ANALECTA

ARCHAEOLOGICA RESSOVIENSIA

VOLUME 18 RZESZÓW 2023

ISSN 2084-4409 | DOI: 10.15584/anarres

ANALECTA

ARCHAEOLOGICA RESSOVIENSIA

ANALECTA

ARCHAEOLOGICA RESSOVIENSIA

VOLUME 18 RZESZÓW 2023

FUNDACJA RZESZOWSKIEGO OŚRODKA ARCHEOLOGICZNEGO

Uniwersytet Rzeszowski
Kolegium Nauk Humanistycznych
Instytut Archeologii

WYDAWNICTWO UNIWERSYTETU RZESZOWSKIEGO

Abstracts of articles from Analecta Archaeologica Ressoviensia are published
in the Central European Journal of Social Sciences and Humanities
Analecta Archaeologica Ressoviensia is regularly listed in ERIH PLUS, CEJSH and ICI

Graphic design, typesetting
DOROTA KOCZĄB

Technical editor, cover design
JULIA SOŃSKA-LAMPART

ISSN 2084-4409 DOI:10.15584/anarres

2075

Editor's Address

INSTITUTE OF ARCHAEOLOGY
RZESZÓW UNIVERSITY
ul. Moniuszki 10, 35-015 Rzeszów, Poland
e-mail: iarch@univ.rzeszow.pl
Home page: www.archeologia.rzeszow.pl

THE UNIVERSITY OF RZESZÓW
PUBLISHING HOUSE
ul. prof. S. Pigonia 6, 35-959 Rzeszów, Poland
tel. 17 872 13 69, tel./fax 17 872 14 26
Home page: https://wydawnictwo.ur.edu.pl

RZESZÓW ARCHEOLOGICAL
CENTRE FUND
ul. Moniuszki 10, 35-015 Rzeszów, Poland
email: froa@froa.pl
Home page: www.froa.pl/

First edition, A4 format, 25,50 publishing sheets, 30,75 printing sheets, order no. 114/2023
Printed and binded: The University of Rzeszów Printing House

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

Contents

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

ARTICLES

Damian Wolski

(private);
e-mail: wolski.damian@outlook.com; ORCID: 0000-0002-9814-2618

DOI: 10.15584/anarres.2023.18.1

Tool Dichotomies in a Period of Inter-epochal Transition – Philosophical and Anthropological Reflections on Post-Neolithic Dual Technology

Abstract

Wolski D. 2023. Tool Dichotomies in a Period of Inter-epochal Transition – Philosophical and Anthropological Reflections on Post-Neolithic Dual Technology. *Analecta Archaeologica Ressoviensia* 18, 7–28

The presented publication is the end result of an authorial, post-doctoral research project devoted to the multi-aspect flint tool dichotomy at the turn of the Stone and Metal Ages. The results of use-wear analysis of archaeological materials from south-eastern Poland and the Moravia region of the Czech Republic, obtained by the author over the last decade, have been supplemented in this article with a philosophical component. By visualising the network of connections on the empirical-theory line, the explanatory value of the dichotomous lithic concept was raised. Moreover, the discourse on the period at the turn of the Stone and Metal Ages has been enriched with new interpretative solutions for economic and social issues of that time in prehistory. The author places his philosophical investigations within the hermeneutical approach. After the study of key terms (dichotomy, divergence, convergence), structuralist thought becomes the leading theme at the end of the article. The paper deals with the concepts of such thinkers as: Martin Heidegger, Hannah Arendt, and Claude Lévi-Strauss.

Keywords: terminal lithic industries, tool dichotomy, early bronze age, archaeological theory, philosophy of science, hermeneutics, structuralism

Received: 26.02.2023; **Revised:** 21.04.2023; **Accepted:** 24.04.2023

Introduction

This work on the philosophy of archaeology has a purely theoretical dimension – the aim is to provide a conceptual humanistic superstructure to the results of the author's empirical research (traseological analyses) undertaken in the last decade. The analysed archaeological materials, as well as the literature database, will serve as the source basis for the presented considerations. Some of the chosen research problems, already demonstrated by the author as preliminary concepts in academic literature (Wolski 2014; 2019a), have the opportunity to be significantly expanded and supplemented in the pages of this publication.

The Early Bronze Age in Europe (~2400–1600 cal. BC) was associated with the development and distribution of metallurgical technology. This phenomenon changed the order of functioning of the world in which for hundreds of thousands of years the basic inorganic raw material for the production of tools was stone. However, in fact, this is a simplified picture of this phenomenon, as copper metallurgy had its origins in the 8th millennium BC in the Middle East, which further resulted in its gradual spread in the Eurasian zone (Kadrow 2017, 64–69). This qualitative transformation did not take place simultaneously in all areas of the European continent, initially leaving some areas – for example those north of the Carpathian mountain chain and east

of the Vistula River – on the periphery of protoclivization centres for processing bronze and other metals (i.a. Kadrow 2001). Regardless of the socio-economic conversions and technological challenges of the era, lithic materials – as still having an undeniable economic potential at that time – successfully functioned on the old continent in the everyday life of prehistoric man for many more centuries (i.a. Libera 2001; Högberg 2009).

The author, referring to his functional analyses of lithic artefacts from southern Poland and Moravia (research methods: cf. Semenov 1964; Keeley 1980; Vaughan 1985; Pawlik 1995; Korobkowa 1999; Ollé *et al.* 2017), comparatively in relation to research results from countries in northern and western Europe, deals in this work with the issues of inventories of the turn of the Neolithic and Bronze Ages from a perspective that has so far been extremely rare. The phenomenon of the multi-aspect formal-utilitarian dichotomy of artefacts, which is the quintessence of the discussed considerations, was noticed by the author, carefully described and critically interpreted in his PhD thesis on the traseology of flint materials from Lesser Poland (Wolski 2016; 2020: monograph on the basis of dissertations), as well as in other publications (Wolski 2019a, 207–212; 2019b). As a result, two lines of dichotomy were listed with the general participation of the undertaken microware analyses (Tab. 1): (a) specialised line – represented by core forms that had special functions in the type of macrolithic sickles and daggers, and (b) opportunistic – manifested in flake forms used for everyday tasks, simple works. The above-mentioned perspective of the dual system of tools prompts for further research going beyond the scope of traditional archaeology.

The idea for this work has matured in the mind of its author over the last few years, along with the practical and theoretical confrontation with the unique nature of post-Neolithic flint materials, in connection with the concepts on this subject known from the academic literature, such as: (a) "tool-technological revolution" (Schild *et al.* 1977, 96; Lech 1983, 53), (b) "conventional and functional tools" (Kopacz and Valde-Nowak 1987, 75, 78–79), (c) chronology and taxonomy of macrolithic bifacial forms (Libera 2001), (d) the concept of "terminal lithic industries" (Kopacz 1987; 2012), (e) technological duality of late Dutch and Scandinavian flint materials (van Gijn 2010a, 153–154, 189–195; 2010b, 46–57; Högberg 2009, 219–240; 2010; Masojć 2014; 2016), (f) tools requiring "minimum and high technological investment" (Fouere 1994, 457–460, 506–507; Furestier 2005, 86, 102–104; 2007; 2008, 294–295; Bailly 2008, 284–287).

Adopting the concept of a multi-aspect dichotomy, understood as a supra-regional emblem of the breakthrough times, gives space for an in-depth, multidimensional reflections of the following types: (a) the opportunity to confront the problem of the functioning in social practice of tools representing both trends

Table 1. Dichotomy of lithic artefacts from the turn of Stone and Bronze Ages in Central and Eastern Europe (Wolski 2019a, 210, tab. X-1).

OPPORTUNISTIC LINE (Fig. 1)	**SPECIALISED LINE (Fig. 2)**
Local raw material, often of low quality	Imported high quality raw material
Small formally simple products on flakes without evident typological characteristics	Macrolithic products of very high complexity, classified as sickles and daggers
Hard percussion, retouch not necessarily required	Soft percussion, pressure technique, bifacial surface retouch
Negligible amount of microwear traces – one-time-use tools of multifunctional character	Well-developed diverse microwear traces – multifunctional tools
Short expedient use (various functions, lack of shape-function correlation)	Prolonged use – reparations, "long life" (specific recurring functions, perhaps seasonal?)
Egalitarian (commonly available) technology (brief learning, "anybody's" knowledge on the settlement)	Elite technology (long learning, trans-generation transfer of knowledge and skill)
Discovery context: settlement	Discovery context: burials, single/loose, presumably funerary finds, depots

of the dichotomy can be seen in the light of dualistic philosophical doctrines (from Platonic premodernity to postmodern critical theories) and in their direct or indirect relation to the prehistoric reality; (b) the vision of the dichotomy as a transregional (and possibly inter-technological) phenomenon seems to be in line with the "spirit" of this groundbreaking time (phil. *Zeitgeist*: cf. Krause 2019). The analysis of this phenomenon – with the use of the abstract concepts of "convergence" and "divergence" in relation to human activities – is intended to verify the developmental tendencies of post-Neolithic communities in the context of technological and economic behaviours (Mugaj 2017; Wolski 2019a, 212).

This paper consists of three parts preceded by an introduction and crowned with a polemical ending that does not end the discussion. Firstly, the author presents the characteristics and interpretation of archaeological materials which were the subject of his earlier research, but this time in a synthetic manner. These studies provide the basis for constructing a theoretical position in relation to the prehistoric issues of interest here. The second part shows what kind of alliance is possible between archaeology and philosophy and what purposes it would serve. The author of this work places his philosophical investigations within the hermeneutical approach, and thanks to the study of key terms (dichotomy, divergence, convergence), he moves to the interpretative third part, in which structuralist thought becomes the guiding principle. Martin Heidegger, Hannah Arendt, Claude Lévi-Strauss – these are just some of the great thinkers thanks to whom the tool dichotomy phenomenon associated with the Stone and Metal Ages can be properly presented.

1. Dual artefacts from the perspective of traceological (functional) analyses

1.1. Early Bronze Age flint materials from Lesser Poland

Creating a traseological perspective in the study of post-Neolithic flint inventories was the challenge of the author's successfully completed doctoral project (Wolski 2016; 2020). The study of flint material from the settlement site of Targowisko 16, Wieliczka district, which was conducted at that time (Włodarczak (ed.) 2012), supplemented the current knowledge of the tools of the Early Bronze Age of Lesser Poland, mainly from the upland area (Kopacz 1976; 2012; Balcer 1977; Kopacz and Valde-Nowak 1987; Kadrow 1995; Kadrow and Machnik 1997; Libera 2001; Bąbel 2013a; 2013b; Wolski 2013), sometimes throwing new insights into the problems of the daily use of tools. In light of the available data, using information from the author's microscopic observations and additionally applying analogies concerning functional analyses of "late" materials from other areas of Europe, the study of Early Bronze Age lithics from Lesser Poland appears to be a very important, even indispensable branch of the past economy. The ad hoc day-to-day production of the settlers from Targowisko, based on the idea of quickly obtaining a small flake with a sharp edge, from rock in the immediate vicinity and mostly of low quality, using a hard hammer, seemed to be permeated by the spirit of pragmatism. The microdeformations discovered on the used tools from the aforementioned settlement are for the most part barely interpretable or even impossible to interpret, as confirmed by the performance of occasional activities of a non-cyclic nature within the households – with formally uncomplicated, commonly available, simple, and thus universal tools, with features that make precise typological qualification difficult, where retouching seems to have been a non-essential/secondary element (Fig. 1).

On the other hand, the constant nature of the activity should be associated with the use of formally legible pieces, discovered loosely outside the settlements and in sepulchral contexts, macrolithic bifacial forms, especially in the type of sickles (but also daggers) – elaborately prepared with flat retouching using pressing techniques, always with the use of high-quality imported raw material (Fig. 2). Such tools were used for a longer period of time, cyclically, most likely seasonally; they were characterized by multifunctionality, a natural formal predestination to be used in the course of earthworks and in the processing of cereals; they were often subjected to modifications and, as a result, to dimension reductions. For microscopic studies of the described types of artefacts, important funerary sites were taken into consideration, including: the cemeteries of the Strzyżowska culture in Raciborowice Kolonia 1 and 2, Chełm district (Ślusarski and Ślusarska-Polańska 1988) and the necropolis of the Mierzanowicka culture in Orliska Sokolnickie 1, Tarnobrzeg district (Czopek *et al.* 1993).

The polarization of the artefacts' characteristics is recognisable via the raw material, technological and utilitarian aspects employed, but also on a dimension beyond the practical. Mutual oppositions between the two described lithic lines can be multiplied, hence the term "dichotomy" as an illustration of the entire phenomena of the tool world of the discussed period of time in prehistory.

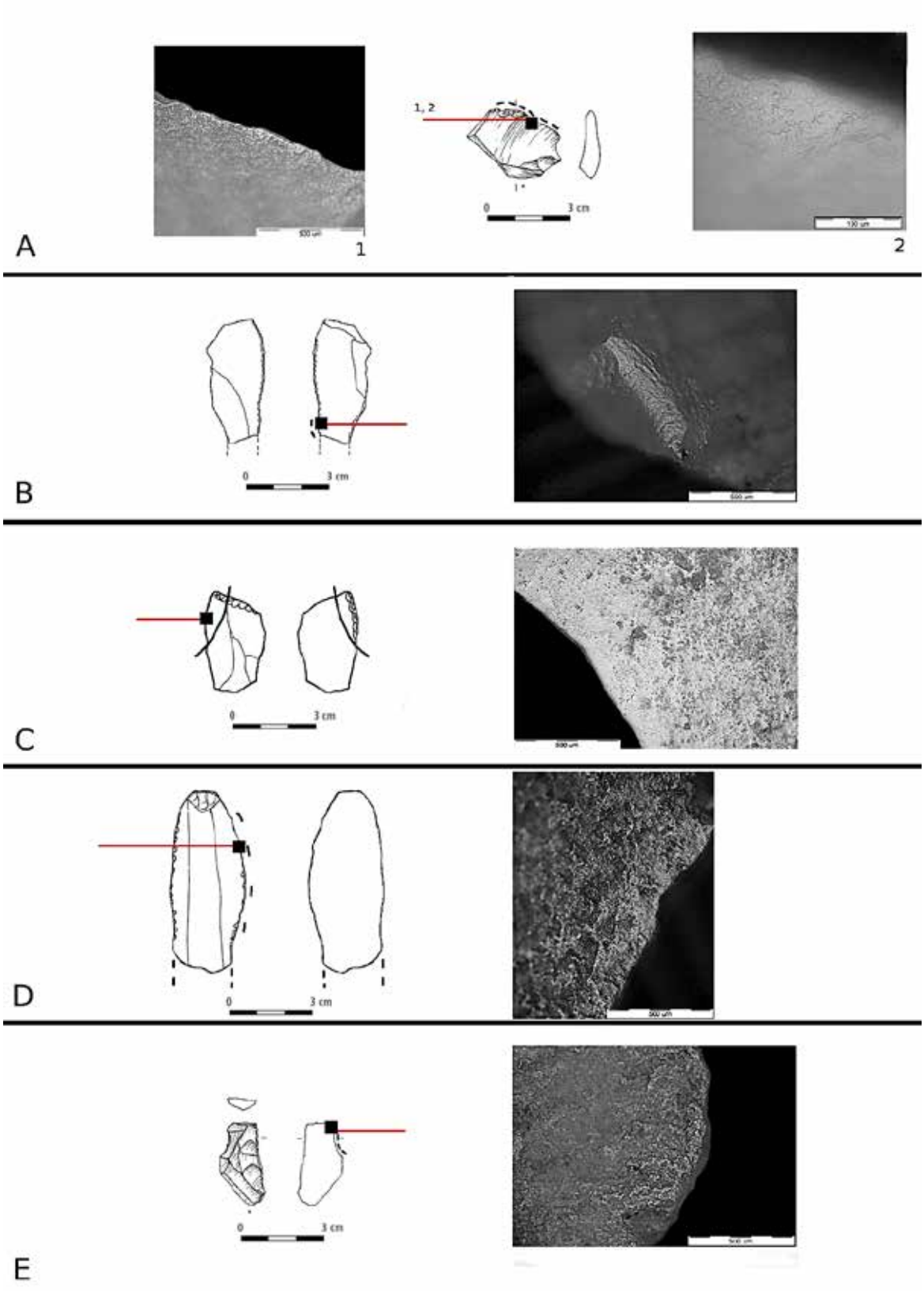


Fig. 1. Example of tools belonging to the opportunistic line – Targowisko 16, Wieliczka district. Microtraces on flint artefacts (A, E – after Włodarczak 2012b, fig. 33, 34; B–D – photos and graphics by D. Wolski; Wolski 2020, 68, fig. 13).

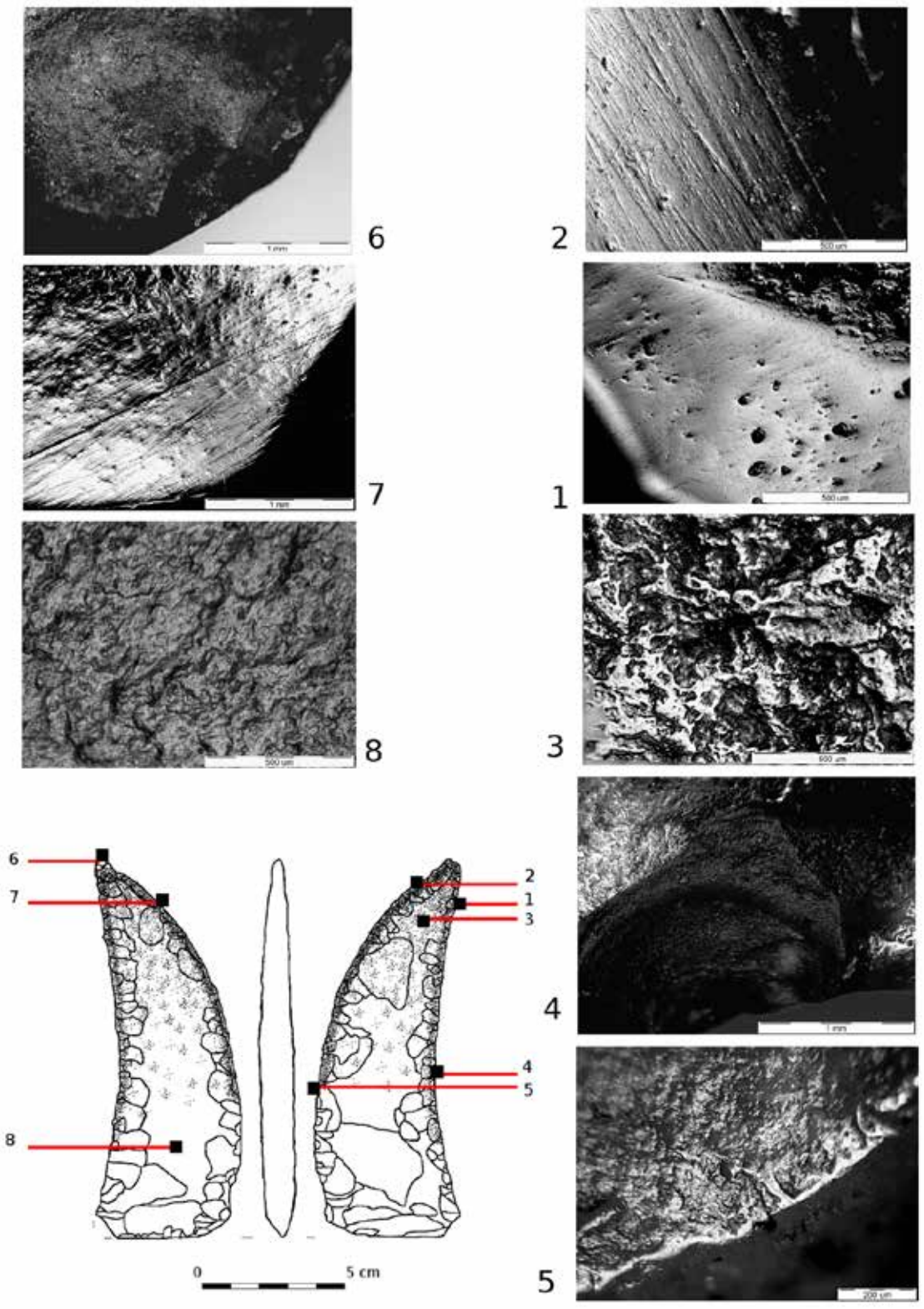


Fig. 2. Example of tool belonging to the specialised line. Microtraces on flint artefact (after Ślusarski and Ślusarska-Polańska 1988, fig. 14: 1; photos and graphics by D. Wolski; Wolski 2020, 103, fig. 24).

It is possible that only a cyclical/seasonal type of economic activity could have ensured the harmonious functioning of Early Bronze Age communities, which became achievable with flint tools – including specialised and technologically advanced ones, the creation of which lay beyond the capabilities of the average inhabitants of the settlements at the time (cf. Wolski 2014). Repeated annual activities, performed only at certain times of the year, noticeably correlate with a specialised line of dual lithic technology, rather than ad hoc settlement production.

1.2. Late Neolithic chipped stone materials from Moravia

The next step with the use of traseology in the study of "terminal lithic industries" was the microscopic analysis carried out for materials from the Stránská Skála hill settlement site in the Brno-Slatina district – the late phase of the development of the Bell Beaker culture in Moravia (Wolski 2019b).

In accordance with the nature of the turn of the Neolithic and Bronze Ages, both the processing of raw material and its utilitarian use by the people settled on the Stránska Skála slope were subject to the rule of optimization in terms of resources management. For example: (a) almost exclusively local rocks of poor quality from the immediate vicinity were used; (b) during reduction, polyhedral, angular cores were favoured, for which mostly hard hammer was used; notable is the microscopically confirmed complete lack of platform edge trimming to create the high degree of knapping control; (c) the splintered technique was willingly used – as it seems, with the intention of both coring (just in case?) and obtaining tools (Wolski 2019b, 146–147).

The performance of microscopic analysis of the artefacts from the excavated pit led to several conclusions, including the following: (a) only a negligible number of flint pieces were in use: singular micro-traces of distinctive wear; use-wear more often in the initial or intermediate developmental stage; (b) few actual working tools were found, indicating the short-lived functioning of the structure (as part of the household environment).

Adopting a dualistic perspective of flint phenomena, the Late Neolithic inventory obtained from Stránska Skála undoubtedly represents only one part of the dichotomy described above. We are dealing with a typically ad hoc technology, in which the specialised line is not represented at all. Analysing the acquired material, it is possible to recognise only a certain focus in the operational chain – in fact, not on macrolithic bifacial tools, but on smaller forms, possibly elements of complex composite implements.

The self-sufficiency achieved in raw material and tool economics by populations functioning at the dawn of a new era should certainly not be viewed in terms of downfall or marginalisation (even despite the potential loss of household flint working status as a cultural medium), but as the result of highly advanced economic and social optimisation. Technological and functional simplification had its practical benefits, but also certain dynamics. The epochal changes that followed in Moravia are clearly reflected in the assemblage of artefacts recovered from the Stránska Skála excavation, which undoubtedly represents the opportunistic line of the dichotomy (cf. Wolski 2019a, 212).

2. Philosophy and archaeology – an inter-academic relationship

Enlightenment and post-Enlightenment philosophy, and with them the growth of scientific knowledge since the 18th century, brought many ideas that resulted in the emergence of new academic disciplines, fully formed in the methodological sense, including archaeology. Interest in prehistory, of the amateur-collector type not yet characterised by a deeper thinking on the essence of the artefact in relation to man as a subject of cognition, dates back to antiquity and the antiquarian activity of the last king of the New Babylonian Empire, Nabonid (reign: 556–539 BC). Professional cultural-historical reflection, based on an elaborate apparatus of excavation, cabinet and laboratory methods, aimed at placing contemporaneous artefacts from homogeneous contexts on the axis of prehistory, only takes its beginnings in the 19th century (Renfrew and Bahn 2002, 25). It took several more decades for, around the middle of the 20th century, prehistorians to reach a critical point in affirming their own branch of knowledge, when it became apparent that the traditional vision of the history of material culture in many approaches was shown to be naïve, intuitive and chaotic, and – consequently – far from sufficient for the developmental needs of the field, looking from the 1960s onwards (Clarke 1973; Krieger 2006, 31–46; Johnson 2013, 42–50). It was at this stage (the so-called New Archaeology or, in other words, processual archaeology) that a mass of new theoretical concepts were incorporated into archaeological discourse, as well as a kind of reflection on the principles of the discipline and the criteria for the truthfulness of inferences about the past. Thus, in the history of archaeological thought, with all its complexity, it is

possible to distinguish at least two stages – pre-theoretical (ca. until the 1960s) and theoretical (continuing until today); however, this is not a unified picture. The introduced division established in the discussion of the philosophy of archaeology, which assumes the theoreticalisation of the discipline and reflection on the course and mechanisms of cognition by prehistorians of the history of man and his culture, an opposition: theory – empiricism (Rączkowski 2009, 7).

Such a view of the matter results in another dualism expressed, on the one hand, in the desire to make the discipline in question fully academic in the scientistic and technician sense (making and verifying hypotheses, problematisation of issues instead of creating a prehistoric historiography, a priori versus a posteriori reasoning, intersubjective testability of the research result, falsifiability). Inspiration from the philosophy of science, often including the formal sciences and therefore deductive-type thinking, is well evident in this trend (cf. Salmon 1982; 1992; Wylie 1985). Still remaining with the discussed term of theory, parallel to the above pro-science trend, which for various reasons is mainstream in research activity especially in Anglo-Saxon studies (academics from continental Europe opt rather for an inductive model of explanation), there is a process of theorising archaeology using the humanities, often together with their methodological apparatus, such as: broadly perceived anthropology, psychology, sociology, linguistics, or philosophy of culture. Based on the illustration provided it can be assessed that, thanks to a kind of "intrusion" into the conglomerate of disciplines from which archaeology constantly tries to take inspiration, the academic distinctiveness of this branch of knowledge – seeking invention according to research needs in pre-modern, modernist, and post-modern conceptual models – is being consolidated.

On the other hand, the aforementioned empirical area includes archaeological activities that do not aspire to scientific or academic status. The practical category is associated with all field research carried out by professionals authorised to do so (often acting as experts on a purely commercial basis, as part of their own business activities), as well as it refers to preliminary cabinet work on the artefacts obtained, aimed at generating specific reports for the relevant institutions, including conservation authorities. This form of schematic, practical action by prehistorians in relation to the object of research, which is the artefact and the context of its discovery, leads to the conclusion-making stage, described above as theory (cf. Rączkowski 2009, 25–26).

2.1. Philosophical emanations in archaeology – an outline of the issue

Regardless of the more scientistic or humanistic orientation of individual researchers in prehistory, in order to make a meaningful contribution to a particular section of archaeology, it is not partial, individual studies of a particular issue, but rather the broad interdisciplinary research of entire academic groups, in which a duality of discourse is the norm: (a) quantitative, qualitative analyses, including various specialised, revealing facts versus (b) pro-interpretative activities, referring to analytically demonstrated findings and explaining phenomena and processes with regard to the social sciences and humanities (e.g. Hildebrandt-Radke *et al.* (eds.) 2011; Przybyła *et al.* (eds.) 2013; Olalde *et al.* 2018; Kadrow and Müller (eds.) 2019; Kopacz and Wolski 2019; Wolski 2021).

Modern archaeology as viewed by the philosophy of archaeology is a discipline that interprets human history, always based on only fragmentary material relics. It is argued that in the process of inference there is a "contamination" of the cognitive subject by its own reality (Mamzer 1998; Pawleta 2016, 13–14), as well as a supremacy of thinking in objectivist categories (i.e. a closed, unchanging system: e.g. Hetmański 2015). Consequently, achieving an interpretive optimum, devoid of superficial explanations, requires adopting a particular theoretical perspective: *ocena jakiejkolwiek pracy na temat odległej przeszłości winna brać pod uwagę nie tyle prawdziwość wypowiadanych sądów, które są niesprawdzalne z racji nieobecności przeszłości, lecz spójność i logiczność interpretacji i argumentacji, a także siłę jej perswazji oraz przekonywania* [*evaluation of any research on the distant past should concern not so much the truth of the formulated statements, which cannot be validated due to the absence of the past, as the cohesion, logic and persuasiveness of the proposed interpretation and argumentation*] (Pawleta 2009, 451), as well as the strength of its persuasion and conviction. Hence, when attempting to refer to phenomena in prehistory, which in fact – due to the rudimentary nature of the available materials – can only be fragmentarily perceived, one should take into account not the authenticity of the referenced narrative, which is unverifiable due to the absence of the cognitive subject in prehistoric times, but the transparency and logic of the argument, as well as the power of intentional, even quasi-performative influence on the scientific community (in the sense of a creation of past reality expressed not only in speech, but also in the written word, using appropriate imagery; on the subject of

performative statements: cf. Austin 1993; Brożek and Kasprzyk 2007).

In contemporary archaeological discourse, the standpoint that new insights into the problem of understanding the past can be provided by philosophical inspirations is increasingly taken (Rączkowski 2009, 20; cf. Mamzer 2020). In such a view, archaeology becomes, as indicated, a highly interpretative discipline, being a kind of area of philosophical emanation, with researchers integrated into an "interpretive system" reaching out to the theoretical concepts of various thinkers. The notion of "hermeneutic understanding", used in attempts to get at the intentions, beliefs and actions of prehistoric man in his own world, is imposed here. In hermeneutic archaeology, what we understand unavoidably remains incomplete, and by its incompleteness open to further consideration. Such an approach prescribes alertness and distance from "established" knowledge, as well as from one's own beliefs and prejudices, which influence one's perception and judgement of the object of knowledge. In the sense of archaeological hermeneutics, even the most established knowledge may need to be reconsidered and a new and different meaning explored. The interpretive experience brings the prehistorian-theorist into a circular relationship of whole and part. On the one hand, it is necessary to understand the object of knowledge as a whole in order to be able to properly understand any of its parts, and on the other hand, it is required to know that object in each of its parts in order to be able to comprehend it as a whole (Gadamer 1993; Grondin 2007). Of course, it would be necessary in this context to decisively distance oneself from methodological anarchism, articulated as anything goes (Feyerabend 1996; cf. Zamelska 2004).

In spite of the unavoidable cognitive limitations of a researcher reaching the prehistoric reality along winding paths and, what is connected to it, the involvement of the prehistoricist as a cognitive subject in the process of cultural co-creation of the present rather than the past, Aleksander Dzbyński's work (2008) entitled *Rytuał i porozumienie. Racjonalne podstawy komunikacji i wymiany w pradziejach Europy Środkowej* [*Ritual and Understanding. Rational Bases of Communication and Exchange in Prehistoric Central Europe*] should be considered an example of a very successful application a concrete philosophical concept to the archaeological ground. The cited author, through the argumentation and exploration of special processes taking place in prehistory, tries to undertake a hermeneutically inspired reflection on the rational aspects of human functioning in the Eneolithic world (~2nd half of the 4th millennium BC to 2nd half of the 3rd millennium BC), with reference to the idea of number and metrological concepts as particular communicative markers preserved in material culture. The researcher attempts to reach the mind of man from the Younger Stone Age (~2nd half of the 6th millennium BC to 2nd half of the 3rd millennium BC), tracing the origins of numbers and measures in the space of social communication. The thesis is that the emergence of the metrological dimension in social relations at the beginning of the agrarian economy in Europe directly influenced social differentiation, the development of inequalities and the formation of hierarchies (in order to provide the most appropriate representation of A. Dzbynski's conception as outlined in his work, this study uses a review by Michał Pawleta (2009)).

The monograph by A. Dzbyński is one of the few convincing attempts in archaeology to draw on critical theory and Frankfurt School thought. The author discusses the issue of communicative rationality, based on the German thinker Jürgen Habermas's two-volume work *Teoria działania komunikacyjnego* [*The Theory of Communicative Action*] (1999; 2002). For J. Habermas, the key initial term is "communicative competence", taken as a certain universal capacity to understand and create rules for communication, appropriate to the social situation, where language has a catalytic function in the complex process of "coming to an understanding". Another relevant definiendum, "social evolution", is described as a: *postępująca racjonalizacja obrazów świata uspołecznionych jednostek ludzkich* [*process of increasing rationalisation of worldviews by socialised human individuals*] (Dzbyński 2008, 22). In the course of this evolution, there is a gradual transformation of communicative action into a completely new stage – ritual practice, conventionally performing social-integrative functions, is replaced by the "authority of consensus"; thus, the sphere of the sacrum is displaced by the sphere of rationalised communication. The transformation occurs through the linguisticisation of norms established through tradition, thus releasing the potential hidden in the rationality of communicative activity: *Promieniująca z sacrum aura zachwytu i przerażenia, oczarowująco-zaklinająca moc świętości, ulega sublimacji i zarazem powszednieje, przechodząc w wiążąco-spajającą moc poddawanych krytyce roszczeń ważnościowych* [*The aura of awe and fear radiating from the sacrum, the bewitching and charming power of the sacrum, is sublimated and at the same time made commonplace, passing into the binding and cohesive power of the validity claims under criticism*] (Habermas 2002, 140; all translations of quo-

tations and terms from Polish-language publications into English – DW). In the reasoning of A. Dzbyński, who uses the remains of material culture preserved in the archaeological record as inferential material, the concept of relieving the linguistic medium by way of reaching understanding, through extra-linguistic media of communication, in the form of various types of utilitarian objects, is presented (Dzbyński 2008, 23).

The axis of A. Dzbyński's work is thus the evolution of communication systems among early agricultural communities in Central Europe, defined as rationalisation (Dzbyński 2008, 34). J. Habermas's concept serves the author as a philosophical parallel in his study of the genesis and occurrence of the phenomenon of: *metrologizacji kultury materialnej, czyli nad powstaniem i ewolucją pierwszych miar na płaszczyźnie komunikacji społecznej* [*the metrologisation of material culture, i.e. the origin and evolution of the first measurements at the level of social communication*] (Dzbyński 2008, 20). The author analyses the formal features of artefacts (flint tools: macrolithic blades, axes; but also ceramic and metal pieces – copper/bronze), emphasising the communicative aspect of interference in their shapes and dimensions, such as fragmentation procedures or modification of forms. The reflection covers various production techniques, the distribution of tools and their exchange. The metrical changes of the artefacts mentioned above are examined (always in connection with specific taxonomic units distinguished by archaeologists, i.e. archaeological cultures). A. Dzbyński comes to the conclusion that in the case of the analysed cultures/societies of the Younger Stone Age, a repetitive phenomenon of the reproduction of a specific system of measurement is observable, which could be linked to the transformation of the rules of communication. The metrological concept, which is the product of rationalised communication, would tend to recognise Eneolithic man's familiarity with the traditional concept of measure and the rules for dividing proportions, into halves, quarters, etc. (Dzbyński 2008, 127–129).

A. Dzbyński tries to present his project in a very broad temporal and territorial framework. As mentioned, the evolutionary rationalisation progressing throughout prehistory was based, according to the cited author, on two basic elements: (a) the process of achieving understanding through the verbal medium of communication, which is language, and (b) the relieving of language by non-verbal, material mediums of communication. It is an indisputable fact that, with the passing of centuries and millennia, there has been a transformation of economic systems from assimilative to productive, and there have been technological developments. At the same time, according to A. Dzbyński's conception, there was a successive decrease in the importance of linguistic communication – from the narrative model (Palaeolithic, Mesolithic, hunter-gatherer) to the achievement of metrological consensus (Bronze and Iron Age, developed agrarian system, advanced metallurgy). Epochally, the critical phase of transformation was to be the Neolithic (developing agriculture, farming and the beginnings of copper and bronze metalworking), when narrative itself loses its power in favour of new, material media of communication – this stage has been described as metrological-narrative (Dzbyński 2008, 30, 230). As M. Pawleta notes in his review of A. Dzbyński's discussed work: *stadia te znamionują stopniowy proces odczarowania świata, czyli odchodzenia od myślenia w kategoriach magicznych (synkretyzmu kulturowego) na rzecz kryteriów racjonalnych i wydzielenia się aspektów techniczno-użytkowych, komunikacyjnych oraz światopoglądowych* [*The stages point to a gradual process of "unbinding the spell-bound world", i.e. to the move from thinking in magical terms (cultural syncretism) towards rational criteria, and to the emergence of technical-functional and communicative aspects and outlooks*] (Pawleta 2009, 460; cf. Dzbyński 2008, 235).

To conclude, in the book by A. Dzbyński briefly presented here, an ambitious attempt was made to reach the phenomena enclosed in the scraps of the material culture of the distant past. In spite of the fact that the author of *Ritual and Understanding* adopts a point of view that is visibly marked by idealism, and finally, perhaps, by an over-universalist approach to the issue and an attempt to interpret the changes in the processes of communication from the Palaeolithic to the present day, there is no doubt that the message coming out of the monograph is cognitively absolutely unique, and in the context of this work, it clearly reveals the possibilities of interaction in the philosophical and archaeological field.

2.2. Philosophy of technology – selected concepts: tool, work, and creation

Let us assume that by the term "tool" we would like to understand *an item or a simple device directly affecting another item, which as a result of performing* [...] *some work is to be changed* (https://encyklopedia.pwn.pl/szukaj/narz%C4%99dzie.html, access: 11.11.2023). In contrast to the encyclopaedic approach presented above, according to which the term we are interested in is considered on strictly functional grounds, a tool

can also be perceived purely formally – as a product characterised by certain typological features, such as shape, stylistics, size or method of its retouching. This type of understanding is appropriate for archaeology, whose researchers, going back even a few million years, empirically reach the origins of the tool sphere and analyse the stages of technological progress, in connection with the development of language and communication among representatives of the genus Homo (e.g. Vyshedskiy 2019). On the axis of successive hundreds of thousands of years, more and more complex conceptual operational schemes on products made by human hand (from simple chopper forms, through the use of core techniques, to the reduction of cores in volumetric type, including microlithic ones) are found in tool inventories Archaeological terminology – especially that concerning pieces made from the most archaic raw materials, i.e. various stone tools, created before the development of specialised methods of analysing the function of artefacts (broadly defined as traseology – optical, scanning and confocal microscopy), today results in the widespread use of associative and intuitive names among prehistorians referring to the forms of artefacts and their presumed functions (such as scrapers, burins, perforators, sickles, etc.), rather than to their actual use by early man. As a result of the historical circumstances described above, the archaeological definition of the term "tool" has two different aspects, often causing controversy in academic discourse: functional and formal (cf. Wolski 2020, 18–20).

The introduction presented, which reveals a certain terminological complexity in the discipline of archaeology (and it is worth noting that, among academic disciplines, it is one of the most representative ones referring to the study of man in the aspect of the history of his material culture), leads to the philosophical revealing of the tool as a definiendum. What is it, how was it perceived by prehistoric man, and how is it seen today? In order to reflect on its ontological status, the author first makes use of statements by M. Heidegger, lightly supplementing, for the purposes of the discussion, the conceptual scope related to toolhood with terms such as "technique" and "work". This way of presentation will allow a more complete, contextual view of the subject of toolhood to be shown.

M. Heidegger characterises in his work *Bycie i czas* [*Being and Time*] the elements that make up the essence of a tool. As one of its designations, indeed as an inherent existential feature, he singles out "handiness" (*Zuhandenheit*), defining the tool's mode of being "in which it reveals itself" (Heidegger 2013, 88). The quoted philosopher gives tools as entities the property of being, and through handiness indicates their existence: […] *jestestwo jest ontycznym warunkiem możliwości odkrywalności bytu, który jest spotykany w świecie, mając sposób bycia powiązania (poręczności) i tak może się ujawniać w swym „w-sobie"* [[...] *Dasein is the ontic condition of the discoverability of an entity that is encountered in the world, having a mode of being of association (handiness) and so can reveal itself in its 'in-self'*] (Heidegger 2013, 112). Thus, if we use a tool, we do not think about its essence (the more perfect it becomes, the more it disappears in the hand, i.e. it "withdraws into handedness": cf. Marzec 2018, 91), but focus on the accomplishment of the task – exploration, reshaping, any physical interference with another object. According to M. Heidegger, tools in the course of performing an activity with them are invisible to the user, *gdyż jako poręczne (zuhanden) i wykonujące zleconą im pracę, jednocześnie znikają zakryte posługującą się nimi ludzką ręką. Przedmiot ujawnia swoją obecność jedynie wtedy, gdy psuje się i zaczyna działać wadliwie. Wówczas, jako nieprzydatny, wyjątkowo pojawia się przed ręką (vorhanden), przechodząc tym samym z obszaru praktyki do sfery teoretycznego oglądu* [*for as they are handy (zuhanden) and do the work assigned to them, they simultaneously disappear covered by the human hand that uses them. An object only reveals its presence when it breaks down and begins to defect. Then, as useless, it exceptionally appears in front of the hand (vorhanden), thus passing from the space of practice to the sphere of theoretical view*] (Marzec 2018, 90–91).

In addition to the attribute of handiness, M. Heidegger reveals further distinctive features of the tool in his work, called "references". A tool is: (a) "to perform a certain action", (b) "to be used with other tools", (c) "to be used for some purpose", (d) "to be used by someone" (Heidegger 2013, 111–113). This four-faceted nature of the tool can be given the following conceptual translation in turn: (a) servitude – what the tool is used for ("handling of tool"), (b) usefulness – what the tool is useful towards ("workshop"), (c) applicability – what can be achieved with the tool ("purpose"), (d) convenience – for whom the tool is suitable ("user"). As Jadwiga Wiertlewska-Bielarz (2010, 21) concludes, *narzędziem zatem jest coś, co zostało z czymś, w celu, przez kogoś, jakoś użyte* [*a tool, then, is something that has been used with something, for a purpose, by someone, somehow*]. "Manipulation" or "manipulative-utilitarian preoccupation", or simply the handling of a tool (Heidegger 2013, 86–89), leads to the disclosure of its attributes and thus results in its determination in rela-

tion to its environment. Importantly, what is irremovable in an essential sense is only the handiness – it is what gives the tool status to the being and defines its being. Thus, what is servile, useful, applicable or convenient does not have a principled character for the tool, but only a modal one, circumstantially agreeable to the world. Reducing M. Heidegger's complex terminology to a rudimentary, or a certain simplification of his outlook, it could be argued that without the human perspective, the being of a tool would never have had the chance to come to light. For it is the human being who performs the "manipulation", i.e. the type of "pro-possibility" activity undertaken (*sposoby bycia jestestwa są niejako sposobami dostępu do specyficznych sposobów bycia bytów z otoczenia* [*the ways of being of Dasein are, as it were, ways of accessing the specific ways of being of the surrounding entities*]) (Wiertlewska-Bielarz 2010, 21), gains access to the tool, thus revealing its few-dimensional nature outlined above (cf. Wiertlewska-Bielarz 2010, 21–23). In other words, if we disregard the subject-object complexity of the relation, ignore being by focusing only on entities, out of context objects would lose their subject reference. A hammer used by a carpenter will be a hammer as long as it serves as a tool for hammering nails (cf. Heidegger 2013, 88). Thus, the moment its use is abandoned, although it has its weight, still has its potential functionality and is among other tools, it loses its direct reference to the one who used it.

Sentences such as: *Poręczność (narzędzia) oznacza istotową dyspozycyjność dla człowieka* [*Handiness (of a tool) implies an essential disposition for man*] (Hoły-Łuczaj 2013, 98) or […] *u „wczesnego" Heideggera stosunek człowieka do rzeczy sprowadza się do użyteczności* [[...] *in the Early Heidegger, man's relation to things is reduced to utility*] (Hoły-Łuczaj 2013, 98) reinforce the conviction of the analysed thinker's purely instrumental approach to the essence of a tool. As can be seen, there is a lack of direct translatability of Heideggerian reasoning into the formalistic view of tool and toolhood known in archaeology, i.e. based on morphometric and typological categories (differently with regard to its functionality: cf. the beginning of this subsection).

In another essay entitled *Pytanie o technikę* [*The Question of Technique*], the late Heidegger (2002), as if in controversy with his convictions in *Bycie i czas* [*Being and Time*], seems to criticise the contemporary instrumentalist attitude towards the tool, or more broadly towards the technology itself leading to the final product, which is the tool. Based on an analysis of the Greek concepts *techne* ("means to an end") and *poiesis* ("the act of man"), the quoted author emphasises the extra-utilitarian value of creation as extraction from the state of nature, which is supposed to be related to the understanding of the concept of art: *Techne należy do wydobywania, do poiesis: jest czymś poetyckim* […], *jest sposobem odkrywania* [*Techne belongs to extraction, to poiesis: it is something poetic* [...], *it is a form of disclosure*] (Heidegger 2002, 231). Meanwhile, the contemporary understanding of technology seems to be reduced to matters of utility and pragmatism, hence *only techne extracted, arising in poetry, can reveal true thinking* (Rebes 2016, 141). M. Heidegger *chce by współczesne myślenie stało się rękodziełem, ręczną robotą, a nie dziełem maszyn. Reguły seryjnego wytwarzania sprawdzające się w świecie działań techniczno-instrumentalnych zawodzą w świecie myśli, niszczą bowiem jej dzieła* [*wants modern thinking to become a handcraft, a manual work, not the work of machines. The rules of serial manufacturing that succeed in the world of technical-instrumental activities fail in the world of thought, for they destroy its creations*] (Maślanka 2004, 177). The obscuring of the essence of technology the thinker of our interest seems to correspond to the confusion of the essence of man himself. "The being of a technology", or the "being of a tool", becomes comprehensible not by giving the technology or the tool purely functionalist qualities (e.g. "a hammer is used for hammering nails" or "an axe for chopping wood"), but above all by seeing in the subject-object relationship meanings defined by the current context of the one acting. One could say: a tool is not a tool because it has been made, but it has been made in order to be a tool. It is not only meant to perform specific functions, but also to "give inspiration", to "constitute a gift", or – which can be read as the quintessence of Heideggerian hermeneutics – to "allow itself to appear as present-at-hand" (cf. Barański 2008, 24–26).

If one were to treat the Heideggerian concept of toolhood as universal for all places and times, then the "making present" of the tool, and thus of essentiality in the object-subject relationship with man, would also be directly referable to prehistoric times. Adopting such a theoretical perspective would hereby reduce the powerful position in today's philosophy of archaeology that in the process of inference the cognitive subject becomes involved in its own reality, so that the attempt to comprehend the past becomes, as already emphasised in an earlier subsection, a misleading construct rather than a reliable reconstruction.

In the follow-up to M. Heidegger, analyses of concepts referring to "work" and "creation", which orig-

inated mainly in Greek, are undertaken by Giorgio Agamben and Hannah Arendt in their studies (with reference to archaeological discourse: cf. Mugaj 2017). In the reflections of the first of the aforementioned philosophers (Agamben 1999), the terms *poiesis* and *praxis* appear, in their articulation more or less coinciding with Heideggerian thought. *Poiesis* wants to understand G. Agamben as a creative activity that goes beyond its own self, or as an activity that gives existence and brings truth to the light. *Praxis*, on the other hand, is a kind of activity closed in on itself and refers to production limited by its own inherent framework. The author sees in the historical process a fusion of the meaning of both terms. As a result, *poiesis* stops being understood as a creation and transforms into a product which is a commodified realisation of the will of the producer. The *techne*, mentioned above, also becomes nothing more than a commodity, which loses its extra-practical face and acquires a purely instrumental character (Agamben 1999, 42–50; cf. Heidegger 2002).

H. Arendt, in her book *Kondycja ludzka* [*The Human Condition*] (2010), seems to argue about the notions of "work" and "creation" in a not very different way than in a post-Heideggerian manner. The term distinguished by the philosopher and referring to man's physical activity, *vita activa*, is the starting point for further reflections on human "action". At the bottom of this hierarchy is the "work" that implicates man in the nature (*praca naszego ciała i dzieło naszych rąk* [*the work of our body and the work of our hands*]) (Arendt 2010, 87), where, as *animal laborans*, he focuses on the necessity of survival, immediately consuming the produced, perishable goods needed to sustain basic existence. "Creation", on the other hand, is the task of *homo faber*, who, being capable of modifying nature, creatively gives a new quality to the material objects brought to life in the made-up world. While "work" can be described as a repetitive, never-ending process, the result of "creation" is single, unique, permanent and – what is important – individualised, able to be realised through interpersonal exchange: *homo faber, budowniczy świata i wytwórca rzeczy, może odkryć właściwą więź z innymi ludźmi, tylko wymieniając się z nimi swoimi wytworami, ponieważ same te produkty są wytwarzane w odosobnieniu* [*homo faber, the builder of the world and the maker of things, can only discover a proper connection with other people by exchanging his products with them, since these goods themselves are produced in isolation*] (Arendt 2010, 189). The objects obtained in the course of creation serve to build the world by objectifying it (Arendt 2010, 166). The highest level of *vita activa* is "action", manifested through human social activity as a form of striving to function together, where mutual interactions allow for full human being (Arendt 2010, 11–12).

