerst geringen Anteilen treten verzierte Scherben des Feldberger und Menkendorfer Typs auf. Allerdings weist der einigermaßen hohe Anteil an unverzierten, aber bereits abgestrichenen Randformen auf ein entwickeltes Keramikspektrum hin, das eher für einen fortgeschrittenen Abschnitt innerhalb der frühslawischen Periode sprechen dürfte (vgl. Kempke 2001, 238). Ausgehend von der unlängst von M. Dulinicz diskutierten Neudatierung der vergleichbaren Keramikkomplexe von Dziedzice und Derczewo in die Zeit um 700 und in das 8. Jahrhundert (Dulinicz 2006, 311–312; 314; vgl. Biermann 2007/2008, 276), ist für das Gefäßinventar von Dobropole Pyrzyckie sicherlich eine ähnliche Datierung vorzunehmen, die aufgrund des geringen Anteils an Menkendorfer Keramik vermutlich auf den Beginn des 9. Jahrhunderts – etwa in die Zeit um 800 – auszudehnen sein dürfte (vgl. Biermann 2007/2008, 276; Dulinicz 2006, 75; Kempke 2001, 238).

Das Siedlungsinventar umfasst weiterhin acht Schleif- und Wetzsteine, zwei Spinnwirtel sowie fünf nicht näher bestimmbare Eisenobjekte (Abb. 20–21). Zu den herausragenden Funden zählt das Fragment einer Bronzenadel aus der Hausgrube S1–37. Die auf einer Länge von 7,7 cm erhaltene Nadel ist gebogen und weist einen runden, etwa 2–4 mm starken Querschnitt auf. Das obere Ende ist an der ehemaligen Öse abgebrochen, die untere Spitze weist starke Abnutzungsspuren auf. Aufgrund des Erhaltungszustandes der Nadel bleibt eine funktionelle Einordnung vorerst offen, wahrscheinlich ist aber eine Nutzung als Schmuck-und Gewandnadel.

Mehrere Schlackebrocken weisen zudem auf eine lokale Eisenverarbeitung in Dobropole Pyrzyckie hin. Aufgrund der geringen Größe der Schlacke ist eine Unterscheidung zwischen Verhüttungs- und Schmiedeschlacke jedoch nicht unproblematisch; (Jöns 1997, 103–104; Westphalen 1989, 211; Schneeweiß 1996, 341) eine eindeutige Ansprache muss gegenwärtig offen bleiben. Hinweise auf landwirtschaftliche Tätigkeiten erlauben dagegen Reste von Lehmwannen, wie sie aus der Hausgrube S1–6 bekannt sind. Sie dienten zur Lagerung und Trocknung des ausgedroschenen Getreides (Herrmann 1985, 76; Meier 1990, 109).

Aufgrund des kleinräumigen Grabungsareals ist die ehemalige Siedlungsstruktur archäologisch nur schwer zu erschließen, zumal auch der Anschluss an die geomagnetisch prospektierten Areale fehlt. Die Befunde verteilen sich relativ gleichmäßig; Hinweise auf Gehöftstrukturen oder Parzellierungen sind nicht zu erkennen. Es ist anzunehmen, dass das Siedlungsbild vergleichbaren haufendorfartig strukturierten Ansiedlungen in Hanglage entsprechen dürfte (Biermann 2007/2008, 281–285; 2009, 313), worauf insbesondere auch die Ergebnisse der geomagnetischen Messung in den hangabwärts gelegenen Bereichen hinweisen.

Die Existenzgrundlage der frühslawischen Siedler bildeten Ackerbau und Viehzucht sowie Fischerei und Jagd (vgl. Dulinicz 2006, 286). Die wenigen archäologischen Hinweise erlauben gegenwärtig nur geringe Einblicke in landwirtschaftliche Tätigkeiten (Speichergruben, Lehmwannen). Das Handwerk war nur bescheiden ausgeprägt; Nachweise für mögliche Handelskontakte fehlen völlig. Die wenigen Kleinfunde weisen auf die Bearbeitung von Geweih und Knochen (Pfriem) sowie die Herstellung von Textilien (Spinnwirtel) hin, darüber hinaus wurde wohl Keramik produziert. Wenige Schlackebrocken könnten zudem eine frühe Eisenver- und -bearbeitung andeuten. Es ergibt sich somit das Bild einer weitgehend bäuerlichen Siedlung, deren Materialbedarf vorwiegend im Hauswerk bzw. im Dorfhandwerk (Eisenproduktion?) gedeckt wurde (vgl. Biermann 2007/2008, 285). Die zu verarbeiteten Ausgangstoffe – wie Knochen, Geweih oder Ton, vielleicht auch Raseneisenerz – konnten im nahen Umfeld unmittelbar beschafft werden, so dass eine autarke Existenzgrundlage gewährleistet wäre.

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Joanna Pilszyk*, Piotr Szmyd**

Use of LIDAR ISOK data Available With the Use of Geoportal 2 Website for Discovering Archaeological Sites

ABSTRACT

Pilszyk J., Szmyd P. 2017. Use of LIDAR ISOK data Available With the Use of Geoportal 2 Website for Discovering Archaeological Sites. *Analecta Archaeologica Ressoviensia* 12*,* 169–176

The aim of the following study is to present archaeological sites, the discovery of which was possible due to the use of spatial data obtained within the framework of the ISOK project and shared in the service of viewing shaded relief terrain for NMT with a resolution of 1m using Geoportal 2.

Key words: ALS, LIDAR, ISOK, Geoportal 2, non-invasive archaeological research

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LiDAR (laser scanning), an acronym from the words Light Detection and Ranging, also known as ALS (Air Laser Scanning), is a topographic research technique that uses an optical laser to scan the earth's surface in 3D (Davis 2012, 4). The pulse is emitted from a scanning device placed under the plane. The result of ALS scanning is a cloud consisting of several thousand to millions of points, which are then processed in the Geographic Information System (GIS) software to generate digital terrain (DEM – acronym Digital Elevation Model). LIDAR is now becoming the primary source of geographic data. This technology collects very accurate geographic data. They are used by scientists representing various fields of science. Data of this type perfectly reflect the shape of the land surface, revealing sites with their own landscape form. Thanks to LIDAR data created within the framework of the ISOK project, we are able to receive accurate imaging of the earth with outlined structures such as earth ramparts, moats, remains of trenches or burial mounds. The obtained imaging has an accuracy of 15 to 30 cm.

ALS has become a very popular method in searching for relics of the past. While analyzing images, it is possible to notice the earth structures

* Ujejskiego 10 Street, 38-200 Jasło; joannapilszyk@wp.pl
** The Carpathian Troy Open-Air Museum at Trzcinica, Trzcinica 646, 38-207 Przysieki, Poland; pszmyd@poczta.fm

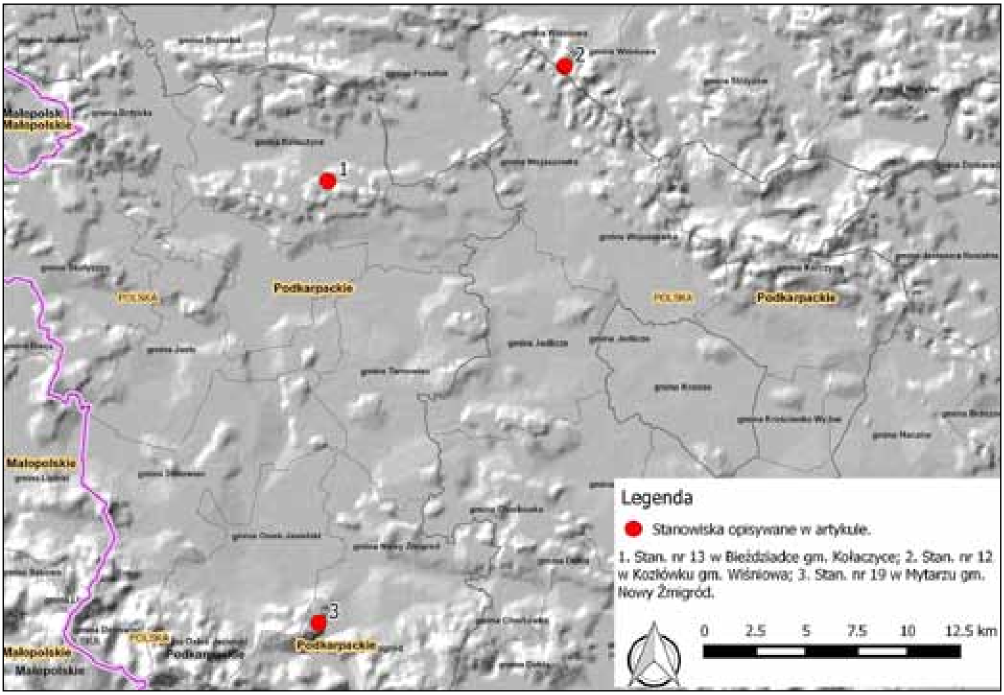

Fig. 1. Location of defensive objects described in the article

hidden under vegetation and inaccessible to the observer in the field. It is a method that allows for non-invasive discoveries and research of historical remains with their own landscape form. In addition, it allows us to generate 3D models of the object as well as its surroundings together with the cross-section of the area. What is more, it makes it possible to study and control destruction processes of given objects.

Based on DEM, DSM (Digital Surface Model) or DTM (Digital Terrain Model) are created. The aforementioned models can be used for various purposes, from area development plans to defining the flood risks. Archaeologists use them to search for relics of the past. DTM is the most useful for archaeological purposes, which reflects the land surface without vegetation and buildings.

Tomasz Brzeziński from Esri Polska defined LIDAR as an „optical method of receiving data. Its operating principle is similar to radar, but instead of a radio beam waves it sends a beam of light. Then we can determine the distance between a sensor and a point that is an obstacle on the basis of measuring the time between emission and reception of the reflected laser pulse" (Brzeziński 2012, 12).

ISOK is a Polish acronym derived from the words „IT system of the Country's Protection Against Extreme Hazards". ISOK data cover 90% of the country, i.e. 289,000 km^2 (Bakuła *et al.* 2014, 309). The project aims to protect the country against threats, mainly against floods. The areas covered by the scan were selected by the National Water Management Authority – KZGW. The data in the ISOK project were prepared in two standards. In the first one, the average density was 4 or 6 points / m^2. In the second standard, the average density was 12 points / m^2 (Kiarszys, Szalast 2014, 271–272).

Polish archaeology used the LIDAR technology for the first time near Piła in Wielkopolska Voivodeship. At the request of the Voivodeship Office for Preservation of Objects of Cultural Heritage, the German company TopScan researched an area of 20 km^2. The research cost 20 thousand euro. Apart from archaeologists the obtained information was used also by geographers and naturalists. Due to these studies, previously unknown burial mounds, fortified settlements and even the system of ancient arable fields were discovered (http://www.rp.pl/artykul/1030693-Archeologia-bez-lopaty.html#ap-2).

Since then, several research programs have been implemented. The flint mines in the Świętokrzyskie Mountains and the Neolithic cemetery in the Muszkowickie Forest in Przedgorze Sudeckie were examined due to financial support by the Ministry of Culture and National Heritage. (http://archeowiesci.pl/2011/10/31/lidar-odkrywa-pozostalosci-pragornictwa-w-polsce/; http://naukawpolsce.pap.pl/aktualnosci/news,393586,pradziejowe-cmentarzyskaodkryto-na-przedgorzu-sudeckim.html). Another milestone in Polish archaeology was to give the access (free of charge) to a website with the LIDAR spatial data viewing service collected as a part of the ISOK project. The data were made available thanks to the website – Geoportal 2. They allowed the archaeological researchers to discover unknown, anthropogenic sites of their own landscape form and great historical significance as well as they allowed scientists to verify already known objects.

Press reports inform us about a series of discoveries from all over Poland. In Stumiany (east of Szczecin) 100 burial mounds were discovered, (http://naukawpolsce.pap.pl/aktualnosci/news%2C401434%2Cponad-100-kurhanowodkryli-archeolodzy-w-woj-zachodniopomorskim.

html) in Masuria barrows and fortified settlements were discovered, as well as the outlines of arable fields, a fortified settlement and burial mounds were identified in the Białowieża Forest (http://archeologia.com.pl/2017/01/01/odkrycia-w-puszczy-bialowieskiej/). In addition, in Gieczno (Zgierz district) a knight's castle, coming from the late Middle Ages was found (http://archeowiesci.pl/2016/02/13/gieczno-grod-odkryty-dzieki-laserowi/), whereas in the intersection of the Biebrza and Supraśl rivers in Podlasie voivodeship, a team of archaeologists from the State Archaeological Museum in Warsaw traced a cluster of fortified settlements (http://geoforum.pl/?page=news&id=23742&link=imponujace-laserowe-odkryciena-podlasiu&menu=46816,46853&category=40).

Below we present a description of three sites discovered in the basin of the Wisłoka and Wisłok rivers. They were all discovered owing to the possibility of viewing the shaded relief terrain representation for NMT with a resolution of 1m (data from the ISOK project) which are available through Geoportal 2. They have their own landscape form. They are characterized by features that allow them to be included in objects with defensive qualities. These objects are located in wooded areas, on headlands falling into valleys of streams or rivers (site No. 13 in Bieździadka, site No. 19 in Mytarz) or on a hill (site No. 12 in Kozłówek), (Fig. 1).

1. Bieździadka, Kołaczyce commune, Jasło district, site No. 13 – „Koci Zamek" (Fig. 2)

The site is located in the north – central part of the Warzyce Ridge which is part of the Strzyżów Foothills. The object is located on the narrow branch of the headland falling down to the Bieździadka stream.

Three sides of it were defended by a natural steepness of the slopes, whereas from the upland, in the place where access was the easiest, the entry was protected by means of two lines of ramparts and the preceding moats. The height of the ramparts reached over 2m and it can be assumed that they were finished with a fence or a palisade. The dimensions of the construction are 42×25 m.

The size of this object is intriguing. It covers an area of about 9 ares. The internal square covers an area of about 3 ares. Such a small space could accommodate only one small dwelling. Furthermore, it is

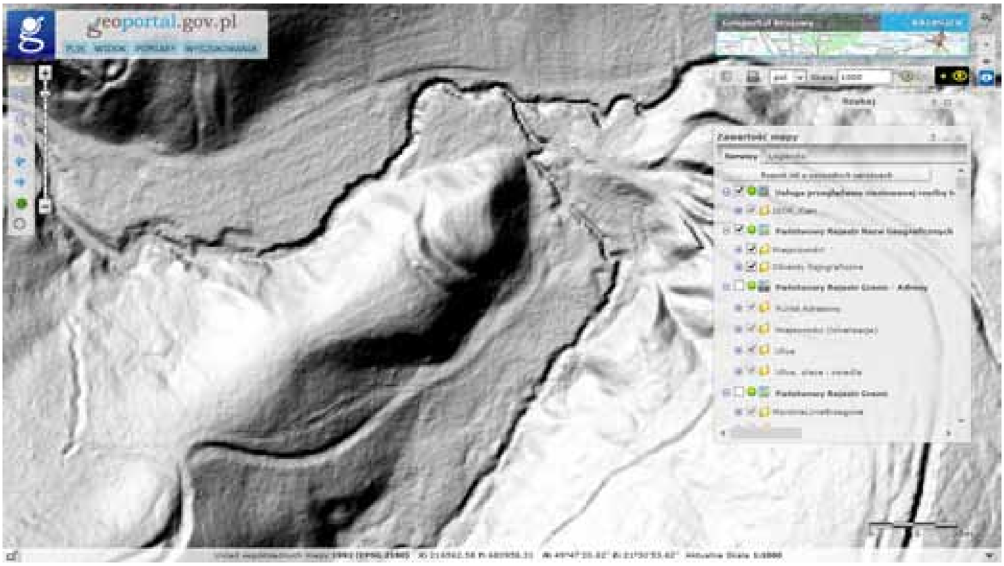

Fig. 2. Screenshot of the website www.geoportal.pl showing site No. 13 in Bieździadka, Kołaczyce commune, Jasło district

worth adding that as for this place there is no extensive view of the area. Therefore, it excludes the possibility of a position of a watchtower or an observation point. The location of the object gives the impression of „covered" or „hidden" one between the hills, located far from the main rivers, which may indicate the desire to hide in the valley, away from the transport routes.

What is more, dating of the object remains the puzzle. During the field research, no artefacts were found, which has made the dating of the object difficult. Some assumptions about the chronology can be drawn from the local name – „Koci Zamek".

„Koci Zamek", „Kocie Miasto", „Kocia Góra" are terms specifying places related to the stay of Hussite groups seeking shelter in Poland in the 15th century. Refugees were looking for peaks with gentle hills with a vast panorama or abandoned defensive places.

2. Kozłówek, Wiśniowa commune, Strzyżów district, site No. 12 (Fig. 3)

This stronghold is located in a place with very good defensive qualities, at the top of a dome-shaped, forested hill (410 m above sea

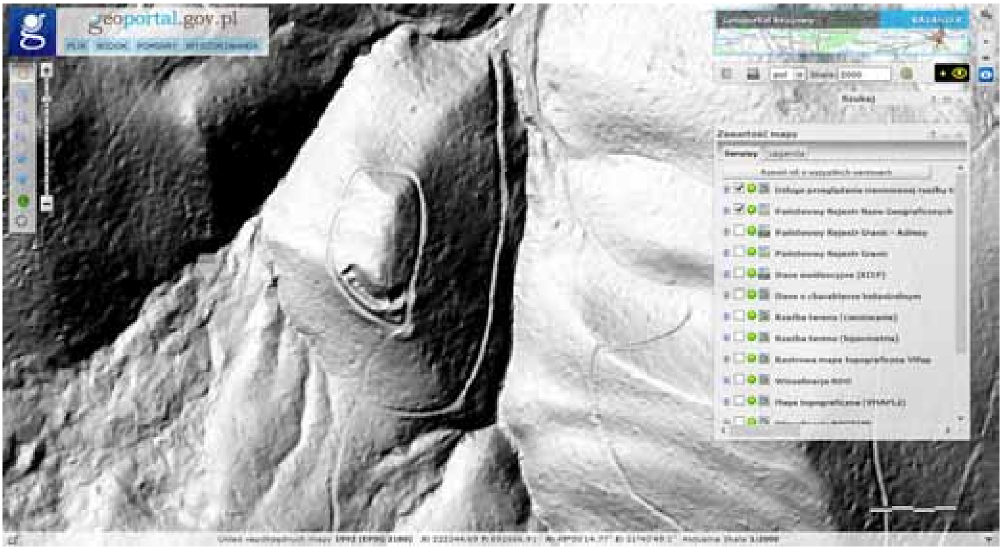

Fig. 3. Screenshot of the website www.geoportal.pl showing site No. 12 in Kozłówek, Wiśniowa commune, Strzyżów district

level). On three sides it is surrounded by a steep slope, descending towards a nameless stream and the „Kamienny Potok" watercourse. From the S side, access is protected by a massive barrier rampart. The stronghold is surrounded by a kind of terrace – a road that was created as a result of the slope buttressing and levelling the surface creating a „road" surrounding the stronghold.

The site covers an area of approximately 60 ares and its dimensions are: 115×65 m. During field research carried out by Joanna Pilszyk and Piotr Szmyd, no historical artefacts were found that could date the object. Initially, the construction can be described as a cone-shaped stronghold based on the form of terrain and analogy.

3. Mytarz, Nowy Żmigród commune, Jasło district, site No. 19 (Fig. 4)

The site is located in the village Mytarz on a nearby headland descending into the Wisłoka river and covered by the forest. This headland is part of a larger hill called Gamracz (436 m.n.n.).

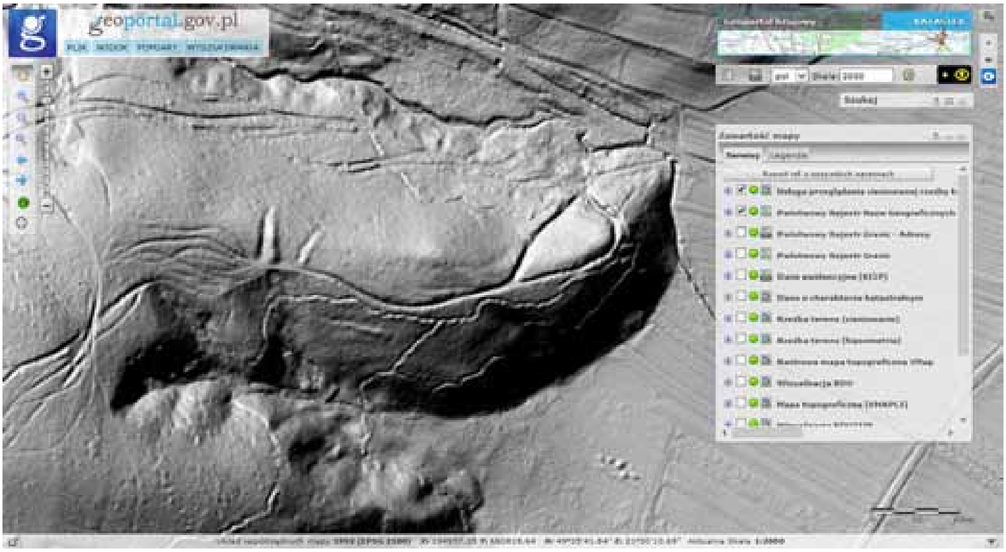

Fig. 4. Screenshot of the website www.geoportal.pl showing site No. 19 in Mytarz, Nowy Zmigród commune, Jasło didtrict

During the field research, two well-preserved earth ramparts were registered, preceded by a moat. The fortifications block the road from the plateau (W) i.e. they are in the place where access was the most convenient.

In other parts, access to the interior was protected by natural slopes or structures that did not leave any records in the area. During the site inspection, no artefacts were found that might date the object. In this place there are also visible trenches from the Second World War.

LIDAR has repeatedly proved its usefulness and archaeologists have received a tool with a powerful cognitive power to discover relics of the past or to verify archaeological sites already known. All you need is the internet access and a review of free of charge data provided by the Geoportal2 platform. The LIDAR ISOK data made it possible to discover sites by means of the proverbial „finger-wandering on the map" without leaving the house. The examples above illustrate how useful they are. And their free of charge access has triggered a flood of discoveries of sites with their own landscape form. That is unique and thus extremely valuable sites. They have enriched historical landscape and broadened our knowledge about the past.

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Piotr Wroniecki*, Roman Brejcha**, Jerzy Sikora***

Knowing Without Digging? Non-invasive Research of the Krzczonów Earthwork and its Surroundings

ABSTRACT

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The topic of this paper is a non-invasive research case study of a protected monument mound in Krzczonów, Świętokrzyskie voivodeship in Lesser Poland. It explores the possibilities of non-invasive methodological approaches in the recognition of archaeological sources by asking whether it is possible to procure relevant information without conducting excavations. A new interpretation of the mound's function and chronology is based on data derived from multi-method field surveys including remote sensing (satellite imagery, UAV, light aircraft, ALS), geophysical (magnetic gradiometry, earth resistance), total station measurements and analytical field walking prospection along with comparison of archival field-walking data. We would like to hypothesize that, contrary to the protected monument list, the Krzczonów earthwork is not a prehistoric feature but could be related to the end of 14th up to the beginning of the 16th century. In this case it could be understood as a remnant of a motte-type castle.

Key words: Krzczonów, non-destructive archaeology, motte-type castle, Late Medieval Period, Early Modern Period

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Introduction

The topic of this paper is research focused on a protected monument and archaeological site in Krzczonów, Świętokrzyskie voivodeship (fig. 1). The area is situated in the eastern tip of Proszowice Plateau which is a coherent part of the Lesser Poland Loess Upland. It is a fertile area covered by chernozem. The most prominent feature of the Krzczonów site, and the only one preserved in topography, is an earthwork mound in the middle of an arable field. It is situated on the southern terrace of the Dobrula small river valley. The earthwork itself is poorly preserved,

* Institut of Archaeology, University of Wrocław, Szewska 48 Street, 50-139 Wrocław, Poland; piotr.wroniecki@gmail.com

** Institute of Archaeology of the Czech Academy of Sciences Letenská 4 Street, 118 01 Praha 1, Czech Republic; brejcha@arup.cas.cz

*** Institute of Archaeology, University of Łódź, G. Narutowicza 65 Street, 90-131 Łodź, Poland; jerzy.sikora@uni.lodz.pl

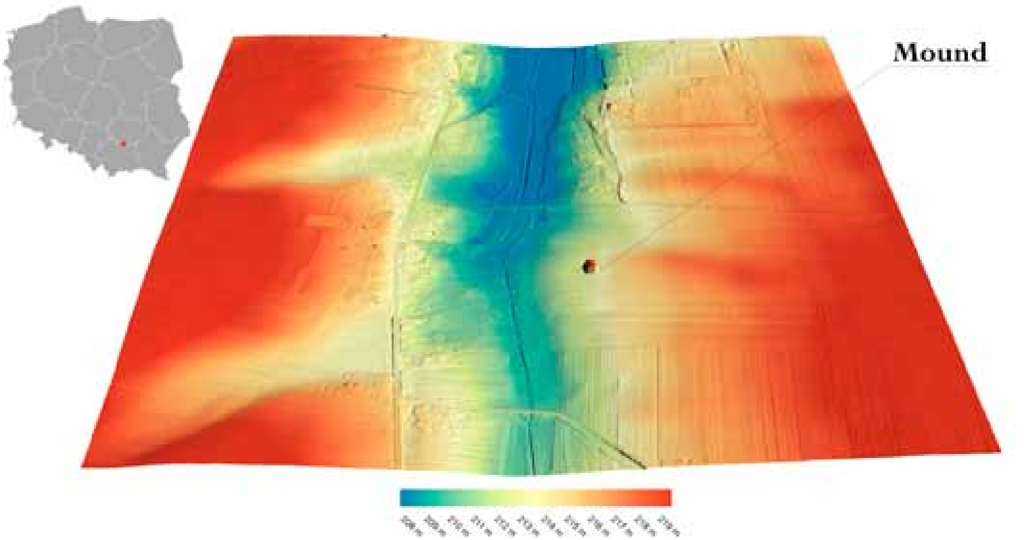

Fig. 1. General three-dimensional view of the Krzczonów landscape based on ALS (ISOK) data. View from the West

approximately 20×20 m in area and 7.5 in height, with very visible signs of natural and anthropogenic erosion.

The mound was added to the national protected cultural heritage monument list in 1986 as a prehistoric barrow (INSPIRE ID: PL.1.9.ZIPOZ. NID_A_26_AR.21851)[1] In Poland this register represents the highest form of legal protection of heritage monuments. The Polish Archaeological Record (Konopka 1981) program (polish: "Archeologiczne Zdjęcie Polski", henceforth abbreviated to AZP), functions in parallel with the register and includes data collected with the prominent use of field-walking. The AZP field survey for Krzczonów (site nr 146, grid 97–63) was carried out in 2004. The acquired AZP data revealed pottery finds in its vicinity dated to Early Medieval (4 sherds)[2] and Early Modern (51 sherds) periods, which is somewhat contradictory with the register.

[1] The register is accessible at the web address: https://danepubliczne.gov.pl/dataset/rejestr-zabytkow-archeologicznych/resource/e50443ee-a891-4a92-9b11-a67ac8667173 [access: 9.11.2017].

[2] However, Early Medieval dating of these four sherds could raise doubts, because according to AZP card dating has been based on surface decoration which is in form of stamp (1x) and engraved wavelet line (3x). Both ornamental elements are known from Late Medieval period as well and as far as wavelet line is concerned, it was found on Late Medieval ceramic material e.g. in nearby site of Łysokanie (Sztyber

This confusing situation regarding the chronology and past function of the mound provides a good example of the shortcomings of field-walking data and hence poses a valid research question: exactly what type of monument is being protected? The answer is important in regard to the archaeological understanding of the area and has impact on heritage management requirements. Barrows and Late Medieval/ Early Modern mounds are places that may for instance require different protections schemes.

It was thought that this problem may be solved through the recognition of archaeological features in its immediate vicinity. In other words, to find out if this anthropogenic structure with topographic relief is a part of some broader archaeological component, which could reveal information about its former function and purpose. To facilitate these aims (and at the same time not cause further destruction of the archaeological site through large-scale excavation) research has been based entirely on non-invasive approaches. The theoretical and methodological framework of this approach has been described in earlier papers (Brejcha, Wroniecki 2010; Wroniecki 2016). Survey work has been taking place intermittently since 2008. Initially on a voluntary basis and also as part of larger field-walking surveys of the University of Warsaw (see Brejcha, Wroniecki 2010; Dulęba *et al.* 2015) and subsequent aerial surveys were undertaken between 2010–2014 as part of the *Prospekcja Małopolska* project (Wroniecki, Maksymowicz 2014). Since 2015 research is taking place as part of The *Hidden Cultural Landscapes of the Western Lesser Poland Upland Non-destructive methods applied to settlement studies* project funded by a National Science Centre research grant (Wroniecki 2016, Wroniecki 2017).

Methods

Since the beginning the research methodology has been fully based on the acquisition of data through non-invasive techniques, including remote sensing (freely available satellite imagery and airborne laser scanning), aerial prospection from a light-aircraft and unmanned aerial vehicle (UAV), geophysical methods (earth resistance and magnetic gradiometry), precise geodetic-topographical measurement

2014, 282) and also during our field survey here in Krzczonów (see below, fig. 8:8). Furthermore, none of our 569 sherds is of Early Medieval dating.

and finally analytical surface artefact collection and a small metal detector survey. These methods have been applied progressively, considering their availability, in order to maximize their effectiveness and mutual complementarity. As has been emphasized many times, integrated approaches to archaeological prospection are necessary to generate reliable information for understanding and management of archaeological sources (cf. Gojda 2004; Cowley 2011; Rączkowski 2011).

Remote sensing techniques were initially used to carry out a preliminary assessment of the study area, its topography and environmental conditions and to document the state of preservation of the mound. The initial phase of research in 2008 consisted of analyzing freely accessible satellite images from Google Earth (http://earth.google.com). This provided basic information about the site and its surroundings, such as the shape and the extent of area and the earthwork itself, the presence of potential crop marks and contemporary land-use of the site and its accessibility. Airborne laser scanning (ALS), as another remote sensing technique, was applied at a later stage. In 2008 ALS data for Poland was not available and the technique itself mostly unknown. Nowadays this method is being employed among the first prospection tools in landscape research mainly due to its general availability. At the beginning of our field research, in 2009, we created a Digital Terrain Model (DTM) through precise total station height measurements tied to national reference points (fig. 4) in order to document the state of preservation of the mound, which has been liable to destruction owing to both anthropological (ploughing, soil extraction) and natural (erosion, bioturbation) factors. From 2015 we have used a DTM (fig. 3) that was interpolated from a point cloud (in the form of LAS-format files)[3] and visualized using the Relief Visualization Toolbox (Kokalj *et al.* 2013). We used the multi-hillshade, hillshade, slope and Sky View Factor visualization techniques.

Aerial prospection from a light, two seater, and high-wing aircraft has been carried out systematically with at least one survey annually since 2010. Most flights were carried out in late June or early July with 58 flight hours having been completed up to 2017. A DSLR camera synchronized with a handheld GPS unit was used to take oblique and near vertical photographs.

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[3] ALS data were obtained from the Polish Geodetic and Cartographic Documentation Centre. More information is available at the website: http://www.codgik.gov.pl/index.php/zasob/numeryczne-dane-wysokosciowe.html [access: 9.11.2017].

The first geophysical survey over an area of approximately 0.32 ha was carried out in 2009 using the earth resistance technique in a 1 m spacing twin-probe configuration with a spatial resolution of 1×1 m. Another 0.72 ha survey was carried out in 2016 with the use of a 0.5 m spacing Wenner array. Magnetic gradiometry prospection over a 5 ha area took place in 2015–2017 with a 1×0.12 m sampling interval. The survey will be continued. Tests were also carried out with the use of total-field magnetic intensity measurements with an Overhauser instrument. The geophysical survey is aimed at large-scale prospection and recognition of archaeological sources and has been the most successful method in understanding the intensity and type of archaeological features hidden within the Krzczonów landscape.

Detailed surface artefact collection was conducted to complement the geophysical survey. Surface collection for prospection purposes was not carried out at the beginning of the research and is included in the workflow of methodical approaches. Establishing an appropriate overall chronology of the site was not the only aim of surface collection. We also wanted this method to contribute to the understanding of structure, characteristic and spatial extent in particular temporal and cultural levels of the site. These aims would be impossible to carry out using the traditional – so called synthetic – field walking approach ("site search") that is why we chose an analytical approach. It is conducted along artificial, regularly spaced units, being considerably smaller that the estimated structure. This resulted in quantitative data being collected that are mutually comparable. The collection takes place in a standardized form and intensity, maintaining a fixed spacing and direction. All finds are collected, not just a subjective selection. Data obtained this way facilitates a proper independent evaluation of the archaeological finds compared to the original model (see Kuna 2001, 28–30; Kuna 2004, 324–333). From the spectrum of systematic field walking methods we have chosen collection on a square grid, which allows a detailed analysis on the distribution and density of surface finds in a chosen area (Kuna 2004, 330–331). In Krzczonów, an area of 3.78 ha around the earthwork mound was divided into 42 square grids, each 30×30 m in size. Survey was undertaken on freshly ploughed soil without any crops, at quite high intensity with 10 field workers. Survey lines were 3m apart.

It is important to note that this research approach is in direct contrast to the established AZP procedures, which included either, more (non-analytical) field-walking, without the possibilities for quantitative and spatial analyses or some form of archaeological excavations. The latter are of course deemed the definitive approach to recognition and protection of archaeological sites – despite their invasive nature. Hence our applied research approach challenges established modes of practice in the recognition of archaeological sites in Poland.

Data assessment

Despite annual aerial prospection surveys, no crop or soil marks were ever registered in the vicinity of the mound (fig. 2). This was caused by a mix of high soil moisture and unfavorable crops such as sugar beets. Satellite imagery was successful in capturing crop growth differences interpreted as remnants of a past road system (see Brejcha,

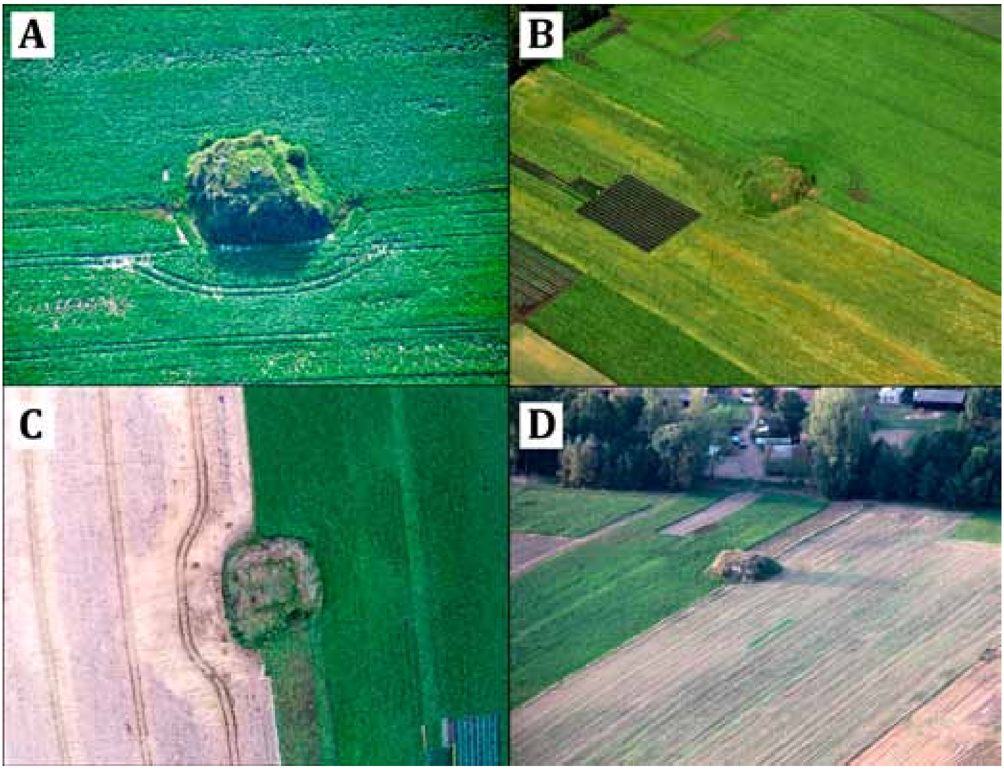

Fig. 2. Krzczonów. Selected results of aerial prospection surveys. Top left: Airplane, 09.07.2012. Top right: Airplane, 06.07.2016. Bottom left: UAV, 25.07.2015. Bottom right: Airplane, 25.09.2015

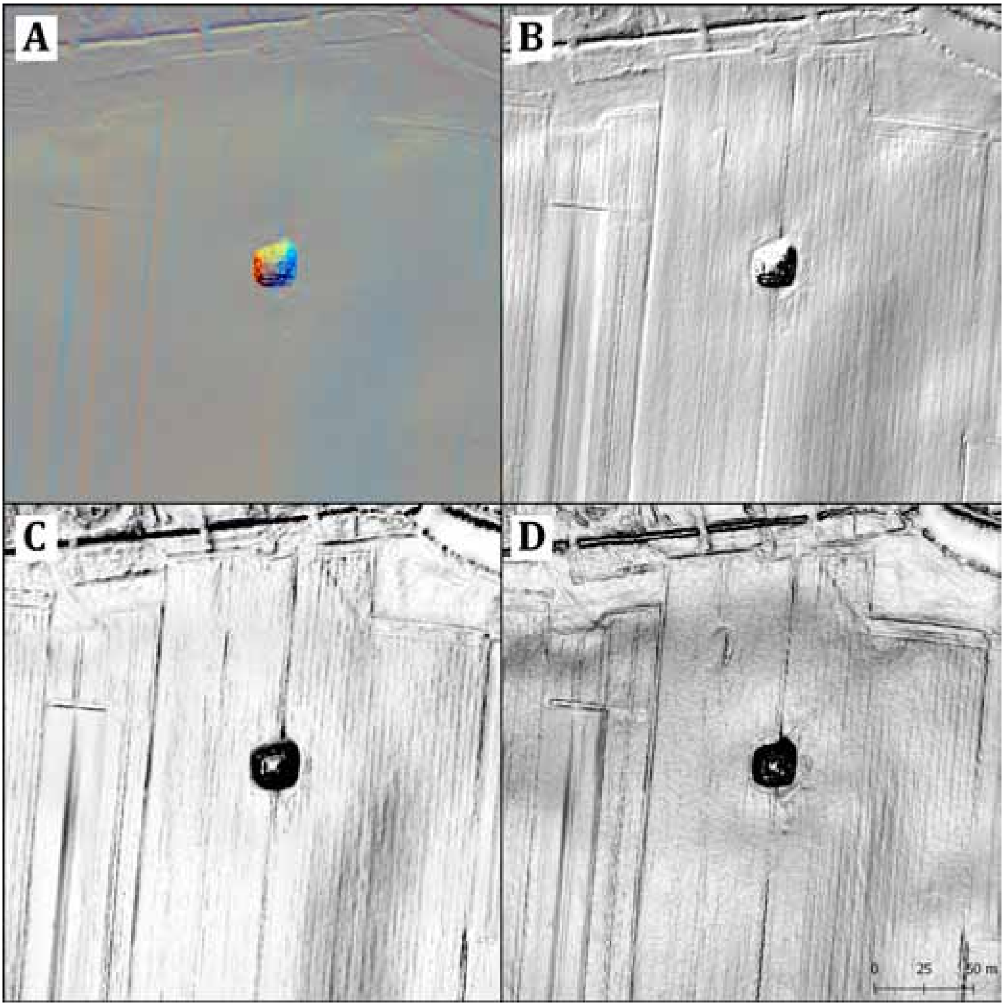

Fig. 3. Krzczonów. Visualizations of reclassified ALS (ISOK) data. A) Multi-directional hillshade B) Hillshade C) Sky view factor D) Slope. North at the top

Wroniecki 2010, 374–376 and Brejcha 2010, 66–67). Aerial imagery, geodetic measurements (fig. 4) and airborne laser scanning (fig. 3) has been an effective way of documenting the mound's rather low state of preservation and visible rectangular structure on its summit. This feature may be indicative of the possible remains of a masonry (?) foundation of the tower structure that were either dismantled for other use or destroyed by WW2 activities in the area.

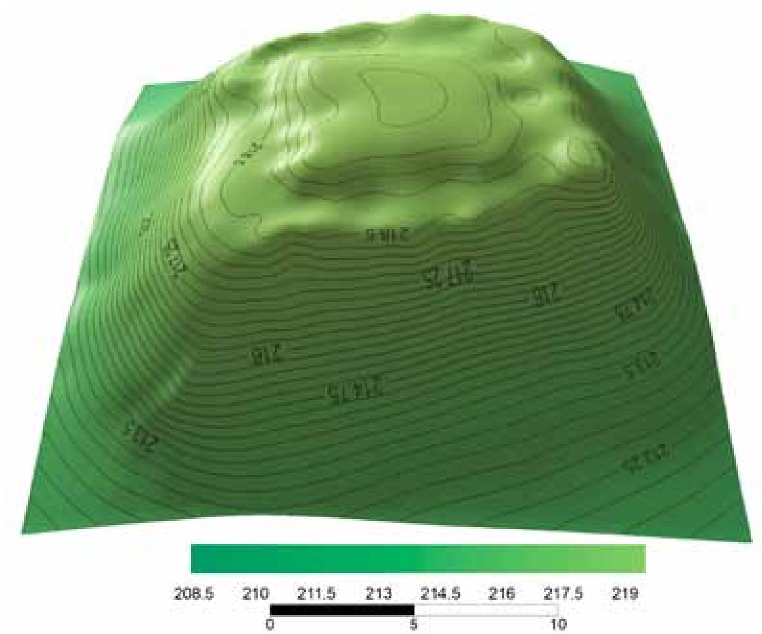

Fig. 4. Krzczonów. Visualization of 2009 total station survey. View from the south. Contour line step is 0,25 m. Altitude scale is in meters a.s.l. Size scale is in meters

The small-scale 2009 twin-probe earth resistance survey revealed a low resistance area in the immediate vicinity of the mound which was interpreted as a remnant of a possible moat (fig. 5). The 2016 survey unfortunately did not reveal any archaeologically significant anomalies. Earth resistance results are strongly influenced by soil moisture indexes, in the same manner as the appearance of crop mark. Another explanation is that the only variable that was changed was the electrode configuration to a 0.5 m Wenner array giving a shallower depth of investigation compared to a 1 m array. A slow rate of data acquisition compared to other techniques, soil moisture dependence and field availability (uncontrollable variables) are direct factors in our conclusion that earth resistance surveys should not be regarded as a prime geophysical method for the recognition of features in the Krzczonów landscape.

The results of the magnetic gradiometry survey resulted in the most significant data spatially and qualitatively (fig. 6). Numerous anomalies were registered in most of the area, including natural closed depressions, local soil changes, contemporary field manuring (as dipolar

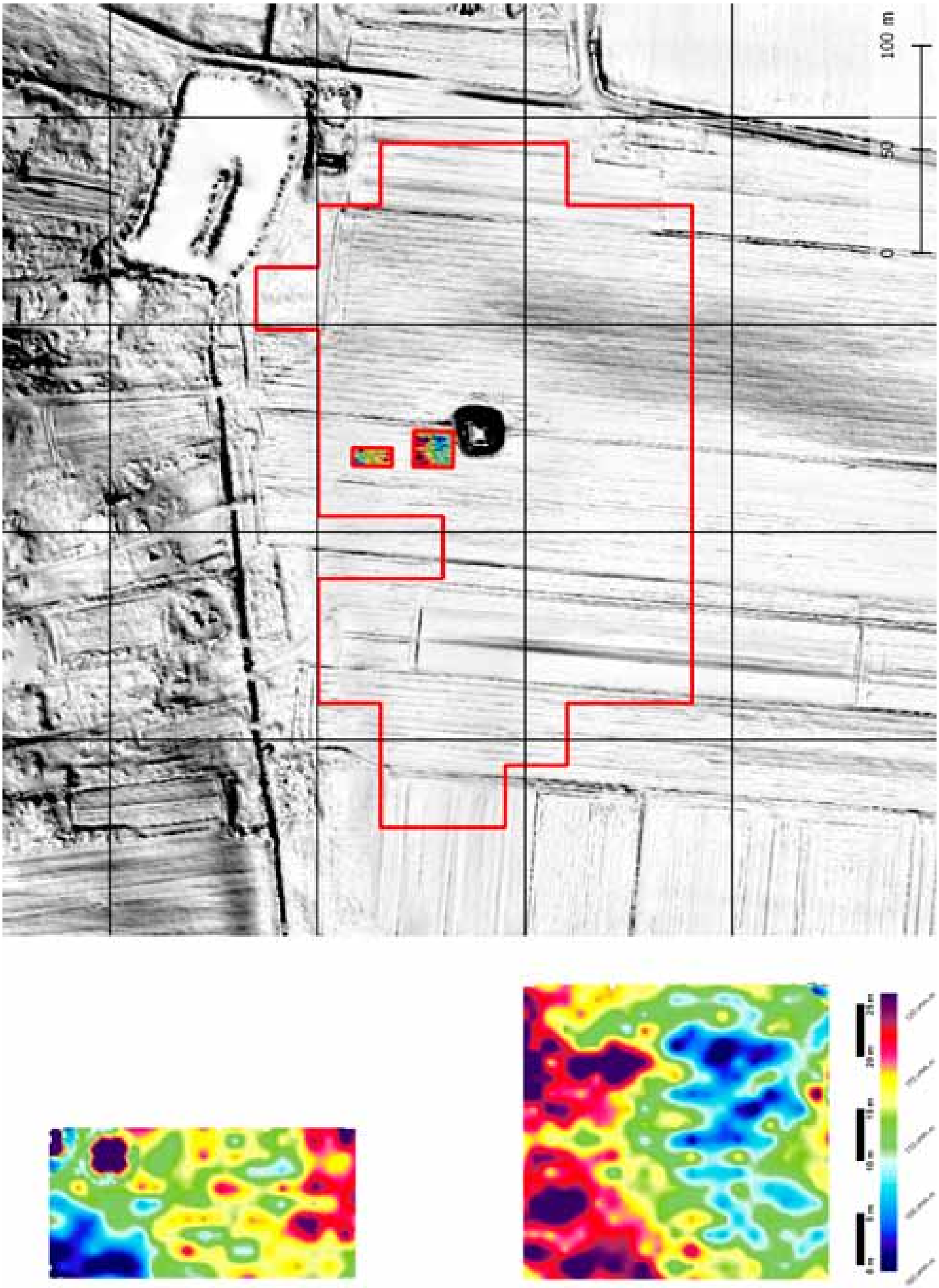

Fig. 5. Krzczonów. Location and visualization of 2009 Twin-probe (1 m spacing) earth resistance survey. North at the top

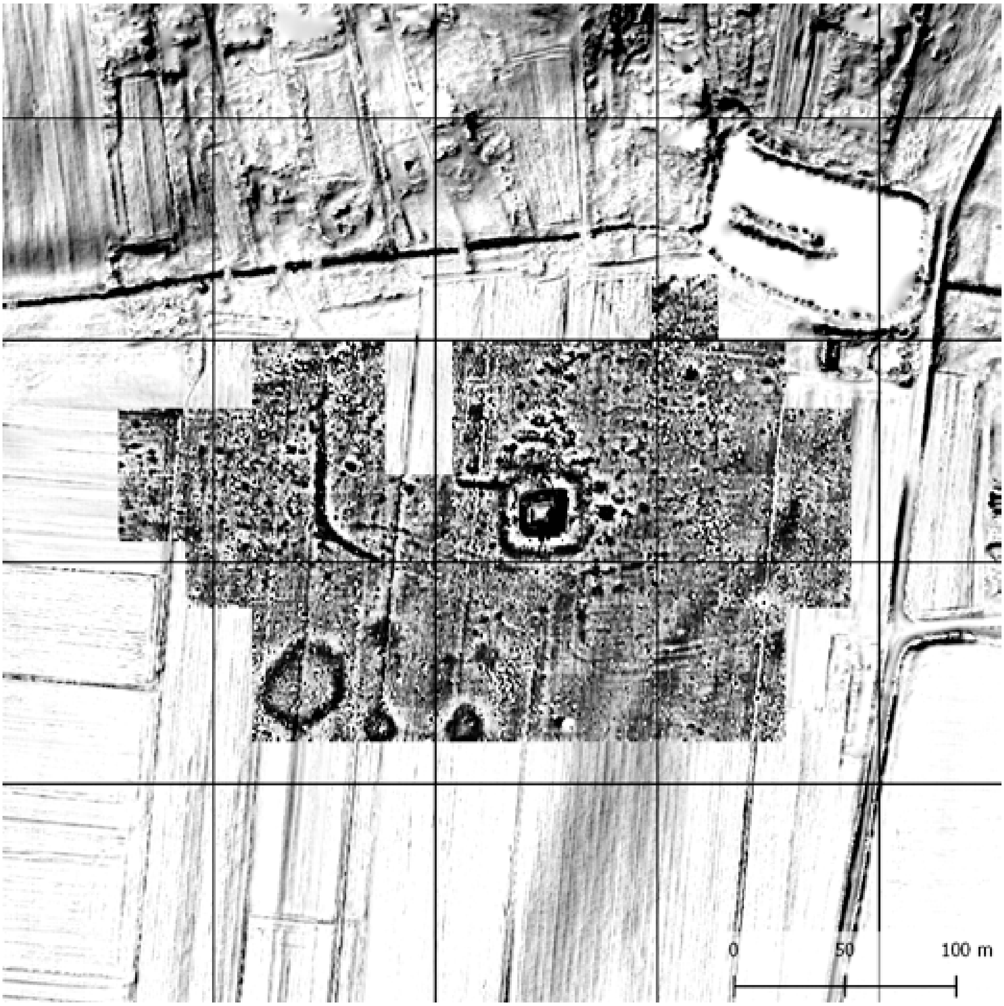

Fig. 6. Krzczonów. Location and visualization (± 1nT, light to dark) of 2015–2017 magnetic gradiometry data. North at the top

anomalies) as well as a multitude of curvilinear and point magnetic anomalies linked with past human activities. Remains of possible man-made structures surround the mound, the most prominent includes a low amplitude rectangular anomaly about 36×36 m in extent and on average about 5m in width wide (fig. 9: A). Immediately adjacent to the mound are a multitude of square and rectangular-shaped, higher amplitude anomalies with average dimensions about 5×5 m dimensions (fig. 9: C). These were registered in high convergence to the north and east of the mound. Similar anomalies further to the north and west of the mound were lower in intensity and could relate to archaeological features. A relatively highly magnetized curvilinear anomaly, oriented approximate N-S is visible almost 100m to the west of the mound. The source of the anomaly could be the artificial leveling/fill of a gully road. Other possible continuations of this road can be recognized in similar responses in the magnetic data. They are located on higher ground, perpendicular to the slope direction and hence were less liable to slope erosion and therefore generate narrower and lower amplitude magnetic anomalies (fig. 9: B).

The analytical field walking survey was carried out in 2016. The collection of artefacts obtained in Krzczonów resulted in 569 potsherds (fig. 7: A) whose total weight was nearly 5 kg. In this group 23 small fragments are dated to 18th–19th centuries (fig. 7: D). These fragments were spread randomly with no specific concentrations and represent typical Late Modern waste scattered in the field. The remaining finds are related to the Late Medieval period (14th–15th centuries; 421 artefacts; fig. 7: B) and the Early Modern Period (16th century; 125 artefacts; fig. 7: C). In this group two raw materials associated with the type of clay used are recognized. Firstly there is ferruginous material, mostly of brick red, brown or grey colors, forming two thirds of assemblage, and the so-called white-type, which differs from white or various shades of creamy to pink colors – if burnt in oxidation atmosphere. If the burning atmosphere was reductive, the pottery surface has dark grey color. There is a (mostly inner) surface finish in form of color glazing (green, olive, honey and yellow) on many fragments of white-type material (fig. 8: 7, 15, 19). The most common form of decoration is multiple horizontal engraved lines (fig. 8: 9), sometimes accompanied by a wavelet line (fig. 8: 8) or vertical notches (fig. 8: 1, 11). Tracing wheel was used as well (fig. 8: 10). Among the white-type material there are two pieces with traces of painted decoration made in a reddish-brown color. From the morphological point of view, the majority of determinable vessel shapes is formed by pots with various forms of rims (fig. 8: 1–7), followed by jugs (fig. 8: 12–14), bowls (fig. 8: 15, 16), pot-lids (fig. 8: 17, 18) and plates (fig. 8: 19). In the assemblage, there is a majority of Late Medieval material, which appears in greater intensity north and west of the mound itself. Its spatial association with the geophysical results representing sunken features, such as traces of

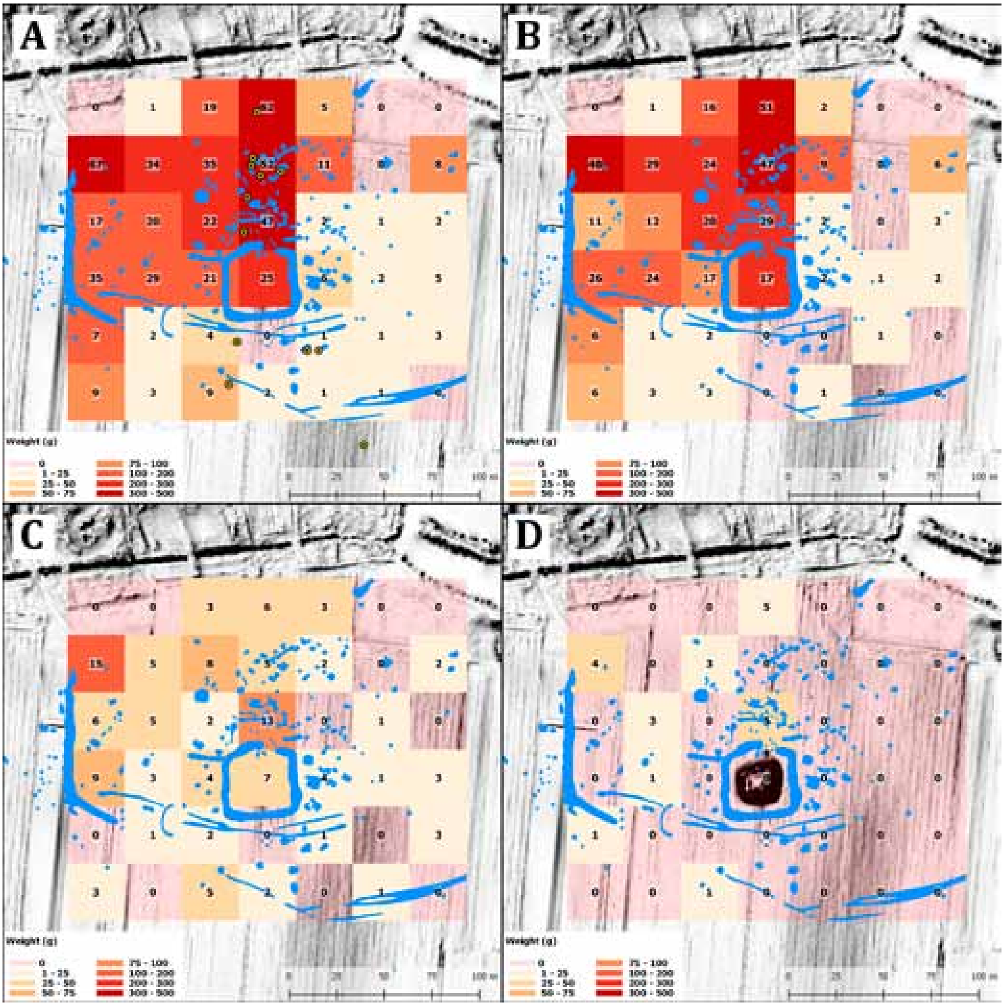

Fig. 7. Krzczonów. Results of analytical field walking data. Archaeological interpretation of geophysical and remote sensing data marked by blue. Color coding represents weight of finds within each grid. Quantity of finds represented by number in center of each grid. A) Full dataset B) Late Medieval C) Early Modern Period D) Modern Period. North at the top

magnetized hypothesized timber constructions, settlement pits and the former moat surrounding the mound, confirm the age of these structures, including the mound, to the 14th–15th centuries with the negligible overlap to the following century.

The 2009 small-scale metal detector survey registered 13 Late-Medieval finds located mostly directly north and south of the mound.

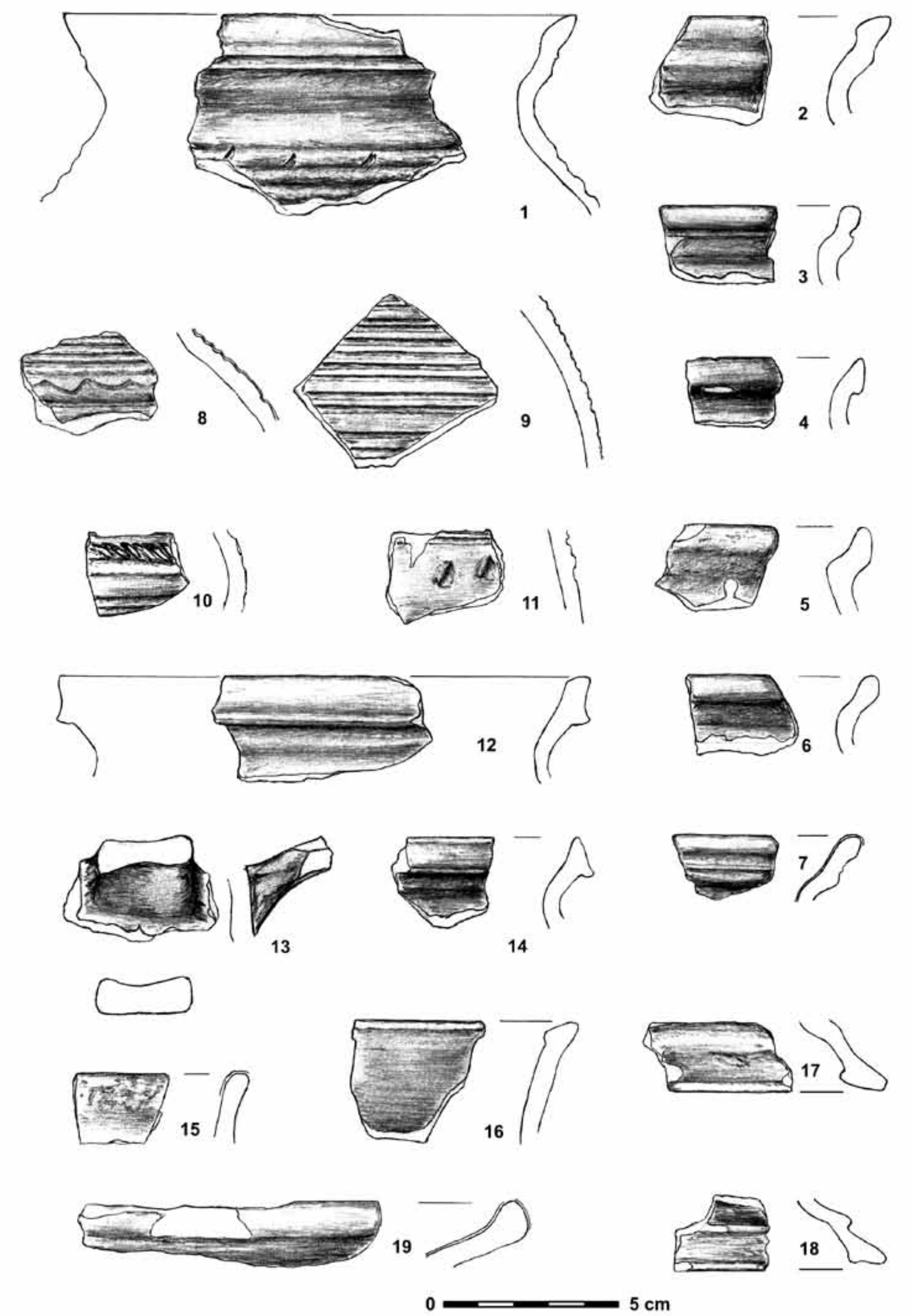

Fig. 8. Late Medieval and Early Modern pottery. A representative sample of 2016 field walking survey assemblage. Drawing and analysis: Agata Sztyber

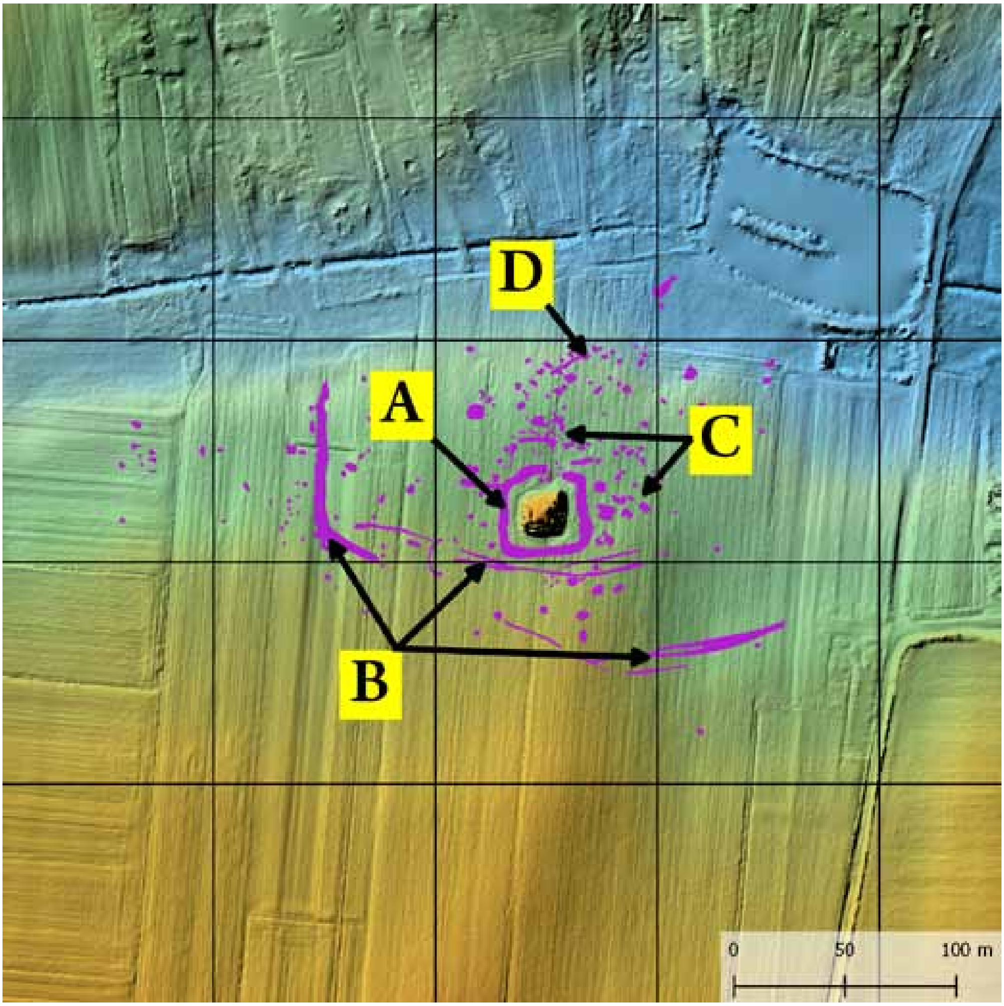

Fig. 9. Krzczonów. Purple) Mapping of remote sensing and geophysical anomalies. A) Fill of possible former moat that surrounded the mound B) Traces of possible road network C) Remains of highly magnetized timber constructions D) Remains of road with traces of settlement pits (?). North at the top

These include 3 Jagiellonian denars, 1 iron belt buckle, 3 bronze coins, 1 silver coin, lead weights and 1 trade seal with a representation of the Fleur-de-lis and Pillars of Giediminas.

The implemented methodology allowed for the collection of archaeologically significant information. Analytical field walking surveys enhance the spatial understanding of past processes taking place in the landscape in different time periods. Aerial remote sensing and geophysical data revealed the spatial dispersion of archaeological features that, based on comparison of their morphology and signature with the known analogies, also allow estimation of cultural and chronological information.

Archaeological interpretations

The present-day mound has been subject to years of natural and agricultural erosion and was once surrounded by a 5 m wide rectangular moat. The moat can be used in a hypothetical reconstruction of the initial size of the mound. It was originally about 35 metres in width. The regular rectangular shape and width of the surrounding moat are crucial data for the archaeological interpretation of the Krzczonów earthwork. Most probably it is not a barrow or of prehistoric chronology. Rectangular barrows are known from the Early Medieval period from extensive areas of Southern Poland, Podlasie and Pomerania, but most of them are much smaller, with dimensions no more than few metres to about 10 metres (Zoll-Adamikowa 1975; 1988; Łosiński 1996). Its morphology is more related to the mound of a Late Medieval motte-type castle. We cannot exclude a later, Post-Medieval chronology but based on the available data this may be a less likely interpretation even though Polish nobles still used this type of mound residence up to the second half of 16th and even later in 17th and 18th century (Kajzer 1996). In these later periods a horizontal layout timber building which required more area than a vertical keep (typical for Late Medieval and Early Modern periods – first half of 16th century) was preferred. A Modern period structure would require a larger area on the top of the mound than which can be observed in the reconstructed topography of Krzczonów.

A. Marciniak-Kajzer in her publication on private residences doubted in rectangular-shaped medieval mottes (2011, 68–69) assuming that this form appeared in the Early Modern period. The chronology of the possible motte in Krzczonów based on surface finds, dimensions and morphology tends to favour a Late Medieval interpretation. Several comparisons to such structures from this time period can be recognized.

In Bebelno a rectangular mound 25 m wide was surrounded by 4 m wide moat. During excavations in 2002–2003 two phases of medieval residence were uncovered. The older one from the 13th–14th

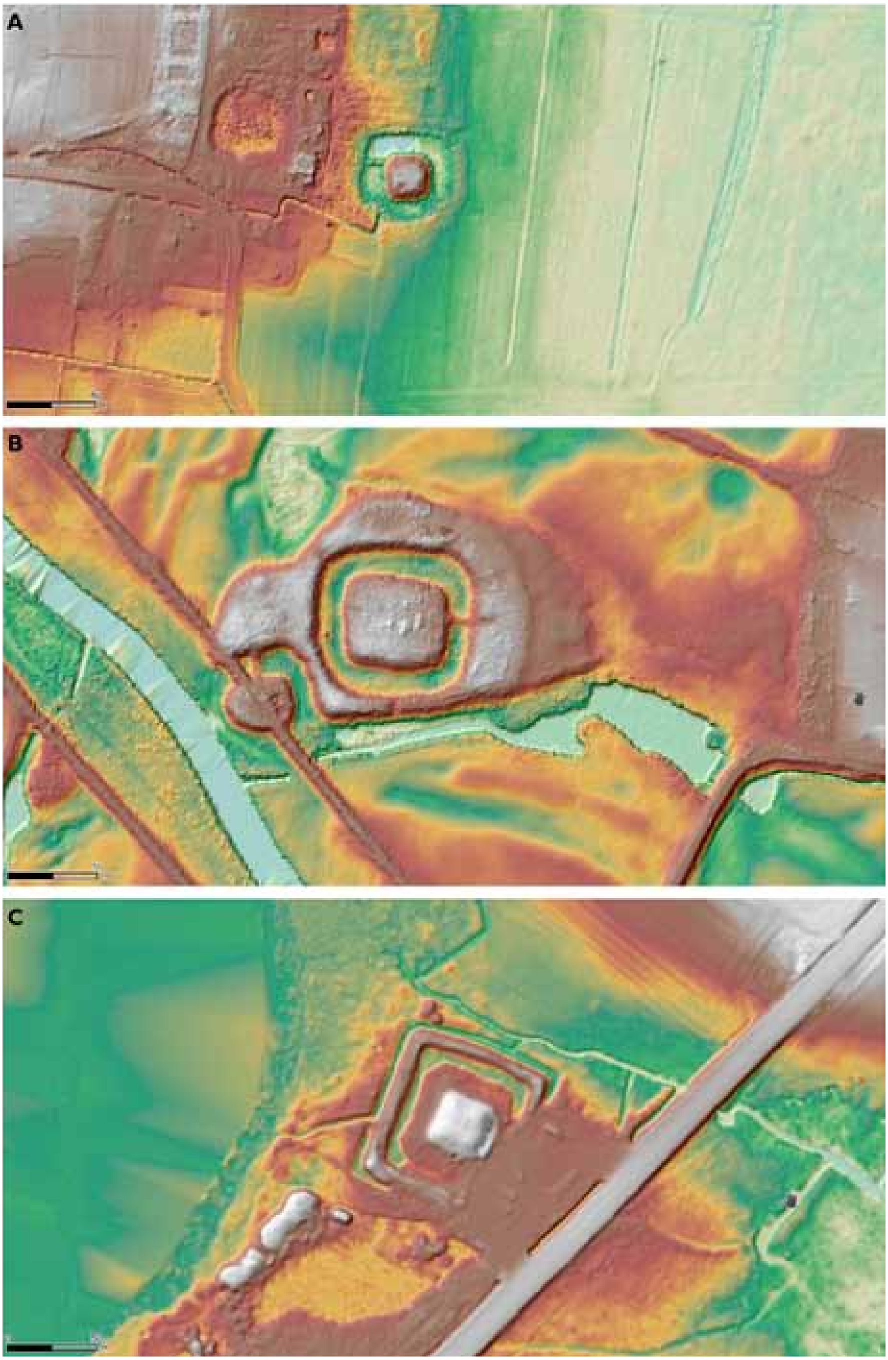

Fig. 10. Hillshaded DEMs of rectangular mottes from Poland. A) Chróścina, gm. Góra, B) Bełcz Mały, gm. Wąsosz, C) Wityń, gm. Świebodzin. North at the top

century constituted a timber building with palisade, the younger period from the 15th century was a masonry tower with dimensions of 6.8×7.5 m (Hadamik 2004). Thoroughly researched remains of a rectangular motte were uncovered during rescue excavations preceding the construction of a motorway in 2003–2005 in Pomorzany. It was a quadrilateral platform of a levelled mound with dimensions of 16×19 m originally surrounded by a moat. Both the mound and the moat were dated (with dendrochronology) to 1385–1386 AD (Świętosławski 2013). According to the excavations of F. Biermann *et al.* (2011) a motte-and-bailey castle in Bełcz Mały (fig. 10: B) was a seat of a castellanus (a ducal official), built around 1400 AD. The remains of the central part of the castle are currently an almost rectangular mound with dimensions 50×54 m on which masonry features were discovered (remains of a residential tower) surrounded by a moat 16 m to 19 m wide. Remains of a bailey adjoin it to the west (28×32 m). In Chróścina (fig. 10: A) another rectangular motte is known, about 26 m wide with a moat 10 m wide. During small scale excavation it was dated to 14th–15th century (Lodowski 2001). In Wityń (fig. 10: C) we can observe a rectangular mound about 30 m wide surrounded with about 20 m wide moat and small rampart (Nowakowski 2008, 566–567). This overview indicates that rectangular forms of motte were not exceptional, especially in the Late Middle Ages (14th and 15th centuries) although most of them are known from Silesia and only some from Late Medieval territory of the Kingdom of Poland.