2.3. Pivotal concepts: dichotomy, divergence, convergence

A chance to answer the research questions of the presented paper, or at least to create favourable conditions for an even clearer highlighting of the problem of the tool dichotomy and its understanding, may be provided by confronting archaeological knowledge with dual philosophical concepts. The intended effect can be attempted to be achieved through the prism of the issues discussed since antiquity based on binary oppositions (e.g. dualism versus monism, empiricism versus rationalism, idealism versus materialism, induction versus deduction, causalism versus finalism, a priori versus a posteriori, etc). The author of this work, the scope of which is strictly defined, does not aspire to provide a profound explanation of the antagonisms indicated, but only to use selected examples of this type of opposition in order to achieve the intellectual objective that has been set.

A binary division, in which a certain category of a superior term is split into two mutually exclusive subcategories, can be referred to as a dichotomous divide (Karwat 2012, 11). On lexical, as well as epistemological grounds, it assumes the existence of linguistic and cognitive antonyms, i.e. notions standing in opposition to each other (e.g. "yes-no", "there is-there is not", "for-against", "small-big", "young-old", "satiated-hungry", "warm-cold", "good-bad", "true-false", etc.). As can be seen from the cited examples, opposition exists not only within the framework of linguistic conventions alone, but also in the relation of the cognitive subject to the surrounding reality, which is unavoidably accompanied by the subjective aspect of the reception of impulses from it, and their further processing and evaluation. A dichotomous division as a logical system must fulfil certain formal conditions: (a) it must be made according to a single criterion, (b) the scopes of the distinguished two notions must be inseparable, (c) the separated two parts must together complement the initial notion (Karwat 2012, 15–29). In the context of the present study, the archaeological dichotomy in the sphere of toolhood at the turn of the Stone Age will be constituted by its two distinct lines: opportunistic and specialised (cf. Tab. 1).

Referring to historiosophy, the term "dichotomy" already appears in Greek philosophical sources as the

name of one of the paradoxes of Zeno of Elea (Wesoły 2013, 73). References to binary oppositions, not explicitly called dichotomy or dualism (both concepts are used synonymously in this paper, although they may be perceived differently in the philosophical tradition), but relating to terms that contradict each other, are also evident in Aristotle's concept of the "golden mean", understood as the search for a compromise between extremes, or, in other words, the right measure between "too much" and "too little" (https://www.newworldencyclopedia.org/entry/Golden_mean_(philosophy), access: 11.11.2023; https://plato.stanford.edu/entries/aristotle-ethics/#DoctMean, access: 11.11.2023).

The antonymic schema is also evident in the Hegelian dialectical process, where a unifying construct, i.e. synthesis, is formed from two opposing terms or phenomena – thesis and antithesis. The three-part system results in the combination of concepts into increasingly complex structures – new entities incorporating the earlier dichotomies (Rosiak 2011, 18–20).

Terms close in meaning to the dichotomy are "divergence" and "convergence". However, while the dichotomy may be perceived as a static, fixed image of reality, the newly introduced definienda can also be understood as a process of divergence or convergence, which is particularly important in the aspect of the study of man and his culture carried out by the author of the present work. Etymologically, both names have penetrated from mathematical and physical sciences to social, legal and natural science disciplines, as a result of which a thesis has been established: under similar conditions, in different places and cultures, similar constructs – divergent and convergent – may be created independently or depending on each other (Tokarczyk 2012, 5; with regard to convergence: cf. Kopaliński 1994, 278). In contrast, the anthropological antonym for the concept of convergence, namely divergence, is described in the dictionary as: *wtórne różnicowanie się* [...] *cech i elementów w odizolowanych od siebie kulturach, spowodowane zmianą ogółu warunków środowiskowych i zewnętrznych wpływających na rozwój kultury* [*a secondary differentiation* [...] *of features and elements in isolated cultures, caused by a change in the totality of environmental and external conditions affecting the development of a culture*] (Olechnicki and Załęcki 1997, 50).

In a cultural studies sense, convergence can be seen in another way: […] *to zjawisko lub pewien proces, w którym obserwować możemy zmieniające się i wzajemnie przenikające zależności pomiędzy treściami* [...] *kulturowymi* […] *oraz ich twórcami i odbiorcami. Za pomocą technologii producenci szukają nowych rynków zbytu* […], *a odbiorcy chcą znaleźć inne, ciekawe i kreatywne formy współuczestniczenia w tych zjawiskach oraz ich współtworzenia* [[...] *is a phenomenon or a certain process in which we can observe a changing and interpenetrating relationship between* [...] *cultural content* [...] *and its creators and users. With the help of technology, suppliers are looking for new markets* [...], *while recipients want to find other, interesting and creative forms of participation in these phenomena and their co-creation*] (Jaskowska 2008). The opposite of this state, emphasising also the cultural studies sense, will be the divergence of expectations, interests and actions of suppliers/creators and recipients/users.

For the author of the publication, the presented terminological suggestions are an important contribution to the attempt to verify the translatability of the functioning of the conceptual apparatus appropriate to the interdisciplinary contexts quoted into archaeological scope, which is expected to provide an interesting exploratory result.

3. In the net of binary oppositions: divergent and convergent mechanisms in dual post-Neolithic technology on the ground of structuralist thought

The key terms analysed so far will acquire a common sense when the concepts of divergence and convergence, introduced above, are integrated into the archaeological discourse seen through the prism of structuralism (Lévi-Strauss 2021); of course, this is not in the full view of this intellectual orientation, but in the light of some of its elements. The choice of interpretative trajectory becomes important for the present work not only because it fits into the model of the inference adopted, but also because structuralism as a somewhat scientistic orientation, or aspiring to be scientific, finds a reference to both archaeology and philosophy (i.e. as fields themselves in some difficulties with their ontological status). The author's understanding of the structuralism in its "non-dogmatic" version he would like to articulate carefully in order to avoid contradictions with reasoning of the hermeneutic type (cf. Januszkiewicz 2018, 186–189), declared as a methodological point of reference for the interpretative content of this paper.

The structuralists wanted to: *naukowo opisać* [...] *świat (znaczeń) takim jakim jest on w swej istocie, aby* [...], *stworzyć gramatykę kultury odwzorowującą rzeczywiście istniejący w niej ład* [...]. [Strukturalizm

stanowił – ed. DW] *o kompletnym opisie wszystkich istotnych relacji kulturowych, co do których żywił przekonanie, iż ukrycie już istnieją, czekając jedynie na swe ujawnienie (stąd właśnie wzięła się najpopularniejsza metafora strukturalistów: metafora geologiczno-archeologiczna – zalegania pod powierzchnią, odkrywania, dokopywania się, zdzierania powierzchniowych warstw, pójścia w głąb itd.). Dzielił świat na to, co konstytutywne (ważne, rozstrzygające, centralne, determinujące resztę, nadrzędne, proste i podstawowe) i to, co pochodne (powierzchniowe, marginesowe, zamazane, chaotyczne i przygodne)* [*scientifically describe* [...] *the world (of meanings) as it is in its essence, in order* [...], *to create a grammar of culture that reflects the order actually existing in it* [...]. [Structuralism was – ed. DW] *about the complete description of all essential cultural relations, for which it was convinced that they already existed secretly, just waiting to be revealed (this is where the most popular metaphor of the structuralists came from: the geological-archaeological one – lying under the ground, discovering, digging in, going deep, etc.). He divided the world into the constitutive (important, conclusive, central, determining the rest, superior, simple and fundamental) and the derivative (superficial, marginal, blurred, chaotic and adventurous)*] (Szahaj 1993, 5–6). The structural method is not meant to lead directly to the construction of meaning (as modern mainstream prehistorical theorists would like to show past reality: cf. subsection 2.1), but to its detection by means of an analysis of the interconnections of all the components of the system. *Stosowanie analizy strukturalnej jest próbą dania absolutnych rozstrzygnięć tłumaczących zjawiska kulturowe i próbą zintegrowania całej humanistyki w totalnym pojęciu struktury, gdzie w strukturze tej wyrażona jest pewna uniwersalna racjonalność zawartych w niej tworów* [*The use of structural analysis is an attempt to give absolute solutions to explain cultural phenomena and an attempt to integrate the whole of the humanities in a total concept of structure, where in this structure is expressed a certain universal rationality of the creations that it contains*] (Ruciński 1971, 214–215). Thus, instead of relativistic thought, a kind of intersubjectivity is to be revealed in interpretation. Such an effect is to be achieved: *dzięki daleko posuniętej formalizacji materiału,* [...], *tj. faktów kulturowych, co prowadzi do sprawdzalnych twierdzeń na temat ich wewnętrznej organizacji, mechanizmu funkcjonowania i mechanizmu znaczenia* [*through a far-reaching formalisation of the material,* [...], *i.e. cultural facts, which leads to verifiable claims about their internal organisation, mechanism of functioning and mechanism of meaning*] (Ruciński 1971, 216).

According to the structural method, the aforementioned "facts" form systems as logical wholes whose elements are so-called possibility structures (models). Ultimately, the actually produced system consists of fragments of realised possibilities, where: *znaki językowe, a dokładnie interpretanty* […] *powiązane są ze sobą siecią rozmaitych relacji, wyznaczających funkcje elementów w systemie* [*linguistic signs, or more precisely interpretants* [...] *are linked to each other by a network of various relations, determining the functions of the elements in the system*] (Ryż 2013, 14). Possibility systems can infiltrate each other – at the level of the models themselves, as well as their individual elements. *Ta wzajemna przekładalność pozwala na zarysowanie* [...] *syntetycznego i totalizującego obrazu kultury ludzkiej* [*This inter-translatability makes it possible to outline* [...] *a synthetic and totalising picture of human culture*] (Ruciński 1971, 216–217), capable of being interpreted in a very specific way in all places and times within the structuralist paradigm.

In the above view, a given systemic structure appears to be a self-sufficient creation, although, of course, it must have previously differentiated and demarcated itself from the "environment" (surroundings), creating a new ontological quality. [The environment – ed. DW] *wciąż w pewnym sensie oddziałuje na system, ale o charakterze tych oddziaływań decyduje już sam system, który na warunki otoczenia reaguje zgodnie ze swoimi wewnętrznymi regułami na podstawie wcześniej wytworzonych wzorów* [*still interacts with the system in a certain sense, but the nature of these interactions is already determined by the system itself, which reacts to the conditions of the environment according to its internal rules on the basis of previously generated patterns*] (Ryż 2013, 51). One of the main principles is that the order of the system must be characterised by a hierarchical (though not necessarily valuational) organisation, the analysis of which requires, in the first instance, a description of the larger things so that the smaller things can be observed from an appropriate perspective (Ryż 2013, 22, 27), according to the order "from the general to the particular".

The formation of a system can be associated with the Heideggerian extraction of "creation" from the state of nature, which results in the origin of the tool's pro-possibility-potential already in the non-natural sphere of culture. In this space, however, the tool does not yet acquire the status of "handiness", but only pretends to this status, without being a fully "cultured" element. The dualistic reference to structuralist thought is well taken in this context: *Pojęcie kultury* [...] *rozumiane jest przez strukturalistów w opozycji do pojęcia*

natury. Jakkolwiek często następuje dyfuzja przedmiotów należących do dwu dziedzin — natury i kultury [*The concept of culture* [...] *is understood by structuralists in opposition to the concept of nature. However often there is a diffusion of objects belonging to two domains – nature and culture*] (Ruciński 1971, 214).

Looking at typical post-Neolithic settlement toolkits (cf. subsections 1.1 and 1.2 of this article), tools belonging to the opportunistic line had to be extracted from the state of nature quite easily (cf. Tab. 1; Fig. 1). Minimal or no technological investment led to the rapid utilitarian success of a given piece, which was used "in relation to something" (a specific organic or inorganic material), "for some purpose" (most likely in the carrying out of a simple, one-time activity), "by someone" (by anyone on the settlement – a non-specialist), "somehow" (short-term working, without remaining distinctive, evident microtraces). Such a mono-functional tool, used once, then abandoned and forgotten, lost its object reference after the work was done with it, disappearing into the past. It only gained renewed interest and significance in the course of its possible reutilisation or when it was found by prehistorians hundreds and thousands of years later.

The situation is different in relation to the tools belonging to the specialised line (cf. Tab. 1; Fig. 2), which are characterised by the pietism of processing and refinement of bifacial macrolithic implements. Flint forms of the highest quality, as being the domain of specialist makers – most likely not farmers, but traders-craftsmen, hermeticising their resources of knowledge and skills, ensuring the intergenerational transfer of these intellectual and competence-manual goods within a narrow, elite group – had to be treated with the highest respect, almost with pathos, by the post-Neolithic population of agricultural and farming settlements, i.e. the recipients/users of bifacial sickles and daggers. Items of this type were meant to provide prestige, but at the same time they had utilitarian functions, only that they were very specific, because they were linked to the seasonality and circularity of the activities. Macrolithic tools presumably remained in use even in the intergenerational cycle, constituting a kind of insignia in the sphere of post-neolithic toolhood. A distinguishing feature of the implements in question was their high resistance to defects (it is a rare phenomenon for flint materials), so that they stayed "handy" (*zuhanden*) tools *sensu stricto* for a very long time and not as quickly as other items left the sphere of practice (i.e. appearing "in front of the hand" – *vorhanden* – as defective, thus losing their tool dimension). In contrast to the opportunistic line, these were the highly specialised tools – in spite of the fact that they performed certain important economic functions – that were the Heideggerian "gift-bestowing inspiration", and at the same time, in a subject-object relationship, they "made themselves present" in the course of the activities performed, providing a current toolhood context for the acting individual.

When considering the duality of the tools of the breakthrough times, one is facing the question of whether there is a splitting (divergence) or a complementing (convergence) of the two orientations of the lithic industries. On the one hand, the externally visible duality can be seen as a hybrid system, stimulating the effective fulfilment of all basic economic activities. This hybrid could be attempted to be interpreted in terms of a desire to sustain the most harmonised co-operation of the polar elements and their integrity. From a theoretical point of view, in the phenomenon of polarisation, the principle is complementary rather than mutually exclusive relations. Also according to the central idea of structuralism, each of the system's components (models or possibility structures), even the seemingly most extreme ones, have to form a common structural skeleton necessary for the functioning of the whole. What is important is what interactions would have to take place between the representatives of two such different formal-utilitarian trends. It may well be that the parallel existence of "special" pieces (used cyclically) and "ordinary" items (used to satisfy elementary needs, formed on the basis of widely available raw materials and based on average knowledge and skills) among communities at the turn of the stone and metal era could have potentially stimulated the efficiency of the former economic system. With this type of conclusion, it is reasonable to believe that the interests of the creators/suppliers and recipients/users of macrolithic products were aligned, and the multi-aspect dichotomy established on the basis of the analysis and interpretation of artefacts was of a convergent nature – suppliers and recipients of special forms participated in the creation of socio-economic reality. In the light of the argument made by the archaeological material and the general humanities (Wolski 2019a; 2020; cf. the content of the present work), the author assumes that the convergence phenomenon may have clearly occurred in particular in areas located in close proximity to flint-bearing formations containing rocks of suitable quality for creating bifacial sickles and daggers. Such a region was Lesser Poland and Volhynia (cf. subsection 1.1), abundant in various types of flints of Jurassic and Cretaceous age (cf. Libera 2001, 77–82, 92–95; Wolski *et al.* 2018).

With reference to the Moravian flint artefacts from the turn of the Neolithic and Bronze Ages (subsection 1.2), which are significantly different in terms of the qualitative aspect from those known from the Lesser Poland area, it is no longer possible to talk about convergence as a phenomenon of common interests and benefits between creators/suppliers and users/recipients. On the contrary, the situation in Moravia indicates the non-complementarity of the two developmental lines of flint industries and thus the arrhythmia of this kind of economic and social relationship between their representatives. The insufficiency of the common cultural content needed to establish any social connection was probably influenced by the distance factor. Hence, long-distance luxury imports in the form of completed bifacial forms reached the Moravian settlements (which were hundreds of kilometres away from the deposits of high-quality raw materials and, consequently, also from the production centres) on a drastically smaller scale than the Lesser Poland settlements. Therefore, when interpreting flint materials from Moravia, it is similar to considering the applicability of not a convergent, but a divergent mechanism – where the commercial and interpersonal aspirations of the holders of both traditions were unrealisable due to geographical barriers, perhaps these traditions excluded each other, or at least did not complement each other *expressis verbis*.

Analysing further the issue of the transition from the Stone Age to the Early Bronze Age – keeping in mind the issues of the management of flint raw materials at the time and the social implications of this phenomenon – it is worth emphasising that a certain interesting intellectual construct has recently been obtained by borrowing from twentieth-century thinkers, including phenomenologists (Mugaj 2017; cf. Wolski 2019a, 211–212). Specific philosophical concepts have been connoted with the archaeological problem of our interest, but first, a principled division of the prehistoric axis into two developmental stages has been made: (1) the "traditional" lithic industries of the Upper Palaeolithic, Mesolithic, and Neolithic early agricultural groups, and (2) the "terminal" lithic industries of the Late Neolithic and Bronze Age. Adopting this model made it possible, with reference to the second of the identified phases, to outline an antagonistic concept differentiating two key concepts: "work" and "creation". Apart from philosophical works, Jakub Mugaj utilised publications on terminal lithic industries in order to present his perception of the dichotomy of turn-of-the-century from a humanist perspective. After first proposing the initial ontological and epistemological issues concerning the problem of technology and quoting the existentialist distinctions made by H. Arendt with regard to the essence of "work" and "creation" (cf. subsection 2.2), the author tried to establish a logical bridge between purely theoretical considerations and archaeological empirical research. Among the many dualities outlined in the article, it is worth recalling a few of the most significant: (1) "work" likened to the behaviour of an animal – *animal laborans* – driven by the necessity of survival versus "creation" as the domain of *homo faber*, who creatively transforms nature into an objectified, beyond purely pragmatic dimension; (2) the impermanence of the results of the effort invested in the activity of "work"; its effects are immediately digested in the life process versus "creation" as a form of activity resulting in the bringing to life of an object ("objectifying the world"); (3) the non-specialised, repetitive "work" called "the work of our bodies" versus "creation" understood as "the work of our hands", being the product of specialists; (4) the "public" sphere of technological behaviour versus the "private" sphere limited to a narrow group (Mugaj 2017, 148–149).

The relationality of the highlighted Arendtian dual concepts to the phenomenon of the formal-utilitarian dichotomy of terminal lithic industries, as characterised in the previous sections of the article (cf. subsections 1.1 and 1.2), seems to be unquestionable. The duality can be seen as the result of the socio-economic differentiation of 'work' and 'creation' – i.e. the specific determinants inherent in the technological system. Quickly made atypical tools, pauperised, characteristic of domestic, routinised everyday flint working, were to constitute (in the terms of the cited H. Arendt: 2010) "work", and therefore played a prime role in the daily maintenance of existence. The functioning of exclusive, high-quality tools provided for special purposes, on the other hand, corresponds to the definition of "creation", which was the responsibility of the few (cf. Mugaj 2017, 151–152).

Beyond the described formal and functional aspects, as well as the relevant philosophical constructs, the specialised line of the lithic dichotomy also seemed to be reflected in other social processes of the time of the turn. These, according to the author's view of the paper, are related to the phenomenon of transgenerational transmission of the idea of "creation" culturally symptomatic goods. The key mechanism stimulating cultural transmission was supposed to be the unavoidable, necessary historical conformism (cf. Sherif 1936; Asch 1955), functioning through the role of socially significant individuals, guarantee-

ing continuity and constancy in the intergenerational process of transferring highly specialised conscious as well as unconscious knowledge (Pelegrin 1990; Wolski 2014). As indicated above, it is very likely that their transmission from generation to generation took place through narrow channels within a hermetically closed group, possibly linked by family ties (cf. Fouere 1994, 505). Another factor of elitism may have been the specific rituals accompanying the "creation" process (for example, Mesopotamian cuneiform plates dated to the 7th century BC are supposed to demonstrate a sequence of various rituals – including offerings in honour of the ancient master-craftsmen – the performance of which guaranteed the obtaining of the intended end result, in this particular case items made of glass: Oppenheim *et al.* (eds.) 1970, 52 after Robinson *et al.* 2004, 139–140).

In conclusion, it is worth stating that, the multi-aspect dichotomy of the characteristics of lithic artefacts – measuring from the turn of the Stone and Metal ages up until the end of the Late Bronze Age – seems to be the result of an economic and social transformation rather than a purely technical one. A specific division of the communities of the prehistoric episode in question in terms of accessibility to exclusive knowledge and skills (metals, faïence or lithics) would represent a kind of controversy in relation to the concept, strongly established in the literature, of the profound egalitarianism of some Early Bronze Age populations – existing in a highly unified world, broken into local, conservative groups with a highly anti-innovation orientation (Kadrow 1995, 116–123; 2001; 167–178). From the perspective of the argumentation presented in this section of the article, the view of the kinship relations of craft groups involved in the "creation" of flint special tools would be equally valid.

Discussion and conclusions

The dichotomous nature of technology and society at the turn of the Neolithic and Bronze Ages as a philosophical topic of consideration appears to be, on the one hand, a difficult task (it is still *terra incognita* in the field of archaeology) and, on the other hand, extremely inspiring. For the author, it is clear that in order to comprehend the multidimensionality of the epochal transformation processes – in Central and Eastern Europe, but not only there – it is necessary to cover the whole issue with extensive humanistic interpretation formulated not only in connection to archaeological analysis of features of the artefacts. The result of such a directed attempt is the content of this paper.

The concept of a flint tool and the whole system of raw material management, as this article has sought to show, has a completely different specificity at the turn of the epoch than in previous prehistoric periods. The qualitative transformation of flint working processes in the period in question set a new historical course towards the area associated with metal working (the equivalents of bronze artefacts – daggers and sickles – refer directly to the specialised line of the dual tool reality, rather than to *ad hoc*, quickly obtained, atypical products of everyday use). Hence, for the fullest possible understanding of the complexity of inter-epoch transformations, the interpretation of terminal lithic industries as not only a technological but also a socio-economic phenomenon should, in the author's opinion, be unavoidably accompanied by dualistic optics.

Purely heuristically, an attempt could be made to extrapolate the phenomenon of dichotomy occurring in relation to flint technologies to other areas of expert manufacture: metal or perhaps faïence. Such an approach would supply the basis for considering the social system in the era of the transition from the Stone Age to the Metal Age, one of the manifestations of which is taken to be the processes of divergence included in the earlier parts of the article – resulting in the differentiation of human communities of the time into two classes: "working" and "creating". The return of pre-dualistic convergence, typical of the Neolithic and older prehistoric periods, would have been gradually evoked with the progressive unification of Bronze Age societies (with increasing prosperity and wealth), synchronously with the expiration of the dualistic phenomenon – i.e. when "creation" based on advanced technologies, not necessarily just lithic industries, became anew shared by the majority (cf. Mugaj 2017, 151–152).

Analysing lithic issues during the epochal turn in Central and Eastern Europe, both north and south of the Carpathian arc, references to the social system are discernible, with an indication of the so-called dualistic organisations operating within it (Lévi-Strauss 2021, 139–169). C. Lévi-Strauss, inspired by the Durkheimian construct of *homo duplex* (which presupposes the perception of man as a dual being: determined both biologically and socially), searched for fixed and unchanging features of human nature. In line with the concept of the collective unconscious, in connection with the formation of rules of social organisation, the cited thinker considered dualism to

be the law of the functioning of the human mind, undistorted by the process of awareness and subjectification. In a dichotomous view of the world, there was to be a structuring of traditional populations within the framework of culture as a whole, composed of ideal patterns formulated by the unconscious, which societies aim at (but in cultural practice never fully achieve) (cf. Herman 2013, 30).

Based on a cross-cultural study of traditional societies from around the world (Indonesia, Micronesia, New Guinea, Melanesia, Fiji, Samoa, Tahiti, Easter Island, the Americas, Africa and Australia: Herman 2013, 32–33), C. Lévi-Strauss undertook the effort to develop a universal theory of dualistic organisation, within which individuals define themselves in relation to the various manifestations of social life, creating a network of various binary oppositions: cooked versus raw food, marriage versus celibacy, the centre of the village versus its periphery, male versus female, sacred versus secular, etc. These antitheses – presuming a dichotomy between state and process, stability and change, identity and transformation, being and becoming, synchrony and diachrony – serve directly for the conscious or unconscious articulation of dualism by cultural participants (Lévi-Strauss 2021, 160). The dualism need not be absolute, expressing itself in all aspects of social life without exception. Its forms can be arbitrary and relate only fragmentarily to specific aspects of the functioning of a population. Referring back to the period of the turn of the Stone and Bronze Ages in Central and Eastern Europe, as highlighted in this article, dual elements are clearly discernible at the junction of technology, economy, and society.

Instead of a conclusion, the vision of the dichotomy understood as an economic and social trans-regional phenomenon, as well as an inter-technological one in line with the "spirit of the age", certainly still requires numerous confirmations and additions, and thus further studies and inquiries. Undertaking these, with the intention of obtaining sufficient empirical indications for putting forward a strong, non-intuitive, dichotomous synthetic interpretation, is viewed by the author of this paper as an interesting research postulate for the future.

The content of this article was previously published in Polish in the form of a mini-monograph by GlobeEdit (Wolski 2022). The text of the paper differs slightly from the previously published version – it has been shortened and further refined.

I dedicate this article to Dr. Hab. Jerzy Kopacz, who has strongly encouraged me to explore the issue of tool dichotomy for several years.

References

Agamben G. 1999. *The Man without Content*. Stanford: Stanford University Press.

Arendt H. 2010. *Kondycja ludzka*. Warszawa: Wydawnictwo Aletheia.

Asch S. 1955. Opinions and social pressure. *Scientific American* 193, 31–35.

Austin J. L. 1993. Jak działać słowami? In J. L. Austin (ed.), *Mówienie i poznawanie. Rozprawy i wykłady filozoficzne* (= *Biblioteka Współczesnych Filozofów*). Warszawa: Wydawnictwo Naukowe PWN, 550–708.

Bailly M. 2008. What does it mean to be Beaker? Domestic routines, lithic technology and cultural identification in Eastern France, Switzerland and Central Italy. A preliminary approach. In M. Baioni, M. Leonini, D. Lo Vetro, F. Martini, R. Poggiani Keller and L. Sarti (eds.), *Bell Beaker in everyday life. Proceedings of the 10th Meeting "Archeologie et Gobelets" (Florence–Siena–Villanuova sul Clisi, May 12–15, 2006)*. Firenze: Museo Fiorentino di Preistoria Paolo Graziosi, 281–290.

Balcer B. 1977. Osada kultury mierzanowickiej na stanowisku 1 w Mierzanowicach, woj. tarnobrzeskie. *Wiadomości Archeologiczne* 42, 175–212.

Barański J. 2008. Antropologia techniki. *Kultura Współczesna* 3, 22–42.

Bąbel J. T. 2013a. *Cmentarzyska społeczności kultury mierzanowickiej na Wyżynie Sandomierskiej. Część I. Obrządek pogrzebowy* (= *Collectio Archaeologica Ressoviensis* 24). Rzeszów: Instytut Archeologii Uniwersytetu Rzeszowskiego.

Bąbel J. T. 2013b. *Cmentarzyska społeczności kultury mierzanowickiej na Wyżynie Sandomierskiej. Część II. Źródła* (= *Collectio Archaeologica Ressoviensis* 24). Rzeszów: Instytut Archeologii Uniwersytetu Rzeszowskiego.

Brożek A. and Kasprzyk Z. 2007. O performatywach i generowaniu. *Filozofia Nauki* 15/2, 115–130.

Clarke D. L. 1973. Archaeology: the loss of innocence. *Antiquity* 47, 6–18.

Czopek S., Kadrow S. and Mitura P. 1993. Materiały z wielokulturowego stanowiska w Orliskach Sokolnickich, woj. Tarnobrzeg, *Materiały i Sprawozdania Rzeszowskiego Ośrodka Archeologicznego za lata 1991–1992*, 53–70.

Dzbyński 2008. *Rytuał i porozumienie. Racjonalne podstawy komunikacji i wymiany w pradziejach Europy Środkowej* (= *Collectio Archaeologica Ressoviensis* 8). Rzeszów: Fundacja Rzeszowskiego Ośrodka Archeologicznego.

Feyerabend P. K. 1996. *Przeciw metodzie*. Wrocław: Wydawnictwo Siedmioróg.

Fouere P. 1994. Les industries en silex entre Neolithique moyen et Campaniforme dans le Nord du Bassin aquitain; approches methodologiques, implications culturelles de l'economie des matieres premieres et du debitage. Bordeaux: manuscript of PhD thesis in the archive of the University of Bordeaux (https://www.academia.edu/22764984, access: 11.11.2023; https://www.academia.edu/22765080, access: 11.11.2023).

Furestier R. 2005. Les industries lithique campaniformes du sud-est de la France, 1–3. Aix-en-Provence: manuscript of PhD thesis in the archive of the University of Aix-Marseille (https://tel.archives-ouvertes.fr/tel-00084729/file/Volume_I_texte.pdf, access: 11.11.2023; https://docplayer.fr/49440096-Les-industries-lithiquescampaniformes-du-sud-est-de-la-france.html, access: 11.11.2023).

Furestier R. 2007. *Les industries lithiques campaniformes du sud-est de la France* (= *BAR International Series* 1684). Oxford: BAR Publishing.

Furestier R. 2008. Bell Beaker lithic industries in the French Midi. In M. Baioni, M. Leonini, D. Lo Vetro, F. Martini, R. Poggiani Keller and L. Sarti (eds.), *Bell Beaker in everyday life. Proceedings of the 10th Meeting "Archeologie et Gobelets" (Florence–Siena–Villanuova sul Clisi, May 12–15, 2006*). Firenze: Museo Fiorentino di Preistoria Paolo Graziosi, 291–299.

Gadamer H-G. 1993. *Prawda i metoda. Zarys hermeneutyki filozoficznej*. Kraków: Inter Esse.

van Gijn A. 2010a. *Flint in Focus. Lithic Biographies in the Neolithic and Bronze Age*. Leiden: Sidestone Press.

van Gijn A. 2010b. Not at all obsolete! The use of flint in the Bronze Age Netherlands. In B. V. Eriksen (ed.), *Lithic Technology in Metal Using Societies. Proceedings of a UISPP Workshop, Lisbon, September 2006. Moesgaard* (= *Jutland Archaeological Society Publications* 67). Højbjerg: Aarhus University Press, 45–60.

Grondin J. 2007. *Wprowadzenie do hermeneutyki filozoficznej* (= *Myśl Filozoficzna*). Kraków: Wydawnictwo WAM.

Habermas J. 1999. *Teoria działania komunikacyjnego*, 1: *Racjonalność działania a racjonalność społeczna* (= *Biblioteka Współczesnych Filozofów*). Warszawa: Wydawnictwo Naukowe PWN.

Habermas J. 2002. *Teoria działania komunikacyjnego*, 2: *Przyczynek do krytyki rozumu funkcjonalnego* (= *Biblioteka Współczesnych Filozofów*). Warszawa: Wydawnictwo Naukowe PWN.

Heidegger M. 2002. Pytanie o technikę. In M. Heidegger (ed.), *Technika i zwrot*. Kraków: Wydawnictwo Baran i Suszczyński.

Heidegger M. 2013. *Bycie i czas*. Warszawa: Wydawnictwo Naukowe PWN.

Herman A. 2013. Teoria i teren. Claude'a Levi-Straussa dualizm organizacji społecznej i perspektywy metodologiczne w badaniach antropologicznych. In E. Nowicka and M. Głowacka-Grajper (eds.), *Antropolog i jego magia. Współczesne inspiracje twórczością Claude'a Levi-Straussa*. Kraków: Nomos, 30–48.

Hetmański M. 2015. Proceduralno-kognitywny charakter ideału obiektywności. *Zagadnienia Naukoznawstwa* 51(2), 97–110.

Hildebrandt-Radke I., Dörfler W., Czebreszuk J. and Müller J. (eds.) 2011. *Anthropogenic Pressure in the Neolithic and Early Bronze on the Central European Lowlands* (= *Studia nad Pradziejami Europy Środkowej / Studien zur Archäologie in Ostmitteleuropa* 8). Poznań, Bonn: Bogucki Wydawnictwo Naukowe, Dr. Rudolf Habelt GmbH.

Hoły-Łuczaj M. 2013. Heideggerowski zwrot: jedność bycia i nieantropologiczna filozofia człowieka. *Acta Universitatis Lodziensis. Folia Philosophica* 26, 95–112.

Högberg A. 2009. *Lithics in the Scandinavian Late Bronze Age. Sociotechnical Change and Persistence*. Oxford: Archaeopress.

Högberg A. 2010. Two traditions and a hybrid? South Scandinavian Late Bronze Age flint. In B. V. Eriksen (ed.), *Lithic Technology in Metal Using Societies. Proceedings of a UISPP Workshop, Lisbon, September 2006. Moesgaard* (= *Jutland Archaeological Society Publications* 67). Hojbjerg: Aarhus University Press, 61–80.

Januszkiewicz M. 2018. Wobec strukturalizmu. *Konteksty Kultury* 15(2), 181–191.

Jaskowska B. 2008. O kulturze konwergencji słów kilka. *Biuletyn EBIB* 1, 1–7 (https://ruj.uj.edu.pl/xmlui/bitstream/handle/item/254600/jaskowska_o_kulturze_konwergencji_slow_kilka_2008.pdf?sequence=3&isAllowed=y, access: 11.11.2023).

Johnson M. 2013. *Teoria archeologii: wprowadzenie*. Kraków: Wydawnictwo Uniwersytetu Jagiellońskiego.

Kadrow S. 1995. *Gospodarka i społeczeństwo. Wczesny okres epoki brązu w Małopolsce*. Kraków: Instytut Archeologii i Etnologii Polskiej Akademii Nauk.

Kadrow S. 2001. *U progu nowej epoki. Gospodarka i społeczeństwo wczesnego okresu epoki brązu w Europie Środkowej*. Kraków: Instytut Archeologii i Etnologii Polskiej Akademii Nauk.

Kadrow S. 2017. The Danubian world and the dawn of the metal ages. In P. Włodarczak (ed.), *The past societes. Polish lands from the first evidence of human presence to the early middle ages*, 2: *5500–2000 BC*. Warszawa: Instytut Archeologii i Etnologii Polskiej Akademii Nauk. Oddział Kraków, 63–106.

Kadrow S. and Machnik J. 1997. *Kultura mierzanowicka. Chronologia, taksonomia, rozwój przestrzenny*. Kra-

ków: Instytut Archeologii i Etnologii Polskiej Akademii Nauk.

Kadrow S. and Müller J. (eds.) 2019. *Habitus? The Social Dimension of Technology and Transformation* (= *Scales and Transformation* 3). Leiden: Sidestone Press.

Karwat Z. 2012. Metoda podziału dychotomicznego i jej znaczenie w analizie prawnej i prawniczej, Lublin: manuscript of a bachelor thesis in the archive of the University of Maria Curie-Skłodowska in Lublin (https://www.academia.edu/25504486/Metoda_podzia%C5%82u_dychotomicznego, access: 11.11.2023).

Keeley L. H. 1980. *Experimental Determination of Stone Tool Uses. A Microwear Analysis*. Chicago: University of Chicago Press.

Kopacz J. 1976. Wstępna charakterystyka technologiczno-typologiczna wczesnobrązowego przemysłu krzemiennego z Iwanowic, woj. Kraków. *Archeologia Polski* 21, 85–107.

Kopacz J. 1987. Krzemieniarstwo kultury trzcinieckiej na przykładzie wybranych materiałów z Krakowa-Nowej Huty. In P. Poleska and J. Rydzewski (eds.), *Kultura trzciniecka w Polsce*. Kraków: Polskie Towarzystwo Archeologiczne i Numizmatyczne, 171–181.

Kopacz J. 2012. Koncepcja krzemieniarstwa schyłkowego na przykładzie eneolitu Moraw. *Przegląd Archeologiczny* 60, 25–47.

Kopacz J. and Valde-Nowak P. 1987. Episznurowy przykarpacki krąg kulturowy w świetle materiałów kamiennych. *Archeologia Polski* 31, 55–92.

Kopacz J. and Wolski D. 2019. Phenomenon of the Bell Beaker Diffusion – from the Mediterranean to Transdanubia. In J. Kopacz (ed.), *The End of the Stone Age on the Stránská skála Hill in Brno – Lithic Production or "Optimalization"?* (= *Collectio Archaeologica Ressoviensis* 41). Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego, 195–205.

Kopaliński W. 1994. *Słownik wyrazów obcych i zwrotów obcojęzycznych*. Warszawa: Wiedza Powszechna.

Korobkowa G. F. 1999. *Narzędzia w pradziejach. Podstawy badania funkcji metodą traseologiczną*. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika w Toruniu.

Krause M. 2019. What is Zeitgeist? Examining period-specific cultural patterns. *Poetics* 76, 1–10.

Krieger W. 2006. *Can There Be a Philosophy of Archaeology? Processual Archaeology and the Philosophy of Science*. Lanham: Lexington Books.

Lech J. 1983. Flint Work of the Early Farmers. Production Trends in Central European Chipping Industries from 4500–1200 BC. An outline. *Acta Archaeologica Carpathica* 22, 5–63.

Lévi-Strauss C. 2021. *Antropologia strukturalna*. Warszawa: Wydawnictwo Aletheia.

Libera J. 2001. *Krzemienne formy bifacjalne na terenach Polski i Zachodniej Ukrainy (od środkowego neolitu do wczesnej epoki żelaza)*. Lublin: Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej.

Mamzer H. 1998. Archeologia jako uobecnienie przeszłości. In W. Wrzosek (ed.), *Świat historii*. Poznań: Wydawnictwo Instytutu Historii Uniwersytetu im. Adama Mickiewicza w Poznaniu, 299–307.

Mamzer H. 2020. „Mowa obrończa" metodologii archeologów Uniwersytetu im. Adama Mickiewicza w Poznaniu. *Folia Praehistorica Posnaniensia* 25, 109–148.

Marzec A. 2018. „Jesteśmy połączonym z sobą światem" – Timothy Morton i widmo innej wspólnoty. *Ekokrytyka. Teksty Drugie* 2018(2), 88–101.

Masojć M. 2014. *Krzemieniarstwo stref rytualnych południowej Skandynawii*. Wrocław: Uniwersytet Wrocławski.

Masojć M. 2016. *Late Bronze Age Flintworking from Ritual Zones in Southern Scandinavia*. Oxford: Archaeopress Archaeology.

Maślanka T. 2004. Korzenie technicznego myślenia w filozofii Martina Heideggera. *Państwo i Społeczeństwo* 4, 169–178.

Mugaj J. 2017. Technologia krzemieniarska w perspektywie filozofii techniki. *Folia Praehistorica Posnaniensia* 22, 143–155.

Olalde I., Kristiansen K., Booth T., Rohland N., Mallick S., Szecsenyi-Nagy A., Mittnik A., Altena E., Lipson M., Lazaridis I., Harper T. K., Patterson N., Broomandkhoshbacht N., Yoan Diekmann Y., Faltyskova Z., Fernandes D., Ferry M., Harney E., Knijff P. de, Michel M., Oppenheimer J., Stewardson K., Barclay A., Alt K. W., Liesau C., Rios P., Blasco C., Miguel J. V., Menduina Garcia R., Aviles Fernandez A., Banffy E., Bernabo-Brea M., Billoin D., Bonsall C., Bonsall L., Allen T., Buster L., Carver S., Castells Navarro L., Craig O. E., Cook G. T., Cunliffe B., Denaire A., Egging Dinwiddy K., Dodwell N., Ernee M., Evans Ch., Kuchař M., Frances Farre J., Fowler Ch., Gazenbeek M., Garrido Pena R., Haber-Uriarte M., Haduch E., Hey G., Jowett N., Knowles T., Massy K., Pfrengle S., Lefranc Ph., Lemercier O., Arnaud Lefebvre A., Heras Martinez C., Galera Olmo V., Bastida Ramirez A., LombaMaurandi J., Majo T., McKinley J. I., McSweeney K., Mende, B.G.,Mod A., Kulcsar G., Kiss V., Czene A., Patay R., Endrődi A., Kohler K., Hajdu T., Szeniczey T., Dani J., Bernert Z., Hoole M., Cheronet O., Keating D., Veleminsky P., Dobeš M., Candilio F., Brown F., Flores Fernandez R., Herrero-Corral A.-M., Tusa, S.,Carnieri E., Lentini L., Valenti A., Waddington C., Delibes G., Guerra-Doce E., Neil B., Brittain M., Luke M., Mortimer R., Desideri J., Besse M., Brucken G., Furmanek M.,

Hałuszko A., Mackiewicz M., Rapiński A., Leach S., Soriano I., Lillios K. T., Cardoso J. L., Parker Pearson M., Włodarczak P., Price T. G., Prieto P., Rey P. J., Risch R., Rojo Guerra M. A., Schmitt A., Serralongue J, Silva A. M., Smrčka V., Vergnaud L., Zilhao J., Caramelli D., Higham T., Thomas M. G., Kennett D. J., Fokkens H., Heyd V., Sheridan A. Sjogren K-G., Stockhammer Ph. W., Krause J., Pinhasi R., Haak W., Barnes I., Laluеza-Fox C. and Reich D. 2018. The Beaker phenomenon and the genomic transformation of Northwest Europe. *Nature* 555, 190–196. DOI: 10.1038/nature25738

Olechnicki K. and Załęcki P. 1997. *Słownik socjologiczny*. Toruń: Graffiti BC.

Ollé A., Pawlik A., Longo L., Skakun N., Gibaja J. F. and Sala R. 2017. New contributions to the functional analysis of prehistoric tools. *Quaternary International* 427, 2–5.

Oppenheim A., Brill R. H., Barag D. and von Saldern A. (eds.). 1970. *Glass and glassmaking in ancient Mesopotamia*. Corning NY: The Corning Museum of Glass.

Pawleta M. 2009. (review) Aleksander Dzbyński. 2008. Rytuał i porozumienie. Racjonalne podstawy komunikacji i wymiany w pradziejach Europy Środkowej / Ritual and understanding. Rational bases of communication and exchange in prehistoric Central Europe (= Collectio Archaeologica Ressoviensis 8, Instytut Archeologii Uniwersytetu Rzeszowskiego). *Sprawozdania Archeologiczne* 61, 451–463.

Pawleta M. 2016. *Przeszłość we współczesności. Studium metodologiczne archeologicznie kreowanej przeszłości w przestrzeni społecznej*. Poznań: Wydawnictwo Naukowe Uniwersytetu im. Adama Mickiewicza w Poznaniu.

Pawlik A. 1995. *Die mikroskopische Analyse von Steingeräten. Experimente-Auswertungsmethoden-Artefaktanalysen*. Tübingen: Archaeologica Venatoria.

Pelegrin J. 1990. Prehistoric Lithic Technology: Some Aspects of research. *Archaeological Review from Cambridge* 9, 116–125.

Przybyła M., Szczepanek A. and Włodarczak P. (eds.) 2013. *Koszyce, stanowisko 3. Przemoc i rytuał u schyłku neolitu* (= *Ocalone Dziedzictwo Archeologiczne* 3). Pękowice, Kraków: Stowarzyszenie Archeologów Terenowych STATER, Wydawnictwo i Pracownia Archeologiczna Profil-Archeo.

Rączkowski W. 2009. Theory, empiricism and practice: archaeological discourses in a network of dependency and opposition. *Analecta Archaeologica Ressoviensia* 4, 7–34.

Rebes M. 2016. Filozoficzny protest Heideggera wobec współczesnej nauki i techniki. *Roczniki Kulturoznawcze* 7(1), 131–145.

Renfrew C. and Bahn P. 2002. *Archeologia. Teorie, metody, praktyka*. Warszawa: Wydawnictwo Prószyński i S-ka.

Robinson C., Baczyńska B. and Polańska M. 2004. Origins of Faience in Poland. *Sprawozdania Archeologiczne* 56, 79–154.

Rosiak M. 2011. *Dialektyka Hegla. Krytyczny komentarz do głównych tekstów metafizycznych*. Kraków: Universitas.

Ruciński B. J. 1971. Pewien strukturalizm: główne koncepcje Claude Levi-Straussa. *Studia Philosophiae Christianae* 7(2), 213–241.

Ryż B. 2013. *Koncepcja języka teoretycznoliterackiego strukturalistów polskich*. Wrocław: Wydawnictwo Fundacji Projekt Nauka.

Salmon M. H. 1982. *Philosophy and Archaeology*. New York: Academic Press.

Salmon M. H. 1992. Philosophical Models for Postprocessual Archaeology. In E. Embree (ed.), *Metaarchaeology. Reflections by Archaeologists and Philosophers*. Dordrecht: Kluwer Academic Publishers, 227–241.

Schild R., Królik H. and Mościbrodzka J. 1977. *Kopalnia krzemienia czekoladowego z przełomu neolitu i epoki brązu w Polanach Koloniach*. Wrocław: Zakład Narodowy im. Ossolińskich.

Semenov S. A. 1964. *Prehistoric Technology*. London: Cory, Adams and Mackay.

Sherif M. 1936. *The psychology of social norms*. New York: Harper & Brothers.

Szahaj A. 1993. Teksty na wolności (strukturalizm – poststrukturalizm – postmodernizm). *Kultura Współczesna* 2, 5–13.

Ślusarski Z. and Ślusarska-Polańska M. 1988. Badania stanowisk kultury strzyżowskiej w Raciborowicach Kolonii, woj. Chełm, w latach 1956, 1958 i 1959. *Sprawozdania Archeologiczne* 40, 167–196.

Tokarczyk R. 2012. Tworzenie prawa: pomiędzy kulturą prawa stanowionego i kulturą *common law.* In O. Nawrot, S. Sykuna and J. Zajadło (eds.), *Konwergencja czy dywergencja kultur i systemów prawnych?* Warszawa: Wydawnictwo C. H. Beck, 3–24.

Vaughan P. C. 1985. *Use-wear analysis of flaked stone tools*. Tucson: University of Arizona Press.

Vyshedskiy A. 2019. Language evolution to revolution. *Research Ideas and Outcomes* 5, 1–50.

Wesoły M. 2013. Zenon z Elei – doksografia i fragmenty. *Symbolae Philologorum Posnaniensium Graecae et Latinae* 23(2), 69–96.

Wiertlewska-Bielarz J. 2010. Specyfika pojęcia narzędzia w koncepcji Wittgensteina i Heideggera. *Słupskie Studia Filozoficzne* 9, 17–31.

Włodarczak P. (ed.) 2012. Opracowanie wyników badań wykopaliskowych. Targowisko, gm. Kłaj, woj. małopolskie, stanowisko 16 (AUT 145). Osada kultury mie-

rzanowickiej, 4. Kraków: manuscript in the archive of the Polish Academy of Sciences, Institute of Archaeology and Ethnology.

Wolski D. 2013. Early Bronze Age flint materials from Lesser Poland – their research problems and suggestions for their interpretation. *Sprawozdania Archeologiczne* 65, 145–193.

Wolski D. 2014. Technologie krzemieniarskie w świetle wybranych koncepcji psychologii społecznej – na przykładzie wczesnobrązowych narzędzi bifacjalnych z Małopolski. *Studia Humanistyczne AGH* 13(2), 153–160.

Wolski D. 2016. Źródła krzemienne z wczesnej epoki brązu w świetle analizy traseologicznej wybranych materiałów z obszaru Małopolski. Rzeszów: manuscript of PhD thesis in the archive of the University of Rzeszów.

Wolski D. 2019a. Multi-Aspect Dichotomy of Terminal Lithic Industries as a Marker of the Breakthrough Times. In J. Kopacz (ed.), *The End of the Stone Age on the Stránská skála Hill in Brno – Lithic Production or "Optimalization"?* (= *Collectio Archaeologica Ressoviensis* 41). Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego, 207–212.

Wolski D. 2019b. Use-Wear Analysis of Knapped Products from the Bell Beaker Structure on Stránská skála, Site IV. In J. Kopacz (ed.), *The End of the Stone Age on the Stránská skála Hill in Brno – Lithic Production or "Optimalization"?* (= *Collectio Archaeologica Ressoviensis* 41). Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego, 143–151.

Wolski D. 2020. *Krzemieniarstwo wczesnobrązowe w Małopolsce w świetle analizy wybranych źródeł. Perspektywa traseologiczna* (= *Collectio Archaeologica Ressoviensis* 42). Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego.

Wolski D. 2021. (review) S. Kadrow and J. Müller (eds.). Habitus? The Social Dimension of Technology and Transformation (= Scales and Transformation 3). Leiden 2019: Sidestone Press, 230 pages, 15 figures (bw), 65 figures (fc). *Analecta Archaeologica Ressoviensia* 16, 157–160.

Wolski D. 2022. *Narzędziowe dychotomizmy w dobie międzyepokowej tranzycji – refleksja filozoficzno-antropologiczna nad dualną technologią postneolitu*. Chisinau: GlobeEdit.

Wolski D., Trąbska J., Nowak A., Kurek D. and Czarnik M. 2018. Przyczynek do badań petroarcheologicznych krzemieni wieku kredowego ze wschodniej Małopolski i zachodniej Ukrainy – projekt „Litoteka". In M. Kuraś (ed.), *Archeologia Kotliny Sandomierskiej*, 2. Stalowa Wola: Muzeum Regionalne w Stalowej Woli, 104–135.

Wylie A. 1985. Between Philosophy and Archaeology. *American Antiquity* 50, 478–490.

Zamelska O. 2004. Anarchizm epistemologiczny a relatywizm. *Diametros* 1, 85–103.

https://encyklopedia.pwn.pl/szukaj/narz%C4%99dzie.html, access: 11.11.2023

https://www.newworldencyclopedia.org/entry/Golden_mean_(philosophy), access: 11.11.2023

https://plato.stanford.edu/entries/aristotle-ethics/#DoctMean, access: 11.11.2023

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

Dmytro Kiosak[1], Maciej Dębiec[2],
Anzhelika Kolesnychenko[3], Thomas Saile[4]

DOI: 10.15584/anarres.2023.18.2

[1] GPR "Human Past", UMR 5607 Ausonius Université Bordeaux Montaigne, U-Bordeaux, 8 Esp. des Antilles, 33600 Pessac, France; Department of History and Philosophy, Odesa I. I. Mechnikov National University, Dvorianska 2, 65083-Odesa, Ukraine; e-mail: dkiosak@ukr.net; ORCID: 0000-0002-3349-4989

[2] Institute of Archaeology, University of Rzeszów, Moniuszki 10, 35-015 Rzeszów, Poland; e-mail: debiecmaciej@gmail.com; ORCID: 0000-0002-8679-6278

[3] Institute of Archaeology, National Academy of Sciences of Ukraine, Department of Archaeology of Crimea and North-Western Black Sea region, Volodymyra Ivasiuka 12, Kyiv-04210, Ukraine; e-mail: a_kolesnychenko@iananu.org.ua; ORCID: 0000-0002-4598-5929

[4] Chair of Prehistory and Early History, University of Regensburg, Universitätsstraβe 31, 93053 Regensburg, Germany; e-mail: thomas.saile@ur.de; ORCID: 0000-0003-0834-5567

The Lithic Industry of the Kamyane-Zavallia Linearbandkeramik Site in Ukraine (2019 Campaign)

Abstract

Kiosak D., Dębiec M., Kolesnychenko A., Saile T. 2023. The Lithic Industry of the Kamyane-Zavallia Linearbandkeramik Site in Ukraine (2019 Campaign). *Analecta Archaeologica Ressoviensia* 18, 29–39

The paper treats a selection of lithic finds from Kamyane-Zavallia (Kam'âne-Zavallâ) – the easternmost Linearbandkeramik culture (LBK) site ever excavated. The lithic assemblage belongs to typical representatives of the early farming lithic industries in the region. It is characterized by prismatic cores for blade production, end-scrapers on fragmented blades and flakes, retouched blades, perforators, and a blade fragment with "sickle gloss". There is a single projectile point of unidentifiable morphology. The authors argue that there is no trace of "Mesolithic heritage" in the assemblage of Kamyane-Zavallia. The assemblage finds close parallels in the sites of Nicolaevca V, Dănceni I, and other LBK sites from Moldova and Romania.

Keywords: Linearbandkeramik, lithic technology, operative chain, trapezes, "Mesolithic heritage"

Received: 06.08.2023; **Revised:** 19.08.2023; **Accepted:** 22.08.2023

Introduction

The study of chipped stone assemblages has been and continues to be an important topic of research in Neolithic studies. Several archaeologists have also attempted to identify and study the different technological traditions in particular lithic industries, especially in the production of lithic tools in the Linearbandkeramik culture (LBK) in the area of its easternmost extent. However, the majority of these studies have focused on typological compositions of assemblages or on certain technological traits (Danilenko 1969; Păunescu 1970; Markevič 1974; Telegin 1985; Larina 1994; Țurcanu 2009). While in Western and Central Europe, the systematic dynamic reconstruction of operative chains became the de-facto standard in research on lithic assemblages of LBK (Allard 2004; Kozłowski and Nowak 2008; Mateiciucova 2008; Allard and Denis 2015), there is yet a long road to be traveled until this approach becomes the standard in Eastern Europe (Vornicu 2012; 2017; Šidlovs´kij and Slêsarêv 2015). Here, we propose a small step in this direction: the publication of a small but quite distinctive lithic assemblage coming from the largest excavation campaign (2019) at the easternmost-ever excavated settlement of LBK – Kamyane-Zavallia (Fig. 1).

The site and the method

Here we will attempt to exemplify the approach by reference to a sample of LBK lithics from the site of Kamyane-Zavallia (Odesa region, Ukraine) recov-

Fig. 1. A – location of Kamyane-Zavallia on the map of Europe (1); B – location of excavation trench 2012–2016 (R12-16) and that of 2019 (R2019, symbols out of scale) (source: Google Earth).

ered during the 2019 campaign. Kamyane-Zavallia is the easternmost LBK site ever excavated (Kiosak 2014; 2017). It was found in 2011 and researched on several occasions in 2012–2016 (Kiosak 2019a). In 2013, a geomagnetic survey of the site was carried out by a team from the University of Regensburg, Germany (Saile *et al.* 2016a; 2016b). The works of 2014–2016 were centered on a large, long pit (Kiosak and Radchenko 2021) over 20 meters long and covering some 120 sq. m. The excavations were carried out in a microstratigraphic way using small excavating tools. These works recovered several hundred lithic items published separately (Kiosak 2019a).

In 2019 a large excavation campaign was conducted by a joint international team (Fig. 2). The strategy of excavations and the methods employed were quite different: the larger area was opened, looking for the spatial organization of features. The opened area (480 sq. m.) contained remains of several Neolithic pits of various shapes (at least 7 features; Fig. 2: A). The excavations resulted in the recovery of 173 chipped stone objects which are studied in this paper. This sample is more than three times smaller than the collection of the 2012–2016 years. However, it is better comparable with the collections previously obtained from the numerous LBK sites because similar excavation methods were utilized, rather than the microstratigraphic "Paleolithic"

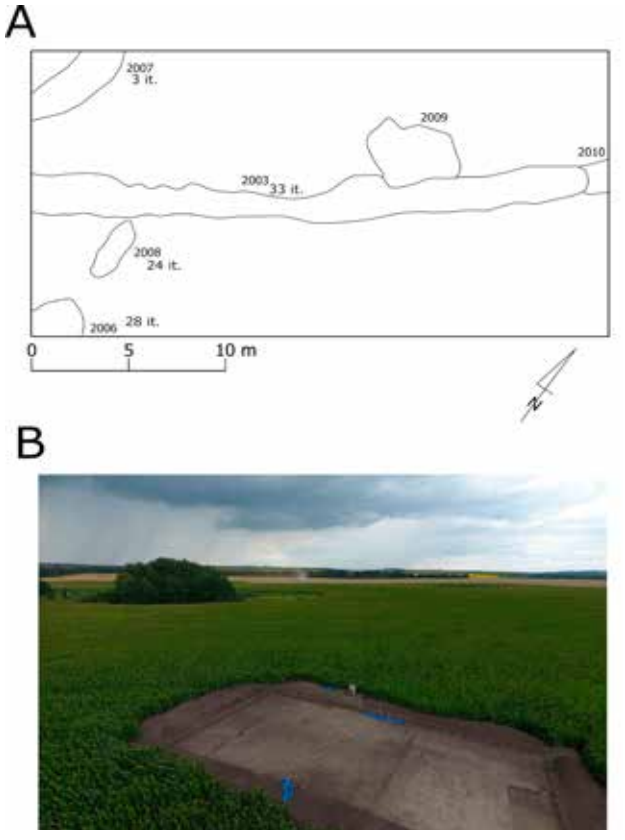


Fig. 2. A – plan of excavation unit of 2019 at Kamyane-Zavallia with an indication of the number of lithics retrieved (2001…2010 – indices of features); B – general photo of the excavation unit of 2019 (drawn by S. Radčenko; photo by S. Radčenko).

way of excavations used in 2012–2016. Thus, these two collections coming from Kamyane-Zavallia should be studied separately in order to account for possible discrepancies related to the different excavation methods.

The analysis relies on a "techno-typological characteristic", a work-flow developed by V. N. Stanko (Stanko 1982; Stanko *et al*. 1999; Stanko and Kiosak 2010) for the analysis of Mesolithic chipped stone assemblages. It is based on a consecutive analysis of the main components attributable to certain stages of a generalized operative chain of knapping: 1) primary treatment: decortication, core preparation, detachment of blades and flakes, maintenance; and 2) secondary treatment: retouch, trimming, or burin blow. The debitage has been subdivided into flakes and laminar pieces – and the latter into microblades (<0.7 cm wide), medium blades or bladelets (0.7–1.2 cm wide), large blades (1.2–2.0 cm wide), and very large blades (>2.0 cm wide). Intact specimens are few, making a metric classification based on their length impossible. The tools were described according to the regional typological list for the Neolithic (Telegín 1976), with additions and modifications.

The finds

The excavation of 2019 yielded 173 chipped stone items; 126 were collected as individual finds (and thus, have associated coordinates). Others can be only attributed to a certain square or to a certain feature.

The raw material is represented mainly by light-grey, transparent and semi-transparent flint of excellent quality. It has a smooth chalk cortex. A similar macroscopic group coming from the earlier excavations at Kamyane-Zavallia is identical to so-called Volhynian flints as defined by petrographic analysis (done by Helen Wehren) (Kiosak 2019a). Other groups are only represented by some items: alluvial flint from valleys of Southern Buh and Dniester, and non-transparent dark-gray flint of Ukrainian Crystalline Shield. Some artefacts are heavily patinated or burnt, so their raw material cannot be examined. According to the materials of the Kamyane-Zavallia collection, high-quality raw materials of the Volhynian type account for more than 75% of the studied sample. The vast majority of the analyzable objects have retained a primary flint crust, which indicates a connection with the primary deposits of this raw material. The closest of them are recorded in the north of the modern Khmelnytskyi region, more than 250 km northwest of the settlement (Petrougne 1995). Thus, despite settling down, early farmers from Kamyane-Zavallia were able to provide themselves with high-quality raw materials from afar, likely via an exchange network (Kiosak 2019a).

The collection comprises a pebble, three cores, 14 technological flakes, 63 flakes, 39 laminar and lamellar detachments, five chunks, and 41 retouched tools (Tab. 1).

The cores belong to different varieties: an exhausted core for bladelets (21 × 18 mm); a flank, mas-

Table 1. Summary of the collection.

N	Group of inventory	2019	%	2012–2016	%
1	Pebble	1	0.58	3	0.47
2	Cores	3	1.73	8	1.26
3	Core-like fragments (as defined by Stanko *et al*. 1999)	3	1.73	2	0.32
4	Technological flakes	14	8.09	56	8.85
	Incl. primary and half-corticated flakes	4	2.31	21	3.32
5	Flakes and chips	63	36.42	279	44.08
6	Blades and bladelets	39	22.54	97	15.32
7	Microblades	0	0.00	3	0.47
8	Chunks	5	2.89	15	2.37
9	Tools	41	23.70	170	26.86
	Total	173	100.00	633	100.00

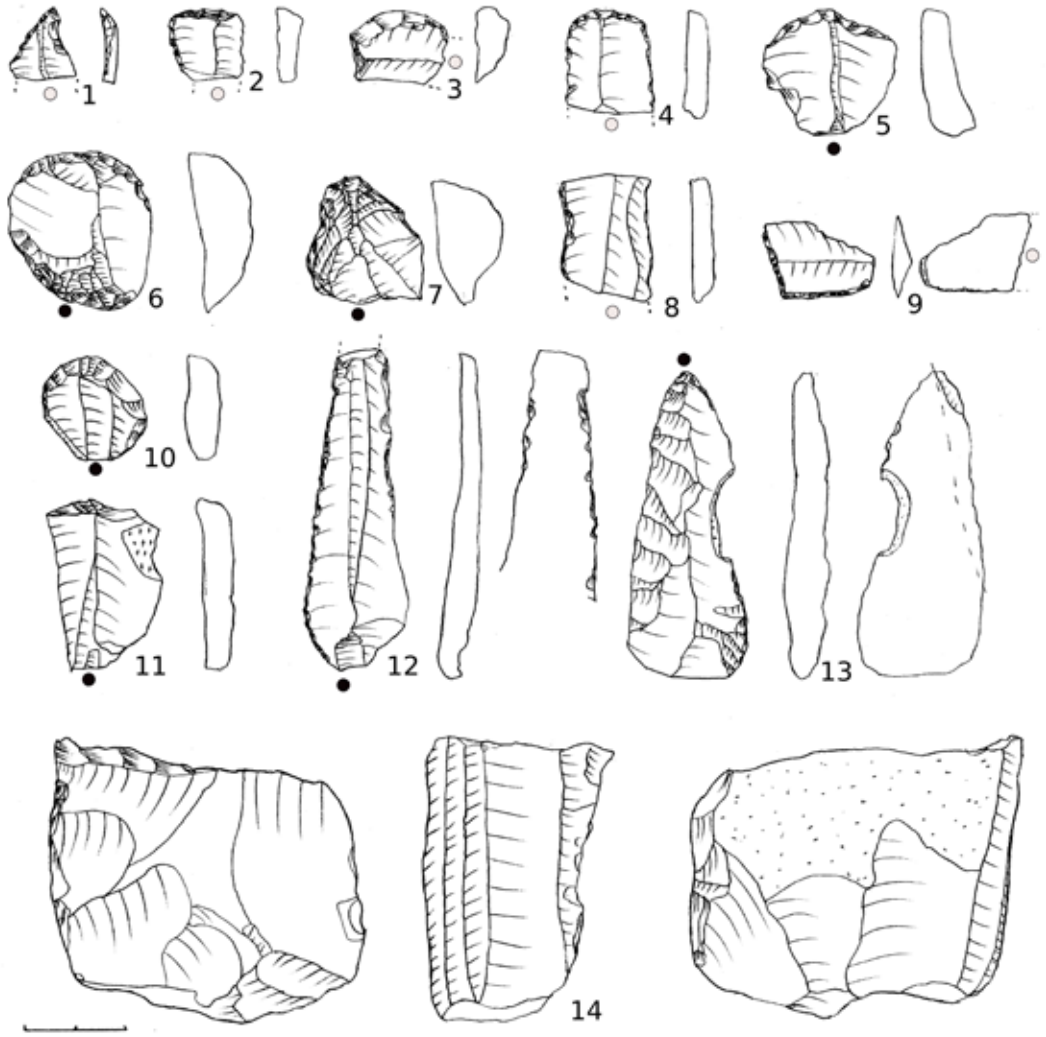


Fig. 3. Lithic finds of Kamyane-Zavallia, 2019 campaign (drawn by D. Kiosak). Dots indicate the point of impact: filled dots – preserved, empty dotes – not preserved.
1 – bladelet with oblique truncation; 2–7, 10–11 – end-scrapers; 9 – microlithic point; 8, 12–13 – retouched blades; 14 – core.

sive core for blades with a single striking platform (Fig. 3: 14); and a core for bladelets with two platforms with diverging working surfaces.

Corticated detachments include seven flakes and four blades. They reflect the on-site exploitation of objects still bearing primary cortexes, so transported from an outcrop in the shape of raw nodules/pebbles or pre-forms retaining large surfaces covered by cortex. The technical flakes comprise an edge flake, a reorientation flake, a crested flake, a flake of the working element of a hammerstone, a semi-crested blade (*lame demi-crête*), and four rejuvenation flakes. The latter include both real *tablettes* and narrow flakes knapped along an edge of core's platform. The set of technological pieces reflects on-site knapping of cores oriented both for blades and flake production, sometimes with a complex preparation of a working surface or a striking platform. However, their numbers and the number of cores are disproportionally small in comparison with the retouched tools in the collection.

Non-retouched flakes (Tab. 2) outnumber non-retouched blades (36%:22%). However, the latter were most often used as blanks for retouched tools. Thus, we can suppose that the blades were intended products of knapping.

The typical laminar detachment is an elongated flake with subparallel sides and a regular dorsal pattern, relatively thick and wide. It has wavy negatives of previous detachments on its dorsal surface and no traces of removal of an overhang between a butt and a dorsal surface. It is likely that most of the blades, in particular those which retained an overhang, were made by means of the punch technique (Pelegrin 2012).

Table 2. Flake sizes.

Size (cm)	No cortex	With cortex	Semi--corticated	Primary	Total
0–1	2	1	0	0	3
1–3	24	7	2	5	38
3–5	12	6	1	2	21
> 5	0	1	0	0	1
	38	15	3	7	63

Table. 3. Blade and bladelets: size and fragmentation.

Mm	0–7	7–12	12–20	> 20	Total
Intact	0	1	5	0	6
Proximal	0	5	13	1	19
Medial	0	3	2	1	6
Distal	0	4	4	0	8
Total	0	13	24	2	39

The retouched tools comprise 23% of the chipped stone items (Tab. 4). This is slightly less than in the collection of 2014–2016. In general, the share of retouched tools is close to 25% of the lithic assemblage. This percentage indicates that some share of the tools was not produced on-site but was imported from elsewhere and, thus, Kamyane-Zavallia is a *consument* settlement similar to LBK sites from the Dniester basin: Nicolaevca V and Dănceni I (Kiosak *et al.* 2021).

End-scrapers make up the most numerous group (slightly less than one in two tools, 17 items, 41.5%, Table 4). Mostly they are made on ends of blades or elongated flakes (Fig. 3: 2, 4–6, 8, 11). Some end-scrapers are microlithic and resemble typical *unguiform* end-scrapers (Fig. 3: 4). There is also a relatively thick end-scraper with a *caréné* working front (Fig. 3: 7). The typological variability is augmented by single specimens of a double end-scraper, an end-scraper on an end and a side, a subcircular end-scraper, and an end-scraper on a retouched blank. A particular side-scraper is retouched along the edge of the medial section of the blade (Fig. 3: 3).

Retouched blades make up the second largest group, comprising 10 items (24.4%). Half of these are fragments with irregular retouch. However, there are regularly retouched edges as well (Fig. 3: 8, 12, 13). A single blade bears a retouched notch. A retouched blade fragment has a distinctive gloss and thus can be provisionally attributed to so-called "sickle inserts".

Table 4. Tool types.

№	Type	N	%
1	Retouched blades	10	24.4
	– with regular retouch	5	12.2
	– with irregular retouch	5	12.2
3	Retouched flakes	2	4.9
	– truncated	0	0.0
4	Notched flakes	0	0.0
5	End-scrapers	17	41.5
	On flakes	12	29.3
	– on an end	8	19.5
	– on a side	1	2.4
	– subcircular	1	2.4
	– double	1	2.4
	– on an end and a side	1	2.4
	On blades	5	12.2
	– on an end	4	9.8
	– on a side	1	2.4
6	Side-scraper on a blade	1	2.4
7	Truncated blades	3	7.3
	– obliquely	2	4.9
	– straight	1	2.4
8	Notched blades	1	2.4
9	Blade with gloss (sickle insert)	1	2.4
10	Retouched chunk	1	2.4
11	Perforators	2	4.9
	On flakes	1	2.4
	On blades	1	2.4
13	Projectile ("rhomboid") point	1	2.4
14	*Pièce esquillée*	1	2.4
15	Hammerstone	1	2.4
16	Total	41	100.0

The excavation of 2019 has not yielded a single geometric microlith, which were systematically recovered in 2014–2016 (Kiosak 2019a). However, there is an item in the 2019 collection which could be a projectile point. It is a medial fragment of a regular blade with an oblique truncation and a retouched side (Fig. 3: 9). The other end of the fragment was removed by "burin-like" detachment, likely a macro-impact. This item was conventionally classified as a rhomboid point, although it is quite far from the classic rhomboid points of the Early Trypillia (Šidlovs´kij and Slêsarêv 2015).

Other formal tools are two perforators on blades. A retouched chunk and a *pièce esquillée* complete the list of retouched tools.

The spatial distribution of the finds is uneven (Tab. 5; Fig. 2). Most of them were recorded outside the structures, in the cultural layer (conventionally designated as feature 2001). In fact, the long, narrow pit 2003 brought 33 flint finds. Another fully investigated, much smaller pit 2008 contained 24 objects, while partially investigated pit 2006 yielded 28 items. A further three items came from the partially investigated pit 2007. The structure of the finds from pits 2001, 2003, 2006 corresponds to the general structure of the 2019 collection. In the sample from pit 2008, the almost complete absence of retouched products is noteworthy (the only product is a retouched chunk, which is only a situational tool at best). However, the small size of the sample and the pit itself rather suggests that it reflects a specific episode of flint knapping and handling rather than any specific economic characteristics of feature 2008.

Discussion

Comparison of collections of 2012–2016 and 2019

Structurally, the collection of 2019 represents all the main technical and typological groups (Fig. 4), suggesting that the knapping was carried out directly on site, although no distinct flint knapping sites were identified during the excavations. On the other hand, there are some important discrepancies when it is compared with the collection from excavations of 2012–2016. The density of finds varies greatly: 4.8 lithic finds per sq. m during the earlier works and 0.36 lithic find per sq. m in 2019. This dissimilarity probably arose from different strategies of excavations: in 2019 an attempt to open a wide area was made, resulting in excavations of a space between structures with a low density of finds in general. Meanwhile, in 2012–2016 works were concentrated on the large "long pit" (pit 1), which alone yielded 418 flints, 2928 bones, and 1395 pottery fragments, measured and inserted into the database as individual finds. Different strategies of excavations also resulted in somewhat different typological composition: some categories of microlithic tools like trapezes or microblades were found in small series in 2012–2016 and are not represented in the collection of 2019. On the other hand, meticulous microstratigraphic excavations applied in 2012–2016 are rarely used in Neolithic studies in the region and, thus, the collection of 2019 is more comparable to other lithic assemblages recorded on the sites of the region.

Table 5. Distribution of lithic finds by the objects of the excavation pit-2019

N	Group of inventory	Total	N2001	N2003	N2006	N2007	N2008
1	Pebble	1	1				
2	Cores	3	2	1			
3	Core-like fragments	3	2				
4	Technological flakes	14	12	3	1		5
	Incl. primary and half-corticated flakes	4	7	1	1		2
5	Flakes and chips	63	18	14	9	2	8
6	Blades and bladelets	39	14	7	6		10
8	Chunks	5	4	0	2		0
9	Tools	40	21	8	9	1	1
10	Hammerstone	1			1		
	Total	173	74	33	28	3	24

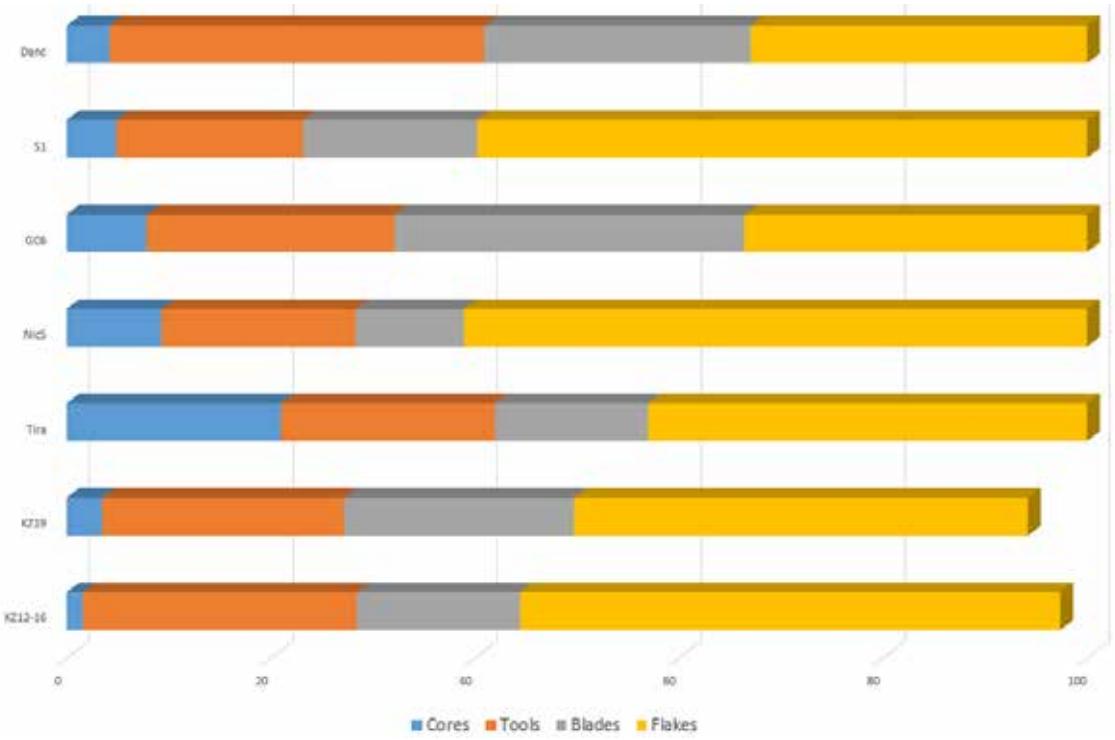


Fig. 4. Comparison of main techno-typological groups of both Kamyane-Zavallia collections and lithic assemblages from the sites of the region.
GC6 – Gura Camencii 6; Danc – Dănceni 1; Nic5 – Nicolaevca V; S1 – Sîngerei I; KZ – Kamyane-Zavallia (2012–2016 and 2019 – years of excavations respectively), Tira – Târa 1.

Comparison with other LBK sites in the region

The lithic collection recovered in 2019 generally corresponds to the structure of the flint complex from previous years of work and as well to the ideas about the flint industry of the *Notenkopf* phase of the LBK east of the Carpathians (Gaskevič 2003). In order to be understood, it should be compared with other well-published lithic collections of the LBK.

The typological structure of the LBK is characterized by the predominance of end-scrapers and knife-like blades with various types of retouch (Kaczanowska 1980). In Kamyane-Zavallia almost half of all tools are end-scrapers, and the second largest group of products is that of retouched blades.

D. L. Gaskevič distinguishes two variants of the flint industry of the LBK of Ukraine and Moldova. One of them is associated with the Middle Dniester region, which lies in only some 125 km from Kamyane-Zavallia. This aspect of lithic industry is distinguished by the presence of subconical nuclei, scalene trapezes and parallelograms, and some subcircular end-scrapers on flakes. The "sickle inserts" are represented by unretouched blade fragments. The peculiarities of the variants are explained by the influence of other Neolithic cultures of the region (Gaskevič 2003, 6). O. V. Larina describes a very similar flint inventory of the sites of the Republic of Moldova (Larina 1994, 46–50). The large collection of Dănceni I contains a regular conical nucleus and two asymmetrical trapezoids bearing ventral retouching. The LBK materials from the Romanian Carpathian region are described by A. Păunescu on the example of the settlements of Glăvăneştii Vechi and Traian Dealul Fântânilor. He notes the presence of pencil-shaped nuclei at Glăvăneştii Vechi. Geometric microliths are represented by parallelograms. Among the products with retouch, end-scrapers on flakes and blades prevail (Păunescu 1970, 38–40). S. Ţurcanu considers the peculiarities of the LBK inventory to be a homogeneous structure with a predominance of end-scrapers and retouched blades, an almost complete absence of burins, the presence of geometric microliths, sometimes (Traian Dealul Fântânilor) in a significant proportion. More than 60% of the tools are microlithic and only 2% are macrolithic (Ţurcanu 2009). Romanian researchers tend to point out archaism (S. Ţurcanu), and Tardenoisian vestiges (A. Păunescu) in the LBK industry of the region. O. V. Larina came to similar conclusions (Larina 1994). Ukrainian scholars have recently suggested that the LBK in western Ukraine was based on a local Mesolithic substratum (Man´ko and Telíženko 2016; Telizhenko and Silaiev 2022).

Kamyane-Zavallia has brought some sub-conical cores, geometric microliths (trapezes) and its end-scrapers sometimes are circular and sub-circular (Kiosak 2019a). Thus, Kamyane-Zavallia is closer to the Dniester variant by typology of lithic assemblage (Kiosak 2017), but we are inclined to approach the issue of the interpretation of its peculiarities as evidence of "Mesolithic heritage" cautiously.

In order to develop the interpretation, we need to place Kamyane-Zavallia into wider context and compare them to lithic collections from other sites of the region: Ţâra II, Nicolaevca V, Gura-Camencii VI, Sîngerei I, Dănceni I (Larina 1994; Kiosak 2017). The primary composition of complexes indicates important differences (Fig. 4, 5). In Dănceni I, retouched tools outnumber blades. In others, flakes are very numerous indicating on-site production. Ţâra II has the highest share of cores.

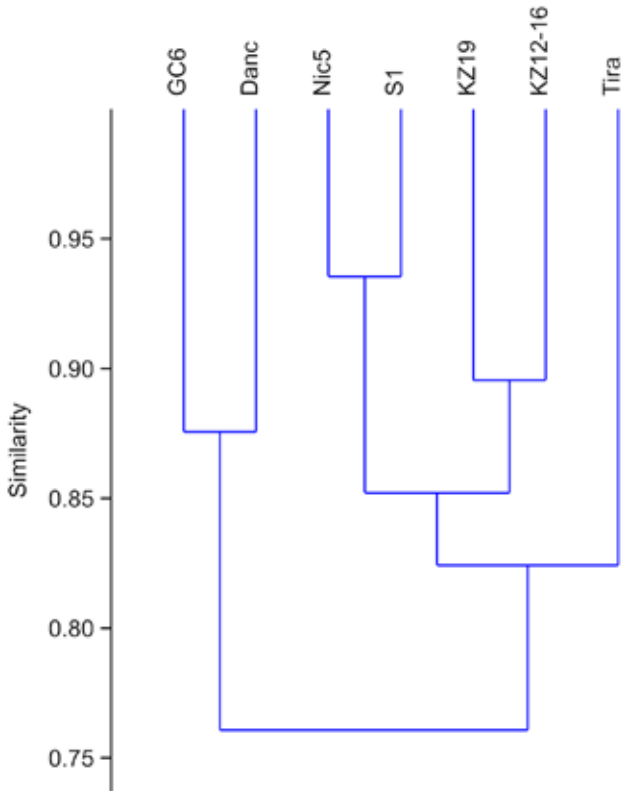


Fig. 5. Hierarchical cluster analysis of assemblage composition with an application of the Bray-Curtis similarity index (done in PAST4.13 software).
GC6 – Gura Camencii 6; Danc – Dănceni I; Nic5 – Nicolaevca V; S1 – Sîngerei I; KZ – Kamyane-Zavallia (2012–2016 and 2019 – years of excavations respectively), Tira – Ţâra 1.

Hierarchical cluster analysis of assemblage composition with an application of the Bray-Curtis similarity index (done in PAST4.13 software; Fig. 5) reveals important differences between sites. The first pair of sites are the sites with high indices of retouched tools, Dănceni I and Gura-Camencii VI. They are clearly "consumer" sites. Their assemblages do contain not enough knapping debris to account for the amount and types of retouched tools found on these sites. The group of "producer sites" with abundant evidence of on-site knapping is heterogeneous. They are sites with blade-oriented industries (like Kamyane-Zavallia) and flake-producing sites (like Nicolaevca V), while Ţâra II complex is, in fact, a selection of items resulting from the blade-producing facility, probably with an intention of their further re-utilization (Kiosak *et al.* 2021). Noteworthy, both collections of Kamyane-Zavallia are classified into the same pair. Thus, "producer sites" include sites with a predominance of flake knapping techniques reflected in the composition of the assemblages as well as in the set of technologies used (Nicolaevca V, Sîngerei I), as well as sites with clear evidence of blade production, but with a lack of finished products in the collection (Ţâra 2). The site of Kamyane-Zavallia stands apart as it shows both evidence of on-site production and developed laminar and lamellar technology (Kiosak 2019a).

The issue of "Mesolithic heritage"

The metric composition of the Kamyane-Zavallia laminar and lamellar detachments contrasts with that of the local Mesolithic industries. The latter are represented, first of all, by sites of the Kukrek cultural tradition (Gaskevič 2005). Microblades (up to 0.7 cm wide) are quite numerous and often predominate (Kiosak *et al.* 2022) in the latter. The industry of Kamyane-Zavallia, on the contrary, is characterised by the predominance of medium-wide blades (Tab. 3).

Several asymmetrical trapezes make the Kamyane-Zavallia complex expressive. These geometric microliths are made from small blanks (microblades) by means of a steep truncation of one end of the blank and retouching of the recess at the other end of the blank (Fig. 6: 71–75).

The preservation of Mesolithic culture remnants is traditionally assumed for Neolithic cultures of Moldova and Ukraine on the basis of finds of regularly faceted (including pencil-shaped) nuclei for blades and microblades and trapezoidal geometric microliths (Zalíznâk 1998; 2005; Telegin *et al.* 2003; Dergachev and Dolukhanov 2007). At the same time, both types of artefacts are widely known in almost every Neolithic culture, and in each of them they are considered evidence of Mesolithic influence (Păunescu 1970; Ţurcanu 2009). Both the pressure-flaking technique and geometrical microliths are known in the Middle East, the distant origin point of most of the Neolithic

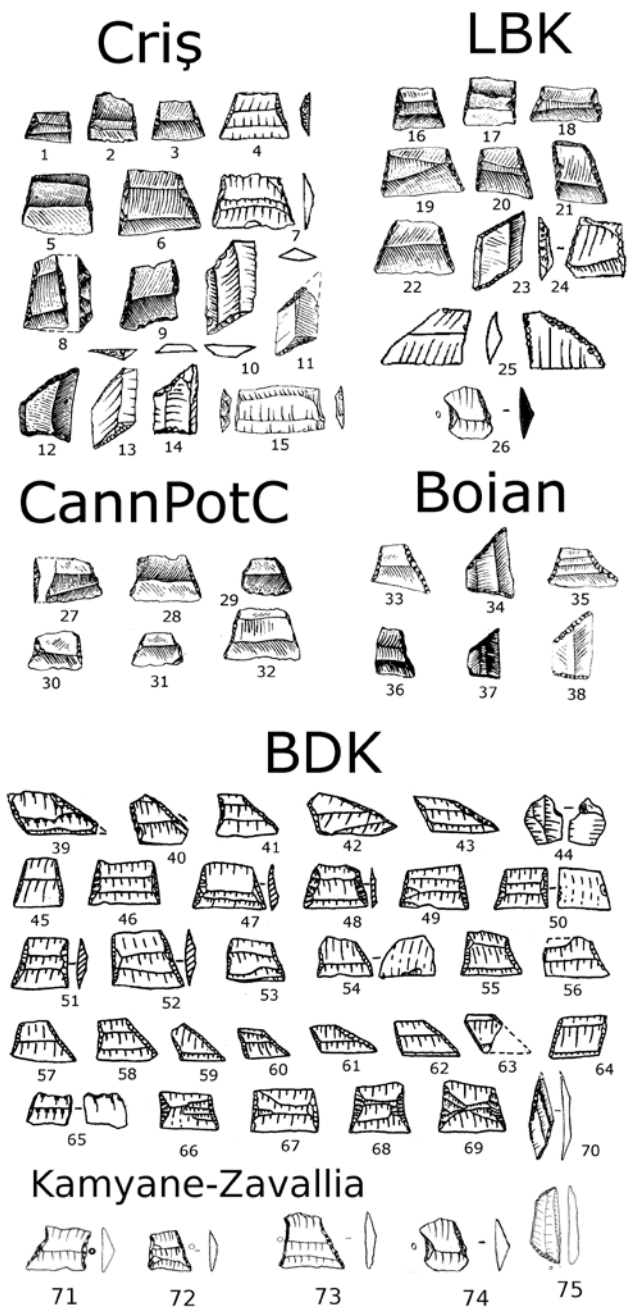


Fig. 6. Geometric microliths of Neolithic from Carpathian-Danubian region and trapezes from Kamyane-Zavallia (after Kiosak 2016 with modifications). Cris – Criș culture (1–15), including Sacarovca group (4, 7, 11, 13–15); LBK – LinearBandkeramik Culture (16–26); CannPotC – Cannellated Ceramic Culture (Dudești (27–29), Vinca-Tordoș (30–32)); Boian – Boian culture (33–38); BDK – Buh-Dniester culture (39–70).
1–3, 5–6, 8 – Cuina Turcului-Dubova; 4–7, 10–11, 13–15 – Sacarovca; 9 – Balș; 12 – Trestiana; 16–17 – Bereşti; 18–22 – Traian-Dialui-Fîntînilor; 23 – Glăvenești Vechi; 24 – Chișchereni V; 25 – Dănceni I, 26 – Kamyane-Zavallia; 27, 29 – Dudești; 28 – Dragceanu; 30–32 – Cleanov Fiera; 33–35, 37–38 – Cernica; 36 – Giulești-București; 39–44 – Gard 3 (44 – micro-burin); 45–69 – Gard 4; 70 – Soroca 5; 71–75 – Kamyane-Zavallia (according to: Păunescu 1970; Markevič 1974; Larina 1994; Tovkajlo 2005; Kiosak 2019a).

cultures of south-eastern Europe, and they could have been brought to the Balkans as part of the "Neolithic package" (Tringham 1973; Connolly 1999; Zaliznyak 2006; 2020; Binder 2008). Undoubtedly, they were a part of technological repertoire of the Criș-Starcevo, Dudești, Boian and LBK cultures (Fig. 6). At least in the Carpathian-Dniester region there is no reason to suppose a new contact with the Mesolithic people in any of the Neolithic cultures with trapezes. It is possible that the ability to produce geometric microliths came from the preceding Neolithic communities, without the direct need to find surviving hunter-gatherer groups to teach them how to manufacture the arrows of the archers of the early farming communities.

Thus, the analysis of the lithic inventory of Kamyane-Zavallia points instead to the Balkan and Central European directions of the LBK population's connections with the territory north of the modern Odesa region (Kiosak 2017). No clear traces of contacts with the local Mesolithic population have been found so far (Kiosak 2019a). Perhaps with time and an increase in the volume of the empirical data such contacts will be confirmed, but today we have to state that there is no empirical evidence (at least based on the composition of the flint industry) of a significant contribution of the local Mesolithic substrate to the formation of the LBK in the easternmost part of its range.

Conclusion

The easternmost LBK settlement ever excavated yielded a set of lithic tools that is very similar to lithic inventories of LBK sites situated much closer to its *Heimatland* – Central Europe. In particular, it finds close parallels in early farmers' settlements from Moldova and Romania. The lithic industry is based on non-local flint, in a neat contrast with local Mesolithic (Kukrek) and para-Neolithic cultures. The metrical standards of laminar and lamellar products differ clearly between local Mesolithic sites and the LBK, thus making likely pronounced technological differences between these cultural aspects. The scalene trapezes from Kamyane-Zavallia could be treated as evidence of the influence of hunter-gatherers. However, the presence of trapezes in the microlithic set cannot in itself speak of a "Mesolithic tradition". Every Neolithic culture in the region already had some geometric microliths in its lithic inventory (Fig. 6). The microlith-production technique is much more informative. Unfortunately, materials for its reconstruction are scarce in the communities of the easternmost LBK and its neighbors.

The LBK groups are a migratory phenomenon in south-western Ukraine (Saile 2020; *contra* Man´ko and Telíženko 2016), and there is little if any indication of local "Mesolithic heritage" in their lithic inventories so far (Kiosak 2019b). The early farming societies were able to supply their settlements with excellent-quality raw materials coming from a notable distance and, in times of need, performed a full-cycle production on the local varieties of chert, which is less suitable for knapping (Kiosak *et al*. 2021). Thus, a straightforward search for a "Mesolithic tradition" underestimates the ingenuity and flexibility of past technological systems.

Acknowledgements

The excavations of Kamyane-Zavallia were supported by a grant from the Deutsche Forschungsgemeinschaft (DFG project 394 525 779). The interpretation of data benefited from the scientific framework of the University of Bordeaux's IdEx "Investments for the Future" program / GPR "Human Past". The ideas on "Mesolithic Heritage" were coined in the discussion with dr. Solene Denis.

References

Allard P. 2004. *L'industrie lithique des populations rubanées du Nord-Est de la France et de la Belgique*. Rahden: Verlag Marie Leidorf.

Allard P. and Denis S. 2015. The Circulation of Flint Raw Materials in the Northern France and Belgium during the Early Neolithic. In T. Kerig and S. Shennan (eds.), *Connecting Networks: characterising contact by measuring lithic exchange in the European Neolithic*. Oxford: Archaeopress, 64–73.

Binder D. 2008. Technologie lithique et comportement social dans le PPN de Çayönü tepesi: un aperçu à travers l'analyse des matières premières. *Paléorient* 34(1), 5–21.

Connolly J. 1999. Technical strategies and technical change at Neolithic Catalhoyouk, Turkey. *Antiquity* 73(282), 791–800.

Danilenko V. N. 1969. *Neolit Ukrainy. Glavy drevnej istorii Ûgo-Vostočnoj Evropy*. Kiev: Naukova dumka.

Dergachev V. A. and Dolukhanov P. M. 2007. The Neolithisation of the north Pontic area and the Balkans in the context of the Black Sea floods. In V. Yanko-Hombach, A. S. Gilbert, N. Panin, and P. M. Dolukhanov (eds.), *The Black Sea Flood Question. Changes in Coastline, Climate and Human Settlement*. New York, Dordrecht, Heidelberg, London: Springer, 489–514.

Gaskevič D. L. 2003. Krem'ânij inventar neolitičnih kul´tur Ukraïni. Kyiv: manuscript of dissertation of candidate of historical sciences in the archive of the Institute of Archaeology National Academy of Sciences of Ukraine.

Gaskevič D. L. 2005. Krem'âní virobi kukreks´koï kul´turnoï tradicíï v ínventarí bugo-dnístrovs´kih pam'âtok Pobužžâ. *Arheologìâ* 3, 24–37.

Kaczanowska M. 1980. Steinindustrie der Kultur der Linienbandkeramik. In J. K. Kozłowski and J. Machnik (eds.), *Problemes de la Neolithisation dans certaines regions de l' Europe*. Wroclaw: Zakład Narodowy im. Ossolińskich, Wydawnictwo Polskiej Akademii Nauk, 79–96.

Kiosak D. 2014. Settlements and Indigenous Populations at the Easternmost Fringe of the Linear Pottery Culture. *Eurasia Antiqua* 20, 117–141.

Kiosak D. 2016. K interpretacii kremneobrabotki Prekuckten´ - Tripol´e A. *Tyragetia* 10(1), 147–163.

Kiosak D. 2017. Kamyane-Zavallia, the eastermost Linear Pottery culture settlement ever excavated. *Sprawozdania Archeologiczne* 69, 253–270.

Kiosak D. 2019a. *Lithic Industries of Early Farmers between Carpathians and Dnieper: Social Context and Organization of Production*. Odesa: Odesa I. I. Mechnikov National University.

Kiosak D. 2019b. The Mesolithic of the north Pontic Region and the transition to the Neolithic. *Eurasian Prehistory* 15(1–2), 279–292.

Kiosak D., Dębiec M., Saile T. and Ţerna S. 2021. Lithic industry of two Linearbandkeramik sites in Moldova (Nicolaevca V and Ţâra II). *Sprawozdania Archeologiczne* 73(1), 303–330. DOI: 10.23858/SA/73.2021.1.2605

Kiosak D., Kotova N., Radchenko S., de Capitani A., Gobet E., Makhortykh S., Nielsen E., Szidat S., Tinner W., Tuboltsev O. and Dzhos V. 2022. Chipped Stone Assemblage of the Layer B of the Kamyana Mohyla 1 Site (South-Eastern Ukraine) and the Issue of Kukrek in the North Meotic Steppe Region. *Open Archaeology* 8(1), 85–113. DOI: 10.1515/opar-2022-0226.

Kiosak D. and Radchenko S. 2021. 3-D pit: Linear pottery culture long pit reconstructed through point-cloud analysis. *Digital Applications in Archaeology and Cultural Heritage* 21, 1–6. DOI: 10.1016/j.daach.2021.e00188.

Kozłowski J. K. and Nowak M. 2008. Problems in reading Mesolithic–Neolithic relations in South-Eastern Europe. In J. K. Kozłowski and M. Nowak (eds.), *Mesolithic/Neolithic Interactions in the Balkans and in the Middle Danube Basin* (= *BAR International Series* 1726). Oxford: Archaeopress, 103–115.

Larina O. V. 1994. Neoliticul pe teritoriul Republicii Moldova. *Thraco-Dacica* 15, 41–66.

Man´ko V. O. and Telíženko S. 2016. Problemi pohodžennâ kul´turi líníjno-stríčkovoï keramíki na zahodí Ukraïni. In L. Vojtovič (ed.), *Naukovì studìï*, 9: *Datuvannâ – hronologìâ – perìodizacìâ*. Rìznì aspekti času v arheologìï. Vinniki, Žešiv, L´vìv: Vidavnictvo Aprìorì, 3–24.

Markevič V. I. 1974. *Bugo-Dnestrovskaâ kul´tura na territorii Moldavii*. Kišinev: Štiinca.

Mateiciucova I. 2008. *Talking stones: the chipped stone industry in Lower Austria and Moravia and the beginnings of the Neolithic in Central Europe (LBK), 5700–4900 BC*. Brno: Masarykova Univerzita.

Păunescu A. 1970. *Evoluția uneltelor și armelor de piatră cioplită descoperite pe teritoriul României*. București: Editura Academiei Republicii Socialiste România.

Pelegrin J. 2012. New Experimental Observations for the Characterization of Pressure Blade Production Techniques. In P. Desrosiers (ed.), *The emergence of pressure blade making*, 465–500. New York, Dordrecht, Heidelberg, London: Springer.

Petrougne V. F. 1995. Petrographical-lithological characteristics of stone materials from the late-Tripolye cemeteries of Sofievka-type. *Baltic-Pontic Studies* 3, 190–199.

Saile T. 2020. On the Bandkeramik to the east of the Vistula River: At the limits of the possible. *Quaternary international* 560–561, 208–227, DOI: 10.1016/j.quaint.2020.04.036.

Saile T., Dębiec M., Posselt M., Ţerna S. and Kiosak D. 2016a. Zur Bandkeramik zwischen Pruth und Südlichem Bug. *Praehistorische Zeitschrift* 91, 1–15. DOI: 10.1515/pz-2016-0001.

Saile T., Posselt M., Dębiec M., Kiosak D. and Tkachuk T. 2016b. Zwei Magnetometerprospektionen auf ukrainischen Fundstellen des Cucuteni-Tripolje-Komplexes an Dnjestr und südlichem Bug. *Archäologisches Korrespondenzblatt* 46, 465–477.

Šidlovs´kij P. and Slêsarêv E. 2015. Tehnologíční osoblivostí krem'ânogo kompleksu rann´otripíl´s´kogo poselennâ Bernašívka I. *Kam'âna doba Ukraïni* 16, 204–224.

Stanko V. N. 1982. *Mirnoe. Problema mezolita stepej Severnogo Pričernomor´â*. Kiev: Naukova dumka.

Stanko V. N., Dolukhanov P. M., Seferiades M., Smyntyna O. V., Pylypenko G. and Holoborodova E. 1999. Mesolithic of the southern Bessarabia. *Papers of Faculty of History* 8, 8–67.

Stanko V. N. and Kiosak D. 2010. The Late Mesolithic Settlement of South-Western Ukraine. *Atti della Società per la Preistoria e Protostoria della Regione Friuli-Venezia Giulia* 17, 27–100.

Telegín D. 1976. Pro nomenklaturnij spisok krem'ânih virobív dobi mezolítu-neolíu. *Arheologìâ* 19, 21–45.

Telegin D. 1985. Voprosy kul´turno-istoričeskogo členeniâ i sinhronizacii pamâtnikov neolita. In D. Telegin (ed.), *Arheologiâ Ukrainskoj SSR*, 1: *Pervobytnaâ arheologiâ*. Kiev: Naukova dumka, 110–118.