Magnetic anomalies mostly to the north, west and directly east of the moat may be interpreted as remains of sunken parts of timber buildings, possibly contemporary to the hypothesised motte. Large, regular, and heavily magnetized anomalies are characteristic of burnt daub walls, typical in Late Medieval Polish architecture. To the north is a rectilinear positive anomaly that is adjacent to the moat feature. These structures can be interpreted as remains of a settlement connected with the residence or most probably as traces of residential, economic or service buildings of the outer bailey that maybe enclosed by a palisade (?). Magnetic gradiometry shows a 5 m wide linear feature that implies the existence of a hollow way road leading from the small river valley, south of the mound, going further in the eastern direction. This group of curvilinear anomalies can be tied to past human activities such as traces of sunken roads (more sunken and infilled hence higher anomalies in parts closer to the valley, higher parts less eroded and narrower anomalies), an important landscape feature.

Based on the available data we would like to hypothesize that the Krzczonów earthwork could be related to the end of 14th up to the beginning of the 16th century. This period fits both to the pottery analysis and is documented by metal finds as Jagiellonian silver denars, buckle and lead textile seal. In this case the whole complex in Krzczonów could be understood as motte-type castle (cf. Sikora, Kittel 2017).

Conclusions

The Krzczonów Mound is one of relatively few archaeological sites in Poland included within the protected monument list[4]. The earthwork itself does not objectively present a high aesthetic value, nor is it well preserved, looking out of place in the contemporary rural landscape. Despite data pointing to other interpretations it is recorded in documentation as a prehistoric barrow. These points altogether form a certain dissonant and contradictory picture of the area's past. Until recently this situation with unclear and missing data presented a seemingly impossible task to properly interpret the site without the use of destructive excavations. The research carried out intermittently since 2008 with multi-method and integrated use of non-invasive techniques has however managed to break the cognitive impasse and propose a more precise interpretation of the function, chronology and range of past cultural activities in the area. The acquired non-invasive data has provided answers to heritage management questions. The applied techniques and methodology are capable of providing significant scientific data. They also facilitate a more precise view of the archaeological landscape of the study area and traces of long forgotten human activities in various chronological periods and spatial contexts. At the foundation of this approach lies the crucial appreciation of the value of integration of methods. Finally, what may seem obvious but is often forgotten when evaluating various methodologies – despite various flaws it is non-destructive, thus the research on certain sites can be repeated many times without damaging unique and irreplaceable archaeological resources.

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[4] According to the AZP there are over half a million known archaeological sites but only around 7700 are actually listed as protected monuments (cf. footnote 1).

Acknowledgements

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Mirosław Furmanek*, Piotr Wroniecki**

Erased by the Plough, Spotted from the Air. Remains of Earthwork Sites from Silesia

ABSTRACT

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Since 2012 south-western Poland has been subject to regular aerial prospection campaigns that covered a vast area of the Upper Silesian, Lower Silesian and Opole regions. Eight surveys were conducted in with a total of 44 flight hours during late spring and summer dates. Their primary aim was the recognition of Neolithic and Early Bronze Age communities and landscapes. Additional photographic documentation of known and newly discovered features from other chronological periods was also obtained. The article presents a selection of data from five medieval settlements (Borucin site 2, Chrzelice site 1, Gniechowice site 1, Komorno site 1, Stary Zamek site 6), whose common feature is their nearly completely leveled earthworks, which makes the presented aerial imagery a basic source of information about them. The potential of remote sensing approaches in the case of quickly deteriorating archeological terrain forms, although not used frequently, has numerous advantages especially in contrary to the still favoured destructive excavation strategies. A visible intensification of archeological site destruction due to all-round development of urban and rural areas has affected all types of archeological sites – also those characterized (until relatively recently) by unique and complex earthwork remains. This situation requires an adaptation of new protection strategies, as well as alternative cognitive and methodical schemes. The case studies presented in this paper are a final wakeup call showcasing the scale of the ongoing, countrywide, systematic destruction of important yet unknown or poorly researched archeological sites. The remedy in our opinion is the recognition of non-invasive remote sensing and geophysical techniques as primary research methods as they allow defining crucial elements, such as form, size, layout, or functional interpretation.

Key words: aerial prospection, remote sensing, fortified settlements, Silesia, Medieval

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Introduction

Since 2012 south-western Poland has been subject to regular aerial prospection campaigns that covered a vast area of the Upper Silesian, Lower Silesian and Opole voivodeships. Eight surveys were conducted in with a total of 44 flight hours during late Spring and Summer dates (Fig. 1: A). Aerial reconnaissance is an important element of

* Institute of Archeology, University of Wrocław, Szewska 48 Street, 50-139 Wrocław, Poland; miroslaw.furmanek@uwr.edu.pl

** Institute of Archeology, University of Wrocław, Szewska 48 Street, 50-139 Wrocław, Poland; piotr.wroniecki@gmail.com

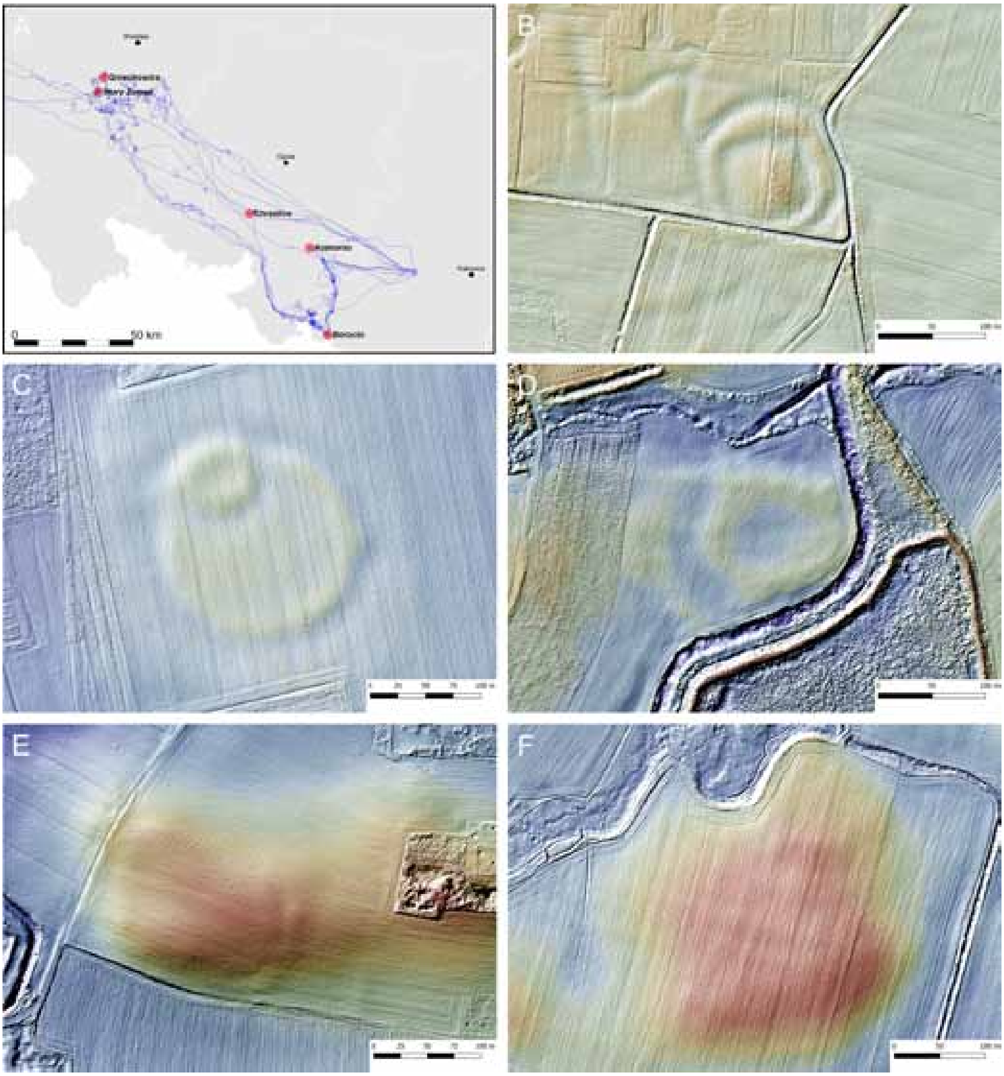

Fig 1. A) Location of archeological sites discussed in this paper with flight tracks from aerial prospection campaigns 2012–2017 and ALS derived hillshaded Digital Elevation Models (B – Borucin,site 1, C – Chrzelice, site 2, D – Gniechowice, site 1, E – Komorno, site 1, F – Stary Zamek, site 6). *Elaborated by. P. Wroniecki*

research projects related to the study of Neolithic and Early Bronze Age communities in Silesia (e.g. Furmanek *et al.* 2015). It was implemented based on the deep conviction of its potential, not only from the perspective of archeological site discovery but also in the understanding of transforming approaches to spatial forms, changes in the cultural landscape, monumentality connected with the emergence of enclosed extensive timber and earthwork constructions and their social, cultural and economic role in past societies. Aerial prospection in this perspective is both a source of new data for the interpretation of these phenomena as well as an element of a more complex program involving the use of non-invasive and other analytical methods ranging from artifact analysis to more advanced geoarcheological and bioarcheological research. Such a comprehensive methodological approach allows creating complex and advanced (re)constructions of past realities. As a side-effect of landscape oriented aerial prospection is the photographic documentation of features and sites from chronological periods that evidently go beyond this scope, falling into two categories: new discoveries and new data about already known archeological sites. For instance selected Iron Age features such as small rectangular enclosures were researched with terrestrial geophysics and test trenches (Dulęba *et al.* 2017).

In the past the geographic region of Silesia was subject only to ad-hoc prospection flights conducted to monitor known and register new archeological sites (e.g. Otto Braasch, Dariusz Krasnodębski, Włodzimierz Rączkowski, Wiesław Stępień, Eugeniusz Tomczak, Mirosław Furmanek; Braasch 1999; Tomczak 2001; Krasnodębski 2005). Some surveys took place along with the construction of the Wrocław Motorway bypass, the S8 expressway (Rączkowski 2009) or for the purposes of documenting selected types of monuments (e.g. medieval strongholds and castles) which were the basis for popular science publications (e.g. Gorgolewski, Tomczak 1996; Tomczak 2012).

The application of aerial prospection in the case of Silesia seems to reflect the wider situation in Polish archeology. Twelve years have passed since the publication of "Biskupin ...and what next?" dedicated to the promotion of remote sensing in archeology, which is freely available for all who are interested as an open access work (Nowakowski *et al. (eds.)* 2005). It included more than 500 pages detailing varied views of individual authors, international case studies and guidelines on implementation. These form a powerful compendium of knowledge about the capabilities of non-invasive prospection. It is however worrying that not much has changed with regards to the popularization of aerial prospection. Its use in research projects as well as cultural heritage strategies is still rare. There have been notable exceptions, for instance by archeologists from Poznań (e.g. Nowakowski, Rączkowski 2000;

Maciejewski, Rączkowski 2005; Prinke *et al.* 2005; Dernoga *et al.* 2007), systematic projects in Lesser Poland (Wroniecki, Maksymowicz 2014, Wroniecki 2016; 2017) and several projects in other parts of Poland (e.g. Kobyliński *et al.* 2000; 2005; Miałdun, Mirkowska 2001a; 2001b; Krasnodębski 2007; Stępień 2005; Sosnowski 2005).

It is particularly worrying that remote sensing approaches have not found their way into standard heritage management strategies. In a key document related to the currently ending *National 2014–2017 Monument Protection Programme* (pol. *Krajowym programie ochrony zabytków i opieki nad zabytkami na lata 2014–2017*), aerial survey as well as other non-invasive methods are not once mentioned, although AZP (pol. *Archeologiczne Zdjęcie Polski*, a national programme aimed at recognition of archeological sites with the use of field-walking) is mentioned over 30 times.

The case studies selected for this article are effects of aerial prospection aimed at monitoring known archeological sites for the purpose of future research with the use of non-invasive methods (Borucin, Chrzelice and Komorno)[1]. The rest (Gniechowice and Stary Zamek) were registered by chance as they are located in the vicinity of known Neolithic sites. They also fall into the category of monuments eagerly studied in Polish archeology – medieval (?) strongholds. Medieval fortifications in general have often been the target of aerial documentation and can be described as one of the most eagerly photographed monuments beginning in the 1920's (e.g. Hellmich 1926; Kowalenko 1938, Rajewski 1962). Most work was done however on sites with clearly visible and well preserved earthworks. Aerial images served mostly as a visual overview without any scientific reflection or for popular publications and albums (Gorgolewski, Tomczak 1996; Tomczak 2012).

In order to show the other side of aerial prospection (one more related to using aerial imagery as means of studying the past) we would like to present five case studies of different fortified settlements in terms of form and chronology in this preliminary report paper: Borucin (site 2, Racibórz district, Silesian voivodeship), Chrzelice (site 1 Prudnik district, Silesian voivodeship), Gniechowice (site 1, Wrocław district,

[1] Borucin and Chrzelice have already been the subject of multi-faceted non-invasive studies conducted by Maksym Mackiewcz nad Bartosz Myślecki. The results have been published (Mackiewicz, Myślecki 2014, 2015a, 2015b)

Lower Silesian voivodeship), Komorno (site 1, Kędzierzyn-Koźle district, Opole voivodeship), Stary Zamek (site 6, Wrocław district, Lower Silesian voivodeship). Their common denominator is their considerably poor state of preservation caused primarily through agrotechnical activities. This makes the aerial imagery presented here a basic source of information about them – not noticeable from the ground and often unreadable in precise ALS derivatives.

Borucin, site 2

The archeological site in Borucin was discovered by Max Hellmich in the interwar period (Kaźmierczyk *et al.* 1977, 66–69). In the 1940's Gerhard Fock (more about G. Fock's activity see Chmielewski 2014) presented a schematic plan with a simplified reconstruction of the monument as a tower located on top of a mound (Fock 1942). Field-walking was conducted in 1968 (A. Kudła) within the AZP framework. In 1998 excavations were carried out by T. Kosmala. Numerous finds, including medieval militaria, were found in soil layers, dating the monument between the 13^{th}–14^{th} centuries. The lack of architectural remains of any sort was interpreted as a result of significant destruction of the archeological site. The results and conclusions of these excavations became one of the elements of polemics concerning the methods of protection of medieval strongholds (Tomczak 2000). In 2013, non-invasive studies including magnetic gradiometry prospection and ALS data analysis were performed by Maksym Mackiewicz and Bartosz Myślecki (Mackiewicz, Myślecki 2015a).

Aerial images (Fig. 2) of the area were acquired in 2008 (27.06), 2013 (7.07), 2014 (7.07), 2015 (25.06) and 2016 (6.07). The area is located in the center of the rather wide Psina valley (Fig. 1: B). The current riverbed is a few hundred meters to the north and northeast from it. Aerial photographs indicate the presence of moats/ditches surrounding the remains of the almost leveled central earthwork from the east and south. Its western part is used as an arable field, and the eastern part, although originally used as a meadow, is also nowadays also a plough field, which undoubtedly contributes to accelerating the process of destruction of the earthwork (the eastern meadow and western arable land based on ALS analyses clearly present a different state of preservation; Mackiewicz, Myślecki 2015a).

Fig 2. Borucin, site 1, Racibórz district: 1 – moats/ditches, 2 – former riverbed *(photo by. P. Wroniecki)*

Visible changes in crop color and growth (Fig. 2) clearly reveal the shape of the earthwork and also ideally illustrating its quite poor state of preservation. It consists of two concentric moats surrounding a quadrate, fairly regular plateau. In between these moats an earthwork embankment was located. In certain details (e.g. size, plan), the form visible from a bird's eye view differs from the one published so far (Kaźmierczyk *et al.* 1977, 66–67). A detailed magnetic gradiometry survey was carried out, which revealed additional remnants of three structures located in the centre, possible timber constructions and perhaps elements of the fortification system (Mackiewicz, Myślecki 2015a). The comparison of their layout with the location of 1998 trenches reveals that excavations missed their mark. Aerial images and ALS data point to a significant symbiosis of the man-made and natural structures. This concerns primarily the adaptation of the old river system as a defensive element and partly transformed into a moat.

Aerial imagery also allows some correction of the location of the archeological site. The AZP map (grid 103–39) and a more precise KEZA (archeological site evidence card) locate it in fact to the northeast beyond the factual location of the stronghold!

Chrzelice, site 1

The Chrzelice archeological site is still, despite years of erosion and leveling through agricultural activities, one of the most magnificent early medieval fortifications in Silesia, (Fig. 1: C). The earthworks are easily discernible on the ALS data even though their relative height does not exceed 50–90 cm (Mackiewicz, Myślecki 2014, 170). Its initial discovery was published by Max Hellmich (1930, 47) before World War II. In 1967 Z. Bagniewski conducted small test trenches (Bagniewski 1967, 26). Another series of survey excavations were carried out by K. Macewicz in 1996 (Macewicz 2000). For many years it was described incorrectly as located within the bounds of the Pogórze village and as such can be found in specialist literature (e.g. Kaźmierczyk *et al*. 1977, 395–398). In 2012 analytical surface artifact collection survey, magnetic gradiometry, ALS data analysis and archival queries were conducted as part of a research project lead by M. Mackiewicz and B. Myślecki (Mackiewicz, Myślecki 2014; 2015a; 2015b). The entire

Fig 3. Chrzelice, site 1, Prudnik district: 1 – inner bailey, 2 – *suburbium*, 3 – entrance *(photo by P. Wroniecki)*

complex can be dated to the Early Medieval (8th–10th and 10th–11th centuries, Kaźmierczyk *et al.*, 397).

Extremely clear crop marks indicate the existence of two circular structures, a small oval inner bailey/acropolis located within the north-west bounds of a larger ovaloid structure. These structures take up an area of around 3 ha (Fig. 1: C). The feature is extremely favourable for aerial prospection, as uniform crops and phenomenally visible crop marks reveal much detail about its structure. Particularly discernible are fortification elements, especially the moat fill and ramparts and in the case of the 2015 survey (Fig. 3: A–B) the course of an embankment's stone construction (registered in previous research). Although crop marks in a spectacular manner and high detail reveal the general layout of the feature, no new information has been acquired with regards to any interior structures (Fig. 3). In this case more details have been provided by magnetic gradiometry (Mackiewicz, Myślecki 2014; 2015a; 2015b). Aerial images also bring information about the surrounding environment, its natural context and landscape changes, both in the periods preceding the formation of the stronghold and in the subsequent centuries after its functioning (e.g. remnants of roads, polygonal structures, relics of ponds and reservoirs). In fact these changes have been very significant. For instance complementary analysis of archival data and historical maps (Mackiewicz, Myślecki 2014; 2015a; 2015b) show that the stronghold was at some point an insular feature, located on a lake that was drained in Modern times. This area is very grateful target for non-invasive prospection as the number and repeatability of the various types of anomalies and crop marks related both to human activity at different times as well as to the geological past of the area.

Gniechowice, site 1

Gniechowice are known from post-war research and several surface surveys conducted after 1945. In 1876, a hoard of silver coins and ingots dating to around 990 AD was discovered in then existing rampart earthworks. A 1968 catalogue publication "*Grodziska wczesnośredniowieczne województwa wrocławskiego*" informs that the archeological site has been leveled by ploughing, although before World War II its wood-earthen constructions were still clearly visible in the field (Kaletynowie, Lodowski 1968). On the sole basis of terrain configuration it was supposed that the

Fig 4. Gniechowice, site 1, Wrocław district: 1 – stronghold, 2 – *suburbium*, 3 – entrance? *(photo by P. Wroniecki)*

fortifications were oval in form. During field walking conducted in 1982 within the AZP framework pottery material was noted on the surface. Research conducted so far dates the feature to the 9th to 10th centuries.

In the context of the available very general data, a large amount of new information is provided by aerial prospection surveys conducted in 2014 (Fig. 4). Irregular curvilinear and ovaloid crop marks reveal a previously unknown outline of a fortification system mostly of infilled moats. It can be interpreted as a form of an inner and outer enclosed area consisting of about 120×150 m and adjacent to the western subdivision, the largest of which is approximately 190 m (Fig. 1: D). The shape of the feature seems to be adapted to the course of nearby small rivers, the Czarna Woda and a nameless small stream. Crop marks indicate that it was enclosed from all sides.

ALS data indicates that the object is not yet fully leveled (Fig. 1: D). The relative height difference between the possible moat feature and the top of an embankment is on average about 0.3–0.4 m, and in the best-preserved part it slightly exceeds 0.6 m. In the aerial photos there are no crop marks that could be associated with interior constructions. Analysis of the data is hindered by features associated with the geology of the Czarna Woda valley. Aerial data also documents a high concentration of mostly round crop marks on the northern side of the stronghold, behind the nameless watercourse (Fig. 4). Their quantity indicates the presence of an extensive archeological site, although not necessarily chronologically and functionally connected with the stronghold. This archeological site is a new discovery and does not appear in the archeological record (AZP).

Komorno, site 1

Komorno was first mentioned as an archeological site in the 19th century and was the focus of field walking research several times in the interwar period, conducted by M. Hellmich, G. Raschke and after 1945 by M. Gedl, J. Kaźmierczyk and K. Macewicz (Kaźmierczyk *et al.* 1977 201–203). In 1971 and 1977 excavations were carried out by M. Parczewski (Parczewski 1976). On the basis of finds, it is dated broadly to the 8th–9th centuries. It was hypothesised to be a possible Bronze Age feature – based on Lusatian Culture pottery finds – but data from excavations precluded this. It is located at the top of an oval

Fig 5. Komorno, site 1, Kędzierzyn-Koźle district: 1 – moat/ditch *(photo by P. Wroniecki)*

elevation (Fig. 1:E). Remains of defensive structures in the form of a rampart and moat are almost completely leveled. It is indicated that the embankment was on the exterior of the ditch. Schematic plans show them as an irregular oval expanding in the western part. On some archival maps (e.g. *Urrmesstischblatt*, 1:25000, 1825, Blatt 3364 *Cosel*) it is marked as a “Schwedenschanze” within a forest. On this map there is also a quadrilateral structure, which does not correspond to the form of current knowledge about its form (trace of some later construction?). Intense forest cultivation practices began in the 1930s and in the following years led to almost a complete degradation of archeological earthwork structures (in 1930 the remnant of the moat was still referred to as a “deep ditch”).

In aerial photographs from 2015 and 2017, the elements of the fortification system were clearly visible as crop marks (Fig. 5). These allowed an initial reconstruction of the stronghold’s form through the characteristic moat. The object is uniquely univocal, without additional elements of the fortification and was adapted to the shape of the terrain on which it was located. Inside the enclosed area there are singular features, which may be related to the presence of settlement features, but the available data does not allow determining the layout of the area within the enclosure.

Stary Zamek, site 6

Site 6 in Stary Zamek is located within the Czarna Woda Valley, surrounded by a system of creeks: the meandering Czarna Woda on the north-western and western sides and irrigation ditches (Fig. 1: F). In 1973 and 1974 J. Lodowski (based on his excavations) payed attention to the remarkable cognitive value of this site for Early Medieval studies. In addition to pit houses and storage pits, three parallel ditches were excavated and numerous ceramics and other finds (including spurs dating back to the 9th century) within them. Most of these date to the 8th–9th centuries. Sparse finds of Funnel Beaker Culture and La Tene were also noted (Lodowski 1974; 1975; 1976).

Aerial surveys in the area were conducted in 2013 (July 7) and in 2014 (April 8 and July 6). In 2013 a crop mark revealed a moat that cut off the promontory from the south and enclosed an area of about 6 hectares (Fig. 6: A). Within it there are numerous mostly round or

Fig 6. Stary Zamek, site 6, Wrocław district: 1 – outer moat/ditch, 2 – pit features, 3 – inner moat/ditch *(photo by P. Wroniecki)*

oval maculae, which are related to possible past settlement activities (pits). A smaller cluster is located also on the outer part of the ditch. Images acquired in the spring of 2014 did not provide new and relevant information due to poor crop cycle (Fig. 6: B). Only in the northern part a bright light belt of soil is visible in the form of a circle section reflecting the configuration of the terrain here. The images taken 3 months later reveal more interesting data (Fig. 6: 3–4). In addition to the ditch noted in 2013, a system of two moats: broader (about 8 m width) and narrower (about 2 m wide) is visible within the depression (visible as a soil mark feature in photos from April 2014. They cover an area of about 1.5 hectares. It is not excluded that drainage ditches could have partially damaged the fortification system from the East and North.

This complementary data obtained during a series of surveys reveals a complicated and large-scale feature consisting of a smaller part most probably surrounded by a double ditch and palisade and an adjoining, larger extensive structure. Although it is not possible to completely exclude an earlier chronology (e.g. Neolithic or Bronze Age), due to its morphology and location it seems very unlikely. Aerial prospection data proves that the Stary Zamek site should be considered as a previously unknown closed settlement site with a completely leveled fortification system. This interpretation is upheld by archival excavation data from the 1970s, during which fragments of ditches and militaria finds were documented.

Discussion

The presented case studies show a considerable potential of aerial images as sources of new and valuable information about earthwork defensive structures in various phases of degradation. It is worth stressing that in one case (Stary Zamek), despite some suggestive discoveries made during excavations (Lodowski 1974; 1975), the archeological site was then not interpreted as a remnant of a possible stronghold – adhering to the idea that "no new hillforts/strongholds are left to discover". Examples of such observations are multifold (e.g. Spychała 2006), which is especially noticeable particularly in recent years, mainly due to the widespread use of publicly available remote sensing data sources (e.g. www.geoportal.gov.pl, Google Earth, etc.) which have now clearly debunked the lack of "new" earthwork sites left for detection. The number of such discoveries is significantly increasing, activating not only professional archeologists but also a large group of hobbyists.

The observations made for some of the presented archeological sites indicate that there is a need for regular prospection based on a series of systematic aerial surveys. This is due to, among other things, the variability of conditions influencing the appearance of crop and soil marks. This is particularly evident on the example of Stary Zamek, where during the 2013 summer survey a linear feature was identified and interpreted as an external moat along with numerous traces indicating the presence of pit features. In turn, images taken in the following year especially in July enabled the identification of an internal fortification system. Similarly, in the case of Chrzelice, where the most significant information was acquired in 2015, where thanks to crop marks various elements of the fortification system can be identified, such as the moat, the course of stone architecture of the external rampart, location of gate entrances and individual building elements. Images from subsequent surveys in 2016 and 2017 did not provide such abundant data.

Information obtained through a series of aerial surveys is also extremely valuable from the perspective of cultural heritage preservation, especially in the era of modern agriculture, infrastructural and industrial development. Repeated multi-year prospecting facilitates the control and monitoring of archeological sites. For example the observations made in Borucin indicate that in 2015 a part of the stronghold used as a meadow was converted into arable land, which will undoubtedly accelerate the feature's degradation (e.g. Tomczak 2000). It is also worth mentioning that it was often possible to notice considerable land use changes (infrastructural investments, new buildings) in areas directly adjacent to earthworks that were not always accompanied by appropriate activities related to the protection of monuments or rescue research.

Until recently the information about most of the presented archeological sites was obtained through small-scale excavations and in this way was mainly related to chronology based on the analysis of finds, stratigraphy, form, size or structural details of their fortifications. The data that we owe to aerial imagery has enabled us to often enrich our knowledge about them and our impression is that the cognitive value of remote sensing data is often greater than the destructive and often times accidentally located excavations. The progressing destruction of these archeological sites is so great that even analysis of ALS data would not be particularly useful here. In addition, the implementation of complementary non-invasive research using geophysical methods and other remote sensing data or archival data sources based on the analytical capabilities of spatial information systems (GIS) allows to obtain unique and useful knowledge. The integrated approach enables multi-faceted identification of archeological heritage resources, and provides a wealth of detailed information about the places being investigated as well as their context. An example of such a methodology, apart from the mentioned studies of Borucin and Chrzelic (Mackiewicz, Myślecki 2014, 2015a, 2015b), has also being carried out for several years in the research projects in Central Poland (for example Sikora *et al.* 2015).

It should be noted that not only earthworks undergoing degradation and destruction should be the aim of aerial prospection and monitoring. We have noticed, however paradoxical, that the worst preserved or even extremely leveled sites often yield large amounts of valuable new information contrary to their better preserved counterparts. The ongoing destruction process is conducive to the emergence of crop and soil marks. This process however also has its end, which is the complete destruction of the monument, and thus the disappearance of factors affecting the development of any information that can be observed from the air.

It has often been pointed out that the widespread use of aerial prospection and the application of geophysical methods, especially on a larger scale, may ultimately contribute to a new understanding of archeological monuments – not only confined to a circle on a map but related to the broader cultural landscape context (see Nowakowski, Rączkowski 2005, 16–17; Kiarszys 2005). The designation of archeological sites in Poland based on the dispersion of surface material such as pottery sherds is often unrealistic. Even ceramics, which are sometimes treated as a particularly lasting category of finds, are subject to erosion and may eventually vanish. The consequence of this can be their modest representation or even the total absence on the surface. In such situations according to the conventional AZP methodology there is no basis for treating an area as archeologically significant or an archeological site at all! The established cognitive scheme which is basically looking at sites through surface finds most likely results in a false positive view of the quantity and existing categories of archeological resources in Poland. The aerial cognitive scheme, or rather the multi-method approach of which they are part of facilitates the understanding of such resources within landscapes and is key in finding and studying areas that were important places in the past cultural landscapes but due to lack of seemingly impressive or large amounts of surface finds and advanced degradation currently seem insignificant.

Conclusions

A visible intensification of archeological site destruction due to all-round development of urban and rural areas has affected all types of archeological sites – also those characterized (until relatively recently) by unique and complex earthwork remains of their original structures. This situation requires an adaptation of new protection strategies, as well as alternative cognitive and methodical schemes. Despite many successes and well-known examples of its use abroad, remote sensing approaches (and other non-invasive methods) are stubbornly resisted as far as their systematic implementation goes. Aerial archeology is an activity reserved for a small group of enthusiasts (or perhaps academic misfits?) and is not part of a wider archeological heritage recognition and protection program. The ever-changing reality has been giving archeologists in Poland regular wake up calls. Often aerial images document the last moments of archeological site existence – just before their complete destruction or liquidation of their key elements. The case studies presented in this paper are yet another or perhaps a final wakeup call showcasing the scale of the ongoing, countrywide, systematic destruction of important (yet unknown or poorly researched) archeological sites. The remedy in our opinion is (especially in the case of degraded fortified settlements devoid of their own terrain form) the recognition of non-invasive remote sensing and geophysical techniques as primary research methods as they allow defining crucial elements, such as form, size, layout, or functional interpretation.

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Kamil Karski*, Sebastian Różycki**, Aleksander Schwarz***

Memories of Recent Past. Objectives and Results of Non-invasive Archaeological Research Project at KL Plaszow Memorial Site

ABSTRACT

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Debate about the possibilities of using interdisciplinary methods in investigations of labor and concentration camps of world war two is well embedded. In this cases, the archaeology is a mixture of sub-disciplines like Combat Archaeology, War Archaeology and Interment Archaeology as well as a Public Archaeology. Field researches, especially non-invasives ones are common practices. In recent years numerous archeological research project has taken place. Some of them were prepared for the investment activities and design of memorials and new museums. The main purpose of documentation, surveys, and excavation of this kind of sites is a preservation of architectural relicts and landscape, but also a supplementing the historical knowledge by authentic archaeological sources. In this paper, authors decided to present the results of archaeological research project prepared in 2016 by The Historical Museum of the City of Kraków (MHK) and the investigations of Rabbinical Commission for Jewish Cemeteries in the area of labor and concentration camp Plaszow. The archeological documentation and investigations were combined with extensive research and study of memorial sites in Poland and Europe, which served as the basis for the scenario of the exhibition and commemoration of KL Plaszow as a future memorial site's institution.

Key words: non-invasive investigation, Holocaust archaeology, memorial site, museum, KL Plaszow, Plaszow camp

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Introduction

The specialized branch of archaeology exploring the relics of the 20th century, including the archaeology of the Holocaust, is now one of the leading problems of the so-called "archaeology of recent past" (González-Ruibal 2014). It involves the use of methods and theories

* Krzysztofory Palace, 35 Main Square, 31-011 Kraków, Poland; nstitute of Archaeology, University of Rzeszów, Moniuszki 10 Street, 35-015 Rzeszów, Poland; kamil.karski@gmail.com
** Faculty of of Geodesy and Cartography, Warsaw University of Technology, Politechnika Square 1, 00-661 Warsaw, Poland; s.różycki@gik.pw.edu.pl
*** Rabbinical Commission for Jewish Cemeteries, Office of the Chief Rabbi of Poland; aleksander.schwarz@gmail.com

of archaeological research in the context of relics of recent past. When exploring recent history, field studies (surveying, prospecting, excavations) obviously represent the final stage of a long analysis of sources, which are not available for archaeological research in prehistory or historical examinations. Besides numerous photographs, maps or drawings, our archives contain witnesses' accounts and memories, permeating the land with human history and endowing it with an extremely important social context. The areas of former camps mostly of the world war two, have undergone extensive transformations, which to a smaller or larger extent distort our current perception of them. They become a specific kind of sites are also attractive for other scientists. As Marek E. Jasiński underline, after Alfredo González-Ruibal, „the boundaries between the archaeology of the contemporary past and those of anthropology, sociology, contemporary history, art. History, history of architecture, material-culture studies and technology studies increasingly overlap, representing the emergence of interdisciplinary cooperation, that will shed a new light on the events of recent history" (Jasiński 2017, 3). Jasiński also suggested, in a similar way as Isaac Gilead *et al.* (2009) did, that the role of archeology is the context of Holocaust studies similar to the process of memorialization, providing the knowledge about the authentic artifacts and physical remains into the public debate. The aim of this paper is to outline the results of non-invasive research into the area of Nazi German Labour and Concentration Camp Plaszow in Kraków.

History of Plaszow camp

The German Nazi forced labor camp was created in autumn of 1942. According to the SS- und Polizeiführer Julian Scherner's directives the official name of camp in German was Zwangsarbeitslager Plaszow des SS- und Polizeiführers im Distrikt Krakau (ZAL Plaszow) (*cf.* Kunicka-Wyrzykowska 1982). In January 1944 the camp was transformed into concentration one and since that date, it was functioning as Konzentrationslager Plaszow bei Krakau or simply KL Plaszow (Kotarba 2009, 24–25; 2017, 68).

There were three main stages of KL Plaszow's aerial evolution (Kotarba 2017, 68). The first one was since the fall and winter od 1942 and the official creation of the camp in 1943. Until the summer of 1943, this stage was marked by inconsistent development. During all that time, the workers were forced to demolishing and devastation of Jewish cemeteries, that becomes the part of camp. The basic works at camp's infrastructure were completed, some facilities were adapted for camp purposes like the funeral parlor (a pre-funeral hall) of the new cemetery of the Kraków Commune (*cf.* Gawron 2012, 396–397). Others were built or designed, eg. the Kommandantur (SS Headquarters), monumental brick walled garrison barracks, a large area of workshops, as well as residential barracks for prisoners and *Appellplatz*. In the beginning, the estimated number of prisons was between 4 and 5 thousand of people.

After the liquidation of Kraków ghetto in March 1943 part of the Jews were transported to Plaszow camp. The bodies of about 2,000 people, whose were killed during that days were buried next to the northern border of Jewish Cemetery of Podgórze Commune (so-called "old cemetery"; Kotarba 2009, 31, 166; *cf*. Biberstein 1985, 108). That place also become a localization of execution.

The second stage started in summer of 1943. The former administrative and residential building (also known as the *Grey House*) of Jewish Cemetery of Kraków Commune (so called "new cemetery") was changed into the SS administration offices. At the same time, the special area of the camp was organized as a "labor re-education camp" (*Arbeitserziehungslager – AEL*) for Poles. Between the new *Appellplatz*, the *Grey House* and funeral parol, the range of barracks was specially dedicated for prisons whose had committed administrative crimes, common crimes or took part in the resistance movement.

In 1943–1944, the Jews who survived the liquidation of the ghettos in Bochnia, Tarnów, Wieliczka, Rzeszów, Przemyśl and the Szebnia labor camp where deported to KL Plaszow. Other inmates were residents of Kraków and its vicinity. Some of them were directed to labor camps at the arms factories in the Radom district (Awtuszewska-Ettrich 2008, 276–280). In the winter of 1943, the former execution site was changed to the former Austrian sconce FS-21 *Wola Duchacka*, which was called „Hujowa Górka".

The construction and building works were intensified at the turn of the summer and autumn of 1943. Eventually, after the renaming to the concentration camp, it expanded to an area of about 80 hectares and reached its maximum area. As Ryszard Kotarba wrote (2009, 40–41):

> [...] in the first half of 1944, the expansion of KL Plaszow continued and some investments were very serious, but as it turned out to be late.

> At a time when the camp reached its peak, it was also the moment of decision to liquidate it. The preserved plans of the camp represent the next stages of camp's expansion. The first one from July of 1943 shows that the camp was still quite chaotic, with an *Appellplatz* next the first mass graves of the Jewish people. The area near Wielicka street and industrial quarter were only partially filled with barracks. In the second plan dating back to March of 1944, buildings near Wielicka street were marked, but without railways. New industrial areas (*Neue Gelände* – KK) and an *Appellplatz* were built. Third plan – undated, from the summer of 1944 shows full development, railway line and incorporated residential area along Pańska Street (*Herrenstraße* – KK) with buildings, as well as planned objects".

When plans are compared, it is evident that the consistent expansion was aimed at creating a concentration camp with all the facilities necessary for its normal functioning, while also exterminating the immediate prisoners and destroying them by work over human abilities.

The main parts of the camp were set up in 1944. The German area was located in the eastern part, with headquarters and barracks. There was also the SS and the SS barracks. The pre-war houses were an adapter for the officers and commandant of the camp, Amon Göth. Also, buildings erected in the 20s and 30s along Jerozolimska Street were used as a telephone exchange. The core area of the camp with the division for men's and women's residential barracks was stretching into the West and reached Swoszowicka Street. It was accompanied by other buildings in other parts of the camp like (laundry, kitchens, bakery, ice houses and hospital sector). The south part of the area, between Jerozolimska and Pańska streets, was devoted to workshops. Each part was separated by internal fences and gates. During the second stage of camp's functioning, in the territory of Jewish Cemetery of Podgórze Commune new bathhouse, and quarantine barracks were erected. Also, the new assembly square was built. Old places of mass executions in the were changed and partially developed for the construction of new buildings. The place of execution has been moved to the other fortification, the sconce FS-22, called by prisons „Cipowy Dołek". The expansion plans also included the development of infrastructure, eg. construction of railway station next *Grey House*. For this purpose the building of the funerary parol was almost completely destroyed on July 10, 1944 (Zbroja 2013, 38–39).

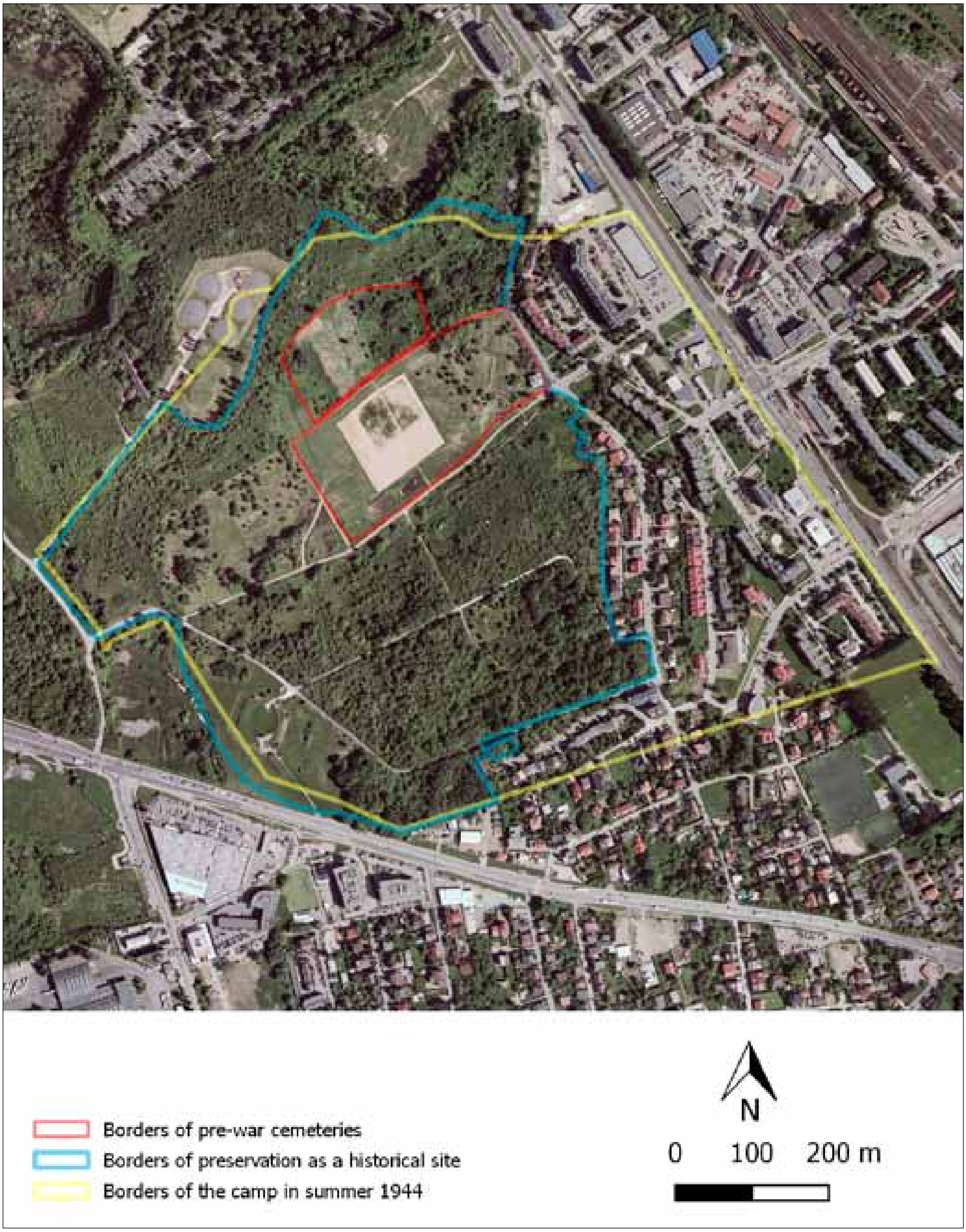
Due to the fires, dense buildings infrastructure was changed, also new water ponds were dug. An extension of the industrial part is still possible to mark. The new companies were located in further workshops on the so-called Neue Gelände. In June 1944, there were 24,000 people in KL Plaszow. About 200 independent buildings were a part of camp's infrastructure.

In 1944, KL Plaszow also served as a transitional camp for Jews from Hungary, deported to KL Auschwitz. From the spring of 1944, prisoners from the camps from the Lublin and Radom districts were evacuated and transported to KL Plaszow. Most of them were taken from KL Plaszow to other labor camps and concentration camps. It is estimated that over the camp's existence, more than 30,000 people were imprisoned there, and the number of victims murdered in the camp was about 5,000.

The third stage of the Plaszow camp's history is connected with the overall situation of the war and the activities aimed at extinguishing the camp. In May 1944 a so-called a „great selection" was conducted. In result, about 1,400 people were sent to Auschwitz. Other prisoners were sent to camps in West, like Gross-Rosen, Mauthausen, Auschwitz, Ravensbrück, and Buchenwald. From September, exhumations of the bodies of the mass graves have begun, followed by the cremation of human bodies. With the last months of 1944, the demolition work of the barracks was over. Ultimately KL Plaszow ceased to exist in January 1945 (Gawron 2012, 421).

The abandoned camp was occupied by Soviet troops and became a military area. Preserved buildings were used as storage facilities. Entry into the area of the former camp was absolutely forbidden. In the report of the Municipal Offices of this period, the presence of Soviet soldiers was reported, which dealt with the demolition of the remaining buildings and the removal of barbed wire spikes (Kotarba 2009, 154; *cf.* Kocik 2016, 100).

During the next decades, many traces of camp's history were disappeared. The rests of funerary parol are still demolished next its original location. During the post-war period, many memorizations were constructed in the post-camp terrain, including most spectacular one- the Monument of Victims of Fascism in the place of Cipowy Dołek. In the 80s in the range between Wielicka and Jerozolimska Streets, a new blocks of flats were built.



Ryc. 1. The area of concentration camp on the background of present-day orthophoto

Gripping the context of camps' archaeology

Until mid-1980s no extensive surface studies were carried out on post-camp sites. One exception is the work near the gas chamber and crematory at KL Auschwitz conducted in 1967. Around 16,000 personal objects of the victims were found, but they were placed in the Auschwitz-Birkenau State Museum only in 2016 (Cajzer 2017). In 1987 the first stage of excavations was started at the former Kulmhof camp in Chełmno nad Nerem, aimed at determining the topography of the camp (Pawlicka-Nowak 2004, 2015). The first project of major importance was the archaeological work in the former extermination camp in Bełżec. The research covered almost the entire area of the camp and the results influenced the shape of the remembrance exhibition which had been underway Kola 2000a, 2015). Similar work was conducted in 2000–2001 in the former camp in Sobibór (Kola 2000b, 2001). Excavations were resumed in 2007 and the last stage ended last winter. Also here the archaeologists' findings, showing the location of gas chambers and the so-called death path, very strongly influenced the shape of the exhibition (Bem, Mazurek 2012; Gilead *et al.* 2009). There are other projects where excavations are minimal or completely absent. Examples of this approach include the interdisciplinary project Sztutowo or Stutthof? (Banaszek 2011, 27–31). The taming of the cultural landscape, and the Holocaust Landscape Project, studying the former camp in Treblinka (Sturdy Colls 2012a, 2012b) In those two places the area of the former camps was carefully surveyed and then various methods of geophysical prospection were used. Finally, in 2013, surface studies and minor excavation work have taken place. From 2015 to 2017 Polish team of IT specialists, historians, surveyors, geo-physicists and cartographers conducted research works in Labor Camp Treblinka I (Różycki *et al.* 2017). Archaeological research on post-camp sites constitutes an attempt at finding a balance between using currently available non-destructive archaeological techniques and classic excavations in a way that produces the broadest range of data regarding memory sites. In addition, the special context of the post-camp grounds makes it an absolute necessity to preserve all ethical and religious standards during archaeological work (eg. See a critique of research in Sobibór in Weiss 2003).

This problem also manifests itself in KL Plaszow. Parts of the camp grounds have merged with the urban fabric, as it has been built over, while the rest is now treated as a recreational area. The lack of visible traces of the past makes the camp site seemingly empty, absorber by the changing landscape of today's Kraków.

Objectives of research

The current research is the first project of this kind at KL Plaszow. The main task of the investigations was the description and preparation of preservation programme of area of the Plaszow camp before the investment process for memorial site's museum. Taking into account the experience of other archaeological projects, the balance between the invasive and non-invasive research. In her book, Caroline Sturdy Colls (2015) present the possible issues and solutions during the archaeological investigations of Holocaust sites. According to her, the research at presented project were divided into main stages:
1. Desk-based investigation,
2. Above-Ground Field Investigations,
3. Below-Ground Field Investigations,
4. Excavation.

Desk-based investigation

As the desk-based investigation we can treat the personal account and analysis of archival photography, plans and maps. The personal accounts and testimonies that are relate directly to war events take different forms. Credibility of some of them may be questioned. Nevertheless, in the case of this studies, these accounts are a better source of information about the model of the functioning of the camp, neither its infrastructure. In essence, the quality of testimony depends on time that passed by after the event. Sturdy Colls (2015, 118) means that the most credible are those accounts written directly in 1945 and immediately after the war. They are the most detailed, and the compositions of the personal accounts were often accompanied by local visions that refer to specific places. So, as opposed to historical research, the accounts and testimony in archaeological research are of limited utility. In the case of KL Plaszow research, a report was made in the archives of the Jewish Historical Institute, Yad Vashem and published memories. Most accurate and useful for the establishing the topography of the camp were the accounts of Jakub Stendig and

Henryk Wohlfeiler. Both of them were engineers, that were forced for take part in the construction of the camp and coordination of works.

The cartographic data are one of most useful in analysis of Holocaust archeology's sites. The beginning of 20th century allows for studies of various type. In the analysis of Plaszow camp, among others standard sources, there are also more precise cartographic detail, like city plans and others. The combination of all were most useful for description of possible architecture structures.

The first of the accurate cartographic sources is a collection of field sketches from August 1909. During the preparation of sketches the northern part of the future camp was elaborated, including the Jewish cemetery of Podgórze Commune and the old funerary parol.

Another map was prepared around 1910. On the schematic draw entitled *Plan budowy Sieci tramwajowej Wielkiego Krakowa* (The plan of tram network of Great Kraków), tram lines were passing through Kraków and Podgórze, as well as overline of cementry's borders are marked. The more detailed documentation of both cemeteries, especially with the documentation of construction is now in the possey of National Archives in Kraków. Nevertheless, the files of each single building are only a part of wider context of urbanized area. More precise is topographic map from 1934. The reprint of map was done in 1944 by Nazi occupants. However, the existing camp buildings were not put on the map. Most precise is analysis of two plans, mentioned by Kotarba (2009, 40–41).

As part of the project, an archival query was carried out in the National Archives of the United States (National Archives and Records Administration – NARA) concerning on archival sources of Plaszow camp in the years 1939–1945. The query concerned the collections of group 373. Collections from group 373 include aerial and satellite photographs, cartographic and architectural materials. The survey covered series 373.3, including aerial photographs from 1935–1960 made by German and Photographic Reconnaissance Units. The result of the query is shown in Table XXX.

The photos shown in Table XX were scanned with an Epson Expression 12 000XL scanner with a resolution of 600 DPI. Both paper photographs (German photos) and negatives available in the archive were scaned.

For prepartion of metric plan of the Plaszow camp, aerial photographs from August and May of 1944 were used as the most suitable. Both photograms depict the camp on a scale allowing recognition of individual

Table 1. The collection of archival aerial photographs of Plaszow camp

Lp.	Date	Scale	Source	Remarks
1.	Uknown	1:46 000	Luftwaffe	Whole camp is visible
2.	Uknown	1:39 000	Luftwaffe	Whole camp is visible
3.	18.07.1942	1:9200	Luftwaffe	Only north part of camp is visible (cementary of Podgórze Commune, and fragment of cementary of Kraków Commune)
4.	3.05.1944	1:15 500	Luftwaffe	Whole camp is visible
5.	20.08.1944	1:14 000	US Airforce	Whole camp is visible
6.	28.12.1944	1:26 000	Luftwaffe	Whole camp is visible
7.	9.02.1945	1:44 000	Luftwaffe	Bad weather conditions (cloudly)
8.	20.02.1945	1:20 000	Luftwaffe	Whole camp is visible
9.	28.12.1945	1:26 000	Luftwaffe	Whole camp is visible

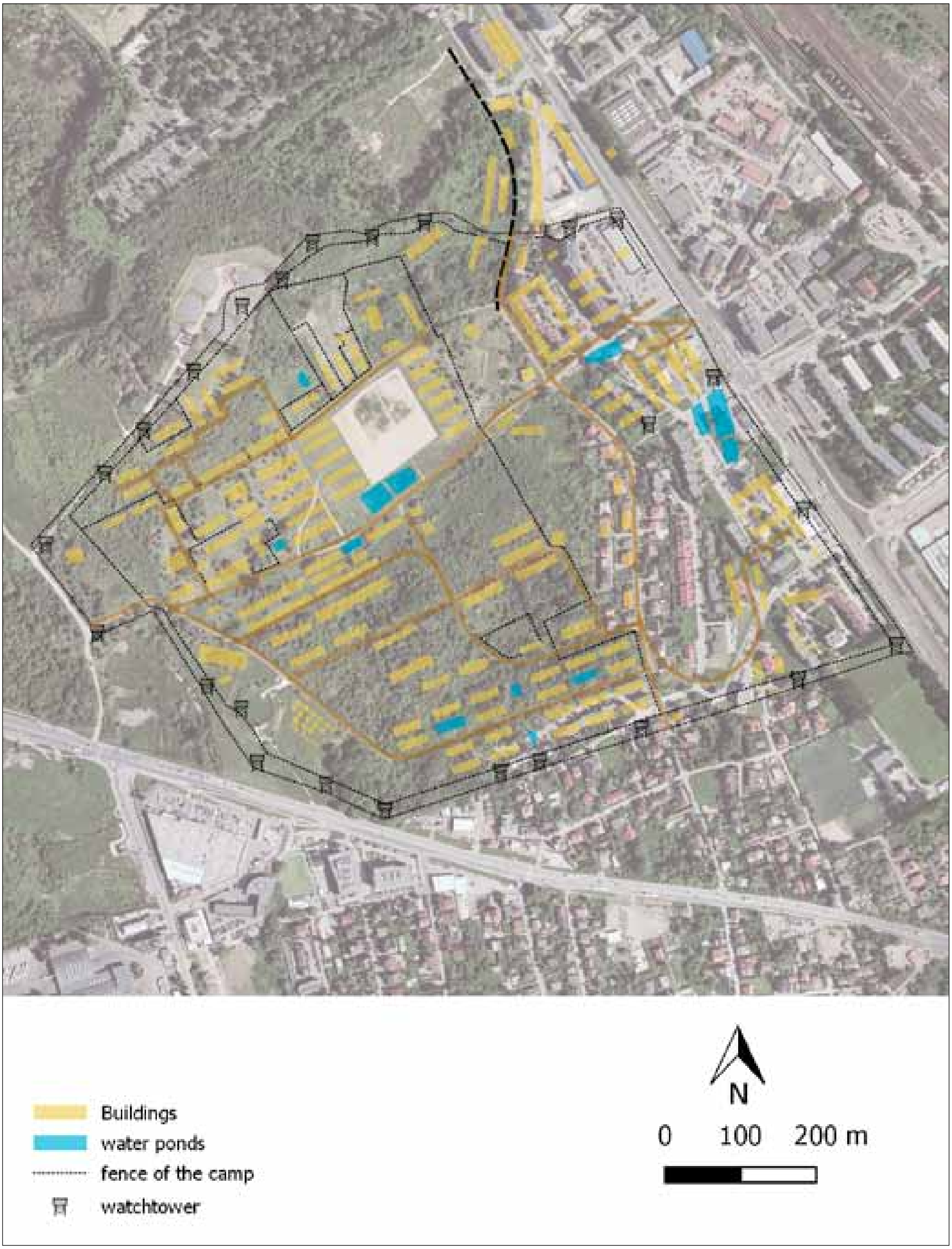
buildings, fences or camp routes. At the same time selected photos are of good quality – they were taken during good weather conditions.

Other photographs (not including photographs with cloud cover) can only be used for comparative analyzes. The possibility of recognizing objects related to the topography of the camp on them is limited. They can be used to interpret and describe the main buildings and roads.

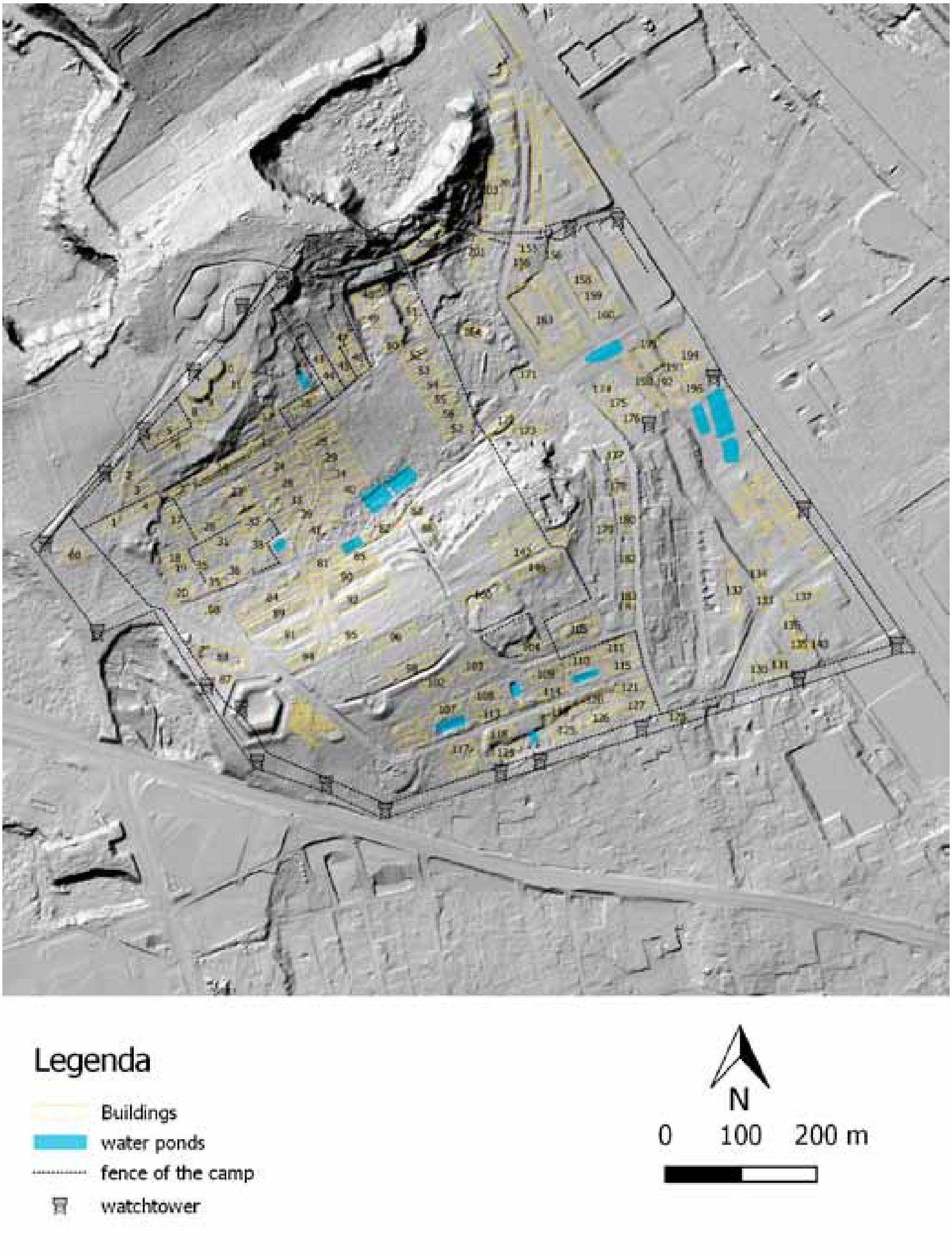
Before proceeding to the stage of preparing the plan, a geometric correction process of selected aerial photographs had to be made. Geometric correction is a multi-stage process. There are several different approaches to this process depending on the geometric model used. The geometric model defines the mathematical relationship between the coordinates of the points (eg B, L, H) and the coordinates of the image (row, column). Due to the lack of camera metrics, the obtained one photo (one from both dates) and the scale of about 1: 20,000 it is justified to carry out the correction process using the polynomial method.

Correction of archival aerial photographs made it possible to compare these materials with actual data (orthophotomaps, topographic maps, cadastral data), but also enabled the creation of metric plans for the camp by using GIS software.

In the first stage of the work, it was necessary to obtain vector layers depicting the camp in May and August 1944: buildings, fences, internal roads, watch towers and water reservoirs. The plans were created by stroking the above-mentioned objects.



Ryc. 2. The plan of Plaszow camp on the background of orthophoto (*prepeard by S. Różycki*)



Ryc. 3. The plan of Plaszow camp on the background of hillshade visualization of ALS (*prepeard by S. Różycki*)

The second stage was adding attributes to each building describing their numbers and function. These attributes were obtained from the Map of Plaszow Camp published by the Historical Museum of the City of Krakow in 2016 based on mentioned orginal plans of the camp.

The analysis of the developed plans of the camps depicting topography from August and May 1944 allows to conclude:

1. The fence of the camp: a photo from August 1944, allowed to determine the course of the outer fence. Only in small fragments of shape and the course departs from the fence marked on the camp plan published by the Museum. However, there are significant changes in the course of the so-called the second inner fance and internal divisions determined on the basis of the aerial photograph compared to the plan. The pictures clearly show the second fence line running, among others in the vicinity of the hospital for the camp Staff and along Wielitzerstrasse. In these fragments the border was not put on the one of original plans. The internal fence also intersected the „Cipowy Dołek", and it did not go around as it was presented on the plan published by the Museum. The designated external fencing allows to calculate the fenced area of the camp, which in August 1944 amounted to 57.61 hectares;
2. Watch towers: on a map prepared from photographs from August 1944 watch towers were placed. On the plan published by the Museum, the number of towers marked is smaller than on the plan prepared from the aerial photo;
3. Water reservoirs and ponds. These objects are visible in aerial photographs and have been designated. The quality of the photos allowed for the marking their exact shapes. The gray tones in the picture also allow you to specify which tanks were dry;
4. *Appellplatz*: This object is clearly visible in the pictures. It is difficult to clearly determine its exact overline. It was connected with internal roads, and its surface allowed vehicles to move around;
5. Railway line: in August 1944, the railway line was brought to the north-west corner of the barracks of *Wachmans*. The tracks could not go any further, towards the camp's camp office in Gray House, because they would encounter the rests of funeral parol. The quality of the August photo allows us to state that the ruins has been preserved to the extent that it is still present. This is also confirmed by the photo from February 10, 1945;

6. The tombstones (matzevas). The quality of aerial photographs does not allow to notice significant changes in the surface, which, according to the report and the map published by the Museum, were associated with the use of tubstones to pave camp roads;
7. Warehouse for metalworking shops: between May and August 1944, two large round warehouses and seven small ones were built. The number of storage facilities visible in the aerial image agrees with the above-ground photograph published on the camp's plan published by the Museum. It can be assumed that the picture could have been made in August of 1944 or later;
8. Camp roads: the aerial photograph from August 1944 allowed for marking the internal roads. Extreme roads are difficult to interpret. This means that the roads were intensively used. The pictures also show roads and walking paths. Roads connecting guard towers are well-readable;
9. Funeral parol: it is immortalized in its entirety in a photo from May 3, 1944. In the picture from August 20, 1944, the funeral parol is demolished – only its western part remained;
10. Camp buildings: the plan issued by the Museum is slightly different from the topography of the camp visible in the photographs from May or August 1944. Based on the interpretation of aerial photographs, we are able to introduce corrections and changes to the plan related to the specification of the shapes of individual buildings or slight adjustments to their location. The biggest differences between the plan published by the Museum and photographs of 1944 are:
    a) no buildings number 161, 162, 163, 164, 141, 142, 143 and 144 in the area of the „Cipowy Dołek". These buildings were not in August 1944,
    b) lack of a new headquater building in August 1944. In August, there is also no trip through the command building to Wielitzerstrasse,
    c) in May 1944, there were no small buildings serving as rooms for hens, geese and rabbits. These objects appeared only in August 1944,
    d) incompatibility of the location of buildings No. 25, 29, 34, 40 9 42 on the camp's plan issued by the Museum in comparison to the buildings of the Jewish section visible in the photographs from May and August 1944.

The next step in the desk-based investigation was also the analysis of photographic sources. Now, more than 800 pictures of various times and stored in many archives are known (like Archives of Photography of The Historical Museum of Kraków, Institute of National Remembrance, National Archives in Kraków, Ghetto Fighters' Museum, Yad Vashem The World Holocaust Remembrance Center, Jewish Historical Institute of Poland, United States Holocaust Memorial Museum and private collections). Mainly it is a post-war documentation of area of the camp. Earliest photographic documentation of the Jewish cemeteries at Jerozolimska Street was made in mid-1909. On June 5, 1909, a catastrophe occurred, caused by a lightning strike in the nearby powder house No. 5 of Austrian stronghold's buildings, located in the immediate vicinity FS-21 swing. During the survey and military inspection, some pictures were taken. In two of them, in the background the area if old cemetery is available to see. Only two photographs related to the occupation period, which may depict the area of one of the Jewish Cemeteries are known. The first one was donated to the Guido Morber to The Historical Museum of the City of Kraków in 2012. The photo is a part of the collection of occupation photographs made in Kraków. However, there is no exact location. On the reverse is the inscription: *Das ist ein Juden Friedhof*. It is difficult to ascertain with certainty whether the photograph originates in one of Krakow's necropolis. If this assumption is to be probable, it should be located in one of the two cemeteries in Podgórze. The cemeteries at Miodowa Street and Remuh had different characteristics.

On the second picture there is a group of people, in the background, the funerary parol of the new cemetery, on the left is the eastern wall of the old necropolis are possible to mark.

The largest and most complete source for verifying the topography of the camp is a collection of about 200 photographs from 1943–1945. Of particular importance is the collection of 70 of them. There are both general views and fragments of single parts of the camp, such as residential area, industrial area, as well as a documentation of the destruction and demolishing of the new funeral parol. The photographs were probably made by one of the military officer lower in rank, who moved freely around the camp, like in the private rooms or the guard towers. The collection of photographs is not an official document. Photos are of unknown origin. They were found in the archives of *Okręgowa Komisja Ścigania Zbrodni Hitlerowskich w Polsce* (the District Commission for the Investigation of Nazi Crimes in Poland) in 1980

(Kotarba 2009, 8). Other parts of known photo sources are photographed are also from the collections of the private commander of the camp, Amon Goth, and have been stolen from his luggage, kept at the Oskar Schindler's factory in Brunnlitz after the evacuation of the Deutsche Emailwarenfabrik from Krakow.

In post-war times the numerous photographs had been made, including the documentation of investigations of Nazi crimes in 1945, as well as the documentation of the area in 60. during the construction of the Memorial of Victims of Fascism. They have been analyzed in terms of post-war land changes

Above-Ground Field Investigation

In the first stage of research project also an orthophotomap was prepared, that this a detailed It allowed for more precisely determine the siting of the foundations of barracks and other camp features. Laser scanning (LIDAR) was also done, providing the data for a Digital Terrain Model (DMT). Next, a three dimensional model of the surface of the camp was built, omitting vegetation, which in many cases obstructs observation of changes of the terrain. When the data provided by these two methods were compared, both the topography of the former camp

Ryc. 4. The reconstruction of photopanorama form 1944 with the permeation of present-day landscape (*prepeard by K. Karski*)

Ryc. 5. The relicts of cementary of Podgórze Commune (*photo by K. Karski*)

and the post-war changes became more clear. The work was carried out in the winter when various architectural features are more visible (gutters, fragments of the icehouse or the SS hospital). The absence of grass and shrubs exposed the earthworks of the „Hujowa Górka" and made it possible to determine its real size. During the interpretation of the DMT more distinct, architectural features and traces of barracks foundations were discovered. The imaging also included the post-war transformations of the terrain, for example, the changing course of the main water pipeline, crossing the area of the former camp along the north-south axis.

The GIS map and DMTs' analysis brought the best results in observation also with the previous analysis of archival photographic data. A large-width panorama made in 1944 was able to reconstruct. In that case, there was a possibility to indicate every single building put into the pictures with references to plans and maps.

In the early spring of 2017, surface surveys and listing of architectural relics were prepared. They consisted in crossing the entire area of the

Ryc. 6. Electric socket fitting produced in Kabel Krakau found during the surfance sur veys (*draw by K. Karski*)

camp on foot and gathering objects lying directly on the ground; they could have been there as a result of natural drenching and leaching processes, or of animal interference. Also possible looters' pits were marked. As a result, more than 100 artifacts in 60 localizations were found. We could mention an electrical socket with an inscription Kabel Krakau; fragments of barbed wire; a pre-war mug produced in the Światowid factory Myszków; a cocoa can with a barely legible inscription *Ovomaltine*; and a whole array of old ammunition parts – shells and bullets for German Mauser rifles. The listing led to the conclusion that relicts of more than 50 structures are available to see. Many of them are a concrete foundations of barracks and machines in the industrial area. In other parts of camp, only a few elements are possible for observation. Mostly the places of barracks are able to distinguish as a revelation of terrain, without any architectural rest over the earth surface. Best preserved components of the architecture of the camp are the relicts of laundries next the male residential area. There also rests of the stone-walled basement of SS hospital.

Below-Ground investigation

The first stage of the work in 2016 also included geophysical prospection using magnetometry in the area of more than 20 hectares. The collected data was also used for a partial reconstruction of the historical topography of the camp. The visualizations clearly show such elements as a cemetery wall, preserved in the northern section of the new cemetery of the Jewish Commune in Kraków; traces of former gutters by the laundries and the male latrine; and groups of minor anomalies coinciding with the contours of specific barracks. On the site of the old Jewish cemetery in the Podgórze district, several anomalies were identified, which could be interpreted as an effect of high temperature. Their source seems to have been the boilers by the camp laundry buildings. The place of the bath was examined, as well as a possible mass grave. The anomalies suggest the occurrence of high temperature here. Disorders of this type and such a clear structure occurred only in these two locations in the scale of the entire camp. It seems reasonable to accept the possibility that this is the result of secondary residual magnetization caused by boilers for heating water. In the accounts, mainly of Jakub Stendig, there is a description of the functioning of the baths and the circumstances of, among others, overheating of boilers due to their overloading. The water was heated in such a way that the heated water vapor was used also for disinfection of clothes, mattresses and other textiles.

In the western part of the former cemetery, there is a mosaic anomaly interpreted by the as the eastern boundary of burials. Unfortunately, the area to the east cannot be effectively examined by the magnetic method due to the unfavorable terrain. Nevertheless, it would seem that this anomaly could, to a certain extent, be a picture of the first mass grave in the cemetery.