Telegin D. Y., Lillie M., Potekhina I. D. and Kovaliukh M. M. 2003. Settlement and economy in Neolithic Ukraine: a new chronology. *Antiquity* 77(297), 456–470. DOI: 10.1017/s0003598x00092528.

Telizhenko S. and Silaiev O. 2022. Lithic Assemblages of the Linear Pottery Culture Settlement Modrychi-I. *Arheologia*, 17–31. DOI: 10.15407/arheologia2022.03.017.

Tovkajlo M. 2005. *Neolít Stepovogo Pobužžâ* (= *Kam'âna doba Ukraïni* 6). Kiïv: Šlâh.

Tringham R. 1973. The Mesolithic of Southeastern Europe. In S. K. Kozłowski (ed.), *The Mesolithic in Europe*. Warsaw: University Press, 531–550.

Ţurcanu S. 2009. *Industria litică cioplită din Neoliticul Moldovei*. Iași: Editura Universității Alexandru Ioan Cuza.

Vornicu D. M. 2012. Industria litică cioplită a comunităților Precucuteni. Studiu de caz: așezările de la Isaiia și Târgu Frumos, Iași, unpublished PhD thesis in the archive of the Al. I. Cuza University in Iași.

Vornicu D. M. 2017. The chipped stone assemblage from the Early Chalcolithic settlement at Isaiia – Balta Popii. *Materiale și cercetări arheologice* 13, 191–212.

Zalíznâk L. L. 1998. *Peredístoríâ Ukraïni X–V tis. do n. e.* Kiïv: Bìblìoteka ukraïncâ.

Zalíznâk L. L. 2005. *Fínal´nij paleolít í mezolít kontinental´noï Ukraïni. Kul´turnij podíl ta períodizacía* (= *Kam'âna doba Ukraïni* 8). Kiïv: Šlâh.

Zaliznyak L. 2006. Grebeniky culture of Odessa region as a possible consequence of the Black Sea Flood. In V. Yanko-Hombach (ed.), *Extended Abstracts of 2nd Plenary Meeting and Field Trip of Project IGCP-521 "Black Sea-Mediterranean corridor during the last 30 ky: sea level change and human adaptation (2005–2009)"*. Odessa: Astroprint, 180–181.

Zaliznyak L. L. 2020. Landscape change, human–landscape interactions and societal developments in the Mesolithic period. In M. Lillie and I. D Potekhina (eds.), *Prehistoric Ukraine. From the First Hunters to the First Farmers*. Oxford: Oxbow Books, 87–110. DOI: 10.2307/j.ctv13nb9rs.8.

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

Marcin Wąs

DOI: 10.15584/anarres.2023.18.3

Institute of Archaeology, University of Gdańsk, Bielańska 5, 80-851 Gdańsk, Poland;
e-mail: marcin.was@ug.edu.pl; ORCID: 0000-0001-9140-2694

Neolithic Flintworking of the Samborzec-Opatów Group in Lesser Poland in the Light of Settlement Materials from Tonie 9 Site, Kraków Commune

Abstract

Wąs M. 2023. Neolithic Flintworking of the Samborzec-Opatów Group in Lesser Poland in the Light of Settlement Materials from Tonie 9 Site, Kraków Commune. *Analecta Archaeologica Ressoviensia* 18, 41–66

The article presents flint materials obtained from settlement site of Samborzec-Opatów group from the Tonie 9 site in Lesser Poland. The flintworking of this unit is still poorly recognized. In the literature, special attention has mainly been paid to ceramic materials, especially in studies on the genesis of this group and its relations with other taxonomic units of the Neolithic in Lesser Poland (especially with the Malice culture and later groups of the Lendziel). Therefore, it is worth introducing the specificity of Samborzec-Opatów flintworking, especially since the recently arrived inventory from the Tonie 9 site is quite numerous and relatively homogeneous. Therefore, the main goal is to present materials that can be used for further studies, e.g. those of a comparative nature.

Keywords: Samborzec-Opatów group, early Neolithic, flint technology, lithic analysis, SE Poland

Received: 02.09.2023; **Revised:** 20.09.2023; **Accepted:** 29.09.2023

1. Introduction

1.1. Location of the site

The Tonie 9 site is located in the Lesser Poland Voivodeship, in the Kraków commune, in the area of the former village of Tonie, and now in the district of Kraków–Prądnik Biały. In terms of physical and geographical area, the area of the site is located in the macro-region of the Kraków-Częstochowa Upland, which is part of the Silesian-Kraków Upland. The range of the site coincides with the area of the broadly understood Kraków Fortress, i.e. the nineteenth-century Austrian fortifications of Kraków. The area of the site is located between the Red Bridge and the Pękowice Ammunition Shelter (no. 8) from the south, and Fort 44a Pękowice from the north. Currently, the site area is partly arable field and wasteland.

1.2. Excavations and their results

The flint materials presented below from the Tonie 9 site (AZP 101-56, site no. 61) were discovered during rescue excavations (Kokolus and Maciaszek 2021). These studies were carried out in connection with the construction of the S52 Northern Bypass of Kraków expressway. Exploration works were carried out in 2019 and 2021 by *Archeo-Explorers Wiesław Koszkul* from Kraków on behalf of GDDKiA branch in Kraków.

As a result of archaeological work, an area of 261 acres was examined. Their result was the discovery of a vast area of the settlement, within which 397 features (pits, post-hole pits and ditches) were distinguished. The archaeological material found there, especially the dominant pottery fragments, was identified as relics of the settlement of the Samborzec-Opatów group (hereinafter referred to as S-O). When assessing the relics from a spatial perspective, attention is drawn to the pit complexes, including two located close to each other in the north-western part of the site. In the remaining area, the features were dispersed, which is particularly visible in the southern part of the site. During the excavation, 5772 fragments of ceramics, 2843 flints, 5 stone axes or their fragments, and 2 stone battle-axes were obtained.

It should be emphasized that no remains of other Neolithic cultures have been recorded at the site.

2. Lithic materials

2.1. Introductory remarks

As a result of excavations carried out at the Tonie 9 site, a collection of 2843 flint artefacts related to the relics of the Neolithic settlement of the Samborzec-Opatów group discovered at the site was obtained.

Due to the stratigraphic context in which individual products were discovered, the entire inventory was divided into two smaller sets at the analysis stage. The first of them contains flint artefacts found in the infills of features that are relics of the S-O settlement. The second distinguished group contains specimens found during the exploration of mechanical layers outside features whose relationship with permanent relics may potentially be smaller. Although other cultural elements have not been distinguished among other categories of sources – especially in the group of ceramics, such a procedure seems justified and beneficial from the perspective of the possibility of demonstrating the relatively culturally pure characteristics of S-O flintworking.

The above division of the collection of flint artefacts also translates into the way in which the materials are presented, and consequently also into the process of analysis and inference.

2.2. Dispersion of flint materials

The dispersion of the flint material shows that it is entirely bound to the relics of a large fragment of the S-O settlement. It was scattered over almost the entire area covered by exploration.

The vast majority of materials from Tonie 9 have been discovered in the infills of features. The remaining specimens from this site, classified as finds from exploration layers outside the objects, might have originally lain in the upper parts of the features. In general, the dispersion of flint artefacts corresponds to the spatial location of individual Neolithic features or their concentrations, mainly recorded in the central and northern parts of the site.

2.3. Raw-material structure

By far the dominant raw material in the inventory of Tonie 9 is the local Jurassic Cracovian flint (Tab. 1; Fig. 1). In general, 2541 specimens were made from this raw material, which is slightly more than 89% of the inventory. In the minority there are products made of flints, which from the perspective of the studied site can be described as exotic (extra local). The most numerous non-local raw material is chocolate flint. At the Tonie 9 site, 97 products made of it were found, which constitutes almost 3.4% of the raw material structure in the discussed inventory. The group of exotic raw materials is complemented by 8 striped flint specimens, which were identified in the inventory of Tonie 9, which constitutes 0.3% of the raw material structure on this site.

On the other hand, about 6.7% are lithics whose degree of thermal transformation which they have undergone makes it impossible to indicate the type of flint raw material. They were classified as burnt specimens (193 pcs.). With a high degree of probability, these are burnt specimens from Jurassic Cracovian flint, which further increases the frequency of this raw material in the entire structure.

In addition to artefacts made of flint, 2 obsidian artefacts were found at the Tonie 9 site. For two other specimens, it was not possible to identify the raw material precisely and were therefore classified as "other".

Table 1. Tonie 9. Raw material structure of the inventory.

RAW MATERIAL	N	%
Jurassic Cracovian Flint	2541	89.4
Chocolate Flint	97	3.4
Banded Flint	8	0.3
Burnt flint	193	6.7
Obsidian	2	0.1
Others	2	0.1
SUM	**2843**	

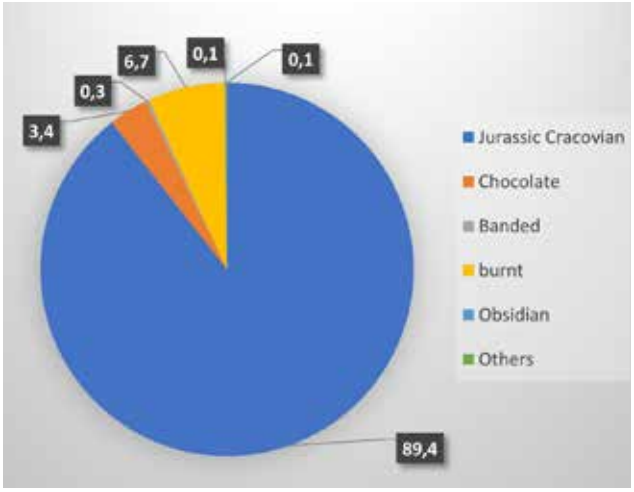


Fig. 1. Tonie 9. Raw material structure of the inventory.

2.4. Quantitative and qualitative structure

The characteristics of the flint materials from the Tonie 9 site will be presented in two parts. The first part contains the entire inventory, while the second part of the inventory is divided into two groups: 1) artefacts from features and 2) artefacts found in exploration layers outside of features. In both approaches, a convention showing the "technological" structure of the collections (as "debitage") and a separate characteristic of the tool group were used.

2.4.1. General structure of the inventory

The total amount of flint products discovered at the Tonie 9 site is 2843, of which 2515 come from features infills, and the remaining 328 specimens from exploration layers outside the objects. The general structure of the inventory consists of products classified under 12 categories of artefacts (Tab. 2; Fig. 2).

Table 2. Tonie 9. Qualitative and quantitative structure of the entire lithic inventory.

MATERIALS	n	%
Blade cores	11	0.4
Flake cores	139	4.9
Blade-flake cores	42	1.5
Blades	171	6.0
Flakes	1258	44.2
Core tablets	18	0.6
Rejuvenation flakes	15	0.5
Crested blades	16	0.6
Tools	936	32.9
Splintered pieces	10	0.4
Chunks	201	7.1
with negatives	*69*	
burnt	*96*	
natural	*36*	
Chips	26	0.9
SUM	**2843**	

The most numerous group of products in the inventory of Tonie 9 are flakes (1258 pcs.), which together with technologically related flake cores (139 pcs.) constitute almost half (about 49.1%) of the entire inventory. Much less numerous are products related to blade technology. Together, they occupy just over 8%. This group includes 171 blades (6%), 11 blade cores (0.4%), 16 crested blades (0.6%), 18 core tablets (0.6%) and 15 rejuvenation flakes (0.5%). This group can be extended by 42 blade-flake cores (1.5%). The inventory also includes a group of splintered exploitation, which consists of 10 splintered pieces, which in total accounts for 0.4% of the entire inventory. A separate part of the inventory (7.1%) are specimens defined as chunks. Most of them are burnt (96 pcs.), with negatives (69 pcs.) and natural untreated concretions and their fragments (36 pcs.). Microdebitage in the form of chips, i.e. flakes smaller than 5 mm, in the amount of 26 pieces (0.9%) was also identified.

In addition to the above-mentioned categories, a tool group was distinguished in the general structure of the inventory from the discussed site. It contains 936 tools, which constitute almost 33% of the total inventory (Tab. 3; Fig. 3). They were classified into 14 types.

Table 3. Tonie 9. Qualitative and quantitative structure of the tools group.

TOOLS	n	%
End-scrapers	63	6.7
Truncated blades	79	8.4
single	*54*	
doubled	*25*	
Perforators	3	0.3
Trapezes	2	0.2
Side-scrapers	7	0.7
Macro end-scrapers	3	0.3
Scrapers	4	0.4
Retouched blades	3	0.3
Micro-retouched blades	43	4.6
Blades with polish	12	1.3
Blades with use retouch	366	39.2
Retouched flakes	87	9.4
Flakes with use-retouch	230	24.6
Hammers/grinders	34	3.6
SUM	**936**	

Due to the degree of retouching, two subgroups of tools are distinguished. The first is typological (conventional) tools. The second group consists of utility tools, i.e. atypically retouched blades and flakes, as well as flakes and blades with traces of their use in the form of the so-called use-retouching and polishes ("sickle gloss").

In total, 164 retouched specimens were distinguished, among which two types prevail quantitatively: truncated blades (79 pcs.) and end-scrapers

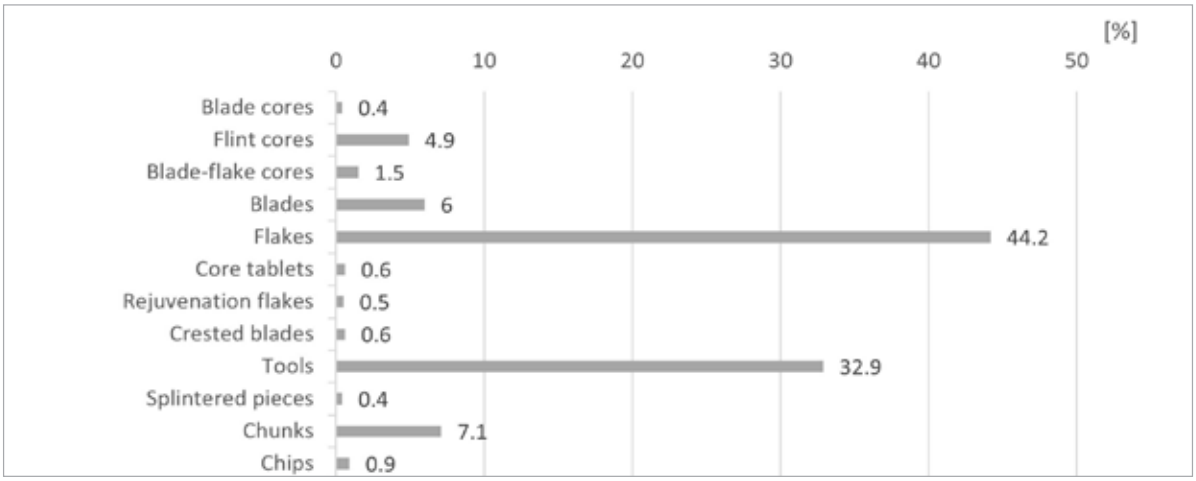


Fig. 2. Tonie 9. Frequency of product types in the entire inventory.

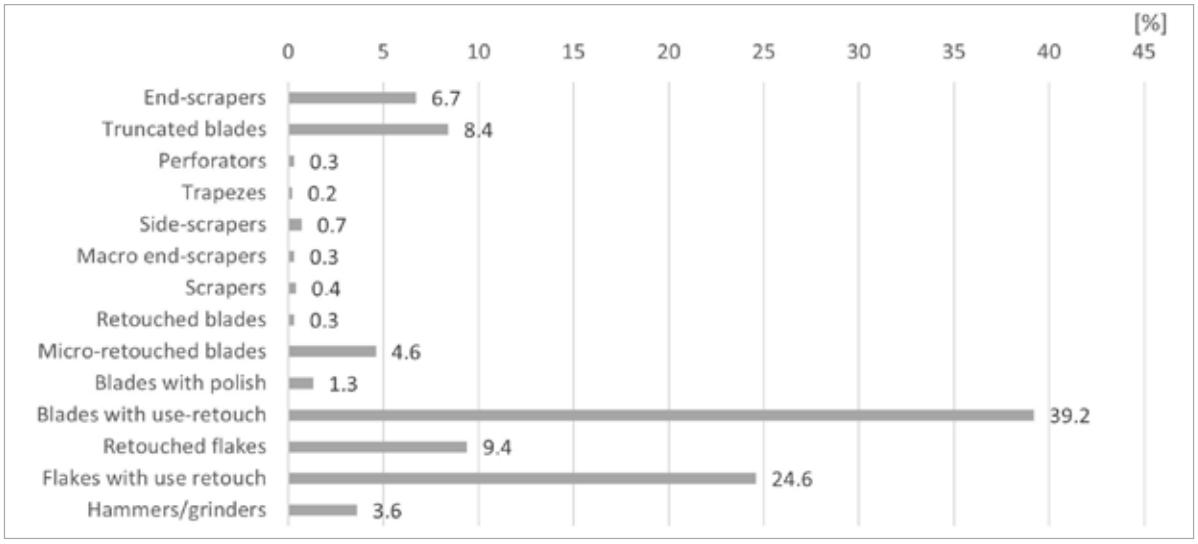


Fig. 3. Tonie 9. Frequency of tool types in the entire inventory.

(63 pcs.). Other categories of tools are represented by several ones: side-scrapers (7 pcs.), scrapers (4 pcs.), macro end-scrapers (3 pcs.), perforators (3 pcs.), retouched blades (3 pcs.) and trapezes (2 pcs.). The remaining more numerous part of the tool group are atypical specimens, of which 738 pieces were distinguished. The most numerous of them are blades with the so-called use-retouch (366 pcs.) and flakes with use-retouch (230 pcs.). The tool group also includes 34 flint hammers/grinders, which are mostly functionally transformed cores of various types.

2.4.2. Structure of collections from features and from the exploration layers outside features

Most of the flint inventory from Tonie 9 comes from the infills of 99 features. Detailed material specification is presented in table 4. In total, 2515 specimens were discovered inside them (Tab. 5; Fig. 4).

In this group, there is a far differentiation in the number of artefacts discovered in individual features. From that point of view, 4 groups can be distinguished. The most numerous of them is a group of 70 features, from which finds from 1 to 10 flints come. Features containing from 11 to 50 specimens are much less numerous – 18 such features have been distinguished. In 5 features, from 51 to 100 flint artefacts were discovered (including 2 containing over 90 pieces). A separate group consists of 6 features, from which the most numerous collections of flint artefacts originate from 113 to 363 products (ft. 47 – 113 pcs., ft. 232 – 203 pcs., ft. 274 – 300 pcs., ft. 278 – 264 pcs., ft. 279 – 363 pcs., ft. 293 – 207 pcs.) (Fig. 7: 2–6; 12: 1–10; 13: 1–4; 14: 1–8). In conclusion, the last of the distinguished groups contains 1450 flint artefacts, which is more than half of the entire inventory (51%).

Table 4. Tonie 9. Qualitative and quantitative structure of lithic from S-O features.

FEATURE	QUANTITY	BLADE CORES	FLAKE CORES	BLADE-FLAKE CORES	BLADES	FLAKES	CORE TABLETS	REJUVENATION FLAKES	CRESTED BLADES	END-SCRAPERS	TRUNCATED BLADES (SINGLE)	TRUNCATED BLADES (DOUBLED)	PERFORATORS	TRAPEZEZ	SIDE-SRAPERS	MACRO END-SCRAPERS	SCRAPERS	RETOUCHED BLADES	MICRO-RETOUCHED BLADES	BLADES WITH POLISH	BLADES WITH USE-RETOUCH	RETOUCHED FLAKES	FLAKES WITH UDE-RETOUCH	SPLINTERED PIECES	CHUNKS (WITH NEGATIVES)	CHUNKS (BURNT)	CHUNKS (NATURAL)	CHIPS	HAMMERS/GRINDERS
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
3	1					1																							
7	3		1							1															1				
8	19				3	7				1	1								1		2	1	2						1
9	1					1																							
10	1				1																								
13	1																		1										
18	3		2			1																							
20	32		3		3	14				1		1								1		1	5	1		2			
23	7				2	2				1											1								1
24	3					1									1						1								
25	1																						1						
28	2																												2
32	15		2		1	9													1		2								
33	7				1	3				1											2								
36	1			1																									
41	1																		1										
42	11		3			3															4		1						

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
43	6		1			2			1												1								1
45	5					4																	1						
46	5		1			2															1					1			
47	113	2	12	4	8	45		1	2	1		2							2		8	8	3	1	7	1		1	5
48	52		3	1		17					1	2							1		10	3	7			1	1		5
49	8		1			5																1			1				
50	3		1			2																							
52	63		7	1	9	19	1		1	1	1	2			1				1		7	1	2		2	3	2		2
53	2						1																1						
60	28	1	2	1		6	1		1	1	1	2					1		4		5		1		1				
61	2																				1		1						
62	30		2	1		17				1			1				1				2		2		2	1			
63	3				2	1																							
76	42			1	2	18				1		1									10		3			5			1
78	27	1	5		1	8				1									1		6		3						1
79	15		4			6															1		2		1	1			
89	4		1			1													1				1						
90	39				1	25		1		2	1								1		1		4		1	2			
91	6					4															1		1						
93	6				2						1	1									2								
94	1																						1						
109	23			1		14				1											4		2			1			
115	1					1																							
146	1																				1								
177	1					1																							
190	1					1																							
193	14		1	2	1	2				1						1			1		1		1		2	1			

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
207	81	1	4	2	6	39				1		3							2	1	7	2	4	1	2	2	2		2
218	6		1			2															1		1						1
222	45		2		3	14			1	3	1				1						8	2	4	1	2		2		1
223	6					2					1								1				2						
224	1					1																							
226	3					3																							
230	4					1			1												2								
232A	1																				1								
232	203		2		18	106	5			5	1	3							4	1	28	3	8	1	6	9	1	1	1
235	3				1	2																							
239	1					1																							
240	5					4																	1						
243	2		1			1																							
246	1									1																			
248	1																				1								
254	6		1			3															2								
256	7				1	5															1								
257	5					4													1										
259	4		2																			1	1						
260	18		1			6			1	1										1			3	2		2			1
260A	32				4	13				1	1	3									4		5	1					
260B	7				1	2				1											1		2						
261	14				2	3					1				1							1	1			1	1	3	
262	6					2																	2			2			
265	1	1																											
269	1																				1								
272	97		8		11	52	1	1	1	2		1									7		4		2	7			

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
274	300		6	5	15	126	1	2	3	8	2	9								3	43	20	27		12	15		1	2
276	3					3																							
278	264	2	5	7	21	118	1			9	1	3	1			1	1	1	3		34	9	26	1	3	3		13	1
279	363	2	12	6	17	195	1	5	1	3	2	4		1	1	1			5	1	49	5	27		7	9	4	3	2
289	1																										1		
291	2					1															1								
293	207		12	2	9	77	2	2	3	4	3	5			1			1	5	2	33	8	27		3	2	2	1	3
298	1													1															
300	5					1						1									1		1						1
301	3					2																	1						
304	6					5																			1				
308	1																					1							
311	3					2				1																			
312	4					1															1					2			
314	3																				3								
315	14		1			6							1								2	1	3						
318	1		1																										
319	1					1																							
320	2		2																										
321	96		2	3	4	46		1		4								1			16	4	9		2		2	2	
323	2					1						1																	
327	40		2	2		26															1	1	2	1		5			
329	7					6															1								
330	4					1						1									2								
332	2		1		1																								
335	5				1	2															1					1			
336	3					2															1								
338	1																									1			

The structure of products from features is dominated by products of flake technology. Their frequency is similar to the general structure of the entire inventory and amounts to almost 50%.

Also, the share of products related to blade exploitation is similar to the general structure presented earlier and amounts to 8.2%. Out of a total of 171 blades in the entire inventory, as many as 152 were found in the features. The other categories of the blade technology group from features are: 10 blade cores, 16 crested blades, 14 core tablets and 13 rejuvenation flakes. Thus, all the crested blades in the inventory come from features, as well as almost all blade cores (10 specimens out of 11 found in total).

A separate group are chunks – 6.2% of the total inventory. Their number, i.e. 156 pieces, accounts for over 75% of all chunks found at the site. Similar to the whole inventory are the quantitative proportions between individual varieties of chunks: burnt specimens predominate, slightly less negative ones, and there are clearly the least natural chunks.

From a comparative perspective, microdebitage stands out. Of the 26 small chips separated in the inventory, almost all (25 pieces) were separated from features in the collection.

In addition, 830 tools were separated from features in the collection, which constitutes 33% of the total collection from features and almost equals the percentage of this category of products in the general inventory structure (32.9%).

This group is quantitatively dominated by categories classified as atypical tools (Tab. 6; Fig. 5). This group contains 687 specimens, which is 78.6% of the tools from the features. The percentage of individual types is comparable in this set with the overall tool structure in the entire inventory.

Conventional tools are found in the group from features in the minority and account for just over 17% of all tools. As in the general structure, truncated blades (64 pcs.) and end-scrapers (59 pcs.) dominate, with the share of end-scrapers slightly higher (7.1%) compared to the general structure of tools, and the share of truncated blades slightly lower (7.7%). Other types of conventional tools are present in almost the same quantities as in the general structure from whole site. In particular, tools such as perforators, trapezes, macro end-scrapers and retouched blades only occurred in the features, while all of the hammers/grinders from the Tonie 9 site (34 pcs.) were found in the infills.

From the exploration layers outside the features come 328 products (Tab. 9; Fig. 6). As in the structure of the facilities, the dominant group are products related to flake technology. They account for 45.1% of this part of the inventory. It consists of 127 flakes and 21 flake cores.

Another technological group, i.e. blade component, contains only 28 products, i.e. almost 8.6%, i.e. a percentage similar to the general structure of flint inventory at this site. It consists of 19 blades, 1 blade core, 2 blade-flake cores, 4 core-tablets and 2 rejuvenation flakes.

Quantitatively, the percentage of chunks is distinguished in this inventory group. Compared to the

Fig. 4. Tonie 9. Frequency of product types in the lithic inventories from S-O features and exploration levels out of features.

group of materials from features, there are more than twice as many of them here and they constitute almost 14%, while in the infills of features they constituted slightly more than 6% of the collection. A different internal structure of this group is noticeable – the most numerous are natural specimens, which in the collection of features, and thus in the general structure, were the least numerous. This is perhaps due to the fact that these specimens are a natural component of the sediments that build the site soil.

Tools constitute 32.3% in the inventory (Tab. 10; Fig. 7). Out of a total of 106 tools, the majority are utility (atypical) tools, which account for about 80%. All forms of tools of this type are distinguished here, which also appeared in the collection of features. The percentage of individual tools is also similar, with a slight increase in the frequency of retouched chips (13.2%).

Conventional types of tools are four times less numerous (less than 20%) of the tool group "from the layer". Truncated blades (15 pcs.) clearly dominate quantitatively over end-scrapers (4 pcs.). In total, 9 categories of tools were distinguished here – 5 less than in the case of a collection of objects. In the exploration layer, such forms as perforators, trapezes, macro end-scrapers, retouched blades and hammers/grinders were not registered, which occurred in the collection from features.

To sum up, the flint inventory structure presented above from the Tonie 9 site, taking into account the division into a group of products from features infills and a group from exploration layers outside features, does not reflect any significant differences. Quantitative and qualitative structures contain almost the same number of similar categories of products. Only the tool structures of the two groups show slight differences. The proportions between the different types of products correspond to the overall quantitative difference between the entire groups of features and the layers outside of the features.

Table 5. Tonie 9. Qualitative and quantitative structure of the lithic inventories from S-O features and exploration levels out of features.

MATERIALS	IN FEATURES		OUT OF FEATURES	
	n	%	n	%
Blade cores	10	0.4	1	0.3
Flake cores	118	4.7	21	6.4
Blade-flake cores	40	1.6	2	0.6
Blades	152	6.0	19	5.9
Flakes	1131	44.9	127	38.7
Core tablets	14	0.6	4	1.2
Rejuvenation flakes	13	0.5	2	0.6
Crested blades	16	0.7	-	-
Tools	830	33.0	106	32.3
Splintered pieces	10	0.4	-	-
Chunks	156	6.2	45	13.7
with negatives	*58*		*11*	
burnt	*80*		*16*	
natural	*18*		*18*	
Chips	25	1.0	1	0.3
SUM	**2515**		**328**	

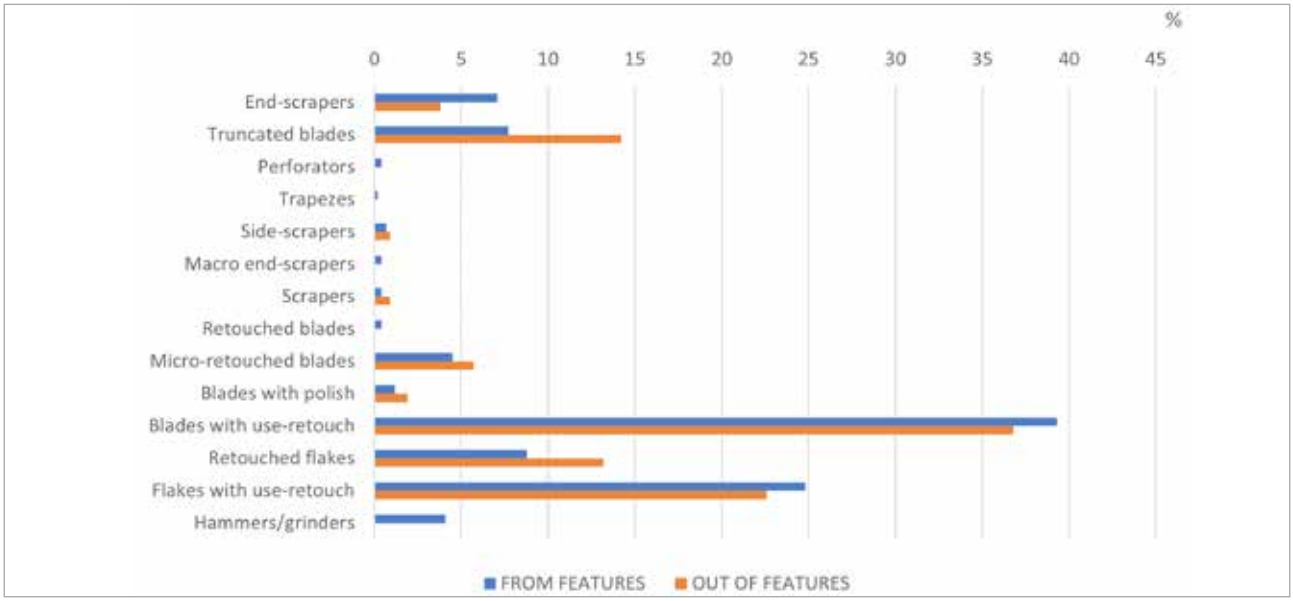


Fig. 5. Tonie 9. Frequency of tools in the lithic inventories from S-O features and exploration levels out of features.

Table 6. Tonie 9. Qualitative and quantitative structure of tool group from S-O features and exploration levels out of features.

TOOLS	IN FEATURES		OUT OF FEATURES	
	n	%	n	%
End-scrapers	59	7.1	4	3.8
Truncated blades	64	7.7	15	14.2
single	*45*		*9*	
doubled	*19*		*6*	
Perforators	3	0.4	-	-
Trapezes	2	0.2	-	-
Side-scrapers	6	0.7	1	0.9
Macro end-scrapers	3	0.4	-	-
Scrapers	3	0.4	1	0.9
Retouched blades	3	0.4	-	-
Micro-retouched blades	37	4.5	6	5.7
Blades with polish	10	1.2	2	1.9
Blades with use retouch	327	39.3	39	36.8
Retouched flakes	73	8.8	14	13.2
Flakes with use-retouch	206	24.8	24	22.6
Hammers/grinders	34	4.1	-	-
SUM	**830**		**106**	

3. General characteristics of flint materials of the Samborzec-Opatów group from the Tonie 9 site

3.1. Technological aspects

Although the structure of the flint collection found at the Tonie 9 site presented above showed quantitative differences between individual groups of artefacts found inside and outside the features, no variation in the internal inventory was noticed at the general level of flint processing technology. This observation coincides with the captured similarities in the quality of structures of sets with different contextual-stratigraphic positions. At the same time, the general qualitative and quantitative structure of the inventory does not contain forms indicating a far-reaching differentiation of flint production at these sites. Therefore, the characteristics of neolithic flintworking can be characterized generally on the basis of data contained in the entire inventory, without separating it into smaller collections, and obviously, due to the large size of the Tonie 9 collection, it is the basic source base for discussing the specifics of flint production. Unfortunately, at the stage of preparing this article, the described flint materials were unavailable to carry out a detailed characterization of the metric features of blades, flakes, and tools and to present them in the form of diagrams.

Blade debitage

In the light of the available data, it is difficult to confirm unambiguously how the blades were obtained by the neolithic S-O communities inhabiting the site. Although there are quite numerous blades here, the number of blade cores and debitage accompanying this branch of production is very modest. Excluding blades, the other categories related to this direction of flintworking (i.e. blade cores, core-tablets, rejuvenation-flakes, crested blades) account for only 2.1% of the total inventory. Perhaps in some – probably narrow – scope there was blade production, so the possibility of local blade production cannot be completely dismissed, but there are no sufficiently convincing relics for this. The individual products distinguished here are not related to the same production episodes, but are fragments of separate "*chaines operatoires*".

Blade production was carried out by exploitation of single-platform blade cores using the indirect percussion technique (cf. Inizan *et al.* 1999). Natural concretions or large and medium-sized crumbs were selected to shape them, the reduction of which was possible without extensive preparatory procedures. Some views on the form of pre-core forms are given by some blade cores. Most of them, however, are forms abandoned at an advanced stage of exploitation or specimens with clearly seen defects and errors that prevented further effective production of blades. In typological terms, these are most often single-platform subconical blade core (Fig. 7: 4; 9: 5; 11: 6; 13: 1–4). Some of them are specimens with two separate flaking surface or specimens resulting from a change of the orientation of the core during processing. Some blade cores are made of chocolate flint, which, however, does not allow for simple inferences to be made about their local exploitation due to the lack of adequate by-products.

Exhausted cores, perhaps exploited at the site, were often reused as hammers or grinders, thus supplementing the deficit of stone raw materials.

Blades

The blades from Tonie 9 have quite similar morpho-stylistic features. There were no specimens that would technologically differ from the canon of Early Neolithic blades known from other Lesser Poland sites, especially from the vicinity of Kraków (Kaczanowska 1971; Balcer 1983).

To determine the technique used for the production of blades, it is necessary to preserve the blades with their proximal parts. Blades from Tonie 9 are incomplete, but the majority (97 pcs.) are total whole

specimens (16 pcs.) and proximal parts (81 pcs.). Most of them have faceted butts without traces of abrasion and removing overhangs on the flaking edge. Similar features are legible on blade tools with preserved butts. The vast majority of blades are negative, which indicates their selection (Fig. 6: 4, 6; 9: 9; 10: 7; 11: 2; 17: 6). On relatively few blades, the cortex is present fragmentarily.

Primary and secondary crested-blades from early core exploitation indicate the output parameters of blade cores. They correlate with some of the completely preserved blades, distinguished by their length. However, the presence of crested-blades does not have to be related to local early processing of cores, but they can be forms of utility tools in the same way as blades without retouching.

Flake debitage

Although flakes are the dominant category of products in this inventory, they cannot all be considered as the result of deliberate production of flakes. Considering the flaked material in general, it can be assumed that it has a diverse technological genesis. A trace of this is the large morpho-metric diversity of the flakes. They have not only different features of the same elements, such as the formation of the proximal part, but also general proportions (ratio of width to thickness) and the nature of the surface. In the latter aspect, 90 fully cortical specimens, 491 partially cortical and 677 negative specimens were distinguished in the group of flakes. It can therefore be assumed that the flakes present here are the result of variously targeted production activities. There are specimens that were produced as deliberate flakes or flaked half-products, but there are also those that may be genetically related to the exploitation of flake cores (mainly their preparation) (e.g. Fig. 9: 5), to the shaping of pre-cores, to the transformation of large flake tools, etc.

On the other hand, the dominant cores in the group – flake cores and blade-flake cores – can be read as relics of local production of flakes with the use of the simplest methods and techniques of direct percussion.

Chunks

In the entire inventory, a group of chunks was separated, which consists of specimens that do not have the characteristics of products from other categories. Within this category, three subgroups have been distinguished. The first of these are specimens burned to the extent that it is impossible to identify their original morphology. A total of 96 such specimens were registered. The second subgroup are natural chunks and larger concretions. Of the 36 specimens, half were deposited in the exploration layers (18 pcs.) and the same number (18 pcs.) were deposited in the features.

The last subgroup are chunks with negatives, probably being amorphous fragments of crushed artefacts whose morphology cannot be determined. 69 pieces of negative chunks were separated, with 11 specimens coming from the layers out of features, and more than five times more (58 specimens) – from features.

3.2. Flint tools

Specimens classified as tools form two groups differing in the degree and standardization of transformations forming their morphology and working edges.

The first of them consists of typological tools, such as: end-scrapers, truncated blades (sickle inserts), perforators and others. The second group is utility tools. In other words, these are atypical forms of tools that cannot be classified into any of the typological tool categories. They consist of either flakes and blades with retouching modifying the edge (or edges) in an atypical way, or "raw" flakes and blades with retouching referred to as utilitarian.

In total, 738 utility tools were distinguished, which is the vast majority in the entire tool inventory and in individual sets separated for features and layers outside of them. The morphological diversity of products from this group shows that it is not possible to indicate an intermediate material (blades or flakes) with specific morpho-metric properties that was selected as appropriate for a given category of tools. The products from this group are probably *ad hoc* selected flakes and blades that ensured the implementation of specific tasks. Among them, 366 blades have been identified quantitatively, which, together with analogous "utility" flakes, accounts for almost 65% of all tools at the site (Fig. 6: 3; 7: 6; 8: 7; 10: 1, 5, 7; 14: 6; 15: 7, 8; 17: 6, 7). A slightly clearer range of secondary treatments that were created for utilitarian purposes or as a result of tool use are borne by specimens referred to as microretouched blades, although the boundary between them and the above-mentioned utility blades is quite fluid (Fig. 6: 9; 7: 1; 8: 8; 10: 6; 11: 2).

In opposition to the group of utility (atypical) tools there are much less numerous conventional (typology) tools (164 pcs.). These are standardized forms shaped by intentional retouching, whose morphology and traces of wear often correlate with one specific activity. A classic example in Early Neolithic inventories are truncated blades, also referred to as sickles or

sickle inserts, associated with cutting cereals, and also end-scrapers (e.g. Małecka-Kukawka 2001).

In the inventory from Tonie 9 site, the most numerous category of typological tools are truncated blades (79 pcs.), with twice as many single truncated blades (54 specimens) registered as double truncated blades (25 pcs.). They are made mainly of blades, but also of flakes (Fig. 6: 2, 7; 7: 2, 3; 8: 1–6; 9: 1–4, 8; 10: 3, 8–10; 11: 4, 5, 8; 12: 1–6, 8; 14: 2–5; 15: 1–4; 16: 1–12; 17: 1, 2). It seems that this group of tools is much more strongly associated with blade semi-raw material than with any other type of tool in this inventory. In addition, negative blades were clearly preferred. The truncation was most often formed in the distal part of blade, which can be seen most clearly in the case of single truncated blades. The specimens referred to as double truncated blades are probably the result of "renewing" the sickle insert by reorienting it, which involved the need to reuse the tool and re-form the second opposite truncation. Most of the truncated blades have traces of use in the form of clear polishing. Overall, from a stylistic and technological perspective, these tools are a very homogeneous

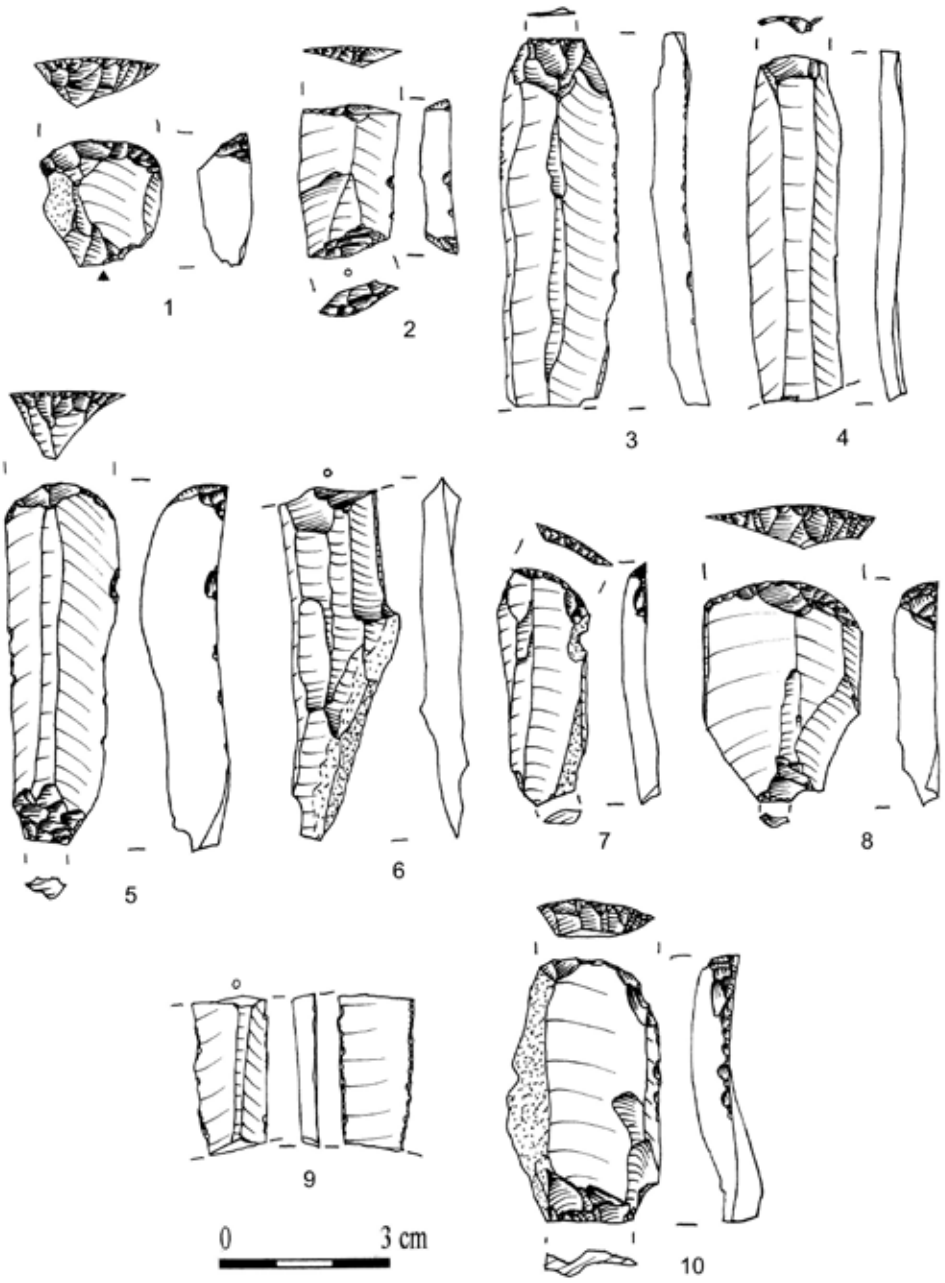


Fig. 6. Tonie 9. S-O flint materials from features: 7 (1), 8 (2–4), 20 (5–7), 23 (8), 32 (9), 33 (10). Jurassic Cracovian flint: 1–10 (drawn by M. Wąs).

group, which is probably due to their specific function requiring standardization of the form, related to the construction of harvest knives or sickles, of which they were an element.

The second most numerous typological tool in the inventory from the discussed site are end-scrapers (63 pcs.). The selected blade or flake semi-raw material transformed into end-scrapers came from various phases of exploitation, as evidenced by the fact that some of them have partially cortex surfaces while others have negative surfaces. Most of them are end-scrapers with one working edge usually located in the distal part of the blade or flake (Fig. 6: 1, 5, 8, 10; 7: 5; 8: 9, 11; 9: 1, 7; 10: 2, 4, 11; 11: 1, 3, 9, 10; 12: 7, 10; 14: 1; 15: 5, 6; 17: 3–5).

In addition to the dominant in the tool group of end-scrapers and truncated blades, the inventory of Tonie 9 includes several other types, among which perforators (Fig. 8: 12; 12: 9) and macro end-scrapers (Fig. 9: 6) stand out morphologically. Other types are represented by single specimens, such as flake scrapers (Fig. 8: 10).

The presence of two trapezes in the tool inventory of Tonie 9 should also be noted, one of which is an incomplete specimen (burnt and crushed), and the other is a form of an asymmetrical trapeze (Fig. 14: 7, 8).

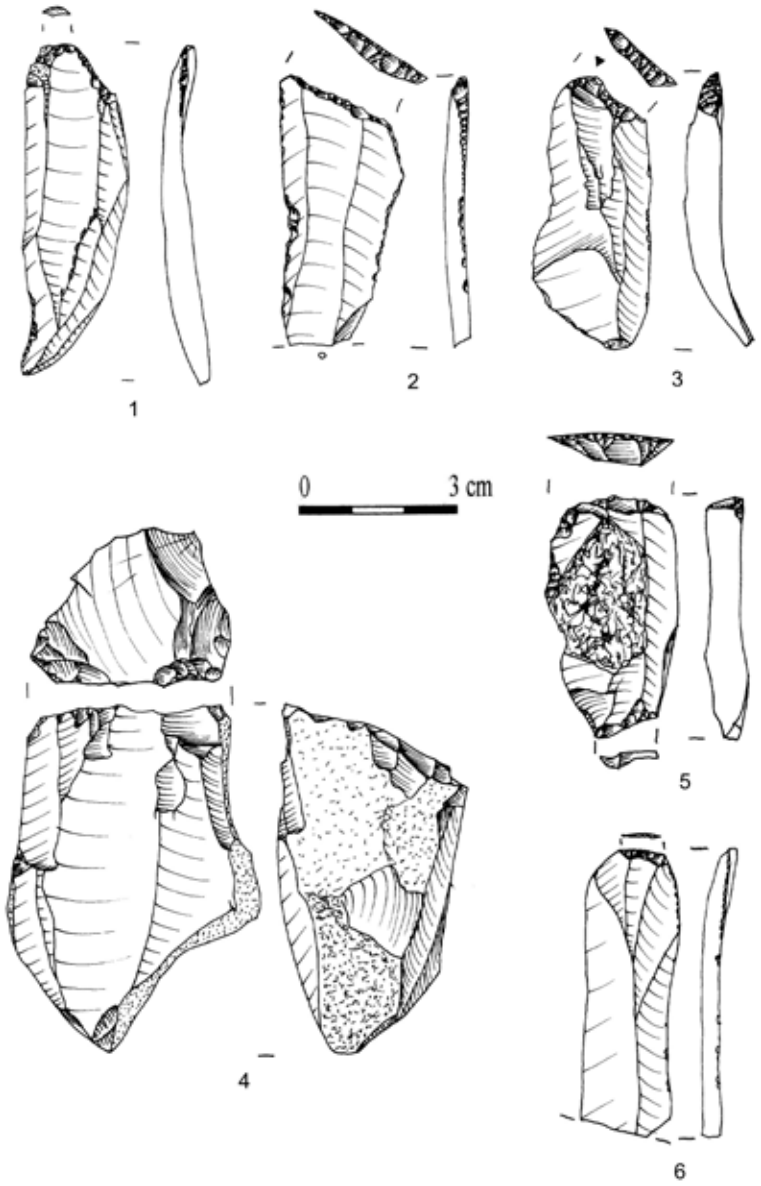


Fig. 7. Tonie 9. S-O flint materials from features: 41 (1), 47 (2–6). Jurassic Cracovian flint: 1–6 (drawn by M. Wąs).

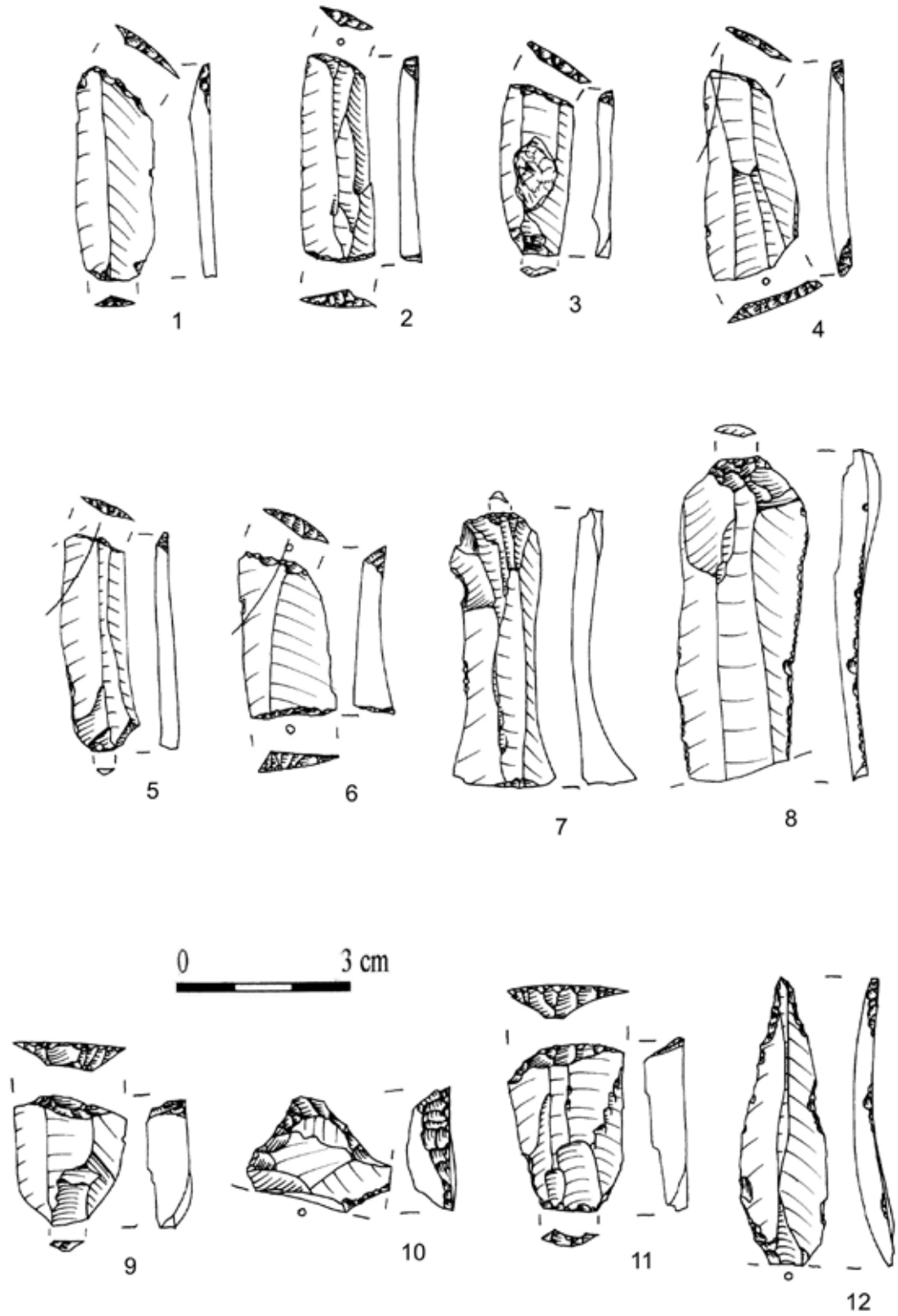


Fig. 8. Tonie 9. S-O flint materials from features: 48 (1–3), 53 (4), 60 (5–10), 62 (11–12). Jurassic Cracovian flint: 1, 2, 4–6, 9–12; c: 7, 8; chocolate flint: 3 (drawn by M. Wąs).

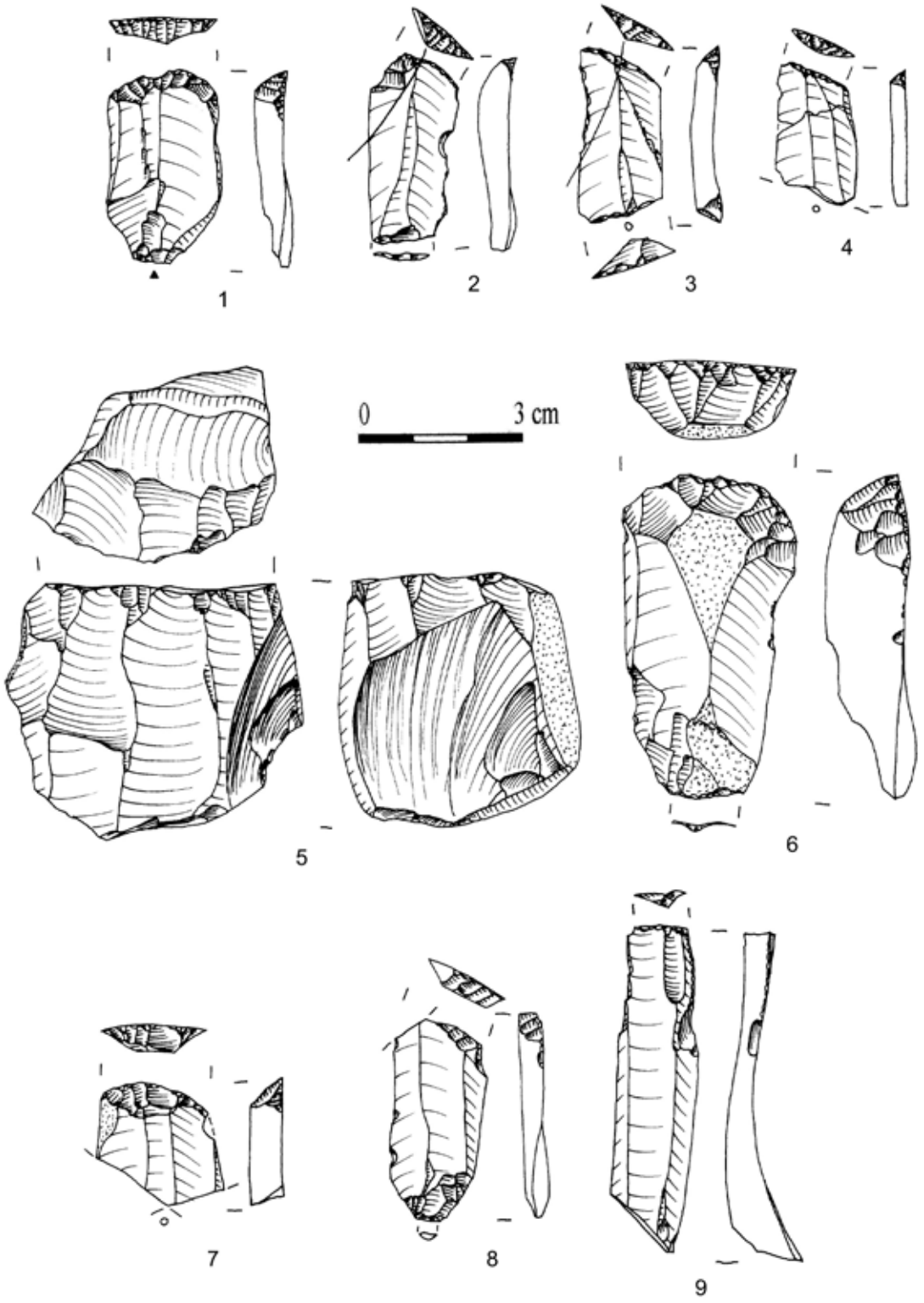


Fig. 9. Tonie 9. S-O flint materials from features: 90 (1, 2), 93 (3, 4), 193 (5, 6), 207 (7–9). Jurassic Cracovian flint: 1, 2, 5, 6, 9; chocolate flint: 7, 8; burnt flint: 3, 4 (drawn by M. Wąs).

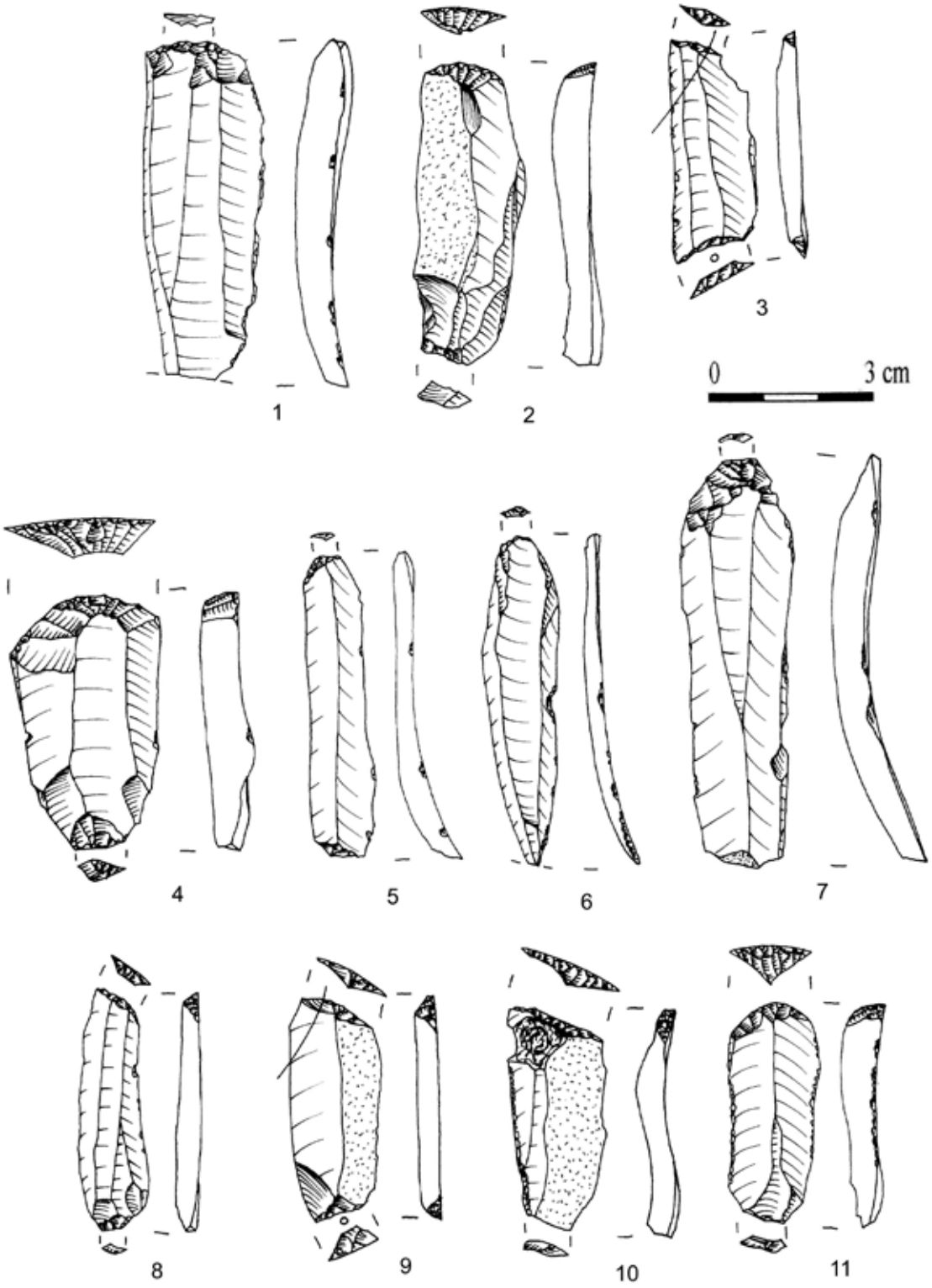


Fig. 10. Tonie 9. S-O flint materials from features: 222 (1, 2), 223 (3), 223c (4–11). Jurassic Cracovian flint: 1–4, 6–11; chocolate flint: 5 (drawn by M. Wąs).

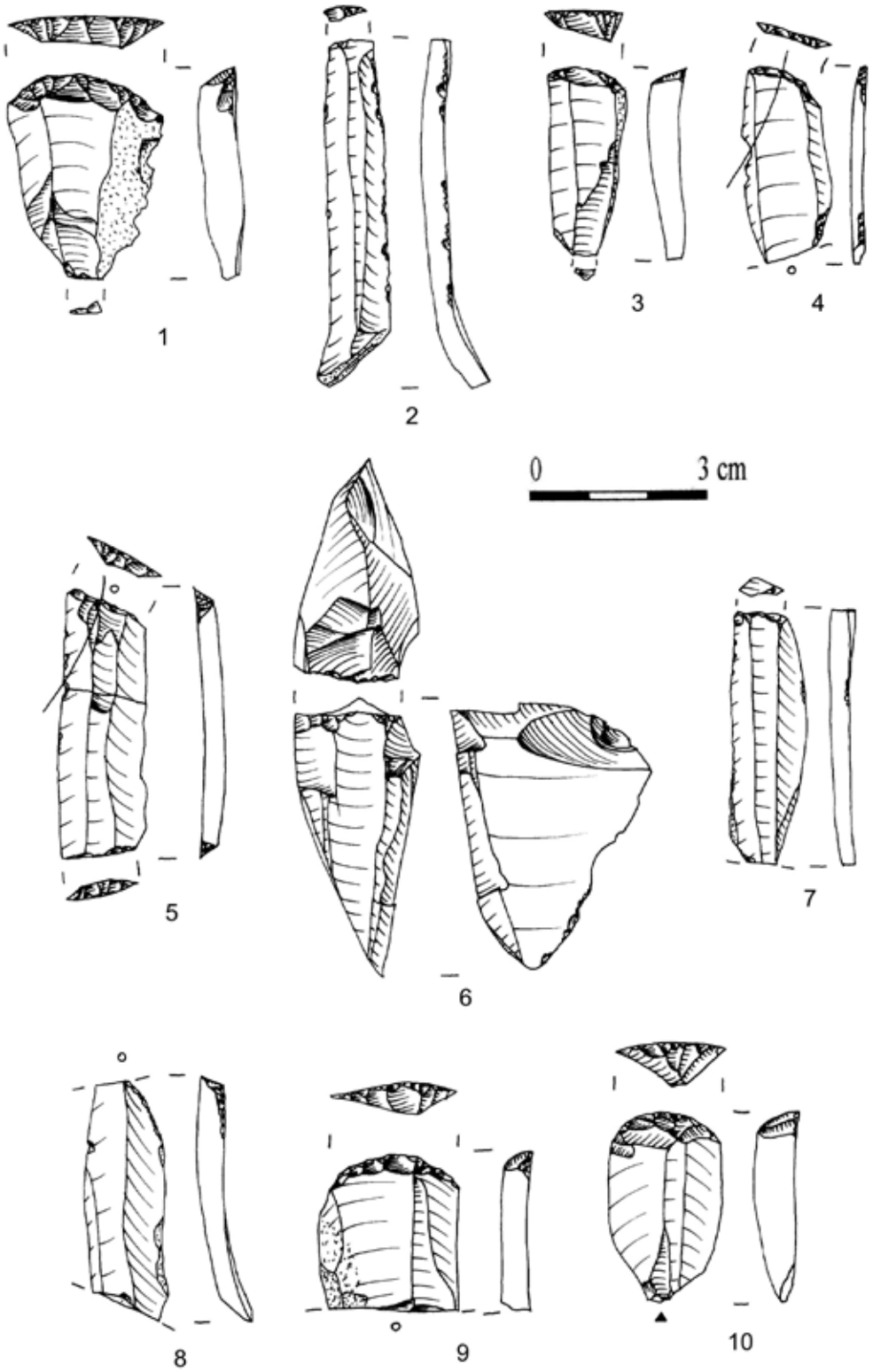


Fig. 11. Tonie 9. S-O flint materials from features: 246 (1), 257 (2), 260 (3, 4), 261 (5), 265 (6), 269 (7), 272 (8–10). Jurassic Cracovian flint: 1–5, 8, 10; chocolate flint: 6, 7, 9 (drawn by M. Wąs).

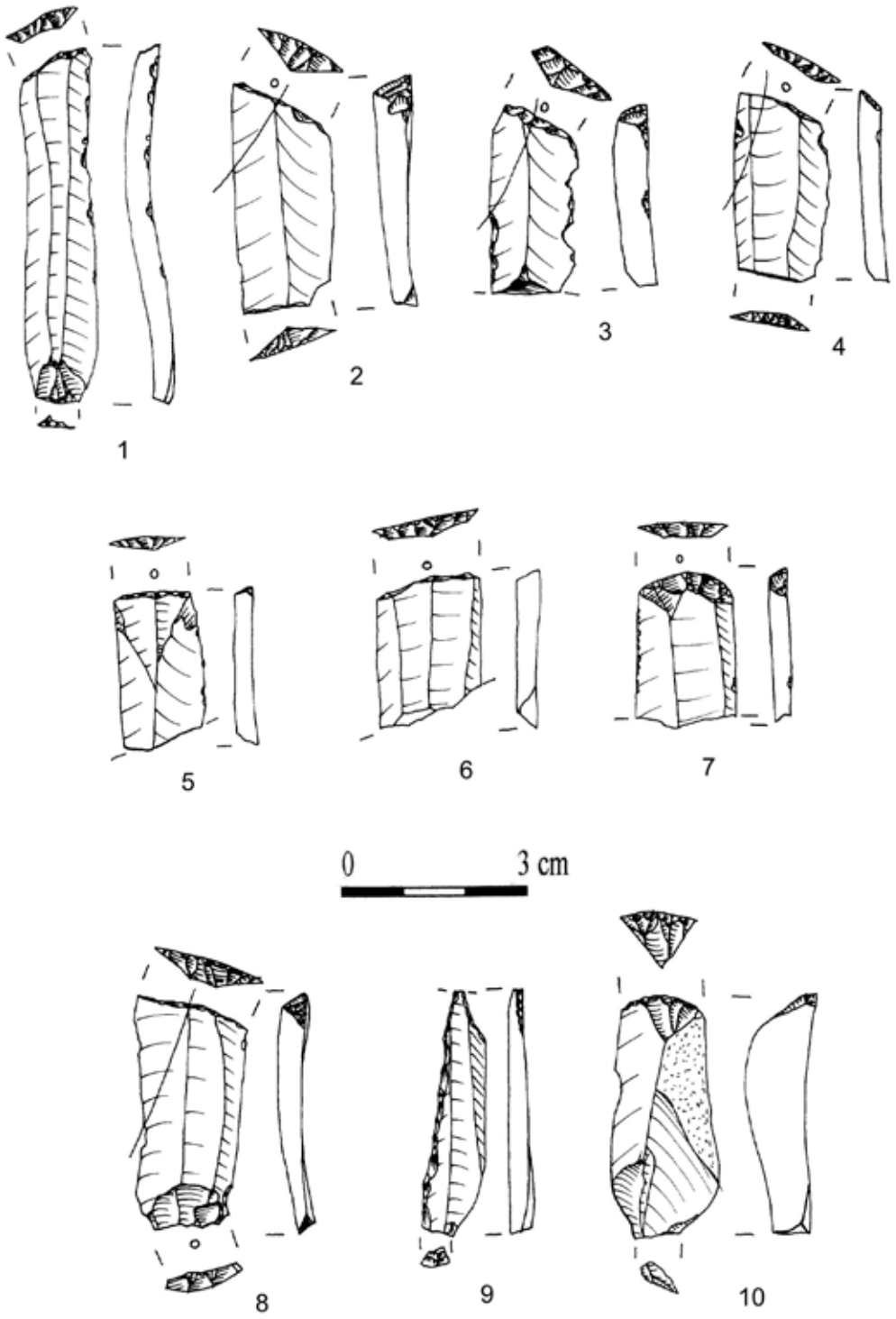


Fig. 12. Tonie 9. S-O flint materials from features: 274 (1–7), 278 (8–10). Jurassic Cracovian flint: 1–5, 8, 9; chocolate flint: 7, 10; burnt flint: 6 (drawn by M. Wąs).

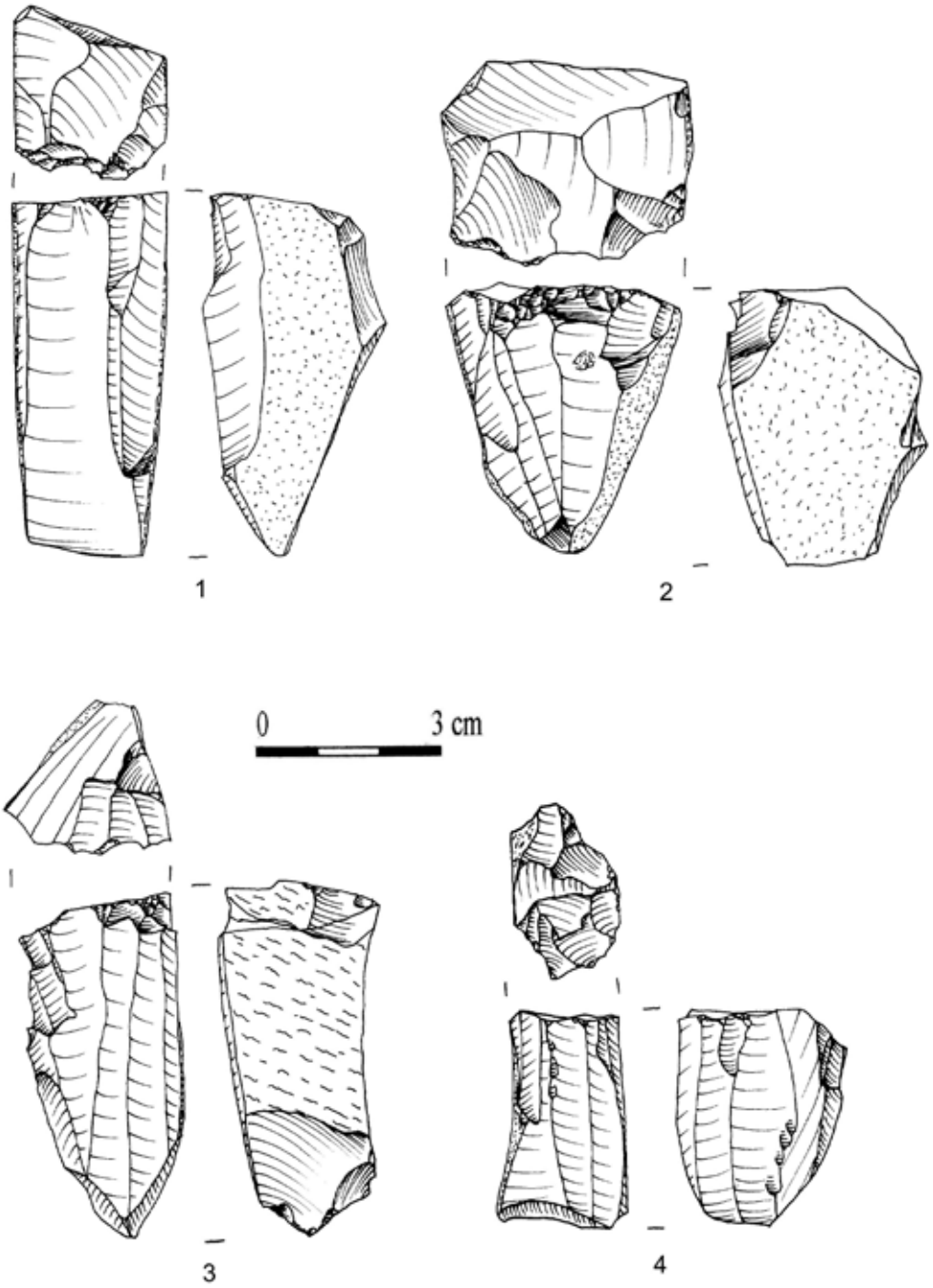


Fig. 13. Tonie 9. S-O flint materials from features: 278 (1, 2), 279 (3, 4). Jurassic Cracovian flint: 2, 4; chocolate flint: 1, 3 (drawn by M. Wąs).

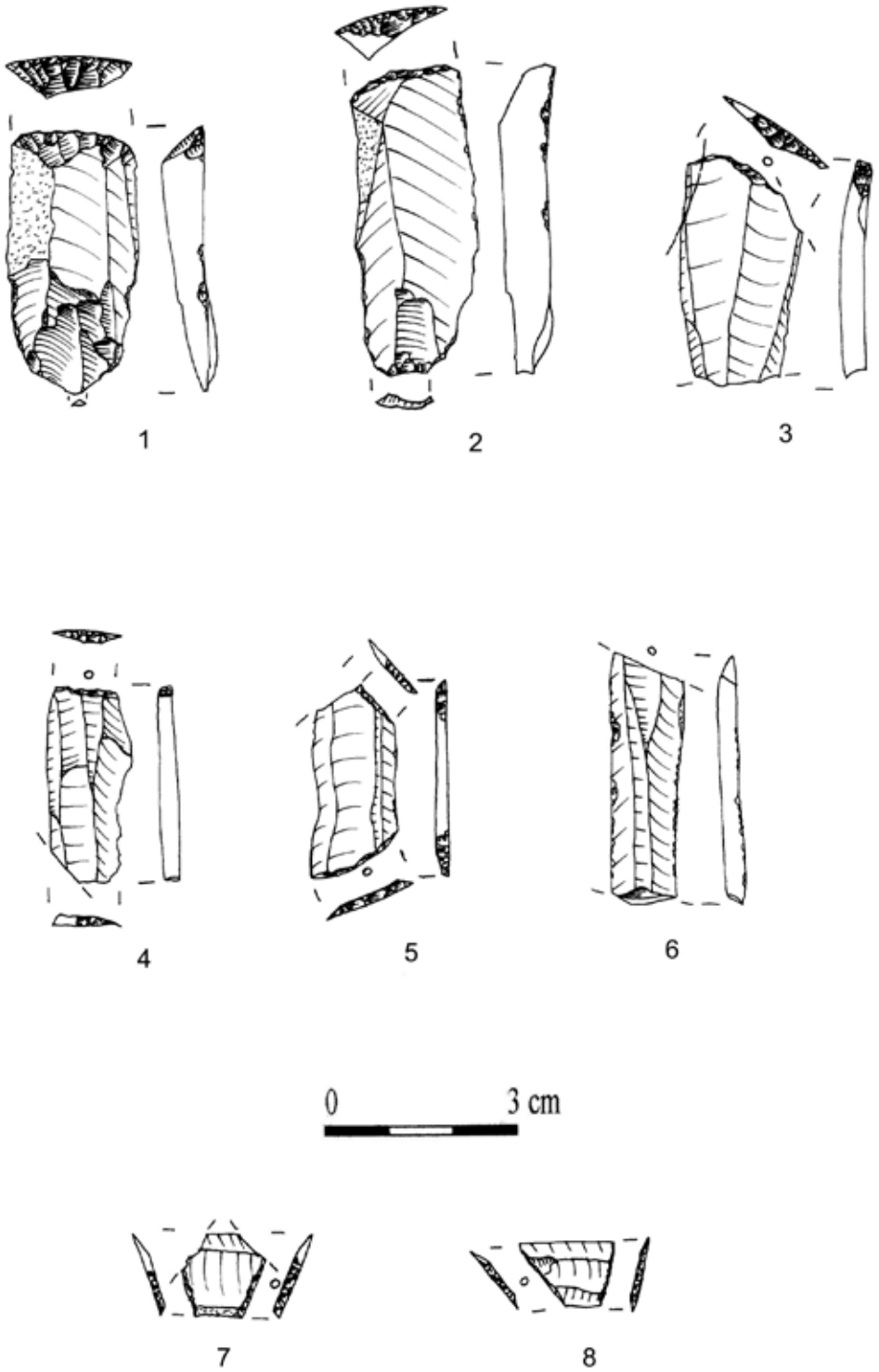


Fig. 14. Tonie 9. S-O flint materials from features: 279 (1–7), 298 (8). Jurassic Cracovian flint: 1–3, 5, 8; chocolate flint: 4, 6; burnt flint: 7 (drawn by M. Wąs).

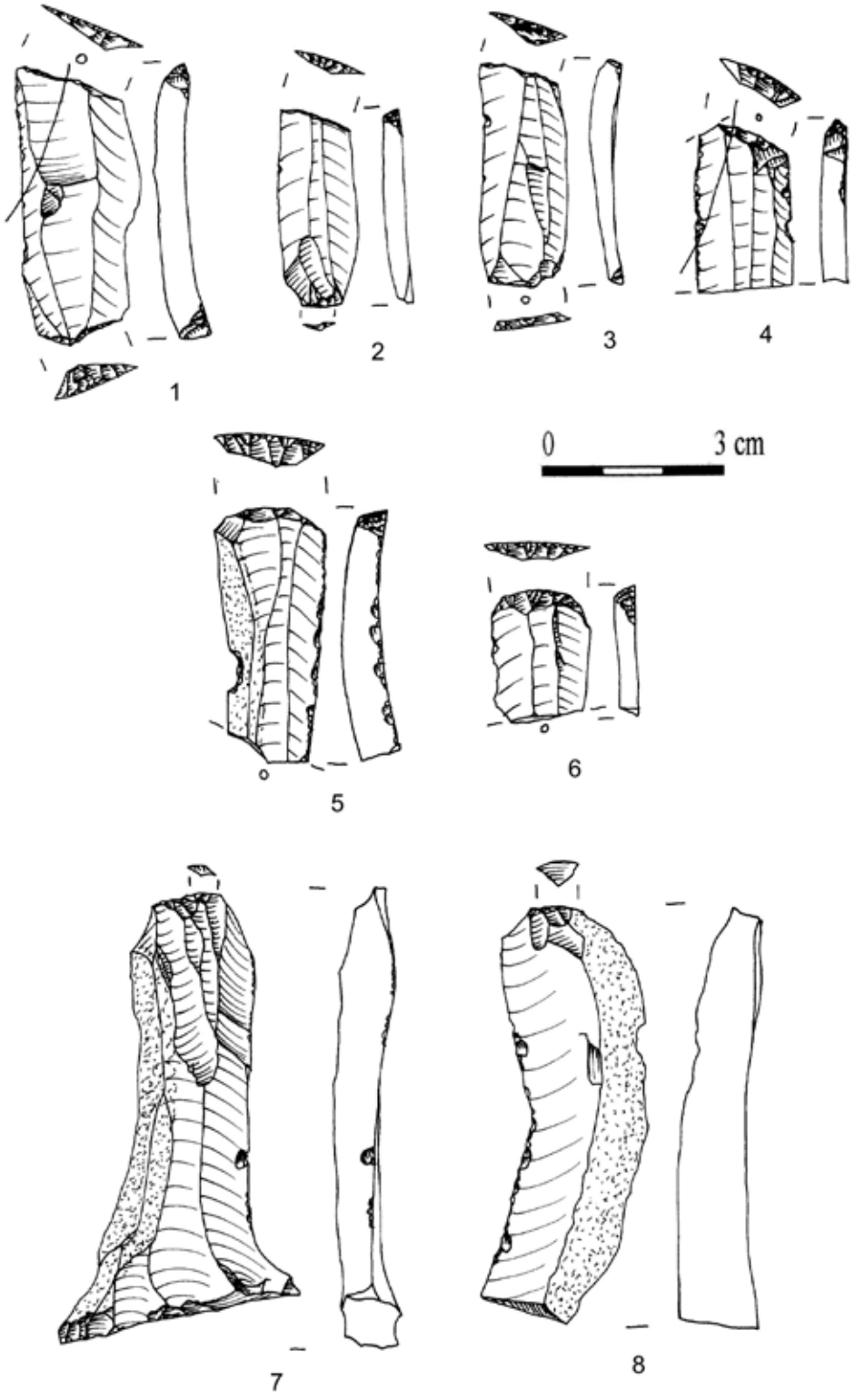


Fig. 15. Tonie 9. S-O flint materials from feature 293 (1–8). Jurassic Cracovian flint: 1, 2, 3, 6, 8; chocolate flint: 2, 5, 7 (drawn by M. Wąs).

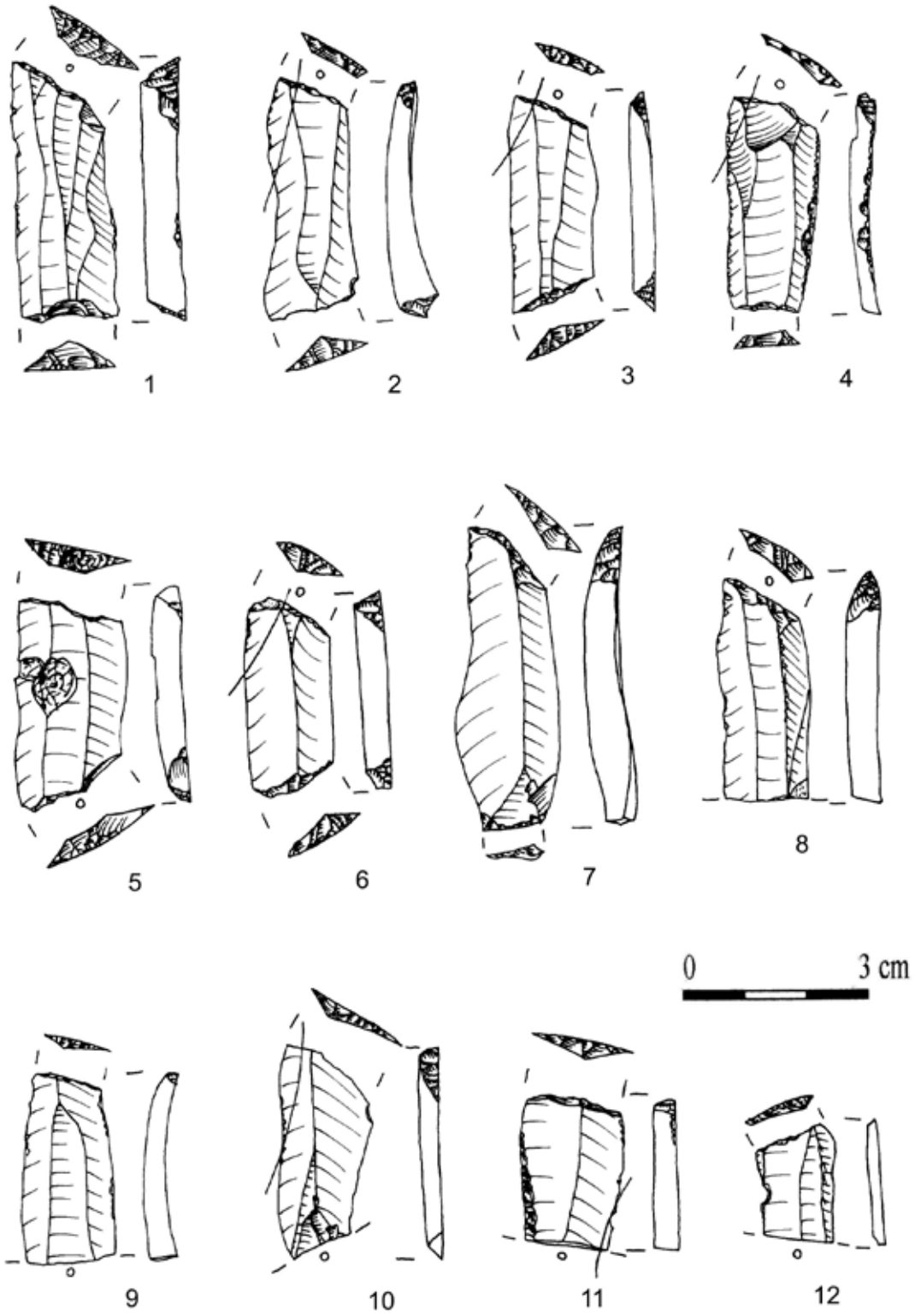


Fig. 16. Tonie 9. Flint materials from exploration levels out of S-O features. Jurassic Cracovian flint: 1–4, 6–12; burnt flint: 5 (drawn by M. Wąs).

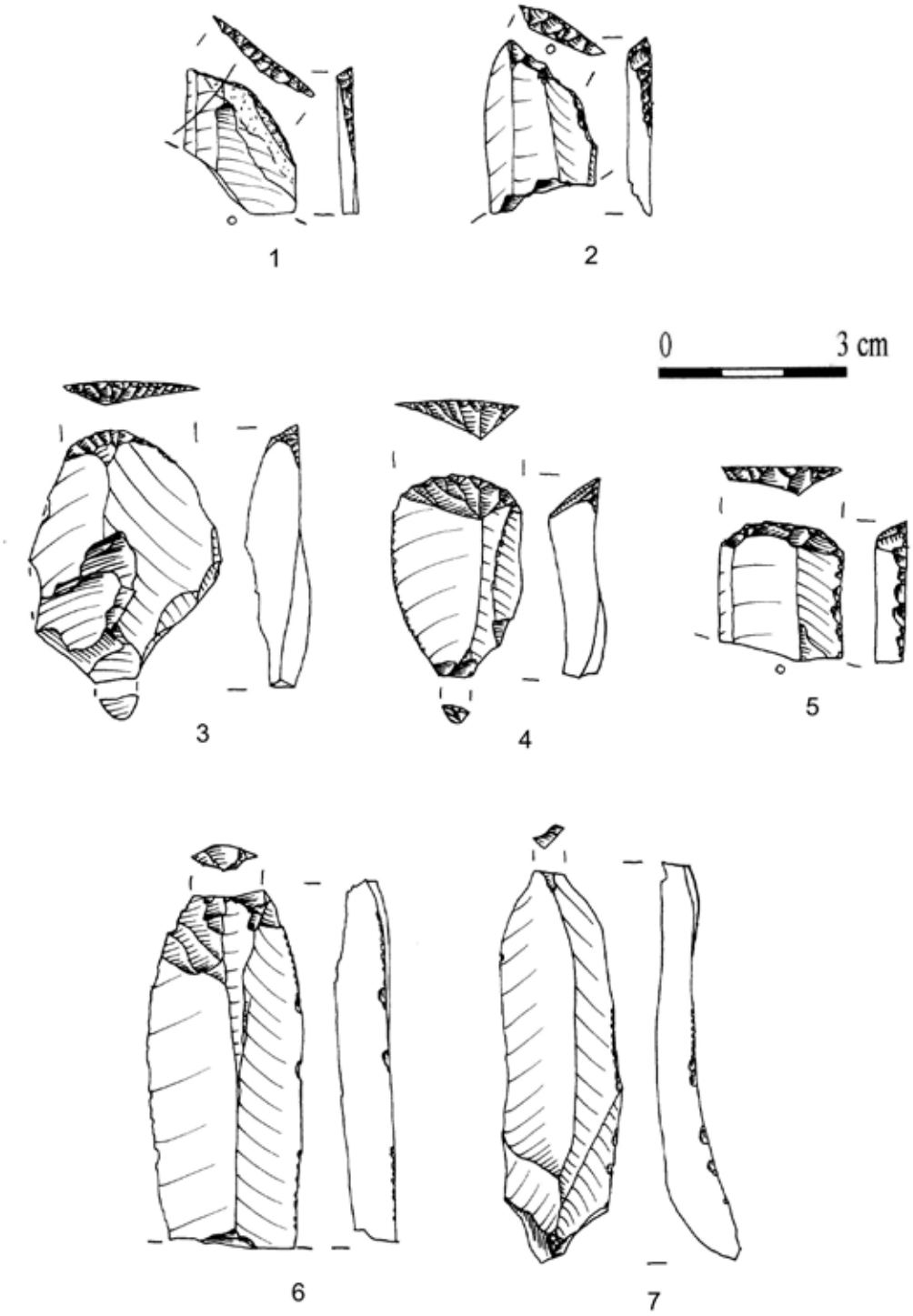


Fig. 17. Tonie 9. Flint materials from exploration levels out of S-O features. Jurassic Cracovian flint: 1–7 (drawn by M. Wąs).

4. Conclusions

Rescue excavations carried out at the Tonie 9 site provided rich flint material associated with the S-O settlement. It contains elements typical for flintworking of this unit and is characterized by a full cross-section of the technological and typological structure of Early Neolithic flint inventories (Kozłowski 1970; Balcer 1983). Also, the raw material structure, containing three components: the dominant local raw material and the trace imported and exotic raw material (like chocolate flint or obsidian), is typical for many other sites of this period in Lesser Poland. Certainly, an interesting and new element here is the presence of banded flint, which represents 8 ordinary flakes. Obsidian, on the other hand, is represented in this site in a trace. On the one hand, this contrasts with the raw material structure of other S-O inventories, and on the other hand, it sheds light on a certain difference in relation to the Malice culture inventories, in which obsidian is sometimes quite numerous (cf. Kaczanowska and Kozłowski 2006; Szeliga 2007; Wilczyński 2010; Wąs 2021).

The analysis carried out above within individual groups revealed a far-reaching standardization of flint making at the discussed site, both in terms of production and especially in terms of use.

Taking into account the qualitative structure of the flint inventory from Tonie 9, one can notice similarities to the Lesser Poland inventories referred to as "user settlements" (Lech 1981). The settlement character of the inventory is matched by the spatial context – the relationship with the relics of potential residential buildings. The structure of the tool group is characteristic of "home" inventories. Truncated blades and end-scrapers definitely dominate here. A quantitatively distinctive category of products with tool use are also blades and flakes with the so-called utility retouch, which do not show the formal standardization and metric preferences.

From a technological point of view, the entire flint inventory of Tonie 9 is a conglomerate of many production episodes. Although semi-raw material forms dominate here (with a predominance of flakes over blades), the scope and place of their production are unspecified in the structure of the settlement. With high probability, it can be pointed out that at least part of the lithic raw material (perhaps in the form of pre-core forms or early exploitation cores) and probably also ready-made semi-raw material (especially blades) from "mine" workshops (Dzieduszycka-Machnikowa and Lech 1976; Lech 1981) or from other settlements where production activities had places (cf. Kruk and Milisauskas 1999, 52–54).

The attempt to embed S-O flint materials from Tonie 9 against a broader comparative background encounters significant and objective limitations. First of all, attention should be paid to the highly unsatisfactory state of diagnosis of flint-making in this unit (see Kaczanowska and Kozłowski 1994; 2006). In this context, the collection of S-O flints from Tonie 9 has great cognitive value as one of the few relatively fully recognized and probably homogeneous settlement inventory. Undoubtedly, the entire S-O collection, is a more important part of the source base for S-O flint-making in Lesser Poland, which will allow for the development of appropriately targeted analytical and comparative studies aimed at identification of its characteristic features.

References

Balcer B. 1983. *Wytwórczość narzędzi krzemiennych w neolicie ziem polskich*. Wrocław: Zakład Narodowy im. Ossolińskich.

Dzieduszycka-Machnikowa A. and Lech J. 1976. *Neolityczne zespoły pracowniane z kopalni krzemienia w Sąspowie* (= *Polskie Badania Archeologiczne* 19). Wrocław: Zakład Narodowy im. Ossolińskich.

Inizan M. L., Redouron-Ballinger M., Roche H. and Tixier J. 1999. *Technology and Terminology of Knapped Stone* (= *Prehistoire de la Pierre Taille* 5). Nanterre: CREP.

Kaczanowska M. 1971. Krzemienne materiały kultur neolitycznych pochodzenia południowego z terenu Nowej Huty. In J. K. Kozłowski (ed.), *Z badań nad krzemieniarstwem neolitycznym i eneolitycznym. Referaty i komunikaty przedstawione na sympozjum w Nowej Hucie dn. 10, 11 maja 1971*. Kraków: Polskie Towarzystwo Archeologiczne, 10–24.

Kaczanowska M. and Kozłowski J. K. 1994. Zur Problematik der Samborzec-Opatów-Gruppe. In P. Koštuřík (ed.), *Internationales Symposium über die Lengyel-Kultur, 1888–1988. Znojmo-Kravsko-Těšetice, 3.–7. 10. 1988*. Brno, Łódź: Masarykowa univerzita. Filozofická fakulta, Muzeum Archeologiczne i Etnograficzne w Łodzi, 85–103.

Kaczanowska M. and Kozłowski J. K. 2006. *Grupa samborzecko-opatowska* [*The Samborzec-Opatów group*]. In M. Kaczanowska (ed.), *Dziedzictwo cywilizacji naddunajskich: Małopolska na przełomie epoki kamienia i miedzi* [*The Danubian heritage: Lesser Poland at the turn of the Stone and Copper Ages*] (= *Biblioteka Muzeum Archeologicznego w Krakowie* 1). Kraków: Muzeum Archeologiczne w Krakowie, 23–36.

Kokolus J. and Maciaszek M. 2021. Sprawozdanie z ratowniczych badań archeologicznych na stanowisku Kraków-Tonie 9 (AZP 101-56/61). Sezon 2021. Kraków: manuscript in the archive of the Archaeological Museum in Kraków.

Kozłowski J. K. 1970. Z badań nad wytwórczością krzemieniarską w kulturze ceramiki wstęgowej rytej. In J. K. Kozłowski (ed.), *Z badań nad kulturą ceramiki wstęgowej rytej*. Kraków: Polskie Towarzystwo Archeologiczne Oddział w Nowej Hucie, 73–94.

Kruk J. and Milisauskas S. 1999. *Rozkwit i upadek społeczeństw rolniczych neolitu*. Kraków: Instytut Archeologii i Etnologii Polskiej Akademii Nauk.

Lech J. 1981. *Górnictwo krzemienia społeczności wczesnorolniczych na Wyżynie Krakowskiej. Koniec VI tysiąclecia – 1 połowa IV tysiąclecia p.n.e*. Wrocław: Zakład Narodowy im. Ossolińskich.

Małecka-Kukawka J. 2001. *Między formą a funkcją. Traseologia neolitycznych zabytków krzemiennych z ziemi chełmińskiej*. Toruń: Wydawnictwo Uniwersytetu Mikołaja Kopernika.

Szeliga M. 2007. Der Zufluss und die Bedeutung des Karpatenobsidians in der Rohstoffwirtschaft der postlinearen Donaugemeinschaften auf der polnischen Gebieten. In J. K. Kozłowski and P. Raczky (eds.), *The Lengyel, Polgar and related cultures in the Middle/Late Neolithic in Central Europe*. Kraków: Polska Akademia Umiejętności, 295–308.

Wąs M. 2021. Early Neolithic Flint Assemblages from the Targowisko Settlement Region. *Analecta Archaeologica Ressoviensia* 16, 43–62.

Wilczyński J. 2010. The Techniques of Obsidian Treatment on the Malice Culture Settlement of Targowisko 11, Lesser Poland. *Przegląd Archeologiczny* 58, 23–38.

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

Taras Tkačuk

DOI: 10.15584/anarres.2023.18.4

National Preserve of Monuments „Davnij Galič", Franka 1, Galič, 77100, Ukraine;
e-mail: tkachukt@gmail.com; ORCID: 0009-0007-4492-2276

Ceramic "Imports" and Imitation of the Culture of Tiszapolgár and Bodrogkeresztúr at the Sites of Trypillia–Cucuteni Culture

Abstract

Tkačuk T. 2023. Ceramic "Imports" and Imitation of the Culture of Tiszapolgár and Bodrogkeresztúr at the Sites of Trypillia–Cucuteni Culture. *Analecta Archaeologica Ressoviensia* 18, 67–81

The article examines the influence of the Tiszapolgár and Bodrogkeresztúr ceramic traditions on the ceramics of the Trypillia–Cucuteni culture. The dynamics of these influences are monitored in the paper, where it was found that there were not many "imports" from the Tiszapolgár culture and their influence on the formation of ceramic complexes of the Trypillia–Cucuteni culture was not significant. The impact of the Bodrogkeresztúr culture on the ceramic complexes of the Shypyntsi local group of the Trypillia culture was somewhat greater.

Keywords: Trypillia–Cucuteni culture, ceramics, "import", Tiszapolgár culture, Bodrogkeresztúr culture, cultural influences.

Received: 14.07.2023; **Revised:** 10.08.2023; **Accepted:** 14.08.2023

Introduction

The population of the cultures that occupied the territory of the Tisza River Basin was quite mobile. According to traditional phasing, the Tisza culture around 4500 BC was replaced by the Tiszapolgár culture and later (around 4000 BC) the Bodrogkeresztúr culture (Raczky *et al.* 2014, 326). The peoples of the Tiszapolgár culture founded the Wężerów, Kraków district settlement in the Odra River Basin, while later, in the Vistula River Basin, the Bodrogkeresztúr culture population founded the settlement of the Wyciąże–Złotniki group (Kozłowski 2006, 53, 57). We know that they often traveled quite considerable distances when looking for sources of copper, gold, and flint (Kadrow 1996a). Evidence of this is, for example, a burial in Veľký Raškovci (Slovakia), where copper tools, copper and gold jewelry, and Volhyn flint were found in the graves (Vizdal 1977). Influences of the Tiszapolgár culture are found on the ceramics of the Malicka culture (Kadrow 1996b, 68). At the beginning of the formation of the Tiszapolgár culture, the Lublin-Volhynian culture began to form under the influence of the Tiszapolgár–Csőszalom–Oborin group (Kadrow and Zakościelna 2000, 208).