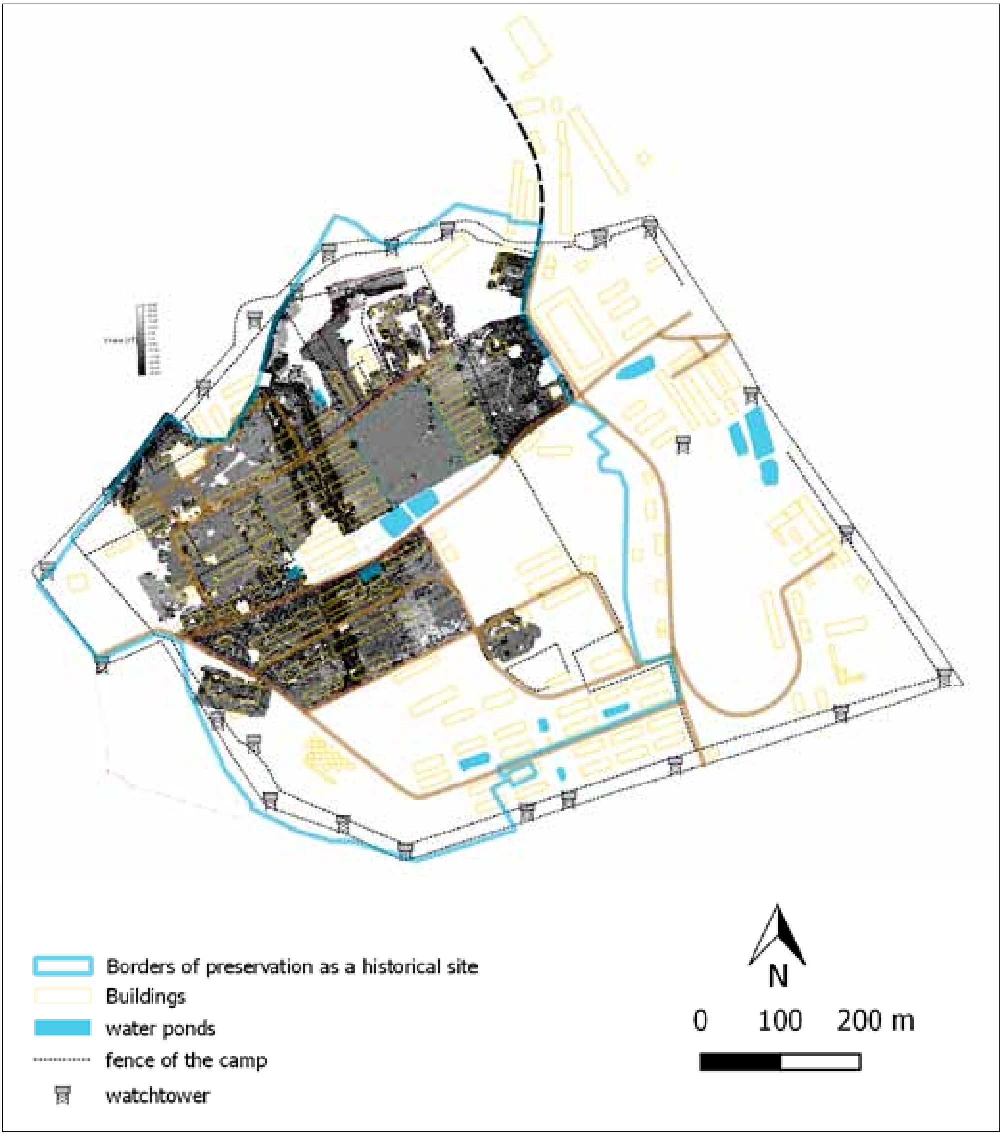
In the industrial part of the camp, the magnetic method did not bring unambiguous effects. The image of the tests is not legible. One of the reasons may be a shallow foundation of limestone, a large accumulation of metal objects and reinforced relics of camp infrastructure as well as post-war garbage dumping in this area.

In 2017 the magnetic method was supplemented with three others: electromagnetic, electric resistivity/conductivity and ground-penetrating radar. The use of a whole range of methods made it possible to compare the readings and data. This resulted in a precise identification and locating of the preserved rests of barracks and other features within the former KL

Plaszow. We also wanted to identify buildings which had stood on the sites of cemeteries and mass graves, where excavations are not possible due to the ethical issues.

On the basis of electric resistivity research in this area, two types of anomalous zones can be indicated. The first one shows areas of increased resistance. It should be recognized, therefore, that in the case when there were no buildings, the noted anomaly was an effect of artificial interference, e.g. through the pouring of lime debris, paving the way for the excavator (called bagier in Polish). In addition, the fence (or rather its remains) is partially visible on the archival photography presented above.

The second form of anomaly visible in the electro-resistance studies is a small point disorder with increased resistance. This is probably related



Ryc. 7. Visualization of data from a geomagnetic test

to the relics of grave cellars that have not been completely destroyed. In the case of electromagnetic research, anomalies are also visible, however, with a much smaller range. A similar disorder, unfortunately, could not be captured in such a visible form in the case of building No. 49- a new bathhouse. However, a small point disturbance was recorded at the place of the expected boiler/installation. As in the case of research, electro-resistance can point to point anomalies, which most probably should be combined with undamaged grave cellars.

Some works were also conducted in the places of planned excavation, especially in the area of males barrack No 24. In the image of magnetic tests, the concentration of anomalies in the southern part of the barrack is visible, coinciding with the outline of the wall. In addition, an additional group of disturbances may be indicated on the area occupied by the barrack, possibly related to the furnace/heating device. In the image of electromagnetic resistance research, the zone with increased resistance along the southern wall of the barracks and in its central part was confirmed. Similar results were obtained in the case of electromagnetic tests. Therefore, it seems likely that the foundations of the zone have been preserved, or relics of foundations under the barrack. On the basis of georadar tests, it can be determined that a certain continuity of the layer occurs at a depth of 0.8–1.2 m, which is probably the boundary between unmixed layers.

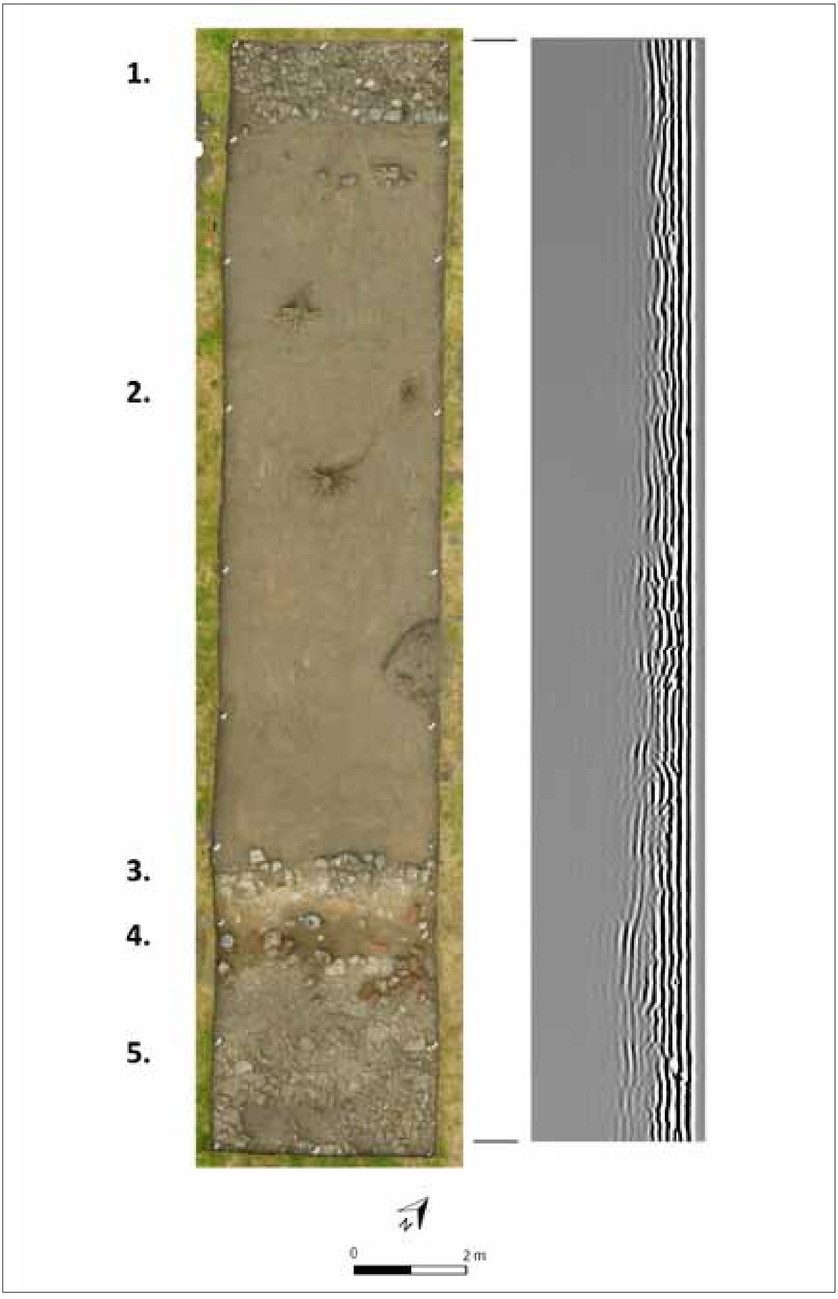
In the course of further work in the area of the Old Jewish Cemetery, further research work was carried out involving the implementation of GPR measurements. As in the case of earlier results of the non-invasive investigation, a clear anomaly running was confirmed. Nevertheless, the results of GPR method were into the discussion. The research was prepared once again by the Rabbinical Commission for Jewish Cemeteries. In fall of 2017, the research was planned for the western part of the graveyard as well as a possible location of the first *Appelplatz*. The results of the investigations are now under the interpretation.

Verification

The verification of the non-invasive methods were possible after the excavations. Excavations covered the area of 100 square metres out of the extant 40 hectares of the camp grounds and were conducted from mid-May till the end of July 2017. They constituted the final stage of archaeological research planned for 2016–2017. The main aim was to determine the topography and stratigraphy of the camp area on the basis of previously acquired data. The explored buildings and other sites included the male barrack No. 24; two laundries and the male latrine (buildings No. 23, 27, 32); the bakery (building No. 38); the presumed Polish hospital (building No. 17); the surgery ward barrack (building No. 20 in the hospital sector); the fire-fighting pond and the children barrack; the so-called Kinderheim (building No. 5) in the women's section; and the barracks of the ironworks, sheet-metal shop (building No. 84), paper mill (building No. 90), and printing house (building No. 92) in the industrial section. Small test-pits were also made to determine the archaeological layers in the industrial sector of the former camp. It soon transpired that the relics of the camp infrastructure are located just below the surface. After removing the top layer of soil, fragments of camp roads between the barracks were uncovered. They were built of finely crushed limestone and numerous pieces of matzevas. Previously it was believed that the tombstones had been mostly used for paving only the roads close to the former bakery building and by the path running to the female sector. But now it should be assumed that crushed tombstones from the desecrated cemetery were used for paving roads throughout the camp.

During work by the camp bakery a pavement with curbs was uncovered, as well as a limestone tract with a small drainage duct, probably running along the eastern wall of the building. We may presume that it is a pre-war road from the times when the building housed a sanatorium for children with tuberculosis run by the Jewish Society for Health Protection. Open gutters run along the main camp roads and small drainage systems were situated around the barracks. In the gutter by the barrack No. 24 numerous artefacts were discovered; they probably had found their way there during the demolition of the building.

The drains in the laundry and male latrine buildings were located outside. A gutter with fragments of a concrete slab at the bottom was discovered in the male latrine building. In the laundry, the drain was entirely covered and probably located by the southern wall. Most barracks were light timber constructions on shallow foundations, as has been confirmed by excavations at the male barrack No. 24, which uncovered an underpinning below the longer wall of the building. The most clear remnants of a wall are found in excavation No. 7. The relatively shallow foundation was laid directly under a layer of stones joined with mortar. Foundations of the longer walls of the male latrine were built of stones joined with mortar, with a concrete slab on top. A limestone wall thickly covered with mortar was detected by the bakery building; it was probably raised during the reconstruction of the TOZ



Ryc. 8. The combination of GPR results and its verification by excavation in the area of barrack No 24; 1. – the paved route; 2. – interior of the building; 3. – foundations of southern wall; 4. – gutter; 5. – the paved route (*photo by I. Pieńkos, GPR investigations by A. Schwarz; analysis by K. Karski*)

building for camp purposes. But only a small amount of crushed brick was found. Presumably it was reused as building material after the war. But brick remnants were found in the uncovered fragment of barrack No. 31, a food store where an underpinning was detected, and by the shorter wall of the laundry (building No. 27). Some buildings also had concrete foundations, the remnants of which are now visible, mostly in the industrial sector of the camp (for example, by the ironworks and metal-sheet shop-building No. 84). Very little was found on the site of the former laundries, besides fragments of dismantled buildings and loose building material.

Final remarks

Thanks to the non-invasive research of the post-camp area, it was possible to determine the degree of authenticity of the area. The preserved elements of the infrastructure and topography were indicated. The results of the research will be used to prepare an effective program for the protection of this place during the work on the scenario of the future museum in the place of memorial site. The authenism of the post-camp area and preservation programme of its historical value is one of the aims of the emerging development process.

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Dawid Kobiałka*

Airborne Laser Scanning and 20th Century Military Heritage in the Woodlands

ABSTRACT

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This paper discusses recent advancements in the context of modern conflict archaeology in the woodlands. One aspect of this development of archaeological research is a broad use and application of airborne laser scanning (ALS). Material remains of a forced labour camp and munitions depot in the forests around Gutowiec (Poland) known as Guttowitz 35 are used as a case study. After approaching prisoners' memories concerning the site, the results of ALS combined with the outcomes of fieldwalking at the site are presented. This article tries to back up the following thesis: due to applications of non-invasive methods (e.g. ALS, fieldwalking), archaeology is able to offer a deeper understanding and contextualization of such sites as Guttowiec 35: a fresh insight into the materiality of conflict landscapes from the recent past in the woodlands.

Key words: airborne laser scanning, modern conflict archaeology, archaeology of the recent past, military heritage, woodlands, landscape, materiality

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Introduction: modern conflict archaeology and woodlands as *terra incognita*

Modern conflict archaeology is a growing field of archaeological interest (e.g. Schofield 2005; Zalewska *et al.* 2017). One of the branches of it is so-called archaeology of the Second World War which focuses on material heritage of this conflict (Sturdy Colls 2012; Moshenska 2013). Archaeologists have been carrying out both invasive and non-invasive field research on such sites as death camps (e.g. Kola 2000; Majorek, Grupa 2015), prisoner of war and forced labour camps (e.g. Carr, Mytum 2012; Mytum, Carr 2013), mass graves (Kola 2005), to mention but a few examples.

However, heritage of Second World War in the forests was out of closer attention for a long period of time (Passmore *et al.* 2014). In this regard archaeology of the Second World War met the same difficulties

* Institute of Archaeology and Ethnology Polish Academy of Sciences, Solidarności 105 Avenue, 00-140 Warsaw, Poland; dawidkobialka@wp.pl

as other kinds of archaeologies. For decades, from an archaeological point of view, forests were a blind spot (e.g. Czebreszuk *et al.* 2013), so to speak. In a nutshell, a density of trees and bushes, among others, did not give opportunities for detailed surveys and research of woodland landscapes. Aerial photography was not efficient in this context too (e.g. Rączkowski 2002; Opitz, Cowley 2013).

The situation has begun to change in the recent years though. The broad applications of non-invasive research, especially ALS (e.g. Hesse 2010) but not only, brought new possibilities. This concerns different categories of landscapes up to and including the conflict landscapes from the recent past (Stichelbaut, Cowley 2016). In short, forest as *archaeological terra incognita* becomes slowly a *terra cognita*. A whole series of books and articles have recently been published where LiDAR derivatives are used in the context of heritage in the woodlands (e.g. Hesse 2010; Kokalj *et al.* 2013; Mlekuž 2013a, 2013b; Štular *et al.* 2012; Irlinger, Suhr 2017). Along these lines, the same is valid about recent research tendencies in Polish archaeology (e.g. Banaszek 2015; Pawleta, Zapłata 2015; Zapłata *et al.* 2014; Kobiałka *et al.* 2016; Kobyliński 2016). It can be even said that ALS is changing our understanding of prehistory. That is to say, archaeologists have recently started writing a *new* prehistory due to a broad use of ALS data.

The body of new articles, books, and projects dealing with heritage of the modern armed conflicts in the woodlands is constantly growing too. Once again, this trend includes both archaeological research in different parts of Europe (e.g. Seitsonen, Herva 2011; Herva 2014; Passmore *et al.* 2014; Capps Tunwell *et al.* 2015) as well as within the context of conflict archaeology in Poland (e.g. Ławrynowicz 2013; Karczewski, Karczewska 2014; Kobiałka *et al.* 2015, 2016, 2017; Konczewski *et al.* 2016). All this research clearly indicates the potential of various archaeological methods in regards to documentation of conflict landscapes of the recent past. From an archaeological point of view, material heritage of the conflict as well the whole landscapes in which conflicts took place are as much valuable data as historical, written documents from the period.

In the same vein, most of the studies highlight the fact that the modern conflict heritage in the woodlands has preserved in a very good condition till present (Passmore, Harrison 2008; Passmore *et al.* 2014; Seitsonen, Kunnas 2009; Seitsonen, Herva 2011). This situation gives unique possibilities to show the strength and advantage of archaeological research in *practice*. For example, as pointed out by David G. Passmore and Steven Harrison (2008, 106) apropos of their research on field fortifications in the Ardennes forests of Belgium dated on the Second World War:

> [archaeological research in the forests – D.K.] provides an illustration of the potential for such studies to explore the hurried deployment of field fortifications in the face of unexpected and imminent threat, while also serving to inform a comparison of battlefield remains with military unit histories, contemporary military doctrine and published accounts of the local conduct of battle. It is to be hoped that the work will stimulate a wider awareness of the value of recording and managing the region's WW2 battlefield heritage in the face of future development pressures, and especially the immediate threat posed by mechanised forestry operations.

Without any doubt, it would be – to put it simply – misunderstanding that archaeological research on material heritage of modern armed conflicts offers to write e.g. a *new history* of Second World War.

Indeed, archaeology is able to document, contextualise and – sometimes – change the dominant understanding of what happened in the recent past. Nonetheless, archaeology does not only offer microhistories: local aspects of the conflict. There are relevant examples where archeological research changes even the *grand narrative* and perception of the conflict. The most obvious example concerns the famous Battle of Little Bighorn in the US where archaeological research could change – as one could put it – the dominant understanding of the battle and its progress (Scott Douglas *et al.* 1989). As a more recent example of such archaeological research can be mentioned a work of Alfredo González-Ruibal (2017) in the context of the Spanish Civil War.

Above all, archaeological research on the conflict landscapes from the recent past especially in the woodlands makes visible the huge amount and diversity of the First and Second Word Wars' heritage. As noted by Passmore *et al.* (2014, 1289) in their influential paper on the topic:

> Writing in 1994 – the year of the fiftieth anniversary of D-Day – Chippindale's *Antiquity* editorial observes that "it is the number and mass of objects that make one aware of the material differences of twentieth-century warfare" (1994, 478). Chippindale would no doubt recognise the vast majority of objects specific to WW2 that have been documented since. But nearly 20 years on, it would appear that we have significantly underestimated the

> "quantity of stuff" (Chippindale 1994, 478) that remains to be documented in the conflict landscapes of WW2 Europe. In hosting such a well-preserved earthwork legacy of constructional features and explosive impacts, forest and woodland environments stand as a unique resource in the context of WW2 battlefields in north-west Europe. This is true not only in terms of the quantity of material, but also in complementing the concrete and brick of widely recognised conflict landscapes with more ephemeral battlefield and bombscape archaeology.

Paradoxically, from a certain point of view, Passmore *et al.* (2014) also underestimated the quantity and variety of *conflict stuff* in the woodlands. Forests of north-western Europe are not a unique resource in this regard. Without any doubt, Polish woodlands are, as recent research indicates, an archaeological *terra repromissionis* as well (e.g. Kobiałka *et al.* 2015; 2017).

Nonetheless, no one is questioning the possibilities offered by a new, non-invasive archaeological research. The results of a broad application of LiDAR derivatives in Poland (Banaszek 2015; Wroniecki *et al.* 2015; Zapłata *et al.* 2014), Germany (e.g. Hesse 2013), Slovenia (Mlekuž 2013a, 2013b), and so on are – to put it simply – outstanding (see also Štular *et al.* 2012; Opitz, Cowley 2013). However, one has to be also aware of the limitations of method. Like every method, it has its strong and weak aspects (Rączkowski 2012). In other words, ALS is not – to use a concept coined by the American philosopher Richard Rorty (1979) – a mirror of nature; a tool that opens up the *black box* of the past. Accordingly, ALS is not the way to reconstruct the past as it really was. During gathering, working, and interpreting of ALS data, a long chain of data reduction takes place (Kiarszys, Szalast 2014; Banaszek 2015; Wroniecki *et al.* 2015; Rączkowski 2017). This is the reason why even ALS data offer only the possibility to study the multitemporality of material aspects of landscapes of the past in the present.

This paper is a case study of one site related to the Second World War in the woodlands around Chojnice, Pomorskie province (Poland). In what follows, I present historical data concerning the site known as *Guttowitz 35*. I discuss some of the testimonies written down by the prisoners of the camp. The next part contextualises the results of an analysis of ALS data of the site combined with outcomes of fieldwalking at the *Guttowitz 35*. All in all, I try to back up the following thesis: due to various applications of non-invasive methods (e.g. ALS), archeology is able to deliver new data, a fresh insight into the conflict landscapes from the recent past in the woodlands.

The site: *Guttowitz 35*

During the Second World War, the Nazi Germany opened – as it is assumed – approximately 40 000 prisoners of war camps, forced labour camps, internment camps, concentration and death camps (e.g. Homze 1967). One has to bear in mind that the concept of forced labour camp is a very broad category (see more in Herbert 1997). It includes structures of different functions and purposes, various shape and diverse infrastructure, etc. Accordingly, there are camps that are well known and about which many oral and historical records survived till present. Some of them are today museums or education centres, to mention but a few contemporary uses of the spaces after the Second World War's camps. There are, however, also structures about which relatively small number of historical documents preserved. Some of such structures were deeply hidden in the forests. In short, after nearly 80 years of closing of such camps, there is very limited knowledge about their functioning, infrastructure and prisoners (see also Myers, Moshenska 2011). One such example is the topic of this study: the camp *Guttowitz 35* hidden in the woodlands between Chojnice and Czersk (e.g. Daniluk 2012).

Written down testimonies/memories of the prisoners say that the camp mostly detained British, French and Belgian soldiers captivated on the Western Front (Fig. 1).

Fig. 1. Belgian (left) and French (French foreign legion) (right) uniform buttons found at *Guttowitz 35* (*photo D. Kobiałka*)

One of the British prisoners of war detained in *Guttowitz 35* was Walter Darbyshire (2005) who served at the Duke of Wellington Regiment. In 1940, he was sent with his regiment to Cherbourg (north of France). Few weeks later, he was captivated by German troops. In short, he finally was taken to Stalag "Thorn" Camp 13XXA and later moved to *Guttowitz 35*. The memories of Darbyshire are – it can be said – a typical story of a soldier who survived the Second World War. For the purpose of this study the most important are those memories which directly refer to *Guttowitz 35*:

> Following the solitary confinement, we struggled on for, I would imagine, somewhere round about six or seven months, when, along with about thirty or so other men, I was moved to Camp 35 at Guttowitz. Although this Camp left a lot to be desired, we did begin to live a bit. The beds were three tier bunks, with – straw palliasses, which were not too hygienic, as by this time, the first lice were beginning to appear, no doubt due to malnutrition and the filthy conditions that we were living in (Darbyshire 2005, available at http://www.bbc.co.uk/history/ww2peopleswar/stories/71/a4083671.shtml, accessed 1.08.2017).

The British soldier describes the camp infrastructure in a vague way (Fig. 2):

> There were some cold showers in this Camp, but at first we had no soap, and not even a change of underclothing. We were issued with wooden clogs and foot rags but not much else. This Camp housed, I would guess, about 500 or 600 men, most of whom went out daily in working parties (Darbyshire 2005, available at http://www.bbc.co.uk/history/ww2peopleswar/stories/71/a4083671.shtml, accessed 1.08.2017).

All in all, Darbyshire spent four years in the camp. The British soldier also mentions the work they had to do. The prisoners were ordered to clean a way through the woods and – what was much more important – to work on a motor-way which run from Berlin to Königsberg, among others. What is also interesting in the Darbyshire's memories is the fact that he mentions the moment and circumstances of the camp's closing. It was in December 1944, while the Red Army was approaching the camp, the prisoners were ordered to carry only what they were able to hold in the hands and marched away towards west (Germany). Fortunately, Darbyshire survived the hash time of marching and was finally released by the Allies troops.

Roy Herbert Godfrey from the British Royal Army ('Briggs') was another British soldier who was taken into German captivity during

Fig. 2. It is striking that Walter Darbyshire did not describe the number, outlook and shape of barracks in which soldiers slept. Remains of some barracks are still visible in the woodland landscape: an outline of one of the them at the terrain of camp (*photo D. Kobiałka*)

the first months of the Second World War on the Western Front. Like Darbyshire, he was taken to a prisoner of war camp in Thor and in October 1940 moved to the camp hidden in the forests around Gutowiec. According to Godfrey, the camp had been still in construction when he arrived. He also mentions the fact that the Allied prisoners were constantly waiting for the Red Cross parcels. The only memory that says something about the outlook of the camp is the one when the British soldier mentions that the prisoners had two tier beds to sleep. He also highlights that the French soldiers were detained at the camp too.

Similar story concerns Bob Master (1960) from the 1st Battalion of the South Wales Borderers who after landing in France, had to surrender to a German patrol. He also, with his comrades, was taken to Thor. Master's memories confirm that Germans used the Allied

Fig. 3. A fragment of artillery shell documented during the field research at *Guttowitz 35* (*photo D. Kobiałka*)

soldiers during a road building that was to link Berlin and Königsberg. The prisoners did some repairs of the local routes too. Just after a few weeks Master was sent back to Thorn.

The memory about *Guttowitz 35* is still alive among local communities as well. According to a regionalist Piotr Szulc (personal communication, 20.03.2017), the elders confirm that a German forced labour camp was functioning in the woodlands near Gutowiec. Elder people remember that French and British soldiers were captivated in the camp and that they had to build the road, among others. These memories also mention the advent of the Soviets who discovered abandoned camp and munitions depot full of stuff left by the Germans (Fig. 3). For a few weeks, the Soviet stationed in the woodlands and blew up the abandoned German munitions supplies.

Without any doubts, oral history of the local communities and memories of the soldiers detained in *Guttowitz 35* are a valuable historical record. However, they say very little about the camp and munitions depot infrastructure. In other words, they lack the very materiality that constituted day-to-day life and work of the prisoners at the camp and munitions depot. Material culture and material transformations in the local woodland landscape are also a valuable historical and archaeological record. The preliminary results of interpretation of ALS data concerning the camp and munitions depot combined with fieldwalking at the site are discussed and presented in the last part of this paper.

The materiality of *Guttowitz 35*: between past and present of the site

The first thing to notice is that the ALS data used in the following case study were not gathered for strictly archaeological purposes. The airborne laser scanning of *Guttowitz 35* was part of a lager, national-wide program called ISOK (Informatyczny System Osłony Kraju przed Nadzwyczajnymi Zagrożeniami; in English: IT System of the Country's Protection) (Wężyk 2014). Nonetheless, the archaeological practice of the last years proved the huge potential of the ISOK data regarding archaeological studies of past landscapes, including the conflict landscapes from the recent past (e.g. Kobiałka *et al.* 2016; 2017). Accordingly, the data for the analysis of *Guttowitz 35* were obtained from the Geodesic and Cartographic Documentation Centre, Poland. The density of scanned area was no less than four point per square meter. Relying on these data, Digital Terrain Model (DTM) was created with a 0,5 meter resolution. DTM was then used to prepare visualizations of certain parts of the landscape thanks to a use of various algorithms. Among these visualizations were a hill shade and local dominance (see more in Hesse 2010; Štular *et al.* 2012). Part of the research methodology was field surveys which aimed at revising structures *in situ* that were discernible on LiDAR derivatives.

Figure 4 presents the general view of *Guttowitz 35* visible on LiDAR derivatives. To put it simply, it makes visible the *quantity and diversity of Second World War stuff* hidden in the forests around Gutowiec. Accordingly, the diversity and quantity of material remains preserved in the forest cause difficulties while interpreting the data. Remains spread around approximately 40 hectares. They have different shapes and depths; it seems that they functioned for various purposes and survived in different condition till now. Even the precise number of – as Laurent Olivier (2011) would have put it – material memories of the camp and munitions depot is hard to assess. One thing is sure: it is a unique military complex consisting of hundreds of different structures built and used by the Germans during the Second World War.

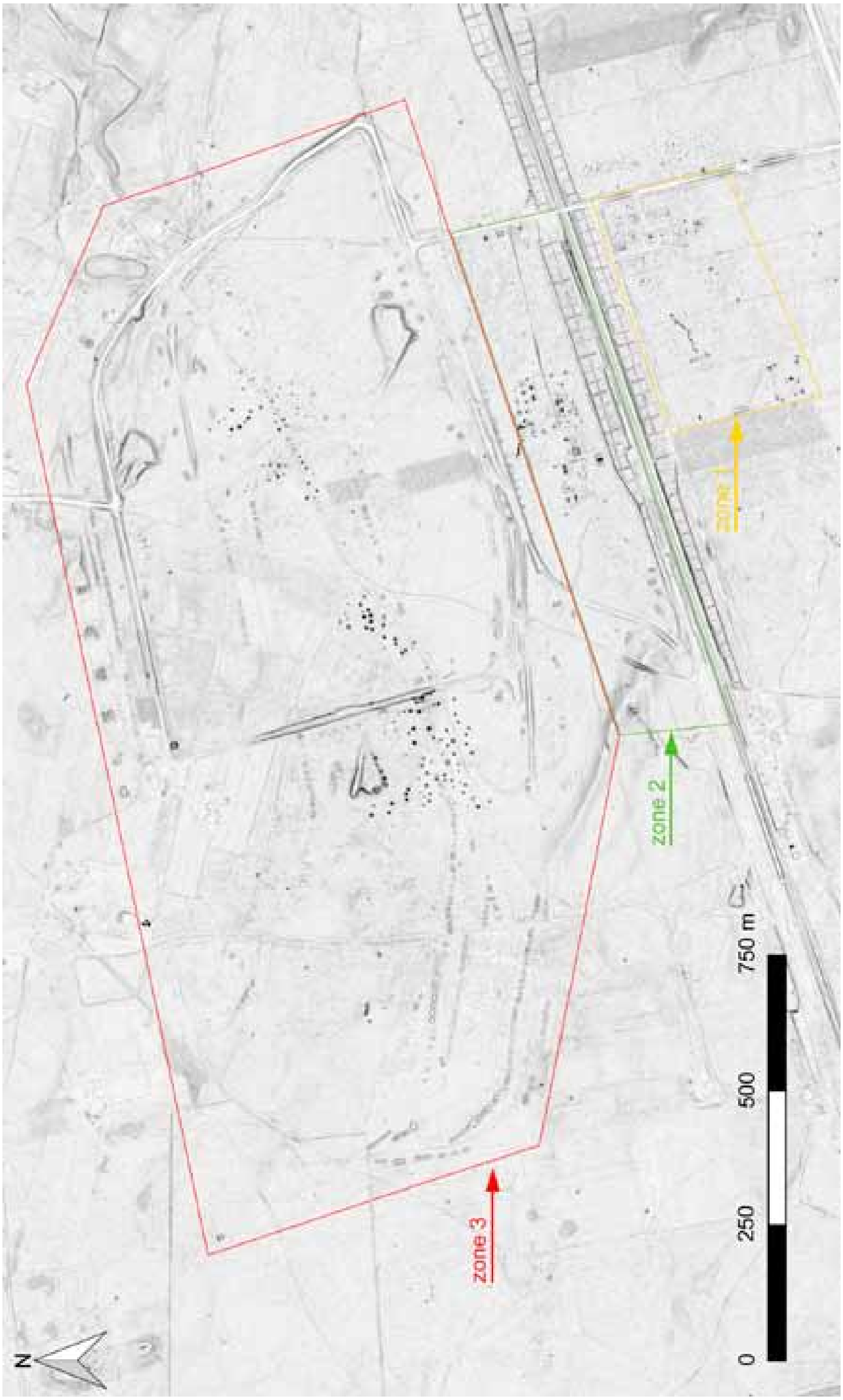

Fig. 4. The *quantity and diversity of Second World War stuff*: material remains of the PoW camp and munitions depot in the forests around Gutowiec visible on LiDAR-derived data (visualization: hill shade)

For the purpose of this study one can distinguish at least three characteristic zones of *Guttowitz 35* readable on LiDAR derivatives which differ with regard to their past function. The first one actually seems to be what the prisoners like Walter Darbyshire, Roy Herbert Godfrey, and Bob Master meant by *Guttowitz 35*: remains of a forced labour camp (Fig. 5). The camp was located on the left side of road made of concrete slabs that linked the camp with the motor-way. There are visible outlines of four rectangular structures. They were approximately located on the N-S axis. Fragments of clay bricks and concrete debris documented around them might indicate that these are foundations of four wooden barracks in which prisoners slept. They were approximately 42 meters long and 13 meters wide. Between the barracks there were located two most intriguing structures which precise function is hard

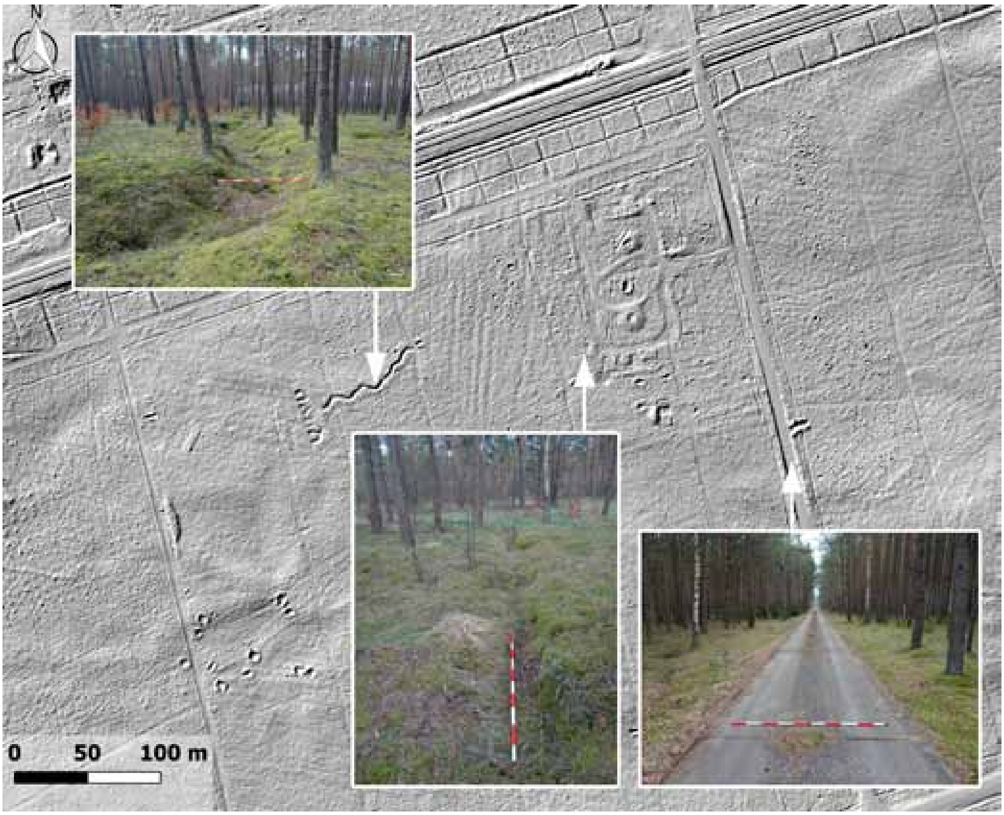

Fig. 5. Remains of the forced labour camp in the forests around Gutowiec visible on LiDAR-derived data (visualization: hill shade)

Fig. 6. Remains of structures related to administration of the munitions depot in the forests around Gutowiec visible on LiDAR-derived data (visualization: local dominance)

to interpret. They are a kind of concrete, circular silos embedded in the ground. Another structure was located to the southern from the barracks. It is smaller than the four barracks. It was 20 meters long and 10 meters wide. This could be a guard barrack.

A trench and gun nests located approximately 100 meters left from the barracks were also part of the camp. A group of 10 rectangular structure – most probably – relate to the functioning of the camp as well. Some researchers interpret such structures as vehicle shelters (Harrison *et al.* 2015, 241). Finally, one cannot but mention also the huge number of contemporary robbery pits visible on the LiDAR derivatives and at the woodland landscape during the field research. The camp had to be fenced. Traces of it, however, are not noticeable in the LiDAR data as well as during the field surveys.

Guttowitz 35 had a deliberate localization. First, it was hidden in the thick forests. Second, the camp was located near the planned motor-

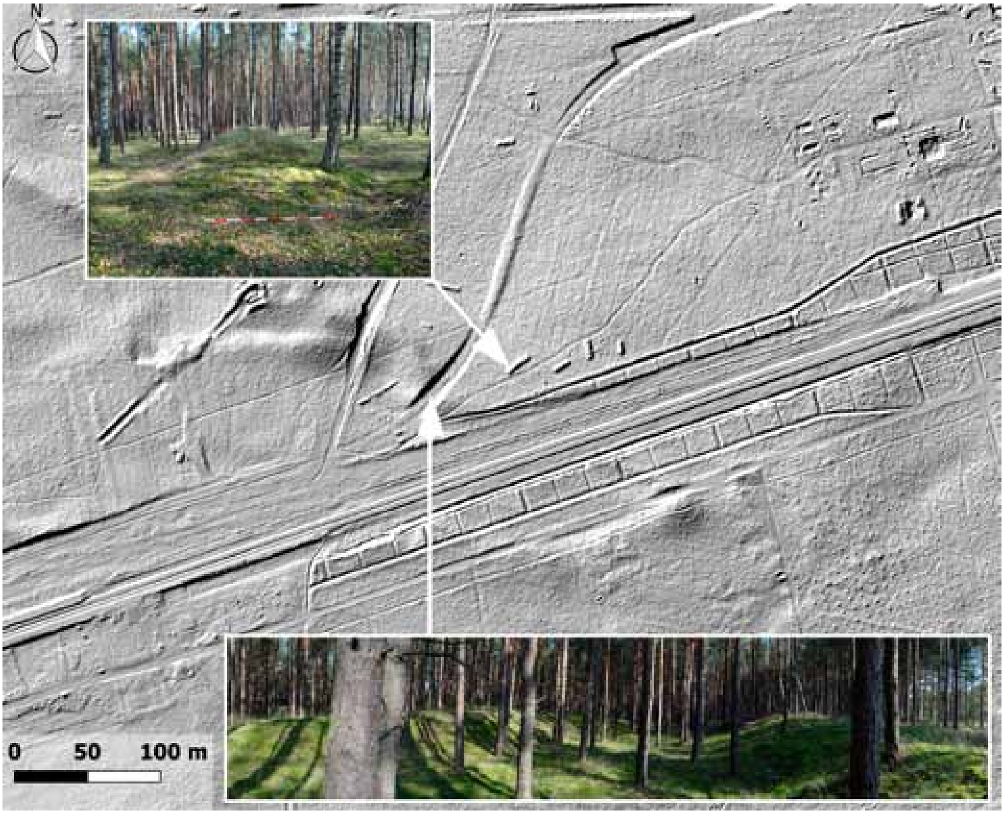

Fig. 7. Remains of a railway siding in the forests around Gutowiec visible on LiDAR-derived data (visualization: hill shade)

way. Last but not least, it was located close to a railway track which was used to deliver and transfer people (e.g. German soldiers, Allais prisoners of war) and material goods (e.g. food, equipment, parcels, up to and including munitions which were stored at the site).

The second distinguished zone of *Guttowitz 35* is a railway siding with infrastructure. The main railway track that links Chojnice and Tczew was – as one can assume – a kind of border which separated the camp from other parts of the site. It consists of various structures. One can distinguish outlines of at least five buildings which are most probably remains of administration barracks (Fig. 6). Traces of five rectangular and square structures which are embedded in the ground up to two-tree meters are also very intriguing. During the field survey, inside of them, I found concrete debris and 'trash' (e.g. tin cans, animal

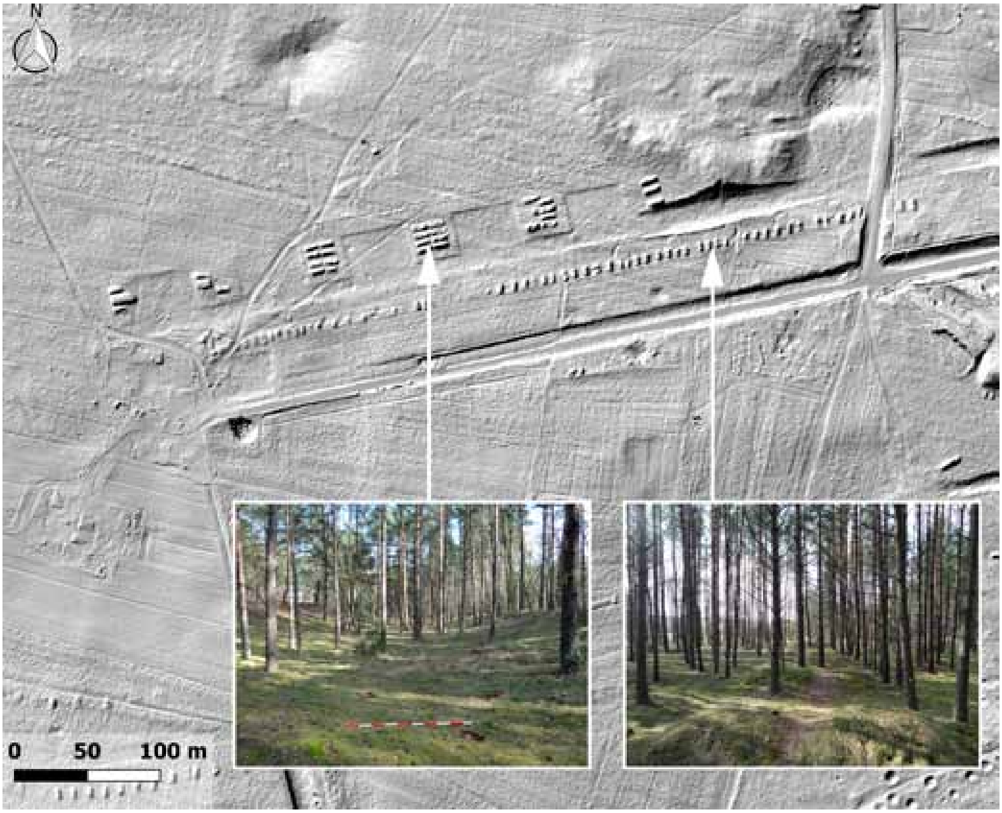

Fig. 8. The remains of tens of different earthen platforms of various forms creating rows and clusters in the forests around Gutowiec visible on LiDAR-derived data (visualization: hill shade)

bones, an iron nail etc.). Part of this zone are also structures which might be interpreted as vehicle shelters.

While building such sites as *Guttowitz 35*a typical practice would be preparing for the air attack from the enemy. Indeed, an anti-air trench located northern to remains of administration buildings has survived in excellent condition till present. It is approximately 90 long and an adult man can hide in it without any trouble. During the field research remains of – what can be interpreted as – anti-aircraft positions consisting of trenches, earthen platforms and vehicle shelters were well visible. Finally, elements of this part of the site are long, rectangular structures dug in the ground which could as storage for ammunition for anti-aircraft gun. However, one of the crucial elements of this landscape is a trace where railway track was laid and siding itself (Fig. 7). Unfortunately,

Fig. 9. A cluster of craters in the forests around Gutowiec visible on LiDAR-derived data (visualization: local dominance)

iron, railway clippers have been – as I was told during the interview with the regionalist Piotr Szulc (personal communication, 20.03.2017), dismantled and sold at scrap metals during the last 20 years.

The last zone of *Guttowitz 35* is the biggest one at the same time. The remains of tens of different earthen platforms of various forms creating rows and clusters of the structures can be – without any doubt – interpreted as related in one way or another to the Germans activities in the forests of Gutowiec during the Second World War (Fig. 8). However, their precise function is hard to assessed at the preliminary stage of research. Most of them created rows of structures that run for up to 530 meters, the same as the ones in the northern part of the depot. Routes made of concrete slabs are part of the depot. Short fragments of trenches as well as rifle trenches had to be interpreted as part of the site. The central part of the depot is covered by tens of craters of various diameter and depth. It seems that this is the remain of the Soviet blowing up of the munitions supplies left by the Germans

Fig. 10. Examples of material culture documented during the field research (*photo D. Kobiałka*)

Fig. 11. The contemporary re-use of the camp infrastructure: a silos as a vessel for water used by firemen during stopping a fire (*photo D. Kobiałka*)

in 1945. The memories of this action are hold among local people till present. The craters are very well visible in the local landscape (Fig. 9).

One can distinguish the approximate outline of the area 3. Rows of small holes are remains of a fence of concrete posts dug in the soil. That is why part of the railway siding and entire zone 3 was fenced. Four structures, that run parallel to the railway track and were 84,5 meters long and 19 meters wide, might be remains of some magazines.

All in all, *Guttowitz 35* is not only a huge *archaeological site* full of different earthen structures related to the camp and munitions depot. Remains of barracks, trenches, gun nests, anti-air trenches, vehicle shelters, and so on are part of this unique landscape. Part of it is also material culture related to the functioning of *Guttowitz 35*. During the field research an interesting assemblage of things was documented. Among the Second World War *artefacts* were medicine and wine glass bottle, tin cans, fragments of artillery shells, shell of signal cartridge, fragments of broken plates, among others (Fig. 10).

Like many sites built and run during the Second World War, the camp and munitions depot were re-used after the war. For example, local community used bricks which were the foundations of camp's barracks while re-building their own houses after 1945 (Szulc, personal communication, 20.03.2017). Similarly, the same history concerns the camp's routes made of concrete slabs. They were very valuable material used while laying foundations of houses and building cellars by local community (Szulc, personal communication 24.08.2017). On the other hand, firemen use two post-camps silos as vessels for water while stopping a fire (Fig. 11). Eventually, the depot's roads made of concrete slabs are used by citizens of local villages (e.g. Krzyż, Stodółki, Kłodnia) even today.

Conclusion

This paper discussed the preliminary results of non-invasive field research at the terrain of a forced labour camp and munitions depot known as *Guttowitz 35*.

In the first part of the paper archaeological research on the woodland landscapes was shortly presented. Indeed, archaeological research in the woodlands is a new, growing field of scientific inquiry. On the other hand, the use of non-invasive methods gives new discoveries and offer more complex understandings of past societies and their relicts/heritage. To a certain degree, one can even risk a thesis that the *new prehistory* is written in front of our eyes. On the other hand, archaeological research concerning the conflict landscapes in the woodlands also brings interesting results (e.g. Passmore *et al.* 2014). In short, not everything was written down in historical documents.

Remains of shelters, trenches, barracks, bomb craters, munitions depots, etc. are a valuable heritage. Such heritage has an obvious historical and cultural value. By the same token, one can said that such heritage has an archaeological value as well (see more in Saunders 2007). There is a constant trend: one discerns the growing interest in the archaeological value of material relicts of the conflicts of the recent past (e.g. Zalewska *et al.* 2017). Sooner rather than later, these relicts will be considered as *archaeological sites*. This paper was also a call for paying closer attention to this kind of the archaeological record. Such landscapes have been systematically penetrated by the so-called treasure hunters who look for Second World War's memorabilia (Fig. 12).

Fig. 12. Contemporary robbery pit at the terrain of *Guttowitz35* (*photo D. Kobiałka*)

One such site in the woodlands dated to the Second World War is so-called *Guttowitz 35* – a previous forced labour camp and munitions depot. The site was used as a case study. Only a few testimonies left by the British soldiers, among other, kept at the camp are known. Another historical material related to the site are memories of local communities. Without any doubt, archaeology can show its full potencial in such cases as *Guttowitz 35* about which the historical record is very limited.

The last part of this article presented the materiality of *Guttowitz 35*: the quantity and diversity of material relicts of the site that preserved till present. Hundreds of structures related to the camp and depot are still visible in the local landscapes. Probably, thousands of artefacts are hidden still in the ground as well.

Archaeologists have just started to learn how to interpret complex structures and material culture related to modern armed conflicts (e.g. First World War, Second World War) (Schofield 2005). Their precise function is sometimes problematic to interpret. Nonetheless, these are structures and material culture that archaeologists will have to learn about in a near future.

All in all, I tried to back up the following thesis in this article: due to applications, among others, of non-invasive methods (e.g. ALS) archaeology is able to offer new data, a fresh insight into the material heritage in woodland's landscapes from the recent past. Without any doubt, Polish woodlands, as this research hopefully indicates, are an archaeological *terra repromissionis*.

Acknowledgement

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Wojciech Pasterkiewicz*,
Bernadeta Rajchel**

Application of GPR Survey in the Investigation of a Plane Crash from the Second World War

ABSTRACT

Pasterkiewicz W., Rajchel B. 2017. Application of GPR Survey in the Investigation of a Plane Crash from the Second World War. *Analecta Archaeologica Ressoviensia* 12, 271–284

The article discusses the use of a ground-penetrating radar (GPR) for locating objects originating from the war period. It also presents the results of GPR research, showing the presence of a World War II aircraft wreck located in the subsurface layer in Krościenko Wyżne, Krosno County, Podkarpackie Voivodeship. Excavations carried out later have confirmed these surveys. The remains of the aircraft were documented in spots in which anomalies were indicated by the GPR. The conducted archaeological work made it possible to assess the effectiveness of the georadar technique.

Key words: GPR research, post-war objects, archaeology

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Introduction

The GPR method is included among available radiowave geophysical methods. It is a non-invasive technique that analyzes subsurface layers and provides information on the presence of subsurface objects. It can be used differently depending on the frequencies of the used antennas (Karczewski 2007). It has a wide application: from geological and engineering surveys or environmental protection to archaeology or criminalistics (Rajchel 2011). Recently, it has been increasingly used to search for various objects beneath the surface, such as military equipment left underground following military operations. This topic is also discussed in the article.

Research objectives

The main purpose of the measurements was to determine the location of a Junkers Ju-87 Stuka aircraft wreck, which had crashed

* Institute of Archaeology, University of Rzeszów, Moniuszki 10 Street, 35-015 Rzeszów, Poland; wojpas@vp.pl

** Stanisław Pigoń State Higher Vocational School in Krosno, Polytechnic Institute, Department of Environmental Engineering and Mining, Dmochowskiego 12 Street, 38-400 Krosno, Poland; bernadeta.rajchel@pwsz.krosno.pl

during World War II, as well as to determine its location and the depth of its deposition. The article presents the results of georadar measurements carried out in the field and compiles them with the results of archaeological research. In addition, the effectiveness of the georadar technique is assessed in accurately determining the location (depth, outline, arrangement) of the identified elements from the plane's remains. One valuable aspect of this project in terms of the usefulness of the georadar technique in this type of research is linked to the fact that it has been possible to confirm non-invasive measurements with invasive research. Excavation works were carried out by the Private Museum of Podkarpacie Battlefields in Krosno – the main initiator of the entire project.

Junkers Ju-87 D3 plane crash in light of archival documents and eyewitness accounts

The plane crash took place on February 11, 1944 at the airport in Łężany (currently called „Iwonicz", Fig. 1), which was Krosno's spare

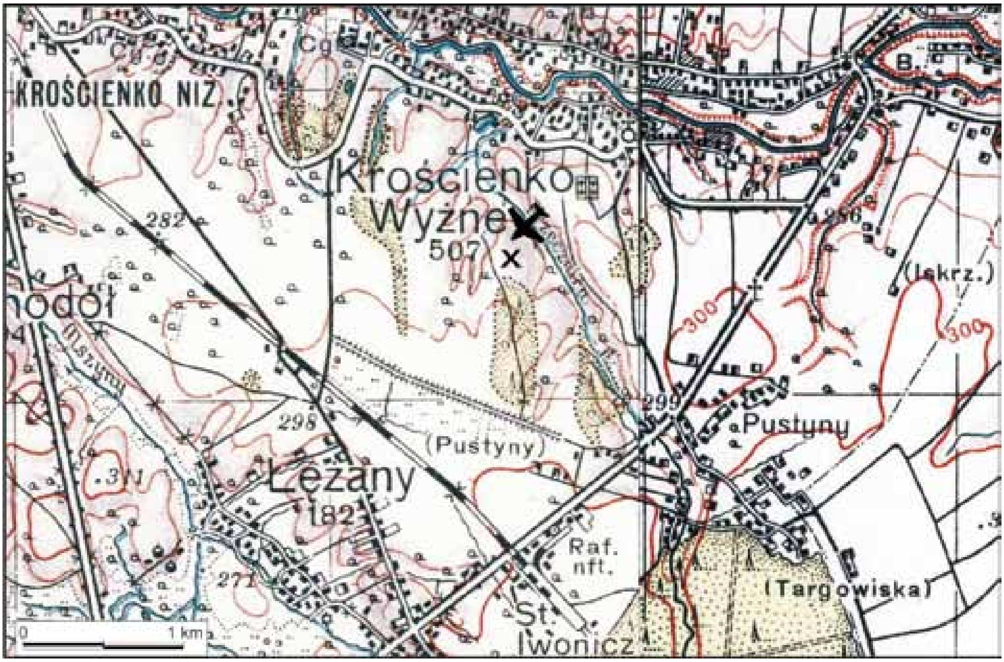

Fig. 1. A section of a 1:10 000 scale WIG map (sheet P50 S33 Jasło and P50 S34 Sanok) with the location of the plane crash

airport (Fryc 2009). The plane was piloted by staff sergeant Ioan Clop, born on February 26, 1921 in Romania in the village of Andrei Saguna, Arad district, in western Romania (Kubit 2016). In early February 1944, he arrived at the airport in Krosno together with a group of Romanian pilots to train on German Junkers Ju-87 planes, which were also used by the Romanian air forces. The described crashed plane was the German dive bomber Junkers Ju-87 D3 (Dora) Wek No. 110757, produced in 1943, which had completed a total of 161 flight hours and conducted 226 landings. The flight was of a training nature and its aim was to bomb a target located on the outskirts of the airport in Łężany. For unknown reasons, the plane did not release the suspended practice bomb and they hit the ground together. According to eyewitnesses, the crash was accompanied by a bang and an explosion, and a crater appeared at the place of impact. Shortly after the incident, an attempt was made to extract the aircraft wreck by the airport's German technical services. However, it was unsuccessful, and only a part of the fuselage was extracted along with the rear tailplane. Some fragments of the plane (e.g. a fragment of the wing) were abandoned and remained lying in a nearby forest until the 1970s.

Research methodology

The georadar Detector Duo (made by the Italian company IDS) was used for georadar measurements. It works with two antennas (hence the name "Duo") with 250 MHz (so-called "deep") and 700 MHz (so-called "shallow") frequencies. This portable radar can locate objects in the ground up to a depth of 6 m, which was a sufficient range for conducting the search. Additionally, a RIS-ONE georadar was used (the same company), with an 80 MHz bistatic antenna (depth range of up to 14 m); however, it did not indicate any objects below 6 m. Weather conditions before and during GPR measurements were adequate – dry and warm, and therefore the soil was not hydrated. The research area was properly prepared – the grass had been cut on the fallow field. Trees did not grow in the discussed area. The aforementioned weather and terrain conditions made it possible to carry out accurate GPR measurements without the electromagnetic signal being suppressed by high humidity or recording unnecessary anomalies originating e.g. from the roots of trees.

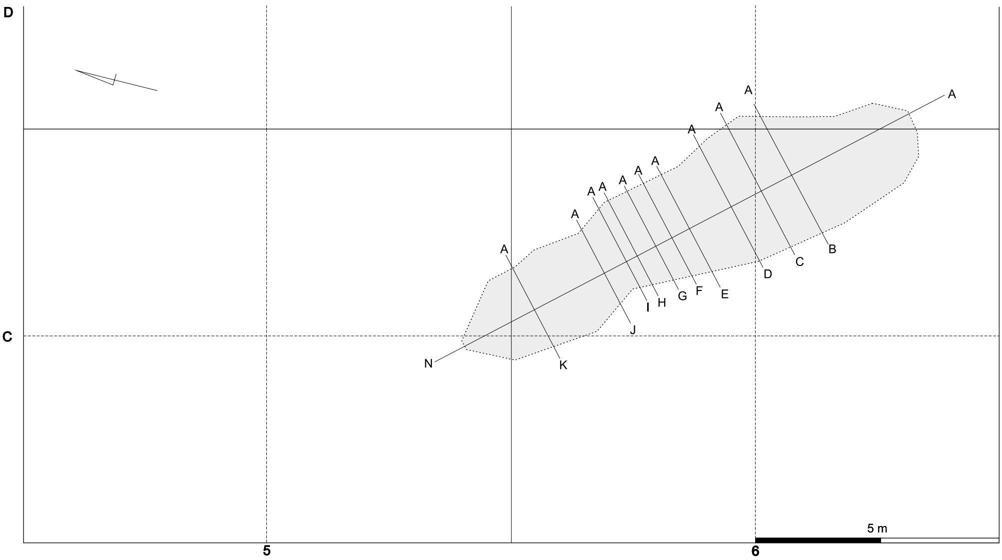

Fig. 2. Krościenko Wyżne, Krosno County, Ju-87D3 plane crash site. The location of the echograms and the range of anomalies indicated during georadar research is provided in grey

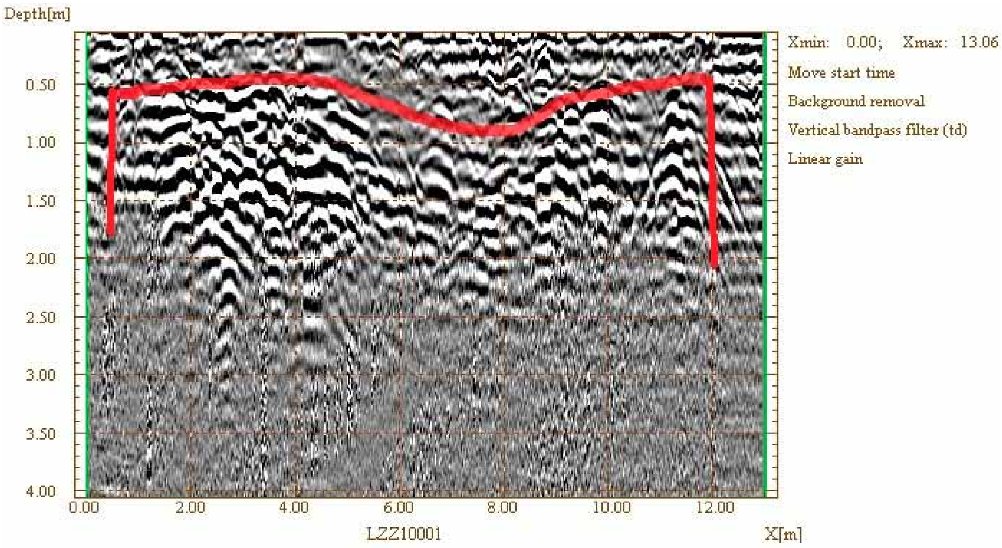

Fig. 3. AN echogram. Measurements taken of the long side of the localized object's outline. IDS / GPR apparatus, 700 MHz shielded antenna. The red line depicts the set of anomalies originating from the aircraft wreck

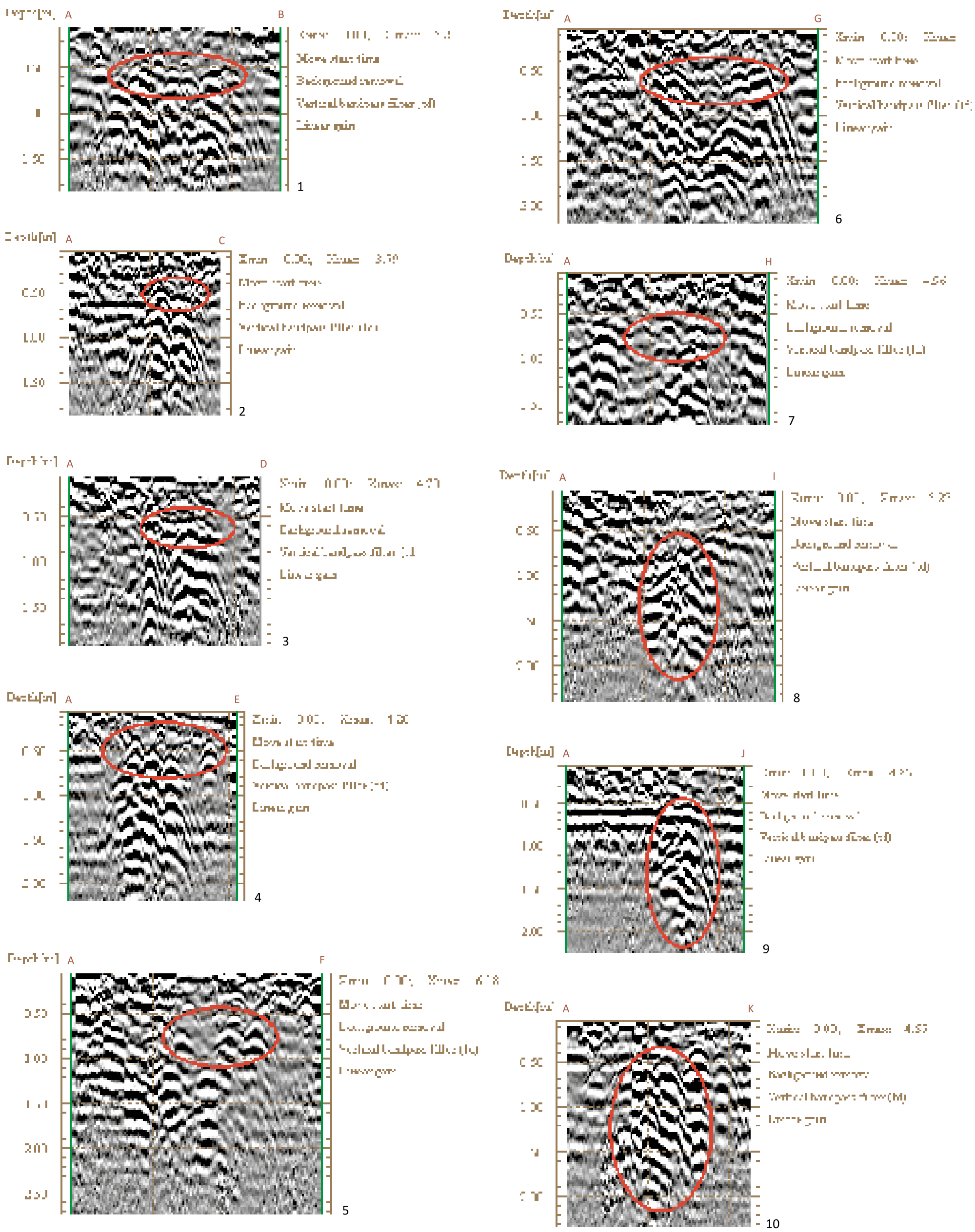

Fig. 4. Krościenko Wyżne, Krosno County, Ju-87D3 plane crash site. Compilation of AB – AK echograms. IDS / GPR apparatus, 700 MHz shielded antenna

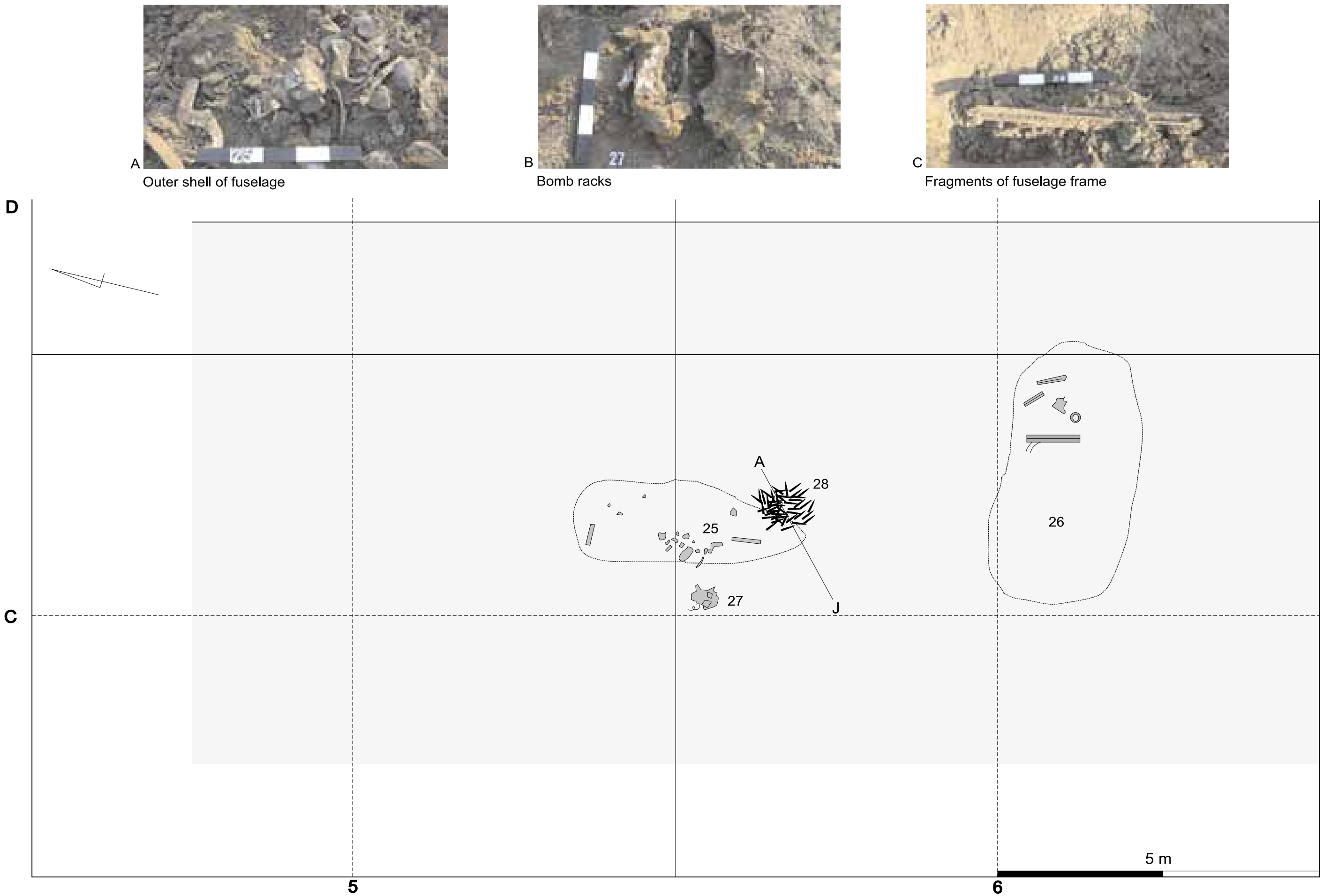

Fig. 5. Krościenko Wyżne, Krosno County, Ju-87D3 plane crash site. Planigraphy of metal objects at a depth of 0–40 cm from the surface and the location of georadar profiles (archaeological trench marked in grey)

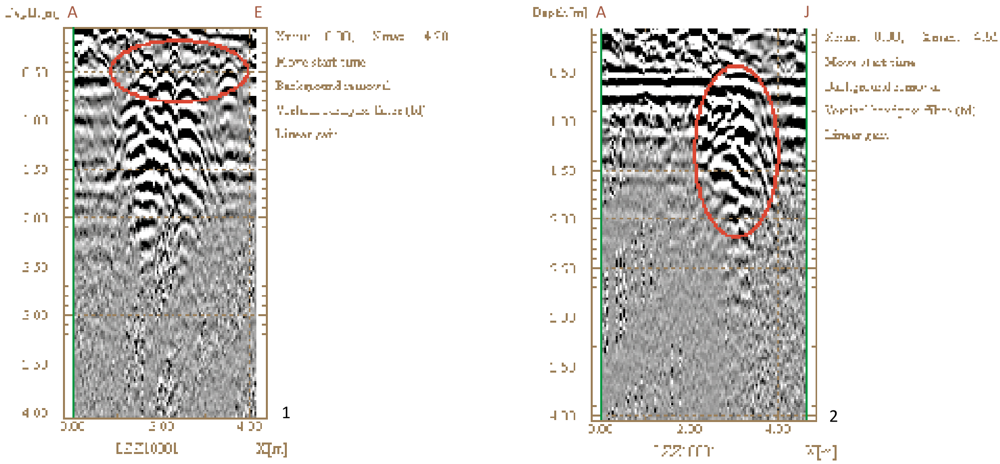

Fig. 6. Krościenko Wyżne, Krosno County, Ju-87D3 plane crash site. AE (1) and AJ (2) echograms. Measurements taken of the shorter side in the middle part of the localized object's outline. The visible anomalies, marked with a red line, originate, among other things, from large amounts of ammunition. IDS / GPR apparatus, 700 MHz shielded antenna

GPR measurements were carried out over the course of two days. On the first day, a measuring grid was established in an area covering approximately 900 m^2, after which preliminary measurements were made at a distance of 2 m from each other vertically and horizontally. After these measurements, the search area was narrowed down to the spot where clear anomalies had been noted during the preliminary tests. This was an area about 11.5 m long and 3 m wide (Fig. 2–4).

On the next day of research, additional GPR measurements were carried out in the designated area in order to confirm the presence of an object giving a strong electromagnetic signal and a more accurate determination of the depth of the object in the ground. Next, the surveyor designated the geodetic points of the spot where this object was located. These points were plotted onto a map.

Georadar and excavation research results

At the spot previously selected during the georadar study, a 10×17 m trench was established. Already after removing 50 cm, dozens of small objects were found, as well as several larger ones coming from the outer shell of the fuselage. In area 6C, the barrel of a MG 17 caliber 7.92 mm

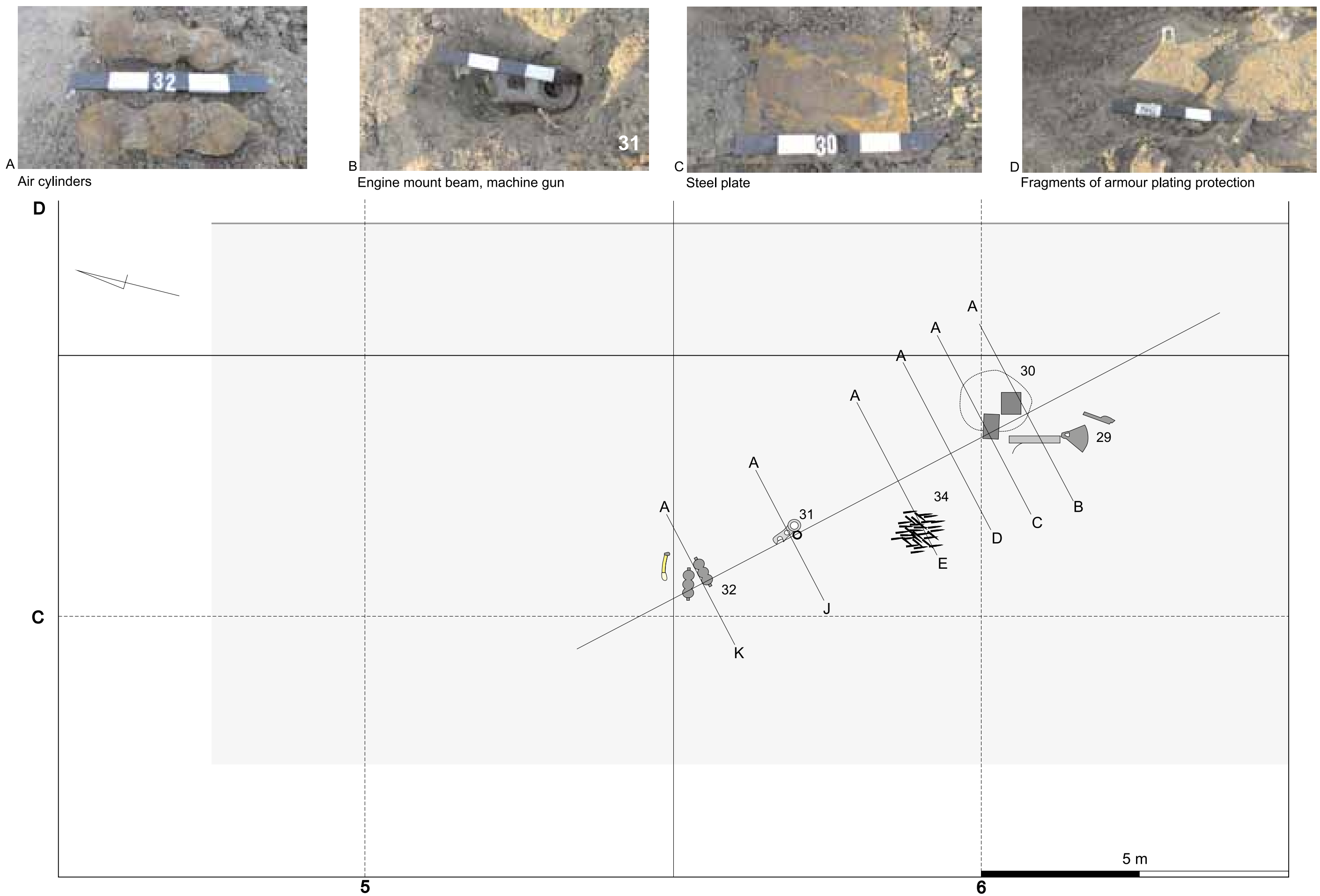

Fig. 7. Krościenko Wyżne, Krosno County, Ju-87D3 plane crash site. Planigraphy of metal objects at a depth of 40–50 cm from the surface and location of georadar profiles (archaeological trench marked in grey)

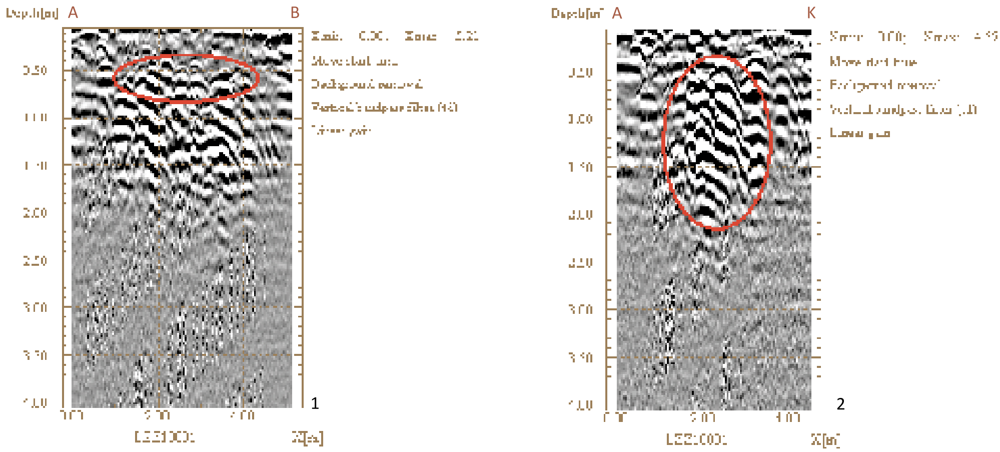

Fig. 8. Krościenko Wyżne, Krosno County, Ju-87D3 plane crash site. AB (1) and AK (2) echograms. Visible anomalies originating from the armour plating and armour elements (AB echogram) and from the air cylinders (AK echogram). IDS / GPR apparatus, 700 MHz shielded antenna

machine gun was uncovered that was stuck almost vertically into the ground (Fig. 5). A fragment of an engine mount beam was located nearby. In its vicinity, there was a concentration of large amounts of ammunition (several hundred pieces), heavily deformed due to the impact and sometimes showing traces of having exploded automatically as a result of fire. These objects were visible in echograms A–E and A–J (Fig. 6) and were marked as an area with distinct anomalies.

At a short distance, another element was found with concentrated mass, which in fact turned out to be the aircraft's aileron balance weight and air cylinders from the wing (Fig. 7). It can be assumed that they were visible in the AK echogram as an anomaly appearing at a depth of 0.5–1.0 m (Fig. 8: 2). In subsequent profiles, anomalies were present at a depth of 0.5 m, reaching a depth of 2.5 m. at the ends (Fig. 4, 8: 1). There were a few larger sheets constituting the outer shell of the fuselage and various structural elements (a fragment of the frame - in the centre wing carrying the loads from the wings, a fragment of the rear part of the fuselage). What is more, 6-mm-thick rectangular steel plates were uncovered measuring 35×45 cm in dimension, as well as one crescent-shaped sheet 40×40 cm in dimension, which were fragments of the armour plating protecting the crew from shelling from the ground (Fig. 7, 9).

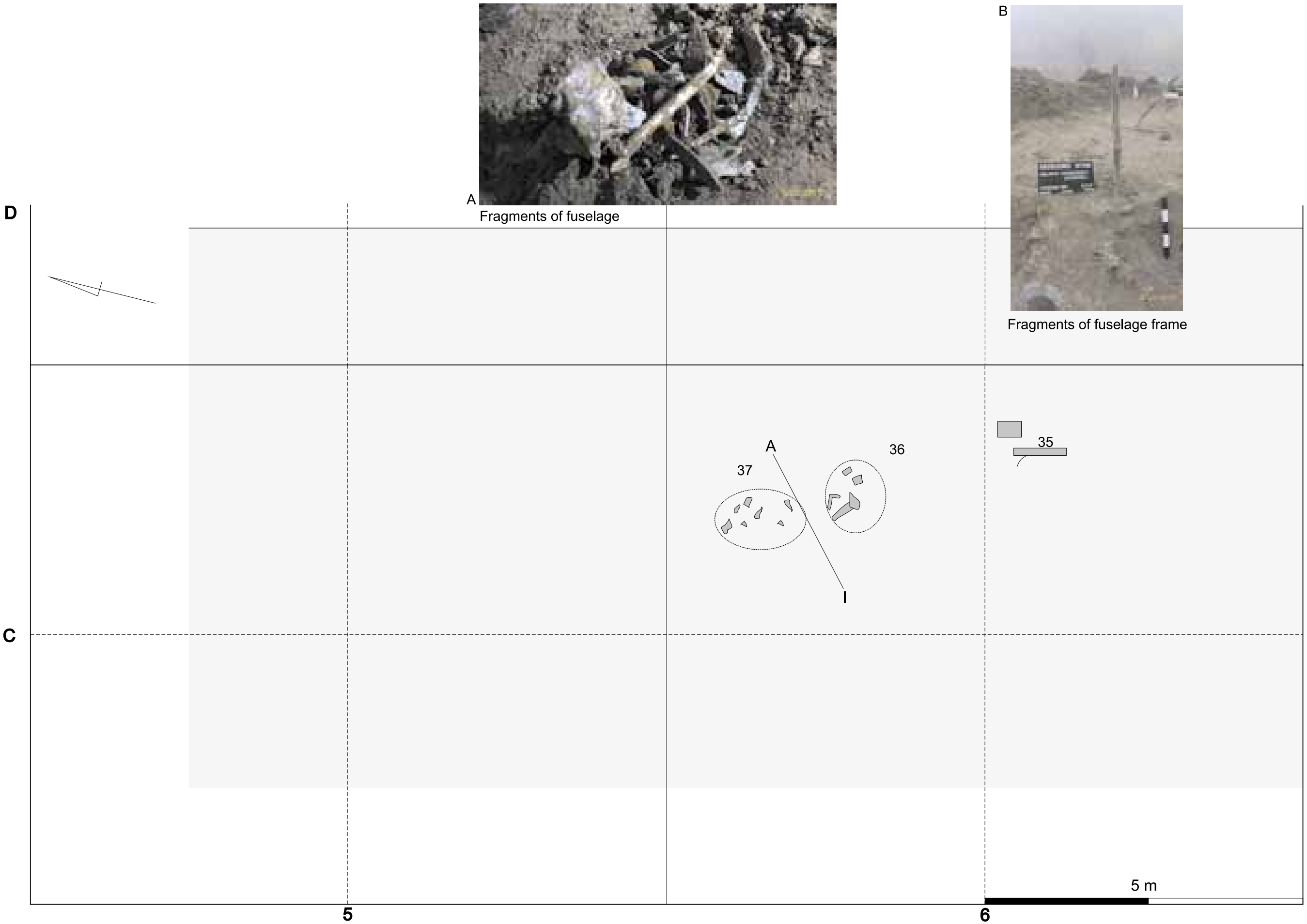

Fig. 9. Krościenko Wyżne, Krosno County, Ju-87D3 plane crash site. Planigraphy of metal objects at a depth of 60–70 cm from the surface and location of georadar profiles (archaeological trench marked in grey)

Fig. 10. Krościenko Wyżne, Krosno County, Ju-87D3 plane crash site. Aircraft fuselage remains at a depth of 300 cm (including various engine equipment)

There was some interference at a depth of more than 2.5–3.0 m. Initially it was assumed that this might be caused by anthropogenic liquid substances or water. After carrying out invasive works, it was found that the interference was caused by aviation fuel, coming from both wing tanks, as well as from the overflow tank located on the inner wing.

The aircraft's cabin part was located starting at a depth of approximately 2.3 m. This was poorly observable in the geowave survey due to the accumulation of large amounts of tiny elements within a small area. As a result of forces acting on the plane when it hit the ground, the cabin part was "flattened". Considering its original length, i.e. nearly 3 m (measured from the point behind the rear gunner's cabin to the pilot's cockpit), it was reduced to a block about 1.5 m in diameter and less than 0.8 m thick. The last large elements of the plane discovered during the excavation included the hub of a three-blade propeller,

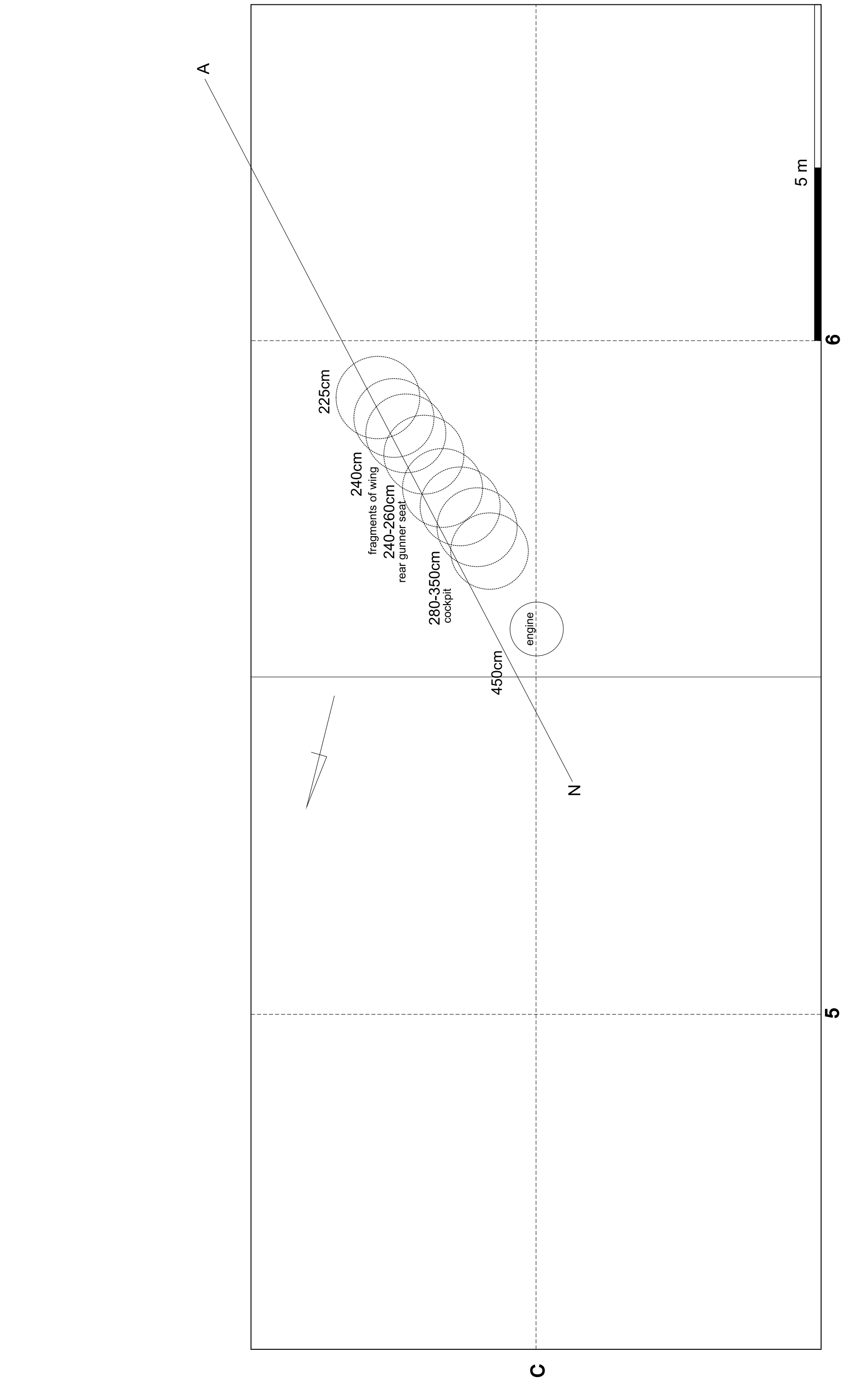

Fig. 11. Krościenko Wyżne, Krosno County, Ju-87D3 plane crash site. Schematic drawing showing the aircraft wreck at various depths, taking into account its larger and more characteristic elements

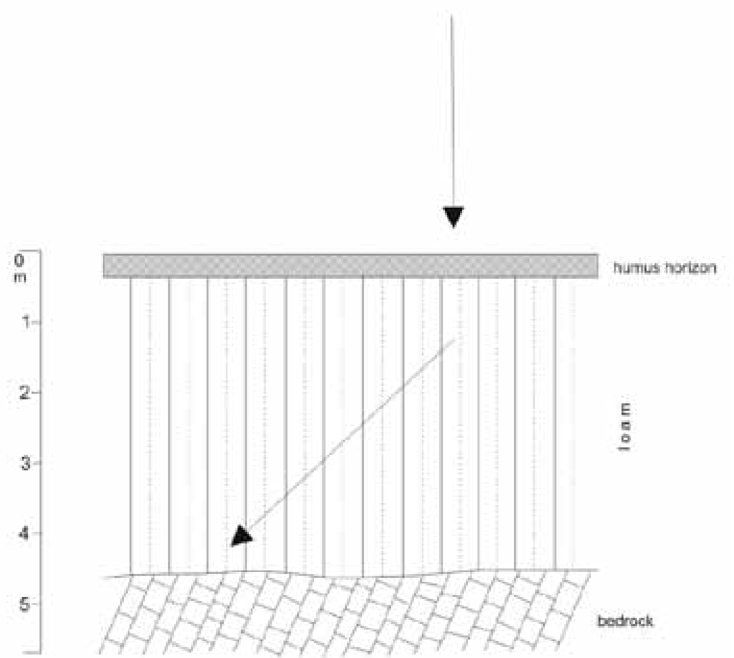

Fig. 12. Krościenko Wyżne, Krosno County, Ju-87D3 plane crash site. Reconstruction of aircraft flight path and fuselage displacement after impact with the ground

a large piece of the concrete practice bomb, and a Jumo 211J type aircraft engine. The engine was found on its side, at a depth of about 3–4.5 m from the surface (Fig. 10).

It could not penetrate deeper into the ground due to the bedrock consisting of layers of sandstone. As we can see from the preserved arrangement of the remains, the plane struck the ground almost vertically (Pasterkiewicz *et al.*, 2015). Torque force and ground resistance caused the engine, as it moved into the ground to a depth of about 4.5 m, to change its angle from 90 degrees to about 60 degrees while simultaneously deviating to the right by about 30 degrees (Fig. 11, 12).

Conclusions

1. The use of the GPR method enabled establishing the location in the ground of the JU-87D3 plane wreck, which had crashed in the final stages of World War II in Krościenko Wyżne.

2. Invasive excavations confirmed the presence of individual parts of the crashed airplane at the designated spots of the georadar anomalies.
3. GPR is an effective device for precisely locating objects made of metal (including duralumin, steel) and rubber.
4. The use of a GPR allowed the researchers to plan the excavation carefully and limit the work to the zone indicated by the georadar.

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Joanna Pyzel*

Field Survey Versus Excavation – Compatibility of Results Illustrated by the Example of Selected Sites from the A1 Motorway in the Włocławek Province, Poland

ABSTRACT

Pyzel J. 2017. Field Survey Versus Excavation – Compatibility of Results Illustrated by the Example of Selected Sites from the A1 Motorway in the Włocławek Province, Poland. *Analecta Archaeologica Ressoviensia* 12, 285–298

This paper reconsiders the compatibility of results from survey and subsequent excavations as their verification: the issues of detection of sites and the reliability of estimations of their size as well as their dating including the relative visibility of separate chronological units based on surface material are discussed here. This is presented through the example of archaeological investigations conducted due to the construction of the A1 motorway route within the former Włocławek Voivodeship.

Key words: survey; emergency excavations; reliability of survey data; dating of survey sites; Polish Archaeological Record; Kuyavia

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Introduction

Archaeological survey, especially fieldwalking, is the most classic type of non-destructive research. It has for a long time been much more than just a preliminary step to subsequent excavations: it serves as the basis of diverse spatial analysis, especially on the macro-regional scale. Polish archaeology in particular has outstanding research traditions in this field because it can benefit from the unique programme of cataloguing of archaeological sites, called the "Polish Archaeological Record" (AZP – *Archeologiczne Zdjęcie Polski*: see Barford *et al.* 2000). For the purposes of the identification of surface material a special method of "technological dating" has been developed, which allows the assignment of small, stylistic undiagnostic pieces of pottery (Czerniak, Kośko 1980). It is all the more surprising that this has not encouraged a serious debate on the reliability and validity of such research, comparable to the discussion on

* Institute of Archaeology, University of Gdańsk, Bielańska 5 Street, 80-851 Gdańsk, Poland; joanna.pyzel@univ.gda.pl

the relative archaeological visibility inspired by the systematic surface survey in, for example, Greece (Rutter 1983) or Bohemia (Neustupný 1993). The results obtained there demonstrate that survey results do not necessarily simply mirror the underground structures and depend much more on diverse factors such as the character of the settlement (depth of features, their density), different depositional and post-depositional transformations, the distinctiveness of surface material, etc. (Neustupný 1998: 53). In this paper fieldwalking data will be confronted with the results of excavations that took place shortly afterwards. The study area is the A1 motorway route within the former Włocławek Voivodeship between Ciechocinek and Lubień Kujawski. It is 73.5 km long and stretches through the eastern edge of the Kuyavian Plateau (mezoregions of the Inowrocław Plateau and the Kuyavian Lake District: Kondracki 2001), close to its boundary with the Vistula River valley (Toruń and Płock Valley mezoregions). This region consists mainly of agriculturally utilised landscapes of high quality soils developed on heavy moraine gleys.

The whole region was surveyed in the 80s as a part of the AZP Programme. Along the future motorway route altogether 21 sites were registered. The new survey took place as the first step of emergency excavations preceding the motorway construction: in autumn 1999 fieldwalking and in spring 2000 additionally small test excavations on 38 selected sites. The survey was conducted by a group of archaeologists connected with different scientific centres in Poznań. The same team analysed and interpreted the data, using the AZP description system (Chłodnicki *et al.* 2000). The survey was conducted in a 300 m wide strip. Its goal was to discover the endangered sites, visible on the surface mainly as scatters of artefacts. In most cases their range delineated boundaries of a site. The absolute number of artefacts from different categories (pottery, lithics, others) divided into chronological units was recorded without further information on the density of the artefacts, different concentrations within a site, etc.

Altogether 177 archaeological sites have been registered (including nine estimated only as regards an optimal location, where observation was not possible). The eightfold increase in site number compared to the AZP results is striking.

Ninety of these sites were selected for subsequent emergency excavations and some of them were combined so that finally it was possible to dig 86 sites. The excavations took place over many seasons between

2001 and 2010, especially intensively at the end of this period. They were conducted by diverse institutions and companies from different parts of Poland. All the results have been analysed so far and their description as well as detailed excavation reports are stored at the National Heritage Board (Narodowy Instytut Dziedzictwa; see also the site catalogue published by Wiśniewski, Kotlewski 2013). Some of these reports have been published as well (see the description of selected sites below).

Because the survey was conducted during only one season by a single team and following emergency excavations albeit by many different organisations but still in a relatively short time afterwards, they provide a unique opportunity to compare the results obtained. The focus of this analysis will be placed on the detection of a site as a whole and the reliability of estimations of its size. Further the dating of surface material will be confronted with excavation results and in this way the relative visibility of separate chronological units will be discussed. For selected sites more detailed reflection will be presented on the relationship between unearthed settlement traces and surface material.

Site detection

The existence of six of altogether 86 sites (7%) selected for the emergency excavations could not be confirmed. One of them was known from the previous AZP research as well. These sites revealed a slightly lower number of surface artefacts (their mean was 30 pottery pieces per site) than the average (74 pieces per site for all sites). In the case of the sites verified negatively the artefacts found were dated not only to the generally most abundant Middle Ages and Modern Times but also prehistoric pottery was found on each of them.

Estimated site size

For each of the surveyed sites not only their whole area but also the size of the space endangered by the motorway construction was estimated. The latter value could be verified thanks to emergency excavations. Altogether 114% of the preliminarily estimated area was unearthed. In seven cases the excavated space equated exactly to the assumed one, for 28 sites it was smaller and for 48, larger. Most of the sites (35) fall in the range of 50 to 150% of the estimated area (the total

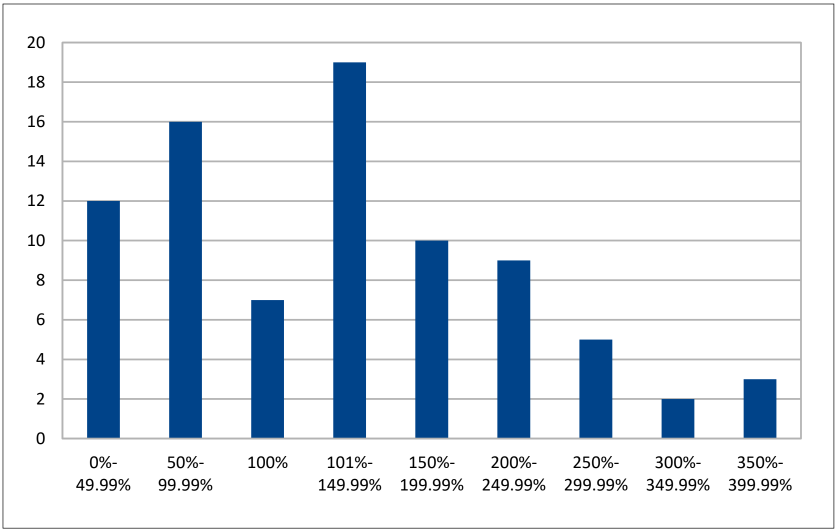

Fig. 1. Percentage of a site´s size estimated in the survey to an excavated one

congruency excluded). The proportion of the excavated to estimated space is demonstrated in fig. 1.

Dating

Altogether it was possible to analyse 75 sites in this paper as they yielded both surface as well as excavated finds. Sites estimated only on the basis of their potential good location (where observation was not possible), interestingly all verified positively, as well as the ones not confirmed by excavations were excluded from this evaluation.

The chronology of sites was estimated mainly on the basis of pottery – altogether 5576 pieces were obtained in the survey. Additionally 86 flint artefacts were found which were classified more generally to the "Stone Age". Chronological estimations from survey and excavations were of different accuracy not only due to the incomparable quantity and quality of finds but also to the use of diverse taxonomic systems. For the purpose of this paper they have been simplified to 12 entities: Stone Age, Linear Pottery Culture (LBK), post-LBK (including the Stroke Band Pottery Culture and the Brześć Kujawski Group/Culture, further BKC), Funnel Beaker Culture (TRB), Globular Amphorae Culture (GAC), Subneolithic, Late Neolithic/Early Bronze Age (INB),

Table 1. Number of pottery pieces found on sites (survey only – verified negatively) divided into chronological entities

	Pottery pcs.	sites	Pcs. survey only	Sites survey only	Pcs. per site	Pcs. per site survey only
LBK	50	15	1	1	3.33	1
Post-LBK	28	6	3	3	4.67	1
TRB	308	29	19	10	10.62	1.9
GAC	58	12	10	4	4.83	2.5
INB	92	20	63	12	4.6	5.25
LC	423	47	57	14	9	4.07
PC	860	40	101	16	21.5	6.31
EMA	768	46	117	21	16.7	5.57
LMA	1509	54	569	34	27.94	17.53
MT	1480	63	142	14	23.49	10.14
	5576	75	1109		74.35	

Lusatian Culture (LC), Przeworsk Culture (PC), Early Middle Ages (EMA), Late Middle Ages (LMA), and Modern Times (MT).

The quantity of diagnostic artefacts for separate categories was not equal: most numerous were the late finds: LMA, MT as well as EMA and PC. The lowest number of sherds per site could be dated to the Neolithic cultures, especially the LBK. Among the Neolithic pottery the TRB was the most abundant (Table 1).

Sites which were verified negatively yielded altogether slightly fewer finds but the proportions between different dating entities were similar. Most numerous was the pottery connected with the LMA and MT, which may be the result of field manuring (Table 1).

Most of the sites on the motorway route have a palimpsest character – they revealed traces of more than one phase of occupation (represented by the above mentioned chronological entities). On average 4.65 such phases were registered per site known from survey and 4.57 from excavations. These are very similar values but specific chronological estimations from these two research types differ strongly. Only on two sites do these values correspond to 100 percent. In nine cases the dating of excavation finds bore no resemblance at all to the survey estimations. On average the datings from both research types correspond in 42.71% of cases, but such matches differ substantially between

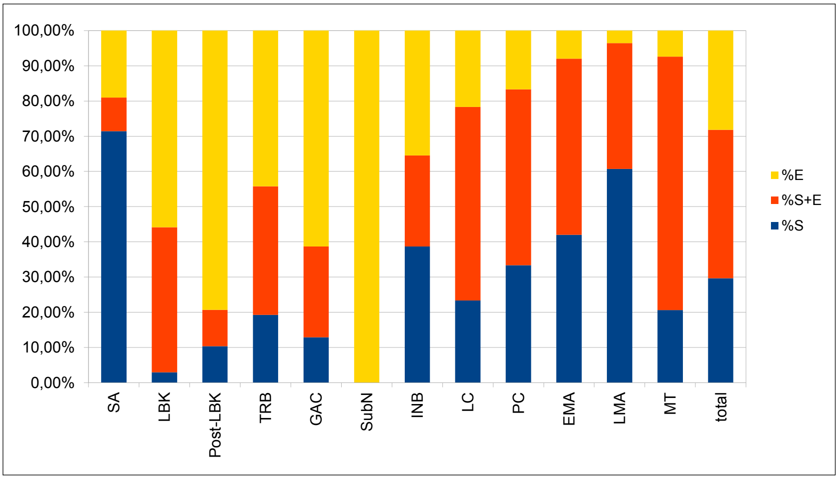

Fig. 2. Percentage of sites known only from survey (S), only from excavations (E) and from both research types (S+E) for separate chronological entities

separate chronological entities as highlighted in fig. 2, presenting the percentage of sites known only from survey (verified negatively), not discovered before the excavations and the ones confirmed by both research types. The "Stone Age" category must be treated with caution as it was estimated on the basis of survey flint finds only and afterwards this dating was mainly provided with details during excavations.

The rate of estimation failure is quite low for the Neolithic cultures – especially for the LBK, due to its highly distinctive pottery. The relatively high percentage of sites mistakenly dated to the TRB is astonishing, while the high (highest) proportion of sites erroneously estimated to the LMA can be explained by field manuring as well as some mistakes in the precise dating for example between the LMA and MT.

It is worth taking a closer look at the ratio of occupation phases discovered only due to excavations. In this category we find all "Subneolithic" estimations, which is quite easy to explain as this pottery occurs only as a small admixture in features connected with other Neolithic cultures and thus it is very difficult to detect in the survey. Moreover for every other chronological entity there is a certain ratio of sites undiscovered in the survey. It is quite low for later periods, especially the Middle Ages and MT, where it does not exceed 10%. The older the culture, the more numerous are sites not detected during the survey. The highest ratio of such sites distinguishes the post-LBK cultures.

Survey vs. excavation: examples of the LBK and post-LBK cultures

The A1 motorway route stretches through a region intensively occupied by the LBK communities and some of the most interesting and important discoveries made during this linear project are connected with this culture (cf. Muzolf *et al.* 2012, Pyzel 2013). Altogether 34 sites were dated to the LBK. Only one survey site, whose dating was based on a single LBK sherd, was verified negatively. In the case of 14 other sites the survey finds estimations were able to be confirmed by excavations. In all the cases we are dealing with occupational traces of various sizes but always with different LBK features discovered. During the survey it was possible to detect all the largest villages: Smólsk 2/10 (Muzolf *et al.* 2012), Kruszyn 10 (Płaza 2016), Wieniec 10 (Maciszewski 2010a) and Ludwinowo 7 (Pyzel 2013). Interestingly the number of artefacts found on their surface (on average four pottery pieces per site) is not significantly higher than on smaller sites.

During emergency excavations 19 new LBK sites were discovered. Among them are five sites with scarce LBK pottery recorded only in secondary contexts. In all other cases we are dealing with traces of real LBK settlements of various sizes: from single pits (one site), isolated hamlets/clusters of pits (five sites) to villages consisting of some quite loosely arranged households (eight sites).

After the field survey altogether six sites had been dated to the post-LBK cultures. Three of them were verified negatively during the excavations. Two of them turned out to be LBK villages, one with a feature without finds but radiocarbon-dated to the first half of the 5th millennium (Maciszewski 2010b). The third site was a large LC settlement.

It was possible to verify three sites positively. Two of them are quite large, stable, long-lasting settlements of the BKC of a relatively loose internal built-up structure (Bodzia 1 and Ludwinowo 3: see Czerniak, Pyzel 2016, 101, fig. 4). The third site is a large LBK village at Ludwinowo 7, which was occasionally visited by the post-LBK communities who, however, did not construct any permanent structures there (Czerniak, Pyzel 2016).

Astonishingly as many as 23 post-LBK sites had not been detected until the excavations. Among them are small pit clusters of the Stroke

Band Pottery Culture, as well as large and stable BKC villages at Dubielewo 8 (Siewiaryn, Mikulski 2016) and Kruszynek 6 (Czerniak, Pyzel 2016: 101, fig. 4).

Presentation of selected sites

Five sites have already been published. These are Kruszyn 10, excavated by the Fundacja Badań Archeologicznych im. Prof. Konrada Jażdżewskiego and the Muzeum Archeologiczne i Etnograficzne w Łodzi (Siciński *et al.* 2016) and four sites dug by Fundacja Uniwersytetu Adama Mickiewicza w Poznaniu: Bodzia 6, Dubielewo 8, Śliwkowo 4 and Witoldowo 1 (Kaczor, Żółkiewski 2013a, 2016a). For these sites it is possible to compare the survey estimations with results of excavations more thoroughly, taking into account among other things the number of features and the quantity of pottery of each settlement phase (Table 2).

At Kruszyn 10 the total excavated area was 27590 sq m and altogether 1515 features have been registered there. Most of them are undated, the dated ones belong mainly to two major settlement phases: the first one is dated to the LBK (more than 100 features) and the second to the PC (84 features). The main concentration of these settlement traces was recorded in the southern part of the site. Scarce pottery of this age could be found on the surface as well.

Furthermore single features of the post-LBK, TRB, the Mierzanowice Culture, the LC (with Pomeranian Culture) were found. None of these phases was represented in the pottery from the survey; sherds dating to the EMA and MT were registered instead (Siciński *et al.* 2016).

At Dubielewo 8 the total unearthed area was 25245 sq m. In the northern part of the site traces of a single LBK household were recorded, as well as a large BKC village stretching over an 80 m wide strip. Interestingly none of these cultures were recorded in the survey. Seven flint artefacts found during the fieldwalking had been assigned to the TRB, but its occupation could not be confirmed by the excavations.

After a very sparse occupation episode in the Bronze and Early Iron Ages (the Trzciniec and Lusatian Cultures) in the Late Pre-Roman Period (PC) a 5000 sq m large, stable settlement was established in the northern part of the excavation area. In the survey material the pottery of both phases – PC as well as LC – was represented (Kaczor, Żółkiewski 2016b).

Table 2. Number of pottery pieces from survey and excavations and number of features dated to separate chronological entities from selected sites

	LBK	Post-LBK	TRB	GAC	INB	LC	PC	EMA	LMA	MT
Kruszyn 10										
survey, pottery pcs.	3	0	0	0	0	0	4	3	0	2
excavation, features	ca. 100	2	2	0	1	17	84	0	0	0
excavation, pottery pcs.	ca. 7000	80	ca. 200	0	1 vessel	519	2136	0	0	0
Bodzia 6										
survey, pottery pcs.	4	0	0	5	0	2	7	172	5	17
excavation, features	14	90	1	0	3	4	0	136	0	3
excavation, pottery pcs.	786	8677	49	0	76	601	0	8267	0	132
Dubielewo 8										
survey, pottery pcs.	0	0	0	0	0	4	20	0	1	0
excavation, features	18	156	0	0	2	30	41	2	0	0
excavation, pottery pcs.	39	4558	0	0	45	1193	6104	128	0	0
Śliwkowo 4										
survey, pottery pcs.	0	0	2	0	0	1	0	0	0	0
excavation, features	0	1	5	1	0	0	0	1	1	30
excavation, pottery pcs.	0	3	13	1	0	0	0	1	24	0
Witoldowo 1										
survey, pottery pcs.	0	0	0	0	0	0	0	4	5	2
excavation, features	1	35	25	71	0	0	0	0	2	11
excavation, pottery pcs.	17	2371	325	1738	66	0	0	0	24	114

At Bodzia 6 altogether 12 000 sq m in the eastern part of the site were excavated. Scarce traces of the LBK occupation were recorded in the north-eastern section of the trench, which had probably belonged to a single household. Thirteen features scattered over the central part of the area could be dated to the Stroke Band Pottery Culture and 71 to the BKC (both post-LBK). The latter represent traces of a loosely arranged village. Single features belonged to the TRB (one feature), the Trzciniec Culture (EBA – three features) and LC (four features). The most intensive traces of occupation are connected with the EMA (136 features spreading out over the whole excavated area). Most of the pottery from the survey dates to this period as well. There are also some pieces of the LBK and the LC in this assemblage, as well as some finds of the GAC, PC, LMA and MT not confirmed in the excavations (Kaczor, Żółkiewski 2013b).

At Witoldowo 1 the excavated area of 19 300 sq m revealed many Neolithic features. Apart from a single LBK pit, these were traces of BKC (35 features), TRB (25 features) and above all GAC settlements (71 features: Jankowska 2013). During the survey, however, absolutely no prehistoric finds had been obtained but only MA and MT pottery. This can be connected with numerous features of these periods scattered over the whole excavated area (Kaczor, Żółkiewski 2013d).

Śliwkowo 4 is the only one of the sites presented here located on sandy soils. During the emergency excavations solely an area of 2000 sq m was investigated here, which yielded altogether ca. 40 features, mostly without any finds. Singular pits could be dated to the post-LBK, GAC, EMA and LMA. In the southern part of the trench five pits of the TRB, concentrated in a small area of 10 m were discovered as well. This corresponds to the survey finds, as two pottery pieces are dated to the TRB. The other one should have belonged to the LC, but the presence of any occupation traces of this time could not be confirmed during the excavations (Kaczor, Żółkiewski 2013c).

Discussion

The comparison of results obtained in the survey and emergency excavations conducted shortly afterwards (which excludes for example the complete destruction of features caused by tillage) clearly demonstrates that surface finds do not exactly mirror what is really underground. The visibility of certain chronological units is indeed relative and depends to a high degree on the distinctiveness of their material. The example of the Danubian cultures is highly indicative: the likelihood that someone will recognise the LBK pottery with its unique ornaments and organic temper is much higher than for the mainly undecorated post-LBK ceramics with its mineral inclusions very common also in many other periods. The fact that these communities in the later phase (BKC) established vast, stable, multigenerational villages with numerous deep features, comparable to the LBK settlements, does not really help. The character of the settlement certainly influences the detectability – by means of precisely this factor we can explain the total lack of finds dated to the early post-LBK (Stroke Band Pottery

Culture) in the surface material[1]. These communities left very scarce occupational traces in the form of small clusters of pits; in addition their pottery can also easily be mistaken for other prehistoric cultures.

This special character of specific cultures and periods must be taken into account while analysing any survey finds. It seems, however, that apart from some differences, the reliability of chronological estimations, especially for prehistory, is high, although for each culture and period a significant number of sites still remains undetected. It is relevant especially for different economic or demographic estimations based on the survey data.

It seems important to point out that the size of a site does not correspond with the quantity of surface finds. This makes, for example, quite popular implications concerning the settlement hierarchy unreliable.

Taking the above into consideration survey data can still be regarded as a very valuable source of information on settlement, especially in the macro-regional scale.

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[1] See similar conclusions made by E. Neustupný for Eastern Bohemia (Neustupný 1993).

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Piotr Szmyd*

Using Geografic Information System (GIS) Tools to Determine the Settlement Preferences in the Upper Wisłoka Valley and to Demarcate Potential Archeological Sites on the Example of Early Medieval Sites

ABSTRACT

Szmyd P. 2017. Using Geografic Information System (GIS) Tools to Determine the Settlement Preferences in the Upper Wisłoka Valley and to Demarcate Potential Archeological Sites on the Example of Early Medieval Sites. *Analecta Archaeologica Ressoviensia* 12, 299–328

The article's objective is to conduct a diagnosis of early medieval settlement and to determine settlement clusters and preferences. The analysis results enable the preparation of maps depicting potential sites. The basic source for the data used in the analyses consists of information collected since the 1970s within the framework of the nationwide Polish Archaeological Record (PAR) project. The data have been subjected to analyses using Geographic Information System tools, such as QGIS, GRASS GIS or Saga GIS.

Key words: GIS, archaeological national heritage, predictive modelling, archaeology, Upper Wisłoka Valley, QGIS, SAGA, GRASS GIS, settlement archaeology, Geographic Information System, Archaeological Predictive Modelling

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Using Geographic Information Systems (acronym GIS) in archaeology enables a multidimensional analysis of the gathered spatial data, including PAR data. It also allows for acquiring new information through merging data originating from different sources, enabling the formulation of hypotheses and their initial testing. An additional advantage is the possibility of introducing new methods of analysis and visualising archaeological data in a three-dimensional form that had been thus far unachievable. This form of presentation is attractive for the general public, i.e. people who do not have contact with archaeology on a daily basis. The term Geographic Information Systems encompasses various spatial and descriptive data (e.g. PAR data, satellite images, documentation from archaeological research), computer software, such as QGIS or GRASS, the user, e.g. the author of this article. GIS enables bringing together data originating from different sources. It makes use of all digital and

* The Carpathian Troy Open-Air Museum at Trzcinica, Trzcinica 646, 38-207 Przysieki, Poland; pszmyd@poczta.fm

analogue materials, e.g. records from archaeological research or non-invasive surveys, satellite imagery, aerial photographs, data from laser scanning. At the heart of every information system there is a database in which all descriptive data is gathered (Borowski, Zapłata 2013, 104). GIS is not a single computer programme but rather a "spatial toolbox" that contains combinations of a few different programmes and technologies.

The use of GIS in archaeology dates back to the end of the 1970s and the beginning of the 1980s. However, due to technological progress and the popularisation of computers, GIS only became widely used in the 1990s. It is worth adding that a number of programmes for analysing spatial information exist, accessible online on Open Source licences (Borowski, Zapłata 2013, 104).

All of the below presented analyses and activities aim to enable acquiring knowledge and a better understanding of the factors that shaped settlement in the Upper Wisłoka Valley. They provide aid in determining clusters and reading settlement preferences, which ultimately will enable determining the factors that had an influence on the choice of locations for settlement.

The analysed territory consists of 11 PAR areas covering about 427 km^2. These areas are located in strips 108–111 and in columns 70–72. The PAR data used in the analyses conducted below were provided by the Subcarpathian Museum in Krosno (Figs. 1, 2).

In administrative terms, the vast majority of the discussed area is located in the Podkarpackie (Subcarpathian) Voivodship in Jasło County. This terrain is diverse in terms of its geological structure, landform and type of soil. From the south, the area opens with the rolling landscape of the Foothills of Jasło, which to the north border the Jasło and Sanok Valleys and the Gorlice Depression. To the north, the area ends with the Hills over the Warzyce, which constitute part of the Foothills of Strzyżów and with the dominant massif of Liwocz Mountain, part of the Ciężkowickie Foothills (Fig. 3).

Thanks to the Polish Archaeological Record (PAR) project conducted since 1978, the reference databases for studies into prehistoric and medieval settlement have been greatly expanded. The data acquired in the course of surface surveys constitute the main framework for the below-presented analyses. This article also makes use of data from the so-called ASTER Digital Elevation Model (DEM), which maps the surface of the terrain, constituting a basis for the preparation of exposure

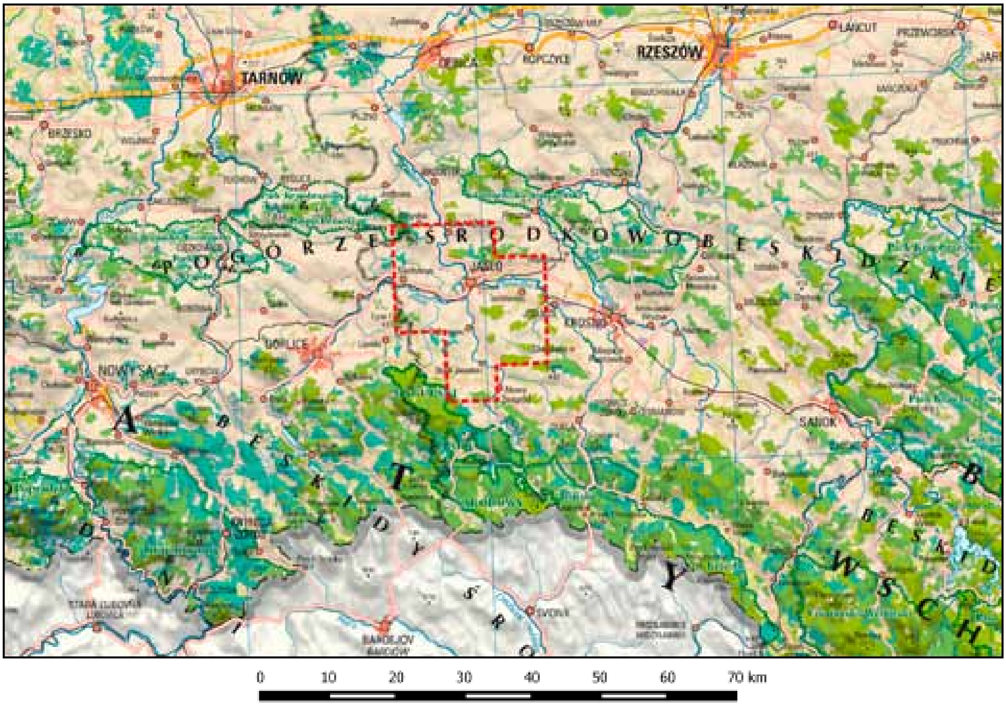

Fig. 1. Research area marked with a red dashed line

maps, slope gradients, as well as height and humidity charts and 3D visualisations. It also enables preparing an analysis of the visibility or of the profile cutting for the selected area.

All of the analyses presented below were made using open-source programmes available online. The core of the analyses was done using the 2.8.2 and 2.12.3 versions of QGIS software and the GRASS programme. My research also involved the application of SAGA GIS software. The ASTER Global Digital Elevation Model (GDEM) was downloaded from the following site: https://asterweb.jpl.nasa.gov/gdem.asp.

In the first stage of my work, I digitalised the PAR map sheets, which were then georeferenced, i.e. they were written into the spatial arrangement. The PAR map sheets were transformed to fit the 1992 National Geodetic Coordinate System (Państwowy Układ Współrzędnych Geodezyjnych). Next, each of the sites registered during the PAR studies was vectorised as polygon layers. Each of them was assigned its own unique features taken from the archaeological site index card. Information

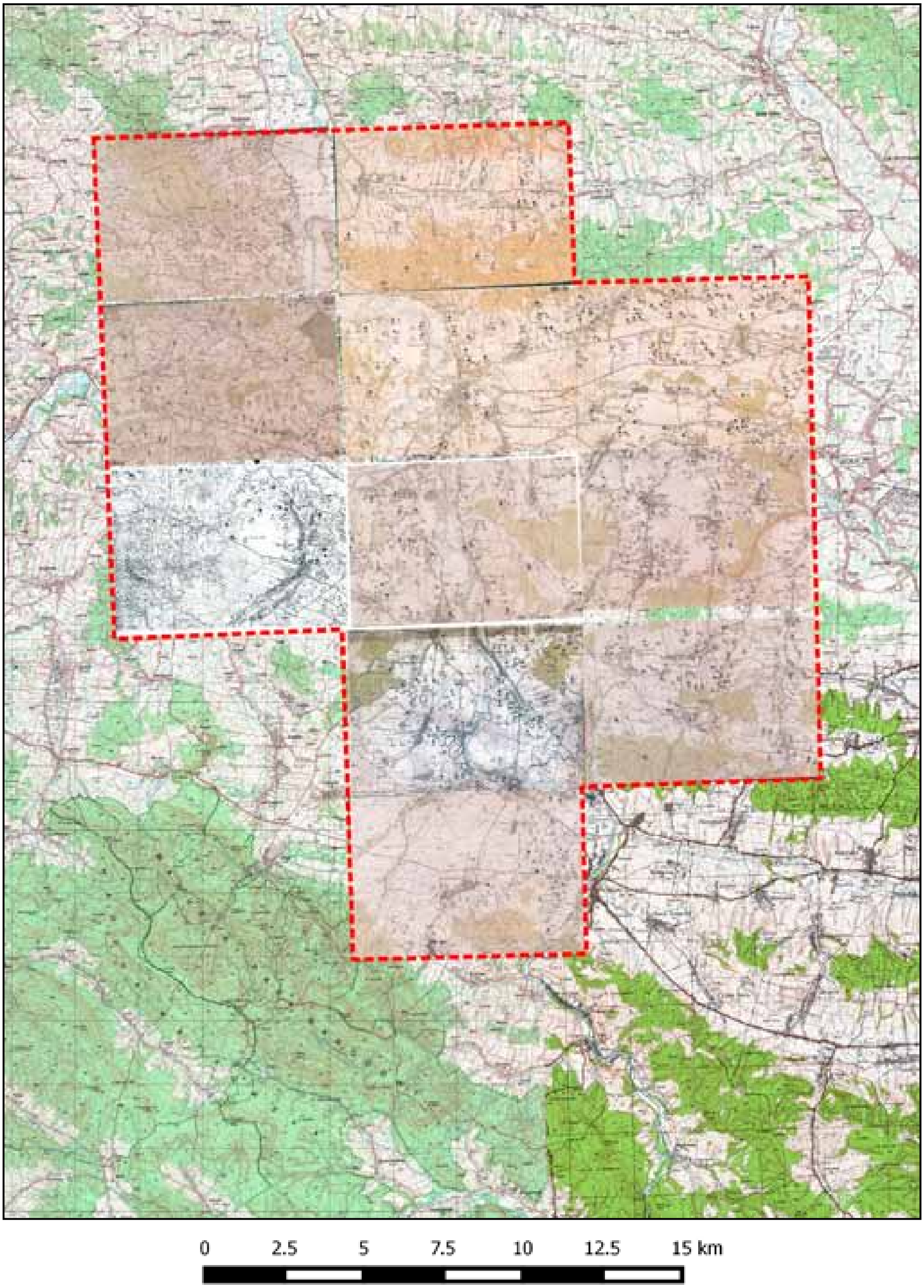

Fig. 2. Research area – close-up. The analysed area includes 11 PAR map sheets

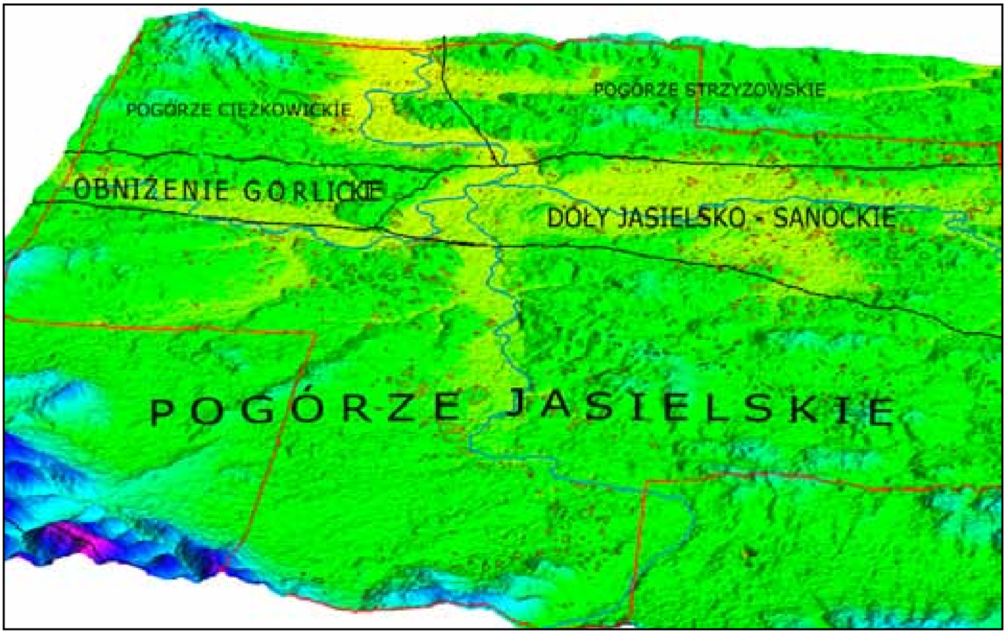

Fig. 3. Plastic representation of the studied area with a division into microregions accordnig J. Kondracki 1980

about the chronology, structure functions, type and quantity of discovered artefacts were found in the QGIS database. The data was subjected to analysis, the result of which will be presented in the form of maps. One advantage of creating such databases is the possibility of reusing them depending on the objective and area of analysis and the scale of the studied surface.

In an area covered by 11 PAR map sheets, on a surface amounting to ca. 427 km^2, 1010 archaeological sites were recorded, out of which 183 were dated to the Early Middle Ages (7th/8th–12th centuries). These latter sites constitute the basis for further multifactorial analyses aiming to determine settlement clusters, identify the nature of early medieval settlement and establish settlement preferences, which would allow for a demarcation of places with conveniently located archaeological sites (Fig. 4). From among the 183 sites dated to the Early Middle Ages, settlement points were identified in 79 of them. 63 sites were shown to have traces of settlement. 37 sites were categorised as settlements. The function of a settlement was established based on the amount of

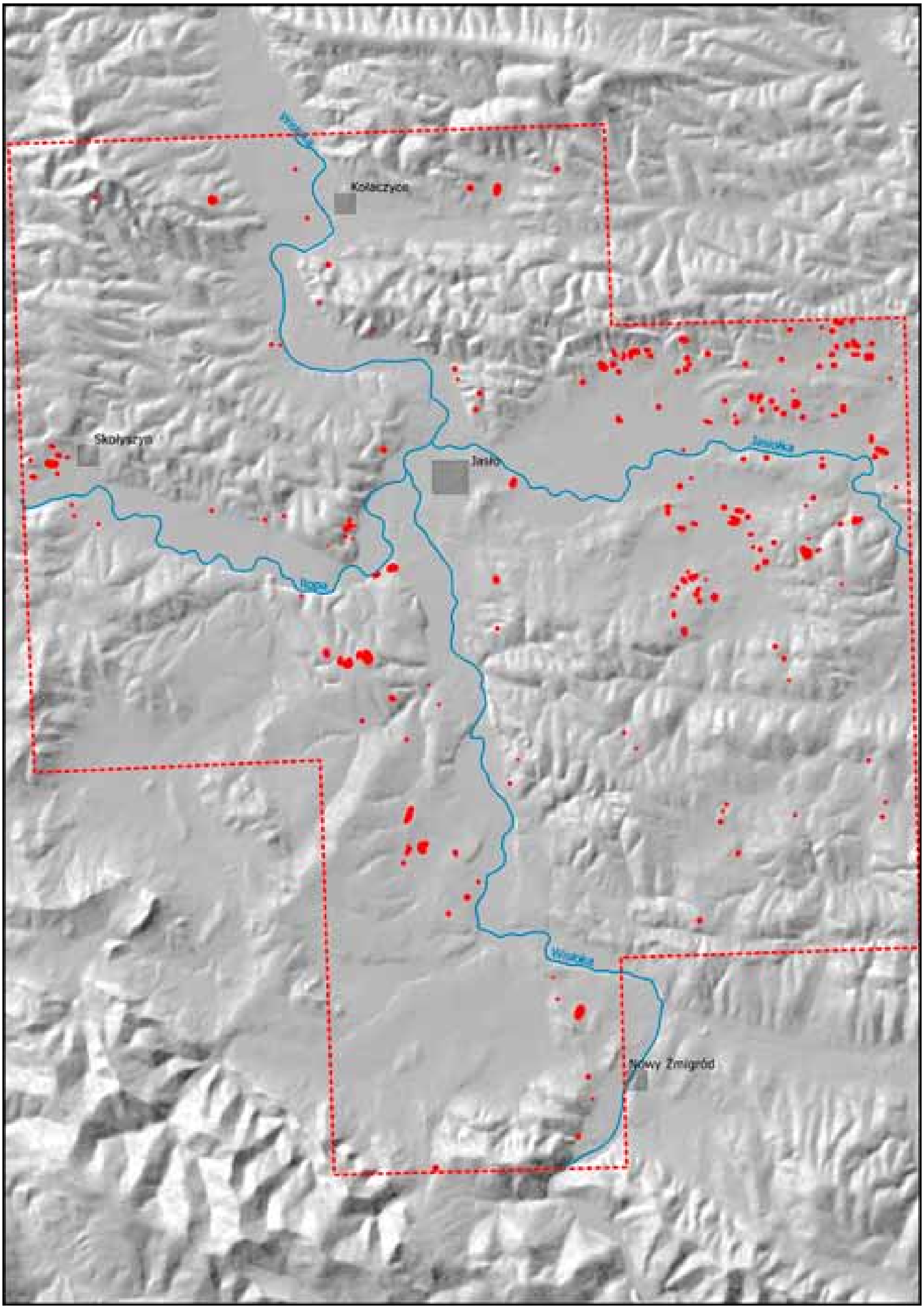

Fig. 4. The locations of archaeological sites dated to the Early Middle Ages. Sites marked with red circles. Based on PAR data

historical material found there. Aside from the above-listed sites, the following elements were located: 3 cemeteries, 1 hillfort in Trzcinica in Jasło County and 4 presumed settlements performing a defensive function.

Marking settlement clusters

Similarly to J. Michalski, the term "settlement cluster" is understood as a concentration of archaeological sites „characterised by internal territorial cohesion and separated from other units of this type by sparsely-settled areas or empty spaces" (Michalski 1989, 294, *translated from polish*).

QGIS software offers a number of tools for the demarcation of settlement clusters. The first of these is a method termed the "Voronoi Diagram" or „Voronoi Polygons" (Fig. 5). This is one of the oldest methods used to demarcate domains of influence. Polygons are defined by boundary points that intersect at equal distances from the applied set of point data. The larger the density of sites, the smaller polygons will be formed.

Another applied method is establishing the amount of sites per km^2 (Fig. 6). The entire studied area was divided into a grid consisting of 1×1 km squares. On this basis, using a palette of colours it is possible to determine the locations with the highest settlement intensity.

An interesting example of the graphic representation of settlement clusters is the so-called thermal map (Fig. 7). This tool uses a buffer to form a halo around a point (site). With the aid of so-called "foci", the map depicts the intensity of a particular phenomenon. The final effect comes in the form of a graphic visualisation of archaeological site concentrations. The intensity of the phenomenon (settlement) increases along with the rise in the colour intensity.

The identification of settlement clusters based on the amount of artefacts found is yet another very important example of an analysis method used to isolate settlement clusters (Fig. 9). The objective of such an analysis is establishing locations at which the highest concentration of moveable archaeological artefacts were discovered, and thus – to indicate the places with the highest intensity of past human activities. Voronoi polygons, determining the amount of sites per km^2, and thermal maps do not take into account the amount of historical material found, only accentuating site concentration, which might lead to the deceptive impression of human activity having been present in places where it was purely incidental. There is some risk that a settlement cluster will

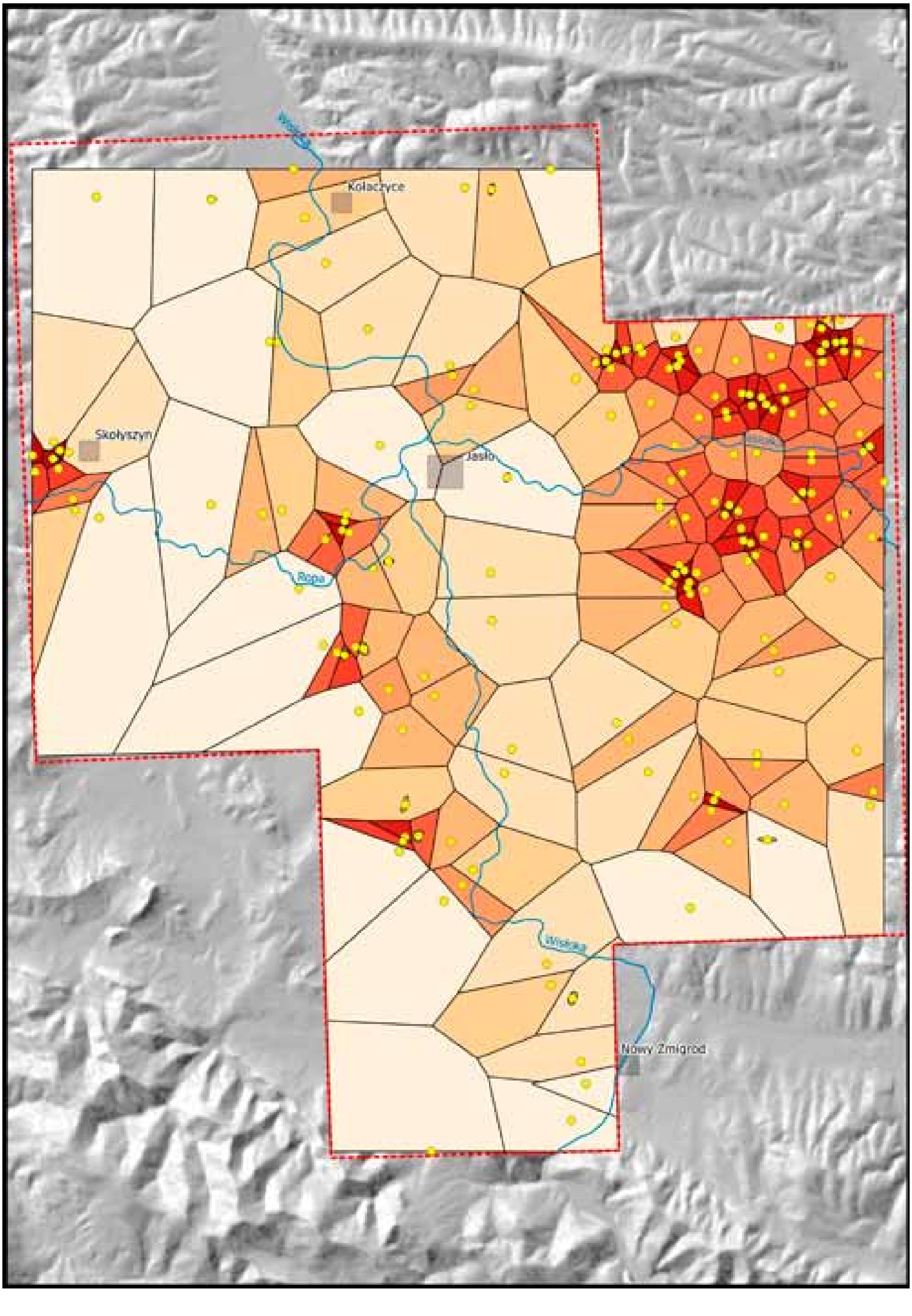

Fig. 5. Representation of Voronoi's Polygons for sites dated to the Early Middle Ages. The higher colour intensity indicates larger site density. Based on PAR data

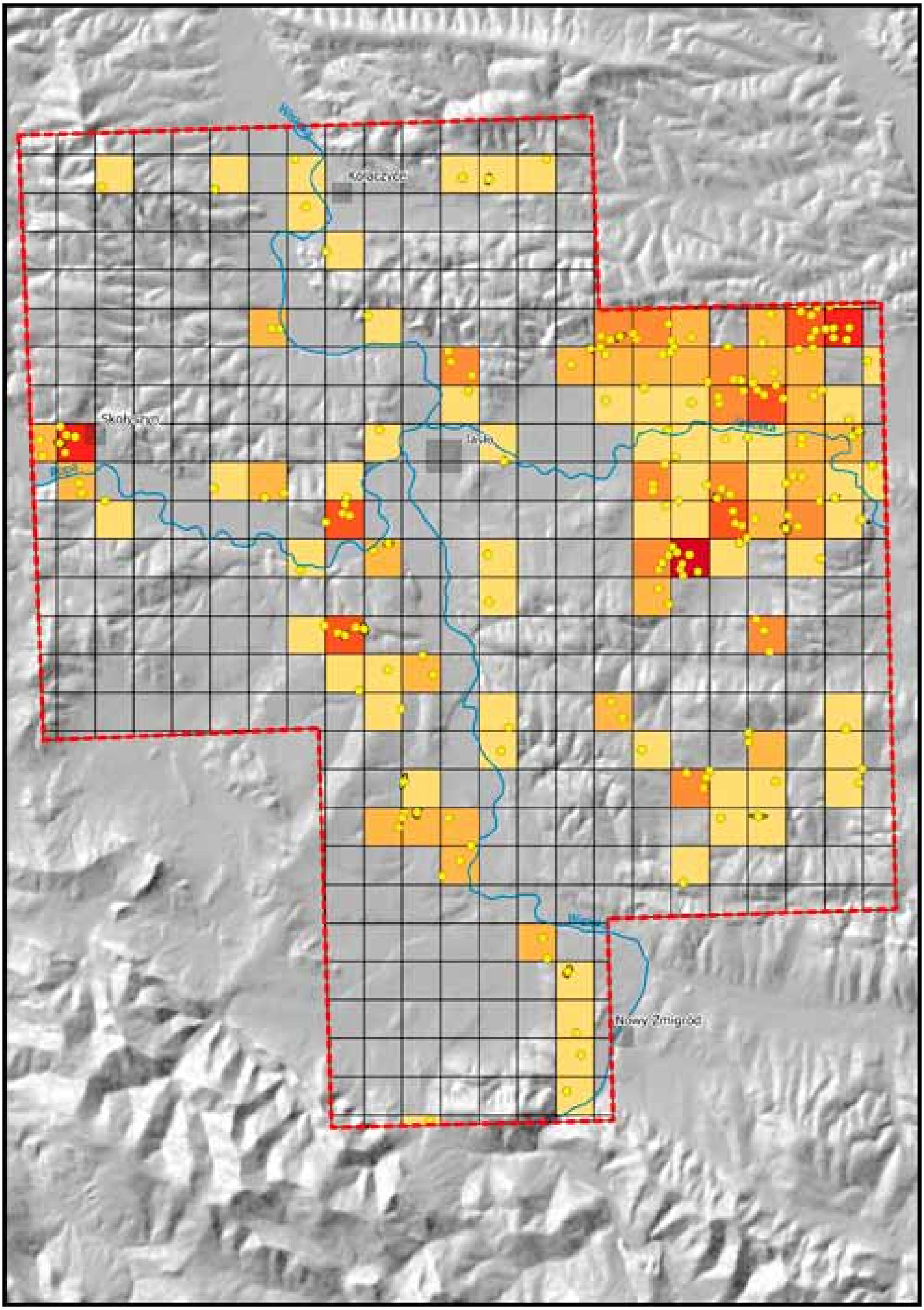

Fig. 6. Establishing the amount of sites per km². The higher colour intensity indicates larger site density. Based on PAR data

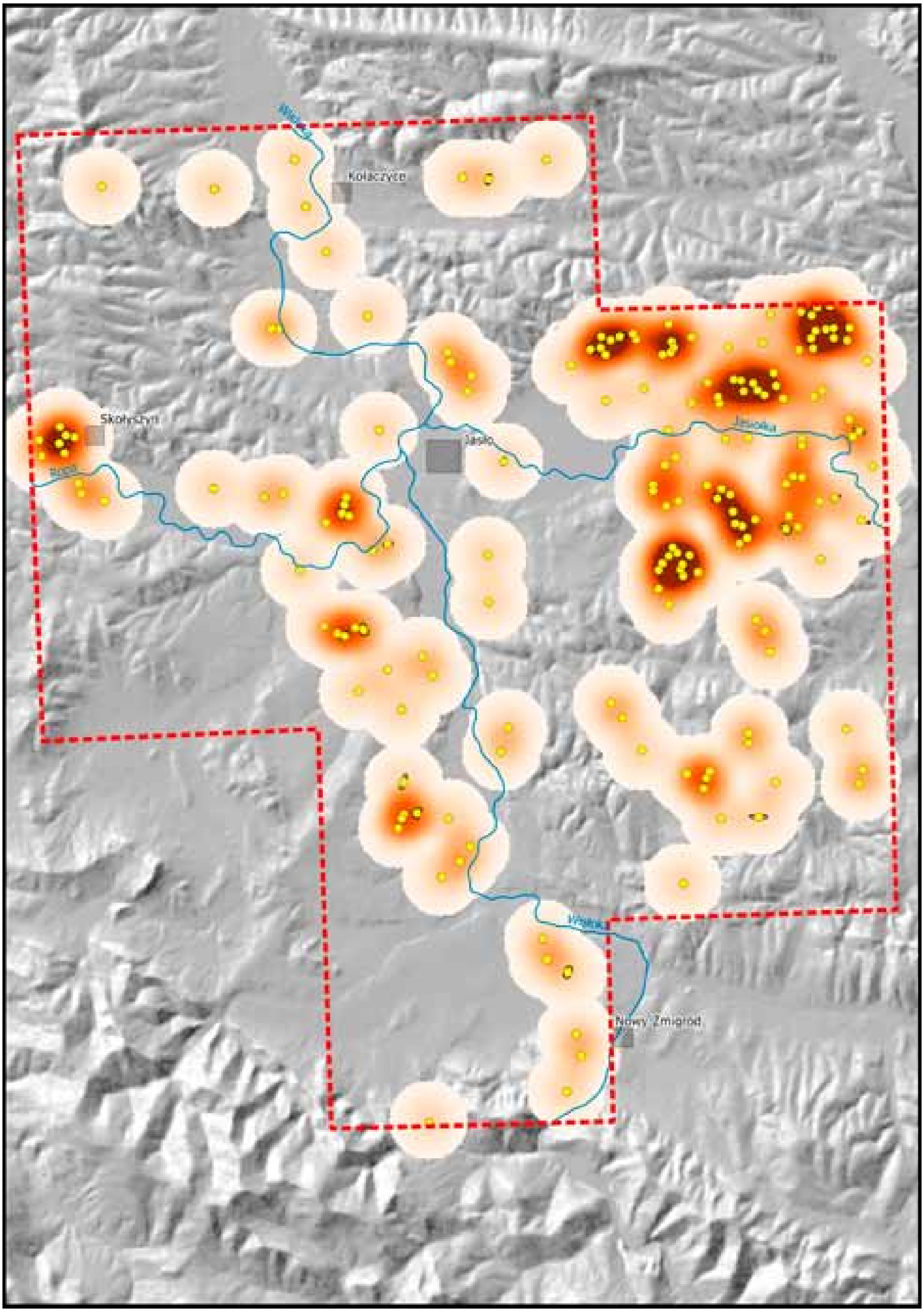

Fig. 7. Thermal map presenting settlement clusters for early medieval sites in the Upper Wisłoka Valley. The higher colour intensity indicates larger site density. Based on PAR data

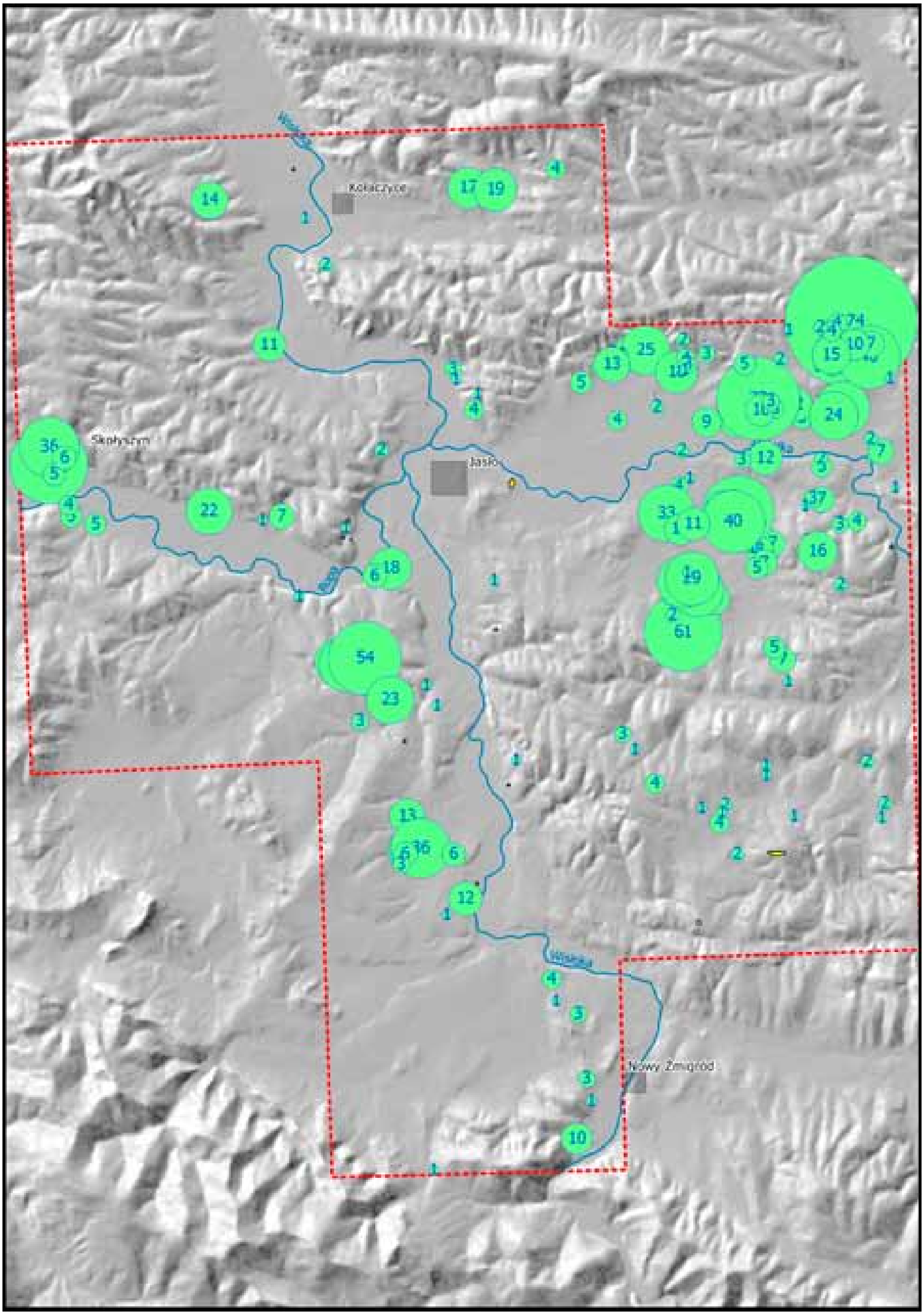

Fig. 8. The analysed area in the Upper Wisłoka Valley. The map depicts the amount of archaeological found in the area (numbers marked in blue). The size of the circle is directly proportional to the amount of discovered material. Based on PAR data

be incorrectly assigned to a spot despite finding minimal amounts of archaeological material. The Łajsce and Łubienka region might serve as such an example. An analysis of the thermal map (Fig. 8) indicates more intense human activity as compared to the map presenting the amount of archaeological material found in the area.