In addition to the northern and northeastern directions, they also moved to the slope, to the environment of the Trypillia–Cucuteni culture between 4500–3800 BC.

Ceramic "imports" from the Carpathian Basin have been discovered at the Trypillia–Cucuteni sites for quite some time. In the article by V. I. Markevič and V. S. Titov, such "imports" in the settlements of the Brînzeni stage/group of the beginning of the C II stage in Moldova were attributed to the Bodrogkeresztúr culture. One of them had the appearance of a large vessel with a high cylindrical neck, a ball-shaped body, and a spout-shaped handle at its largest expansion (Titov and Markevič 1974; Markevič 1981, 177–178, fig. 106: 1). O. V. Cvek discovered "imports" and imitations of the Tiszapolgár culture among the pottery of settlements of the B I–B II stage at the confluence of the Southern Bug and Dnieper Rivers, in particular at Veselij Kut. They include a jug, an open-type jug, a quadrangular dish, a large bowl with two rows of handles, and a krater ornamented with incised nets (Cvek

1989, fig. 5: 2). In 1977 an article was published by V. O. Kruc and S. M. Rižov, which collected ceramic "imports" and imitations of the "Polgar" culture (Tyszapolgár and Bodrogkeresztúr) known at the time in the sites of Trypillia culture. According to the relative chronology, their appearance in Trypillia settlements is limited to the B I–B II and the beginning of C II stage (Kruc and Rižov 1997, 26). "Polgár" pottery and their fragments are presented in the article mixed with "Lengyel" pottery. However, according to new studies, "Lengyel" pottery belong to the Malice or Lublin-Volhynian cultures.

In 2000, the next volume of *Baltic-Pontic Studies* was published, which included articles by Ukrainian researchers, which considered the connections of Trypillia with the cultures of Central Europe, including the Tiszapolgár and Bodrogkeresztúr cultures. Part of T. G. Movša's article is devoted to the Tiszapolgár and Bodrogkeresztúr ceramic "imports" and their imitation in the Trypillia milieu. She included among them large cylinder-conical and cylinder-spherical bowls with handles with vertical holes located under the rims outward; truncated conical bowl with rows of protrusions; a cup-shaped vessel with handles with horizontal holes located under the crowns, a spheroconical large bowl with beak-like hanging adhesions on the outside; large bowls and pithos-shaped vessels with rows of handles arranged in a checkerboard pattern on the outside; square bowls; bowls with protrusions above crowns; a cup-shaped vessel and an amphora with cup-shaped adhesions located below the extensions of the trunks; dishes with "horned" handles; large pear-shaped vessels with handles located above and below the extensions of the bodies (Movsha 2000, 136, 140, 142, 148, 153, 157, 160, fig. 1, 3, 4, 7, 9–11).

The article by M. I. Videjko in this volume is dedicated to the connections of the Trypillian culture with the Eneolithic cultures of Central Europe. According to the researcher, the influence of Tiszapolgár culture was so strong that for the period 4200–3800 BC that he proposed term "polgárization" of the Trypillia culture (Videiko 2000, 13). We have listed the most well-argued works devoted to the topic of connections between the Eneolithic cultures of the Tisza Basin and Trypilla–Cucuteni, although researchers of the Upper Dniester and Volhynia have mentioned them in passing before (Peleŝišin 1997, 47; Konoplâ 2005, 71; Ohrìmenko 2007, 281).

Discussion

In our opinion, the influences of the Tiszapolgár, and then Bodrogkeresztúr, while not as intense, were still somewhat vivid and can be delineated relatively early on in the Upper Dniester. In the site of Kozina, in a pit belonging to the Trypillia culture of stage A (Tkačuk *et al*. 2010), fragments of three tableware on which the remains of white paint were preserved were found among 170 tableware and 79 kitchen vessels (Fig. 1). White paint is characteristic of the ornamentation of the Csőszalom cultural group (proto Tiszapolgár) (Raczky *et al*. 2007, 63–64) and cultures that are contemporaneous or related to it (Zakościelna 1996, 102).

The "imports" include a fragment of the upper part of the pot with a tall cylindrical neck. Under its

Fig. 1. Kozina. Fragments of dishes covered with white paint.

base, four groups of incised shot lines were printed. They formed four hanging triangles (Fig. 2). Similar ornamentation occurs on dishes of the Tiszapolgár culture (Iercoşan 2002, 330, fig. 104: 3). Proto-Tiszapolgár and early Tiszapolgár date from 4500 to 4400 BC (Raczky *et al.* 2007, 65). Based on this dating, we can assume the appearance of representatives of Tisza Basin cultures in the Upper Dniester in the middle of the 5th millennium BC.

At the stage of Trypillia B I–Cucuteni A, 4350–4050 BC (Mantu 1998, 132) the influence of the Tiszapolgár culture has been traced on the ceramic complexes of the settlements of the local group of the Trypillian culture Drăguşeni-Jura, located in the Prut and Dniester basins and identified by V. Sorokin (2002).

Thus, among the ceramics from the five objects of the Trypollia culture at the site of Cuconeşti Vechi (Sorokin 2002, 263) in the Prut River Basin, we can single out ten vessels that belong to "imports" or imitations of the traditions of the Tiszapolgár culture. These include a pot with paired protrusion under the crown and a large round protrusions with a rounded depression on the body (Sorokin 2002, 316, fig. 62: 6), a tall bowl of the closed type with oblique protrusions under the crown and rounded protrusions arranged in a checkerboard pattern on body (Sorokin 2002, 317, fig. 63: 5), a tall cup-shaped vessel with handles with vertical holes at the maximum expansion of body and a horizontal row of rounded protrusions under the crown (Sorokin 2002, 318, fig. 64: 14), a tall bowl with round protrusions arranged in a checkerboard pattern (Sorokin 2002, 319, fig. 65: 4), cup-shaped vessels with protrusions under the crowns (Sorokin 2002, 326, 327, fig. 72: 3; 73: 6), bowl-shaped vessels with rounded protrusions arranged in a checkerboard pattern on the body (Sorokin 2002, 327, 329, fig. 73: 3; 75: 3), closed cup-shaped vessels on pallets. The body of one vessel is covered with many round protrusions, and the body of the second had single adhesions at the maximum expansion (Sorokin 2002, 328, 329, fig. 74: 2; 75: 2; cf. Fig. 3).

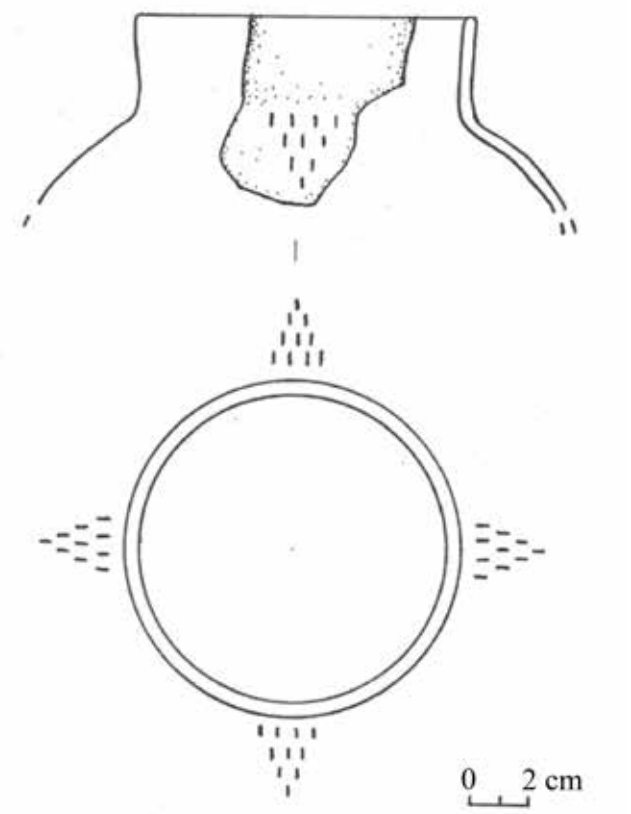


Fig. 2. Kozina. A fragment of a vessel ornamented with hanging triangles.

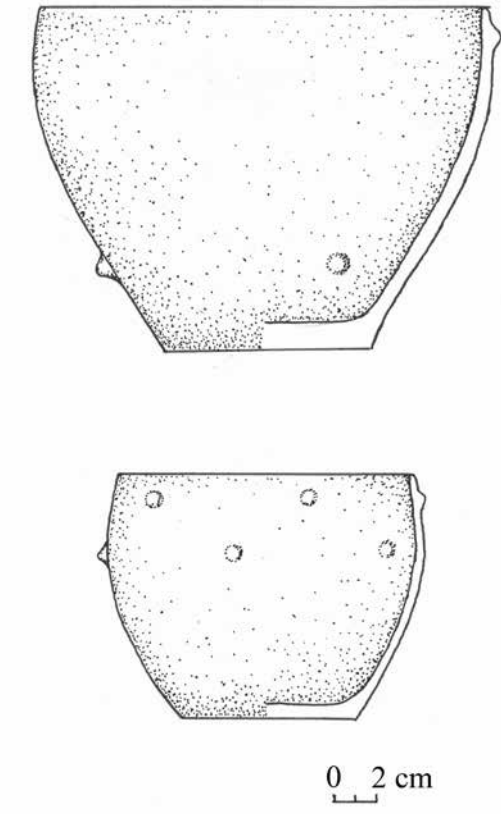


Fig. 3. Cuconeşti Vechi. Spherical vessels with adhesions from the outside (according to V. Sorokin 2002).

Ceramic "imports" and imitations of the Tiszapolgár culture can be seen among the dishes of a particularly well-researched and published site of this time, Truşeşti. A total of 98 dwellings were excavated at the settlement, of which 93 belonged to the Cucuteni A stage (Trypillia B I), and five to the Cucuteni B stage (Trypillia C I) (Dîmboviţa *et al.* 1999, 23). Only one ceramic "import" (or imitation) of the Tiszapolgár culture was found in each of four dwellings.

A tall open-type cup-shaped vessel with small rounded protrusions on the outside was found in building XI (Dîmboviţa *et al.* 1999, 428, fig. 314: 1), a large bowl-shaped closed-type vessel with rounded and hanging protrusions arranged in a checkerboard pattern (Dîmboviţa *et al.* 1999, 428, fig. 314: 6); another large open-type bowl with small rounded protrusions located on the outside comes from construction LXXVI (Dîmboviţa *et al.* 1999, 428, fig. 314: 10); a large open-type bowl-shaped vessel with two rows of handles located outside in a checkerboard pattern come from the building LXIII (Dîmboviţa *et al.* 1999, 429, fig. 315: 5). In the 196 pits discovered at the settlement (Dîmboviţa *et al.* 1999, 198–213), six pots were found that can be attributed as "imports" or imitations of the traditions of the Tiszapolgár culture (Dîmboviţa *et al.* 1999, 428–431, 433, 447, fig. 314: 3; 315: 6; 316: 1; 317: 1; 318: 1–2; 331: 10).

Thus, the "imports" or imitations of the Tiszapolgár culture include large bowls of open or closed forms with handles or protrusions located on the outside in a checkerboard pattern, cup-like tall vessels of open or closed forms with bosses under the crowns or on the bodies, large pithos-shaped vessels of closed forms with handles located on the outside in a checkerboard pattern. Small bowls with paired inlays under the crowns, cup-shaped vessels on pallets, and pear-shaped vessels with inlays and tall cylindrical necks are rare. These potteries are often referred to as "kitchen" ware but it is important to note that there are a few exemplars of these potteries and that they do not form typological ranks among the ceramics of the Cucuteni–Trypillia culture. They are clearly foreign, brought from another ceramic tradition.

Among the ceramics from the settlement of the Cucuteni A stage (Trypillia B I) of Dumeşti, there is a vessel on which the lower parts are without ornament with adhered or hanging handles, and the upper parts have a painted ornament typical for that time (Alaiba 2007, 75, 114, fig. 20; 47: 1). This is vivid evidence of the combination of two ceramic traditions, namely the Tiszapolgár and Cucuteni–Trypillia cultures. In the Middle Dniester, during the research of the Oževe-Ostrìv site of this time, a large pithos-like vessel with handles located on the outside in a checkerboard pattern was found (Čornovol 2022, 109).

At the later sites of the Cucuteni A–B – Trypillia B I–B II, 4250 BC (Mantu 1998, 132) dishes made according to the Tiszapolgár traditions were discovered. These are large pithos-shaped vessels of closed forms with handles located on the outside, often in a checkerboard pattern, large truncated-spherical bowls with adhesions or bundles located on the outside, tall cup-shaped vessels with adhesions under the crowns, small truncated-spherical bowls with paired protrusions under the crowns and (not often) square vessels. Single finds of such dishes are known from various parts of the Trypillia–Cucuteni culture. A large pithos-like and quadrangular vessel with highly raised crowns on the corners was found at the site of Traian-Dealul Fântânilor of this time (Lazarovici 2010, 97, 98, fig. 31, 33).

Among the ceramics from the sites of the Zalìŝiki group of the Trypillia culture of the B–B II stage of Middle and Upper Dniester, dishes made according to the Tiszapolgár traditions were found in the sites of Bučač (Fedìr Gora), Vìktorìv (Pušikova Gora), Bìl´šìvcì (Kut) and Zalìŝiki. In Bučač, at the site on Mount Fedìr, during the study of the Trypillian site, a large pithos-like vessel with rows of handles located on the outside in a checkerboard pattern was discovered. Researchers of this site have highlighted that a similar vessel was found in Zalìŝiki (Sitnik and Âgodins´ka 2012, 189, 196, fig. 4: 12).

A large pithos-like vessel with rows of handles located on the outside and a cup-like vessel with protrusions under a perforated crown were found in the site of Bìl´šìvcì (Kut) (Tkačuk *et al.* 2017, 18, fig. 6). During the excavations of the pits of the Zalìŝiki group of the Trypillia culture of this site, several more vessels made under the influence of Tiszapolgár traditions were found. In one pit, a truncated spherical bowl made of silted dough was found. Under its crown there were three paired protrusions. Fragments of polychrome (red on a white background) painting have been preserved on the outer surface of the bowl. On the outer surface of the bottom of the bowl, there was a drawing of an H – a similar sign (Tkačuk *et al.* 2020, 96, fig. 76; cf. Fig. 4, 5) to those of the "Danube script" we have a similar shape with analogies (Winn 1981, 24, fig. 41, 48). Bowls of this shape and with such adhesions are known among the ceramics of the Tiszapolgár culture (Iercoşan 2002, 268, 278, 284, fig. 42: 1; 50: 1; 58: 1). This bowl is a vivid example of the synthesis of the ceramic traditions of the Tiszapolgár

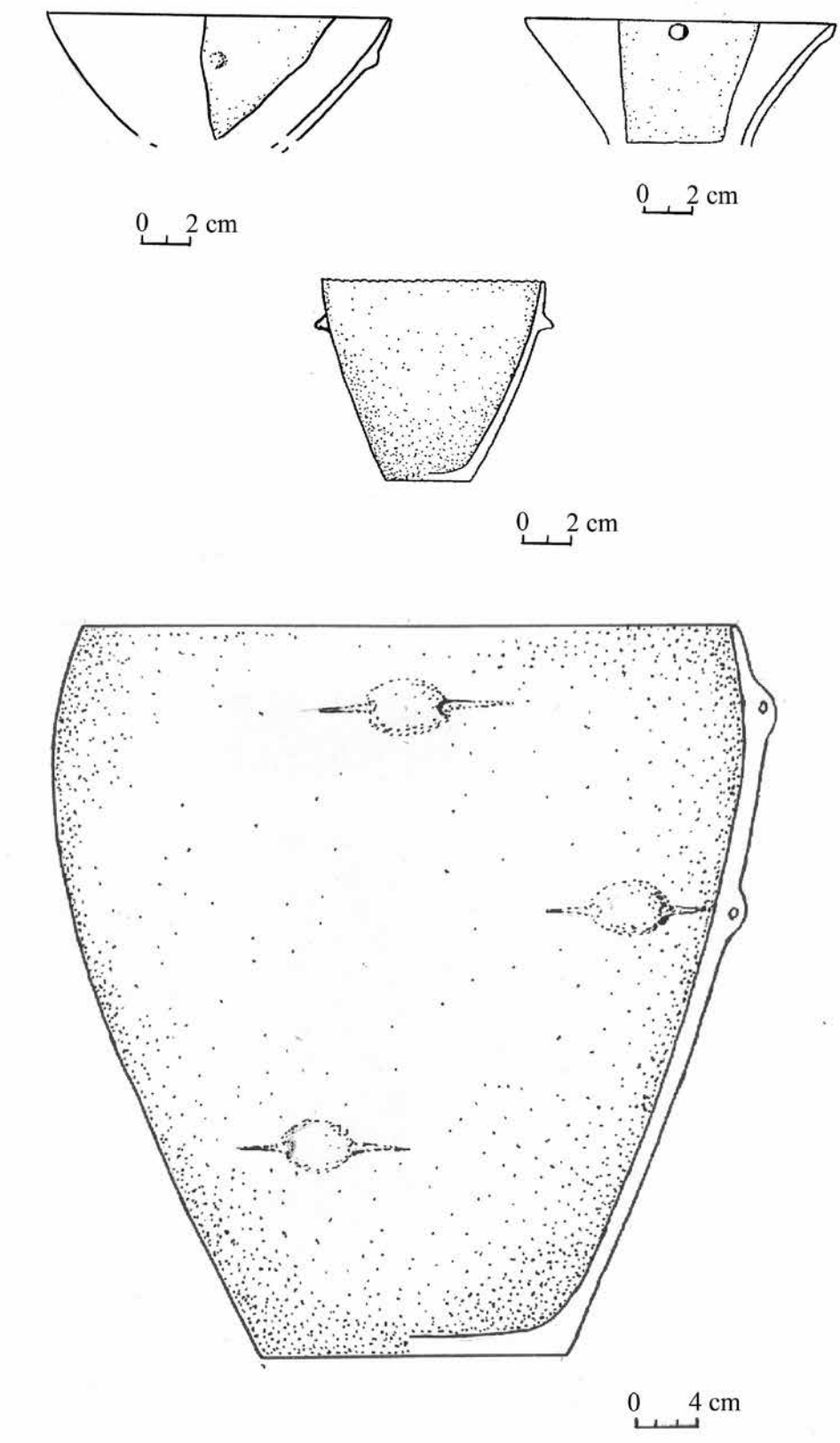


Fig. 4. Bìl´šivcì. Dishes with handles and stickers located on the outside.

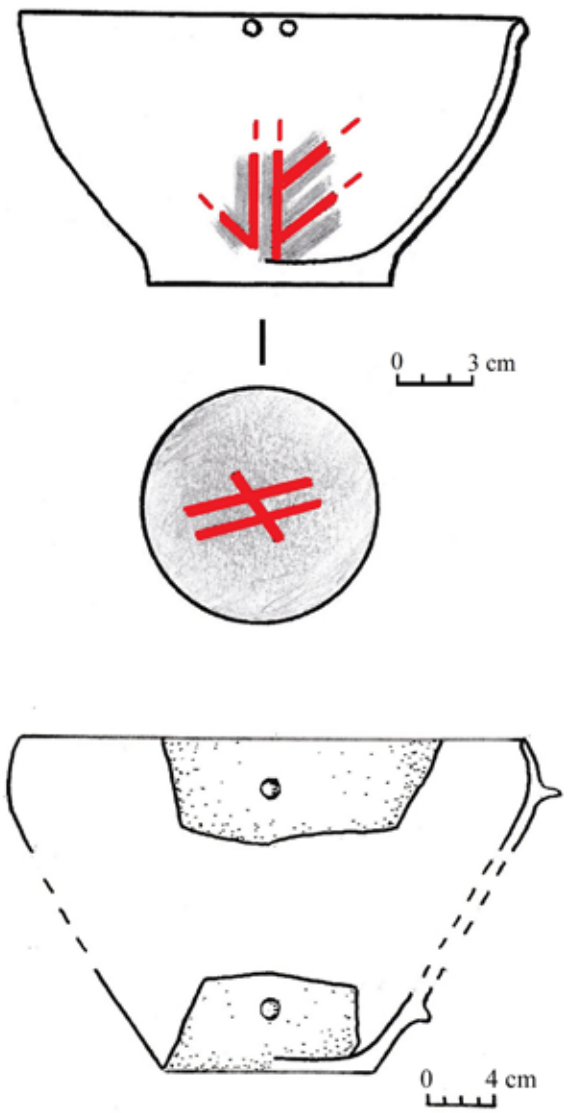


Fig. 5. Bìl´šìvcì. Spherical bowl with stickers under the crown and painting on the body.

culture (its shape and signs on the bottom) and the Trypillia culture (painted bichrome ornament).

Among the relatively well-researched ceramic complexes of the Trypillia sites of the Upper Dniester, there are not many dishes made according to Tiszapolgár samples, or "imports". For example, among the 136 table and kitchen bowls in the cultural layer and objects of the Zalìŝiki group of the Bìl´šìvcì site (Kut), we only have eight bowls that can be attributed to this category. Ceramic "imports" and imitations of the traditions of the Tiszapolgár culture are found among the dishes of the Trypillia culture of the B I–B II stage of the South Bug River Basin. For example, at the site of Rusanìvcì I, a large pithos-like vessel with rows of external handles founded buried among the Trypillian construction (Ovčinnikov and Šiânova 2012, 131–136). A small number of spherical bowls with external protrusions under the crowns and a pear-shaped vessel with two rows of handles were found among the ceramics from the Klìŝìv site of the same time. One row is located almost on the rounded edge of the vessel, and the second is slightly above the bottom (Zaec and Ryžov 1992, 115, 118, fig. 50: 3, 4; 51: 16).

In the sites situated between the Southern Bug and Dnieper Rivers, a small amount of pottery has also been found which can be attributed to the "imports" of the Tiszapolgár culture. For example, in the Veselij Kut site, a krater ornamented with a wide stripe on the crown and areas on the trunk filled with a thick incised mesh was found (Cvek 2006, 26, fig. 10: 11). The researcher of this site attributed this krater to the early stage of Bordogkeresztúr culture (Tsvek 2000, 122). It should be noted that Hungarian researchers have recently indicated the coexistence of Tiszapolgár and Bodrogkeresztúr ceramic styles on some monuments of the Carpathian Basin from 4300 to 4000 BC (Raczky *et al.* 2014, 326, 337). This is the time of the existence of the local groups of the Trypillia B I–B II–Cucuteni A–B culture. Therefore, in our case, it is difficult to confidently attribute this krater and other vessels with "Tiszapolgár" features to any of these cultures.

In addition to the krater among the tableware from Veselij Kut, O. V. Cvek includes a large conical bowl with handles on the outside, a cup-shaped vessel with a hanging protrusions under the edge, and two amphorae with protrusions as "Polgár" influences and "imports" (Tsvek 2000, 122, 123, fig. 6). The influence of the Tiszapolgár–Bodrogkeresztúr ceramic traditions also reached the sites located in the Dnieper Basin. Thus, in the site of Verem'â (Dovžok), V. V. Hvojka found a large pear-shaped vessel with incised ornamentation and two rows of handles. One row was located under the crown, and the second below the edge of the vessel (Hvojka 2016, 60, fig. 90).

During the Trypillia B II–Cucuteni B phase, 3950/3850 BC (Mantu 1998, 132), pottery with features of the ceramics of the Tiszapolgár–Bodrogkeresztúr culture is also found in the ceramic complexes of the sites. For example, in the Bodaki site, which was located in the upper Horyn River, we have the largest number of such dishes. This is be caused by the presence of deposits of high-quality Volhynian flint near this site, which attracted the bearers of the traditions of various local groups of Trypillia culture namely Šipinec´ka, Merešovska as well as Malice and Lublin-Volhynia, Tiszapolgár–Bodrogkeresztúr cultures. This was reflected in the ceramic complex of the Bodaki site.

Spherical bowls with protrusions on the outside (Skakun and Starkova 2003, 155, fig. 4, 5, 9), tall cup-shaped vessels with hanging short protrusions under the crowns (Cynkałowski 1969, 223, fig. 2: b, d; Skakun and Starkova 2003, 155, fig. 5: 5; Skakun *et al.* 2005, 58, fig. 43) were found here (Fig. 6). Two pithos-shaped vessels with handles located on the outside and a tall cup with short hanging protrusions under the crown were discovered in the site of Zalukva (Sad) of this time, which was on the Upper Dniester. It is possible that the people of the Tiszapolgár–Bodroghkeresztúr ceramic traditions were attracted by deposits of Upper Dniester flint, which is not inferior in quality to Volhynian flint.

In Middle Dniester area, the influence of the Tiszapolgár–Bodrogkerestúr ceramic traditions was found at the Trypillia site of stage B II, Bil'če Zolote Park II. These are three quadrangular vessels with rounded edges but with monochrome paintings (Fig. 7). At the sites of Trypillia C I–Cucuteni B, 3850/3650–3500 BC (Mantu 1998, 132) we find dishes made under the influence of the traditions of the Bodrogkeresztúr culture, which re-

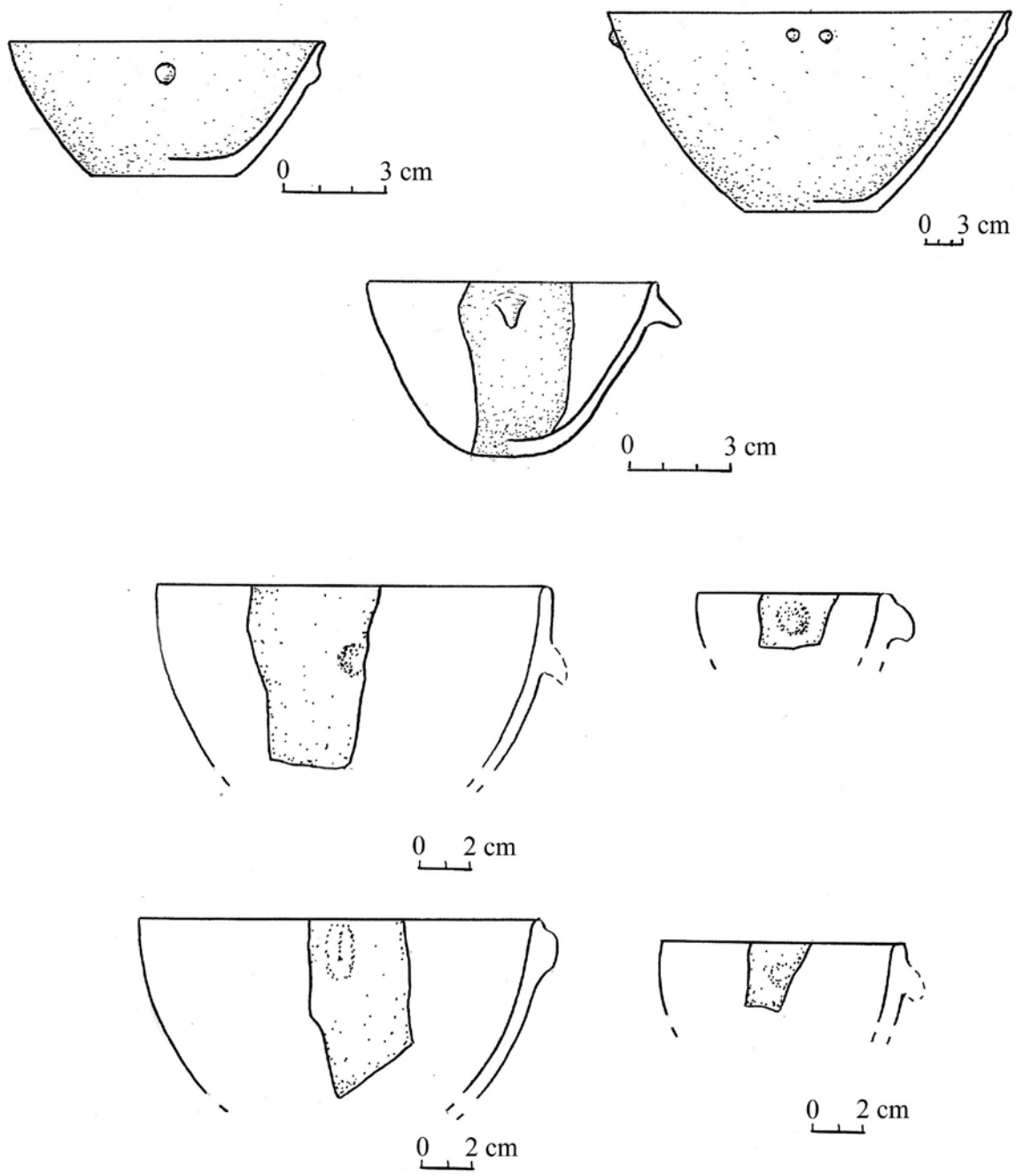


Fig. 6. Bodaki. Dishes with stickers on the outside.

placed the Tiszapolgár culture in the Carpathian Basin around 4000 BC and existed until 3750 BC (Raczky *et al.* 2014, 326, fig. 6). The morphology of these vessels did not differ from vessels made under the influence of Tiszapolgár traditions.

Among the ceramics from the eponymous site of the Šipincì group, there are two large spherical bowls with handles located below the ribs, two quadrangular vessels with rounded corners and handles located on the outside, four tall cup-shaped vessels with hanging short protrusions under the crowns, three tall cup-shaped vessels with rounded protrusions under the crowns, a large pithos-like vessel with a high cylindrical crown and rows of handles arranged on the outside in a checkerboard pattern (Kandiba 2004, 139, fig. 107, 109, 119, 128; cf. Fig. 8, 9).

In the Upper Dniester, a tall cup-shaped vessel with short hanging protrusions under the crowns was found at the site of the Šipinec´ka group of Baleluâ (Tkačuk 2003, 63, fig. 4). From the Middle Dniester, we have ceramics of the Šipinec´ka group from the Bil′če Zolote Verteba Cave I, which is deposited in the Museum of Archeology in Kraków. Among the collection of materials from the first layer of Verteba Cave,

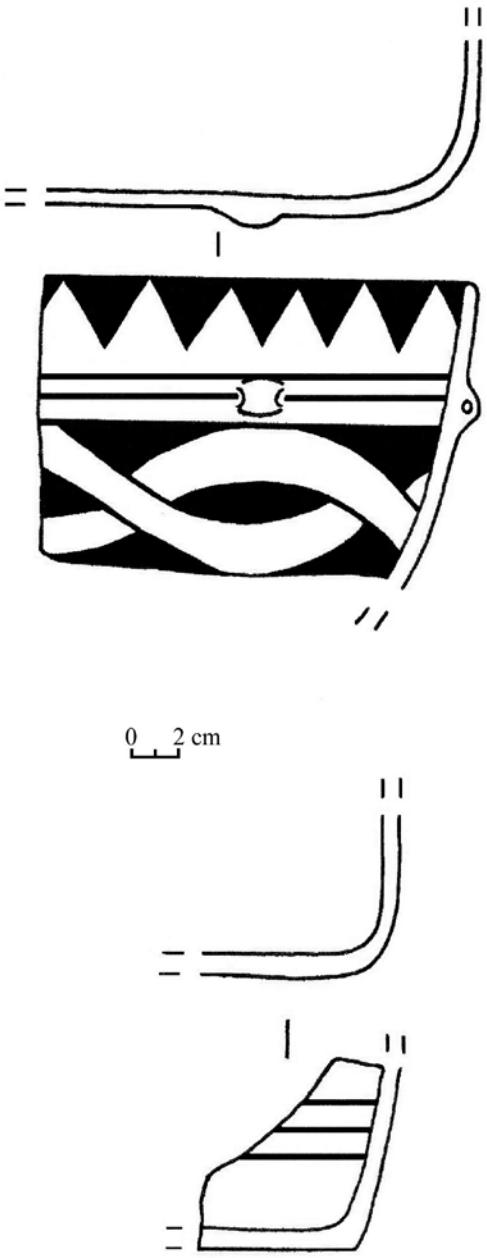


Fig. 7. Bilče Zolote Park II. Fragments of quadrangular vessels.

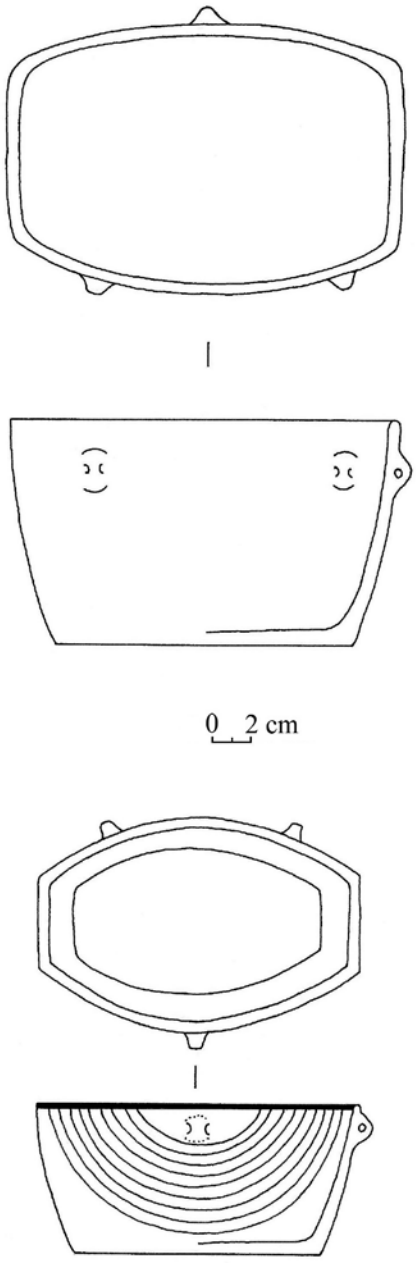


Fig. 8. Šipincì. Dishes with handles and stickers located on the outside.

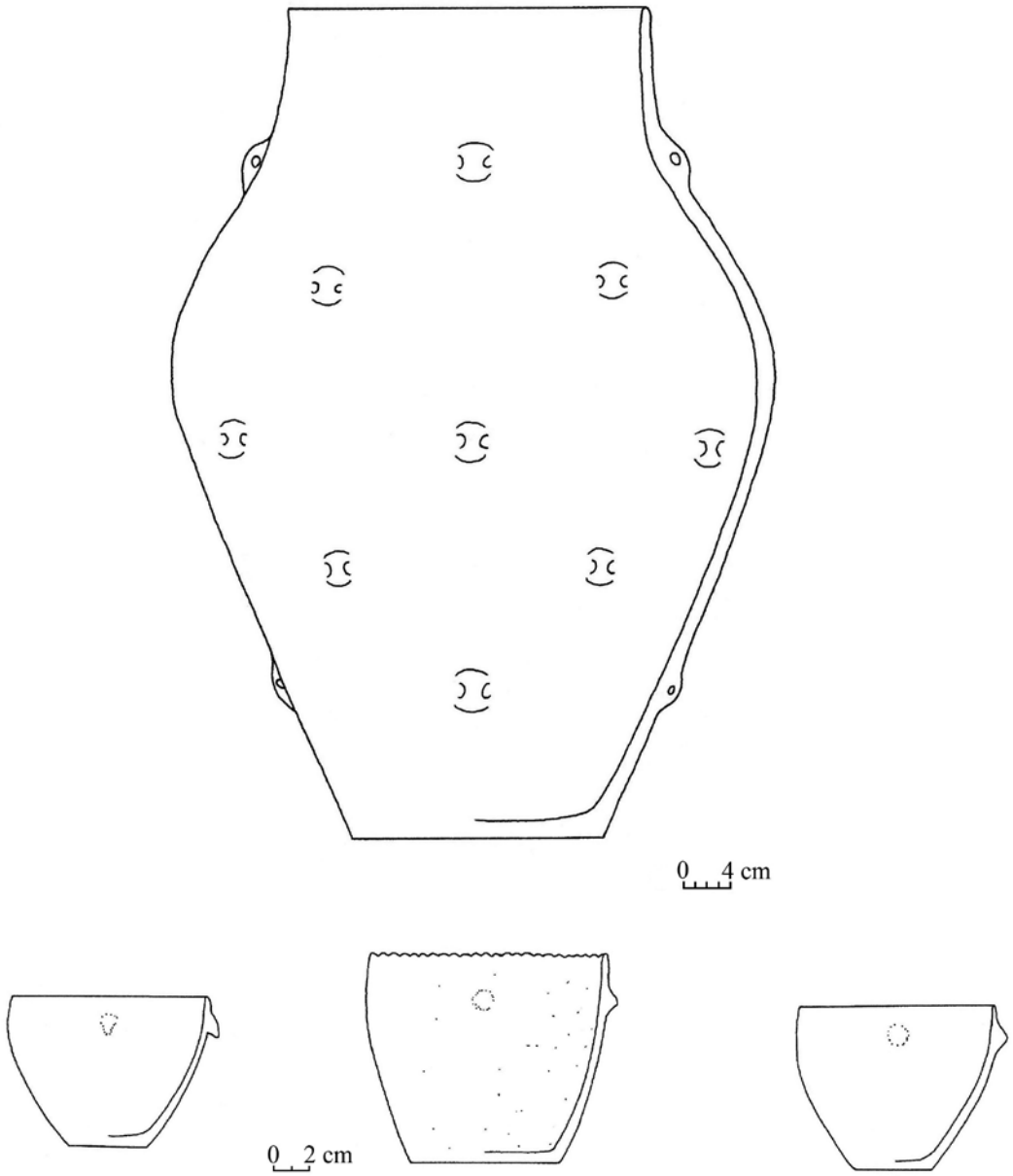


Fig. 9. Šipincì. Dishes with handles and stickers located on the outside.

there are about 98 vessels that can be attributed to the influence of the ceramic traditions of the Bodrogkeresztúr culture. The vast majority of them are highly fragmented but several forms have been preserved intact. Among the "table" dishes, there is a large spherical bowl with external handles and (Sohac´kij 2003, 56, fig. 4: 2), a large spherical bowl with rows of handles arranged in a checkerboard pattern, a pithos-like oval vessel with handles on the outside, a large pithos-like vessel with handles located on the outside in a checkerboard pattern (Tkačuk 2013, 225, fig. 113: 2, 7, 9).

Among the 50 "kitchen" bowls from Bil′če Zolote Verteba I, eight have a single protrusion under the crowns, two have horizontal rows of protrusions under the crowns, two – have protrusions on the trunks (Tkachuk 2013, 218, 219, fig. 106: 3, 7, 12; 107: 5, 6, 12, 26). Two tall cup-shaped vessels with hanging short protrusions located under the crowns also come from this collection (Tkachuk 2013, 211, fig. 99: 24, 32; cf. Fig. 10, 11).

At the sites of the Petreni group of the Trypillia culture of the C I stage, little is known about pottery made under the influence of the ceramic traditions of the Bodrogkeresztúr culture. For example, one large pithos-like vessel with rows of handles arranged in a checkerboard pattern on the outside was found at the

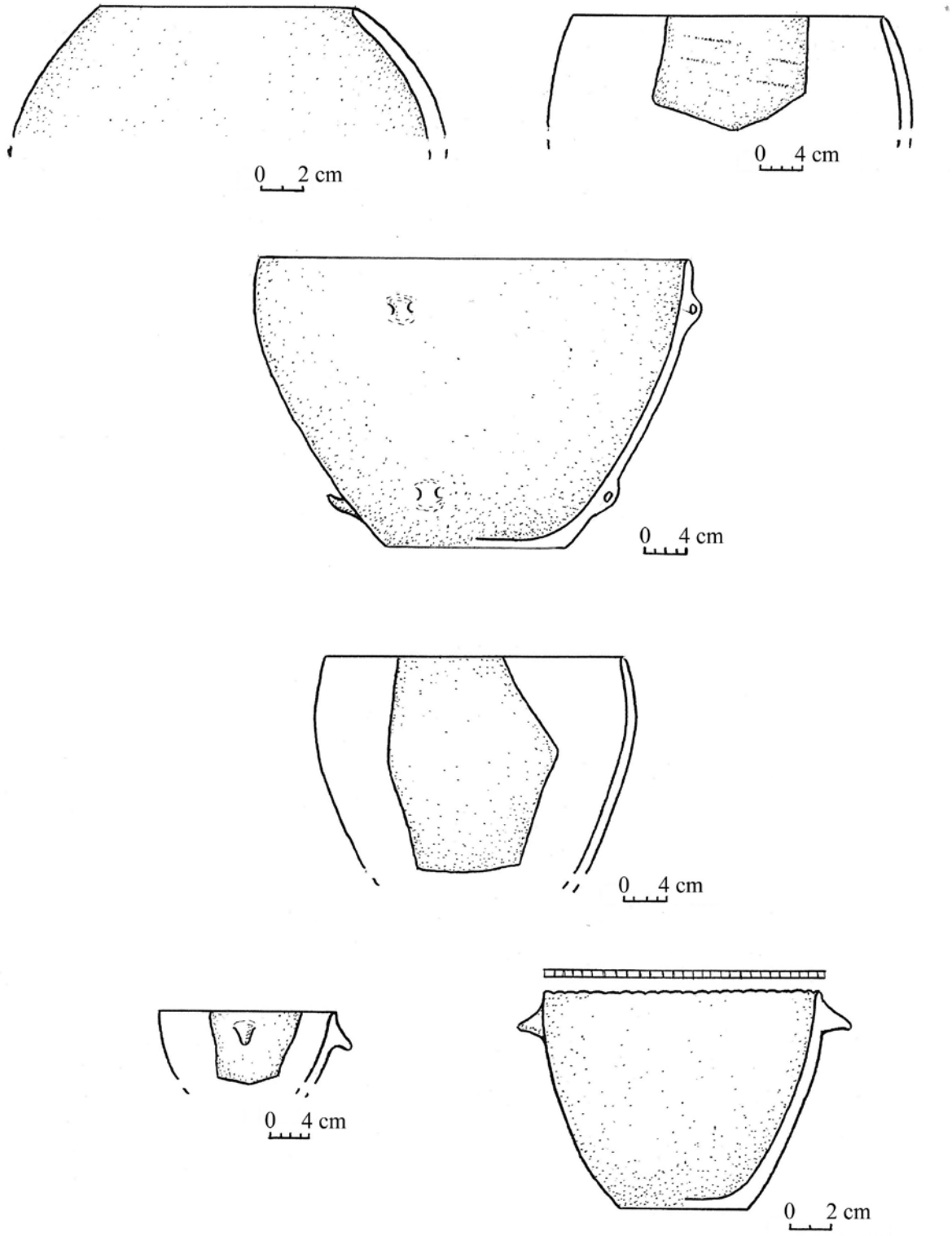


Fig. 10. Bil'če Zolote Verteba I. Dishes with handles and stickers located on the outside.

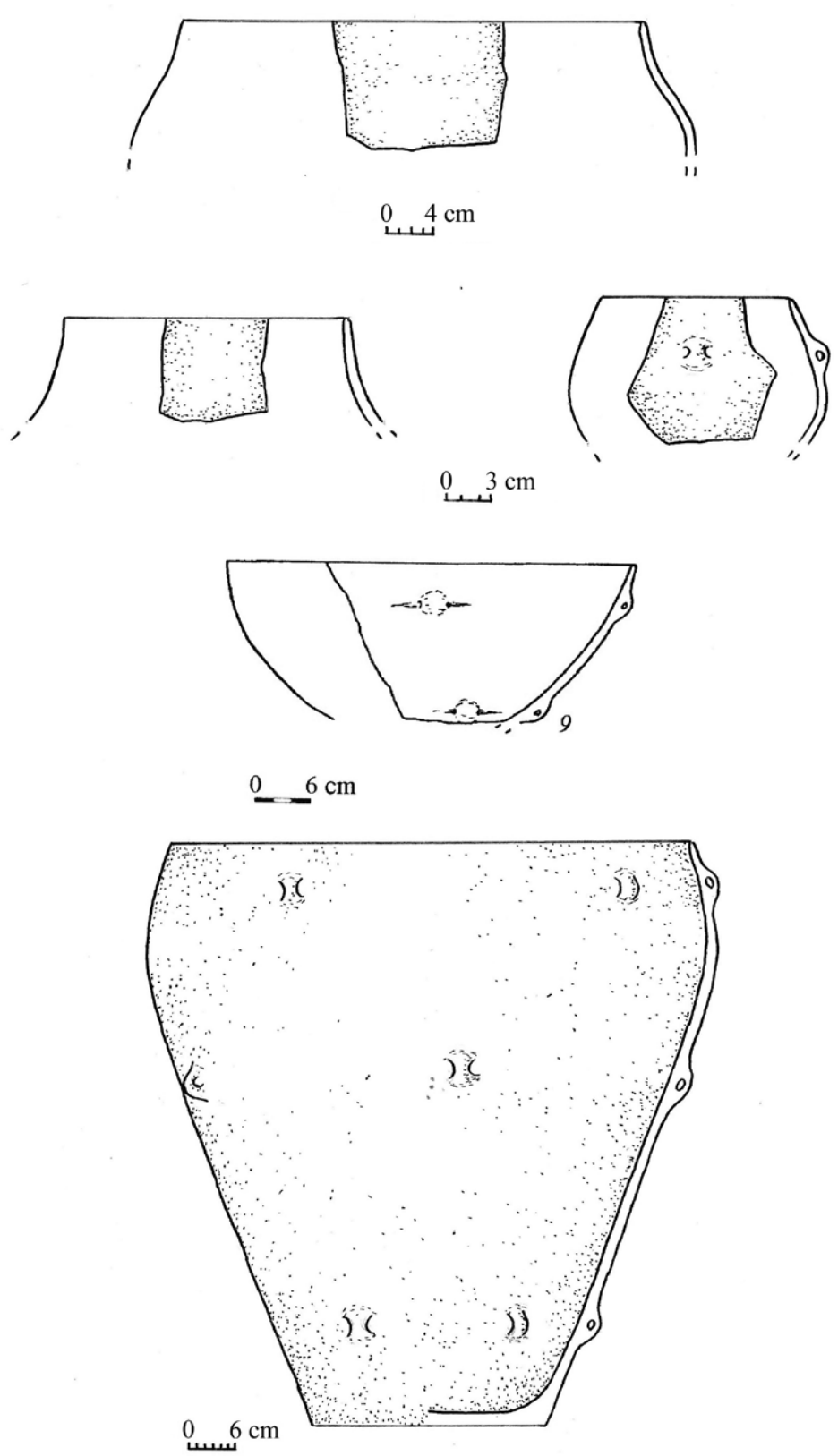


Fig. 11. Bil'če Zolote Verteba I. Dishes with handles and stickers located on the outside.

Petreni settlement (Markevič 1981, 21, fig. 17: 10), but no such vessel was found at the Bernašivka site of the Petrini group. Spherical bowls with bosses located under the crowns were found in the Cucuteni sites of Moldova (Ghelăeşti-Nedeia, Văleni-Piatra Neamţ, Hlăpeşti, Poduri) (Cucoş 1999, 254, 281, fig. 28; 60: 2, 4, 5).

At the sites of the Brînzeni group, several vessels were found which were considered "imports" and influences of the Bodrogkeresztúr culture (Markevič 1981, 178, fig. 108: 1–5). According to the new chronology based on radiocarbon dating, the Brînzeni group of the Trypillia culture of the beginning of stage C II, 3700/3600–3400/3300 BC (Rybicka *et al.* 2019, 93) did not coexist with the Bodrogkeresztúr culture but rather replaced by the Hunyadihalom culture in the Carpathian Basin (Raczky *et al.* 2014, 326). The same applies to the Šarin III settlement of the Kosenìvka group, 3620–3200 BC (Kuštan 2015, 438). Large bowls with rows of handles located on the outside were found here (Kuštan 2015, 433, fig. 3: 8, 10).