Ultimately, it has been possible to distinguish a number of settlement clusters, temporarily named after neighbouring villages:
1) the „Skołyszyn" cluster – 8 sites, 112 potsherds; 2) the „Trzcinica" cluster; 3) the „Osobnica" cluster – 5 sites, 128 potsherds; 4) the „Wola Dębowiecka" cluster – 4 sites, 50 potsherds; 5) the „Warzyce" cluster – 14 sites, 97 potsherds; 6) the „Szebnie" cluster – 11 sites, 120 potsherds; 7) the „Niepla" cluster – 13 sites, 289 potsherds; 8) the „Tarnowiec" cluster – 10 sites, 130 potsherds; 9) the „Umieszcz" cluster – 11 sites, 122 potsherds.

An analysis of the discussed clusters shows a tendency towards the arrangement of settlements along the Wisłoka River Valley and its tributaries – Ropa and Jasiołka. An exceptionally high concentration of settlements can be observed on the southern slopes of the Hills over Warzyce that dip down towards the Jasiołka and Sanok Depressions. Rich traces of settlement can also be found in the valley of the Czarny Potok – the left-bank tributary of the Jasiołka stream, where numerous early medieval sites have been located near the villages of Tarnowiec and Umieszcz. It is worth nothing the fact that the cone-shaped gord in Brzezówka is situated at a short distance from the discussed area.

In order to designate places with features conducive to settlement, we must identify their character and determine the settlement preferences in the Early Middle Ages.

A wide range of factors influences the choice of a location for establishing a settlement or some other form of human activity. The most important such factors include the landform, water relations, climate, type of soil, altitude above sea level, insolation. Decisive factors influencing the site selected for an open settlement are different to those that had an impact on the location of a place of cult or defensive settlement. People choosing a place to live during a more dangerous period in history follow different criteria than during times of peace. In the former case, the defensiveness of a place comes to the foreground, including the steepness of the slopes and possibility of constructing fortifications with the least amount of effort. The actions undertaken are limited by the encountered environmental conditions, which are not identical in various surrounding landscape. Many different limitations can be listed. In general, human beings and livestock must have access to a steady source of water. Agricultural societies cannot function on very steep slopes or without fertile lands. They must also have enough space for residential buildings and outhouses.

Hunter-gatherer communities will be guided by different environmental factors than those relevant to societies that have developed agricultural activities and livestock breeding. An agricultural economy is the most demanding and the most dependent on natural environmental conditions (Tunia 2004, 330). The method of farming given terrain depends on many constitutive environmental factors, which limit the usefulness of the land. Slopes appropriate for agricultural purposes must be at an angle of between 0 to 12 degrees (Pullen *et al.* 2003, 31), but at an angle of over 6^{O} erosion processes increase (Reniger 1954, 63; 1954a, 42; Starkel 1954, 202; Tunia 2004, 333). Horse ploughing can be applied at an angle of up to 30^{O} (Starkel 1954, 202; Tunia 2004, 333). Cultivation fields should have the best soil possible and a quite small slope angle. They should also have the appropriate level of insolation and not be covered too long by snow. They should also have the right humidity. If it is too low, the plants will dry up; on the other hand, if it is too high they will rot.

Knowing the cultural, economic and political conditions is important in any attempt at identifying settlement networks and can significantly aid in designating places with archaeological sites.

The example of the Ammassalik people, who live on the eastern coast of Greenland, is an ideal illustration of the lifestyle and economy of hunter-gatherer groups. This community living in the subarctic climate returns to its large patriarchal homes in September in order to spend the winter. During this period, the hunters go out to hunting in dog sleds. Once the summer comes, i.e. at the beginning of June, the families abandon their shared homes and scatter across the area for three months to search for food. The families travel following game animals and building temporary camps. This is a period of intensive gathering of wild plants (Gessain 1978, 16).

Changes in the settlement patterns may occur within a single generation or cultural unit. Such a transformation might result from the appearance of a military threat or the introduction of technological innovations. The Gava culture, inhabiting the eastern part of the

Kłodzko Valley in the Bronze Age, can serve as such an example. Their economy was based on livestock breeding and the cultivation of plants. The appearance of nomads and their aggressive politics forced the Gava to leave the territory they had previously occupied and to build fortified refugee settlements in highlands and mountainous areas (Chochorowski 1989, 536–542; 2014, 9–12). Technological innovations might be another factor influencing changes in settlement preferences. According to L. Starkel, the introduction of iron tools enabled cultivating heavier soil types, which up until that point had been inaccessible for communities during Roman influences in the area (Starkel 2001, 54).

Three factors have been selected for the identification of settlement preferences: the direction of the exposure, the slope gradient and the distance from the main rivers – Wisłoka, Jasiołka and Ropa. These allow for establishing the character of the settlement and finding correlations between the site's location and the environmental features.

Assuming that the selection of the place for founding the settlement was not random and that natural environmental conditions have some influence on the choice of the site for building a settlement, it can be speculated that human behaviour in terrain of a similar character should exact similar activities (Tunia 2004, 330). Czopek and Poradyło have rightly noted that „as is apparent from geomorphologists' synthetic determinations, areas that offer prehistoric societies diverse environmental conditions were especially attractive (Łanczont, Wojtanowicz 2005, 44–45), which was generally linked to the possibility of running a multidirectional economy and relative ease in acquiring diverse nourishment" (Czopek, Poradyło 2008, 7).

Within the framework of the Polish Archaeological Record and the conducted surface surveys, a significant amount of historic material was acquired dated to the Early Middle Ages. Nonetheless, the level to which the archaeological sites have been excavated remains unsatisfactory. Only a few of them were studied archaeologically (usually through sondages). In these terms, the gord in Trzcinica and its surroundings have been subjected to the most detailed studies (Gancarski 2006). A few structures with an early medieval chronology have been identified in this vicinity, while a few others have been noted on the surface. Unfortunately, they are being destroyed by agricultural activities. These are sites that have a certain location in space. A few of the sites, like site no. 14 in Nienaszów in Nowy Żmigród commune, site no. 7 Niepli in

Jasło commune, research conducted by Anna Tyniec. In the course of road construction in Warzyce in Warzyce, district of Jaslo site no. 20 structures were uncovered from the early medieval period, identified during surveys. The remaining sites have been dated based on material found on the surface. Due to issues with precise dating, it is impossible to distinguish settlement clusters in particular settlement phases. Ultimately, we have a "flattened" image of settlement in the area. Sites that might come from different phases appear together in the images.

Transferring the archaeological sites from the PAR maps allows for their exact localisation in geographic space within a broader space. The mapping procedure enables recreating the range of the permanently inhabited areas, as well as allowing for the precise designation of empty spaces in terms of settlement and tribal areas. It also enables plotting areas with increased activities into tribal groupings.

The Slavic population in the Early Middle Ages located its settlements according to specific preferences. It chose terrain with low denivelations, not exceeding a height of 350 m. a.s.l., and with fertile soil. These were the conditions met by the Jasło-Sanok Valleys and the Rzeszów-Przemyśl Loesses (Parczewski 1991, 21). Terraces were selected in flood plains along watercourses. In his analysis of settlement in the Kisielina, Uszwica and Raba river basin, Jacek Poleski observed a certain regularity in the oecumene occupied by the Slavs. The sites are located in flood plain terraces along watercourses. Aside from a few exceptions, the isohypse of 350 m. a.s.l. was not exceeded (Parczewski 1991, 21, Fig. 2; Poleski 2006, 46). It seems that the Slavs did not know of the phenomenon of thermal inversion (Kostrakiewicz 1967; Poleski 2006, 47).

Establishing settlement preferences

The objective of the first determinant is establishing the location of the site in relation to the direction of exposure.

The map portraying the exposure and slope gradient was generated using the GRASS GIS programme. The maps were created based on a numeric terrain model showing the earth's surface – ASTER GDEM. Using the r.slope and r.aspect functions, I created a map of the exposure and slope gradient. Next, the maps were reclassified, forming a layer consisting of 4 classes for exposure maps (classes accordant with the points of the compass: north N, south S, east E and west W) and 5 classes for the slope gradient map (class 1 for slope gradient 0–1 degrees, class 2 for slope gradient 1–3 degrees, class 3 for slope gradient 3–7 degrees, class 4 for gradient 7–15 degrees and class 5 for slope gradient 15–30 degrees).

In terms of the direction of exposure, southern slopes were preferred, showing the highest amount of sites – 52 (with 205 ha/site). The amount of sites on W and E slopes is similar, with a slightly more W slopes, 45 (214ha/site) and 50 (220 ha/site) respectively (Fig. 9).

Slopes with a northern tilt were avoided as they were unattractive for medieval settlement due to the lower insolation and longer retention of the snow cover (Tunia 2004, 338; Hess 1965, 155–160).

Northern slopes receive much less insolation than southern ones; however, in the morning and evening, as well as during long summer days they receive a large amount of energy. They are subjected to longer winter periods, and a higher amount of days during which snow and frost is retained. The last ground frost occurs here 10 days later than on the southern slopes (after Tunia 2004, 338; Hess 1965, 155–160). The average difference in temperature between northern and southern slopes amounts to 6–7°. This difference in temperatures leads to a delay in the plant-ripening period by 1–2 weeks (Tunia 2004, 338; Mosołow 1950, 14). Northern slopes are very similar in character to eastern ones. On northern slopes, „along with the increase in the gradient, the angle at which the sun's rays fall decreases, which leads to a lowering in radiation intensity „ (Tunia 2004, 338; Bury-Zaleska 1963, 45).

Southern slopes are the most attractive terrains for plant cultivation. They are the warmest, while the sun's rays are almost perpendicular. Western slopes are similar in character to southern slopes.

Meadows located on southern slopes provide better quality fodder for animals (Hołub-Pacewiczowa 1931, 181; Kubijowicz 1927, 10–12; Kowalska-Lewicka 1980, 107). The snow cover lingers for shorter periods on southern slopes. This fact is relevant in the case of free-grazing animals, which may have to dig through the snow in search for food. In the case of domestic cattle, the maximum limit is 30 cm, while it is 15 cm for sheep (after Tunia 2004, 342; Naumow 1961, 352–358).

The next factor aims to determine the location of the site in relation to the slope gradient. The conducted analyses indicate a preference for slopes with a gradient of 1–3°. 42 such sites were registered in an area covering a surface of 7,685.8 ha (18% of the analysed surface).

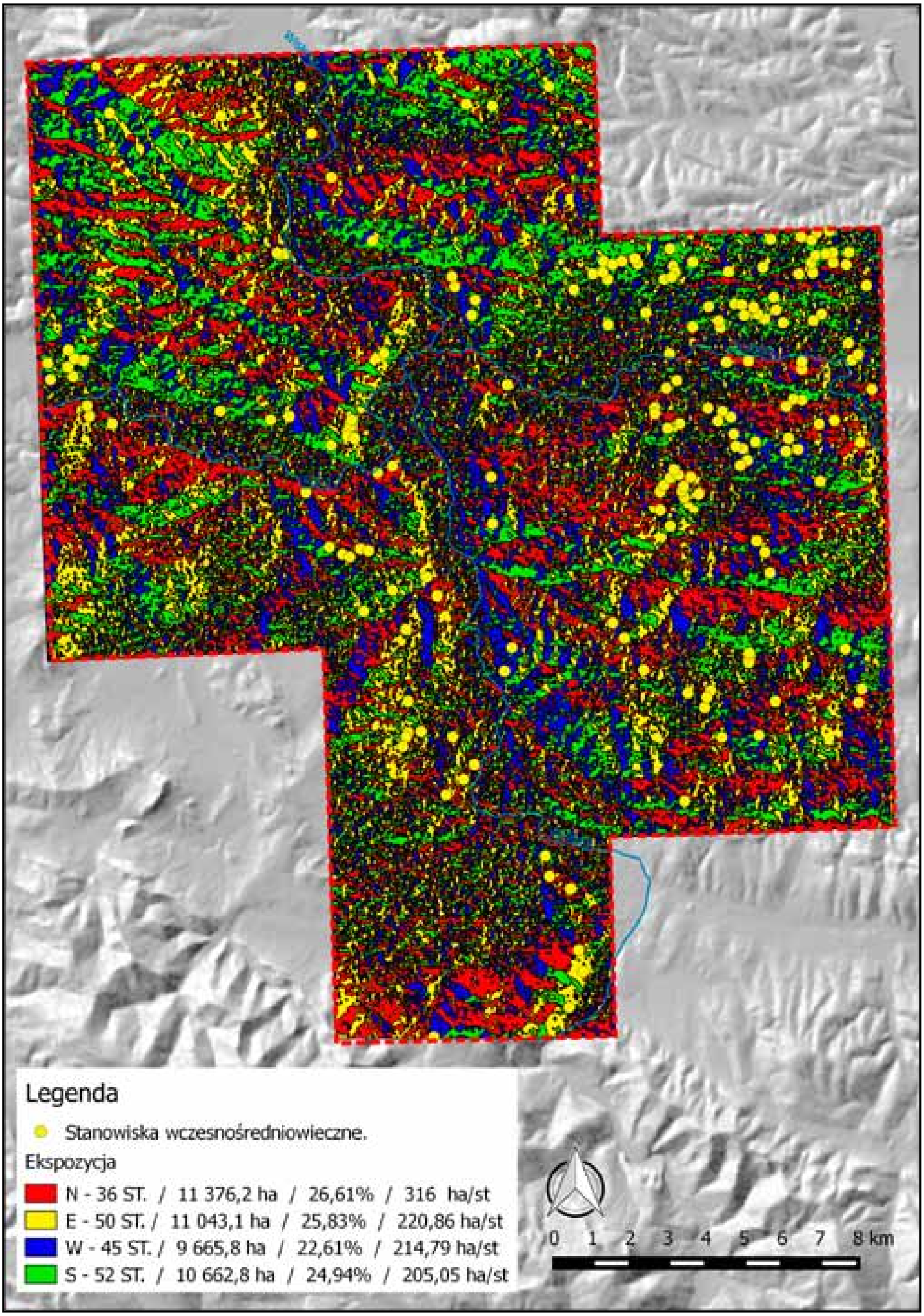

Fig. 9. Exposure map based on ASTER GDEM data

One site amounts to 192.14 ha. Slopes with a gradient of between 3 and 7^{O} are second in line. 87 sites were registered in a surface covering 18,114.8 ha (42.4% of the studied area). Terrain with a gradient of between 7 and 15^{O} is in third position, with 50 sites. Such areas cover a surface of 13,461.2 ha (31.5% of the studied surface), which amounts to 375 ha/site. Settlement density becomes lower as the slope gradient rises (Fig. 10).

Another important factor that should be considered is the distance of the archaeological site from permanent water reservoirs or watercourses. Water is a key resource with a huge influence on where settlements are situated. It is also accessible in the form of rain or snow, i.e. temporary sources, or as water reservoirs such as lakes and rivers. The last of the selected determinants aims to determine the location of the sites in relation to their distance from rivers. Many sites are concentrated along the valleys of the main rivers – Wisłoka, Jasiołka and Ropa, with the highest amount – 60 sites – at a distance of up to 1 km from the present-day course of the river. Slightly less, i.e. 46 sites, were located at a distance of between 1 and 2 km, while 45 sites – between 2 and 3 km. The amount of sites decreases at a distance of more than 3 km from the riverbanks (Fig. 11).

Upon demarcating the areas with the densest settlement patterns, we receive terrains located at a distance of 1 km from the rivers, with a southern exposure and 1–3^{O} slope gradient. After separating out the areas with the densest settlement patterns and distinguishing the parts that overlap, we receive the zone with the most convenient features for settlement – probability I areas, i.e. those on which archaeological sites are probably located (Figs. 12, 13). These can be broadened to encompass areas with a western exposure and a 3–7^{O} gradient and lying at a distance of 3 km from the riverbanks (Figs. 14, 15).

Based on the identified settlement preferences among early medieval people, it is possible to designate places with the most convenient qualities for founding a settlement. Such a technique attempting to foresee the location of archaeological sites is termed Predictive Modelling, with the acronym PM (Chapman 2006; Kohler, Parker 1986; Kvamme 1990; Lock 2003). In archaeology, predictive modelling uses knowledge about the location of identified archaeological sites and their relation to the surrounding environment, and then "transfers" this information onto terrain with similar environmental parameters,

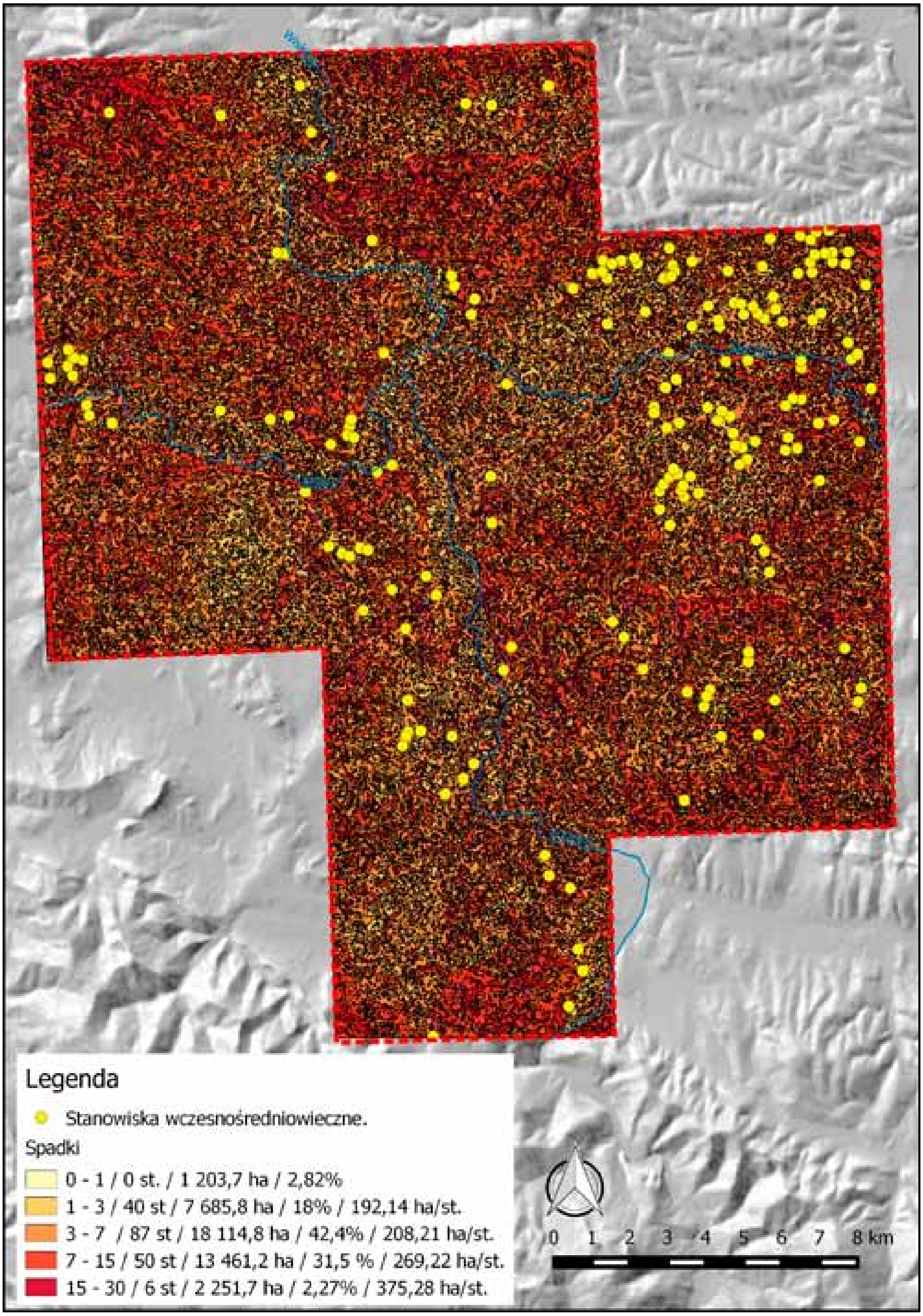

Fig. 10. Map depicting the down gradient of the terrain based on ASTER GDEM data

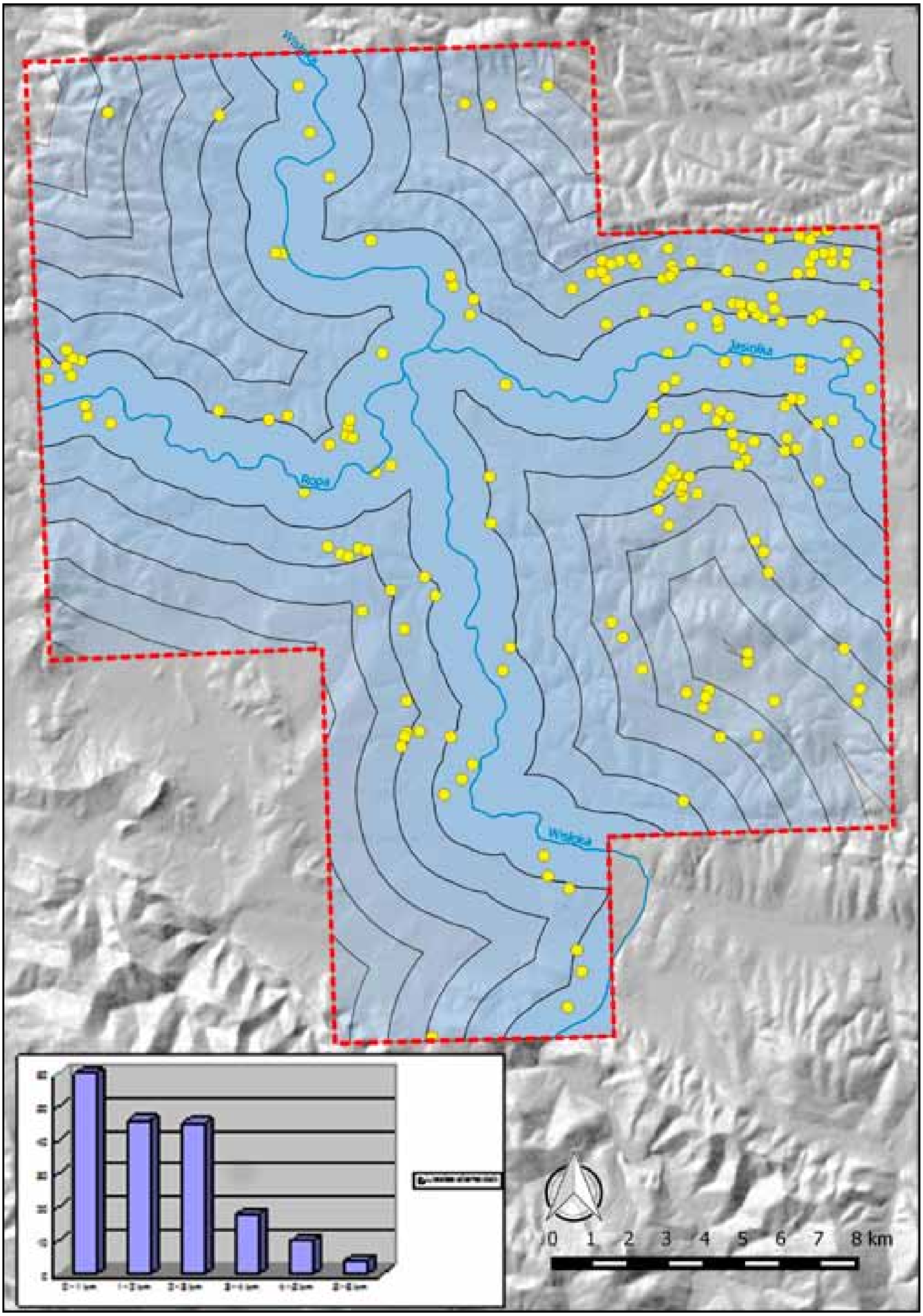

Fig. 11. Map presenting buffers at a distance of 1 km

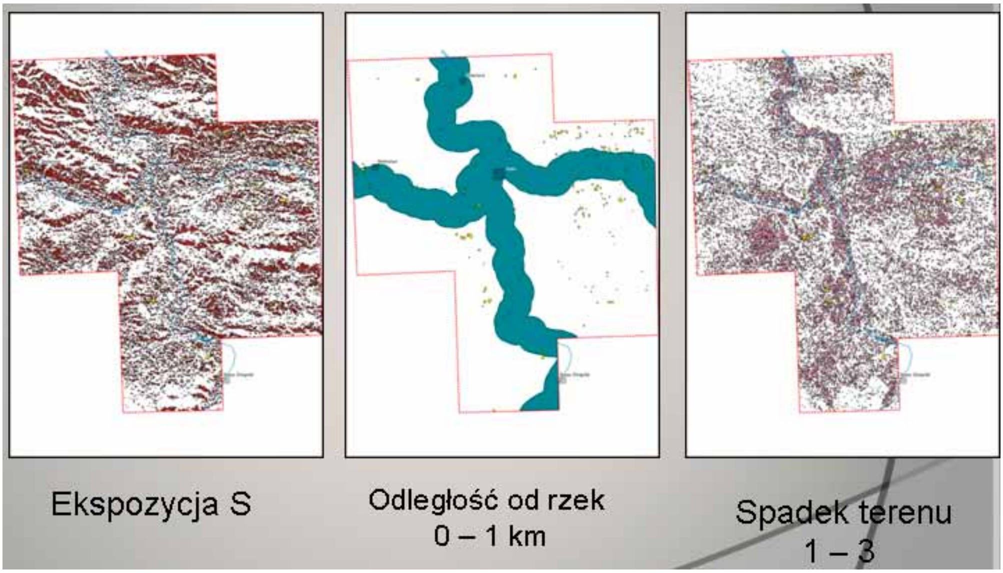

Fig. 12. The distinguished areas have the highest amount of archaeological sites

in which the areas have not yet been studied archaeologically due to the vegetation cover or urban development. Predictive modelling is based on finding a relation between the location of the archaeological site and environmental factors. Constructing predictive models is useful as an activity supplementary to surface surveys and preceding investment. It constitutes the first step in the non-invasive search for archaeological sites (Zapłata, Borowski 2013), enabling the better identification of the researched area and the formulation of initial hypotheses that can later be verified.

Rafał Zapłata and Marcin Borowski describe predictive modelling as a process "based on the use of knowledge and information about identified archaeological sites and their surroundings and determining the mutual relations between data and phenomena, linking this information with environmental conditions, as well as 'preferences' known, for example, based on the analyses of the landform, types of soil or distance from water reservoirs" (Chapman 2006, s. 157; Kamermans 1999; Borowski, Zapłata 2013, 105).

Factors linked to the environment, topography and infrastructure narrow the occurrence of phenomena. Predictive modelling attempts to describe these limitations through the spatial correlation of historical

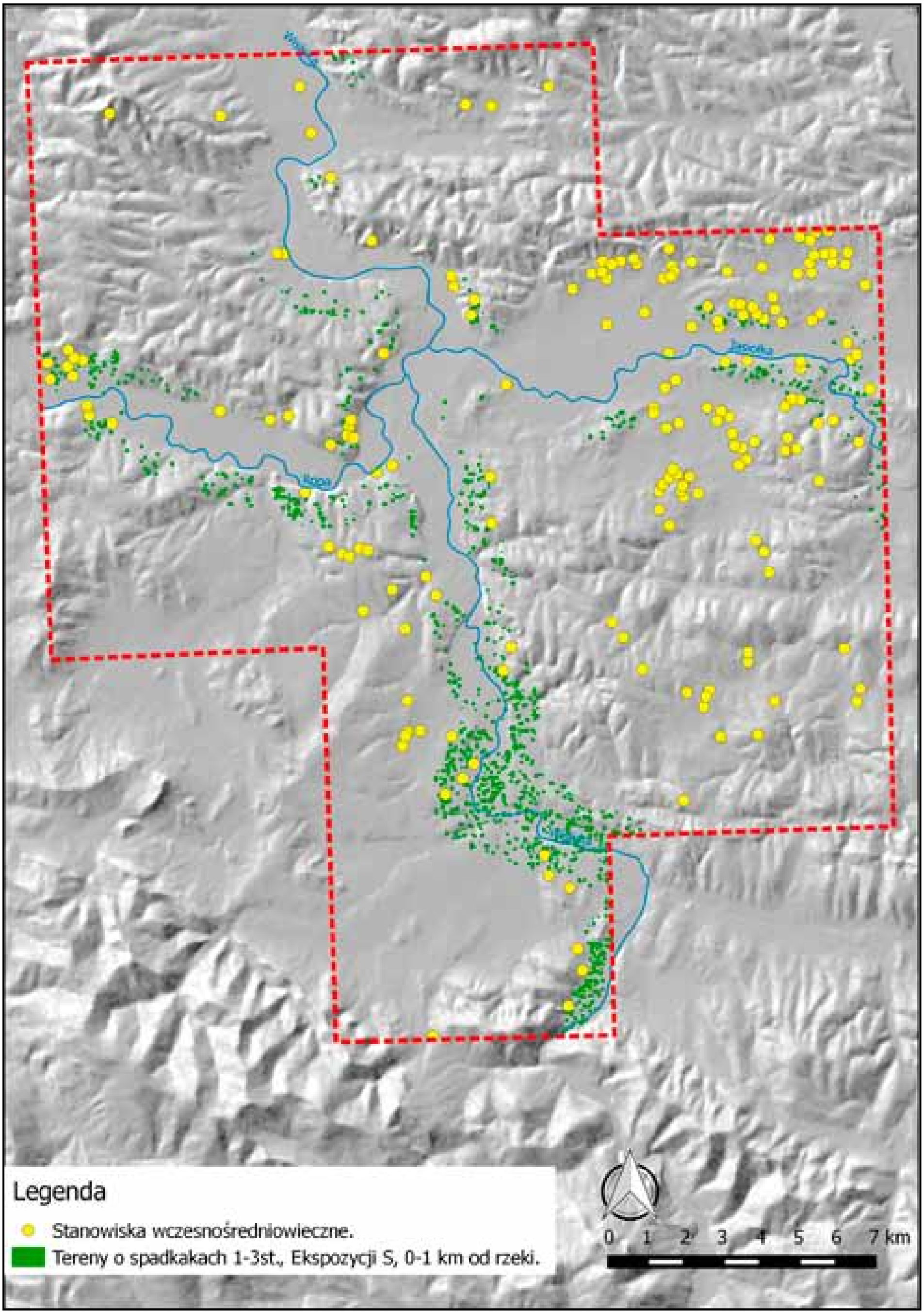

Fig. 13. Distinguished areas with an S exposure, a slope gradient between 1 and 3 degrees and located at a distance of 1 km from the river's course

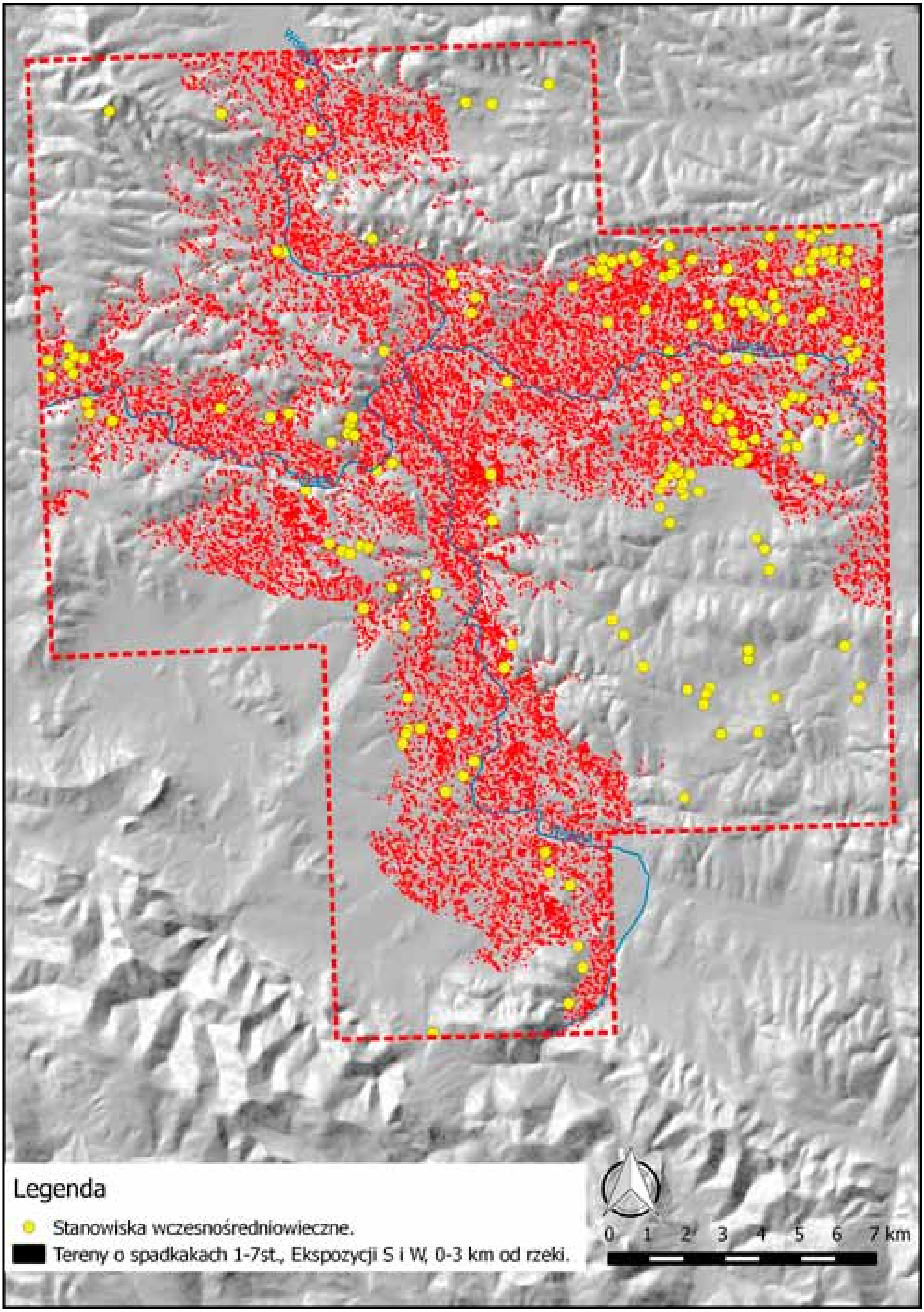

Fig. 14. Distinguished areas with an S, W and E exposure, a slope gradient of between 1 and 7 degrees and located at a distance of 0–3 km from the river's course

Fig. 15. The correlation between the distinguished areas from satellite images depicting the buildings in the village of Dębowiec. Green is used to mark areas with an S exposure, a 1–3° slope gradient, located at a distance of 1km from the river. Red is used to mark areas with S, E, W exposure, a 1–7 slope gradient, located at a distance of 3 km from the river

events with environmental factors.

Criticism of predictive modelling

Using PM in the management of national heritage resources has met with both supportand criticism. In countries such as the USA, Canada, the Czech Republic, Australia and – to a lesser extent Germany, predictive modelling is regularly used to establish the density of archaeological sites. In some countries, it is used in order to map out the terrain before research is done there or as a tool providing support in making decisions about area management. In some countries, like England and France, the use of PM is rejected completely in national heritage management. The argument used to justify this is the impossibility of predicting the location of all archaeological sites. This is especially relevant in the case of terrains classified as areas with a low probability of containing archaeological sites. They might be completely omitted in the reconnaissance, and thus all sites located there would be irrevocably lost (Verghen, Whitley 2012).

One significant problem with this method that should be mentioned is the way in which data is "prepared" for analyses aimed at determining the locations of potential sites. Vectorised archaeological sites are recorded in the form of polygon layers. It is necessary to substitute the polygon layer by a point layer to meet the requirements of the analysis, wherein the programme automatically determines the centre of the polygon layers. This substitution leads to errors, e.g. when the site includes western, eastern and southern slopes, then the central point can only be assigned as being located on the western slope. The amount and quality of the analysed data influences the results of the analyses. In the above analyses, data gathered in the course of the largest Polish research project – the Polish Archaeological Record – were used. The research itself provided a lot of very valuable information useful for describing prehistoric settlement in Poland. However, it has also been criticised. PAR's most frequently listed faults include: the artificial condensation of the settlement network, huge difficulties in dating archaeological material, as a result of which the majority is dated very generally, e.g. to the Neolith or Bronze Age or the Early Middle Ages, i.e. four centuries [$7^{th}/8^{th}$ – 11^{th}–12^{th}], the proliferation of sites through archaeological material being moved (Poleski 2006, 45–46, after Moździoch 2002, 14–15), the archaeological material found on the surface does not always coincide with the presence of structures, the size and location of the sites is determined based on a few artefacts recovered from the surface.

There is no possibility of recreating the dynamics of change in the settlement's oecumene, which results in a static "flattened" image of settlement. This is because PAR research constitutes the sum of diverse past human activities. It does not enable tracking the changes in the settlement's dynamics. Sites from various phases can be included in the presented map of early medieval settlement. The term "Early Middle Ages" can refer to ca. four centuries of history.

Summary

The results of the analyses depend on the type and quality of the introduced data. One should be aware that the presented model is not a magic wand that can determine the location of an archaeological site, but rather a set of tools allowing one to select spots with the best conditions for settlement, and – thus – potentially having archaeological sites.

For such considerations and analyses, sites and structures that have been precisely located in the terrain are especially important. Unfortunately, the vast majority of archaeological sites have been identified based on a few artefacts discovered on the surface, while the defined range of settlement does not coincide with the actual area the site covers.

Merging the results of PAR research and GIS tools allows for an initial reconstruction of prehistoric and early medieval settlement in a selected area and provides images of this settlement in the form of maps. Nonetheless, one should keep in mind the incompleteness of the PAR data. Sites that had until recently been unknown are constantly being discovered and one must be aware of the existence of archaeological sites hidden beneath modern-day buildings in towns and villages.

One advantage of using GIS software is acquiring new information through associating data originating from various sources, e.g. analogue data, such as field documentation, which can be referenced with digital data, e.g. from satellite images, ALS data or the results of non-invasive surveys. The end product of predictive modelling might be a map illustrating a few variations of high, medium and low probability of encountering an archaeological site in the studied area. Such maps can be useful in land planning and management.

Using GIS in archaeology is another example of associating the efforts of many different researchers participating since 1970 in the largest non-invasive survey project (PAR) with new technologies. Testing new research techniques might contribute to providing new information about the prehistoric settlement landscape. Such research is very significant in the precise establishment of the location of tribes and intertribal empty regions. Undoubtedly, GIS software works well as a tool used by an archaeologist for collecting, searching and analysing archaeological data. An additional asset in the case of ready databases is the possibility of reusing them in any scale, within any scope and any chronological framework, while the research results can be illustrated in the easily comprehensible form of maps.

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REVIEWS

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Marta Połtowicz-Bobak*

Tadeusz Wiśniewski (ed.) Klementowice. A Magdalenian site in eastern Poland, Institute of Archaeology Maria Curie-Skłodowska University in Lublin, Lublin, 2015, 346 pp.

Monographic studies of collected materials coming from the sites, especially the rich ones, known and essential for research in a particular field, are usually valuable and expected items by archaeologists involved in the subject. The same situation occurred in the case of the book presented here – a monograph of the site in Klementowice, one of the most important traces of the settlement of Magdalenian communities in Poland. This work is a summary of long-term, interdisciplinary work, first carried out in the early 1980s (1981–1982) and then continued at the turn of the first and second decade of the 21st century (2007–2011). This dissertation was published as part of the project called "Klementowice monograph – settlement in the eastern peripheries of Magdalenian culture circle" (02498/13/FPK/NID) included in the program of Cultural Heritage priority Protection of Archaeological Artefacts in two-year mode (2013–2014).

The 346-page book, published by the Institute of Archaeology at UMCS, consists of four parts devoted to the main groups of issues: archaeology, natural environment, animal remains, petrography and mineralogy. In total, there are 19 chapters written by specialists dealing with particular issues, in fact creating a situation in which a large team of representatives of various sciences took part. These four parts are preceded by an introduction and a summary with general conclusions. The last chapter is an annex devoted to younger settlement than the one described in the main content of the work. The text is accompanied by numerous tables, figures and charts presenting the most important data and a very large selection of stone artefacts made by knapping technique and other types of items such as stone slabs. Each of the chapters is preceded by a short abstract.

The work has been printed in English but it also has a digital Polish version.

* Institute of Archaeology, University of Rzeszów, Moniuszki 10 Street, 35-015 Rzeszów, Poland; mpoltowicz@lithic.eu

Part one – “Archaeology” consists of four chapters. The first one (the most extensive), written by T. Wiśniewski, is devoted to the discussion of archaeological materials from the site in Klementowice. The research of materials is carried out according to the classic scheme: research history, research methods – separately discussed time ranges, i.e. 1981–82 and 2007–2011, a short presentation of the site stratigraphy and stratigraphic locations of the finds, chronology and a discussion (the most comprehensive) of stone inventories. In total, during all research seasons, 331 m^2 was explored, obtaining over 47,000 artefacts made by the use of knapping technology and other items such as hammer stones, fabricators and a series of stone slabs.

A lot of attention (perhaps too much) is devoted to the history of research, where each of the research season and each stage of fieldwork have been described, whereas the stratigraphic and chronological issues have only been signaled. The reader is sent back to the subsequent parts of the book, where these issues were described in detail by other authors. However, attention has been drawn to the presence of two assemblages marked as A and B at the site. As for the further parts of the study, apart from the entire inventory, the analysis includes these two concentrations.

The research of artefacts made by knapping techniques is described most widely. Diversity of raw materials is discussed in detail. Three types of flint dominate here: chocolate, Świeciechów and erratic flint; other flint raw materials play a marginal role. This final arrangement of the raw material issue regarding Klementowice complex should be considered crucial and valuable. It is important, among other things, to reject explicitly the hypothesis about occurrence of the Volyn flint. However, the additional argumentation that a lack of this raw material is somehow conditioned by the absence of the Magdalenian in the east of the Bug river as well as a lack of evidence for relations between the Magdalenian and Epigravettian populations are the issues (in my opinion) debatable. It is necessary to note that there is evidence for long-distance imports of raw materials also originating from areas beyond the range of culture.

Stone artefacts (non-chipped) were made of various rocks, mainly sandstones of various types and quartzites.

The analysis of flint artefacts includes the following groups: cores, debitage and technical forms, tools along with characteristic waste forms, chips. Each time the description of the group comprises the raw material structure and then the technological or typological diversity of a given category of artefacts.

Considering the description of cores, their diversity due to the stage of the core process, the type of obtained preforms, the number of striking platforms, the location of the flaking surface (on the wider or narrower surface), external angles were taken into account. Technological analysis of this category of artefacts is very limited; there is no description of e.g. the method of preparation or operation, although characteristic wastes indicating the types of treatments were noted. Therefore, the technological development of cores is incomplete.

Debitage is described according to classical rules – flakes and, together, blades and bladelets. The description focuses on the issues of raw materials, metric data and data related to the butt-bulb part. However, the issues of the nature of the upper side were omitted, which is also a kind of deficiency. It is also a pity that the author has not decided to separate blades and bladelets into separate groups. A separate presentation of these two categories could show the possible differences between blades and bladelets in their production. Probably the omission of these factors results from a planned assumption (from the beginning) of not focusing on technological issues, which may be a drawback of synthetic materials to some extent. On the other hand, the author was entitled to such a choice especially in the face of an extraordinary inventory richness.

Research of chips and micro-chips was limited to place them in metric ranges and in terms of raw material classification.

Tool analysis includes 13 typological groups (among others: scrapers, burins, trunceted blades, piercers with borers and perforators, microliths divided into bladelets and backed points, combination tools, splintered cores and others). Moreover, participation of particular groups in the whole tool set, their typological and raw material differentiation is presented.

What is more, the presence and share of characteristic waste products (burin spalls and microburins) is noticed. The latter are referred to in the Polish version of the text as *mikrorylce*, which is an unnecessary and unjustified language calque (French *microburin*) in my opinion.

Furthermore, the analysis includes other categories of artefacts – hammers, fabricators and perhaps fire flints, and then one uncovered pebble and finally stone slabs - one of the characteristic elements in Magdalenian sites.

All these elements are also described regarding a differentiation into the assemblage A and B. Other parts of the study include spatial analysis of the site – differentiation of 24 so-called "features", i.e. hollows, some of which (13) are filled with red dust. All there are artefacts, the differences depend on their number and type. One of these objects was recognized as a cryogenic structure.

The issue of refits was discussed in a limited way. Until the monograph was prepared, only a very small part of the material was refitted. Therefore, this issue was deliberately omitted. However, regarding the already refitted items there were both the examples of core flaking and tools production (mainly burins and burin spalls) as well as the fitting of cracked artefacts. It gives future prospects.

A very valuable part of the work is spatial analysis and presented density maps. They were made for the whole site, for both assemblages, with a distinction between the artefacts coming from the intact layer and those found in the contemporary soil layer. Separate maps for different categories of artefacts were prepared. The series of maps with densities allows us to observe scattering of individual categories of artefacts, which along with other data (use-wear traces on tools, burned elements...) may provide the basis for presenting the functional diversity of space. However, there is no comprehensive commentary and interpretation of the results in this research.

The last issue in the chapter is a summary – an attempt to interpret the site in terms of function, residence time and number of stays and its interpretation in a broader context. The researchers used both the data presented earlier and those that were discussed in subsequent parts of the book, which of course is not an allegation here.

The whole chapter is complemented by numerous figures presenting flint and stone inventory.

The remaining chapters are much shorter. They discussed the following matters: methods of data digitalization from the site (M. Zawadzki, A. Sabat, T. Wiśniewski), results of traseological research (K. Pyżewicz) and sources for research on Paleolithic settlement of the upland part of the Lublin region after the last glacial maximum (J. Libera).

The short chapter on digitalization is devoted to the ways of preparing records of research and subsequent work related to its digitalization as well as running a project website. It is a part devoted to the methods of documentation of an archaeological site, therefore, it seems that it concerns rather issues which should be included in the initial part of the monograph.

On the other hand, the chapter presenting studies on use-wear traces is valuable. The results of research of slightly more than 500 flint items were shown here, indicating post-depositional, technological and functional traces. It is worth mentioning that various types of artefacts were analyzed – cores and debitage as well as a large series of tools. Owing to the research, it was possible to identify the activities performed at the site – mainly related to the processing of animal carcasses and raw materials such as bone, antlers and skin, but also few traces associated with the treatment of plants. What is more, some artefacts (single blades) have been identified as products used to strike a fire. The descriptions are accompanied by photos of traces and a table with a detailed description of each analysed artefact.

The last chapter analyses the settlement after the last glacial maximum which presents sources coming most often from surface surveys as well as from accidental discoveries and amateur searches. Overall, there have been catalogued 195 sites, which can be associated with the very end of the Pleistocene and the beginning of the Holocene, and thus the period that is not directly related to the Magdalenian settlement.

The second part – "Natural environment" is devoted to natural issues such as the natural environment in the further and immediate vicinity of the site (P. Mroczek, J. Rodzik), absolute dating (S. Fedorowicz), soil analyzes (J. Rodzik, P. Mroczek) and micromorphology of soil profiles and grain size of loess deposits in the vicinity of the camp (P. Mroczek). The last chapter considers the use of GPS and GIS in the study of the site (P. Zagórski).

Chapters regarding geology and pedology aim to reconstruct environment of both further and immediate vicinity of the site. These findings were based on field, cabinet and laboratory studies on collected samples. Research methods are discussed in the text. On the basis of the research, contemporary terrain of the site's surroundings has been described and the Pleistocene terrain has been reconstructed. The analysis indicated that the site was located in the area covered with loess patches formed by loess blown in the last glaciation, in the end of eolian sedimentation. It was situated on the flattening of the slope, in the most favourable place: as warm as possible, with easy access to water and with diverse environmental characteristics. It is important to reconstruct the Late Pleistocene terrain (other than contemporary one), as well as to identify and describe cryogenic structures whose presence was also noted within the site, together with the reconstruction of water relations, which were different from contemporary period in micro-scale, and at the same time having a decisive impact on settlement possibilities. Research data on vegetation comes only from literature usually referring to areas not directly adjacent to the site. It was a tundra zone, probably with trees. Soils, including soil levels from the site, were identified and characterized.

It should be emphasized that geological and pedological studies involved the execution of enormous field work, analyses of over 100 profiles and studies of plenty of samples. In total, a series of chapters consists of a comprehensive and deep discussion of natural issues related to the environment and the site itself.

A separate topic of this part of the book is absolute dating. The age was determined by the use of C14, TL and OSL methods. These methods are described inside the text. The dates, obtained by means of aforementioned methods, are presented here and interpreted. Places of taking the samples are shown in the photographs. This is a development of information already contained in the first chapter of the monograph. Summarizing them, it is worth mentioning that as for the group of dates there are two age ranges: older – corresponding to the Final Pleistocene and, at the same time, dating of the site in Klementowice and much younger determination which cannot be connected with Palaeolithic settlement. The most important for the study is the date C14 Poz-54 82 which gave the value of 12 730 ± 90 BP. This is the first absolute date for the Klementowice determining the age of the site that falls into the period GS-2a and thus preceding the warming GI-1e (Interstadial Bølling / Meiendorf), for which the complex was dated on the basis of typological features. This determination is extremely important also from the point of view of the research on the entire eastern province of Magdalenian.

The third part, tilted "Animal remains" consists of four chapters. It includes an archeozoological and taphonomic study of animal remains (J. Wilczyński), an analysis of seasonal horse migrations (A.J.E .Pryor, R.E. Stevens, A.W.G. Pike) and seasonality of the camp (M. Nývlatová-

Fišáková) and mitochondrial DNA coming from a horse tooth found in Klementowice (M. Gryzińska).

Only 83 pieces of bone remains, teeth and bones of horses were found on the site. These remains are poorly preserved, partly as a result of post-depositional processes, and partly due to the intentional fragmentation of them by the users of the camp, which makes the research difficult. The remains were found in both assemblages, and their location indicates that they are almost certainly related to the Magdalenian settlement. Next chapters are devoted to various studies considering various issues, both natural and cultural. Each chapter contains a presentation of the applied research methods, an analytical procedure and then discussion of the results. Scant amount and poor condition of the materials significantly limits the possibilities of research. Nevertheless, the authors managed to obtain valuable results, taking into account that the site in Klementowice is one of the very few in Poland where any bone remains were preserved.

The most important findings include identification of the number and age of individuals. There are at least two horses; one adult (about two years old) and one young individual (under one year old), which was determined on the basis of teeth analysis. Some bones wear traces of intentional action related to the processing of the carcass. It is not known whether all carcasses or only selected parts were brought to the camp. However, it cannot be unambiguously determined whether it was the only species of game that might have indicated hunting speciation.

The analysis of isotopes (oxygen, carbon, strontium) obtained from the older horse's tooth allows the researchers to determine the time of slaughter (early autumn) and its origin from areas not located in the immediate vicinity of the site, which confirms seasonal migrations of animals. The season of the year in which the animals were slaughtered is also confirmed by the analysis of the teeth. Moreover, it is the same time when the camp functioned. However, mtDNA studies did not deliver any results until the publication, apart from the recorded fact that such attempts to receive this research from one of the preserved teeth took place.

Part four: "Petrography and mineralogy" is devoted to the petrographic research of stone artefacts (L. Gazda), chipped artefacts made of siliceous rock (L. Gazda, M. Huber) and red ferrous raw materials and "black crusting" on the surface of artefacts (J. Trąbska , A. Wesełucha-Birczyńska,

B. Trybalska). Petrographic analyses allowed for the identification of raw materials and sources of their origin. Considering non-siliceous rocks, it is worth mentioning mainly different types of sandstones, quartzites and few igneous and metamorphic rocks that are not quartzites. All these rocks are associated with glacial sediments and they were probably obtained in the near vicinity of the site; therefore, it is possible to talk about the use of local raw materials. What is more, analyses of selected artefacts made of atypical siliceous rocks, other than flint material, allowed the researchers to locate probable sources of their occurrence. These are most often areas of the Świętokrzyskie Mountains. Implemented methods, based on microscopic analysis (SEM scanning microscope) and chemical analysis (EDS), allowed for identification of rock origins, which would be impossible with the use of macroscopic observations only. At the same time, it is an example that some raw materials, considered often as long-distance imports, are in fact rocks exploited locally or relatively close regions forming part of the exploited territory.

Equally important are analyses of ferrous raw materials, often described in the archaeological literature as "ochre". Detailed studies (RLM, PLM, XRD, SEM / EDS methods) of six artefacts allowed to determine their types, chemical composition, features and properties also useful from the point of view of users as well as sources of their origin. What is more, their possible usage was also discussed here. The research included several types of artefacts: artefacts (lumps), and microartefacts collected from the surface of flint products and sediments.

The research also covered black organic and inorganic substances occurring in the form of crusting on the surface of artefacts or in the form of lumps. Observations have allowed to indicate that residues of organic substances can be distinguished as prepared in an intentional way as well as natural black inorganic discolorations, which include, among others, manganese. The latter is also observed on the surfaces of stones in the form of a black coating.

The last part of the monograph is the Summary written by T. Wiśniewski, which is a tabular summary of information obtained during the research, as well as an the Annex, where the traces of the Neolithic, Bronze Age and modern times settlement have been collected by T. Wiśniewski and B. Niezabitowska-Wiśniewska.

The monograph devoted to the site in Klementowice is certainly an extremely important item in the literature devoted to the Magdalenian complex not only in Poland, but also in Europe, especially in Central Europe. What is more, the publication of the thesis in English broadens the group of recipients and allows it enter the wider circle of information regarding this important site. It is necessary to emphasize the very large interdisciplinary nature of the study. Extensive natural research has allowed the researchers not only to reconstruct the environment, but also to obtain information that might have escaped completely our attention, such as the issue of the origin of rock materials or the issue of black crusting on artefacts. Undoubtedly, a great element of the book are figures, tables and plans. Tables are an extremely important component here due to the fact that they include a huge part of the results of all research. What is more, the summaries written at the beginning of each chapter facilitate the orientation in its content. Valuable elements are also presented introductions to research methods every time, even if they seem a bit too extensive in some places (e.g. discussing subsequent methods of absolute dating).

The work has accumulated a huge amount of data. Its weaker part, especially in the archaeological part, is the discussion and interpretation of the results, including those presented in the tables. Some of the information was not discussed at all, for instance the weight of raw materials; given in the tables when discussing various groups of artefacts, it was not commented. On the other hand, other information, such as those concerning raw materials, are repeated in several places. Moreover, figures indicating places from which samples have been collected for absolute dating are also repeated.

One can also consider the monograph construction and the order of subsequent chapters. Some of them, e.g. a chapter regarding data digitization or the use of GPS and GIS should be included in the initial part of the book. An arrangement proposed by the authors makes it difficult to read, disrupting the internal logic of the disquisition. Similar objections can be raised in some parts of the book to the process of narration. The missing element in this thesis is presenting the site in a wider cultural and settlement background.

The aforementioned monograph, despite some shortcomings and deficiencies, largely unavoidable in case of such a large work prepared by a large team of researchers, is an important and valuable study, obligatory for all researchers involved in both the Magdalenian complex and the beginnings of the Final Pleistocene.

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Valeska Becker*

Michael Doneus, Die hinterlassene Landschaft – Prospektion und Interpretation in der Landschaftsarchäologie. Mitteilungen der Prähistorischen Kommission 78. Verlag der Österreichischen Akademie der Wissenschaften, Wien 2013, 400 pages, 217 figures

Like no other of the humanities, prehistoric archaeology draws on various fields of research to gain and augment insights into human behaviour in the past. From its very beginnings, geography has played an important role in this respect: as early as the 1920ies, archaeologists have reflected on the character and the history of ancient landscapes, soil types and palaeo-vegetation. As landscape archaeology, these early beginnings have a permanent place in modern-day research, with new methods still being incorporated into the already-large corpus of possible approaches to describe and analyze prehistoric landscapes.

It is this large and fruitful field of research that Michael Doneus deals with in his book "Die hinterlassene Landschaft – Prospektion und Interpretation in der Landschaftsarchäologie" (The bequeathed landscape – prospection and interpretation in landscape archaeology). The book was submitted as a *Habilitationsschrift* (post-doctoral lecture qualification) at Vienna University in 2009 and published in 2013. Michael Doneus is certainly predestinated for such a work: He is a professor for prehistoric and protohistoric archaeology as well as landscape and environmental archaeology at Vienna university and likewise vice director of the Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology in Vienna; furthermore, he is the director of the Vienna aerial archive.

The book is divided into six large parts with 19 chapters. After the acknowledgements (chapter 1, pp. 11–12) and a rather short introduction outlining the book's setup (chapter 2, pp. 13–16), the first part with

* Westfälische Wilhelms-Universität Münster Historisches Seminar, Abt. für Ur- u. Frühgeschichtliche Archäologie, Robert-Koch-Str. 29, 48149 Münster, Deutschland; valeska.becker@uni-muenster.de

the chapters 3–5 is dedicated to a discussion of terminology, methods and concepts of landscape archaeology.

It is evident that any form of landscape archaeology is closely connected to concepts of space and spatial order, but already since the beginnings of prehistoric archaeology as a scientific field and the invention of distribution maps, geography became an obvious choice for a transfer of methods. In chapter 3 (pp. 18–28), Doneus criticizes the rather careless use in German-speaking archaeology of terminology connected to landscape archaeology (*e.g.* landscape, territory, space). Meticulously, he even determines the linguistic roots of words like *Raum* (space), *Ort* (place) and *Landschaft* (landscape) and breaks down their connotations in archaeology. Especially important for the following chapters will be his distinction between the natural and the cultural landscape. Chapter 4 takes a closer look at the history of research regarding landscape archaeology (pp. 29–38). Doneus points out that settlement archaeology played a large part at beginning of the 20th century, especially in Germany, where these two fields were not so strictly separated at first. Doneus does not fail to mention names like Gustaf Kossinna and Herbert Jankuhn, although others, especially Kossinna's antagonists like Alfred Kiekebusch and Carl Schuchhardt, who pointed out the importance of incorporating the analysis of the landscape around a settlement into research, including the consideration of the character of the surrounding landscape, soil types, the climate and the biosphere (Kiekebusch 1928; Schuchhardt 1944), are not brought up. In any case, the interdependence of settlement and landscape archaeology at that time has to be stressed. It will not be until the 1990ies that these two concepts are being treated separately in Germany, *e.g.* by Jens Lüning in a paper published in 1997 (Lüning 1997), although Doneus pinpoints Thomas Saile's paper on "landscape archaeology in the northern Wetterau (Hesse): environmental analysis with a geographic information system (GIS)" from 1997 as the first work in this respect. Although short to the point of being sketchy, one might have mentioned Peter Haupt's introductory work on landscape archaeology (Haupt 2012). Doneus outlines the development of landscape archaeology in the English-speaking countries and outlines the influences from processual and postprocessual archaeology.

Finally, chapter 5 (39–46) deals with the concept of landscape archaeology in detail. Here, the reader may find a) useful definitions both of landscape, settlement and environmental archaeology, and b) their respective fields of work, not neglecting to mention overlaps and intersections between the three.

Part 2 with its chapters 6–8 focusses on the description of a landscape. Doneus discerns between the physical and the cultural structure of a landscape and admits himself that these are entwined in many aspects since they are dynamic and influence each other (p. 47). Chapter 6 describes the methods of analyzing a landscape's physical structure (pp. 48–76). Some of this is again very detailed and may be intended for beginners to the subject, *e.g.* when Doneus describes the differences between the terms weather (*Wetter*), weather conditions (*Witterung*) and climate (*Klima*; cf. p. 49). Nonetheless, this thorough compilation of a landscape's physical conditions (pp. atmosphere/climate; lithosphere with relief, sediments, soils; hydrosphere with phreatic water, springs and river systems; biosphere) is very useful, and each of the spheres is discussed in relation to the landscape and its influence on humans.

Chapter 7 aims to pinpoint some of the factors that determine spatially relevant behaviour, thus creating a landscape's cultural structure (pp. 77–101). Very thoughtfully, Doneus places a section discussing environmental determinism at the beginning of this part and contrasts this with other models of human behaviour. Then, he sets out to examine the mutual reactions of a landscape's physical and cultural structures. Although Doneus stresses that environmental determinism is certainly outdated and that humans always have a choice how to act, bringing the term "agency" into the discussion (p. 80), the information given on the following pages leaves the reader with the impression that indeed a landscape's physical structure determined a large part of human behaviour in the past, and increasingly so the more one progresses into the past. However, Doneus' thoughts regarding the social-religious, the political and the historical sphere in landscape archaeology are very much worth reading and direct the attention to questions regarding communication, territoriality and religious concepts.

Chapter 8 is dedicated to the description of the material aspects of a landscape (pp. 102–125). Here, Doneus lists possible problems, advantages and disadvantages of traditional maps and GIS combined with archaeological data. Especially important is his statement that landscape archaeology aims at analysing the correlation and interaction between sites and their landscape (p. 121), thus trying to shift the attention away from a find-based approach which is still common in German archaeology towards the space around a settlement; a demand which has been voiced time over time also by German researchers such as Georg Kossack (Kossack 1986; 1992) and others, yet without much of an echo.

Part 3 with its chapters 9–11 places methods of landscape archaeology in the focus. While chapter 9 (pp. 128–134) includes thoughts regarding site formation, site changes and site destruction, chapter 10 (pp. 135–240) can be viewed as the core of this part. It contains detailed information on methods of prospection, listing and elaborating procedures such as archaeological surveys, aerial photography, satellite remote sensing, LiDAR, geomagnetics, geoelectrics, geo-radar, electromagnetics, seismic technology, sonar, terrestrial topographic surveys, chemical prospection, biological prospection, the analysis of literature, documentation of finds, enquiries and the analysis of historic sources and field names. Each of these is described *in extenso*, and Doneus does not fail to point out possible pitfalls and problems with each method. Especially useful are the numerous figures in this chapter which illustrate and complement the text and which are taken mostly from the aerial archive of Vienna university. The chapter should be considered a must for all landscape archaeologists and is worth reading both for beginners and experienced researchers.

Chapter 11 (pp. 241–274) adds numerous examples for the methods described in chapter 10, most of which are based on Doneus' own works. Since he is himself the head of the Vienna university aerial archive, it is no wonder that the focus is on aerial photography and LiDAR, but other methods are covered as well. At the end of this chapter, Doneus points out that these, however, only constitute the basis for further work; he states that "archaeological prospection alone does not represent landscape archaeology (…) without data from prospections and excavations, the landscape under investigation remains empty and ahistorical" (p. 274).

This very problem is addressed in part 4 with its chapters 12–14. Here, Doneus distinguishes between an etic and an emic explanation in archaeology, differentiating "explaining" and "understanding approaches". Chapter 12 (pp. 277–294) deals with the etic dimension of landscape archaeology which incorporates methods that search for and describe patterns in settling. These are taken mainly from the field of mathematics and geography and incorporate models concerning distribution patterns such as nearest neighbour, kernel density estimates, Voronoi diagrams, Delaunay triangulations, site catchment analysis and predictive modeling. He offers examples for the use of these models and thoroughly describes shortfalls and problems when using them. Furthermore, he discusses models concerning the organisation of settlements (central places, core-periphery model, rank-size rules, gravity model), again with examples and a discussion of the underlying premises. Evidently, these models are based on assumptions of reproducible human behaviour and often contain a large proportion of environmental deterministic presuppositions; Doneus debates this concisely and points out their value if their restrictions are considered carefully (p. 293).

In order to cope with the deficits that arise from a sole use of rule-based models in landscape archaeology, chapter 13 attempts to tackle approaches to landscape archaeology from an emic side. The main aspect that is discussed in this chapter is phenomenology, a field of research that up to now is mainly observable in English-speaking countries. The focus shifts from the object to the subjective, including researchers' own understanding of a landscape, their feelings, thoughts and visual resp. audible communication. This *modus operandi* originates from postprocessualism and has earned a great deal of criticism. Doneus also voices his doubts regarding phenomenology and points out that, on the one hand, some aspects of phenomenology can be achieved by using GIS and, on the other hand, a modern researcher can hardly feel the same as a prehistoric human in a landscape; besides, a phenomenologist approach is rather time-consuming, and its applicability is debatable in the light of the drastic change most landscapes have undergone since prehistoric times.

Doneus tries to answer the question of how to unite the two approaches sketched in chapters 12 and 13 in chapter 14 (pp. 301–310). He targets GIS as an integrative method to combine landscape analysis and aspects of perception, especially visibility maps (viewshed analysis). Doneus himself points out the difficulties concering the interpretation of such maps, *e.g.* a lack of knowledge of the palaeo-vegetation, differences in visibility connected with changing seasons or atmospheric conditions and a supposed contemporaneity of settlements due to insufficient methods of precise dating. Also, and this may be even more important, a great number of variables that affect human behaviour and that Doneus names himself (p. 302), such as religious, social and cultural filters, cannot be integrated into this kind of analysis since they are and remain widely unknown.

Part 5 concludes Doneus' comprehensive study with the chapters 15–17 (pp. 311–346). Doneus reflects again on human behaviour, this time taking approaches from sociology into account, especially rational choice theory whose methodological background is explained in chapter 15 (pp. 312–317). This is then tested on two examples in chapters 16 (pp. 318–335) and 17 (pp. 336–346). The first application (chapter 16) is taken from research on ancient roads. The region Doneus selected for this is the Leitha mountains in Lower Austria, for which an extensive network of ancient roads had been discovered in the course of LiDAR scanning of the region. Late Bronze Age / early Iron Age hillforts and ravines crisscrossing the mountains could be located. Employing cost-surface analysis (least-cost-path analysis) resp. friction surface, Doneus discusses the connection of the sites via the old roads and lists possible determining factors for the selection of paths (technology of transport, visibility, taboo zones, places of collective memory, topography, rivers, soil consistency and vegetation, p. 331). The results differ according to different parameters such as slope, visibility and openness / prominence, slope and openness being the most likely factors for the layout of the routes during the late Bronze / Iron Age.

The second example (chapter 17, pp. 336–346) is taken from the monastery St. Anna in der Wüste in the Leitha mountains. Doneus elaborates on environmental parameters of the site and points out that they offer only a limited access to the reasons why the monastery was placed in such a rather remote spot. A comprehensive analysis of written sources and etchings from the time, however, gives insight into the religious rules that were applied when setting up the monastery. The demand for seclusion and the wish to create the outline of the monastery boundaries to resemble a heart can be recognized in the layout of the site. A modeling of visibility and topographic prominence yielded evidence that the surrounding hermitages had a clear view of the monastery and that the church spire was likewise visible from the outside, whereas the monastery itself and its walls were only partly visible. Doneus states that even without the written sources, these factors would have become obvious in the analysis.

Part 6 with chapters 18–19 offers a German summary of the text and an extensive bibliography (chapter 19, pp. 356–398).

With this book, Doneus has certainly set new standards in the field of landscape archaeology. The text is worth reading both for beginners and advanced researchers, offering a broad overview of the subject as well as profound and careful considerations concerning metholodogy. The well-arranged composition of the work adds to its consistent comprehensibility. Although clearly meant for German-speaking readers, an English summary would have been useful especially for researchers from other parts of continental Europe.

It is understandable that most examples used in the book derive from Doneus' own work and his research at the aerial archive at Vienna university and the Vienna Ludwig Boltzmann Institute. He does offer bibliographic information on other works as well, but some important research in the field of landscape archaeology goes unmentioned, *e.g.* the works originating from the Kiel graduate school "Human Development in Landscapes".

The meticulous outline of the course of action one should follow when describing the physical and cultural structure of a landscape, as it is layed out by Doneus in part 2 of the book, is certainly a valuable guideline. One would wish that he would apply this once in one of his examples, but these do not bother with the physical description of the landscape and rather focus on selective aspects.

Nonetheless, the book will certainly become a benchmark in the field of landscape archaeology. Its richness in content, its thorough methodology and its illustrative examples invite any reader to pick it up again and again to explore sections of it in more detail and gain a comprehensive and state-of-the-art overview of a growing field of research in archaeology.

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Sławomir Kadrow*

(review) M. Szmyt (ed.) 2016. *Biały Potok. Materials from Józef Kostrzewski's Podolia Excavations* (= *Bibliotheca Fontes Archaeologici Posnaniensis* 19). Poznań: Archaeological Museum in Poznań; 526 pages

The materials of the Trypillia, the Globular Amphora and Komarów cultures, which were collected in Biały Potok in Podolia in Ukraine by Józef Kostrzewski in the 1920s., have been finally published. Marzena Szmyt has gathered a large, international team of researchers around herself. They are specialists in various fields of archaeological sources. As a result of their research efforts, a comprehensive and competent work was created, which can be distinguished by a high scientific and editorial level. It has issued in Polish and English language version in the respectable publishing series of the Archaeological Museum in Poznań entitled *Bibliotheca Fontes Archaeologici Posnaniensis*, as its 19 volume. Its publication was supported by the funds of the Ministry of Culture and National Heritage in a significant way.

In the *Preface*, Marzena Szmyt briefly described the reasons for undertaking scientific research and the issue of materials excavated in Podolia by Józef Kostrzewski.

Subsequent parts of the work are divided into four parts: I. Introduction (chapters 1–3), II. Settlement of the 4th mill. BC (chapters 4–17), III. Graves of the 3rd and 2nd mill. BC (chapters 18–21) and IV. Recapitulation (chapters 22–24).

In Chapter 1 (*The History and Results of Józef Kostrzewski's Investigations in Biały Potok*), Justyna Cieszewska-Braniecki and Marzena Szmyt have presented the details of excavation research carried out by Józef Kostrzewski in 1925 in Biały Potok. They were supplemented with information on remarks and reports from these studies and on conference presentations where the results of the research team on the discussed materials were presented.

* Institute of Archaeology, University of Rzeszów, Moniuszki 10 Street, 35-015 Rzeszów, Poland; slawekkadrow@gmail.com

Chapter 2 (*Józef Kostrzewski's Notes of the Investigations in Biały Potok*), written by Agata Drejer-Kowalska and Patrycja Silska, is devoted to detailed observations on documentation based on research in Biały Potok in the form of preserved notes and drawings.

Iwona Hildebrandt-Radke in Chapter 3 (*Hydrology and Terrain in the Area of Biały Potok*) describes selected geographical elements of the site and its surroundings in a wider regional background.

Chapter 4 (*Buildings in the Settlement of the Trypillia Culture in the Light of Daub Analysis*), whose authors are Aleksandr Diachenko and Karolina Harat-Strotsen, which begins part II of the work, is devoted to an in-depth analysis of traces of building structures based on daub fragments. Owing to the aforementioned analysis, it was possible to identify the remains of several dwellings, including three houses with two floors which are so characteristic in the Trypillia culture.

Taras Tkachuk, an outstanding expert in the pottery of the Trypillia culture, is the author of Chapter 5 (*Pottery of the Trypillia Culture*). In the analysed collection of pottery vessels, he has distinguished materials from the Shypintsy, Koshylivtsy, Gorodsk, Kasperivtsi, Gordinesti groups and imports from the Badragii group. The author's competent considerations are complemented by numerous drawings (mainly made by himself) in a convention comparable to the best studies of the pottery of the Trypillia culture.

The author of Chapter 6 (*Mineralogical and Petrographic Description of TRypillia Culture Pottery and Daub*), Anna Rauba-Bukowska has analysed 16 pottery sherds and 4 daub lumps in terms of mineralogy and petrography. Detailed technological descriptions of ceramics are accompanied by excellent microscopic images of samples.

The same specialist is the author of Chapter 7 (*Colorants Used in Trypillia Culture Pottery in Biały Potok*). She has presented there the results of dyes analysis used to make a colourful ornamentation on three pottery sherds of the Tripolye culture. It has been found that different types of natural ochre were used for the dyes in these cases.

Items of figural (anthropomorphic and zoomorphic) ceramics and miniature ceramic vessels are presented in Chapter 8 (*Figurine Art Forms and Special Vessels*) by Justyna Cieszewska-Braniecki and Marzena Szmyt.

Andrzej Pelisiak, the author of Chapter 9 (*Flint Materials of the Trypillia Culture*), characterizes a series of artefacts made of chalk flint with almost 5,000 pieces. He describes the raw material issues and presents the general typological characteristics of artefacts. Then he presents a description of flint remains with their division into huts, in the context where they were discovered. Finally, he describes the technological and production procedures. The characteristics made by the author lets him outline the image of flintworking of the Trypillia culture in Biały Potok and review it in a wider background.

Functional issues of flint tools in the light of traseological analysis are discussed in Chapter 10 (*Functional Analysis of Selected Flint Tools*) by Małgorzata Winiarska-Kabacińska. In total, she has analysed 57 tools, including blades, retouched flakes and scrapers. Functional identification of the examined artefacts was supported by extensive and professional discussion of examples taken from almost the entire Eneolithic Europe.

Chapter 11 (*Exploitation of Rock Materials*), written by Mateusz Zieliński and Marzena Szmyt, is devoted to the characteristics of rock raw materials in the collection of artefacts from Biały Potok, in the light of a local geological structure.

Andrzej Sikorski, in Chapter 12 (*Production and Use of Textiles*), deals with the issues of spinning and weaving production and its use. Textile evidence in ceramic impressions, spindle whorls and loom weights have been analysed.

Paleobotanical remains are discussed in Chapter 13 (*Palaeobotanical Sources from the Trypillia Culture Settlement*) by Joanna Koszałka. Wheat and barley evidence has been found.

Analysis of animal bones are presented in Chapter 14 (*Exploitation of Mammals*) by renowned specialist Daniel Makowiecki.

Bone and antler products have been also subjected to microscopic analysis by Małgorzata Winiarska-Kabacińska in Chapter 15 (*Microscopic Analysis of Bone and Antler Artefacts*).

Shells of molluscs have become the subject of Aldona Kurzawska's analysis in Chapter 16 (*Mollusc Shells Analysis*).

Owing to Taras Tkachuk, the author of Chapter 17 (*The Biały Potok Settlement in the Context of Regional Trypillia Culture Groups*), it is possible to find the place of the Trypillia settlement in Biały Potok in the network of regional cultural conditions. The traces of multiphase settlement found in Biały Potok are related to the youngest phase of the Shypintsy group, the younger phase of the Koshylivtsy group and the Kasperivtsy group (from the end of the CI phase to the end of the CII phase of the Trypillia culture).

Marzena Szmyt, together with Chapter 18 (*Grave form the 3rd mill. BC*) begins the third part of the reviewed work. She presents the description and equipment of the grave of the Globular Amphora culture. She also reconstructs the background of this object in the context of regional groups of the aforementioned culture in Podolia.

Przemysław Makarowicz, the author of Chapter 19 (*Graves from the 2nd mill. BC. Komarów Culture Necropolis by the River Seret*), presents three graves of Kamarów culture with the burials of four deceased. Uncovered grave inventory (ceramics, flints, a copper artefact?) has been described together with detailed cultural and chronological identification. Moreover, its place in the network of local cultural references is defined.

The authors of Chapter 20 (*Mitochondrial DNA Analysis of the Bronze Age Indyvidual from Biały Potok*) are Maciej Chyleński and Anna Juras.

Małgorzata Winiarska-Kabacińska, in Chapter 21 (Use-Wear Analysis of a Flint Axe from Grave III), deals with the traseological analysis of an axe found in one of the graves of the Komarów culture.

Chapter 22 (*Absolute Chronology of Settlement and Graves from Biały Potok*), written by Tomasz Goslar and Marzena Szmyt, is devoted to the interpretation of a series of absolute age determinations from Biały Potok by the use of ^{14}C method.

Summarizing comments (emphasizing the importance of research in Bialy Potok) can be found in Chapter 23 (*Prehistoric Settlement in Biały Potok in the Light of Józef Kostrzewski's Investigations*) by Marzena Szmyt.

Przemysław Makarowicz, Jan Romaniszyn, Rafał Skrzyniecki and Robert Staniuk share their impressions (partially sentimental) after their visit to Biały Potok in 2012. The text is enriched with photographs of genre scenes and monuments from this village. All details are in chapter 24 (*Biały Potok 90 Years After*), ending the whole work.

The reviewed book is a well-structured and clearly written work. It is distinguished by rich graphic design. It is part of a series of publications that are not so numerous, which professionally fill up wide gaps in presenting archaeological researchers a set of important sources uncovered a long time ago, which remained in the darkness of museum magazines for a long time due to various historical circumstances.

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Thomas Saile*

Weißes Gold. Anmerkungen zu den jüngsten ethnoarchäologischen Studien über die vorindustrielle Salzgewinnung in der rumänischen Region Moldau

Nachdem bereits in den Fünfzigerjahren des vergangenen Jahrhunderts die erste kupferzeitliche Salzgewinnungsstätte Rumäniens im Kreis Suceava entdeckt worden war (Solca, „Slatina Mare“), verdichteten sich in den Achtzigerjahren Hinweise auf weitere frühe Salzorte im östlichen Karpatenraum und seinem Vorland (Dumitroaia 1987; 1994; Monah 1990). Die Untersuchungen wurden Mitte der Neunzigerjahre durch eine französisch-rumänische Kooperation intensiviert und die gewonnenen Erkenntnisse in der bislang unveröffentlichten Dissertationsschrift von Olivier Weller zusammenfassend dargestellt (Weller 2000, insbes. 56–111). Die Zusammenarbeit fand ihren Höhepunkt in den Gemeinschaftsprojekten zu Archäologie und Ethnologie des Salzes im Ostkarpatenraum, die zwischen 2003 und 2016 durchgeführt wurden.

Im Mittelpunkt nachfolgender Ausführungen steht ein 2016 erschienener Sammelband (Alexianu *et al.* 2016), der aus diesen gemeinsamen Projektarbeiten hervorgegangen ist und eine Zusammenstellung wichtiger, allerdings bereits auch an anderer Stelle publizierter Beiträge bietet. Am Thema Interessierte mögen es als nützlich empfinden, die teils etwas schwerer zugänglichen Darstellungen in einem Werk vereint zu finden. Um einen hinreichend aktuellen Überblick zum Forschungsfeld zu erlangen, sind weiterhin die auf internationale Tagungen (2004, 2008, 2010, 2012 und 2013) zurückgehenden Bände *L'exploitation du sel à travers le temps* (Monah *et al.* 2007), *Archaeology and Anthropology of Salt* (Alexianu *et al.* 2011 b), *Salz und Gold* (Nikolov, Bacvarov 2012), *Salt Effect* (Alexianu *et al.* 2015) und *Archaeology of Salt* (Brigand, Weller 2015) heranzuziehen. Die in diesem Zusammenhang ebenfalls zu beachtende Veröffentlichung zum

* Universität Regensburg, Institut für Geschichte, Lehrstuhl für Vor- und Frühgeschichte, 93040 Regensburg, Deutschland; thomas.saile@ur.de

ersten *International Congress on the Anthropology of Salt* in Iași 2015 befindet sich in Vorbereitung.

Die vorgelegte Sammlung von Einzelbeiträgen kann eine noch ausstehende, abwägende und konzise Synthese der auf lange Sicht fortwirkenden, grundlegenden Untersuchungsergebnisse nicht ersetzen. Diese kann jedoch erst verfasst werden, wenn die Beobachtungen der Geländearbeiten detailliert und umfassend veröffentlicht sind. Die bisherigen Publikationen haben eher den Charakter von Vorberichten. Dadurch bleiben beispielsweise die Möglichkeiten zur Überprüfung teils widersprüchlicher Angaben zur Zeitstellung des archäologischen Fundmaterials oder zu interessanten Befundsituationen bis auf Weiteres noch erheblich eingeschränkt.

Das Sammelwerk besteht aus einem kurzen, einleitenden „Projektteil“ und einem umfangreichen „Beitragsteil“. Zunächst werden die Aktivitäten der französischen und rumänischen Arbeitsgruppen auf etwa 40 Seiten vorgestellt; umfassende Literaturlisten erleichtern den Zugang. Der Hauptteil des Bandes umfasst auf über 500 Seiten 35 Beiträge zu ausgewählten Themen der Archäologie und Ethnologie des Salzes, deren räumlicher Schwerpunkt in den östlichen Karpaten und ihrem Vorland liegt. In zeitlicher Hinsicht stehen vor allem das Neolithikum und die Kupferzeit im Zentrum der Berichte. Außerdem finden sich auch kurze Darstellungen zur Iberischen Halbinsel (S. 67–72), zu Thrakien (S. 329–333) oder zum Vorderen Orient (S. 211–235), wodurch ein etwas heterogener Gesamteindruck entsteht. Der englische Titel des Sammelwerkes lässt zunächst nicht vermuten, dass ein Drittel der Beiträge in Französisch verfasst ist; wenngleich sich diese auf einem sprachlich deutlich höheren Niveau bewegen als ihre Übertragungen in andere Sprachen.

Der etwas isoliert erscheinende deutschsprachige Beitrag (S. 413–429) wurde übrigens bereits 2012 in ähnlicher Form in dem von V. Nikolov und K. Bacvarov herausgegebenen Tagungsband *Salz und Gold* veröffentlicht (Alexianu *et al.* 2012), außerdem im 20. Band der Zeitschrift *Studia Antiqua et Archaeologica* (Alexianu *et al.* 2014). Beim deutschen Text handelt es sich wiederum in wesentlichen Teilen um die Übersetzung eines 2011 erschienenen Tagungsbeitrages von M. Alexianu, O. Weller, R. Brigand, R.-G. Curcă, V. Cotiugă und I. Moga mit dem Titel *Salt Springs in Today’s Rural World* (Alexianu *et al.* 2011 a); dieser Aufsatz ist ebenfalls im hier zu besprechenden Band auf den

Seiten 335–354 enthalten. Als inhaltliche Vorläufer können Varianten der Studie *Ethnoarchéologie des sources salées de la Moldavie précarpatique* (S. 315–328) angesehen werden.

Bei der gewählten Publikationsstrategie, die im Wesentlichen auf der Herausgabe von Tagungsbänden beruht, überrascht es nicht, dass auch verschiedene Abbildungen mehrfach erscheinen. Das für den Umschlag gewählte Foto aus Lunca, „Poiana Slatinei" mit einer stimmungsvollen Darstellung dreier Pferdewagen, die mit Sole beladen werden, erscheint im Buch noch an vier weiteren Stellen (S. 87 Abb. 4, S. 180 Abb. 7,7, S. 379 Abb. 1, S. 550 Abb. 5). Offenbar soll das dem Fundplatz zugemessene Gewicht durch stets wiederkehrende Erwähnung unterstrichen werden. So erscheint ein Übersichtsplan dreimal (S. 55 Abb. 3, S. 163 Abb. 6, S. 194 Abb. 3); ebenso eine Grafik der Radiokohlenstoffdatierungen (S. 56 Abb. 6, S. 165 Abb. 8, S. 194 Abb. 3). Nun mag man die Bedeutung der in Lunca, „Poiana Slatinei" gewonnenen Erkenntnisse durchaus hoch einschätzen, die häufige Wiederholung bildgleicher Inhalte entfaltet jedoch eine ermüdende Wirkung. Auch hinsichtlich der viermal erscheinenden Pferdedarstellung (S. 115 Abb. 14, S. 174 Abb. 3,3, S. 382 Abb. 4,3, S. 455 Abb. 2,C) kann man sich des Eindrucks einer teils redundanten Kompilation kaum erwehren.

Verschiedene Karten, Übersichtspläne und Profilzeichnungen sind teilweise nur schwer deutbar (beispielsweise S. 239 Abb. 3, S. 364 Abb. 9, S. 381 Abb. 3 oder S. 459 Abb. 5). Mit Detailinformationen überladene kartographische Darstellungen bleiben indifferent, unübersichtlich und verwirrend. Hier gilt: Klarheit geht vor Genauigkeit. Sachgerechte Kataloge der Untersuchungsgegenstände bilden die Grundlage wissenschaftlicher Auswertungen. Eine fortlaufende Nummerierung der nach den regionalen Verwaltungseinheiten geordneten Solquellen in den drei Erkundungsberichten *Recherches systématiques autour des sources salées de Moldavie* wäre dem Verständnis der übrigen Textbeiträge sehr förderlich gewesen, da die Quellen dort oftmals nur unter ihren zumeist ähnlich lautenden Flurnamen Erwähnung finden und somit zu Verwechslungen Anlass geben.

Diese kritischen Anmerkungen hinsichtlich formaler Aspekte sollen jedoch keineswegs den Blick auf die bemerkenswerten Forschungsergebnisse der rumänischen Salzarchäologie verstellen, die in den letzten Jahren im Ostkarpatenraum und seinem Vorland erzielt werden konnten. Sie stellen einen komplementären Forschungserfolg zu den Arbeiten im siebenbürgischen Beclean, „Băile Figa“ dar (Harding, Kavruk 2013).

Ein Schwerpunkt der Projektarbeiten lag auf einem ethnoarchäologischen Ansatz, dessen komparatives Potential bereits in Studien aus den frühen Neunzigerjahren des letzten Jahrhunderts zu erkennen war (Alexianu *et al.* 1992). Mittlerweile konnten im Rahmen eines intensiven ethnologischen Feldforschungsprogrammes über 250 Solquellen in der Region Moldau festgestellt und 89% der Lokalitäten dokumentiert werden (vgl. ergänzend Weller, Brigand 2016), von denen wiederum 21 besonders hervorgehoben wurden (Übersicht der bedeutendsten Solquellen auf S. 178. – Vgl. dazu bereits auf Rumänisch Alexianu *et al.* 2008 b [S. 162 Abb. 6] und auf Französisch Alexianu *et al.* 2008 a [S. 59 Abb. 6]). Durch Befragung von über 200 Informanten wurden außerdem Daten zur gegenwärtigen Gewinnung und Verarbeitung der Sole einschließlich der Kristallisationsprozesse, zur Lagerung des Salzes und zu seinem Transport sowie hinsichtlich Austausch und Verwendung sowie schließlich zu seiner Symbolik und Nutzung in der Volksmedizin erhoben. Dabei konnten unterschiedliche Arten der traditionellen, vorindustriellen Nutzung von Solquellen beobachtet und verschiedene räumliche Austauschnetzwerke beschrieben werden. Während die Sole geeigneter Quellen üblicherweise nur im lokalen oder regionalen Rahmen transportiert wurde, sind für Krisenzeiten Transporte von Salzwasser in Entfernungen von bis zu 100 km belegt. Nach Verdunstung des Wassers wurde die noch feuchte Salzmasse (*huscă*) zu besser austausch- und lagerbaren Salzbarren getrocknet und durch Zwischenhändler über Distanzen von bis zu 300 km transportiert. Ein Kilogramm Siedesalz erbrachte zwei bis drei Kilogramm Weizen (S. 425). Gegenwärtig erfolgt die Verwendung geschmacklich und qualitativ als geeignet erscheinender Sole vor allem zur Konservierung von Gemüse und Herstellung bestimmter Käsesorten (*telemea*). Leider lassen die ethnographischen Studien quantitative Angaben zum Ausmaß der periodischen Solquellen-Nutzung vermissen. So bleibt unklar, wie viel Sole in welchem Zeitraum regelmäßig abtransportiert wird.

Das Streben nach Salz führte in Mittelalter und früher Neuzeit vielerorts zu einer intensiven Nutzung der Rohstoffvorkommen und zu beachtlichen technischen Entwicklungen. Bedauerlicherweise wird die faktenreiche salinistische Literatur in den durchgeführten ethnographischen Arbeiten aber gar nicht zur Kenntnis genommen. Dies wäre jedoch erforderlich gewesen, um beispielsweise die wirtschaftliche Bedeutung lokaler bäuerlicher Solquellennutzung richtig einschätzen zu können. Hinsichtlich Galiziens und der Bukowina hätte man beispielsweise erfahren können, dass im 18. Jahrhundert an über 200 Orten mehr als 600 Solquellen und -schächte bekannt waren. In über 100, zumeist verpachteten Salinen unterschiedlicher Größe wurden jährlich etwa 57.000 Tonnen Salz in einem Gegenwert von fast 900.000 polnischen Gulden produziert und teils weit nach Litauen, Wolhynien und Podolien sowie in die weitere Ukraine und die Walachei verhandelt (Kelb 1876. – Zur Bukowina vgl. insbesondere die geologische Übersichtskarte in Fischer 1899).

Auf die Problematik des archäologischen Nachweises einer saisonalen Salzgewinnung mit einfachsten Mitteln muss hier nicht vertiefend eingegangen werden: Der kurzfristige Aufenthalt einer kleineren Menschengruppe an einer Solquelle, die verschiedene Behältnisse mit Salzwasser befüllt und auf Wagen abtransportiert, hinterlässt in der Regel keine langfristig nachweisbaren eindeutigen Spuren. Dennoch ist ein vergleichend-ethnographischer Ansatz für die archäologische Forschung insbesondere wegen seiner Möglichkeit zum Analogieschluss interessant (Ickerodt 2010): Nicht mehr zu beobachtendes menschliches Kulturverhalten wird durch gegenwärtige Feststellungen zu den materiellen Konsequenzen kulturellen Handelns ergänzt, um verallgemeinerbare Aussagen abzuleiten. Für die allgemein-vergleichende Analogiebildung ist es vorteilhaft, trotz einer unterbrochenen regionalen Kulturtradition, Unterschiede und Gemeinsamkeiten in ähnlichen Naturräumen zu erkennen ohne Beispiele aus weit entfernten Regionen heranziehen zu müssen.

Spuren vorgeschichtlicher Salzgewinnung wurden an 21 Solquellen des Moldauischen Karpatenvorlandes beobachtet (S. 457); abweichende Angaben nennen 14 (S. 401) oder 15 (S. 309 f. Abb. 42–43, S. 414 Abb. 1). Neun Solquellen wurden bereits im Neolithikum beziehungsweise in der Kupferzeit genutzt (Weller, Brigand 2016, 252 Abb. 47). Weitere Quellen dürften sich wegen günstiger Eigenschaften wie Salzgehalt, Schüttung, Zugänglichkeit etc. für eine vorgeschichtliche Nutzung geeignet haben; ihr Anteil liegt möglicherweise bei etwa 20% der bekannten Solquellen (S. 458 ff.). Die archäologischen

Arbeiten konzentrierten sich auf den Kreis Neamț und die nördlich und südlich angrenzenden Kreise Suceava und Bacău. An acht Stellen wurden Solquellen und ihr unmittelbares Umfeld in mehr oder weniger begrenzten Ausschnitten archäologisch näher untersucht: Solca, „Slatina Mare“, Cacica, „Salina“, Lunca, „Poiana Slatinei“, Oglinzi, „Băi“, Țolici, „Hălăbutoaia“, Gârcina, „Slatina Cozla“, Negritești, „Slatina Mare“ und Cucuieți, „Slatina Veche“ (Abb. 1). Die räumliche Nähe zwischen Starčevo-Criş-, Präcucuteni- oder Cucuteni-Fundstellen und verschiedenen Solquellen wie z. B. Lunca, „Poiana Slatinei“ oder Oglinzi, „Băi“ wurde schon früh hervorgehoben (Weller 2000, 102 Abb. 36. – Vgl. auch S. 161 Abb. 4). Allerdings sind beide Fundkategorien in der Region Moldau zahlreich. Die allgemeine Übersichtskarte auf S. 17 (ebenso S. 456 Abb. 3) oder die großmaßstäbigere Karte auf S. 399 lassen eine Verdichtung der Solquellen in den östlichen Ausläufern der Karpaten erkennen, während neolithische und kupferzeitliche Siedlungen vorwiegend in den östlich anschließenden Ebenen verbreitet waren und sich hier wiederum auf den fruchtbaren Tschernosemen konzentrierten. Hinsichtlich der kartographischen Auswertungen erscheint dem Rezensenten die oftmals vorgenommene Zusammenfassung der Jahre zwischen 6000 und 3500 v. Chr. zu einer zeitlichen Einheit als eine zu grobe Bezugsgröße, die räumliche und zeitliche Feinheiten der Besiedlungsgeschichte sowie ihre mögliche Verzahnung mit der Salzgewinnung nicht hinreichend detailliert zu erkennen gibt (vgl. beispielsweise die Karten S. 17 Abb. 1 = S. 456 Abb. 3, S. 149 Abb. 40, S. 266 Abb. 2 und S. 364 Abb. 9).

An anderer Stelle wird die neolithische und kupferzeitliche Bevölkerungsentwicklung als ein zunehmend dynamisches System dargestellt (S. 405 ff. Abb. 4), das vor allem durch einen signifikant geringen Anteil bandkeramischer Fundstellen charakterisiert ist, der allerdings durch die bei geringerer Materialkenntnis gegebene Möglichkeit zur Verwechselung mit Präcucuteni-Material teilweise erklärt werden kann. Dabei variieren die Fundstellenzahlen (insgesamt 1437) bezogen auf die gewählten Zeitscheiben bei ähnlicher Epochenlänge ganz erheblich (S. 457). Während die Dauer der Epochen um den Faktor 2 voneinander abweicht, unterscheiden sich die Fundstellenzahlen im Höchstfall um den Faktor 11:

– Starčevo-Criş (700 Jahre, 6000–5300 v. Chr.) = 13% (n = 191),
– Bandkeramik (300 Jahre, 5300–5000 v. Chr.) = 4% (n = 56),
– Präcucuteni (400 Jahre, 5000–4600 v. Chr.) = 8% (n = 109),

– Cucuteni A (500 Jahre, 4600–4100 v. Chr.) = 43% (n = 620),
– Cucuteni A-B und B (600 Jahre, 4100–3500 v. Chr.) = 32% (461).

Die Zahl der in den genannten Phasen des Neolithikums beziehungsweise der Kupferzeit genutzten Solquellen ist recht gering und schwankt zwischen zwei und sieben (Weller, Brigand 2016, 199 Tab. 1). Beispielsweise soll in Starčevo-Criş an drei, während der Bandkeramik an zwei und in der Stufe Cucuteni B an sieben Quellen Salz gewonnen worden sein.

Das Solquellengebiet am Fuße der Karpaten wurde in den westlichen Saum des Präcucuteni-Cucuteni-Kulturraumes einbezogen. Eine landschaftsarchäologische Studie scheint eine Abhängigkeit zwischen der Siedelplatzwahl und der Nähe oder dem Salzgehalt einer Solquelle festgestellt zu haben (S. 431–440). Dieser behauptete Zusammenhang besteht jedoch keineswegs: Kupferzeitliche Siedlungen wurden bevorzugt auf guten Böden in Höhen um 350 m auf leicht nach Südosten geneigten Hängen mit guter Wasserversorgung angelegt. Zudem befinden sich 70% der 129 in die Studie einbezogenen kupferzeitlichen Siedlungen weniger als 10 km von der nächsten gegenwärtig bestehenden Solquelle (n = 41) entfernt, wobei allerdings die weitere Umgebung der Solquellen wegen ihres eine Besiedlung zumeist abweisenden Charakters gemieden wird. Dieser Wert wird durch die Dimensionierung des Untersuchungsgebietes – hier der Flächeninhalt eines Kreises mit Radius von 30 km und Mittelpunkt in der Solquelle von Lunca, „Poiana Slatinei" – maßgeblich beeinflusst. Er ist entsprechend leicht durch eine Veränderung der in die Untersuchung einbezogenen Fläche bei gleichbleibender Bezugsgröße (41 Punkte) zu variieren und damit aussagelos.

Insofern handelt es sich auch bei einem etwas anders gelagerten Gedankenspiel, das einen engen Zusammenhang zwischen Rohstoffvorkommen (Solquellen), Macht (Befestigungen) und Wohlstand (Kupfergegenstände) festgestellt zu haben vermeint, eher um die Diskussion von Scheinkorrelationen als um den Nachweis voneinander abhängiger Variablen (S. 453–470). Über wichtige quellenkritische Gesichtspunkte, die eine vertiefte Diskussion erfordert hätten, wird mit einer irritierenden Nonchalance hinweggegangen; und zwar hinsichtlich:

– des konkreten Nachweises einer Solquellennutzung in den behandelten Zeiträumen,
– der Fundumstände bestimmter Fundgattungen und des Einflusses von Überlieferungsfiltern auf das Fundbild,

– des Charakters und der Zeitstellung der Befestigungen,
– der Begrenzung des Arbeitsgebietes und seines Einflusses auf die Ergebnisse räumlicher Analysen.

Das Fehlen der behaupteten Beziehung zwischen der Verbreitung von Kupferäxten und den neun in Jungstein- bzw. Kupferzeit genutzten Solquellen wird im Übrigen durch eine von der Projektgruppe erstellte Karte nachdrücklich vor Augen geführt (Weller, Brigand 2016, 252 Abb. 47).

Der nordöstliche Karpatenbogen ist aufgrund seiner geologischen Beschaffenheit durch einen beachtlichen Salzreichtum charakterisiert (Bukowski 2013, 30 Abb. 2.2; Harding 2014, 592 Abb. 1). Eine Vielzahl von Sol- und Mineralquellen ist bekannt. Allein in Rumänien wird ihre Zahl auf 3.000 geschätzt (S. 547). Einige wurden nachweislich in vorgeschichtlicher Zeit genutzt. Sie erstrecken sich von Rumänien über die westliche Ukraine (Novoselycja/Tarasivka, „Királyvölgy“: Harding, Kavruk 2013, 159–167 Abb. 5.3–5.12) bis ins südliche Polen, wo kürzlich eine Produktionsstätte nahe Tyrawa Solna untersucht werden konnte (Dębiec *et al.* 2015). Die hier näher zu betrachtenden Fundplätze in der Region Moldau konzentrieren sich in drei Gebieten (Übersichtskarte S. 546 Abb. 1): Im Zentrum des Kreises Suceava, im Norden des Kreises Neamț und im Nordosten des Kreises Bacău.

Angesichts der Bedeutung des Untersuchungsgebietes für die frühe Salzgewinnung und der Projektdauer überrascht der geringe Umfang archäologischer Geländearbeiten, die sich zudem auf wenige Plätze beschränkten. Irritierend ist der Mangel an überzeugend dokumentierten Befunden und an aussagefähigen Abbildungen des geborgenen Materials. Die Sprödigkeit der technischen Keramik mag diesen Umstand teilweise erklären. Für ein vertieftes Verständnis der technischen Prozesse sowie der regionalen Besonderheiten bleibt eine ausführliche Materialvorlage allerdings unverzichtbar. Immerhin wirkten die verschiedenen Aktivitäten rund um das Thema Salz inspirierend auf in der Region tätige Archäologen, die sich mancher Salzstätte annahmen. Nachweise früher Aktivitäten an den Solquellen gelangen an folgenden – von Norden nach Süden aufgezählten – Fundstellen:

Die in siedlungsungünstigem Gelände in 654 m Höhe gelegene Salzgewinnungsstätte von Solca, „Slatina Mare“ wurde bereits Mitte des 20. Jahrhunderts durch den Geowissenschaftler Ion Șandru untersucht und erbrachte Material der Stufen Starčevo-Criș (fraglich), Präcucuteni III, Cucuteni A und B sowie Hallstatt. Mit dem Cucuteni–Tripolje-Kulturkomplex sind große Mengen an *briquetage* zu verbinden. Der Verweis von N. Ursulescu (1977) auf Starčevo-Criş-zeitliches *briquetage* ist wohl nicht zutreffend. – Im Bereich eines modernen Steinsalzbergwerkes in Cacica, „Salina“ wurden mehrere Ablagerungen von bis zu 0,8 m Mächtigkeit aus Cucuteni-B-Keramik, *briquetage*, Cucuteni-„Typ-C“-Ware sowie Holzkohle und Asche festgestellt.

Die Fundstelle Lunca, „Poiana Slatinei“ liegt mit einer Ausdehnung von ca. 2 ha in einem Besiedlung abweisenden, hügelig-rauen Gelände in einer Höhe von etwa 500 m (Plan und Übersichtsfoto: Dumitroaia 1994, n. S. 8 Abb. 2; 10 Abb. 3,1. – Aktueller Übersichtsplan der Grabungsschnitte: Diaconu 2016, 158 Abb. 32,1). Eine ovale, künstliche Aufschüttung aus Verbrennungsrückständen und Überresten von Feuerstellen, die sich über eine Fläche von 60×25 m erstreckt und eine Höhe von über 3 m erreicht, wurde seit 1983 in mehreren Kampagnen untersucht. Sie wird als Bereich A bezeichnet (Dumitroaia 1987, 1994; Monah 2015, 113 f.; Preoteasa 2015, 139). Die Ausgrabungen erbrachten aus über 50 stratifizierten Horizonten Material der Kulturkomplexe Starčevo-Criş (Sufen IIIb–IVa), Bandkeramik, Präcucuteni II und III, Cucuteni A und B, Komarov-Costişa, Noua und Hallstatt sowie jüngerer Epochen (Profile der kleinen *sondage S 1.02 élargi* von 4×5 m aus dem Jahre 2004: S. 196 f. Abb. 5–6). Radiokohlenstoffdatierungen bestätigen die zeitliche Einordnung der untersten Schichten des Hügels in die erste Hälfte des 6. Jahrtausends v. Chr. *Briquetage* tritt erst in Cucuteni-Fundzusammenhängen auf; für ältere Zeitstufen ist mit archaischeren Formen der Solenutzung zu rechnen (S. 371–378. – Vgl. Sordoillet *et al.* 2018). Diese Beobachtung besitzt auch für die übrigen frühen Salzorte im Osten Rumäniens Gültigkeit. Der hohe Anteil an muschelgemagerter Cucuteni-„Typ-C“-Keramik wird von Dan Monah (2015) mit einer mutmaßlich saisonalen Salzproduktion und Bevölkerungsgruppen der nordpontischen Steppengebiete in Verbindung gebracht. Es wird angenommen, dass das kupferzeitliche Produktionszentrum in Lunca – möglicherweise nur vorübergehend in der Stufe Cucuteni B – von der etwa 6 km südöstlich gelegenen Siedlung Târgu Neamţ, „Dealul Pometea“ kontrolliert wurde. – Unmittelbar südlich an den Bereich A angrenzend befindet sich die moderne, hochgrädige Solquelle. Aus dem etwa 25 m nordöstlich gelegenen Bereich B werden Starčevo-Criş-Funde und „*quelques vestiges du Rubané*“

erwähnt (S. 193. – Vgl. Dumitroaia 1994, 49, Abb. 39,3); außerdem wurde Cucuteni- sowie bronze- und hallstattzeitliches Material gefunden. Die Fläche B wurde im Jahre 2000 durch eine Arbeitsgruppe unter Leitung von John Chapman magnetisch prospektiert und eine Sondagegrabung unternommen. Der östlich der Solquelle gelegene Bereich C erbrachte latènezeitliches Material.

Etwa 30 m südlich der Solquelle von Oglinzi, „Băi" (auch als Baile Oglinzi bezeichnet) wurden etwa 390 m ü. M. Präcucuteni-II-Funde gemacht (Băi I); Feuerstellen konnten hier nicht beobachtet werden. In geringer Entfernung wurde Starčevo-Criş-Material gefunden (Băi II). Etwa 500 m östlich der Solquelle von Oglinzi, „Băi" bestand in der späten Urnenfelderzeit eine Siedlung der Noua-Kultur, die den Zugang zu dieser und einer benachbarten Quelle in Oglinzi, „Fântâna Corugea" kontrolliert haben mag (Diaconu, Dimitroaia 2016). Eine überzeugende Begründung für die These einer wie auch immer gearteten ökonomischen Kontrolle beziehungsweise politischen Herrschaft fehlt und ist grundsätzlich in jedem Einzelfall zu fordern. Der allgemeine Verweis auf eine vage räumliche Nähe zwischen Quelle und zuweilen befestigter Siedlung offenbart ein eher geringes Reflexionsniveau. – Die mehrperiodige Siedlungsstelle Oglinzi, „Cetăţuia" (392 m ü. M.) erbrachte neben Starčevo-Criş- und Cucuteni-zeitlichen Funden möglicherweise auch einige bandkeramische Stücke. Sie ist unweit der Solquelle von Oglinzi, „Sărături" und nur etwa 1 km nördlich der Solquelle in Lunca, „Poiana Slatinei" gelegen.

Etwa 40 m nördlich der Solquelle Ţolici, „Hălăbutoaia" (376 m ü. M.) liegt auf dem rechten Ufer des Slatina-Baches ein Hügel mit einem Durchmesser von ca. 35 m (Übersichtsplan S. 239 Abb. 3 = S. 499 Abb. 2). Während der Ausgrabung unter Leitung von Gheorghe Dumitroaia im Jahre 2007 wurde eine 8 m mächtige stratigraphische Schichtenfolge aus Verbrennungsrückständen und Keramik untersucht, die vom Neolithikum (Starčevo-Criş-Komplex, Linienbandkeramik [Dumitroaia *et al.* 2008, 219 Abb. 15]) über das Chalkolithikum (Präcucuteni II, Cucuteni A und B) bis in die Bronzezeit reicht (schematisches Profil der Ausgrabung auf S. 500 Abb. 3. – Vgl. Sordoillet *et al.* 2018, 49 Abb. 3). Neben Lunca ist Ţolici die einzige Salzproduktionsstätte, die einen umfangreichen Starčevo-Criş-Materialkomplex erbrachte. Insgesamt wurden 1,5 Tonnen Keramik geborgen, darunter zahlreiche *briquetage*-Fragmente und Cucuteni-„Typ-C"-Ware.

Die Salzproduktion soll von ca. 6000 bis 3500 v. Chr. betrieben worden sein. Vegetationsgeschichtliche Untersuchungen zeigen zwischen 5500 und 4000 v. Chr. im Pollendiagramm Entwaldungsprozesse, die mit der Gewinnung von Brennmaterial für die Salzproduktion in Verbindung gebracht werden. Wie in Lunca wurden auch in Ţolici keine Spuren einer längerfristigen Besiedlung beobachtet. Dies könnte die Annahme einer nur saisonalen Nutzung der in siedlungsabweisendem Gelände befindlichen Solquellen stützen. Etwa sechs Kilometer nordwestlich von Ţolici liegt unweit Grumazesti (324 m ü. M.) eine bedeutende Siedlung des Starčevo-Criş-Komplexes. Somit ergibt sich hier die bislang ungenutzte Möglichkeit, durch einen Vergleich benachbarter Fundinventare Ähnlichkeiten und Unterschiede herauszustellen, die möglicherweise mit funktionalen Aspekten von Siedlungstätigkeit und Salzgewinnung erklärt werden können. Die Kenntnis der Solquellen von Ţolici und Lunca in bandkeramischer Zeit ist durch mehrere charakteristische Keramikbruchstücke im weiteren Quellbereich belegt. Sie bezeugen aber wohl eher ein allgemeines Interesse an der geologischen Besonderheit und sicherlich auch eine lokale Verwendung der Sole als eine eigenständige Salzproduktion im größeren Maßstab. Rund sieben Kilometer nördlich von Ţolici liegt die bekannte bandkeramische Siedlungsstelle von Târpeşti (Marinescu-Bîlcu 1981). Die nächste Präcucuteni-Siedlung befindet sich zwei Kilometer entfernt am Friedhof von Ţolici.

Im Zentrum des Kreises Neamţ wurde 2005 in Gârcina, „Slatina Cozla" ein Hügel von 15 m Durchmesser und 1,5 m Höhe untersucht. Eine Cucuteni-B-zeitliche Salzgewinnung konnte durch *briquetage*-Funde und Cucuteni – „Typ-C" – Ware wahrscheinlich gemacht werden (Garvăn, Munteanu 2012, 511 f. Nr. 8 Abb. 4). – Im Süden des Kreises Neamţ soll die Nutzung der Solquelle von Negriteşti, „Slatina Mare", von der Cucuteni-B-zeitliches *briquetage* überliefert ist, durch die in 2–3 km Entfernung gelegene Cucuteni-A-und-B-zeitliche Siedlung von Negriteşti, „Movila Flocoasă" kontrolliert worden sein.

Im Norden des Kreises Bacău konnte in Cucuieţi, „Slatina Veche" Salzgewinnung seit dem frühen Neolithikum nachgewiesen werden. Zwei benachbarte Hügel erbrachten Material der Zeitstufen Starčevo-Criş, Präcucuteni III und Cucuteni A sowie der Bronze- und Eisenzeit. Allerdings wurde bislang kein *briquetage* gefunden. – Etwa 14 km südlich liegt verkehrsgünstig der kupferzeitliche Tell Poduri, „Dealul

Ghindaru“ (Präcucuteni II und III, Cucuteni A und B). Er ist weniger als 2 km von der nächsten Solquelle entfernt. In größerer Nähe befinden sich zwei Cucuteni-A-zeitliche saisonale Plätze, die in Abhängigkeit vom regionalen Zentralort gestanden haben könnten, der die gesamte Kleinregion Tazlăul Sărat dominierte (Monah 1990, 293 f.; Preoteasa 2015).

Im vorletzten Beitrag des hier besprochenen Sammelbandes wird vorgeschlagen, die Solquellen im Osten Rumäniens in die Liste des Weltkulturerbes aufnehmen zu lassen (S. 545–555). Ohne die Bedeutung der jüngsten Entdeckungen im östlichen Karpatenbogen und seinem Vorland gering zu schätzen, erscheint dem Rezensenten dieses Anliegen jedoch nur erfolgversprechend, wenn zugleich weitere bedeutende Stätten früher Salzgewinnung in Europa in einem gehaltvollen Antrag Berücksichtigung fänden. Nur durch eine in räumlicher und zeitlicher Hinsicht weite Perspektive lassen sich der mit einer frühen Salznutzung verbundene Ideen- und Erfindungsreichtum sowie das ganze technische Spektrum früher Produzenten und die Distributionswege des gewonnenen Salzes unter Berücksichtigung regionaler Besonderheiten anschaulich sichtbar machen.

Angesichts der zahlreichen noch unbeantworteten Fragen zum prähistorischen Salz in Ostmitteleuropa sollte die Beschäftigung mit dem Thema eine Fortsetzung erfahren. Bedeutsam erscheint dabei eine stärkere methodisch-theoretische Auseinandersetzung mit den Begriffsfeldern Rohstoffgewinnung und -verarbeitung, Austausch und Handel, Macht und Herrschaft. Zudem ist es nützlich, deutlich zwischen einer regionalen Kenntnis über Solquellen und ihrer lokalen Nutzung einerseits sowie der Produktion verhandelbarer Salzbarren andererseits zu unterscheiden. Der Nachweis einer regionalen Salzproduktion lässt sich durch besondere technische Einrichtungen oder eine spezifische Keramik erbringen. In der Region Moldau tritt *briquetage* erst im Cucuteni-B-Zusammenhang auf. Dies entspricht grob der einsetzenden *briquetage*-Verwendung in Mitteleuropa (Saile 2012). Zuvor sind die Solquellen sicherlich bereits regional bekannt und auf lokaler Ebene mag Sole genutzt und gegebenenfalls auch abtransportiert worden sein. Eine Produktion, die über den lokalen Rahmen hinausweist, setzt jedoch in der Moldau erst in der ersten Hälfte des 4. Jt. v. Chr. ein.

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Michał Dzik*

Straying from the Path of Research into the Magic and Funerary Rites of Early Medieval Slavs

[**Joanna Wawrzeniuk, Magia ochronna Słowian we wczesnym średniowieczu na ziemiach polskich** (**Slavic Protective Magic in the Early Middle Ages on Polish Territories**), Wydawnictwo Uniwersytetu Kardynała Stefana Wyszyńskiego, Warsaw 2016, pp. 517]

When I began writing my review of Joanna Wawrzeniuk's publication, I had planned to refer to the entire book. Nonetheless, due to the scale of the encountered substantive errors and overinterpretation of the sources, the rectification of which would have taken too much space, I came to the decision to limit my discussion to only one part, on a subject in which I am especially interested, i.e. funerary rites. The majority of the following article is dedicated to this topic.

The author's objective in the writing of the discussed study was an attempt "at inquiring into the dualistic structure of thinking among the early medieval Slavs by analysing the apotropaic observances they performed" (p. 15)[1]. It should be emphasized that J. Wawrzeniuk is tackling exceptionally difficult and ambitious subject matter, the study of which requires extensive knowledge and skill. The author has provided a clear chronological and territorial range, covering an area within the current Polish borders (to the exclusion of the north-eastern part, inhabited in the studied period by the Balts) between the 7th and the 13th centuries (p. 17). Archaeological materials were the main source for the considerations, with the analysis focusing on "written accounts, ethnographic notes and analogies from comparative religious studies" (p. 15). The author also made use of the results of various linguistic studies.

[1] All quotations in this article as well as the titles of the chapters in the reviewed book are translations of the original Polish texts (see Polish version of the paper in this volume).

* Institute of Archaeology, University of Rzeszów, Moniuszki 10 Street, 35-015 Rzeszów, Poland; mdzik@archeologia.rzeszow.pl

The publication is divided into eight chapters, of which the last one is a summary. It is supplemented by two annexes: a list of the medieval cemeteries lying within the current Polish borders that were taken into account in the publication and a list of Slavic early-medieval places of cult from this area, known from archaeological studies. Yet another element of the book is the quite extensive (128-page) catalogue of archaeological sources referred to in the publication, which – according to the author – attest to the practice of protective magic.

The first chapter of the study contains a discussion of the referenced sources and of the state of research into magical thinking among the early-medieval Western Slavs. As J. Wawrzeniuk rightly notes, the current state of research into the topic leaves much to be desired as interest thus far in this topic in academic circles has been quite limited. The next two chapters present various theoretical issues, such as the definitions of magic and spells and a characterisation of magical thinking. In the third chapter, the author also discusses a series of measures to protect one from harmful practices that employ magic (pp. 38–47). Moving on to the sources from the studied period, she states "it was believed [on Slavic lands – MD] that bloody sacrifices of people and animals were preferred by the deities, followed by offerings of plants and objects" (p. 42). To corroborate this conclusion, the author quotes a few sources that mention such sacrifices, including the chronicles written by Thietmar, Cosmas, Helmold (Wawrzeniuk incorrectly discusses Cosmas's text as having been written in the second half of the 10th century – fn. 12, while it, in fact, originates from the first quarter of the 12th century). However, she did not take into account that information about human sacrifices in some of the descriptions of the Slavs might have resulted from the use of a topos functioning among Christian authors writing about pagan customs. It might also have been introduced as an accusation to add barbaric features to the opponent the particular chronicler was describing. It is obvious that the discussion lacks even an attempt at a critical approach to the cited written sources. The conclusion formulated by J. Wawrzeniuk does not become any more credible through her reference to the account of Adam of Bremen, discussing non-Slavic customs in Swedish Uppsala (p. 43).

In my opinion, a significant flaw of the publication is the layout of the content adopted in her discussion of the particular issues. As can be deduced based on the information provided in the introduction, J. Wawrzeniuk has adhered to the following scheme: "firstly, ethnographic sources will be presented, if need be – linguistic sources, next – written ones, and finally – the appropriate archaeological sources" (p. 16). The very assumptions of such an arrangement raise some doubt as they lead to the risk of bringing 19th and 20th century ethnographic material to the foreground. They do have some significance for the researched topic; however, they perform a supplementary role in relation to sources from the era. Further analysis of J. Wawrzeniuk's book confirms that indeed ethnographic materials are the bases of the publication.

Chapters 4–6 constitute a fundamental part of the book, dedicated to a discussion of magical protective practices performed, respectively, in the house, at the cemetery and in places of cult. In the rest of my review, I will concentrate on providing an analysis of the content of Chapter 5 ("The apotropaic role of magical practices conducted at cemeteries"), referring to the remaining parts of the book only when necessary.

Chapter 5 consists of five subchapters preceded by an untitled few-page-long introduction. The reader can find information concerning such issues as the Slavic perception of the afterlife, supplemented by a list of practices known from ethnographic material, performed by the deceased person's close ones following his or her death. The way in which J. Wawrzeniuk constructs her narration in this part means that readers without sufficient knowledge of the methods of critical analysis of sources might wrongly consider many of the descriptions based on 19th–20th century observations as referring to the Slavs in the period up until the 13th century.

The overwhelming dominance of ethnographic descriptions is especially visible in subchapter 5.1 ("Apotropaic symbolism of the deceased in rituals of passage"; pp. 171–174). The reader can find a short theoretical discussion of the stages of funerary rites understood as rituals of passage, as well as a list of ethnographic customs corresponding to these stages. Among other things, these are linked to the family's behaviour following the death of a family member, the method of carrying the coffin from the house to the cemetery, the necessity of having a wake or the appropriate conduct during the mourning period. However, the chapter contains no references whatsoever to any written accounts or archaeological material. In the paragraph summarizing the passage of the book on contemporary customs, we read that "the quoted example of the existence of 'rituals of passage' in the ethnographic material from the 19th and beginning of the 20th century might have had its place in the Slavic funerary rites in the Early Middle Ages" (pp. 173–174). J. Wawrzeniuk summarizes a similar listing of folk traditions linked to death in the introduction to the chapter in the following manner: "the above-described ethnographic material, which comes mainly from 19th century studies, suggests that similar symbolic and magical practices might already have been in use in the Early Middle Ages" (p. 169). How does it suggest such a conclusion? What premises do we have that would allow for the claim that the many practices accompanying the act of carrying the coffin with the body to the cemetery (p. 171) were already in use in the Early Middle Ages? Over the hundreds of years that separate the 19th and 20th centuries from the Early Middle Ages, many new customs and traditions appeared as a result of the evolution of religious rituals, as well as of changes in the belief system, social situation and other aspects (cf. Wiślicz 2001, 161 f.; Burke 2009). Iconography might have been one inspiration for such changes, including religious representations adorning churches and content propagated through pamphlets, preachers or even so-called wandering storytellers (cf. Michajłowa 2010, 216 f. *passim*). These customs might have had a local genealogy or incoming German, Jewish, Vlach, Rus', Dutch and other settlers may have instilled them in different regions. The reviewed publication lacks any discussion of this issue. In fact, quite the contrary, the scheme used in the book to discuss many of the issues related to the belief system and magical practices adheres to the following pattern. Firstly, the reader receives a list of various ethnographic observations, sometimes diversified by adding some information from different époques, which the author then summarizes by stating that many modern-day customs might have pre-Christian roots. Due to the omission of a critical analysis of the ethnographic material, treating them as a source in a discussion of the Early Middle Ages is a serious methodological mistake.

This is the point at which yet another problem emerges in the way in which J. Wawrzeniuk uses ethnographic materials in the publication. In the case of particular issues, the author only lists the customs, on rare occasions also providing the region in which these observances were practiced. We read for example that "in Germany, as of the Middle Ages, we know of the imperative to cease working and to abstain from washing oneself or spinning when a member of the household dies" (p. 169, fn. 12). What does this information, quoted after Adam Fischer (1921), add to the analysis? The reader will not be able to deduce whether this data also applies to the regions inhabited by the Slavs or from which part of this long historical period the mention in the sources comes from or even what the context of writing it down was. The reviewed book is full of such statements as: “in order to expedite death, the person in the process of dying was placed on the ground, pillows were taken out from under his head” (p. 166); “the deceased person was taken out through a special opening in the roof, and – if it was missing – through the smoke hole or the hut’s collapsed wall” (p. 171), etc. Such a presentation of this category of sources in a discussion of issues related to the Early Middle Ages would perhaps be sufficient if it only served to indicate certain possible human behaviours or customs. If, however, the ethnographic sources are to be one of the bases for proving the existence of these customs in the Early Middle Ages (and this is how the author treats them), then they should be subjected to criticism that would take into account such aspects as the place and time of acquiring the information, the available knowledge on the history of the countryside and the origins of its inhabitants or the scale of the dissemination of the custom in the 19th and 20th centuries. Their analysis should be supplemented by a discussion of written sources that would indicate the roots of certain customs and any information on their presence in Western Slavdom in the Middle Ages and in modern times. However, a search for any semblance of source criticism in J. Wawrzeniuk’s book would be in vain; thus, the propounded suggestions about 19th century traditions being rooted in the Early Middle Ages are simply meaningless verbiage.

However, this does not signify that J. Wawrzeniuk does not compare ethnographic sources with written ones. The reader will find references within the discussed publication to the latter, including to early and late medieval accounts, as well as to modern ones. Unfortunately, the author frequently quotes descriptions that refer to other ethnic groups as arguments that could serve as a bases for the reconstruction of the world of Slavic beliefs. For example, we learn that “Polabian burials in the shape of stone boats or Rus’ boat burials, tying into Ibn Fadlan’s description of a funeral, as well as mention of Olga’s revenge and the burial of the Drevlians in a boat, might attest that the land of the dead could be located across the water” (p. 168). It is not about whether the concept of the localisation of the land of the dead across the sea has sound foundations but rather about the choice of arguments. As

J. Wawrzeniuk is well aware, the quoted description of a funeral does not refer to Slavs but to Scandinavian Rus' people. It is also difficult to consider the story of the Drevlians being buried in a boat as a good argument as in *The Tale of Past Years* this was the effect of a ruse employed by Princess Olga. The Kiev elites of the time, in majority consisting of Scandinavians, were under the strong influence of customs originating from the North, while Olga herself was almost certainly of Scandinavian descent (cf. Duczko 2006, 176–178; Brzozowska 2014, 12 – see therein for older literature). In addition, the fact that the Drevlians were not aware that being carried in a boat might be a harbinger of their death indicates that the custom of the so-called boat burial was actually foreign to the Slavs (assuming, of course, the story is true). All this makes the author's deduction implausible; thus, the listed arguments cannot be treated as evidence concerning Slavic customs.

Further criticism should be put forward in reference to the method of using and interpreting archaeological sources. Let us refer to the example of the above-referenced issue of the localisation of the afterworld in the beliefs of past Slavs. The boat graves mentioned in the fragment cited above are often considered to be burial places for Scandinavians or traces of the strong influence of their culture and belief system on the communities inhabiting Baltic lands (e.g. Zoll-Adamikowa 1979, 229, 230; Dulinicz 2001, 203, 205; Kotowicz 2007, 63). Including such burials in the reviewed publication should have been followed by at least a few sentences of commentary informing the reader on the range of doubts that appear when using these finds in the reconstruction of the Slavic belief system. In the fragment discussing the role of water in Slavic funerary rites, we can read the following: "However, the relative proximity of cremation cemeteries to rivers, streams and other natural water reservoirs, ca. 200–600 metres, has been noted in the archaeological research… There can be no certainty whether eschatological reasons or simply the need to quickly put out the cremation pile were the decisive factor" (p. 168). This information about the location of the cemeteries in relation to water is provided after texts written by Helena Zoll-Adamikowa (1979) and Piotr Kotowicz (2007). Though it is correct, it should be emphasized that sometimes the distance amounts to as much as 1.5–2 km, as indicated by the above-mentioned authors (Zoll-Adamikowa 1979, 27; Kotowicz 2007, 66–73). While the influence of beliefs on the location of the necropolis in relation to water cannot be excluded in the case of some sites, the second concept – about the need to quickly put out fires – lacks any supporting arguments. Firstly, we still do not know whether such cremation piles were common at cemeteries. Secondly, nothing indicates the existence of "the need to quickly put out the cremation pile". What is more, the very high levels of overfiring and fragmentation of human bones discovered in the graves suggest quite the opposite. Thirdly, it is hard to agree that a few hundred metres is a small distance when carrying water to put out any type of fire. J. Wawrzeniuk omits the most important factor influencing the distance of the necropolis from the particular watercourse or reservoir, which is the fact that for obvious reasons settlements were constructed near water, while places of burial were usually a few hundred metres from the settlements (cf. Zoll-Adamikowa 1979, 17; Dzik 2015, 96–100).

Subchapter 5.2 provides a characterisation of the medieval funerary rite (pp. 174–199). J. Wawrzeniuk divides it into five parts, of which two present the cremation rite and the skeleton rite within written and archaeological sources (subchapters 5.2.1 & 5.2.4), while the next three characterise the construction of graves at various types of cemeteries: cremation (5.2.2), mixed-rite (5.2.3) and skeleton (5.2.5). The questionable sense of such a layout of the content is obvious even in the convoluted explanation provided by the author (p. 175, fn. 23). We discover that mixed-rite cemeteries, i.e. those "with both cremation and skeleton burials, …have been included in the chapter dedicated to kurgan structures" (so subchapter 5.2.2), while sites with graves in stone-settings, also of the mixed-rite type – in the part discussing skeleton necropoleis.

In the introduction to subchapter 5.2.1, the author rightly states that the cremation of the body "is considered a funerary rite typical for early medieval Slavs". However, she quite unnecessarily quotes the opinion of the Italian philologist, Evel Gasparini, according to whom the Western Slavs mainly buried their dead in inhumation rite between the 6th and the 8th centuries (p. 175, fn. 22). This opinion is unfounded in the sources and has not been taken into account in academic discussions for a number of decades, while in the discussed text it seems to have the position of an almost equivalent hypothesis. Continuing her argument, J. Wawrzeniuk refers to a few source accounts mentioning "the Slavic and primeval nature of cremation" (p. 176). Why then has Ahmad ibn Fadlan's account from the funeral of a Rus' chief been included among them? In no way can this be treated as evidence in this case as the Rus' people at that time (the 920s) were not Slavs.

Various pieces of information about kurgans and flat cemeteries were included into this same subchapter (p. 177), of which some can be cause for surprise. Amongst others, we find out that "half of the kurgan sites consist of over a dozen kurgans." However, according to the only such compilation of all the cemeteries across Poland with graves of this type, such amounts of tumuli were only noted at 15% of the sites (Zoll-Adamikowa 1979, 34–38). J. Wawrzeniuk then goes on to write that "the burial was placed in the centre of the kurgan", referring to Cezary Buśko's article (1993), which – however – discussed kurgans belonging to the Lusatian culture (*sic*!). While it is good that this information was supplemented by a list of burial types according to H. Zoll-Adamikow, it is a shame that no explanation was provided of the meaning of particular terms. In all probability, for most readers such phrases as "mound burials" or "layered burials" will be unclear. Yet another of the author's statement which may cause some surprise claims that "according to written sources, a man's funeral most probably took place simultaneously with the funeral of his wife, female slaves and other people linked to the deceased person" (p. 177). A few independent sources do in fact mention that among the Slavs the wife of a dead man could (but did not have to) take her own life and be buried with him, and that this was perceived favourably among the Slavs (e.g. GŁŹ 1952, 91, 136; IBN ROSTEH 1977, 37 [203–205]; cf. Lewicki 1952–1953, 128; Zoll-Adamikowa 1979, 190). While it cannot be excluded that other people were buried along with deceased of a higher social status, the value of the accounts that are the basis for this hypothesis raise some very justified doubts (cf. Zoll-Adamikowa 1979, 187, 188). It should also be added that the only assertion claiming a woman was always killed following her husband's death comes from Thietmar's *Chronicle* (THIETMAR 2002, 218 [VIII, 3]). This information was noted in the year 1018 as applying to the period before Mieszko I's baptism; thus, it is difficult to treat it as being fully credible. A number of factors might have influenced its content. Firstly, it cannot be excluded that this information was based on an orally transmitted story, which after many decades might have been strongly distorted in its details. Secondly, exaggerated information about Slavic customs seems to be highly probable among the Christian German elites (i.e. the exaggeration may have come from the source of Thietmar's data or from the chronicler himself), regardless of whether this served to show the barbarity of the pagans or just to draw the listener's or reader's attention through the violence of the description. Finally, thirdly, the context of how this information was presented by the bishop from Merseburg – i.e. as part of an argument denouncing women's incontinence, including that of married women – might have caused its content to be modified in order to enhance the atmosphere surrounding what he wanted to convey. For the above reasons, the information the text contains, not confirmed by any other independent sources from the period – i.e. about the killing of the wife of every deceased husband and about the form of her death through her head being cut off – should be seen as not credible.

Subchapter 5.2.2 primarily discusses the features of Slavic kurgans. According to J. Wawrzeniuk, "in protective practices, the kurgan structure inspired by both the symbolism of the circle and that of the cosmic mountain seems to have been the most 'in use'" (p. 178). The first stage of the construction of such a grave, i.e. the allotment of the space beneath it, "aimed to introduce order into the original chaos by separating hostile forces and those favourable to humans, so the isolation of a certain area of the *sacrum* from the ever pervasive *profanum*." These and other such similar statements are in majority unprovable assumptions, at times standing in juxtaposition to what is stated in the sources. For example, it is in no way obvious that Slavs piled the tumuli on the plan of a circle (cf. Zoll-Adamikowa 1979, 77). The presently identified circular or oval shape of the mounds can be deceptive if we take into account erosion processes, as well as the weak discernibility of the borders of the mounds in the terrain. It should be noted that such a conical shape with the base in the form of a circle or oval is the result of the law of motion acting with particulate matter. A certain premise that attests to the originally planned form of the grave might be the shape of the aboveground structures uncovered inside the mounds – rectangular (frequently square) stone or wooden structures were found underneath many of the fills. Those built on a circular plan are much less frequently encountered. Therefore, would not the noting of the "symbolism of the circle" in the kurgans simply be a modern-day overinterpretation? The height of the vast majority of the kurgans amounts to 0.5–1 m, with a diameter of between 5 and 10 m. Even taking into account erosion processes, these structures would not have been very impressive in terms of their size; thus, attaching "cosmic mountain" symbolism seems to be quite far-fetched (on the meaning of the term, cf. Eliade 1961, 42–49; Bator 2002, 224–225).

The part discussing the forms of the wood and stone structures in kurgans (pp. 180–186), which in fact is a synopsis of what H. Zoll-Adamikowa had already previously determined –unfortunately not noted as such in Wawrzeniuk's text – is full of substantive and editorial mistakes. I will list but a few. For example, the author claims that one of the wood structure forms – the so-called chambers – were present "in most of the studied kurgans located on Polish lands" (p. 180). In fact, the exact opposite is true. Such structures, a description of which J. Wawrzeniuk provides by quoting the unreferenced work by H. Zoll-Adamikowa (1979, 95) almost literally, are to be found not in Poland but primarily by the Oka River in Russia (*ibid*., fig. 38). The reader then discovers that the size of the wooden quadrilateral structure in the kurgan was dependent on the size of the latter (p. 181) and about the long kurgans "in the vicinity of Pskovska" (p. 186; it should be Pskov – the capital of the Pskovska administrative district). Wawrzeniuk's method of compiling H. Zoll-Adamikowa's texts led to the same piece of information being provided twice, i.e. the Cracow-based archaeologist's interpretation of the stages of the construction of kurgan no. 1 in Kornatka in the Myślenice county (pp. 182, 185), with the second being an aggregated description of the construction process of the kurgans (cf. Zoll-Adamikowa 1968, 144). This is not the place to discuss this very debatable reconstruction. It should however be emphasized that providing observations concerning one feature, and an atypical one at that (both a wooden structure and a stone one were found inside), as a general description of the stages in the construction of Slavic kurgans misinforms the reader.

J. Wawrzeniuk mentions the concept of posts erected on the kurgans or next to them, considering only "whether vessels were placed directly on top of them or if the posts supported some more complex 'buildings', such as houses of the dead" (pp. 181, 182). To illustrate the problem, she cites three sources, i.e. *The Tale of Past Years*, Cosmas's chronicle and the life of Saint Otto of Bamberg written by Ebo. It should be emphasized that the last two accounts do not make even the slightest mention of posts that support anything. Only *The Tale* contains information about the placement of urns next to the roads (or at crossroads), *на столпѣ* (PSRL 1908, 14). In medieval Rus' accounts, this word was used not only in the meaning of a post but also to refer to a gravestone, an elevated place (mound?) or an enclosed site and even sometimes a sarcophagus (SRL 1849, 51; D'yachenko 1899, 665–666; SDYA 2016, 674–679). Taking into account the meaning of the term in the sources from this period and younger ones, Borys Rybakov put forward the hypothesis that it might have been used in reference to sepulchral structures similar in appearance to houses (Rybakov 1970, 43–44). This interpretation seems interesting in as far as the mention in *The Tale* would correspond to contemporaneous information about shacks erected at crossroads in Czech (on the subject, see Dzik 2015, n. 350). If the hypothesis about the posts supporting urns has such a weak basis, is it worthwhile to develop further ideas, such as posts on kurgans and posts with 'houses of the dead', without providing any arguments and foundations for such conclusions?

In the context of the described hypothesis, it is clear what mistakes can occur when one makes use exclusively of translations of the sources and their further interpretations, which is a standard within the discussed publication. This is in reference to a fragment of Ebo's text, which discusses Saint Otto forbidding the Pomeranians from placing sticks on graves: *ne fustes ad sepulchra eorum ponant* (EBO 1969, 45 [II, 12]). On page 182, J. Wawrzeniuk quotes this phrase as the source-related justification of considerations of the placement of urns or "houses of the dead" on posts. A few pages later, we have the same account, but this time following Alfons Labudda's interpretation (1983, 56), serving as the basis for the claim that "the newly converted were to also abandon the pagan custom of throwing branches, sticks and brushwood onto the graves" (p. 192). It is obvious that the ambiguously phrased account can be understood in various ways. However, the fact that it was used as evidence for the existence in the Early Middle Ages of two so different customs indicates that either the author did not realize that they referred to the same sentence or she considered this fact to be insignificant. In both cases, it speaks poorly of the author's knowledge of critical academic methods.

In subchapter 5.2.2 ("Characteristics of the construction of a grave at mixed-rite cemeteries"; pp. 187–190), J. Wawrzeniuk includes a short discussion of flat graves of the Alt-Käbelich type, supplemented by a fragment – completely irrelevant to the subchapter's topic – containing information from written and ethnographic sources about the reasons for burning the dead among Slavs and Balts (of which about half is an almost literal quote from A. Labudda's text 1983, 49). Contrary to what we can read on p. 187, the passage to the inhumation rite on Polish lands was initiated not at the beginning of the 11th century, but at latest in the last quarter of the 10th century (Sikora 2015; Buko 2016, 35–44 – see therein for older literature). Quoting an excerpt from Al-Bekri's text, Wawrzeniuk describes it as a text written by Ibrahim ibn Ya'qub, which indicates a lack of understanding of what the so-called *Ibrahim Ibn Ya'qub's Account* and Al-Bekri's chronicle in fact are (cf. Sikorski 2012, 20–36).

The discussion of the graves contained in this subchapter constitutes an example of mistaking a description of an archaeological source and its interpretation, as well as of the misuse of various archaeological terminology. Thus, the reader finds out the cemeteries from Pomerania had so-called "houses of the dead", usually in the form of fair-sized pits, containing, among other things, small fragments of burnt human bones (p. 187). In archaeological literature, the term "'graves of the Alt Käbelich type' has been adopted to refer to such features, as also noted by J. Wawrzeniuk (p. 188). Due to their form, analogous to structures discovered in settlements and considered to be the remains of residential buildings, it is quite widely accepted that these graves were similar in construction to houses (cf. Szymański 2004, 302–307 – see therein for further literature). This is where the phrase "houses of the dead" comes from, but it is an interpretation and not a term that refers to a type or variety of structure. It is worth remembering this, all the more as this is a much broader term, encompassing also structures of a different construction than graves of the Alt Käbelich type (Szymański 2004; Sikora 2010, 307–312; Dzik 2014b, 97–101). According to J. Wawrzeniuk, a frequent feature of these structures was supposedly that they often contained a "skeleton grave" (p. 188). However, it is not graves that are found in these structures but skeleton burials (or individual bones), while a 'burial' and a 'grave' are most definitely not synonymous terms. Further, referring to Völker Schmidt's text (1992, 14–15), the author lists three varieties of "houses of the dead", including "graves of the Alt Käbelich type, so-called sunken houses of the dead" and "graves of the Alt Käbelich type, so-called flat houses of the dead, constructed using a log-frame structure, less frequently a post construction" (p. 188). This is yet another example of a methodologically incorrect mixing of archaeological terms (type of grave) with their interpretation. In the quoted text, the German archaeologist does not in fact refer to both these forms of graves as being of the Alt Käbelich type. Even though the issue of the diagnostic features for this type of structure continues to be a topic of debate, it is very difficult to agree to two structures with such diverse features being included under this term.