Conclusion

Contacts between the Eneolithic cultures of Tiszapolgár and Trypillia–Cucuteni have been determined as starting from 4500 BC. They are manifested in the form of ceramic "imports", influences and imitations at the Trypillia–Cucuteni sites. The origins of such forms of dishes and ideas (for example, the arrangement of handles on the outside in a checkerboard pat-

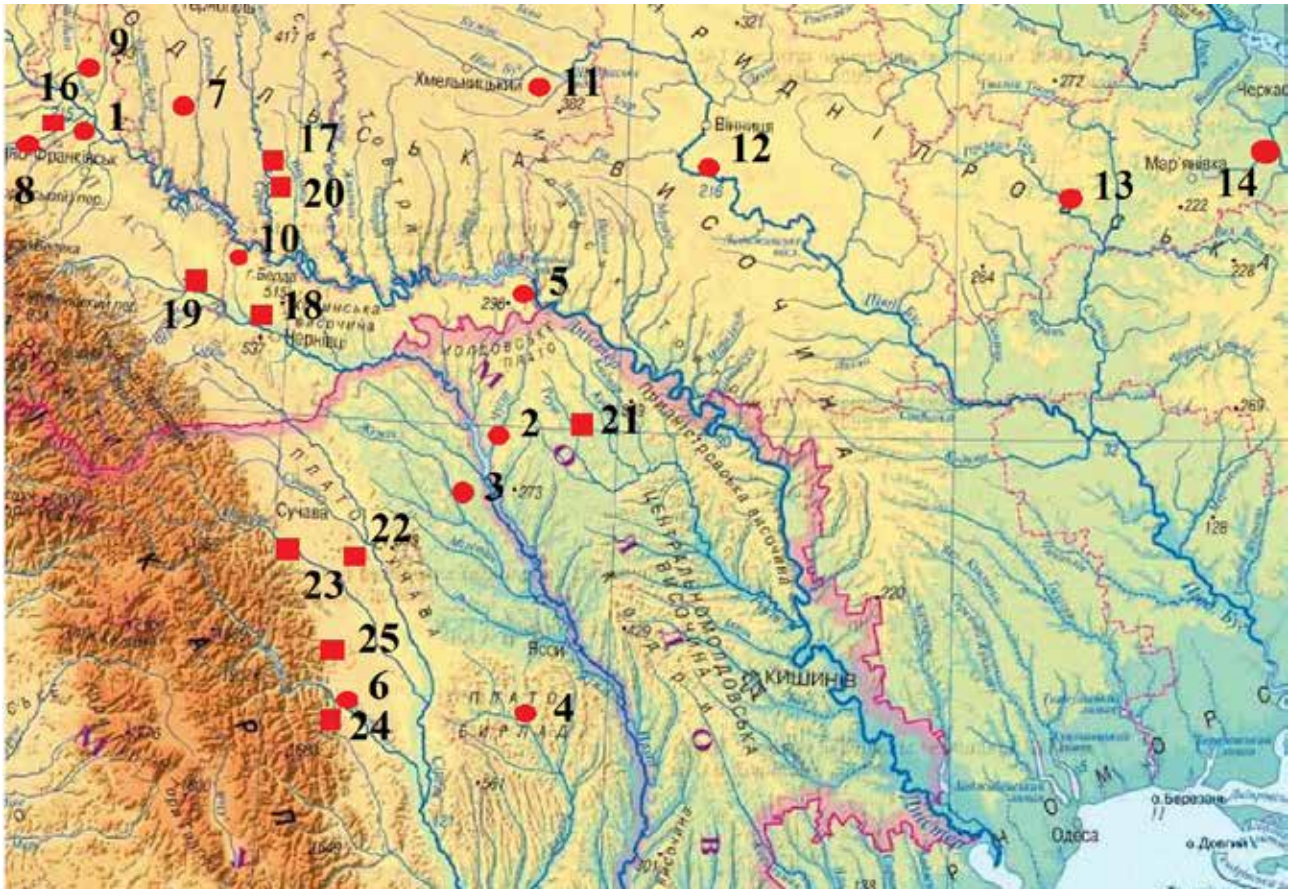


Fig. 12. Location of settlements mentioned in the text.
1. Kozina, Ivano-Frankìvs′k district (Ukraine). 2. Cuconeşti Vechi, Edineţ district (Moldova). 3. Truşeşti, Botoşani district (Romania). 4. Dumeşti, Iaşi district (Romania). 5. Oževe-Ostrìv, Dnìstrovs´kij district (Ukraine). 6. Traian-Dealul Fântânilor, Neamţ district (Romania). 7. Bučač (Fedìr Gora), Čortkìv district (Ukraine). 8. Vìktorìv (Pušikova Gora), Ivano-Frankìvs′k district (Ukraine). 9. Bìl´šivcì (Kut), Ivano-Frankìvs′k district (Ukraine). 10. Zališiki, Čortkìv district (Ukraine). 11. Rusanìvcì I, Hmel´niskij district (Ukraine). 12. Klšv, Vìnnicâ district (Ukraine). 13. Veselij Kut, Zvenigorod district (Ukraine). 14. Verem'â (Dovžok), Obuhìv district (Ukraine). 15. Bodaki, Kremenec´ district (Ukraine). 16. Zalukva (Sad), Ivano-Frankìvs′k district (Ukraine). 17. Bil′če Zolote Park II, Čortkìv district (Ukraine). 18. Šipincì, Černìvcï district (Ukraine). 19. Baleluâ, Kolomiâ district (Ukraine). 20. Bil′če Zolote Verteba Cave I, Čortkìv district (Ukraine). 21. Petreni, Drochia district (Moldova). 22. Ghelăeşti-Nedeia, Neamţ district (Romania). 23. Văleni-Piatra Neamţ. 24. Poduri, Bacău district (Romania). 25. Hlăpeşti, Neamţ district (Romania).

tern) cannot be found among the Trypillia–Cucuteni ceramics. In the Trypillia–Cucuteni ceramic complexes, they do not form a typological series. Instead, such forms of dishes and ideas of their design are found among the dishes of the Tiszapolgár (and, later, Bodrogkeresztúr) culture. The uneven distribution of Tiszapolgár "imports" and influences is currently being studied and there are more of them at the sites of the Prut–Dniester confluence. This can be explained by their territorial proximity to the area of the Tiszapolgár culture (Fig. 12).

The number of "imports" and the intensity of influences from the Bodrogkeresztúr culture (which replaced the Tiszapolgár culture) slightly increases during the Trypillia C I–Cucuteni B stage. This is observed only in the ceramic complexes of the Šipinec´ka group of the Trypillia culture. These "imports" and ideas reached the sites of the Bug–Dnieper interfluve, perhaps through the mediation of the population of the Dniester settlements. The question arises of why did the people of the Trypillia–Cucuteni culture, having a large number of high-quality ceramics, adopt the dishes of the cultures of the Carpathian basin and imitate them? Perhaps the representatives of the Tiszapolgár and Bodrogkeresztúr cultures, who brought copper (and gold) products for exchange, enjoyed a high status among the Trypillians and, accordingly, their things as well.

Acknowledgments

I would like to thank Dr. S. Teliženko for their help with this article, Dr. Â. Âkovišìna for pointed me in the direction of the article by E. Ovčinnikov, and to Sean Mark Miller, MA. for polishing the English version of my text.

References

Alaiba R. 2007. *Complexul cultural Cucuteni–Tripolie Meşteşugul olăritului*. Iaşi: Editura Junimea.

Čornovol D. 2022. Oževe – "ostrìv skarbìv". In Â. P. Gerškovič and D. S. Grečko (eds.), *Arheologìâ Ukraïni za roki nezaležnostì*. Kiïv: Ìnstitut arheologìï Nacìonal′na akademìâ nauk Ukraïni, 106–110.

Cucoş Ş. 1999. *Faza Cucuteni B în zona Subcarpaticâ a Moldovei*. Piatra Neamţ: Editura Constantin Marasă.

Cvek E. V. 1989. Bugo-dneprovskij variant vostočno-tripol′skoj kul′tury (K probleme vydeleniâ kul′tur i lokal′nyh variantov Tripol′â). In S. S. Berezanskaâ (ed.), *Pervobytnaâ arheologiâ. Materialy i issledovaniâ*. Kiev: Naukova dumka, 106–117.

Cvek O. V. 2006. *Poselennâ Shìdnotripìl′s′koï kul′turi (korotkij naris)*. Kiïv: Ìnstitut arheologìï Nacìonal′na akademìâ nauk Ukraïni.

Cynkałowski A. 1969. Osiedle kultury trypolskiej w Bodakach nad Horyniem. *Wiadomości Archeologiczne* 34, 221–227.

Dîmboviţa M. P., Florescu M. and Florescu A. 1999. *Truşeşti. Monografie arheologică*. Bucureşti, Iaşi: Editura Akademiei Române şi Complexul Muzeal Naţional Moldova.

Hvojka V. V. 2006. Neolìt. In N. V. Blaževič, N. R. Mihajlova and O. O. Moška (eds.), *Doslìdžennâ tripìl´s´koï civìlizatsìï u naukovìj spadšinì arheologa Vìkentìâ Hvojki*, 1: *Perekladi naukovih prac′ ta komentarì*. Kiïv: Mìnìsterstvo osvìti ì nauki Ukraïni, Ìnstitut arheologìï Nacìonal′na akademìâ nauk Ukraïni, 41–72.

Iercoşan N. 2002. *Cultura Tiszapolgár în vestul României*. Cluj-Napoca: Editura Muzeului Sătmărean, Editura Nereamia Napocae.

Kadrow S. 1996a. Rola kultury tiszapolgarskiej w eneolicie Europy Środkowej. In J. Kozłowski (ed.), *Kultura malicka. Drugi etap adaptacji naddunajskich wzorców kulturowych w neolicie północnej części Środkowej Europy*. Kraków: Polska Akademia Umiejętności, 141–142.

Kadrow S. 1996b. Faza rzeszowska kultury malickiej. In J. Kozłowski (ed.), *Kultura malicka. Drugi etap adaptacji naddunajskich wzorców kulturowych w neolicie północnej części Środkowej Europy*. Kraków: Polska Akademia Umiejętności, 51–70.

Kadrow S. and Zakościelna A. 2000. Outline of the Evolution of Danubian Cultures in Małopolska and Western Ukraine. In A. Kośko (ed.), *The western border area of the Tripolye culture* (= *Baltic-Pontic Studies* 9). Poznań: Institute of Prehistory Adam Mickiewicz University, 187–255.

Kandiba O. 2004. *Šipincì. Mistectvo ta znarâddâ neolìtičnogo selišа*. Černìvcì: Bukrek.

Konoplâ V. 2005. Poselennâ tripìl´s´koï kul´turi Vìktorìv I. In A. Garbacz and M. Kuraś (eds.), *Kultura trypolska. Wybrane problemy. Materiały z polsko-ukraińskiego seminarium naukowego, Muzeum Regionalne w Stalowej Woli, 7 października 2005*. Stalowa Wola: Muzeum Regionalne, Fundacja Turleja, 71–99.

Kozłowski J. K. 2006. Grupa Wyciąże–Złotniki i bezpośrednie oddziaływania późnopolgarskie [*The Wyciąże–Zlotniki Group and direct Late-Polgar influences*]. In M. Kaczanowska (ed.), *Dziedzictwo cywilizacji naddunajskich: Małopolska na przełomie epok kamienia i miedzi* [*The Danubian Heritage: Lesser Poland at the Turn of the Stone and Copper Ages*] (= *Biblioteka Muzeum Archeologicznego w Krakowie* 1). Kraków: Muzeum Archeologiczne w Krakowie, 53–61.

Kruc A. O and Rižov S. M. 1997. Verhn´odnìstrovs´ka lokal´na grupa pam'âtok tripìl´skoï kul´turi ta novì danì pro zv'âzki tripìl´cìv z naselennâm polgars´koï ta lendel´s´koï kul´tur. *Arheologìa* 2, 23–32.

Kuštan D. 2015. Keramìčnij kompleks pìzn´otripìl´s´kogo poselennâ Šarin III. In O. Dâčenko, F. Menottì, S. Rižov, K. Bunâtân and S. Kadrow (eds.), *Kul´turnij kompleks Kukuten´–Tripìllâ ta jogo susìdi*. L'vìv: Astrolâbìâ, 429–439.

Lazarovici C-M. 2010. New data regarding the chronology of the Precucuteni, Cucuteni and Horodişti-Erbiceni cultures. In J. Šuteková, P. Pavúk, P. Kalábková and B. Kovár (eds.), *Panta rhei. Studies in chronology and cultural development of South-Eastern and Central Europe in earlier prehistory presented to Juraj Pavúk on the occasion of his 75. birthday* (= *Studia Archaeologica et Mediaevalia* 11). Bratislava: Comenius University in Bratislava, 91–114.

Mantu C-M. 1998. *Cultura Cucuteni. Evoluţie, cronologie, legături* (= *Bibliotheca Memoriae Antiquitatis* 5). Piatra Neamţ: Muzeul de Istorie Piatra Neamţ.

Markevič V. I. 1981. *Pozdnetripol´skie plemena Severnoj Moldavii*. Kišinev: Štiinca.

Movsha T. G. 2000. The Tripolye–Cucuteni and Lengyel-Polgár cultures. In A. Kośko (ed.), *The western border area of the Tripolye culture* (= *Baltic-Pontic Studies* 9). Poznań: Institute of Prehistory Adam Mickiewicz University, 133–167.

Ohrìmenko G. 2007. Pro etnomìgracìjnì procesi na teritorìï Volins´kogo Polìssâ v epohu eneolìtu ì bronzi. In G. Ohrìmenko, N. Sklârenko, O. Kalìšuk, V. Tkač and O. Romančuk (eds.), *Oleksandr Cinkalovs´kij ta praìstorïîâ Volynì*. Luc´k: Wolins´ka oblasna drukarnâ, 277–305.

Ovčinnikov E. V. and Šiânova G. V. 2012. "Pìfos" ìz tripìl´s´kogo poselennâ Rusanìvcì I: vìd viâvlennâ do eksponuvannâ. In *Starodavnìj Medžibìž v ìstoriko-kul´turnìij spadšinì Ukraïni*, 1. Medžibìž, Hmel´nickij: P. P. Mel´nik A. A., 131–136.

Peleŝišin M. 1997. Z ìstorìï perših tripìl´s´kih obŝin u Seredn´omu Pogorinnì. *Arheologìčnì doslìdžennâ L´vìvs´kogo unìversitetu* 2, 47–65.

Raczky P., Anders A. and Siklósi Z. 2014. Trajectories of Continuity and Change between the Late Neolithic and the Cooper Age in Eastern Hungary. In W. Schier and F. Draşovean (eds.), *The Neolithic and Eneolithic in Southeast Europe. New approaches to dating and cultural dynamics in the 6th to 4th millennium BC* (= *Prähistoriche Archäologie in Südosteurop*e 28). Rhaden/Westfalen: Verlag Marie Leidorf, 319–346.

Raczky P., Domboróczki L. and Hajdú Z. 2007. The site of Polgár-Csőszhalom and its cultural and chronological connection with the Lengyel culture. In J. Kozłowski and P. Raczky (eds.), *The Lengyel, Polgár and related cultures in the Middle/Late Neolithic in Central Europe*. Kraków: Polska Akademia Umiejętności, 49–70.

Rybicka M., Sîrbu G., Król D. and Bicbaev V. 2019. New radiocarbon dates for stage C II Tripolye culture, Northern Moldova. *Baltic-Pontic Studies* 24, 87–103.

Sitnik O. S and Âgodins´ka M. O. 2012. Ohoronnì rozkopki tripìl´s´kogo ta slov'âns´kogo poselen´ v Bučačì. In V. V. Otroŝenko, V. Kruc, M. I. Gladkih, N. Skakun and E. Cvek (eds.), *Zemledel'cy i skotovody Drevnej Evropy. Problemy, novye otkrytiâ, gipotezy*. Kiev, Sankt-Peterburg: Institut arheologii Nacional´naâ akademiâ nauk Ukrainy, Institut istorii material´noj kul´tury Rossijskaâ akademiâ nauk, 187–201.

Skakun N. N., Cvek E. V., Kruc V. A., Mateva B. I., Korvin-Piotrovskij A. G, Samzun A. and Âkovleva L. M. 2005. *Arheologičeskie issledovanâ tripol´skogo poseleniâ Bodaki v 2005 g*. Kiev, Sankt-Peterburg: Korvin Press.

Skakun N. N and Starkova E. G. 2003. Osobennosti keramičeskogo kompleksa tripol´s´kogo poseleniâ Bodaki. In A. G. Korvin-Piotrovskij (ed.), *Tripìl´s´kì poselennâ-gìganti. Materìali mìžnarodnoï konferencji*. Kiïv: Korvin Press, 148–160.

Sohac´kij M. 2003. Arheologìčnì rozkopki v pečerì Verteba bïïlâ sela Bìl´če-Zolote v 1996–1998 rokah. In I. Vìnokur and D. Kozak (eds.), *Arheologìâ Ternopìl´šini*. Ternopìl´: Džura, 45–59.

Sorokin V. 2002. *Aspectul regional cucutenian Drăguşeni-Jura* (= *Bibliotheca Memoriae Antiquitatis* 11). Piatra Neaţ: Editura Constantin Matasă.

Titov V. S. and Markevič V. I. 1974. Novye dannye o zapadnyh svâzâh pozdnego Tripol´â. *Sovetskaâ arheologiâ* 3, 150–164.

Tkachuk T. 2013. Painted ceramics. In S. Kadrow (ed.), *Bilcze Złote. Materials of the Tripolye culture from the Werteba and the Ogród sites* (= *Biblioteka Muzeum Archeologicznego w Krakowie* 5). Kraków: Muzeum Archeologiczne w Krakowie, 29–44.

Tkačuk T. 2003. Materìali do vivčennâ aktual'nih problem tripìl's'koï kul'turi Verhn'ogo Podnìstrov'â ì Popruttâ. In P. Toločko, V. Baran, O. Beregovski, T. Tkačuk and Â. Kluba (eds.), *Galič v doìstorïï ì seredn'oviččì. Materìali mìžnarodnoï naukovoï arheologìčnoï konferenìï*. Galič: Galicka drukarnâ, 57–63.

Tkačuk T., Kočkìn Ì. and Ŝodrovs´kij R. 2017. *Bagatošarove poselennâ Bìl´šivcì (ur. Kuti) na Verhn´omu Podnìstrov'ï. Zbori P. Pereklìti. Doslìdžennâ 1999 r.* Galič, Ivano-Frankìvs´k: Prosvita.

Tkačuk T., Kočkìn Ì. and Ŝodrovs´kij R. 2020. *Bagatošarove poselennâ Bìl´šivcì (ur. Kuti) na Verhn´omu Podnìstrov'ï. Doslìdžennâ 2001 r*. Galič, Ivano-Frankìvs´k: Prosvita.

Tkačuk T., Kukula R., Krehovec´kij Ì., Mel´ničuk O. and Fìgol´ A. 2010. Poselennâ rann´ogo Tripìllâ Kozina (uročiše Solovče) na Verhn´omu Podnìstrov'ï. *Arheologìčnì doslìdžennâ L´vìvs´kogo unìversitetu* 13, 219–238.

Tsvek O. V. 2000. The Eastern Tripolye culture and its contacts with the Eneolithic tribes of Europe. In A. Kośko (ed.), *The western border area of the Tripolye culture* (= *Baltic-Pontic Studies* 9). Poznań: Institute of Prehistory Adam Mickiewicz University, 111–132.

Videiko M. Y. 2000. Tripolye and the cultures of Central Europe: facts and the character of interactions: 4200–2750 BC. In A. Kośko (ed.), *The western border area of the Tripolye culture* (= *Baltic-Pontic Studies* 9). Poznań: Institute of Prehistory Adam Mickiewicz University, 13–68.

Vizdal J. 1977. *Tiszapolgárske pohrebisko vo Veľkých Raškovciach*. Košice: Vydavatelstvo pre Zemplìske Múzeum v Michalovciah.

Winn S. M. M. 1981. *Pre-writing in Southeastern Europe. The sign system of the Vinċa culture ca. 4000 B.C.* Calgary: Western Publishers.

Zaec I. I. and Ryžov S. N. 1992. *Poselenie tripol'skoj kul'tury Klišev na Ûžnom Buge*. Kiev: Naukova kniga.

Zakościelna A. 1996. *Krzemieniarstwo kultury wołyńsko-lubelskiej ceramiki malowanej* (= *Lubelskie Materiały Archeologiczne* 10). Lublin: Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej.

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

Anna Zakościelna[1], Kamil Adamczak[2],
Aldona Garbacz-Klempka[3], Łukasz Kowalski[4]

DOI: 10.15584/anarres.2023.18.5

[1] Institute of Archaeology, Maria Curie-Skłodowska University in Lublin, M. Curie-Skłodowska 4 Sq., 20-031 Lublin, Poland;
e-mail: anna.zakoscielna@mail.umcs.pl; ORCID: 0000-0002-1487-0117

[2] Institute of Archaeology, Nicolaus Copernicus University in Toruń; Szosa Bydgoska 44/48, 87-100 Toruń, Poland;
e-mail: adamczak@umk.pl; ORCID: 0000-0002-8847-5670

[3] Faculty of Foundry Engineering, The Historical Layers Research Centre, AGH University of Science and Technology, Reymonta 23, 30-059 Kraków, Poland;
e-mail: agarbacz@agh.edu.pl; ORCID: 0000-0001-8417-6131

[4] Institute of Archaeology, Nicolaus Copernicus University in Toruń; Szosa Bydgoska 44/48, 87-100 Toruń, Poland;
e-mail: lukasz.kowalski@umk.pl, ORCID: 0000-0003-0647-826X

A Cucuteni-Vădastra Type Dagger from Site 26 at Strzyżów (S-E Poland) Attests to the Intercultural Landscape of the Eneolithic Eastern Carpathians

Abstract

Zakościelna A., Adamczak K., Garbacz-Klempka A., Kowalski Ł. 2023. A Cucuteni-Vădastra Type Dagger from Site 26 at Strzyżów (S-E Poland) Attests to the Intercultural Landscape of the Eneolithic Eastern Carpathians. *Analecta Archaeologica Ressoviensia* 18, 83–95

In the mid-1990s, a copper dagger of the Cucuteni-Vădastra type was found in the Lublin-Volhynian culture cemetery at Strzyżów, south-eastern Poland. The dagger was customized as a pendant and deposited in an inhumation burial that contained the remains of an adult male and over ten other grave offerings dating to the 2nd quarter of the 4th millennium BC. This paper presents the results of archaeological and metallographic examinations of the dagger from Strzyżów and relates them to a wider cultural context of the region. The results of our study show that the dagger has no signs of use-wear, and furthermore indicate that the metal used for its production is fahlore copper which could have been sourced from the Slovak Ore Mountains. The two other Cucuteni-Vădastra type daggers that were discovered in the vicinity of Strzyżów mark the Western Volhynian Upland as a distinct cluster of the Cucuteni-Vădastra dagger industry in Europe. Furthermore, the daggers from Poland evidence a close relationship between the Lublin-Volhynian culture and the Cucuteni-Tripillia complex and attest to the intercultural landscape of the Eastern Carpathians region during the Eneolithic.

Keywords: Eneolithic, Lublin-Volhynian culture, grave goods, copper dagger, ED XRF analysis, Western Volhynian Upland

Received: 29.09.2023; **Revised:** 17.10.2023; **Accepted: 26.10.2023**

Introduction

The dagger was discovered in the mid-1990s during archaeological excavations at site 26 in Strzyżów, Lublin Voivodeship (Zakościelna and Gurba 1995, 6; Zakościelna 2010, 49–52, 295–300; fig. 12, tab. 61). The artefact was found *in situ* in an inhumation burial that contained the remains of an adult male and other grave offerings (Zakościelna 2010, 296), enabling an accurate assessment of the exact location of the artefact in the grave pit and its relation to the skeleton. The dagger belongs to the Cucuteni-Vădastra type, following the classification by Irenäus Matuschik (1998), and can be assigned to the late phase of the Lublin-Volhynian culture (hereafter L-VC; 3800–3600 BC). The results of archaeological and anthropological analyses (Kozak-Zychman and Maślanka 2005) provided precise information concerning the cultural,

social and chronological context of the dagger, which is rare for metal artefacts and gave us a solid contextual background for research on the earliest copper metalwork from this region of modern Poland.

This paper aims to provide a more detailed typological and contextual characterization of the dagger from Strzyżów and to establish its elemental composition and manufacturing technology. The obtained results, aided by several finds of Eneolithic daggers made in south-eastern Poland and western Ukraine, provided the basis for the construction of an archaeological model proposing the movement and absorption of Cucuteni-Vădastra daggers in the region and allowed us to broaden our interpretations concerning the distribution pattern of these artefacts in the geohistorical range of the L-VC people and neighbouring regions.

The site and grave 1

The L-VC cemetery in Strzyżów 26 is located on the Horodło Ridge (851.11 – Solon *et al.* 2018, map), in the edge zone of the Bug River valley, on a promontory with south-western, southern, south-eastern, and eastern exposures, ca. 20 m above the lower floodplain. The cemetery is set on a rectangle or trapezoid plan of 16 × 28 m, with the long axis oriented west-east and probably contained eight graves clustered in pairs in the corners (seven were excavated, the eighth was destroyed by a military trench in 1941). The site was strongly damaged by slope erosion, and the graves were discovered at a small depth and with no outlines of the burial pits (Zakościelna 2010, 49–52, fig. 12, 295–296, tab. LXI). Also, an inhumation grave dating to the Roman period was found in the central part of the cemetery (Zakościelna and Gurba 1997).

Grave 1 is located in the south-western corner of the cemetery (Zakościelna 2010, 49–52, fig. 12). At the junction between the topsoil and subsoil, 15–20 cm underground, badly preserved skeletal remains of an adult male aged 25–30 years were recorded (Kozak-Zychman and Maślanka 2005) along with a disturbance of the original arrangement of grave furnishings that resulted from the agricultural use of the site. The male was buried with his head oriented to the south. The upper skeleton was discovered lying on its back, but the position of the right fibula appears to indicate that the lower limbs were bent to the right. The furnishings include a bowl (placed south to the head), the copper dagger in question (found near the right clavicle), a fragment of copper wire (found between the ribs and the right pelvic plate) and five flint artefacts (a blade located near the dagger, two end-scrapers and a retouched blade – all three located 20 cm west of the bowl fragments, a damaged trapeze found 50 cm north of the remains of the lower limbs). Near the pelvis and the place where the lower limbs were supposed to have rested, crumbled mussel shells were discovered (Fig. 1).

Typological analysis

The dagger has an elongated triangular blade part with a middle rib and a short triangular blade base topped with three rivet-holes (Fig. 2). Metrics: total length 12.3 cm long, width 3.8 cm, thickness 0.3–0.5 cm, weight 53 g. The base of the blade was folded and customized as a pendant, which reduced its original length (Fig. 3), however this does not affect the typological analysis, which is presented in the *Discussion* section.

The most detailed overview of the earliest copper dagger industry of Central, Eastern, and Southern Europe can be found in the publications by Ivan Vajsov (1993) and Irenäus Matuschik (1998). According to the classification scheme developed by Ivan Vajsov (1993, 124), the dagger from Strzyżów belongs to variant II of the Cucuteni type. Based on the previous typological and chronological schemes of the earliest copper daggers in Europe and comparisons of their elemental compositions, I. Matuschik (1998) proposed a new typology of Cucuteni daggers that includes three different variants: Vădastra, Lovas (A and B) and Mondsee, which are characterised by standardised shapes and other morphological features. The classification scheme and terminology used for the dagger from Strzyżów follows I. Matuschik (1998). Accordingly, the dagger can be labelled as the Vădastra variant (Fig. 3) and its morphology adheres well to the Cucuteni type: an elongated triangular blade, triangular or trapezoidal blade base topped with rivet-holes (usually three) and a central rib running almost the entire length of the blade (cf. Matuschik 1998, fig. 223–226).

Also Ion Mareş in his work on the metallurgy of the Cucuteni culture distinguished the Cucuteni type daggers that contains specimens with a triangular blade provided with a central rib and rivet-holes (Mareş 2002, 117; 2012, 204).

Metallographic analyses

The dagger was examined for casting defects, plastic deformation, and use-wear traces by a Nikon SMZ 745Z stereoscopic microscope equipped with

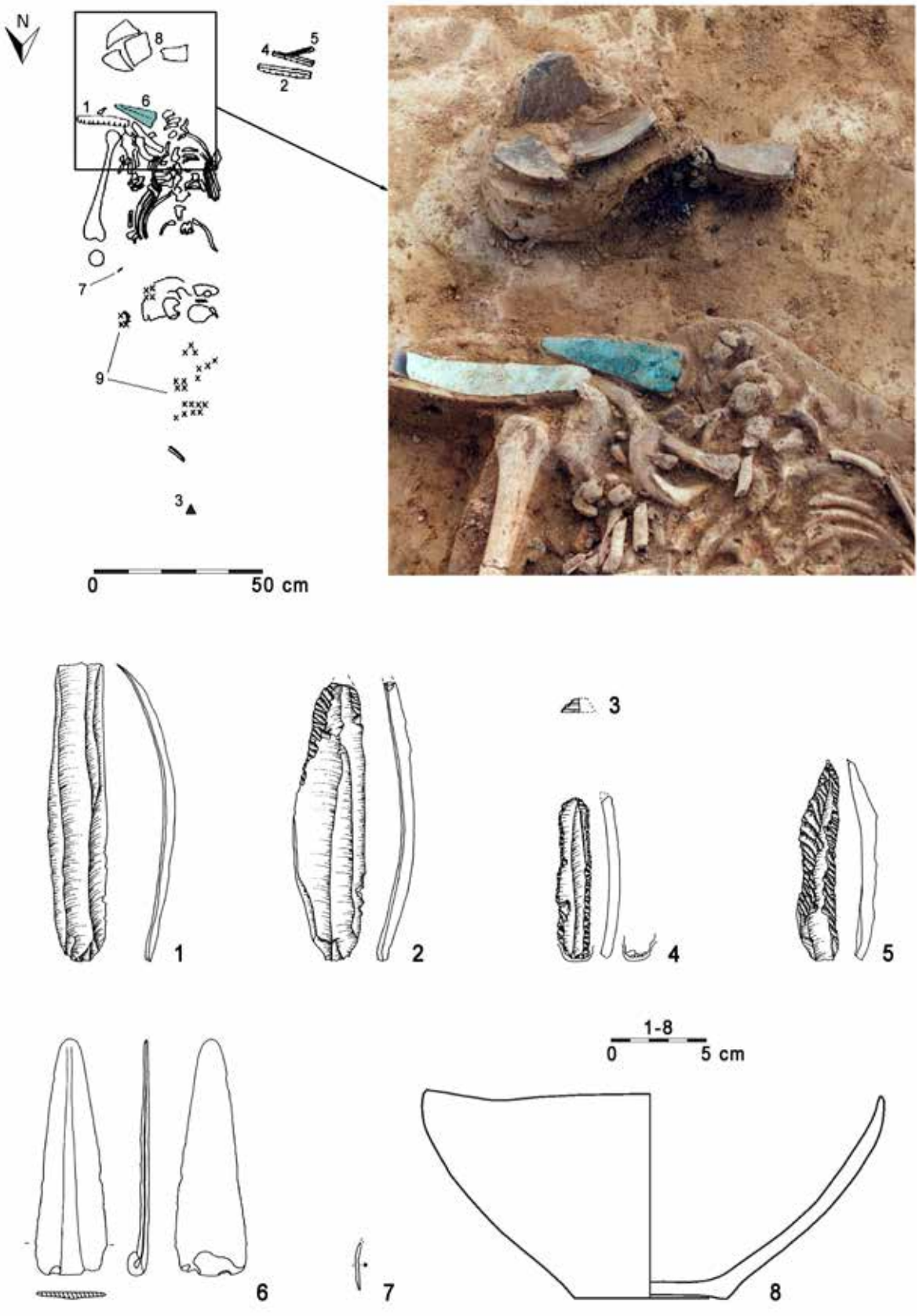


Fig. 1. Strzyżów, site 26. Layout and inventory of grave 1 with an *in situ* view of the dagger. 1–5 – blades and flint tools; 6 – copper dagger; 7 – fragment of copper wire; 8 – vessel; 9 – mussel shells (after Zakościelna 2010, tab. LXI, with changes; photo by A. Zakościelna; graphic design by E. Starkova).

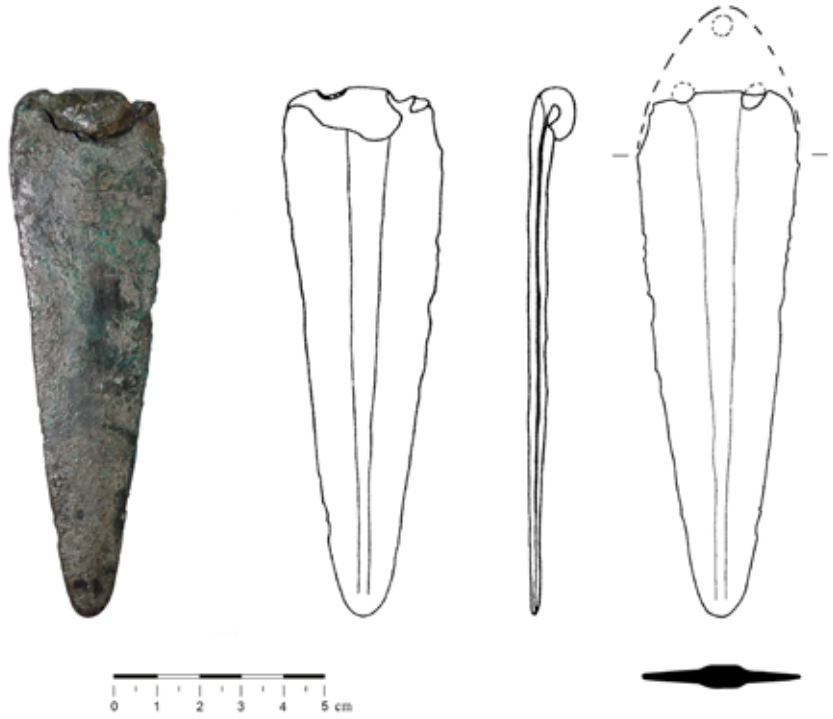


Fig. 2. Strzyżów, site 26, grave 1. Copper dagger (after Zakościelna 2010, tab. LXI: 6, with changes; drawn by A. Zakościelna; graphic design by E. Starkova, K. Adamczak; photo by Ł. Kowalski).

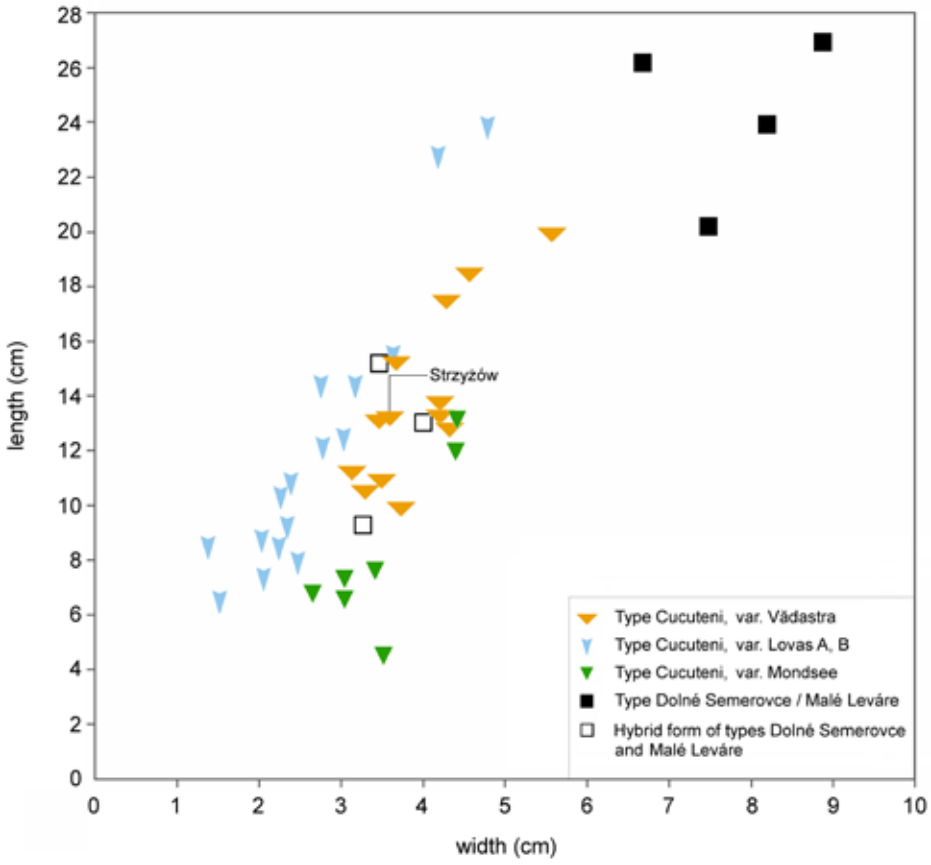


Fig. 3. Length vs width diagram for the Cucuteni daggers, Vădastra, Lovas and Mondsee variants, with daggers and special forms of Dolné Semerovce/Malé Leváre series. The daggers of the L-VC and W-ZG culture are also displayed in the diagram (after Matuschik 1998, fig. 229 with changes).

a Nikon Digital Sight DsFi1 microscope camera and the Nis-Elements BR system for picture analysis. The freshly exposed and cleaned surface of the dagger was analysed for elemental concentrations (Fe, Co, Ni, Cu, As, Ag, Sn, Sb, Pb and Bi) using a Spectro Midex spectrometer equipped with a molybdenum X-ray tube and a Si Drift Detector (SDD), with 150 eV resolution at 5.9 keV. To optimise the data reliability for each metal object, ten measurements were taken in two different areas to compensate for possible heterogeneity.

The macrophotographs confirm that dagger was cast, as evidenced by numerous irregularities resulting from physicochemical reactions in the contact zone of the molten metal and the casting mould (Fig. 4: B, C). Misruns shown in Fig. 4: A occurred when the molten metal did not fill the mould. Casting defects were not fully removed during the finishing touches. The object displays no use-wear traces (cf. Fig. 4: F) and the chipping of the blade (Fig. 4: D) was caused by corrosion.

Before burial, the dagger went through plastic work that most probably involved annealing (the base and edge of the blade are welded) and eventually it was customized as a pendant (Fig. 4: E).

The ED XRF analyses show that the dagger is made of copper with a noticeable amount of antimony (Sb) and silver (Ag) making up 0.67% and 0.32%, respectively (Tab. 1). A relatively high amount of bismuth (Bi=0.17%) is accompanied by a low content of iron (Fe<0.02%), which is typical for the Eneolithic metalwork (Cook and Aschenbrenner 1975, 253).

The results indicate that fahlore copper was used for the dagger from Strzyżów, which can be further classified into group IVa of antimony copper, according to Rüdiger Krause (2003, 90, fig. 40). This type of antimony copper is sometimes called Nográdmárcal copper and is assumed to come from the ore deposits in the western Carpathians; their utilisation ceased towards the late Early Copper Age (Schubert 1982; Krause 2003; Šikulová and Zápotocký 2010; Siklósi *et al.* 2022). As there is no fahlore copper documented from the region of modern Bulgaria and Serbia (e.g., Pernicka *et al.* 1993; 1997), the most probable origin of the copper used for the dagger from Strzyżów are metal ore deposits in the Slovak Ore Mountains. Some of the mineralisations in this region produced a significant amount of Bi, which is consistent with the content of this element in the analysed object (Schreiner 2007). However, this must be confirmed in the future by lead isotope analysis.

A Vădastra-type dagger discovered in Kraków Nowa Huta-Wyciąże was also cast in antimony copper (Tab. 1; Kozłowski 1971, 88, tab. 1), however the available elemental compositions of Vădastra-type daggers indicate that different types of copper ores were used for their production, as evidenced by daggers from Sărata Monteoru and Galiče which were made of arsenical copper (Matuschik 1998, cf. tab. 1).

Discussion

Among the several hundred copper artefacts discovered in Poland that date to the Early Eneolithic, there are six known daggers, three of which can be linked to the L-VC (Strzyżów 26, grave 1; Łasków 1, Hrubieszów district, alleged grave; Horodło/Stefankowice, Hrubieszów district, stray find; however the stray find of a dagger from site 12 at Janki, published by A. Zakościelna (2006, fig. 5: 12) with L-VC copper artefacts, was not added as L-VC metalwork due to its high content of tin (>2%). The three others come from the Wyciąże-Złotniki group (hereafter W-ZG) in western Lesser Poland (Kraków-Nowa Huta-Wyciąże 5, grave 6; Ojców 18, Ciemna Cave, Kraków district – two finds). Most of these are finds with no associated material or

Table 1. Elemental compositions (wt%) of the dagger from Strzyżów and contemporary Cucuteni-Vădastra daggers from Europe (after Matuschik 1998, 235–237, fig. 233, 234, with changes).

Locality	Lab. no.	Fe	Co	Ni	Cu	As	Ag	Sn	Sb	Pb	Bi
Strzyżów, PL	…	< 0.02	0.05	0.07	98.7	< 0.01	0.32	< 0.05	0.67	< 0.02	0.17
Kraków Nowa-Huta, PL	CL 863	0	0.00	0	99.1	0.03	0.37	0	0.42	0	0.06
	KR 863	0.00	…	0.00	99.4	0.03	0.37	0.00	0.42	0.00	0.86
Contesti, RO	SAM 8544	0.00	0.00	0.00	98.6	0.00	0.21	0.00	0.36	0.00	0.04
Sarata Monteoru, RO	SAM 8543	0.00	0.00	< 0.01	98.6	1.4	0.02	0.00	…	0.00	0.00
Galiče, BG	HDM 2737	< 0.04	0.00	0.01	98.7	1.3	0.00	< 0.01	0.04	0.01	…

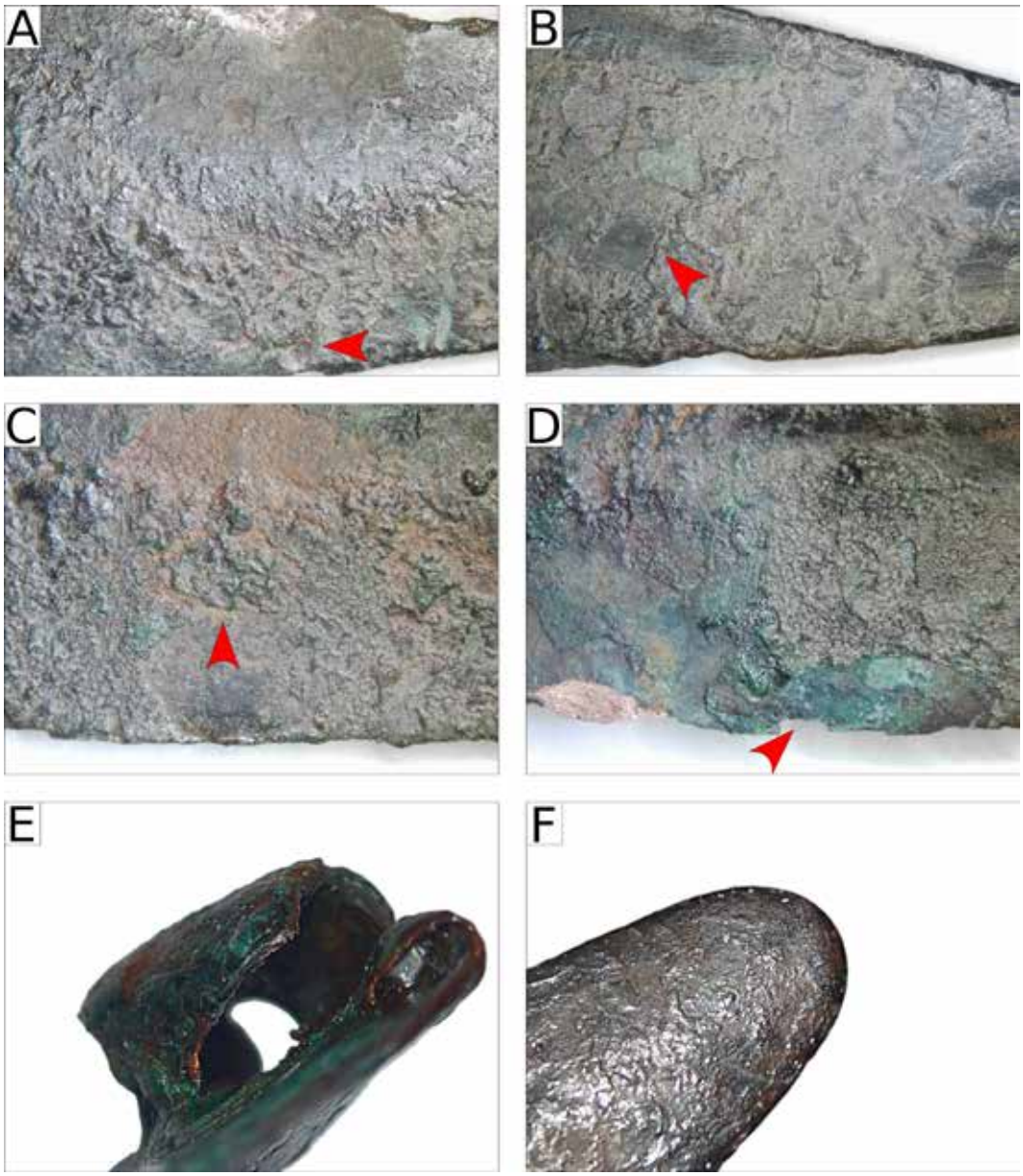


Fig. 4. Strzyżów, site 26, grave no. 1. Macrostructures indicating the production technology of the dagger and the later modification.
A – misrun; B, C – macrostructures indicating a reaction between the molten metal with the casting mould; D – corrosion damage; E – modification of the blade base; F – dagger point with no visible use-wear patterns (photo by P. Jurecki, A. Garbacz-Klempka).

structure, and only the daggers from Strzyżów 26 and Kraków-Nowa Huta-Wyciąże 5 (Kozłowski 1971, 69, tab. II; X: 3; Zakościelna 2010, 148, 296, tab. LXI: 6) were found in their original (funeral) deposition context during archaeological excavations. A dagger from Gorodok, Lviv Oblast, in western Ukraine was presumably a part of grave furnishings as well (accompanied by the L-VK vessels and copper jewellery; Pavlìv and Petegirič 2016, fig. 5: 1; 6: 1; 7).