The chapters discussing rites and skeleton cemeteries contain numerous content-related or terminological mistakes (5.2.4, 5.2.5). Some sentences, such as "with the exception of kurgan burials, other skeleton cemeteries… were situated in new locations" (p. 190), "skeleton burials were divided into flat and kurgan ones" (p. 195), once again indicate that the author has problems differentiating between a burial and a grave. In the eastern Mazovia region, so-called non-churchyard cemeteries do not function until the first half of the 12th century (p. 190) but until the 13th century, and in present-day Podlachia area even up until the early modern period (cf. Bronicka-Rauhut, Rauhut 1977, 84; Dzik 2015, 202–203). On page 191, the reader discovers that the presence of such items in the graves as animal-fang pendants, *kaptorgas* (amulet containers), fossils, eggs and other such objects indicates the employment of anti-vampire practices. However, this is a far-fetched overinterpretation. J. Wawrzeniuk presents this claim as following from H. Zoll-Adamikowa's text (1971, 126–127), which is yet another mistake pointing to the author not having read her predecessors' works carefully enough. One other sentence contains a few mistakes concerning where non-churchyard cemeteries were typically situated. They were supposedly established "far from settlements and keeps, in the fields and forests in Western Pomerania and Czech…, similarly as in the Małopolska, where most of the cemeteries were located in the fields and at the cleared edges of forests (e.g. Goszyce), at the sites of former settlements (e.g. Chroberz, Horodyszcze, Stradów I, Cracow-Wawel, the annex to the rotunda of the Blessed Virgin Mary)" (p. 191). Significantly, a number of sites belonging to this category were in fact found very close to settlements and keeps. Secondly, the information about the establishment of cemeteries in Pomerania and Czech in fields and forests – even if we disregard the issue of the arguable reasons for providing this detail – is an overinterpretation of two accounts. The phrase therein used referring to burying the dead *in silvis aut in campis* (EBO 1969, 45 [II, 12]) and *in silvis et in campis* (KOSMAS 1923, 161 [III, 1]) is a topos repetitively used in the sources in reference to the location of burial places the authors of the particular texts considered to be unsuitable for Christians. Therefore, it says little about the actual location of these necropoleis. It is also significant that they do not have to refer to so-called non-churchyard skeleton cemeteries (for a discussion of this issue, cf. Zoll-Adamikowa 1979, 171–178). To go back to the issue of the places where non-churchyard cemeteries were established, it should be emphasized that present-day discovery of such sites in fields and at the edges of forests says nothing about their localisation in relation to nearby vegetation at the time when they were constructed. Finally, including the grave discovered at the Wawel next to the Rotunda of the Blessed Virgin Mary into the group of non-churchyard cemeteries is a complete misunderstanding.

Subsequent sentences on the features of skeleton cemeteries (e.g. "The customary funerary norms at that time applied to hills and elevated sites…; however, burials were not situated near waterway networks" (p. 191), "The orientation of the body with the head facing westward so that the deceased could see the setting sun remained unknown to the Slavs and the Germanic peoples" (p. 194)) in part make no sense and also lack any basis in the available sources. This is true of both the comments that refer – at least theoretically – to the archaeological material and those derived from written sources. Interpreting Cosmas's account of casting the murdered Vrshovici into a pit without coffins (KOSMAS 1923, 193 [III, 24]) as an indication that the "'pagan' skeleton rite was still in use in the 12th century" (p. 192) discourages any further commentary. The reading of this subchapter is not made any easier by the accumulation of inflexion and syntactic errors.

In her discussion of graves in stone-settings, J. Wawrzeniuk states after Lechosław Rauhut (1971, 460) that their appearance in the Mazovia region sometime in the mid 11th century was "most probably the result of the forced necessity of switching from cremation to skeleton burials" (s. 197). According to the author, filling the graves with multi-layered paving served to protect the living from the return of the dead (here the author refers to my article – Dzik 2014b, 89 – without noticing that in the quoted fragment I am simply summarising L. Rauhut's concept, while my whole text is dedicated to showing that the reasons for using the stones were completely different). For some obscure reasons, this interpretation supposedly was somehow confirmed by the presence of cremation graves in Mazovia and Podlachia (p. 197). In the remaining part of her argument, J. Wawrzeniuk refers to other interpretations available in literature of flat graves and kurgans with stone structures; however, her summary is such that the reader has no opportunity of gaining any understanding of the current state of knowledge on the topic. In the summary of the subchapter, the author emphasizes that "houses of the dead" and the methods of constructing graves were "primarily supposed to isolate the deceased from the world of the living" and that the construction of the graves might have been "the result of a belief in 'the living dead'" (pp. 198, 199).

Subchapter 5.3 entitled "The sacral power of the deceased" is primarily a discussion of the meaning behind so-called grave goods. As J. Wawrzeniuk rightly notes, "each item accompanying a deceased person could have at least a double meaning" (p. 199), i.e. not only a banausic one, but also a magical and symbolic one. Their division *ad hoc* into those that had a magical significance and those that did not is an error that negatively influences their interpretation (p. 191, fn. 43). An important supplement for this part of the book is table 26 (pp. 381–413), containing a list of archaeological finds that were the basis for the discussion of the subject.

The first of the subchapters in this part (5.3.1 "The clothing of the deceased as the result of apotropaic observances") is yet another example of overrating the significance of ethnographic material as a basis for the reconstruction of early medieval beliefs and customs. The author ends the two-page discussion based on modern-day observations with the sentence: "Archaeological material linked to the attire provided to the deceased person has been preserved only residually. It is difficult to state with any certainty whether the fragments that have survived constitute part of the deceased's garments or of the shroud in which the body was wrapped" (p. 201). Is this really all that can be stated about the deceased person's attire in the Early Middle Ages? Actually, various metal elements of his garments, such as buckles, hook-and-eyes, buttons (including glass ones), can also provide some data. Some basis for various conclusions can also result from the presence of adornments worn on the head, neck or arms, not that infrequent in fact, which provide evidence, for example, that a particular person was not buried in just an ordinary burial shirt. Tools attached to the belt, often kept in a sheath – such as knives, pins, flints – can also serve as a source of information. Analysing the dependency between the wealth of the adornment elements or parts of the attire and the age of the deceased could provide many interesting conclusions, e.g. for research into the custom of burying unmarried people in wedding garments (cf. Koperkiewicz 2011, 275). Instead, the reader encounters a list of information gathered from various ethnographic texts, such as "Slavs rarely put on shoes in the coffin, …instead they used socks and stockings" or "according to Germanic customs, mortal shoes called '*helsko*' were tied to their legs" (p. 200). What does all this tell us about a dead Slav's attire in the Early Middle Ages?

In subchapter 5.3.2, the author focuses on the apotropaic symbolism of grave goods and the reasons behind giving items to the dead (in light of ethnographic material). Ultimately, she distinguishes four groups of equipment provided to the deceased: 1) items linked to his attire; 2) gifts from the family; 3) objects put into the grave in connection with the performance of additional acts of a symbolic nature; 4) items "related to active cult of the dead or ancestor worship" (p. 203). At the same time, she notes that one item may belong to more than one group.

Moving on to a discussion of select archaeological artefacts, J. Wawrzeniuk has divided them into nine categories. The first of these consist of coins and shells (pp. 204–207). The author justifies this atypical compilation of two types of artefacts by stating that shells can sometimes be equivalents to coins. However, she does not indicate the basis for this claim, while simultaneously emphasizing that there might have been more such substitutes (p. 207). Why then were these omitted? It should also be added that shells frequently occur as collier elements, in a function in which it is very difficult to find a connection to coins – and regardless at that of whether the latter were perceived simply as silver or already as a currency. However, it would be fruitless to search for any analysis of the function of shells in this fragment of the book. It mainly contains a summary of various concepts regarding the significance of coins as grave goods. It is a shame that the author did not take into account the conclusions reached by the most comprehensive text on the topic, i.e. Łukasz Miechowicz's article (2011), even though it is actually included in the reference list. It is surprising to note the complete lack of references to the significance of the placement of the coins in relation to the deceased. Considering the subject of the book, it would have been worthwhile to focus some attention on the discovery of coins near the mandible or jaw. Early Modern written sources and ethnographic material indicate that numismatic materials with an apotropaic function were frequently placed inside the deceased person's mouth (Dzik 2007, 87; Miechowicz 2011, 349). Consideration should also be given to the issue of whether the custom might have had early medieval roots.

Amulets are the second category of finds distinguished by the author (pp. 207, 208). Isolating this particular group raises some doubts as the role of amulets could have been performed by most of the artefacts included in the remaining categories (coins, *kaptorgas*, rattles, belemnites, etc.). This is all the more striking as J. Wawrzeniuk is aware of the lexical ambiguity of the term as demonstrated during her discussion of amulets in one of the earlier chapters (pp. 107–118). Methodologically, it would have been more correct to apply a single criterion for the division of artefacts originating from cemeteries. In this particular case, the basis for the division was the purported function, while in the case of the remaining categories – the type of object. The author includes here items made from animal fangs, bird bones and fruit within the amulet category, but also – for undecipherable reasons – a few glass and stone beads and shells with holes (pp. 208, 390, 391).

Another distinguished group consists of needles, pins and sickles (pp. 208–210). According to the author, "the needles found at the early medieval cemeteries could probably be used to protect one from the deceased person and to provide 'protection' to the deceased" (p. 208). Unfortunately, no explanation is given as to the foundation for such a confidently stated conclusion. There were only six finds from four cemeteries serving as the basis for the discussion of pins. In this case, J. Wawrzeniuk omitted the so-called ringed pins, which are a type of awl identified at a couple of dozen cemeteries in different regions in the country. It is hard to understand why the alleged sickle from Czersk should confirm the thesis "according to which the deceased person (or his/her soul) possessed by evil forces could also disrupt the worldly order" (p. 210). The connection this item has with the burial is in fact uncertain as it was found in the backfill of a grave dug into a half-dugout and thus might have originated from the latter (Bronicka-Rauhut 1998, 41, 113, fig. 104: 4; cf. Dzik 2014a, fn. 619).

The fourth category of artefacts from the graves includes so-called *hetkas* (long bone or wooden buttons), bell-shaped pendants and rattles. According to the author's concept, these are items whose "power to scare away [something] was in the sound they made" (p. 210). Why then have *hetkas* been added to this group? They primarily served to fasten various elements of one's attire and could have been used as aerophones only theoretically, as was convincingly demonstrated by Tadeusz Malinowski (1993, 3–10). The finds from cemeteries do not indicate that they were placed in funerary context as instruments. In turn, in the case of the bell-shaped pendants, it is more probable that they were placed inside the graves as elements of deceased person's attire or that they had been attached to other objects (such as sheaths or pouches) than as "gifts". The text lacks even an attempt at determining what the location of the finds in relation to other artefacts and the skeleton say about their functions. Rattles are the only finds among those included into this category that were almost certainly items given to the deceased person. However, in this case also an analysis of the archaeological context is lacking (it is also missing in the fragment referring to the function of these objects – pp. 154, 155). It is a shame that the author completely omits the issue of possible symbolism of the ornament and colour of so-called knobbed rattles, which might have been just as significant for the item's users as the ornamentation of dyed eggs.

The next category includes eggshells and painted eggs, to which the majority of egg-shaped rattles have also been added (pp. 211–213; 404–406). In the context of finds discovered in graves, the following statement made by J. Wawrzeniuk remains unconvincing: "The painted egg as a gift (sacrifice) protected [the deceased person? – MD] from unfavourable natural phenomena, ensured peace to those in the grave, and constituted a symbol of safe procreation [whose? – MD]". Reading the discussion of the sixth group of findings (crosses and *kaptorgas*), one can discover that "the sign of the cross was placed on the bottom of vessels put inside the graves" (p. 214) as a pagan symbol of closure. The author returns to this topic slightly further in the text, writing that this sign most probably fenced one off from a dead person's negative powers (p. 218). These pottery signs are by no means finds unique for graves, and their meaning and religious connotations are not as obvious as Wawrzeniuk suggests (cf. Buko 2011, 367 f.). Despite what can be read in the publication, amber crosses are not the most abundant group of such finds from cemeteries. Among other things, J. Wawrzeniuk omits numerous early medieval devotional objects from the cemeteries in the Polish-Rus' borderland and Eastern Mazovia, including the most abundant collection of such items from Święck-Strumiany in the Wysokie Mazowieckie County (Jaskanis 2008, 204 n.).

The common feature allowing for the next group (belemnites, quernstones, ceramic stars) to be distinguished was their scarcity among the discoveries in the graves (p. 214). For example, J. Wawrzeniuk knows of three belemnite finds from two graves in Złota, Pińczów County. The fact that their location in relation to the skeletons remains unspecified (cf. Miśkiewicz 1967, 116, 120; it cannot be excluded that they ended up in the graves' backfills by accident) did not stop J. Wawrzeniuk from including a sketch presenting the arrangement of the belemnites in the graves (fig. 45). There is absolutely no basis for or value to this visualisation. The last two categories constitute the following: 1) organic-based gifts, or – as can be deduced from the tabulation (p. 413) – fruit and seeds, and 2) vessels (omitted in the catalogue of finds).

J. Wawrzeniuk has collected a large but vastly incomplete assemblage of finds. Unfortunately, a common feature of all the descriptions of the artefacts found in graves is that they lack any conclusions reached by the author of the publication. In the discussion of the objects, the reader can find more or less relevant comments about their symbolism, some of which we already know from the applicable academic literature, and not much else. This is also true of the descriptions provided in subchapter 4.5, in which part of the artefacts were discussed in more detail. Even though the author has gathered some information about the find contexts of the artefacts (the localisation within the grave, accompanying artefacts, the sex of the deceased, the item's chronology), as well as preparing illustrations depicting the arrangement of the items in relation to the skeletons, she has not drawn any conclusions on this basis.

In subchapter 5.4, J. Wawrzeniuk focuses on so-called atypical burials. The author discusses them one by one: "empty burials", partial ones and so-called 'vampire' burials. Even the title of this part of the book contains an error, repeated also in its content, as there is no such thing as an "empty burial" (pp. 219, 220). It is graves that can be – and sometimes are – empty. The author omits two very important issues in her considerations of these phenomena. Firstly, the lack of remains in many excavated kurgans were often the result of the cursory exploration of humus, in which – in the case of burials located on the tops of kurgans – there were overfired bones (Zoll-Adamikowa 1979, 126–133). Secondly, in numerous cases, due to the conditions in which they were deposited, the bones would fully decompose. Thirdly and finally, it cannot be excluded that in the Early Middle Ages so-called double burials were in use, i.e. the deceased was taken out of the grave and buried once again, as a result of which the original place where the body had been deposited might have remained empty (cf. Dzik 2015, 67).

Some of the interpretations proposed by J. Wawrzeniuk result either from a poor knowledge of the archaeological material or from an irreverent approach to facts based on source material. According to the author, the comparison of the bases for identifying anti-vampire practices, including the ethnographic and archaeological criteria, "indicate many similarities in the application of anti-vampire practices recorded in folklore and among the Slavs before the adoption of Christianity" (p. 225, tab. I). This is a surprising conclusion as these archaeological data come from cemeteries functioning exclusively after the adoption of Christianity, including late medieval and modern cemeteries. Yet another example of an unusual approach to sources would be her discussion of the burials from kurgans nos. 15 and 23 in Kornatka (s. 219) or the reinterpretation of the oak that grew on Krakus Mound as a post on which an urn had supposedly been located (p. 219, n. 97). A complex system of roots belonging to one several-century-old tree had been discovered in the upper parts of the mound (Jamka 1965, 203–205) – how is it possible that this could have been evidence of a post? A pole in the middle of the mound was in fact found but a few metres under the peak (Jamka 1965, 203 f.). It was perceivable at most of the height of the fill (to 15 m lower than its peak) and it should be linked to the construction of the mound.

In the context of atypical burials, one aspect that is definitely lacking is a discussion of the archaeological finds dated to the Early Middle Ages, interpreted as traces of the secondary opening of graves in order to perform certain apotropaic observances (cf. Dzik 2010, on the subject of partially-cremated burials; see Gardeła *et al.* 2015 – for older literature).

The last part of the chapter – "Protective practices performed around graves" – consists of two parts (pp. 231–242). The first is entitled "Reconstruction of the funerary rites in light of ethnographic and written sources" (subchapter 5.5.1); however, it only contains some comments on rites that were conducted after the deceased person had been buried. The reader will primarily find a compilation of descriptions taken from ethnographic studies and written sources. The latter are sometimes quoted as a justification of theses to which they are in no way linked. What ritual fights are being discussed in the fragments of *The Tale of Past Years* quoted by the author (pp. 235, 236, n. 122, 123)? If the slaughter of five thousand Drevlians in the story of Olga's revenge following the murder of her husband is supposed to serve as an example of such Slavic "ritual fights" during the *trizna*, then this is an art of interpretation comparative to the act of making a bungee jump without a cord.

In the last subchapter (5.5.2), J. Wawrzeniuk provides a short discussion of the remnants of magic practices linked to rites conducted on All Soul's Day (*Zaduszki*). These include traces of burning fires at the cemeteries, finds of animal bones in graves and discoveries of vessels and potsherds at sepulchral sites. Data collected from publications of 13 cemeteries from around Poland constituted the basis for this discussion (tab. 30, pp. 426–431). The modest base must have had some influence on the capacity for reaching particular conclusions. The author states that the traces of burning fire (divided into bonfires and hearths) discovered outside the grave pits are most probably the result of certain apotropaic practices (p. 238). However, she does not provide any arguments in support of this thesis. The discussion of animal bones lacks information that the items found next to the deceased do not have to be the remains of feasts and other rites performed after the person is placed in the grave. They might, for example, be an offering placed inside the grave as nourishment for the road they are embarking on (or for some other purpose). The paragraph discussing pottery finds repeats much of the same above-mentioned mistakes (pp. 216–218), ending with the peculiar statement that "the identified potsherds from the cremation kurgans have the form of pots for domestic use" (p. 241).

Finally, I would like to add some general comments concerning the academic methodology. The publication shows the author's unique approach to quoted sources and studies. In many cases, J. Wawrzeniuk rewrites fragments of statements published by other researchers and introduces them into her own text as part of her own argument. As an example may serve the introduction to the subchapter on the so-called vampire burials (p. 223), which the author of the book has constructed from modified statements made by Alfons Labudda, Józef Kostrzewski, Lech Leciejewicz, Wanda Heckowa, and Kazimierz Moszyński. In order to shorten the whole discussion, I will only quote fragments from the texts of three researchers:

> If it [belief in spectres – MD] developed, as researchers of such phenomena assume, in the Balkans, it must have spread from there very early on, since the term Upir appears as early as in 1047 as the surname of a pope in Novogorod, in north-western Russia. Belief in spectres most probably developed during an epidemic, during which a few people died one after the other… (Kostrzewski 1962, 344).

> Some researchers consider the term *defuncti vivi* to have developed on Christian fundaments and deny it had older content, pagan in essence (Leciejewicz 1997, 54).

> If in a given village or farmyard a few people fell victim to an illness one after the other over a short interval of time… the peasants would dig up the corpse of the person who had begun the death procession or those who for one or another reason were suspected of a propensity for vampirism… At times, in order to make the finding of the culprit more certain a few or several deceased people were dug up, taking into account their appearance… (Moszyński 1967, 656).

In the reviewed book, we can read the following:

> It is supposed that the first beliefs in vampires appeared in the Balkans, but they spread very quickly. In 1047, the term *upir* appears as the name of a pope in Novgorod, in north-western Russia (Kostrzewski 1962, p. 344). Belief in spectres probably appeared against the background of lethal incidents, occurring one after another many times over at various intervals, which might have been triggered by some epidemic-type illnesses. *Defuncti vivi* – belief in the "living corpse" – according to some researchers, developed on Christian fundaments and they deny it had older content, pagan in essence (Leciejewicz 1997, p. 54)… In Slavic folk culture, the superstition existed that if in a particular village or farmyard a few people fell victim to an illness over a short interval of time, the peasants would dig up the corpses of the person who first began the death procession or a person who for one or another reason was suspected of a propensity for vampirism. At times, also, during the search for the culprit a few graves were dug up, taking into account to the dead person's appearance, after which the appropriate observances were conducted (Moszyński 1967, p. 656).

This type of compilation, even though it provides references, is in my opinion extremely dishonest in terms of research methods, indicating also the author's lack of skill at drawing her own conclusions. In addition, this leads to a series of mistakes in the publication. Firstly, the state of knowledge from a few decades ago is presented to the readers as up-to-date (cf. the motif of the Balkan genesis of the belief in vampires). Secondly, the author frequently changes the original meaning of the statement, which leads to the formation of false assertions (cf. on p. 191 on artefacts from graves as evidence of anti-vampire practices, allegedly according to H. Zoll-Adamikowa). Thirdly, J. Wawrzeniuk does not take the trouble to search for the bases of particular information in the sources, while frequently she repeats erroneous interpretations that have long since been rectified by historians and archaeologists.

It is difficult not to notice that J. Wawrzeniuk makes use almost exclusively of texts published in Polish, only seldom referring to texts in Russian, and very sporadically to publications in other languages. In fact, she does not even know some of them first hand, referring to them only indirectly through Polish texts. To give an example, J. Wawrzeniuk knows E. Gasparini's concepts, which she quotes in the book (pp. 175, 224), only from Helena Przesławska's publication (1962). However, the subject of the text would require referring to the rich achievements of not only Polish archaeologists, historians, religious studies scholars and cultural anthropologists, especially as J. Wawrzeniuk declares interest in the phenomenology of religion (p. 15). Instead, the text contains individual examples of customs recorded in different countries and linked to various historical periods, often cited without any explanation why they are referred to.

The other serious flaw is the method of quoting texts from written sources, which is frequently indiscriminate and often encumbered with errors. This constant quoting of sources after secondary sources instead of citing critical publications is especially striking, e.g. Burchard of Worms and Peter of Duisburg after Adam Fischer's ethnographic text (pp. 170, 200) or Al-Bekri and Ibn Rosteh's texts after a study on funerary liturgy in Poland by Alfons Labudda (p. 189). In addition, translated quotes should be supplemented by the texts in the original languages, at least in the case of Latin or Old Rus' sources. This would make it easier for the readers to evaluate the accuracy of the interpretations presented by the author. Another striking aspect is J. Wawrzeniuk's unreflective approach to modern folk traditions as probable remains of pre-Christian Slavic customs, as discussed in the text above.

In J. Wawrzeniuk's book, the reader can find some accurate remarks and conclusions, usually copied from other researchers. However, these become insignificant in comparison to the accumulation of substantive and technical mistakes, as well as the multitude of other issues, including the messy arrangement of the content (the contents of some of the subchapters do not correspond to the purported subjects), grammatical mistakes, repeated footnotes (cf. chapter 5, fn. 37, 41), numerous missing positions in the list of referenced literature, errors in the titles of studies, as well as in the transliteration of surnames and titles of publications originally in Cyrillic.

Due to the attractive subject matter, this book will most definitely appeal to a wide audience of people interested in the Early Middle Ages and the Slavs. They very much should have the right to consider J. Wawrzeniuk's extensive publication, endorsed by the Cardinal Stefan Wyszyński University in Warsaw, co-financed by the Polish Ministry of Science and Higher Education, reviewed by prof. dr hab. Andrzej P. Kowalski, as the Polish academia's crowning achievement on an important aspect of the spiritual culture of the early medieval Slavs. If so, it is quite a poor testimony.

Michał Dzik

O bezdrożach badań nad magią i obrzędami pogrzebowymi wczesnośredniowiecznych Słowian

[**Joanna Wawrzeniuk, Magia ochronna Słowian we wczesnym średniowieczu na ziemiach polskich,** Wydawnictwo Uniwersytetu Kardynała Stefana Wyszyńskiego, Warszawa 2016, ss. 517]

Przystępując do recenzji publikacji Joanny Wawrzeniuk planowałem odnieść się do całej książki. Niemniej jednak, ze względu na skalę zastanych w niej błędów warsztatowych i przeinterpretowania źródeł, których pełne sprostowanie zajęłoby zbyt dużą objętość, zdecydowałem ograniczyć się do omówienia jednej tylko jej części, dotyczącej tematyki najbardziej mi bliskiej, czyli obrzędowości pogrzebowej. Jej poświęcona jest większość poniższego tekstu.

Celem przyświecającym Autorce przy tworzeniu omawianego opracowania była próba „wejrzenia w dualistyczną strukturę myślenia wczesnośredniowiecznych Słowian przy pomocy analizy zabiegów apotropeicznych przez nich stosowanych" (s. 15). Należy podkreślić, iż J. Wawrzeniuk podjęła się zagadnienia niezwykle trudnego i ambitnego, którego opracowanie wymaga dużej wiedzy i umiejętności. Autorka jasno określiła zakres chronologiczny i terytorialny pracy, obejmujący ziemie w obecnych granicach Polski (z wyłączeniem części północno-wschodniej, zamieszkanej w badanym okresie przez Bałtów), między VII a XIII wiekiem. (s. 17). Główną podstawę źródłową rozważań miały być materiały archeologiczne, do których analizy Autorka wykorzystała „przekazy pisane, zapisy etnograficzne oraz analogie z religioznawstwa porównawczego" (s. 15). Korzystała również z wyników badań językoznawczych.

Publikacja podzielona jest na osiem rozdziałów, z których ostatni stanowi jej podsumowanie. Uzupełniają ją dwa aneksy: lista uwzględnionych w pracy średniowiecznych cmentarzysk w obecnych granicach Polski oraz lista słowiańskich, wczesnośredniowiecznych miejsc kultu z tego obszaru, znanych z badań archeologicznych. Kolejnym elementem pracy jest dość obszerny (128 stron) katalog przywołanych w publikacji źródeł archeologicznych, które według Autorki prawdopodobnie są świadectwem magii ochronnej.

Pierwszy rozdział pracy zawiera omówienie podstawy źródłowej oraz stanu badań nad myśleniem magicznym u wczesnośredniowiecznych Słowian Zachodnich. Ów stan, jak słusznie zauważa J. Wawrzeniuk, pozostawia wiele do życzenia, jako że dotychczas zainteresowanie tą tematyką w piśmiennictwie naukowym było niewielkie. Kolejne dwa rozdziały poświęcone są zagadnieniom teoretycznym, tj. definicjom magii i uroku oraz charakterystyce myślenia magicznego. W rozdziale trzecim Autorka omówiła też szereg zabiegów chroniących przed szkodliwymi praktykami wykorzystującymi magię (s. 38–47). Przechodząc do źródeł z badanej epoki stwierdziła, iż „wierzono [na ziemiach słowiańskich – MD], że najchętniej przyjmowane były przez bóstwa ofiary krwawe z ludzi, zwierząt, a następnie ofiary roślinne i przedmiotowe." (s. 42). Na poparcie tego wniosku Autorka przywołała kilka wzmianek źródłowych o takichż ofiarach, m.in. z kronik Thietmara, Kosmasa, Helmolda (dzieło tego drugiego Autorka opisała błędnie, jako powstałe w drugiej połowie X wieku (przyp. 12), podczas gdy pochodzi ono z pierwszej ćwierci XII w.). Nie wzięła jednak pod uwagę, że obecność informacji o ofiarach z ludzi w niektórych opisach Słowian mogła wynikać z zastosowania toposu, funkcjonującego wśród chrześcijańskich autorów na temat zwyczajów pogan. Mogła też być oskarżeniem mającym dodać cech barbarzyńskich opisywanemu przez danego kronikarza przeciwnikowi. Zdecydowanie zabrakło tutaj choćby próby krytyki przywołanych przekazów pisanych. Wiarygodności wnioskowi sformułowanemu przez J. Wawrzeniuk nie dodaje również powołanie się na przekaz Adama z Bremy, dotyczący niesłowiańskich zwyczajów ze szwedzkiej Uppsali (s. 43).

Istotnym – moim zdaniem – mankamentem pracy jest układ treści przyjęty przy omówieniu poszczególnych zagadnień. Jak wynika z informacji podanych we wprowadzeniu, Autorka zastosowała następujący schemat: „jako pierwsze przedstawione zostaną źródła etnograficzne, w miarę potrzeby językoznawcze, następnie pisane, a na końcu odpowiednie źródła archeologiczne" (s. 16). Już w samym swym założeniu schemat ten budzi wątpliwości, bowiem stwarza ryzyko wysunięcia na pierwszy plan materiałów etnograficznych, a więc pochodzących z XIX i XX w. Mają one znaczenie dla badanego zagadnienia, jednak pełnią rolę tylko pomocniczą w stosunku do źródeł z epoki. Dalsza lektura książki J. Wawrzeniuk potwierdza, że to właśnie materiały etnograficzne są główną podstawą książki.

Zasadniczą część pracy stanowią rozdziały 4–6, poświęcone magicznym działaniom ochronnym dokonywanym kolejno: w domu, na cmentarzu i w miejscach kultu. W dalszej części recenzji skupię się na przeanalizowaniu treści rozdziału 5. („Apotropeiczna rola zabiegów magicznych dokonywanych na cmentarzu"), do pozostałych partii książki odnosząc się jedynie, gdy będzie to konieczne.

Rozdział 5. składa się pięciu podrozdziałów poprzedzonych kilkustronicowym, nietytułowanym wprowadzeniem. Czytelnik znajdzie tu m.in. informacje na temat wyobrażeń słowiańskich o świecie pozagrobowym, uzupełnione o listę znanych z materiałów etnograficznych zabiegów, podejmowanych po śmierci danej osoby przez jej bliskich. Sposób prowadzenia przez Autorkę narracji w tej części powoduje, że wiele opisów opartych wyłącznie na obserwacjach z XIX–XX w. może być błędnie uznana, przez czytelników nieposiadających wystarczającej wiedzy źródłoznawczej, za dotyczące Słowian w okresie do XIII w.

Zdecydowana dominacja opisów etnograficznych widoczna jest w podrozdziale 5.1 („Apotropeiczna symbolika zmarłego w rytuałach przejścia"; s. 171–174). Czytelnik znajdzie w nim krótki wywód teoretyczny na temat etapów obrzędów pogrzebowych, rozumianych jako obrzędy przejścia, oraz listę zwyczajów etnograficznych odpowiadających owym etapom. Wiążą się one m.in. z zachowaniem się rodziny po śmierci jej członka, sposobem przenoszenia trumny z domu na cmentarz, koniecznością odprawiania stypy, postępowaniem w okresie żałoby. W rozdziale nie ma natomiast żadnego odniesienia do jakichkolwiek przekazów pisanych lub materiałów archeologicznych. W akapicie podsumowującym ustęp o współczesnych zwyczajach możemy przeczytać, że: „Przytoczony przykład egzystowania »obrzędów przejścia« w materiale etnograficznym z XIX i początku XX wieku mógł mieć swoje miejsce w słowiańskim obrzędzie pogrzebowym w okresie wczesnego średniowiecza" (s. 173–174). Podobnie wyliczenie zwyczajów ludowych związanych ze śmiercią we wstępie rozdziału J. Wawrzeniuk podsumowuje zdaniem: „Opisany wyżej materiał etnograficzny pochodzący głównie z dziewiętnastowiecznych badań sugeruje, że podobne zabiegi symboliczno-magiczne mogły być stosowane już we wczesnym średniowieczu" (s. 169). W jaki sposób miałby to sugerować? Jakie mamy przesłanki, by twierdzić, że np. liczne zabiegi towarzyszące wynoszeniu trumny z ciałem na cmentarz (s. 171), były znane już we wczesnym średniowieczu? Przez setki lat, które dzielą okres XIX–XX w. od wczesnego średniowiecza pojawiały się przecież liczne nowe zwyczaje i tradycje, powstające w wyniku ewolucji rytuałów religijnych, zmian wyznaniowych, obyczajowych i innych (por. Wiślicz 2001, 161 n.; Burke 2009). Ich inspiracją mogła być ikonografia, w tym przedstawienia religijne zdobiące kościoły, treści propagowane przez druki ulotne, kaznodziejów, a nawet tzw. wędrownych dziadów (por. Michajłowa 2010, 216 n. passim). Owe zwyczaje mogły mieć rodowód miejscowy lub zostać zaszczepionymi w różnych regionach przez napływających osadników niemieckich, żydowskich, wołoskich, ruskich, holenderskich i innych. W recenzowanej pracy brak jakiejkolwiek refleksji na ten temat. Przeciwnie, lektura książki wskazuje, że schemat omówienia wielu zagadnień z zakresu wierzeń i zabiegów magicznych jest w niej następujący: w pierwszej kolejności czytelnik otrzymuje spis różnych obserwacji etnograficznych, ewentualnie urozmaicony kilkoma informacjami ze źródeł z różnych epok, który Autorka podsumowuje konstatacją, że wiele ze zwyczajów współczesnych może mieć korzenie przedchrześcijańskie. Wobec pominięcia analizy krytycznej materiałów etnograficznych, traktowanie ich jako źródeł do wczesnego średniowiecza jest poważnym błędem metodologicznym.

I tu pojawia się problem następny, związany ze sposobem wykorzystania materiałów etnograficznych przez J. Wawrzeniuk. Przy poszczególnych zagadnieniach Autorka ogranicza się do wymienienia zwyczajów, w rzadkich przypadkach podając także region, w którym owe obserwacje prowadzono. Czytamy na przykład, że: „W Niemczech już od średniowiecza znany był nakaz zaprzestania pracy oraz zakaz mycia się i przędzenia w przypadku śmierci domownika" (s. 169, przyp. 12). Co wnosi ta informacja, podana za Adamem Fischerem (1921)? Czytelnik nie dowie się z niej, czy wiadomość ta dotyczy regionów zamieszkałych przez Słowian, ani z którego fragmentu tego długiego okresu dziejów pochodzą źródłowe wzmianki, a tym bardziej jaki był kontekst ich zanotowania. Recenzowana książka jest pełna sformułowań w rodzaju: „Celem przyśpieszenia śmierci układano konającego na ziemi, wyjmowano spod głowy poduszkę (s. 166)"; „Wynoszono zmarłego przez specjalny otwór w dachu, a w razie jego braku przez dymnik lub zwaloną ścianę chaty" (s. 171), itd. Taka prezentacja tej kategorii źródeł przy omawianiu zagadnień dotyczących wczesnego średniowiecza byłaby może wystarczająca, gdyby służyła tylko wskazaniu możliwych zachowań i zwyczajów ludzkich. Jeżeli jednak źródła etnograficzne miały być jedną z podstaw dowodzących istnienia takich zwyczajów we wczesnym średniowieczu – a tak są przez Autorkę traktowane – wówczas powinny zostać poddane krytyce uwzględniającej m.in. miejsce i czas uzyskania wiadomości, dostępną wiedzę o historii wsi i pochodzeniu jej mieszkańców, skalę rozpowszechnienia zwyczaju w XIX–XX w. Ich analiza powinna być uzupełniona o źródła pisane, które wskazywałyby na korzenie danych zwyczajów i ewentualną obecność na zachodniej Słowiańszczyźnie w średniowieczu i okresie nowożytnym. W całej pracy J. Wawrzeniuk próżno szukać jakiejkolwiek krytyki źródeł, stąd wysuwane sugestie o zakorzenieniu dziewiętnastowiecznych tradycji we wczesnym średniowieczu są wielokrotnie tylko pustosłowiem.

Nie oznacza to jednak, że J. Wawrzeniuk nie zestawia źródeł etnograficznych z pisanymi. Czytelnik znajdzie w omawianej publikacji odniesienia do tych ostatnich, w tym do przekazów wczesno- i późnośredniowiecznych oraz nowożytnych. Niestety Autorka często przywołuje opisy dotyczące innych ludów, jako argumenty służące za podstawę rekonstrukcji świata wierzeń Słowian. Dowiadujemy się na przykład, iż „O tym, że kraina zmarłych mogła być położona za wodą, świadczą połabskie pochówki w kształcie łodzi kamiennej czy ruskie pochówki łodziowe, nawiązujące do opisu pogrzebu u Ibn Fadlana i wzmianki o zemście Olgi i pochowaniu Drewlan w łodzi" (s. 168). Nie chodzi tutaj o to, czy koncepcja lokalizacji krainy zmarłych za wodą ma dobre podstawy, ale o dobór argumentów. Przywołany opis pogrzebu nie dotyczy Słowian, a skandynawskich Rusów – czego J. Wawrzeniuk ma świadomość. Trudno też uznać za argument historię o pogrzebaniu Drewlan w łodzi, skoro w przekazie *Powieści minionych lat* był to efekt podstępu użytego przez księżnę Olgę. Ówczesne elity kijowskie, w dużej części złożone ze Skandynawów, były pod przemożnym wpływem obyczajów z Północy, a sama Olga była niemal na pewno skandynawskiego pochodzenia (por. Duczko 2006, 176–178; Brzozowska 2014, 12 – tam starsza literatura). Co więcej fakt, iż Drewlanie nie zdawali sobie sprawy, że niesienie ich w łodzi może być zapowiedzią śmierci, świadczy wręcz obcości wśród tych Słowian zwyczaju tzw. pochówku łodziowego (oczywiście przy założeniu, że opowieść ta jest prawdziwą). To wszystko czyni wywód autorki niewiarygodnym, a wymienione argumenty nie mogą być traktowane jako świadectwa zwyczajów słowiańskich.

Kolejne zarzuty należy wysunąć w stosunku do sposobu wykorzystania i interpretowania źródeł archeologicznych. Przykładem niech będzie poruszony wyżej wątek lokalizacji zaświatów w wierzeniach dawnych Słowian. Groby łodziowe, wspomniane w ustępie cytowanym w poprzednim akapicie, są często uznawane za miejsca pochówku Skandynawów lub będące śladem silnego wpływu ich kultury i wierzeń na społeczności ziem nadbałtyckich (np. Zoll-Adamikowa 1979, 229, 230; Dulinicz 2001, 203, 205; Kotowicz 2007, 63). Uwzględnienie ich w recenzowanej pracy wymagało przynajmniej kilku zdań komentarza informującego czytelnika co do zakresu wątpliwości, które pojawiają się przy użyciu tych znalezisk do rekonstrukcji wierzeń Słowian. We fragmencie na temat roli wody w obrzędowości pogrzebowej Słowian, czytamy: „W badaniach archeologicznych zauważono jednak względną bliskość cmentarzysk ciałopalnych względem rzek, strumieni i innych naturalnych zbiorników wodnych – średnio 200–600 metrów… Nie ma pewności, czy decydowały o tym względy eschatologiczne, czy tylko potrzeba szybkiego ugaszenia stosu ciałopalnego." (s. 168). Informację o położeniu cmentarzysk względem wody Autorka podała za pracami Heleny Zoll-Adamikowej (1979) i Piotra Kotowicza (2007) – jest ona słuszna, choć trzeba zaznaczyć, że niekiedy odległość ta dochodzi do 1,5–2 km, na co wskazywali m.in. wymienieni autorzy (Zoll-Adamikowa 1979, 27; Kotowicz 2007, 66–73). O ile wpływu wierzeń na położenie nekropoli względem wody w przypadku części stanowisk nie można wykluczyć, o tyle koncepcja druga – o potrzebie szybkiego gaszenia stosu – jest już pozbawiona jakichkolwiek argumentów. Po pierwsze, wciąż nie wiemy, czy takie stosy rzeczywiście powszechnie umiejscawiano na cmentarzach. Po drugie, nic nie wiadomo o tym, aby istniała „potrzeba szybkiego ugaszenia stosu"; co więcej, typowy dla tego okresu, bardzo silny stopień przepalenia i rozdrobnienia kości ludzkich odkrywanych w grobach, sugeruje coś przeciwnego. Po trzecie, trudno zgodzić się, że kilkaset metrów to odległość niewielka, gdy chodziłoby o noszenie wody do ugaszenia czegokolwiek. J. Wawrzeniuk pomija najistotniejszy czynnik wpływający na odległość nekropoli od cieków i zbiorników wodnych, tj. fakt, iż z oczywistych względów blisko wody budowano osady, a miejsca grzebalne znajdowały się niedaleko, najczęściej kilkaset metrów od osad (por. Zoll-Adamikowa 1979, 17; Dzik 2015, 96–100).

Charakterystyce średniowiecznego obrządku pogrzebowego poświęcony jest podrozdział 5.2 (s. 174–199). J. Wawrzeniuk podzieliła go na pięć części, z których dwie poświęcone są przedstawieniu obrządku ciałopalnego i szkieletowego w świetle źródeł pisanych i archeologicznych (podrozdz. 5.2.1 i 5.2.4), trzy zaś – charakterystyce budowy grobów na cmentarzyskach: ciałopalnych (5.2.2), o obrządku mieszanym (5.2.3) i szkieletowych (5.2.5). Wątpliwy sens takiego układu treści jest widoczny już w jego zagmatwanym wytłumaczeniu podanym przez Autorkę (s. 175, przyp. 23), z którego dowiadujemy się, że cmentarzyska o obrządku mieszanym, tj. „…z pochówkami zarówno ciałopalnymi, jak i szkieletowymi… uwzględniono w rozdziale poświęconym konstrukcjom kurhanowym" (czyli podrozdz. 5.2.2), zaś stanowiska z grobami w obudowach kamiennych, również o obrządku mieszanym – w części o nekropolach szkieletowych.

We wstępie do podrozdziału 5.2.1 Autorka słusznie konstatuje, że ciałopalenie „uważane jest za typowy dla wczesnośredniowiecznych Słowian obrządek pogrzebowy", niepotrzebnie jednak przytacza jednocześnie pogląd włoskiego filologa, Evela Gaspariniego, wedle którego między VI a VIII wiekiem Słowianie zachodni grzebali zmarłych głównie w rycie inhumacyjnym (s. 175, przyp. 22). Jest on bowiem pozbawiony podstaw źródłowych i od kilkudziesięciu lat niebrany pod uwagę w dyskusji naukowej, a w niniejszym tekście sprawia wrażenie niemal równorzędnej hipotezy. Kontynuując wywód, J. Wawrzeniuk przytacza kilka przekazów źródłowych wspominających „O słowiańskim i pierwotnym charakterze ciałopalenia" (s. 176). Dlaczego jednak wśród nich znalazła się relacja Ahmada ibn Fadlana z pogrzebu ruskiego wodza? W żaden sposób nie może być ona tutaj dowodem, bowiem ówcześni Rusowie (lata dwudzieste X w.) nie byli Słowianami.

W tym samym podrozdziale znalazło się kilka informacji o cmentarzyskach kurhanowych i płaskich (s. 177), z których niektóre budzą duże zdziwienie. Dowiadujemy się m.in., że „Połowa stanowisk kurhanowych składała się z kilkunastu kurhanów". Tymczasem, zgodnie z wciąż jedynym zestawieniem cmentarzysk z terenu całej Polski z grobami o tej formie, po tyleż mogił liczyło około 15% stanowisk (Zoll-Adamikowa 1979, 34–38). Dalej J. Wawrzeniuk pisze: „Pochówek umieszczano zazwyczaj w centrum kurhanu", powołując się przy tym na artykuł Cezarego Buśko (1993), dotyczący wszakże kurhanów kultury łużyckiej (sic!). Dobrze, że informacja ta uzupełniona została wyliczeniem typów pochówków według H. Zoll-Adamikowej, szkoda jednak, że zabrakło tu wyjaśnienia znaczenia poszczególnych terminów. Przypuszczalnie dla większości czytelników takie określenia pochówków, jak „nasypowy" lub „warstwowy" będą niejasne. Zdziwienie budzi kolejne stwierdzenie Autorki, iż „Według źródeł pisanych razem z pogrzebem mężczyzny odbywał się również zapewne pogrzeb jego żony, niewolnic i innych osób związanych ze zmarłym." (s. 177). Kilka niezależnych źródeł wspomina – owszem – o tym, że u Słowian żona zmarłego mężczyzny może (nie musi) odebrać sobie życie i zostać pochowaną wraz z nim, oraz, że jest to dobrze widziane wśród Słowian (np. GŁŹ 1952, 91, 136; IBN ROSTEH 1977, 37 [203–205]; por. Lewicki 1952–1953, 128; Zoll-Adamikowa 1979, 190). Niewykluczone, że i inne osoby chowano wraz ze zmarłymi o najwyższym statusie społecznym, jednak wartość przekazów będących podstawą tej hipotezy budzi słuszne wątpliwości (por. Zoll-Adamikowa 1979, 187, 188). Należy też dodać, że jedyny tekst, który mówi o tym, że kobietę zawsze zabijano po śmierci jej męża, pochodzi z *Kroniki* Thietmara (THIETMAR 2002, 218 [VIII, 3]). Informacja ta została odnotowana pod rokiem 1018, jako dotycząca czasów sprzed chrztu Mieszka I, i trudno ją traktować, jako w pełni wiarygodną. Na jej treść mogło rzutować kilka czynników. Po pierwsze, niewykluczone jest, że jej podstawą był przekaz ustny, po dziesiątkach lat już w szczegółach mocno zniekształcony. Po drugie, przerysowywanie informacji o zwyczajach Słowian w chrześcijańskim środowisku elit niemieckich (tj. przez źródło wiadomości Thietmara lub przez samego kronikarza) wydaje się dość prawdopodobne, niezależnie od tego, czy miało to służyć ukazaniu barbarzyństwa pogan, czy tylko zwróceniu uwagi słuchacza lub czytelnika przez drastyczność informacji. Po trzecie wreszcie, kontekst podania tej wiadomości przez biskupa merseburskiego – tj. w wywodzie potępiającym rozwiązłość kobiet, w tym zamężnych – mógł spowodować, iż jej treść została odpowiednio zmieniona w celu wyostrzenia całego przekazu. Z powyższych względów zawarte w nim informacje, które nie mają potwierdzenia w innych, niezależnych źródłach z epoki – tj. o zabijaniu żony każdego zmarłego męża oraz o formie jej śmierci, przez obcięcie głowy – należy uznać za mało wiarygodne.

Podrozdział 5.2.2 poświęcony jest przede wszystkim omówieniu cech słowiańskich kurhanów. Według J. Wawrzeniuk, „Najbardziej »wykorzystywana« w zabiegach ochronnych wydaje się konstrukcja kurhanowa nawiązująca zarówno do symboliki koła, jak i do góry kosmicznej" (s. 178). Pierwszy etap budowy takiego grobu, tj. wydzielenie podeń przestrzeni, „miał na celu uporządkowanie pierwotnego chaosu poprzez rozdzielenie sił wrogich i sprzyjających człowiekowi, czyli wyodrębnienie spośród wszechobecnego *profanum* pewnego obszaru *sacrum*." Te, i im podobne stwierdzenia są w większości nieudowadnialnymi przypuszczeniami, niekiedy stojącymi w sprzeczności ze źródłami. Oto bowiem nie jest wcale oczywistym, że Słowianie sypali mogiły na planie koła (por. Zoll-Adamikowa 1979, 77). Obecnie dokumentowany, kolisty lub owalny kształt kopców, może być zwodniczy, zważywszy na procesy erozyjne, a także słabą czytelność granic mogił w terenie. Należy mieć na uwadze, iż forma stożka o podstawie koła lub owalu jest wynikiem praw mechaniki ciał sypkich. Pewną przesłanką świadczącą o pierwotnie planowanej formie grobu może być kształt konstrukcji naziemnych odsłanianych wewnątrz mogił – pod wieloma nasypami odkryto prostokątne (często kwadratowe) konstrukcje kamienne lub drewniane, te na planie koła są natomiast zdecydowanie rzadsze. Czy zatem dostrzeganie w kurhanach „symboliki koła" nie jest tylko współczesną nadinterpretacją? Wysokość zdecydowanej większości kurhanów wynosi 0,5–1 m, przy średnicy między 5 a 10 m. Nawet biorąc pod uwagę procesy erozyjne, obiekty te nie imponowały rozmiarami, stąd także dopatrywanie się w nich symboliki „góry kosmicznej" wydaje się daleką przesadą (o znaczeniu pojęcia por. Eliade 1961, 42–49; Bator 2002, 224–225).

Część poświęcona formom konstrukcji drewnianych i kamiennych w kurhanach (s. 180–186), będąca streszczeniem ustaleń H. Zoll-Adamikowej – co nie zostało niestety zaznaczone – jest wypełniona błędami merytorycznymi i redakcyjnymi. Wymienię tylko niektóre. Autorka stwierdza na przykład, że jedna z form konstrukcji drewnianych – tzw. komory – wystąpiła „w większości z przebadanych kurhanów na ziemiach polskich." (s. 180). Otóż jest dokładnie odwrotnie. Takie konstrukcje, których opis J. Wawrzeniuk przytacza niemal dosłownie za niewymienioną pracą H. Zoll-Adamikowej (1979, 95), występują nie w Polsce a głównie nad Oką, w Rosji (tamże, ryc. 38). Dalej czytelnik dowie się, że wielkość drewnianej konstrukcji czworobocznej w kurhanie była zależna od rozmiarów tego ostatniego (s. 181) i przeczyta o długich kurhanach „w okolicach Pskowska" (s. 186; winno być Pskowa – stolicy ziemi pskowskiej). Sposób kompilowania tekstów H. Zoll-Adamikowej przez Autorkę spowodował, że w tej części dwukrotnie podana została interpretacja krakowskiej archeolog dotycząca etapów budowy kurhanu nr 1 w Kornatce, pow. myślenicki (s. 182, 185), z tym, że za drugim razem, jako sumaryczny opis przebiegu budowy kurhanów (por. Zoll-Adamikowa 1968, 144). Nie miejsce tu na omawianie tej dyskusyjnej rekonstrukcji. Należy jednak podkreślić, że podawanie obserwacji dotyczącej jednego obiektu, do tego nietypowego (odkryto w nim konstrukcję drewnianą oraz kamienną), jako ogólnego opisu etapów budowy kurhanów słowiańskich, jest wprowadzaniem w błąd czytelnika.

J. Wawrzeniuk wspomina o koncepcji słupów stawianych na kurhanach lub przy nich, zastanawiając się tylko, „czy naczynia umieszczano wprost na nich, czy też słupy dźwigały jakieś bardziej złożone »budowle« w typie domków zmarłych…" (s. 181, 182). Dla ilustracji problemu cytuje trzy źródła: *Powieść minionych lat*, kronikę Kosmasa oraz żywot św. Ottona z Bambergu autorstwa Ebona. Wypada wyjaśnić, iż ostatnie dwa przekazy nie wspominają ani słowem o słupach podtrzymujących cokolwiek. Jedynie w *Powieści* znajduje się informacja o ustawianiu popielnic przy drogach (ew. na rozdrożu), *на столпѣ* (PSRL 1908, 14). Słowo to w średniowiecznych przekazach ruskich *używane jest nie tylko w znaczeniu słupa, ale oznacza* również m.in. kamień nagrobny, miejsce wywyższone (kopiec?) lub ogrodzone, a nawet sarkofag (SRL 1849, 51; D'yachenko 1899, 665–666; SDYA 2016, 674–679). Biorąc pod uwagę znaczenie terminu w źródłach z tego okresu i młodszych, Borys Rybakow postawił hipotezę, iż mogły być nim określane także domopodobne konstrukcje nagrobne (Rybakov 1970, 43–44). Interpretacja ta wydaje się o tyle interesującą, że *wówczas wzmianka z Powieści* byłaby zbieżna ze współczesną jej informacją o budkach stawianych na rozdrożach, w Czechach (na ten temat: Dzik 2015, przyp. 350). Skoro hipoteza o słupach podtrzymujących popielnice ma tak nikłą podstawę, to czy warto rozbudowywać ją o kolejne pomysły, takie jak słupy na kurhanach lub słupy z „domkami zmarłych", bez podawania jakichkolwiek argumentów i podstaw wnioskowania?

W kontekście opisanej hipotezy dobitnie widać, do jakich błędów może prowadzić korzystanie wyłącznie z przekładów źródeł oraz ich dalszych interpretacji, co jest standardem w omawianej pracy. Chodzi tu o fragment dzieła Ebona, mówiący o zakazaniu przez św. Ottona umieszczania przez Pomorzan kijów na grobach: …*ne fustes ad sepulchra eorum ponant*… (EBO 1969, 45 [II, 12]). Na s. 182 jest on przytoczony przez J. Wawrzeniuk jako uzasadnienie źródłowe rozważań na temat stawiania popielnic lub „domków zmarłych" na słupach. Z kolei kilka stron dalej ten sam przekaz, ale już za interpretacją Alfonsa Labuddy (1983, 56), posłużył jako podstawa stwierdzenia, iż „Nowo nawróceni mieli również odstąpić od pogańskiego zwyczaju rzucania gałęzi, patyków czy chrustu na groby" (s. 192). Oczywistym jest, iż niejednoznaczny przekaz może być różnie rozumiany. Jednak użycie go jako dowodu na występowanie we wczesnym średniowieczu dwóch tak różnych zwyczajów wskazuje, że albo Autorka nie zdawała sobie sprawy, iż chodzi tu o to samo zdanie, albo uznała ten fakt za nieistotny. W jednym i drugim przypadku źle to świadczy o warsztacie naukowym.

W podrozdziale 5.2.2 („Charakterystyka budowy grobu na cmentarzyskach o obrządku mieszanym"; s. 187–190), J. Wawrzeniuk zawarła krótkie omówienie płaskich grobów typu Alt-Käbelich, uzupełnione o – niemający związku z tematem podrozdziału – fragment z informacjami ze źródeł pisanych i etnograficznych o powodach palenia zmarłych wśród Słowian i Bałtów (będący w połowie niemal dosłownym cytatem z pracy A. Labuddy 1983, 49). Wbrew temu, co możemy przeczytać na s. 187, przechodzenie do rytu inhumacyjnego na ziemiach polskich rozpoczęło się nie na początku XI w., ale najpóźniej w ostatniej ćwierci X stulecia (Sikora 2015; Buko 2016, 35–44 – tam starsza literatura). Cytując wyjątek z dzieła Al-Bekriego Autorka opisuje go jako tekst napisany przez Ibrahima ibn Jakuba, co wskazuje na niezrozumienie, czym jest tzw. *Relacja Ibrahima ibn Jakuba* oraz sama kronika Al-Bekriego (por. Sikorski 2012, 20–36).

Zawarte w tym podrozdziale omówienie grobów stanowi przykład mylenia opisu źródła archeologicznego i jego interpretacji, a także terminologii archeologicznej. Tak oto, na początku czytelnik dowie się o występowaniu na cmentarzyskach z Pomorza tzw. „domków zmarłych", będących zazwyczaj jamami znacznych rozmiarów, zawierającymi m.in. ułamki przepalonych kości ludzkich (s. 187). Dla takich obiektów przyjęto w literaturze przedmiotu termin 'groby typu Alt Käbelich', co też odnotowuje J. Wawrzeniuk (s. 188). Ze względu na formę analogiczną do obiektów odkrywanych na osadach i uznawanych za pozostałości budynków mieszkalnych przyjmuje się dość powszechnie, że groby te nawiązywały konstrukcją do domów (por. Szymański 2004, 302–307 – tam dalsza literatura). Stąd określenie „domy zmarłych", które jest jednak interpretacją, a nie terminem oznaczającym typ lub odmianę obiektu. Warto o tym pamiętać tym bardziej, że jest to pojęcie szersze, w którego zakres wchodzą także obiekty o konstrukcji odmiennej od grobów typu Alt Käbelich (Szymański 2004; Sikora 2010, 307–312; Dzik 2014b, 97–101). Według Autorki, częstą cechą tych obiektów miałoby być występowanie w nich m.in. „grobu szkieletowego" (s. 188). Tyle, że w tych obiektach odkrywane bywają nie groby, tylko pochówki szkieletowe (lub pojedyncze kości), a 'pochówek' i 'grób' zdecydowanie nie są pojęciami tożsamymi. Dalej, powołując się na pracę Völkera Schmidta (1992, 14–15), Autorka wymienia trzy odmiany „domów zmarłych", w tym m.in. „groby typu Alt Käbelich, tzw. zagłębione domy zmarłych" oraz „groby typu Alt Käbelich, tzw. płaskie domy zmarłych, wznoszone w konstrukcji zrębowej, rzadziej słupowej." (s. 188). Jest to kolejny przykład metodologicznie błędnego mieszania terminów archeologicznych (typ grobu) z ich interpretacjami. W przywołanej pracy niemiecki archeolog nie określa zresztą obu form tych grobów jako typu Alt Käbelich. Choć kwestia cech diagnostycznych tego typu obiektów wciąż jest przedmiotem dyskusji, trudno zgodzić się z zaliczaniem doń obiektów archeologicznych o tak odmiennych cechach.

Liczne błędy merytoryczne i terminologiczne zawierają rozdziały poświęcone obrządkowi i cmentarzyskom szkieletowym (5.2.4, 5.2.5). Zdania takie jak: „Z wyjątkiem pochówków kurhanowych inne cmentarzyska szkieletowe… sytuowane były w nowych miejscach" (s. 190), „pochówki szkieletowe podzielono na płaskie i kurhanowe" (s. 195) ponownie wskazują, że Autorka ma problem z rozróżnieniem, czym jest pochówek, a czym grób. Na wschodnim Mazowszu tzw. cmentarzyska nieprzykościelne występują nie do pierwszej połowy XII w. (s. 190), ale do XIII w., a na terenie obecnego Podlasia aż po okres wczesnonowożytny (por. Bronicka-Rauhut, Rauhut 1977, 84; Dzik 2015, 202–203). Na s. 191 czytelnik dowie się, że obecność w grobach przedmiotów takich jak: zawieszki z kłów zwierzęcych, kaptorgi, skamieliny, jajka i in., wskazuje na stosowanie praktyk antywampirycznych. Jest to jednak daleką nadinterpretacją. Wiadomość tę J. Wawrzeniuk przedstawia jako podaną za H. Zoll-Adamikową (1971, 126–127), co jest kolejn*ą pomyłką* wskazując*ą* na nieuważne czytanie przez Autorkę prac poprzedników. Kilka błędów zawiera jedno tylko zdanie, dotyczące lokalizacji cmentarzysk nieprzykościelnych, które miałyby być zakładane „…z dala od osad i grodów, na terenie Pomorza Zachodniego i Czech na polach i lasach…, podobnie w Małopolsce, gdzie większość cmentarzysk leżała na polach lub na skraju lasów, które uległy wykarczowaniu (np. Goszyce), na miejscu dawnych osad (np. Chroberz, Horodyszcze, Stradów I, Kraków-Wawel, aneks przy rotundzie NMP)" (s. 191). Po pierwsze, szereg stanowisk zaliczonych do tej kategorii odkryto bardzo blisko osad i grodów. Po drugie, informacja o zakładaniu cmentarzy na Pomorzu i w Czechach na polach i lasach – pomijając *wątpliwy sens* jej podania – jest nadinterpretacją dwóch przekazów źródłowych. Zawarte w nich zwroty o chowaniu zmarłych… *in silvis aut in campis*… (EBO 1969, 45 [II, 12]), …*in silvis et in campis*… (KOSMAS 1923, 161 [III, 1]), to powtarzający się w źródłach topos *o położeniu* miejsc grzebalnych, uznawanych przez autorów danych tekstów za nieodpowiednie dla chrześcijan. Niewiele on zatem mówi o rzeczywistej lokalizacji takich nekropoli. Istotne jest również to, że nie muszą być one tożsame z tzw. cmentarzyskami szkieletowymi nieprzykościelnymi (odnośnie do dyskusji nad problemem por. Zoll-Adamikowa 1979, 171–178). Wracając do miejsc zakładania cmentarzy nieprzykościelnych trzeba wyjaśnić, że odkrycie ich obecnie na polach lub skrajach lasów nic nam nie *mówi o położeniu względem szaty roślinnej w czasie* ich zakładania. Wreszcie, zaliczenie grobu odkrytego na Wawelu, przy rotundzie NMP, do cmentarzysk nieprzykościelnych jest całkowitym nieporozumieniem.

Kolejne zdania na temat cech cmentarzysk szkieletowych, np. „Ówczesne zwyczajowe normy pogrzebowe dotyczyły wzgórz i miejsc wyniosłych…, brak natomiast było sytuowania pochówków w pobliżu sieci wodnych…" (s. 191), „Orientacja ciała z głową na zachód, by zmarły mógł widzieć zachodzące słońce, nie była znana Słowianom i Germanom" (s. 194), są po części pozbawione sensu, nie wspominając o podstawie źródłowej. Dotyczy to tak uwag opartych – przynajmniej teoretycznie – na materiałach archeologicznych, jak i wyprowadzonych na podstawie źródeł pisanych. Zinterpretowanie przekazu Kosmasa o wrzuceniu zamordowanych Wrszowców bez trumny do dołu (KOSMAS 1923, 193 [III, 24]), jako przesłanki, iż „»Pogański« obrządek szkieletowy stosowano jeszcze w wieku XII" (s. 192), zniechęca do jakichkolwiek komentarzy. Lektury nie ułatwia wyjątkowo duże nagromadzenie błędów fleksyjnych i składniowych w tym podrozdziale.

Poruszając temat grobów w obudowach kamiennych J. Wawrzeniuk stwierdza za Lechosławem Rauhutem (1971, 460), iż ich pojawienie się na Mazowszu około połowy XI w. było „zapewne skutkiem wymuszonej konieczności przejścia od ciałopalenia do pochówków szkieletowych" (s. 197). Zabezpieczeniu się żywych przed powrotem umarłych miałoby służyć wypełnianie grobów wielowarstwowymi brukami (tu Autorka powołuje się na mój artykuł – Dzik 2014b, 89 – nie zauważając, że w odnośnym fragmencie reasumuję jedynie koncepcję L. Rauhuta, a cały tekst poświęcony jest wykazaniu, iż powody użycia kamieni były zupełnie inne). Z nieznanych powodów ową interpretację miałaby potwierdzać obecność grobów ciałopalnych na Mazowszu i Podlasiu (s. 197). W dalszej części wywodu Autorka przytacza inne, funkcjonujące w piśmiennictwie interpretacje grobów płaskich i kurhanów z konstrukcjami kamiennymi, jednak streszcza je w taki sposób, że czytelnik nie ma szans zrozumieć, jaki jest stan wiedzy na ich temat. W podsumowaniu podrozdziału Autorka podkreśla, iż „domy zmarłych" i sposoby budowy grobów miały „przede wszystkim odizolować zmarłego od świata żywych" oraz, że konstrukcja grobów mogła być „wynikiem wiary w »żywego trupa«" (s. 198, 199).

Podrozdział 5.3, zatytułowany „Sakralna moc zmarłego", poświęcony jest przede wszystkim omówieniu znaczenia tzw. wyposażenia grobowego. J. Wawrzeniuk *słusznie* zauważa, iż „każdy przedmiot towarzyszący zmarłemu mógł mieć co najmniej podwójne znaczenie" (s. 199), tj. nie tylko użytkowe, ale i magiczne lub symboliczne. Dzielenie ich *ad hoc* na takie, które miały znaczenie magiczne lub nie, jest błędem wpływającym negatywnie na ich interpretację (s. 191, przyp. 43). Istotnym uzupełnieniem tej części jest tabela 26 (s. 381–413), zawierająca wykaz znalezisk archeologicznych, które stały się podstawą opracowania tematu.

Pierwszy z podrozdziałów tej części (5.3.1 „Ubiór zmarłego jako wynik zabiegów apotropeicznych") jest kolejnym przykładem zdecydowanego przecenienia znaczenia materiałów etnograficznych jako podstawy dla rekonstrukcji wierzeń i zwyczajów wczesnośredniowiecznych. Dwustronicowy wywód oparty na współczesnych obserwacjach, Autorka kończy zdaniem: „Materiał archeologiczny dotyczący stroju dawanego zmarłym zachowany jest w sposób szczątkowy. Trudno jednoznacznie stwierdzić, czy pozostawione fragmenty stanowią część szaty zmarłego czy całunu, którym było owijane ciało" (s. 201). Czy naprawdę to jest wszystko, co można powiedzieć o stroju zmarłego we wczesnym średniowieczu? Przecież informację niosą o nim także metalowe jego elementy, np. sprzączki, heftki, guziki (także szklane). Podstawą wnioskowania może być też obecność ozdób głowy, szyi i rąk, nierzadka przecież, a dowodząca m.in. iż dana osoba nie była pochowana w samej śmiertelnicy (czechle). *Źródłem informacji są nawet narzędzia – noże, szpile, krzesiwa – które były przytwierdzone do pasa, często w pochewkach.* Przeanalizowanie zależności bogactwa elementów ozdób, części stroju względem wieku zmarłych mogłoby dostarczyć interesujących wniosków np. do badań nad zwyczajem grzebania osób niezamężnych w stroju weselnym (por. Koperkiewicz 2011, 275). Zamiast tego czytelnik napotka tu listę informacji zebranych z prac etnograficznych, takich jak: „Słowianie rzadko wkładali buty do trumny… Zamiast nich używano skarpetek i pończoszek" oraz „według zwyczajów germańskich zmarłym przywiązywano do nóg obuwie śmiertelne zwane »helsko«" (s. 200). Co nam to wszystko mówi o ubiorze zmarłego Słowianina w okresie wczesnośredniowiecznym?

W podrozdziale 5.3.2 Autorka zajęła się apotropeiczną symboliką darów grobowych. W pierwszej kolejności omawia problem kategoryzacji darów grobowych oraz przyczyny dawania przedmiotów zmarłym (w świetle materiałów etnograficznych). Ostatecznie wyróżnia cztery grupy wyposażenia zmarłego: 1) przedmioty związane z jego strojem; 2) dary od rodziny; 3) przedmioty włożone do grobu w związku z zastosowaniem dodatkowych czynności o symbolicznym charakterze; 4) przedmioty „mające związek z czynnym kultem zmarłych lub kultem przodków" (s. 203). Zwraca przy tym uwagę, iż jeden przedmiot może należeć do więcej, niż jednej grupy.

Przechodząc do omówienia wybranego materiału archeologicznego, J. Wawrzeniuk podzieliła go na dziewięć kategorii. Pierwszą z nich stanowią monety i muszle (s. 204–207). Autorka uzasadni*ła* to nietypowe zestawienie dwóch rodzajów zabytków tym, że muszle mogły być ekwiwalentem monet. Nie wskazuje jednak podstaw owego wniosku, zaznaczając przy tym, że owych zastępników mogło być więcej (s. 207) – czemu zatem pozostałe zostały pominięte? Dodać trzeba, iż muszle często występują jako element kolii, w funkcji w której trudno dopatrywać się związku z monetą – i to niezależnie od tego, czy ta ostatnia była tylko srebrem, czy już walutą. W treści tego fragmentu próżno jednak szukać analizy funkcji muszel. Zawiera on *głównie streszczeni*e koncepcji dotyczących znaczenia monet, jako wyposażenia grobowego. Szkoda, że Autorka nie uwzględniła tu ustaleń zawartych w najobszerniejszej pracy na ten temat, tj. artykułu Łukasza Miechowicza (2011), choć zamieściła go w spisie literatury. Dziwi zupełny brak odniesienia się do znaczenia położenia monet względem zmarłego. Zważywszy na temat książki warto było zwrócić uwagę na przykład na monety odkrywane w obrębie żuchwy lub szczęki. Nowożytne źródła pisane oraz materiały etnograficzne wskazują, iż w usta zmarłych wkładano numizmaty, które miały spełnić funkcję apotropeiczn*ą* (Dzik 2007, 87; Miechowicz 2011, 349). Należałoby rozważyć, czy zwyczaj ten mógł mieć korzenie wczesnośredniowieczne.

Druga kategoria znalezisk wydzielona przez Autorkę, to amulety (s. 207, 208). W*ątpliwości budzi sens* jej wyróżnienia, skoro rolę amuletu mogła pełnić większość zabytków ujętych też w pozostałych grupach (monety, kaptorgi, grzechotki, belemnity itd.). Zastanawia to tym bardziej, że J. Wawrzeniuk zdaje sobie sprawę z wieloznaczności tego pojęcia, czego dowodzi w omówieniu amuletów w jednym z wcześniejszych rozdziałów (s. 107–118). Metodycznie poprawnym byłoby zastosowanie jednego kryterium podziału zabytków pochodzących z cmentarzysk. Tutaj podstawą stała się domniemana funkcja, podczas gdy w większości pozostałych kategorii – rodzaj przedmiotów. Jako amulety Autorka wymieni*ła* przedmioty wykonane z kłów zwierząt, kości ptasich oraz owoców, ale dołączyła do nich także – z niewyjaśnionych przyczyn – kilka odkryć paciorków szklanych i kamiennych oraz muszle z otworkami (s. 208, 390, 391).

Kolejną wyróżnioną grupę zabytków stanowią: igły, szydła oraz sierpy (s. 208–210). Według Autorki, „Igły znajdowane na cmentarzyskach wczesnośredniowiecznych służyły zapewne przede wszystkim do ochrony przed zmarłym i zmarłemu do »obrony«" (s. 208). Niestety zabrakło tutaj wyjaśnienia, na jakiej podstawie wysunięty został tak jednoznacznie postawiony wniosek. Podstawę do omówienia szydeł stanowi raptem sześć znalezisk z czterech cmentarzysk. J. Wawrzeniuk pominęła tutaj tzw. szpile pierścieniowate, stanowiące rodzaj szydeł, znane z kilkudziesięciu cmentarzysk z różnych regionów kraju. Trudno zrozumieć, dlaczego rzekomy miniaturowy sierp z Czerska miałby potwierdzać tezę, „według której zmarły (lub jego dusza) opanowany przez siły nieczyste mógł również zaburzać ład doczesny" (s. 210). Związek owego przedmiotu z pochówkiem jest zresztą niepewny, jako został on odkryty w zasypisku grobu wkopanego w półziemiankę i mógł pochodzić z tej ostatniej (Bronicka-Rauhut 1998, 41, 113, ryc. 104: 4; por. Dzik 2014a, przyp. 619).

Czwartą kategorią zabytków z grobów są: hetki, wisiorki dzwoneczkowate i grzechotki. W zamyśle Autorki są to przedmioty, których „mocą odstraszającą miał być dźwięk, jaki wydawały" (s. 210). Dlaczego jednak znalazły się tutaj hetki? Przecież służyły one przede wszystkim do zapięcia różnych elementów stroju, i tylko teoretycznie mog*ły być aerofonami*, co przekonująco wykazał już ćwierć wieku temu Tadeusz Malinowski (1993, 3–10). Znaleziska z cmentarzysk bynajmniej nie wskazują, by w kontekście grobowym znalazły się one jako instrumenty. Z kolei w przypadku zawieszek dzwoneczkowatych bardziej prawdopodobne jest, że trafiły one do grobów jako elementy strojów lub przytwierdzone do innych przedmiotów (np. pochewek, sakw), niż jako „dary". W tekście zabrakło choćby próby rozważenia, co o funkcji tych znalezisk *mówi nam* ich położenie względem innych zabytków i szkieletu. Jedynymi znaleziskami spośród tu uwzględnionych, które niemal na pewno były przedmiotami danymi zmarłemu, są grzechotki. W ich przypadku także zabrakło tu analizy kontekstu archeologicznego (której brakuje również we fragmencie o funkcji tych przedmiotów – s. 154, 155). Szkoda, że Autorka całkowicie pominęła kwestię możliwej symboliki ornamentu i barwy tzw. grzechotek guzowatych, która mogła być równie istotna dla użytkowników, jak ornamentyka tzw. pisanek.

Następną kategorię stanowią skorupki jajek i pisanki, do których zaliczona została również większość grzechotek o formie jaja (s. 211–213; 404–406). W kontekście znalezisk grobowych nieprzekonującym jest stwierdzenie Autorki, iż „Pisanka jako dar (ofiara) chroniła [zmarłego? – MD] przed niekorzystnymi zjawiskami przyrodniczymi, zapewniała spokój w grobie, stanowiła symbol bezpiecznej prokreacji [czyjej? – MD]". Czytając omówienie szóstej grupy znalezisk (krzyżyki i kaptorgi), czytelnik dowie się, że „znak krzyża umieszczano także na dnach naczyń wstawianych do grobu" (s. 214), jako pogański znak zamknięcia. Do tematu Autorka powraca też nieco dalej, pisząc iż znak ten zapewne odgradzał przed negatywną siłą zmarłego (s. 218). Owe znaki garncarskie bynajmniej nie są specyficzne dla znalezisk grobowych, a ich znaczenie i konotacje religijne nie są tak oczywiste, jak sugeruje Autorka (por. Buko 2011, 367 n.). Wbrew temu, co możemy przeczytać w pracy, krzyżyki z bursztynu nie są najliczniejszą grupą takich znalezisk z cmentarzysk. J. Wawrzeniuk pominęła m.in. liczne odkrycia dewocjonaliów wczesnośredniowiecznych z cmentarzysk pogranicza polsko-ruskiego oraz z Mazowsza Wschodniego, w tym najliczniejszy ich zbiór ze Święcka-Strumian, pow. wysokomazowiecki (Jaskanis 2008, 204 n.).

Za wspólną cechę pozwalającą wyróżnić kolejną grupę (belemnity, kamienie żarnowe, gwiazdy ceramiczne), uznana została rzadkość ich odkryć w grobach (s. 214). Przykładowo, Autorce znane są trzy znaleziska belemnitów *z dwóch grobów w Złotej, pow. pińczowski*. Fakt, iż położenie ich względem szkieletów nie jest bliżej znane (por. Miśkiewicz 1967, 116, 120; nie można wykluczyć, że znalazły się on w zasypiskach grob*ów* przypadkowo), nie przeszkodził J. Wawrzeniuk w zamieszczeniu ryciny prezentującej schemat rozmieszczenia belemnitów w grobach (ryc. 45). Podstawa i wartość tej wizualizacji jest żadna. Ostatnie dwie kategorie stanowią: 1) dary pochodzenia organicznego, czyli – jak wynika z zestawienia tabelarycznego (s. 413) – owoce i nasiona, oraz 2) naczynia (pominięte w katalogu znalezisk).

J. Wawrzeniuk zebrała sporą, choć bardzo niekompletną liczbę znalezisk. Niestety, cechą wspólną wszystkich opisów zabytków z grobów jest brak wniosków samej Autorki. W omówieniu przedmiotów czytelnik znajdzie mniej lub bardziej trafne uwagi o ich symbolice, niektóre ich interpretacje znane z literatury, i niewiele więcej. Dotyczy to także opisów podanych w podrozdziale 4.5, w którym część zabytków zostało szerzej omówionych. Mimo, że Autorka zebrała niektóre informacje o kontekście odkrycia zabytków (lokalizacja przedmiotu w grobie, współwystępujące zabytki, płeć zmarłych, chronologia obiektu) i wykonała ryciny ukazujące rozmieszczenie przedmiotów względem szkieletów, nie wyprowadziła żadnych wniosków na tej podstawie.

W podrozdziale 5.4 Autorka zajęła się tzw. pochówkami nietypowymi. Omówiła w nim kolejno: „Pochówki puste", cząstkowe oraz tzw. pochówki wampiryczne. Już w tytule tej części jest błąd, powtarzany także w treści wypowiedzi, bowiem nie ma czegoś takiego, jak „pochówki puste" (s. 219, 220), puste mogą być i bywają groby. Zastanawiając się nad nimi Autorka pominęła dwa istotne wątki. Po pierwsze, brak szczątków w wielu zbadanych kurhanach bywał wynikiem nieuważnej eksploracji warstwy próchnicznej, w której to – w przypadku pochówków nakurhanowych – znajdowały się przepalone kości (Zoll-Adamikowa 1979, 126–133). Po drugie, w licznych przypadkach ze względu na warunki zalegania dochodziło do pełnego rozłożenia kości. Po trzecie wreszcie, niewykluczone jest stosowanie we wczesnym średniowieczu tzw. pochówk*ów* dwukrotnych, tj. związanych z podjęciem z grobu i powtórnym pochowaniem zmarłego, w efekcie czego pierwotne miejsce *złożenia jego ciała* mogło pozosta*ć* pustym (por. Dzik 2015, 67).

Szereg interpretacji zaproponowanych przez J. Wawrzeniuk wynika bądź ze słabej znajomości materiałów archeologicznych, bądź z lekceważącego podejścia do faktów źródłowych. Zestawienie podstaw rozpoznawania zabiegów antywampirycznych, w tym kryteriów etnograficznych oraz archeologicznych, według Autorki „wskazuje na liczne podobieństwa w stosowaniu praktyk antywampirycznych odnotowanych w folklorze ludowym i u Słowian przed przyjęciem chrześcijaństwa" (s. 225, tab. I). To zadziwiający wniosek, skoro owe dane archeologiczne pochodzą z cmentarzysk funkcjonujących wyłącznie po przyjęciu chrześcijaństwa, w tym z cmentarzysk późnośredniowiecznych i nowożytnych. Kolejnym przykładem nietypowego podejścia do źródeł są dywagacje na temat pochówków z kurhanów nr 15 i 23 w Kornatce (s. 219), albo też reinterpretacja dębu, który rósł na Kopcu Krakusa, jako słupa, na którym miałaby znajdować się popielnica (s. 219, przyp. 97). W górnych partiach nasypu odkryto przecież rozwinięty system korzeni jednego, kilkusetletniego drzewa (Jamka 1965, 203–205) – jakim sposobem miałby on być pozostałością słupa? Słup pośrodku kopca odkryto, owszem, ale kilka metrów pod wierzchołkiem (Jamka 1965, 203 n.). Uchwytny był on na większości wysokości nasypu (do 15 m poniżej jego kulminacji) i wiązać go trzeba z konstrukcją kopca.

W kontekście pochówków nietypowych zdecydowanie zabrakło omówienia znalezisk archeologicznych datowanych na wczesne średniowiecze, interpretowanych jako ślady wtórnego otwierania grobów w celu przeprowadzenia zabiegów o charakterze apotropeicznym (por. Dzik 2010, na temat pochówków częściowo ciałopalnych; Gardeła *et al.* 2015 – tam starsza literatura).

Ostatnia część rozdziału – „Zabiegi ochronne wykonywane wokół grobów" – składa się z dwóch części (s. 231–242). Pierwsza z nich nosi tytuł „Rekonstrukcja obrzędowości pogrzebowej w świetle źródeł etnograficznych i pisanych" (podrozdz. 5.5.1), jednak zawiera uwagi dotyczące tylko obrzędów, które następowały po pochowaniu zmarłego. Czytelnik znajdzie tu przede wszystkim kompilację opisów wziętych z opracowań etnograficznych oraz źródeł pisanych. Te ostatnie przywoływane bywają nieraz na uzasadnienie tez, z którymi nie mają nic wspólnego. O jakich obrzędowych walkach mówią cytowane przez Autorkę fragmenty *Powieści minionych lat* (s. 235, 236, przyp. 122, 123)? Jeżeli rzeź pięciu tysięcy Drewlan w historii o zemście Olgi za zabicie męża ma być przykładem takich słowiańskich „obrzędowych walk" w trakcie tryzn, to jest to sztuka interpretacji porównywalna ze skokiem na bungee, tylko bez liny.

W ostatnim podrozdziale (5.5.2), J. Wawrzeniuk omówiła pokrótce materialne pozostałości zabiegów magicznych, które wiąże z obrzędowością zaduszną. Zalicza do nich: ślady palenia ognia na cmentarzyskach, znaleziska kości zwierzęcych w grobach, pochówki zwierząt oraz odkrycia naczyń i ich fragmentów na stanowiskach sepulkralnych. Podstawą stały się dane zebrane z opracowań 13 cmentarzysk z terenu Polski (tab. 30, s. 426–431). Skromna baza niewątpliwie wpłynęła na możliwości wnioskowania. Autorka stwierdza, że odkryte poza jamami grobowymi ślady palenia ognia (które dzieli na ogniska i paleniska) są zapewne wynikiem zabiegów apotropeicznych (s. 238). Nie uzasadnia jednak tej tezy. W omówieniu kości zwierzęcych zabrakło informacji, iż odkryte przy zmarłych nie muszą być pozostałością uczt i innych obrzędów odprawianych po złożeniu nieboszczyka do grobu. Mogą być przecież samym darem, danym do grobu jako pożywienie na dalszą drogę (lub w innym celu). Akapit poświęcony tematowi znalezisk naczyń i ich fragmentów jest powtórzeniem niektórych uwag podanych już wcześniej (s. 216–218), zakończonym osobliwym stwierdzeniem, iż: „Znane fragmenty naczyń z kurhanów ciałopalnych posiadają formy garnków używanych w domu…" (s. 241).

Na koniec dodam jeszcze uwagi ogólne, dotyczące warsztatu naukowego. Pracę cechuje swoisty stosunek Autorki do przywoływanych źródeł i opracowań. W bardzo wielu przypadkach J. Wawrzeniuk przeredagowuje fragmenty wypowiedzi innych badaczy i wstawia je jako część własnego wywodu. Przykładem może być wstęp podrozdziału o tzw. pochówkach wampirycznych (s. 223), który Autorka ułożyła ze zmienionych wypowiedzi Alfonsa Labuddy, Józefa Kostrzewskego, Lecha Leciejewicza, Wandy Heckowej, i Kazimierza Moszyńskiego. Dla skrócenia wywodu podam tu tylko fragmenty prac trojga z wymienionych:

> Jeżeli rozwinęła się ona [wiara w upiory – MD], jak przypuszczają badacze tego zjawiska, na Bałkanach, to w każdym razie bardzo wcześnie musiała się rozszerzyć stamtąd, skoro już w roku 1047 wyraz Upir występuje jako nazwisko popa w Nowgorodzie, na północnym zachodzie Rosji. Wiara w upiory powstała zapewne w czasie jakiejś epidemii, kiedy umierało kolejno po sobie kilka osób… (Kostrzewski 1962, 344).

> Niektórzy badacze uznają, że pojęcie *defuncti vivi* wyrosło na gruncie chrześcijańskim i odmawiają mu starszych, pogańskich w istocie rzeczy treści" (Leciejewicz 1997, 54).

> Gdy w danej wsi czy obejściu padło ofiarą choroby w krótkim przeciągu czasu kilkoro ludzi jedno za drugim… chłopi odkopywali trupa osoby, co pierwsza rozpoczęła pochód śmierci, albo też tej, którą z tych lub innych powodów posądzano o skłonności do wampiryzmu… Niekiedy w celu tym pewniejszego odszukania winowajcy odkopywano paru lub kilku zmarłych, zwracając uwagę na ich wygląd… (Moszyński 1967, 656).

W recenzowanej książce przeczytamy:

> Przypuszcza się, że pierwsze wierzenia w wampiry pojawiły się na Bałkanach, ale bardzo szybko się rozszerzyły. W roku 1047 wyraz *upir* występuje jako

> imię popa w Nowogrodzie, w północno-zachodniej Rosji (Kostrzewski 1962, s. 344). Wiara w upiory powstała prawdopodobnie na tle wypadków śmiertelnych następujących po sobie wielokrotnie w krótkich odstępach czasu, co mogło być wywołane jakimiś chorobami typu epidemicznego. *Defuncti vivi* – wiara w „żywego trupa" – jak twierdzą niektórzy badacze, wyrosła na gruncie chrześcijańskim i odmawiają mu starszych pogańskich w istocie rzeczy treści (Leciejewicz 1997, s. 54)… W kulturze ludowej Słowian istniał przesąd, że gdy w danej wsi czy w obejściu padło ofiarą choroby w krótkim czasie kilkoro ludzi, chłopi odkopywali zwłoki osoby, która pierwsza rozpoczęła pochód śmierci, albo też tej, którą z tych lub innych powodów posądzano o skłonności do wampiryzmu, i dokonywali czynności unieszkodliwiających zmarłego. Czasami też, szukając winowajcy, rozkopywano kilka grobów i zwracając uwagę na wygląd zmarłego, dokonywano następnie odpowiednich zabiegów (Moszyński 1967, s. 656).

Tego rodzaju kompilacja, choć stworzona z podaniem prac źródłowych, jest moim zdaniem skrajną nieuczciwością badawczą, wskazującą również na brak umiejętności wyprowadzania własnych wniosków u Autorki. Prowadzi ona ponadto do szeregu błędów. Po pierwsze, stan wiedzy sprzed kilkudziesięciu lat jest przedstawiany czytelnikowi jako aktualny (por. wątek o bałkańskiej genezie wiary w wampiry). Po drugie, Autorka zmienia niejednokrotnie sens pierwotnej wypowiedzi, co prowadzi do powstania stwierdzeń fałszywych (por. na s. 191 zabytki z grobów jako dowody praktyk antywampirycznych, rzekomo według H. Zoll-Adamikowej). Po trzecie, J. Wawrzeniuk nie zadaje sobie trudu odszukania podstaw źródłowych danych informacji, a powtarza niejednokrotnie dawno już sprostowane przez historyków i archeologów błędne interpretacje.

Trudno nie zwrócić uwagi na to, że J. Wawrzeniuk korzysta niemal wyłącznie z prac wydanych w języku polskim, niekiedy tylko sięgając do prac wydanych po rosyjsku, sporadycznie do publikacji w innych językach. Części z nich nie zna zresztą z autopsji, a przywołuje za pracami polskimi. Tak choćby przytaczane w książce koncepcje E. Gaspariniego (s. 175, 224), Autorka zna wyłącznie z recenzji jego książki napisanej przez Helenę Przesławską (1962). A temat pracy wymagał wręcz sięgnięcia po bogaty dorobek nie tylko polskich archeologów, historyków, religioznawców i antropologów kultury, szczególnie że J. Wawrzeniuk deklaruje zainteresowanie fenomenologią religii (s. 15). Zamiast tego w pracy znajdują się pojedyncze przykłady zwyczajów zanotowanych w różnych krajach i dotyczące różnych okresów dziejów, podane często bez wyjaśnienia, czemu ma służyć ich przywołanie.

Inną, poważną *ułomnością jest* sposób przywoływania tekstów źródeł pisanych, zwykle bezkrytyczny i często obarczony błędami. Razi fakt nagminnego cytowania źródeł za wtórnymi opracowaniami, zamiast za wydaniami krytycznymi, np. Burcharda z Wormacji i Piotra z Duisburga za pracą etnograficzną Adama Fischera (s. 170, 200) lub dzieł Al-Bekriego i Ibn Rosteha za opracowaniem liturgii pogrzebowej w Polsce, Alfonsa Labuddy (s. 189).

Ponadto, cytowanie tłumaczeń powinno być uzupełnione o teksty w języku oryginałów, przynajmniej w odniesieniu do źródeł łacińskich i staroruskich. Ułatwiłoby czytelnikom ocenę prawidłowości interpretacji przedstawionych przez Autorkę. Uderzające jest również bezrefleksyjne traktowanie przez J. Wawrzeniuk współczesnych tradycji ludowych, jako prawdopodobnych pozostałości przedchrześcijańskich zwyczajów słowiańskich, na co już wyżej zwracałem uwagę.

W książce J. Wawrzeniuk czytelnik znajdzie prawidłowe spostrzeżenia i wnioski, zwykle powt*órzo*ne za innymi badaczami. Jednak nikną one w nagromadzeniu błędów merytorycznych i warsztatowych, do których dochodzą: bałagan w układzie treści (zawartość niektórych podrozdziałów nie odpowiada ich tematowi), błędy gramatyczne, powtórzone przypisy (por. rozdz. 5, przyp. 37, 41), liczne braki cytowanych prac w spisie literatury, błędy w tytułach opracowań, a także w transliteracji nazwisk i tytułów publikacji napisanych grażdanką.

Z racji atrakcyjnej tematyki, książka ta niewątpliwie znajdzie bardzo szeroki krąg czytelników wśród osób zainteresowanych wczesnym średniowieczem i Słowianami. Będą oni mieli prawo sądzić, iż obszerna publikacja J. Wawrzeniuk, firmowana przez Uniwersytet Kardynała Stefana Wyszyńskiego w Warszawie, dofinansowana przez Ministerstwo Nauki i Szkolnictwa Wyższego, zrecenzowana przez prof. dr. hab. Andrzeja P. Kowalskiego, jest niejako ukoronowaniem dorobku polskiej nauki na temat ważnego aspektu kultury duchowej wczesnośredniowiecznych Słowian. Marne to świadectwo.

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OBITUARY NOTE

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Sławomir Kadrow

Prof. Dr. Dr. h.c. mult. Bernhard Hänsel (24/05/1937 – 01/04/2017)

Nearly a year ago, on 1 April 2017, prof. Bernhard Hänsel one of the most outstanding German archaeologists diedpassed away in Burow, in Mecklenburg. He was born on 24 May 1937 in Stuttgart. His childhood, including the period of World War II, he spent in Dresden. He began his archaeological studies at the East Berlin Humboldt University. He continued the studies in Jena. After escaping to West Germany in 1960, he was a student of Vladimir Milojčić in Heidelberg, who had a great influence on him and supervised Bernhard Hänsel's PhD thesis. His doctoral dissertation was devoted to the middle period of the Bronze Age in the Carpathian Basin and defended in 1964. A year later he became an assistant at the University of Bochum. Furthermore, he received a scholarship, thanks to which he studied the chronology of the older Hallstatt period over the lower Danube and, as a result, he wrote a habilitation dissertation in 1972.

In the years 1973–1976 he was an Associate Professor at the University of Erlangen, later a Professor, becoming a successor of the famous Georg Kossack in the renowned Ur- und Frühgeschichte Cathedral at the Kiel University. While working in Erlangen he began extremely important research for the synchronization of the prehistory of Greece and the Balkans and Central Europe in the Bronze Age and the beginning of the Iron Age, i.e. excavation research in Kastanas (1975–1979).

After taking up the professorship at the Free University of West Berlin (1981–2006), he carried out field research in Feudvar in Serbia (1986–1991), interrupted by civil war in Yugoslavia. Later, he studied a tell in Agios Mamas in Greece (1994–1996) and finally he conducted excavations at the spectacular site in Monkodonja in Istria, Croatia (1997–2007).

The Bronze Age and the Early Iron Age, especially in South-Eastern Europe always remained in the centre of scientific interests of Prof. Benhard Hänsel. He focused his attention on chronology, hoards and settlement.

He co-edited the series Universitätsforschungen zur Prähistorischen Archäologie for many years. He also founded the well-known series

Prähistorische Archäologie Südosteuropas. In the years 1982–2007 he was the chief editor of the prestigious journal Praehistorische Zeitschrift. From 1985 until his death, he edited the annual Mitteilungen der Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte, and from 1995 the journal Archäologisches Nachrichtenblatt.

Bernhard Hänsel was given a title of *doctor honoris causa* by the University of Bucharest and the Slovak Academy of Sciences. He was also a member of the Polish Academy of Arts and Sciences in Kraków and the Saxon Academy of Sciences in Dresden. Unfortunately, he did not live to be lauded for the occasion of his admission as a member of the Österreichische Gesellschaft für Ur- und Frühgeschichte, delivered on 4 April 2017.

Owing to his great scientific achievements, editorial work, spectacular field research and occupied positions in archaeological institutions, he exerted a huge influence on the development of German and Central European archaeology. Furthermore, he promoted a large group of recognized archaeology figures in Germany and other countries as a supervisor of doctoral dissertations and Gastgeber scholarship holders of the Humboldt Foundation, DAAD and others.

He was one of very few who knew the history and culture of countries of Central and South-Eastern Europe. Apart from English, French and Italian, he spoke Serbian and Russian. He showed himself to be a lover and expert on literary classics and classical music. He also was a supporter of Rudolf Steiner's anthroposophy and Waldorf pedagogy (Freie Waldorfschule). An outstanding archaeologist, a thoroughly educated humanist, and a Great Man has passed away.

Memoria non moriatur

CHRONICLE

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Constantin Preoteasa*

International Colloquium. Beyond Excavation. Geophysics, Aerial Photography and the Use of Drones in Eastern and South-East European Archaeology, 5–8 December 2016, Piatra-Neamţ, Romania

ABSTRACT

Preoteasa C. 2017. International Colloquium. Beyond Excavation. Geophysics, Aerial Photography and the Use of Drones in Eastern and South-East European Archaeology, 5–8 December 2016, Piatra-Neamţ, Romania. *Analecta Archaeologica Ressoviensia* 12, 421–428

The paper presents several data on the international colloquium organized in 5–8 December 2016 to the Cucuteni Eneolithic Art Museum of Piatra-Neamţ (Romania) by a Romanian-German joint research team, having as topic non-invasive interdisciplinary archaeological researches, especially geophysical surveys and aerial photographs made with drones. On this occasion were presented results of the profile investigations made especially during the last years in various historical and civilization sites, by scientists of the prestigious museums, universities and academic institutions from Romania, Germany, Poland, Republic of Moldova, Ukraine, Czech Republic, Hungary and Netherlands, through 22 presentations and 4 posters. These data are also included in the volume of abstracts of the event; currently the organizers are editing the volume with the proceedings of the colloquium.

Key words: interdisciplinary archaeology, non-invasive surveys, geophysics prospections, aerial photography, drones, GIS, GPR, LiDAR

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In recent years, non-invasive interdisciplinary archaeological investigations, including geophysical surveys and aerial photographs made with drones, have become standard research methods worldwide in modern archeology, due to their many advantages.

Undertakings of this type, especially in areas where the cultural heritage – immobile and mobile, material and immaterial – was not destroyed due to the anthropic impact, represented mainly by construction, industrial and agricultural works, required the organization of a scientific manifestation, bringing together specialists in the field, from prestigious museums, universities and academic institutions, with the aim of introducing the results obtained in the scientific circuit,

* Neamţ County Museum Complex – Cucuteni Culture International Research Centre – Cucuteni Eneolithic Art Museum of Piatra-Neamţ, 3 Stefan cel Mare, 610029 Piatra-Neamt, Neamt County, Romania; Constantin.preoteasa@yahoo.com

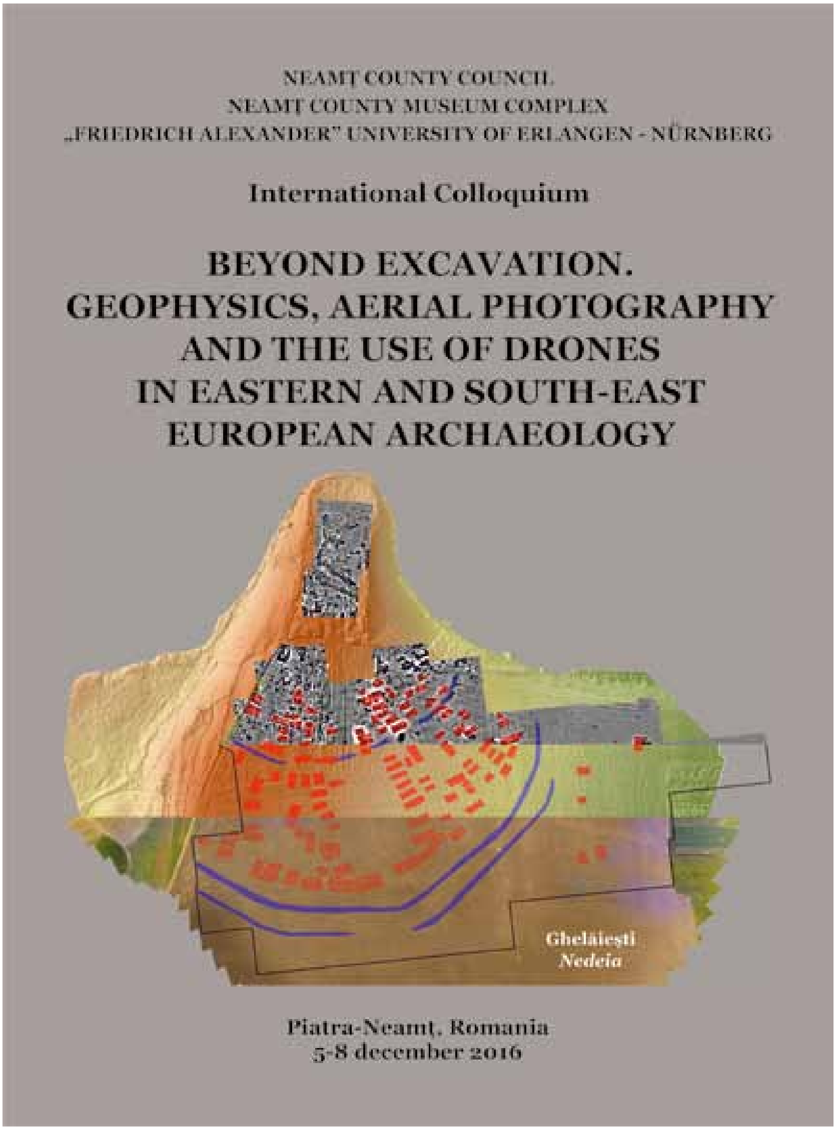

Fig. 1. Poster of the scientific event

exchanging experience and providing new insights into these types of investigations, depending on the technical possibilities available and the limits of the methods used.

Thus, on the basis of the existing official cooperation agreement between Neamț County Museum Complex, through the Cucuteni

Fig. 2. Aspects from the colloquium works

Culture International Research Center and the Cucuteni Eneolithic Art Museum of Piatra Neamț, respectively the „Friedrich Alexander" University of Erlangen-Nürnberg, through The Faculty of Philosophy and Theology and the Institute of Pre- and Proto-history in Erlangen, during 5–8 December 2016, was organized at Piatra-Neamț (Romania) the International Colloquium *Beyond Excavation. Geophysics, Aerial Photography and the Use of Drones in Eastern and South-East European Archaeology*. Besides, the collaboration between these institutions has materialized in recent years in geophysical surveys, aerial photographs made with drones and digital modeling of the terrain (GIS) for several sites belonging to the Precucuteni-Cucuteni-Tripolye cultural complex and the Middle Age in the Moldavian Subcarpathians (Romania), conducted by German-Romanian joint research team, coordinated by Prof. Dr. Doris Mischka, Dr. Carsten Mischka and Dr. Constantin Preoteasa. In this respect, it is worth mentioning that the drone owned by the „Friedrich Alexander" University of Erlangen-Nürnberg, administered on the territory of Romania by the Neamț County Museum Complex, is the first apparatus of this type officially registered in Romania – according to the legal provisions in force – exclusively for scientific research activities (not only in the field of archeology).

Fig. 3. Aspects from the colloquium works

The scientific event from Piatra-Neamț was attended by 56 specialists from 32 museums, universities and academic institutions from Romania, Germany, Poland, Republic of Moldova, Ukraine, Czech Republic, Hungary and Netherlands, who contributed to the colloquium with 22 presentations and 4 posters, included in a volume of abstracts published in 2016 (Mischka *et alii*, 2016); the volume of the colloquial papers is currently being published. On the last day dedicated to the event, a study visit was organized for the participants to Izvoare-*La Izvoare* and Văleni-*Cetățuia* – two famous *tell*-type Precucuteni-Cucuteni-Tripolye sites, researched multidisciplinarily over time, and recently through geophysical surveys, aerial photographs made with drones and digital terrain modeling (GIS).

During the colloquium, the results of older and newer geomagnetic researches were presented, which focused mainly on neo-eneolithic settlements belonging to the Starčevo-Criş culture (Mihailovca VII – Republic of Moldova), to Linear Pottery Culture (Bumbăta III, Găureni I and Nicolaevca V – Republic of Moldova) and especially to the Precucuteni-Cucuteni-Tripolye cultural complex (Baia, Tăcuta, Scânteia, Ghelăiești, Văleni, Adâncata and Ripiceni – Romania; Nicolaevca V, Putineşti III, Stolniceni I, Trinca, Cunicea I, Cunicea II, Cunicea III and

Fig. 4. Contributors of the event

Cunicea IV – Republic of Moldova; Mihailovka, Viitovka, Trostyanchyk, Nebelevka, Talnoe III, Moshurov I, Talyanki, Maydanetskoe, Glybochok, Podgortsy, Chapaevka, Grebeni, Kolomishchina I and Kolomishchina II – Ukraine). Also, geophysical investigations from the late Neolithic sites of Altheim I and Altheim II (Germany), as well as from the prehistoric site of Malżyce (Poland), were also mentioned. For the Bronze Age sites were mentioned the surveys in the necropolis and the settlement of the Noua culture from Tăcuta (Romania) and Ripiceni (Romania) respectively, the settlement of the Vatya culture from Kakucs (Hungary) and the brine-exploitation related site from Tyrawa Solna 12 (Poland). Geomagnetic investigations were also carried out for the Iron Age sites belonging to the Basarabi culture from Tărtăria (Romania) or the Poieneşti-Lucaşeuca culture from Brăneşti and Ivancea (Republic of Moldova). At the same time, such investigations also focused on the ancient sites on the current territory of Romania, from Războieni and Moigrad-Porolissum. Geomagnetic surveys were also carried out in the medieval site of Sasova (Romania) and in the modern age site from Skorczów (Poland).

Regarding the aerial photographs, during the event mentions were made on the results obtained for the sites of Malżyce, Ghelăiești, Văleni, Scânteia, Mihailovka, Viitovka, Altheim I, Altheim II, Tărtăria, Brănești, Ivancea, Războieni, Moigrad-Porolissum and Skorczów.

The GIS data (consisting of digital modeling of the terrain) refers to the sites of Ghelăiești, Văleni, Scânteia, Războieni, Moigrad-Porolissum and Sasova.

Lesser are the GPR investigations conducted at Maydanetskoe, as well as the LiDAR investigations conducted at Moigrad-Porolissum.

In some cases preliminary data previously provided by non-invasive research were subsequently confirmed by archaeological excavations.

Non-invasive interdisciplinary archaeological investigations (geophysical surveys, aerial photographs, GPR, LiDAR, GIS) provide important preliminary scientific data on the characteristics of the sites investigated, such as their location, shape, dimensions and boundaries, types of complexes within them, the organization of the living space, the absence or presence of fortification systems, the intensity of habitation from different epochs and civilizations, or the current state of conservation of the remains. They cannot, however, provide data to allow an exact delimitation of the settlements and complexes belonging to different epochs and civilizations within multilayer sites.

In the case of sites that have previously benefited from archaeological excavations, information can also be obtained on the trenches and surfaces opened and possibly some data already published can be corrected.

Non-invasive interdisciplinary archaeological research must precede the future archaeological excavations, as the preliminary results obtained – which may or may not be confirmed by the subsequent invasive investigations – allow a more effective protection, research and valorization of the cultural heritage (immobile and mobile, material and immaterial), as well as a better use of the human, material and financial resources – always limited – available to the specialists of the institutions.

References

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Marcin Szeliga*

The First Chronometric Markings of the Late Stage of the LPC in the Northern Foreland of the Sandomierz Upland

ABSTRACT

Szeliga M. 2017. The First Chronometric Markings of the Late Stage of the LPC in the Northern Foreland of the Sandomierz Upland. Analecta Archaeologica Ressoviensia 12, 431–448

The article presents results of first radiocarbon analyses carried out for samples obtained from the Linear Pottery Culture settlement on site 6 in Tominy, Opatów district. Presented radiocarbon dates highly enrich current database of chronometric markings relating to the early Neolithic in the Sandomierz Upland and its northern foreland. Together with data on stylistic and typological differentiation of the vascular pottery, seem to reveal a specific course of development of local groups of the Linear Pottery Culture, which is characterized by particularly long term functioning of the music note ornamental traditions, as well as their late, little intense and retarded coexistence with the early-Želiezovce stylistic influences. These data are also a quite significant contribution both to the discussion on the overall time range of the Linear Pottery Culture, as well as the nature and course of the final stage of its development in the upper basin of the Vistula River.

Key words: early Neolithic, Linear Pottery Culture, late stage, radiocarbon dating, retardation

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Introduction

Archaeological excavations carried out in recent years in the areas of southern and south-eastern Poland, entailed a substantial increase in radiocarbon dates relating to the initial phase of the Neolithic, and to related period of development of the Linear Pottery Culture (further LPC). Unfortunately, this overall progress is not reflected in a comparable abundance and representativeness of chronometric markings within particular clusters of settlement of this formation. Dominant and secluded position in this regard, are the areas of western Lesser Poland, from where comes together more than 40 radiocarbon markings, correlated with the early Neolithic cultural and chronological horizon (Mook 1985, 53; Milisauskas 1986, 42–43; Godłowska *et al.* 1987, Tab. 1; Czekaj-Zastawny 2008, tab. I; 2014, tab. XI). In the

* Institute of Archaeology, Maria Curie-Skłodowska University in Lublin, M. Curie-Skłodowska Square 4, 20-031 Lublin, Poland; marcin.szeliga@poczta.umcs.lublin.pl

remaining areas of the upper Vistula basin, this situation is much worse. As far, from here are known only incomparably smaller series of dating markings, obtained only from a few sites within the Sandomierz Upland (Kulczycka-Leciejewiczowa 2008, Fig. 55–56), Rzeszów Foothills (Dębiec, Dzbyński 2007, 56–58; Dębiec 2014, 107–108; Czopek *et al.* 2014, 53–54) and Wiśnicz Foothills (Valde-Nowak 2009, tab. 1).

The lack of adequately large series of radiocarbon markings is particularly perceptible in the case of Sandomierz settlement cluster from where comes only four ^{14}C dates, obtained for site I in Samborzec (Kulczycka-Leciejewiczowa 2008, Fig. 55–56). This situation in extremely serious range reduces both – the possibility of credible and accurate identification of the general time frame of settlement and development of LPC within the Sandomierz Upland and its northern foreland, as well as the chronology of development of various stylistic phases within the internal periodization of this formation. At the same time, this makes it difficult to carry out reliable comparative studies, which takes into account more extensive territorial context, extremely important, primarily because of emphasized in the literature territorially diverse rhythm of the stylistic development of vascular pottery (Kozłowski 1985, 69) and – postulated in connection with it – temporary retardation of LPC in the areas of the upper Vistula basin (Kadrow, Zakościelna 2000, 191–194; see also: Nowak 2009, 112–113). This announcement, along with presented new radiocarbon markings from site 6 in Tominy, is a small, and at the same only initial contribution on the field of this complex and very important issue.

Site 6 in Tominy

Site 6 in Tominy (Ożarów commune, Opatów district, świętokrzyskie voivodeship) is situated within the south-eastern part of the Iłża Foothills, about 1 km north-east from the edge of the compact loess cover of the Sandomierz Uppland (Kondracki 1998, fig. 38). Its range covers the culmination and gentle, south-western slope of upper-Jurassic cretaceous inselberg, that creates at this point a headland located on the eastern edge of the steep-walled valley of a small watercourse – Wyszmontowski Stream (fig. 1), escaping into the valley of the Czyżówka River. This promontory is covered by brown soils, formed on fluvioglacial sand and glacial tills of the Odra glaciations (Złonkiewicz 1994, 31–34; 1998).

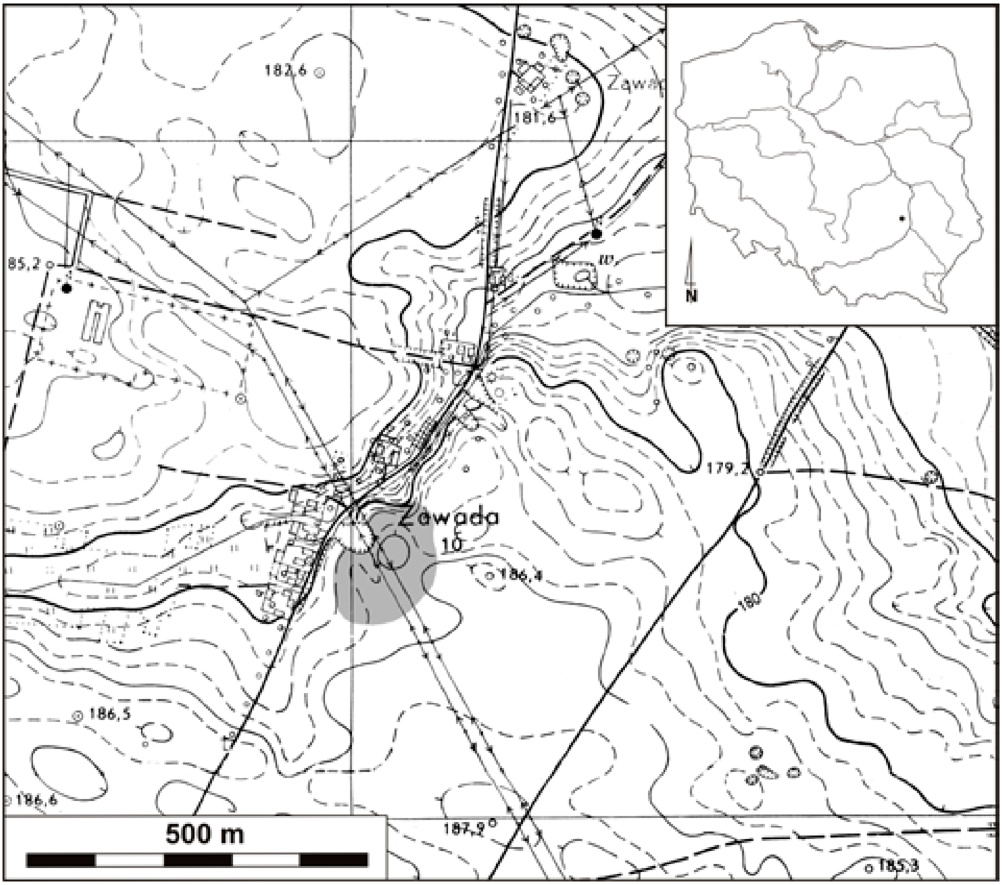
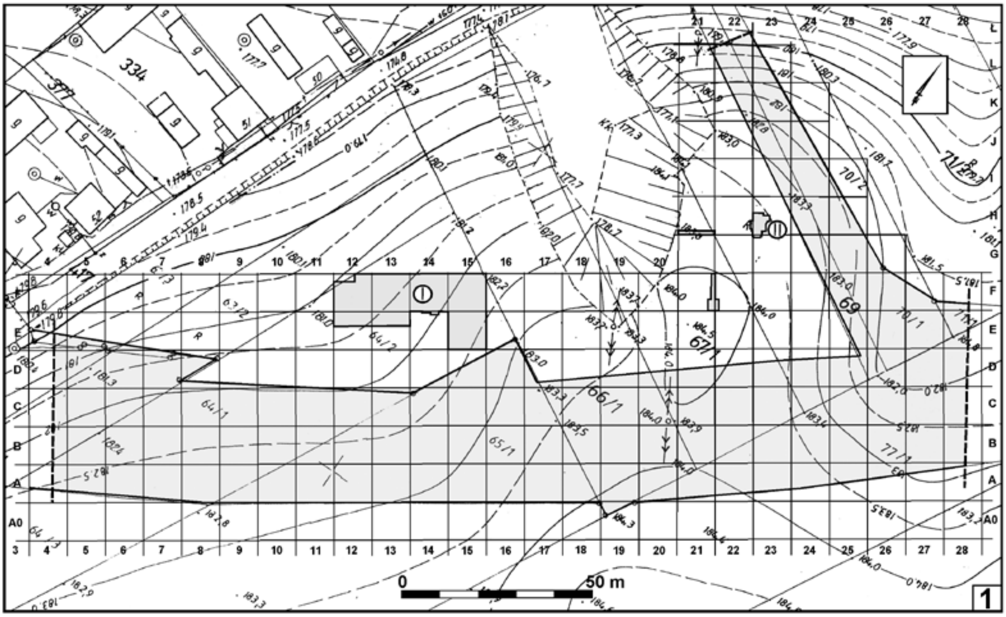


Fig. 1. Tominy, site 6. Location and extent of site (fragment of a map 145.313 Bidziny, scale 1:10 000; published by the Main Centre of Geodetic and Cartographic Documentation in Warsaw, Warsaw 1979; (*graphic design by M. Szeliga*)

Rescue excavations within this site were initiated in 2006 in connection with plans of construction of Ożarów ring road. Initially they were concentrated only in the area of interfering with the course of the planned road investment, than in the area located in immediate vicinity (Szeliga, Zakościelna 2007, 9–11; Szeliga 2008, 9, fig. 1), successively recognized also in further seasons of excavation (fig. 2: 1). In total, the study carried out in 2006–2009 led to the identification of an area of over 100 ares and to discovery of rich relics of diverse human activity, undertaken by multicultural communities from the Middle Palaeolithic up to modern times (Szeliga, Zakościelna 2007,



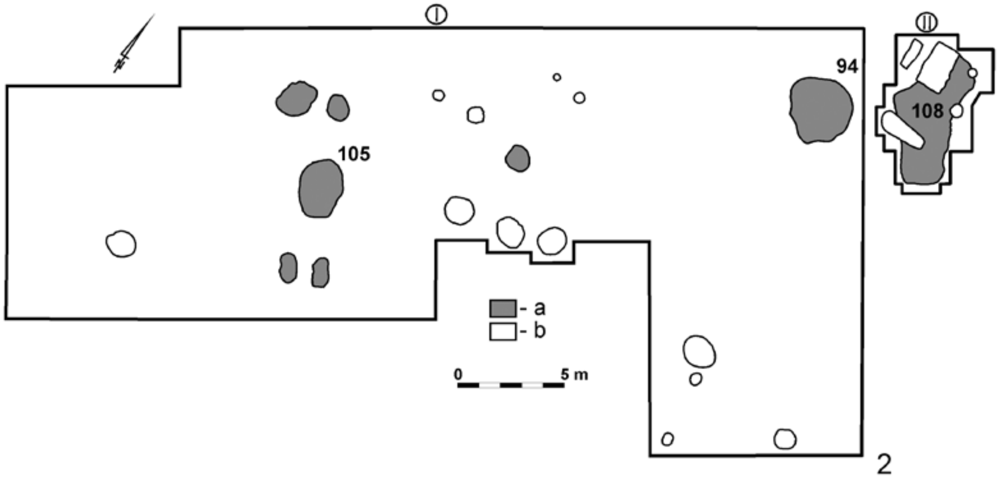


Fig. 2. Tominy, site 6. 1 – area of site excavated in 2006–2009; 2 – trenches with localization of features from which dated samples originated (a – Linear Pottery culture features; b – younger features) (*graphic design by M. Szeliga*)

11–22; 2009; Szeliga 2009). Phase of the most intensive settlement on this site was related with the early Neolithic, and more precisely with settlement of LPC. Current results of excavations allow for its unequivocal evaluation as the biggest, and at the same–studied in the largest spatial extent – settlement of this formation between its western Lesser Poland and Kuyavian clusters of settlement.

The nature and context of dated samples

Presented radiocarbon markings were made for organic matter, acquired in 2006–2009, during the exploration of three stationary features, located within the south-western slope (features 94 and 105) and in the culmination part (feature 108) of promontory, in close proximity to area recognized during emergency, pre-investment excavations (fig. 2: 1).

Feature No. 94

It was a vast, though quite shallow pit, characterized by irregularly oval outline in the plan, pan-shaped profile (fig. 3: 2) and homogeneous, unstratified filling of dark gray-brown color. It was discovered in 2006 within are F15 (fig. 2: 1–2) at a depth of about 50 cm directly beneath the silt, gray-beige deluvial layer, lying between contemporary humus and ceiling part of glacigenic sandy-clay sediments. In terms of functional object is most likely the remains of the deepest part of structure of building or construction character (i.e. bottom part of clay pit), though clearly it is impossible to exclude the possibility of its residential character, i.e. pit-house (Szeliga 2008, 16). Inventory of artifacts acquired during exploration, consist of a total of 395 articles of flint and obsidian, 237 fragments of pottery and 4 artifacts from the non-flint rocks (Szeliga 2008, 16). Formal and stylistic analysis of collection of vascular pottery confirmed its relationship with the music note phase of the development of LPC. Widespread presence of quite irregular, and at the same time very often elongated, oval music note holes, accompanying by diverse compositions of engraved double lines (fig. 4: 1–4), shows the closest references to the style typical for the late section of the music note phase (i.e. phase NIII; see Pavúk 1969, 273–275; Kadrow 1990, 61–62). In the collection was registered also the presence of numerous fragments of vessels, ornamented in a manner typical for groups of the Eastern Linear cultural circle from north-eastern zone of the Carpathian Basin (fig. 4: 5), the most probably for Bükk Culture (see Kalicz, Makkay 1977, Taf. 100: 5). During the exploration of filling

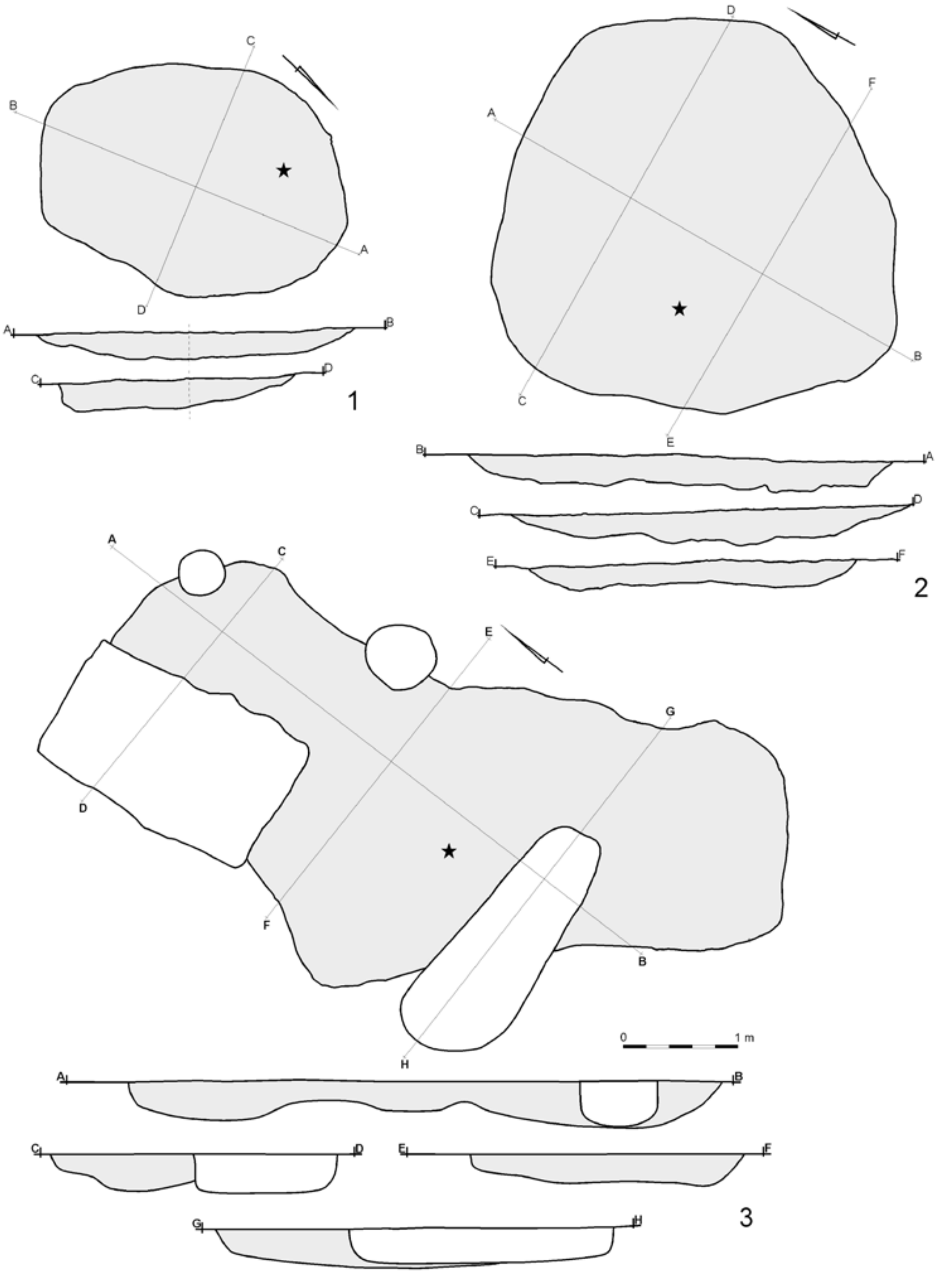


Fig. 3. Tominy, site 6. The outline in the plan and sections of features, with location of positions of dated samples; 1 – feature No. 105; 2 – feature No. 94; 3 – feature No. 108 (*drawn by M. Szeliga*)

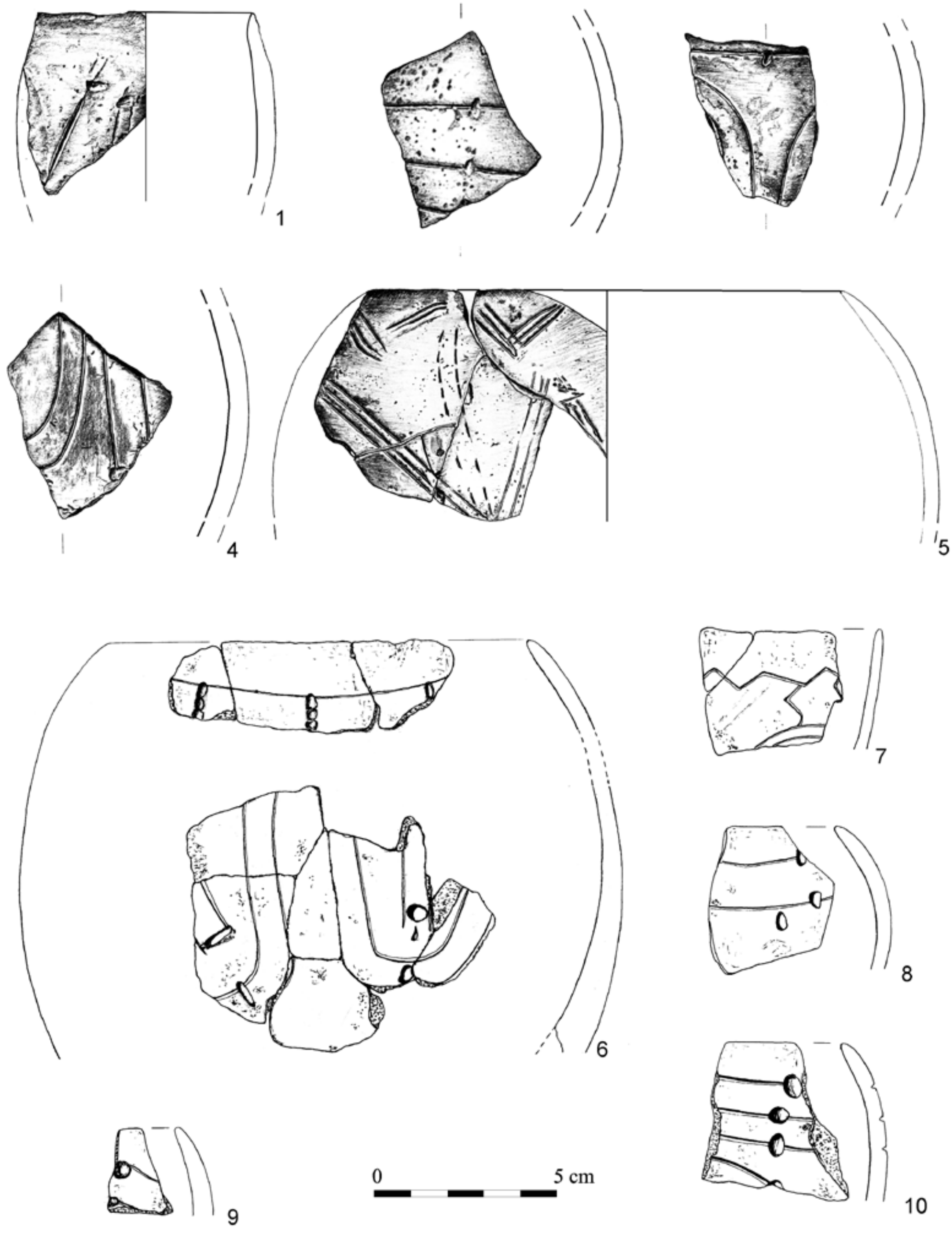


Fig. 4. Tominy, site 6. Selection of ceramic materials from features 94 (1–5) and 105 (6–10) (1–5 – after Szeliga 2008, fig. 10: 2–5, 9; 6–10 – *drawn by K. Gawryjołek-Szeliga*)

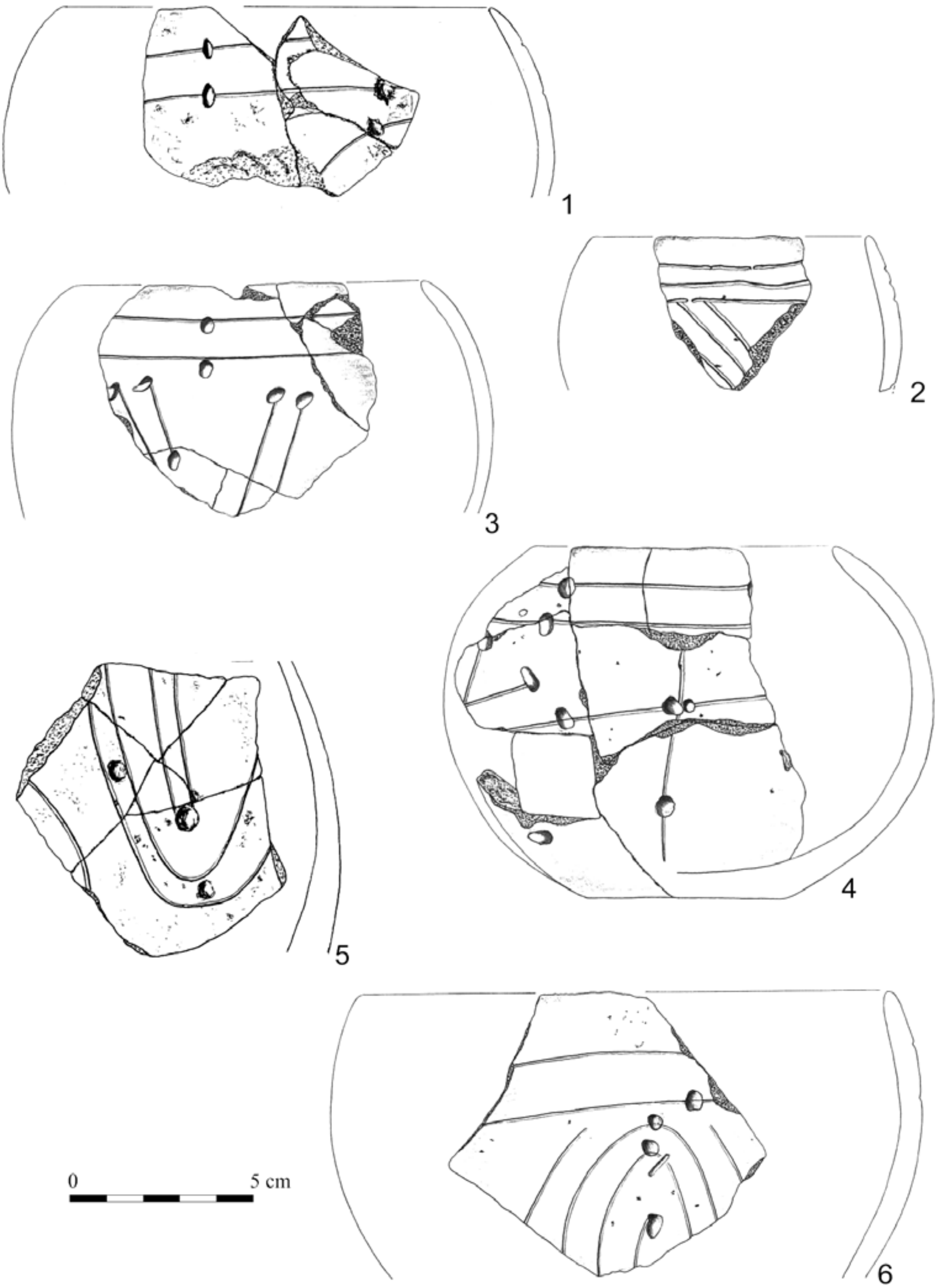


Fig. 5. Tominy, site 6. Selection of ceramic materials from features 105 (1, 5) and 108 (2–4, 6), (*drawn by K. Gawryjołek-Szeliga*)

of feature, also 3 highly fragmented bones and teeth of the animals were discovered, as well as several small concentration of charcoal, the largest of which –was chosen for radiocarbon analysis – enveloped in the eastern quadrant of the feature (fig. 3: 2) within its near-bottom part (approx. 72 cm from the surface), in contact with the clay surface.

Feature No. 105

This feature was discovered in 2008 within the are F13, a little over 20 m south-westfrom the pit 94, in the immediate vicinity of the four other stationary LPC features, creating with them a kind of concentration with a clear linear arrangement, consistent with the axis of the NW-SE (fig. 2: 2). The feature was characterized by the large size (206×280 cm) and oval outline in the plan, pan-shaped profile and small thickness (fig. 3: 1), as well as unstratified filling of dark gray-brown color. Its outline – just like in the case of feature 94 – was captured directly beneath the deluvial layer, at a depth of about 40 cm. The location, orientation and thickness of the feature 105, as well as other accompanying feature-like structures, allow their interpretation as remnants of the deepest parts (so-called recess) of a single foundation of construction character in type of clay pit. Among them feature 105 provided the largest amount of artifacts, represented by a total of 554 fragments of pottery, 225 flint articles and 3 stone artifacts. Analysis of ceramic materials collection revealed a clear dominance of specimens decorated in typical classic and late stage of the music note phase (fig. 4: 8–10; 5: 1, 5). Simultaneously only a very small attendance of ornamental motifs specific to the design of the early-Želiezovce phase was registered, represented mainly by rows of overlapping music note holes, coexisting with notches connecting two adjacent engraved lines (fig. 4: 6). Their presence allows the positioning of the entire collection between the late section of the music note phase, and the early stage of the Želiezovce phase (i.e. NIII-ŽI; see Pavúk 1969, 275–277; Kadrow 1990, 62). Ceramic materials discovered in the feature 105 were also accompanied by a few fragments (fig. 4: 7) revealing stylistic reference to the Bükk Culture ornamental tradition (e.g. Kalicz, Makkay 1977, Taf. 99: 1). On the inner surfaces of one of the partially reconstructed vessels, defaulting within the north-western part of the feature (fig. 3: 1), at a depth of approx. 10 cm above the ceiling, the presence of organic tarry material, similar to wood tar, was also found. This substance has been designated for radiocarbon analysis.

Feature No. 108

The last presented stationary feature was discovered in 2009 within a space situated in culmination part of promontory, on which the site is located (are H23; see fig. 2: 1–2). It was a vast (324×620 cm) pit with a homogeneous, intensely dark brown-black filling, oriented along the NW-SE axis. It was characterized by elongated and quite irregular outline in the plan, uneven level of trim and profile similar to pan-shaped (fig. 3: 3). An outline of the object was registered directly beneath the contemporary humus, its continuity was interrupted by two postholes and two skeletal graves related to – located in this part of the site – cemetery of the Funnel Beaker Culture. Analogically to the case of previously discussed feature, orientation, outline and dimensions of feature 108 suggest its interpretation as the remains of clay pit, related to the construction and functioning in this place of residential building, in the type of longhouse. During exploration of the object was obtained a very rich collection of artifacts, including 823 fragments of vessels, 581 artifacts of flint and obsidian and 13 stone artifacts. Ceramic materials are solely related to the music note phase of development of LPC, including forms decorated in the style typical primarily for its classic stage and, to a lesser extent, a late stage (fig. 5: 3–4, 6). For several shards also observed the presence of black organic matter, analogous in terms of macroscopic, to that discovered in the feature 105. The largest and best preserved sample of the substance – designed for radiocarbon analysis – was registered near bottom of western part of the feature (fig. 3: 3), at a depth of about 30 cm from the ceiling.

The results of radiocarbon analyzes

Samples selected for radiocarbon analysis were represented by a small concentration of charcoal from the feature 94 and the remains of an unidentified tarry organic matter, probably wood tar, preserved on the surface of vessels, discovered in features 105 and 108. This substance has not been physically and chemically analyzed for precise identification. Nevertheless, its potential link with wood tar is probable

Table 1. Tominy, site 6. Juxtaposition and calibration of obtained ^{14}C markings

Feature	Laboratory, number of sample	^{14}C data [BP]	Kind of sample	Calibration – after Ramsey 2013		Stylistic clasification of pottery
				68.2% probability:	95.4% probability:	
94	Poz-31596	6090 ± 40	Charcoal	5056–4942 BC (68.2%)	5207–5148 BC (10.5%) 5137–5128 BC (0.8%) 5121–5094 BC (2.5%) 5082–4900 BC (80.2%) 4865–4854 BC (1.3%)	N III
105	Poz-31595	5820 ± 40	Wood tar	4725–4612 BC (68.2%)	4781–4579 BC (92.5%) 4572–4556 BC (2.9%)	NIII-ŽI
108	Poz-49591	6160 ± 40	Wood tar	5207–5144 BC (31.2%) 5139–5092 BC (23.1%) 5082–5055 BC (13.9%)	5217–5000 BC (95.4%)	NII-NIII

due to confirmation of its presence in several other parts of LPC vessels, obtained in studied site during the pre-investment excavations in 2006 (Langer, Pietrzak 2006). All mentioned samples have been subjected to dating using AMS technology in Poznań Radiocarbon Laboratory, which resulted in the following ^{14}C markings: 6090 ± 40 BP (feature 94); 5820 ± 40 BP (feature 105) and 6160 ± 40 BP (feature 108) (Table 1; fig. 6).

Discussion

The results of the radiocarbon analyzes suggest relatively long period of Tominy settlement occupation by the communities of LPC, closing at least between 5100 and 4800/4700 BC. This interval, in its general outline, partially meshes with the late stage of development of this culture in Central Europe, as well as with the chronological framework laid out for its music note and Želiezovce phases of development in south-eastern Poland (Kulczycka-Leciejewiczowa 2008, 106–108; 2010, 557; Czekaj-Zastawny 2008, 116; 2014, 94, 104). Obtained ^{14}C markings reveal at the same time, a very close chronological position of features 94 and 108, and visibly younger to them position of feature 105. This situation may reflect the phase nature of settlement of LPC communities within this site, but too small for the moment the number of radiocarbon markings does not allow for a clear decision in this critical issue. Regardless of that, the differences in radiocarbon markings of particular features only slightly responds to stylistic diversity of discovered ceramic materials. Basically,

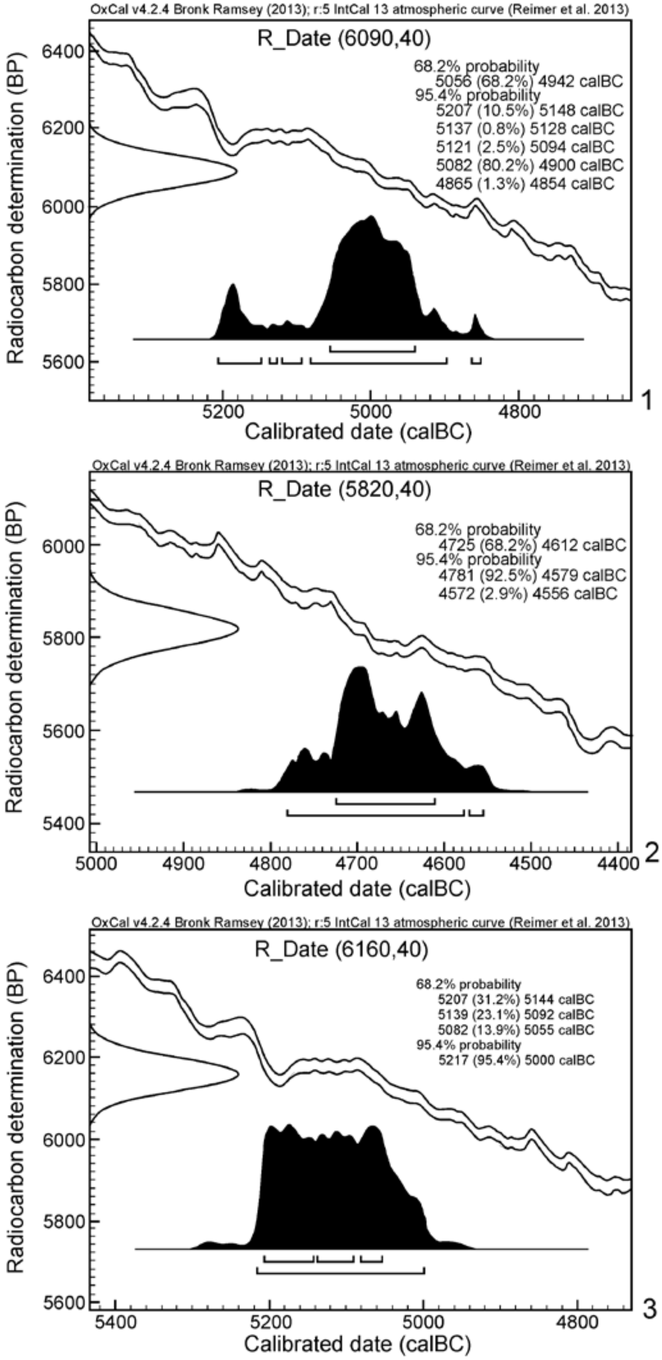


Fig. 6. Tominy, site 6. The calibration curves of obtained dates: 1 – feature No. 94; 2 – feature No. 105; 3 – feature No. 108

for distinctiveness of chronologically youngest ceramic inventory from feature 105, in relation to other two analyzed concentrations, indicates only the presence of very few fragments derived from a single vessel decorated in early-Želiezovce style (fig. 4: 6).

Generally, a small range of stylistic variation of vessels ornamentation within all of these stationary features – with considerably chronological extent of obtained radiocarbon markings – clearly indicates for long duration of music note ornamental traditions among communities inhabiting the settlement in Tominy, as well as their partial and late (1^{st} quarter of the 5^{th} millenium BC), little intense co-existence with of the early-Želiezovce interactions. These observations confirm to a certain extent, and also quite prominently supplement the data from the site I in Samborzec, situated about 25 km south of Tominy. A high degree of convergence of ^{14}C markings of the local early-Želiezovce inventory from the pit 173, i.e. 5210–4960 BC (95,4%; see Kulczycka-Leciejewiczowa 2008, Fig. 55), and dating of the music note phase features No. 94 and 108 from Tominy (Table 1), points to an even earlier coexistence of the two ornamental styles, considered within the Sandomierz Upland and its northern foreland. These observations represent also a confirmation of much earlier conjectures about the possibility of simultaneous occurrence in the upper Vistula basin of the Želiezovce and music note decorative styles (Kulczycka-Leciejewiczowa 1964, 59–62; 1968, 93).

Therefore, the aforementioned data seem to reflect a particularly long-term retardation of classical and late music note decorative traditions within Sandomierz clusters of LPC settlement, runs partially parallel with reception of early Želiezovce style (for Tominy also retarded). This situation fits very well to much broader context of phenomena and cultural changes, postulated for areas of northern and north-eastern foreland of the Carpathians, starting from the music note phase of LPC. They consist of gradual weakening and ultimately complete expiration of the impacts from the current cultural center in the south-western Slovakia, resulting in inhibition of further stylistic and typological development of vascular ceramics in mentioned areas (Kozłowski 1985, 69). According to one hypothesis, fundamental implication of these processes would be the long-term stagnation of music note ornamental traditions within particular clusters of settlements, extending until the decline of the LPC, alongside with emerging of territorially limited Želiezovce interactions (Kadrow, Zakościelna 2000, 192). Presented data seem to confirm this concept in relation to the Sandomierz Upland and its northern foreland, revealing particularly long stagnation of music note tradition in production and decoration of ceramic in these areas (approx. 5200–4800/4700 BC) and their partially parallel coexistence with early-Želiezovce style (at least from approx. 5100/5000 BC).

The presented data is, it seems, quite significant contribution to the discussion on the nature and course of the final stage of development of LPC in upper basin of Vistula. Quite suggestive, though not without controversy, data in this area provides the youngest of the presented radiocarbon markings from Tomin, closing at intervals 4725–4612 BC (σ1) and 4781–4579 BC (σ2; Tab. 1; fig. 6: 2). It is currently one of the latter ^{14}C markings obtained for LPC unit with dominant attendance of pottery decorated in the music note style, and also one of the youngest datings of this culture on the northern side of Carpathians, beyond the commonly accepted chronological extent of its development between 5000 and 4800 BC (e.g. Lüning 1991, 37; 2005, Abb. 23; Whittle 1996, 177; Petrasch 1999, 162; Grygiel 2004, 523; Dolukhanov *et al.* 2005, 1448). With this dating quite well corresponds the part of youngest radiocarbon markings from site 17 in Brzezie, Kłaj region, obtained for units correlated with the music note and Želiezovce phases (Czekaj-Zastawny 2008, 37, 116). However, correctness of some of them was recently seriously weakened by different results of confirmatory datings, carried out in another radiocarbon laboratory (features no. 2170, 2175 and 2186; see Czekaj-Zastawna 2014, Tab. XI). The question of credibility of the rest, latest datings from this site (Tab. 2) is at the moment still open, but in the context of already recorded clear divergences, undoubtedly requires a particularly skeptical and critical approach. This does not apply of course to incredibly late date of the features 216/B and 238/C, which go far beyond the chronological extent of LPC development. Regardless of any uncertainty about the procedural correctness of the remaining youngest datings from Brzezie 17, as well as contesting of their potential relationship with the music note phase of LPC (Nowak 2009, 112), in the light of presented data from Tominy, the possibility of local continuance of retarded music note-Želiezovce styles during the 1st quarter of the 5th millenium BC, as well as its coexistence in different variations and combinations within particular clusters of settlement in basin of upper Vistula seems to be very likely.

Completion

Despite its small numbers, presented datings from Tominy strongly enrich existing base of chronometric determinations, relating to the early Neolithic in the Sandomierz Upland and its northern foreland, also providing new important data on the temporal range and course of development of the local ecumene of the LPC. Together with the earlier ^{14}C markings from the site I in Samborzec, they allow for highly probable extension of chronological frames of development of this formation in studied areas, for a period containing at least between 5300 and 4800/4700 BC. Particularly interesting is the younger section of this period, attributable to the first centuries of the 5th millennium BC. Presented radiocarbon markings, along with the data on stylistic and typological differentiation of the vascular ceramics, seem to show a highly specific course of development of local LPC groups, characterized by particularly long-term functioning of music note ornamental traditions, as well as their late – extending until to the beginning of the 2nd quarter of the 5th millenia BC – coexistence with little intense, retarded early-Želiezovce interactions. That important and intriguing issue requires undoubtedly further and detailed studies, based on much larger series of reliable – in terms of procedural – radiocarbon markings, obtained primarily for the stylistically youngest LPC inventories from areas of southern and south-eastern Poland.

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