Five of these daggers represent the Cucuteni-Vădastra type (Strzyżów 26, Łasków 1, Horodło/Stefankowice, Kraków-Nowa Huta-Wyciąże 5 and one specimen from Ojców 18, Ciemna Cave – not published, hosted by the Archaeological Museum in Kraków, ref. no. MAK/N/85). The other dagger from Ojców 18, Ciemna Cave (Kostrzewski 1948, 159, fig. 53: 12; Gedl 1980, 38, fig. 11: 63) was labelled by Ivan Vajsov as type Dolné Semerovce (Vajsov 1993, 135), although I. Matuschik (1998, fig. 228, 230) changed its typological assignation to a hybrid type Dolné Semerovce/Malé Leváre. It is difficult to relate the dagger from Gorodok to any of the variants of the Cu-

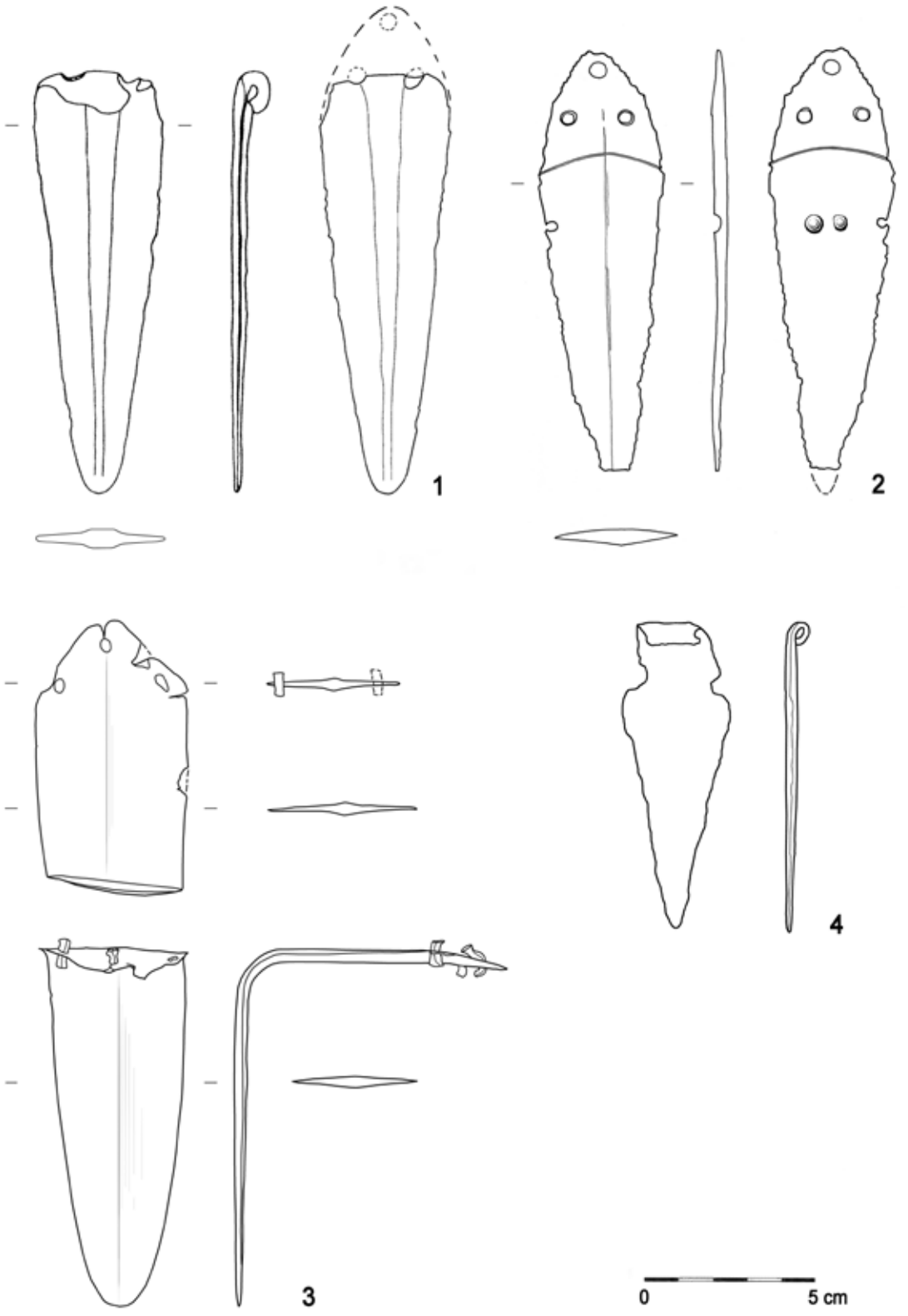


Fig. 5. Cucuteni-Vădastra type daggers assigned to the L-VC.
1 – Strzyżów, site 26; 2 – Łasków, site 1; 3 – Horodło/Stefankowice; a special form: 4 – Gorodok, Lviv Oblast
(1, 2 – drawn by A. Zakościelna; 3 – A. Kokowski, 4 – after Pavlìv and Petegirič 2016, fig. 6: 1, with changes).

cuteni type. Although it has dimensions typical of the Vădastra variant (Fig. 5), in the available photographic and drawing documentation of the dagger from Gorodok, no central rib can be distinguished (cf. Pavlìv and Petegirič 2016, fig. 5: 1; 6: 1; 7), which is a distinctive feature of the Cucuteni type daggers. It is also difficult to assess if the large rivet-half-holes present on the dagger from Gorodok result from damaging the original rivet-holes during the usage of the object or post-depositional corrosion, or perhaps they are original features, similar to the rivet-half-holes visible on the dagger from Bratislava, Slovakia (cf. Matuschik 1998, fig. 228: 7). There is a need for detailed research and conservation of the dagger from Gorodok to clarify its morphology features; until then, this specimen should be treated as a special form, akin to the dagger from Bratislava.

Cucuteni-Vădastra daggers are distributed throughout the southern, eastern, and northern ridges of the Carpathians (Fig. 6). South of Poland, they come from settlement contexts of Cucuteni B and Sălcuța IV (Hanești, Cucuteni, Sărata Monteoru, Băile Herculane, Vădastra) or stray finds (Galiče in north-western Bulgaria and vicinities of Levice in south-western Slovakia; Vajsov 1993, fig. 1, 35; Matushik 1998, 248–249, fig. 223, 230).

The Cucuteni-Vădastra daggers of the circum-Carpathian region are complemented by two specimens from western Lesser Poland that can be assigned to the W-ZG metal inventories. The first comes from grave no. 6, at the W-ZG cemetery in Kraków-Nowa Huta-Wyciąże 5, and was placed near the left hip bone of a dead body inhumed in the foetal position, on its left side, with the head oriented to the north (Kozłowski 1971, 69, tab. II; X: 3; Gedl 1980, 38; Kaczanowska and Tunia 2009, 264, fig. 79: 6). The other specimen was found in Ojców, site 18, Ciemna Cave, and was given to the Archaeological Museum in Kraków by the finders, according to whom the dagger was found by chance deep inside the cave

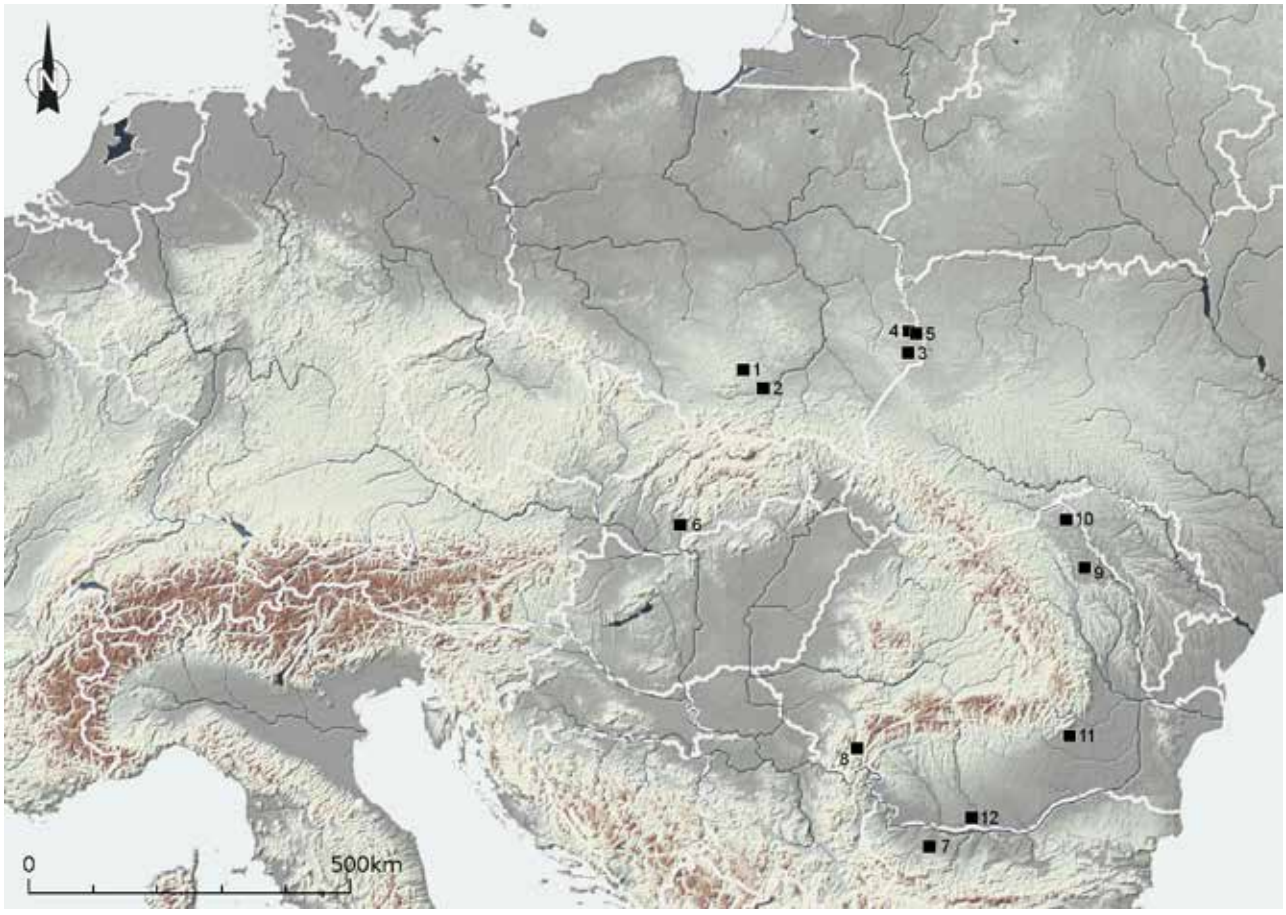


Fig. 6. Distribution of Cucuteni-Vădastra type daggers in Europe.
1 – Ciemna Cave, Ojców; 2 – Kraków-Nowa Huta-Wyciąże; 3 – Łasków; 4 – Horodło/Stefankowice; 5 – Strzyżów; 6 – Levice; 7 – Galiče; 8 – Băile Herculane; 9 – Cucuteni; 10 – Hănești; 11 – Sărata-Monteoru; 12 – Vădastra (after Matushik 1998, fig. 230, with changes; map background: Vitoriano Junior/Shutterstock.com).

(https://archeologicznyatlas.pl/pl/katalog/zabytek/24, access: 28.08.2023).

Another three Cucuteni-Vădastra daggers, including the specimen found in grave 1 at Strzyżów, are linked to the Western Volhynian L-VC settlement cluster, which is far from the distribution network and presumed production centre of daggers of such types (Matuschik 1998, 221; cf. Fig. 6). The dagger from Łasków 1, was found by chance during sand procurement, accompanied by the remains of a human skeleton. A subsequent survey of the findspot yielded tiny fragments of human bones, nine ceramic vessels and a flint blade that had once furnished the damaged L-VC grave (Gurba 1970, fig. 7; 1982, pl. 281: 1–2; Zakościelna 2010, 276), and it cannot be excluded that the dagger was originally associated with the recovered human bones and grave offerings. Another stray find of a Cucuteni-Vădastra dagger with a preserved rivet was made by a metal detectorist in the early 1990s in the village of Horodło or Stefankowice (Niedźwiedź and Panasiewicz 1994, fig. 2: 2).

As mentioned before, Cucuteni-Vădastra daggers are chiefly known from the outer arc of the Carpathians and are attested in the cultural contexts of Cucuteni B, Tripillia BII? –CI and Vădastra IV, which date to the very end of the 5th and the first half of the 4th millennium BC. To date, the dagger from grave 1 in Strzyżów 26 is the only radiocarbon-dated specimen. A sample taken from the humerus of the buried individual was dated in the Kiev Radiocarbon Laboratory and gave a radiocarbon age of 4875±50 BP (Ki-6972) with two possible date ranges: 3710–3635 at 68.2% and 3780–3390 at 95.4% (3780–3620 at 83.6%; 3530–3390 at 11.8). Radiocarbon dates were also obtained from grave 2 (Ki-6974 4810±55 BP) and grave 4 (4740±60 BP) from the Strzyżów 26 cemetery (cf. Kadrow and Zakościelna 2000, fig. 43; Zakościelna 2010, tab. 6). The same site corresponds well to the late phase of the L-VC, as evidenced by the shape and decoration style of funeral pottery, including ceramic vessels from grave no. 5 having a distinct tendency towards the beakers of Michelsberg-Baalberg culture (Zakościelna 2010, tab. LXV: 4, 5). The radiocarbon date returned from grave no. 1 roughly corresponds to the late phase of the L-VC dated to 3800?–3650/3600 BC (Kadrow and Zakościelna 2000, 249–255; Bronicki *et al.* 2003, 24–28; 2004, 101–105), whereas the dates from graves nos. 2 and 4 are too young and should thus be rejected (Zakościelna 2010, 35). It seems likely that the remaining Cucuteni-Vădastra daggers in the range of the L-VC also signify its late phase of development.

It is also reasonable to expect that Cucuteni-Vădastra daggers of the L-VC are material evidence of contacts between the L-VC people and the societies of the Cucuteni-Tripolye culture complex (hereafter CTCC). This is supported by the distribution of the Cucuteni-Vădastra daggers in Central Europe, which overlaps with the CTCC area, and their absence in the Eastern Carpathian Basin region (Fig. 6), which is the presumed supplier and influencer of copper ornaments and weaponry for the L-VC people (Zakościelna and Kadrow 2000, 247; Zakościelna 2010 145–149; Wilk 2014, *passim*). On the other hand, the end of the 5th and beginning of the 4th millennium BC saw the intensification of cultural contacts on the border between the CTCC and L-VC, particularly in the interfluve of the Styr and Horyn. At the same time, the first CTCC groups of the BII/CI phase reached the outcrops of Volhynian flint – at the settlement of Bodaki dated to BII/CI phase ceramic imports and imitations of L-VC pottery were found (Starkova 2009; Starkova and Zakościelna 2018). The cultural landscape of these lands was highly prone to cultural hybridisation and integration (Kadrow and Zakościelna 2022, 192), which is well reflected in the cremation cemetery at Ostrog-Zeman that yielded graves containing both Trypillian and L-VC vessels (Pozìhov´skij and Samolûk 2008, fig. 6: 2). In addition, L-VC ceramic imports are known from CTCC sites along the Dniester, as well as from the interfluve of the Dniester and Boh (Tkaczuk 2005, fig. 1–3).

The circulation of copper products or patterns of their production between the societies of the CTCC and L-VC is not only attested by the Cucuteni-Vădastra daggers. Here, a unique bracelet made of copper sheet metal with edges ornamented with punched decoration, deposited in grave No. 2 at the cemetery in Książnice 2, is worth mentioning (Wilk 2004, fig. 3: 1; 11: 5; 239). One of its ends is narrowed and rounded, with a small opening, the other end is straight. The bracelet was probably remade from a larger ornament. The only known parallel is a "diadem" from a metal hoard from Gorodnicâ II on the Dniester, dating to phase BII/CI of CTCC (Sulimirski 1961, 92, fig. 1: 5; Dergačev 2002, 200, fig. 65: A94).

We can hardly doubt that the Cucuteni-Vădastra daggers found their way to the W-ZG societies via trading routes running from the L-VC. Both of these groups were neighbours in the region of western Lesser Poland and maintained a close relationship, particularly well reflected by the W-ZG pottery (Nowak 2014, 247, 273–275). A good example of this is grave no. 6 from the cemetery in Kraków-Nowa Huta-

Wyciąże 5, which contained a Cucuteni-Vădastra dagger and a deep bowl with four conical protuberances on the rim which is a signature mark of the L-VC potters (Kozłowski 1971, tab. 2: 1; Zakościelna 2010, e.g., tab. IIIc: 7; IVa: 13, 14; IXa: 6; Xa: 10 and others).

The dagger from Strzyżów was customized as a pendant by folding the base and edge of the blade (Fig. 2; 4: E). As a result, the artefact lost its original function of a weapon and could be used as an ornament. As mentioned before, the dagger-pendant was discovered on the right clavicle (Fig. 1: 6), which may suggest that it was worn on the neck, hanging on the chest. A long blade made of Volhynian flint was deposited next to the copper dagger, and these two items could be used to signal the high social rank of the buried male in the local community. The same technological dealing can be traced to the L-VC site of Gorodok, which also yielded copper dagger customized as a pendant (Pavlìv and Petegirič 2016, fig. 5: 1; 6: 1; 7). We can only speculate as to whether the customization of these two daggers was a result of their damage in the past, or if perhaps there are other cultural or social factors behind this treatment.

Conclusions

Copper artefacts emerged in the classical phase of the L-VC, but they were relatively rare at that time, and importantly they were only used as funeral jewellery of adult females. Archaeological data indicate that the in-flow of copper metalwork and its local production gained momentum in the late phase of the L-VC (Zakościelna 2006, 85; 2010, 150, 204–205; Wilk 2014). Only rarely have metal artefacts been discovered at the L-VC settlements, and there is no evidence of their use in everyday life and farming activities. On the other hand, tuyères and crucibles as well as copper droplets on vessels were reported from the settlements of Złota "Grodzisko I", Łańcut 10, and Las Stocki 7 which may support arguments for the emergence of local copper metallurgy (Dziekoński 1962; Zakościelna 1985, fig. 1: 2, 3; Kadrow and Kłosińska 1988, fig. 13).

The copper artefacts of the L-VC are mainly found in the grave context of richly equipped burials of adult human individuals (less frequently from child graves). At the time of writing, nearly 60 metal artefacts have been reported from about 30 features (Zakościelna 2010, 145–150; Wilk 2014; Wilk and Garbacz-Klempka 2016). While female burials contained mostly copper ornaments, sometimes very luxurious (Książnice 2, grave 8 – Wilk 2014, fig. 5–7, 10, 11), weaponry and tools are deposited in male graves; only one single male burial yielded a copper bracelet (Złota, "Grodzisko II", grave 101 – Sałacińska and Zakościelna 2007, fig. 19; 21: 16/XIX, 17/XIX). The majority of the L-VC copper artefacts are related to the Polgar culture and Western Carpathian Basin region, and only spectacle-shaped pendants can be used as evidence for contacts with the Lengyel milieu (Kadrow and Zakościelna 2000, 247; Wilk 2014, 230–232). The Cucuteni-Vădastra daggers connect the L-VC with the CTCC. All these connections clearly indicate that there was room in the L-VC culture for technological and stylistic innovations from other cultural regions.

The copper artefacts deposited in the richly equipped graves of the L-VC were prestigious goods attesting to the high rank of selected community members, mainly adult males. These were relatively rare tools and copper weaponry (battle-axes, daggers, axes, chisels), antler battle-axes, bone daggers, macrolithic blades and retouched blade daggers made of flint. Some of the adult female graves were also richly equipped, and the indicators of their high social rank were body and dress ornaments (copper earrings, necklaces and bracelets as well as necklaces and bracelets made of shells; Sałacińska and Zakościelna 2007, fig. 11–13; Zakościelna 2010, 180–191; Wilk 2014). Exceptionally rich grave goods, also made of copper, were deposited in certain graves of female children (e.g., Wilk 2004, fig. 4). The wealth of grave inventories – in the sense of raw material diversity, number of deposited goods and presence of prestigious artefacts – divides the L-VC graves into several classes reflecting a complex social structure, with powerful elites led by adult male warriors that were buried with the richest sets of grave goods, including prestigious items having a symbolic meaning (Zakościelna 2008; 2010, 145, 166–167, 211–218).

The dichotomy of funerary rites between male and female individuals, burying the dead at cemeteries separated from settlements, qualitative and quantitative differentiation of L-VC grave inventories, which contain, e.g., prestigious artefacts (weaponry and ornaments) together with production specialisation (copper metallurgy, technology of flint superblade production) and participation in interregional distribution of goods (owing to the access to Volhynian flint of superb quality) make the L-VC one of those Eneolithic cultures that can be compared to societies of the Carpathian Basin (Tiszapolgár-Bodrogkeresztúr cultures), and – to a certain degree – the Eastern Balkans (Hamangia-Varna cultures) (Zakościelna 2010, 212–218, 229–233). Social relations in the L-VC societies were likewise complex and produced power

elites led by adult males, possibly organised in associations of a military character (Kadrow 2010, 84; 2011, 295–302; Zakościelna 2010, 211–218). This model of the social organisation of the L-VC is supported by differences in grave inventories, although in the case of the local elites it was not as striking as in the Eastern Balkans and Eastern Carpathian Basin region, but corresponded to the local environmental and cultural conditions. Adult male warriors manifested their high social rank through different symbols of action, especially weaponry: flint retouched blade daggers, antler battle-axes, and unique copper artefacts, including Cucuteni-Vădastra daggers.

Acknowledgements

We would like to thank the employees of the Department of Lesser Poland Prehistory of the Archaeological Museum in Kraków for the information on the copper dagger from Ojców, Ciemna Cave, and Piotr Moskała for translating this paper into English.

References

Bronicki A., Kadrow S. and Zakościelna A. 2003. Radiocarbon Dating of the Neolithic Settlement in Zimne, Volhynia, in Light of the Chronology of the Lublin-Volhynia Culture and the South-Eastern Group of the Funnel Beaker Culture. In A. Kośko (ed.), *The Foundations of Radiocarbon Chronology of Cultures between the Vistula and Dnieper: 4000–1000 BC* (= *Baltic-Pontic Studies* 12). Poznań: Adam Mickiewicz University Institute of Eastern Studies Institute of Prehistory, 22–66.

Bronicki A., Kadrow S. and Zakościelna A. 2004. Uwagi na temat wzajemnych relacji chronologicznych późnej fazy kultury lubelsko-wołyńskiej oraz kultury pucharów lejkowatych z uwzględnieniem najnowszych wyników badań w Zimnie. In J. Libera and A. Zakościelna (eds.), *Przez pradzieje i wczesne średniowiecze. Księga pamiątkowa dedykowana doc. dr. Janowi Gurbie w siedemdziesiątą piątą rocznicę urodzin*. Lublin: Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej, 101–125.

Cook S. R. B. and Aschenbrenner S. 1975. The Occurence of Metallic Iron in Ancient Copper. *Journal of Field Archaeology* 2(3), 251–266.

Dergačev V. 2002. *Die aneolithischen und bronzezeitlichen Metallfunde aus Moldavien* (= *Prahistorische Bronzefunde* 20/9). Stuttgart: Franz Steiner Verlag.

Dziekoński T. 1962. Metalurgia miedzi w osadzie kultury ceramiki wstęgowej malowanej w Złotej, pow. Sandomierz, oraz próba ustalenia pochodzenia przerabianego tam surowca. *Studia z Dziejów Górnictwa i Hutnictwa* 7, 7–125.

Gedl M. 1980. *Die Dolche und Stabdolche in Polen* (= *Prähistorische Bronzefunde* 6/4). München: C.H. Beck'sche Verlag.

Gurba J. 1970. Najnowsze badania nad neolitem Lubelszczyzny (przegląd badań). *Rocznik Lubelski* 13, 173–186.

Gurba J. 1982. Sépulture à inhumation (?) Łasków, comm. de Miączyn, dép. de Zamość. In L. Gajewski (ed.), *Le néolitique du plateau de Lublin* (= *Inventaria Archaeologica Pologne* 46). Warszawa: Państwowe Wydawnictwo Naukowe, pl. 281.

Kaczanowska M. and Tunia K. 2009. Kultura lendzielska. Katalog. In A. Czekaj-Zastawny (ed.), *Obrządek pogrzebowy kultur pochodzenia naddunajskiego w neolicie Polski południowo-wschodniej (5600/5500–2900 BC)* [*The funerary rite of the Danubian Cultures in the Neolithic of southeastern Poland (5600/5500–2900 BC)*]. Kraków: Instytut Archeologii i Etnologii Polskiej Akademii Nauk, 259–308.

Kadrow S. 2010. Antropopresja, neodarwinizm, globalne zmiany klimatyczne i teoria ewolucji społecznej Habermasa. In S. Czopek and S. Kadrow (eds.), *Mente et rutro. Studia archaeologica Johanni Machnik viro doctissimo octogesimo vitae anno ab amicis, collegis et discipulis oblata*. Rzeszów: Instytut Archeologii Uniwersytetu Rzeszowskiego, Fundacja Rzeszowskiego Ośrodka Archeologicznego, 61–90.

Kadrow S. 2011. The Early Copper Age: socio-cultural proces in modern sociological interpretation [Początki epoki miedzi – interpretacja procesu społeczno-kulturowego w świetle nowszych koncepcji socjologicznych]. *Analecta Archaeologica Ressoviensia* 4, 265–302.

Kadrow S. and Kłosińska E. 1988. Obiekt kultury lubelsko-wołyńskiej na stanowisku 10 w Łańcucie, woj. Rzeszów. *Sprawozdania Archeologiczne* 40, 9–25.

Kadrow S. and Zakościelna A. 2000. Outline of the Evolution of Danubian Cultures in Małopolska and Western Ukraine. In A. Kośko (ed.), *The western border area of the Tripolye culture* (= *Baltic-Pontic Studies* 9). Poznań: Institute of Prehistory Adam Mickiewicz University, 187–255.

Kadrow S. and Zakościelna A. 2022. The origin of the trough retouch in the Lublin-Volhynian culture. *Sprawozdania Archeologiczne* 74(1), 151–186.

Kostrzewski J. 1948. Od mezolitu do okresu wędrówek ludów. In S. Krukowski, J. Kostrzewski and R. Jakimowicz (eds.), *Prehistoria ziem polskich.* Kraków: Polska Akademia Umiejętności, 118–359.

Kozak-Zychman W. and Maślanka Z. 2005. Szczątki kostne z pochówków ludności kultury wołyńsko-lubelskiej ceramiki malowanej ze stan. 26 w Strzyżowie, pow.

Hrubieszów. *Archeologia Polski Środkowowschodniej* 7, 176–182.

Kozłowski J. K. 1971. Eneolityczne groby szkieletowe z Nowej Huty Wyciąża. *Materiały Starożytne i Wczesnośredniowieczne* 1, 65–97.

Krause R. 2003. *Studien zur kupfer- und frühbronzezeitlichen Metallurgie zwischen Karpatenbecken Und Ostsee* (= *Vorgeschichtliche Forschungen* 24). Rahden/Westfalen: Leidorf.

Mareş I. 2002. *Metalurgia arameiîn neo-eneoliticul României*. Suceava: Editura Universitatii Stefan cel Mare.

Mareş I. 2012. *Metalurgia aramei în civilizaţiile Precucuteni şi Cucuteni*. Suceava: Editura Universităţii Stefan cel Mare.

Matuschik I. 1998. Kupferfunde und Metallurgie-Belege, zugleichein Beitragzur Geschichte der kupferzeitlichen Dolche Mittel-, Ost- und Südosteuropas. In M. Mainberger (ed.), *Das Moordorf von Reute. Archäologische Untersuchungen in der jungeneolithischen Siedlung Reute-Schorrenried*. Staufen: Teraqua CAP, 207–261.

Niedźwiedź J. and Panasiewicz W. 1994. *Nadbużańskie wykopaliska 1994. Wystawa*. Hrubieszów: Muzeum im. ks. Stanisława Staszica w Hrubieszowie.

Nowak M. 2014. Późny etap rozwoju cyklu lendzielsko-polgarskiego w zachodniej Małopolsce. In K. Czarniak, J. Kolenda and M. Markiewicz (eds.), *Szkice neolityczne. Księga poświęcona pamięci Profesor Anny Kulczyckiej-Leciejewiczowej*. Wrocław: Wydawnictwo Instytutu Archeologii i Etnologii Polskiej Akademii Nauk, Ośrodek Badań nad Kulturą Późnego Antyku i Wczesnego Średniowiecza, 239–283.

Pavlìv D. and Petegirič V. 2016. Bogate pohovannâ volinsko-lûblìnskoï kul´turi z Gorodka na L´vìvŝinì. *Naukovì studìï* 9, 149–163.

Pernicka E., Begemann F., Schmitt-Strecker S., Todorova H. and Kuleff I. 1997. Prehistoric copper in Bulgaria. Its composition and provenance. *Eurasia Antiqua* 3, 41–180.

Pernicka E., Begemann F., Schmitt-Strecker S. and Wagner G. A. 1993. Eneolithic and Early Bronze Age copper artefacts from the Balkans and their relation to Serbian copper ores. *Praehistorische Zeitschrift* 68(1), 1–57.

Pozìhov´skij O. A. and Samolûk V. O. 2008. Eneolìtičnij kremacìjnij mogil´nik v okolicâh Ostroga na zahìdnìj Volynì. *Arheologìâ* 1, 28–41.

Sałacińska B. and Zakościelna A. 2007. „Pierwsze groby kultur ceramik wstęgowych w Polsce" (Groby kultury lubelsko-wołyńskiej ze stanowiska Złota „Grodzisko I i II"). *Wiadomości Archeologiczne* 58, 77–114.

Schreiner M. 2007. *Erzlagerstätten im Hrontal, Slowakei: Genese und prähistorische Nutzung*. Rahden/Westfalen: Verlag Marie Leidorf Gmbh.

Schubert E. 1982. Grundzüge der metallurgischen Entwicklung im nordwestlichen Karpatenbecken bis zur Mitte des 2. Jahrtausends v. u. Z. *Archeologia Polski* 27, 315–317.

Siklósi Z., Horváth E., Villa I. M., Nisi S., Mozgai V., Bajnóczi B., Csippán P., Hornok P. and Kiss P. 2022. The provenance of the raw material and the manufacturing technology of copper artefacts from the Copper Age hoard from Magyaregres, Hungary. *PLoS ONE* 17(11), 1–41. DOI:10.1371/journal.pone.0278116

Šikulová V. and Zápotocký M. 2010. Raně eneolitický měděný pektorál z vrchu Kotouče u Štramberka. *Archeologické rozhledy* 52, 395–428.

Solon J., Borzyszkowski J., Bidłasik M., Richling A., Badora K., Balon J., Brzezińska-Wójcik T., Chabudziński Ł., Dobrowolski R., Grzegorczyk I., Jodłowski M., Kistowski M., Kot R., Krąż P., Lechnio J., Macias A., Majchrowska A., Malinowska E., Migoń P., Myga-Piątek U., Nita J., Papińska E., Rodzik J., Strzyż M., Terpiłowski S. and Ziaja W. 2018. Physico-geographical mesoregions of Poland. Verification and adjustment of boundaries on the basis of contemporary spatial data. *Geographia Polonica* 91, 143–170.

Starkova E. G. 2009. Problema formirovaniâ lokal´nyh variantov v severo-zapadnoj časti tripol´skogo areala v period BII. In S. A. Vasil´ev and L. V. Kulakovskaâ (eds.), *S. N. Bibikov i pervobytnaâ arheologiâ*. Sankt Peterburg: Rossijskaâ akademiâ nauk Institut istorii material´noj kul´tury, Nacional´naâ akademiâ nauk Ukrainy Institut arheologii, 299–305.

Starkova E. and Zakościelna A. 2018. Traditions of ceramics production in the Central and Eastern Europe Eneolithic. Tripolye, late Malice and Lublin-Volhynian cultures. *Sprawozdania Archeologiczne* 70, 67–85.

Sulimirski T. 1961. Copper hoard from Horodnica on the Dniester. *Mitteilungen der Anthropologischen Gesellschaft in Wien* 91, 91–97.

Tkaczuk T. 2005. Importy kultur malickiej i lubelsko-wołyńskiej na osadach kultury trypolskiej etapu BI–BII. *Archeologia Polski Środkowowschodniej* 7, 150–155.

Vajsov I. 1993. Die frühesten Metalldolche Südost- und Mitteleuropas. *Praehistorische Zeitschrit* 68(1), 103–145.

Wilk S. 2004. Graves of the Lublin-Volhynian culture at site 2 in Książnice, district of Busko Zdrój. 2001/2002, 2003 exploration seasons. *Sprawozdania Archeologiczne* 56, 223–270.

Wilk S. 2014. An elite burial from the Copper Age: Grave 8 at the cemetery of the Lublin-Volhynian culture at

site 2 in Książnice, Świętokrzyskie Province. *Analecta Archaeologica Ressoviensia* 9, 209–258.

Wilk S. and Garbacz-Klempka A. 2016. Eneolithic copper jewellery from grave 7 of the Lublin-Volhynian culture at site 2 in Książnice, Świętokrzyskie province, Poland. Typological and physical metallurgy characteristic. *Recherches Archéologiques. Nouvelle Serie* 8, 29–46.

Zakościelna A. 1985. Las Stocki, stan. 7, gm. Końskowola, woj. lubelskie. In J. Gurba (ed.), *Sprawozdania z badań terenowych Katedry Archeologii UMCS i Archeologicznego Ośrodka Badawczo-Konserwatorskiego w Lublinie w 1985 roku*. Lublin: Uniwersytet Marii Curie-Skłodowskiej, Katedra Archeologii, 3–4.

Zakościelna A. 2006. Kultura lubelsko-wołyńska. Zagadnienia jej genezy, periodyzacji i chronologii [The Lublin-Volhynian Culture. The problems of its origin, periodization and chronology]. In M. Kaczanowska (ed.), *Dziedzictwo cywilizacji naddunajskich: Małopolska na przełomie epok kamienia i miedzi* [*The Danubian Heritage: Lesser Poland at the Turn of the Stone and Copper Ages*] (= *Biblioteka Muzeum Archeologicznego w Krakowie* 1). Kraków: Muzeum Archeologiczne w Krakowie, 77–94.

Zakościelna A. 2008. Wiórowce-sztylety jako atrybuty pozycji społecznej mężczyzn kultury lubelsko-wołyńskiej. In J. Bednarczyk, J. Czebreszuk, P. Makarowicz and M. Szmyt (eds.), *Na pograniczu światów. Studia z pradziejów międzymorza bałtycko-pontyjskiego*. Poznań: Wydawnictwo Poznańskie, 577–591.

Zakościelna A. 2010. *Studium obrządku pogrzebowego kultury lubelsko-wołyńskiej*. Lublin: Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej.

Zakościelna A. and Gurba J. 1995. Badania cmentarzysk kultury wołyńsko-lubelskiej ceramiki malowanej na Grzędzie Horodelskiej. In J. Gurba (ed.), *Sprawozdania z badań terenowych Katedry Archeologii UMCS w Lublinie w 1994 roku*. Lublin: Uniwersytet Marii Curie-Skłodowskiej, Katedra Archeologii, 3–7.

Zakościelna A. and Gurba J. 1997. Obiekt grobowy grupy masłomęckiej ze stanowiska 26 w Strzyżowie, gm. Horodło, woj. zamojskie. *Studia Gothica* 2, 221–230.

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

Halina Taras[1], Anna Zakościelna[2], Marcin Osak[3], Grzegorz Buszewicz[4], Grzegorz Teresiński[5]

DOI: 10.15584/anarres.2023.18.6

[1] Institute of Archaeology, Maria Curie-Skłodowska University in Lublin, M. Curie-Skłodowska 4 Sq., 20-031 Lublin, Poland; e-mail: halina.taras@mail.umcs.pl; ORCID: 0000-0002-8143-0090

[2] Institute of Archaeology, Maria Curie-Skłodowska University in Lublin, M. Curie-Skłodowska 4 Sq, 20-031 Lublin, Poland; e-mail: anna.zakoscielna@mail.umcs.pl; ORCID: 0000-0002-1487-0117

[3] Chair and Department of Forensic Medicine, Medical University of Lublin, Jaczewski 8b, 20-090 Lublin, Poland; e-mail: marcino343@gmail.com; ORCID: 0000-0001-6378-6272

[4] Chair and Department of Forensic Medicine, Medical University of Lublin, Jaczewski 8b, 20-090 Lublin, Poland; e-mail: grzegorz.buszewicz@umlub.pl; ORCID: 0000-0001-7637-6387

[5] Chair and Department of Forensic Medicine, Medical University in Lublin, Jaczewski 8b, 20-090 Lublin, Poland; e-mail: grzegorz.teresinski@umlub.pl; ORCID: 0000-0002-4184-9305

A Contribution to the Study of Traces of Psychotropic Substances Inside Miniature Vessels and Collared Flasks of the Eneolithic Funnel Beaker culture (FBC) from Poland

Abstract

Taras H., Zakościelna A., Osak M., Buszewicz G., Teresiński G. 2023. A Contribution to the Study of Traces of Psychotropic Substances Inside Miniature Vessels and Collared Flasks of the Eneolithic Funnel Beaker culture (FBC) from Poland. *Analecta Archaeologica Ressoviensia* 18, 97–102

The text presents the results of laboratory analyses conducted on vegetal intoxicating substances identified on the walls of selected pottery forms discovered at Polish sites attributed to the south-eastern group of the FBC. The samples taken from miniature vessels and collared flasks were examined using the GC-MS/MS method (triple quadrupole) and then the reference method LC-MS/MS (linear ion trap). As a result of the research, psychotropic substances were identified in four samples: papaverine, scopolamine and atropine.

Keywords: psychoactive substances, miniature vessels, Eneolithic, SE group of the FBC, Poland, GC-MS/MS, LC-MS/MS

Received: 19.09.2023; **Revised:** 08.10.2023; **Accepted:** 23.10.2023

Introduction

The importance of various stimulants, especially psychoactive substances, in rites and religions of primary societies, including prehistoric communities and many civilisations, has already been highlighted in several publications, including ethnological and archaeological ones (e.g. Furst (ed.) 1972; Harner (ed.) 1973; Motyka 1985; Noll 1985; Eliade 1988; Sherratt 1991; Sikora 1999; Szyjewski 2001; Motyka and Marcinkowski 2014). This phenomenon has already been reported for the earliest times, including the Eneolithic, FBC communities (Rudgley 2002, 21–27; Krzak 1994, 56).

In Polish archaeological literature, the hypothesis that the FBC communities knew and used psychoactive substances was formulated most comprehensively by Jerzy T. Bąbel (2006). He noted that FBC inventories include characteristic containers, so-called collared flasks, which imitate poppy heads. The most faithful copies are known from the northern group (Nowak 2017, fig. 1), especially Jutland. Certain specimens with spherical bellies not only have notched collars but are also ornamented with vertical grooves. So far, this hypothesis has not been supported by any specialist research. It has been suggested that other ceramic artefacts (e.g. smoking pipes, spoons, goblets) might have also been

used for storing and consuming intoxicating substances (Bąbel 2006, fig. 4–6). In our opinion, the group of containers used for this purpose should also include miniature forms (see e.g. Zakościelna and Taras 2022).

Ceramic miniatures which replicate "typical" containers constitute peculiar elements of the FBC inventories throughout the distribution range of the said culture. Their use is unclear. Most often, they are interpreted as children's toys (e.g. Kulczycka-Leciejewiczowa 1997, 242; 2002, 82; Steiner 1997; Röder 2010), ritual vessels (Sochacki 1988, 73–74; Szmyt 2018, 529), or containers for special substances, such as medicines, cosmetics, seasoning, etc. (Szajt and Wieczorek-Kańczura 2018, 374).

This work presents the results of specialist laboratory analyses conducted on several miniature vessels found at settlement sites and collared flasks from graves attributed to the south-eastern group of the FBC (Fig. 1), the aim of which was to identify psychoactive substances. The research was carried out within the framework of the joint project by the Institute of Archaeology, Maria Curie-Skłodowska University in Lublin and the Chair and Department of Forensic Medicine, Medical University of Lublin.

Materials

Twelve samples were subject to the examination. They included nine specimens of miniature vessels from two settlements of the SE group of the FBC – six from Dubeczno 1, Włodawa district – settlement, materials from the cultural layer (samples D1–D6 – Zakościelna and Taras 2019) (Fig. 2: 3, 5–9) and three from Gródek 1C, Hrubieszów district – settlement (samples G1–G3 – unpublished vessels in the collection of the museum in Zamość; sample G2 – the cultural layer, level 50–60 cm) (Fig. 2: 1, 2, 4), as well as three collared flasks (Fig. 3). Two specimens included in the latter group had been discovered in the monumental tombs of the FBC on the Nałęczów Plateau, explored in Wąwolnica 7, Puławy district – central grave in megalithic tomb (sample W1 – Bargieł *et al.* 1982) (Fig. 3: 3) and Zgórzyńskie 1, Puławy district – grave in flat cemetery (sample N2 – unpublished vessel, information in Kutyłowski 1974) (Fig. 3: 2), while the third flask is a stray find discovered at an unspecified localisation, also within the Nałęczów Plateau (sample N1 – unpublished) (Fig. 3: 1). All artefacts can be dated to the classical phase of the FBC.

Methods

The analytical study focused on the presence of opiate and tropane alkaloids. The reference samples consisted of randomly selected clay sherds, free of analytical signals corresponding to the target substances, originating from the cultural layer from the same FBC sites as the studied material.

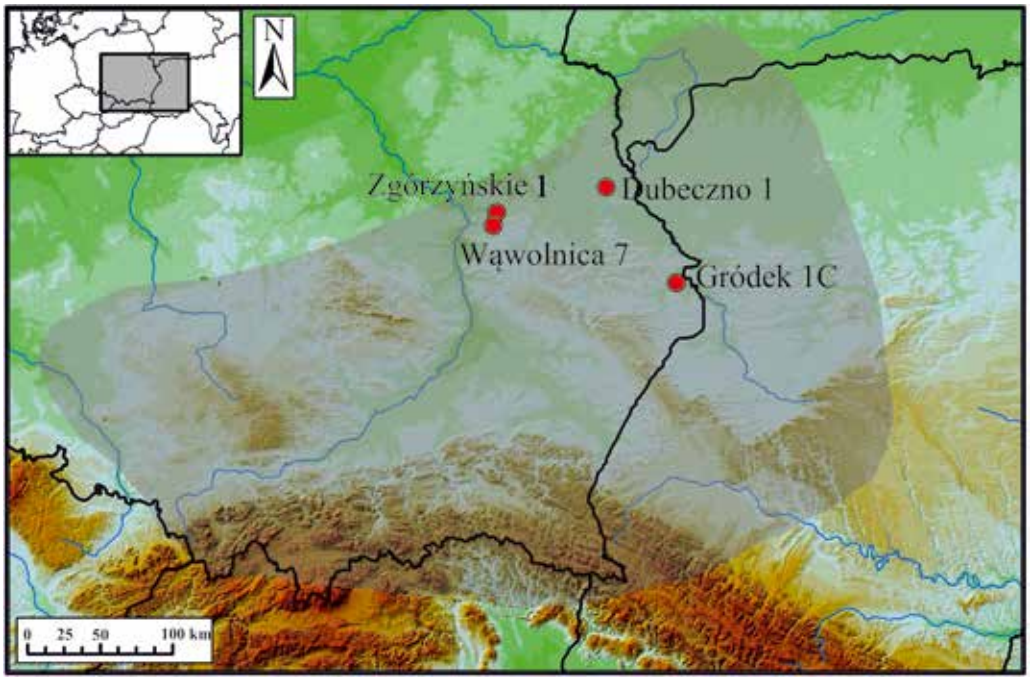


Fig. 1. Location of the sites from which the analysed vessels come from, against the background of the territory of the south-eastern FBC group (after Nowak 2017; figure by the authors – based on Leszek Gawrysiak's map).

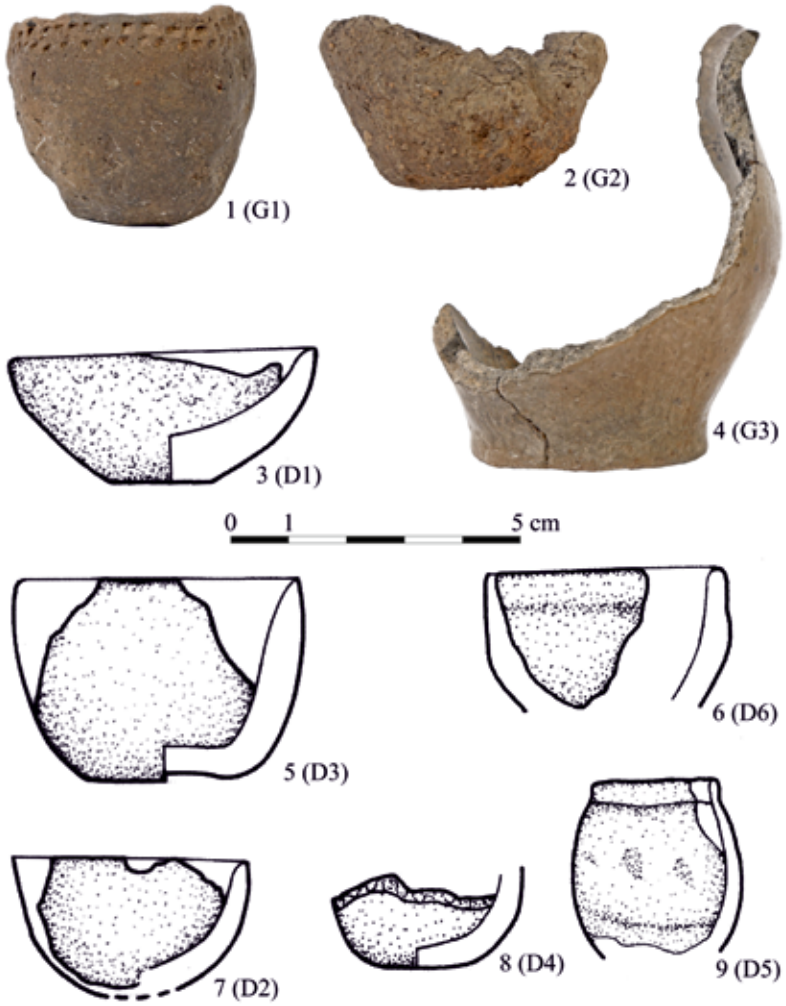


Fig. 2. Analysed vessels: 1, 2, 4 – Gródek 1C; 3, 5–9 – Dubeczno 1 (photo by S. Oliwiak; figure after Zakościelna and Taras 2019).

Fig. 3. Analysed vessels: 1 – unknown locality (Nałęczów Plateau); 2 – Zgórzyńskie 1; 3 – Wąwolnica 7 (photo by the authors).

Samples were taken from the inner surface of the vessel bottoms or their immediate vicinity. Both the reference material and the analysed pottery were ground with a mini grinder equipped with a stone tip to obtain the specified amount of ceramic powder. Samples, each weighing 200 mg, were placed in vials and subject to ultrasound-assisted liquid-liquid extraction in an alkaline environment. The analysis of the extract was conducted with gas chromatography–tandem mass spectrometry (GC-MS/MS) method and, subsequently, with liquid chromatography–tandem mass spectrometry (LC-MS/MS) reference method in order to compare the results. Our instrumental sets posed an integrated system of Trace 1310 Gas Chromatograph with TSQ 8000 EVO Triple Quadrupole Mass Spectrometer (Thermo Fisher Scientific®, Waltham, MA, USA), and configuration of ultra-high performance liquid chromatograph Dionex Ultimate 3000 with linear ion trap spectrometer LTQ Velos Pro (Thermo Fisher Scientific®, Waltham, MA, USA).

Alkaloids in samples were analysed in two separate sets: in a native or derivatized form, as silyl esters, depending on the requirements of the particular method.

Results

By utilizing the GC-MS/MS technique, a papaverine peak was identified in the obtained chromatograms in the case of three archaeological items (Fig. 4), while peaks corresponding to atropine and scopolamine were found in one specimen (sample D1 – miniature vessel) (Fig. 5). Moreover, LC-MS/MS com-

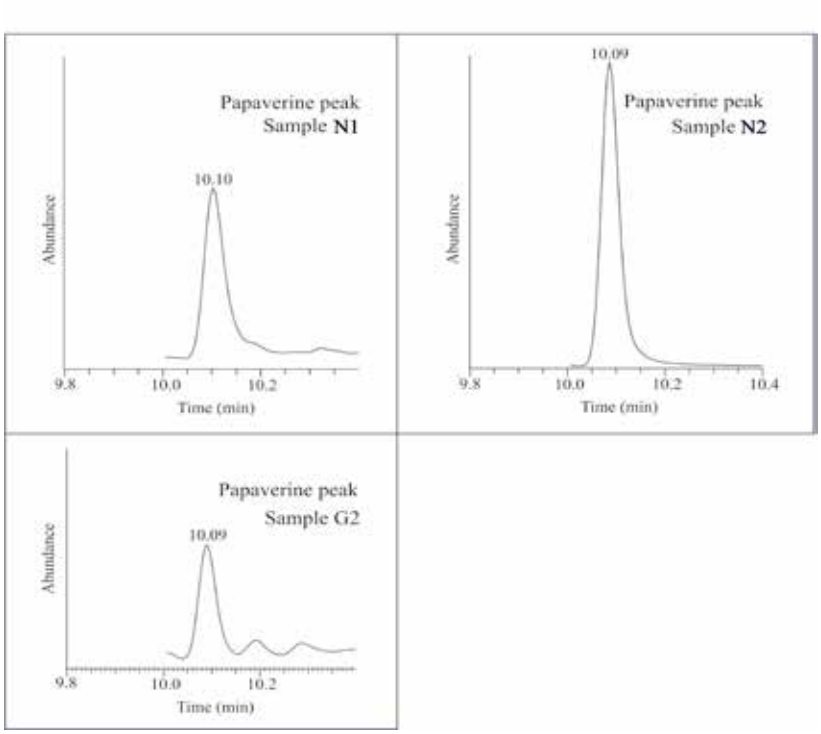


Fig. 4. Chromatograms obtained by GC-MS/MS analysis showing the detection of papaverine (figure by the authors).

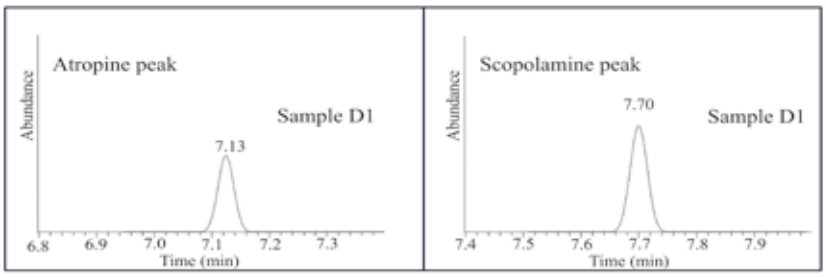


Fig. 5. Chromatograms obtained by GC-MS/MS analysis showing the detection of atropine and scopolamine (figure by the authors).

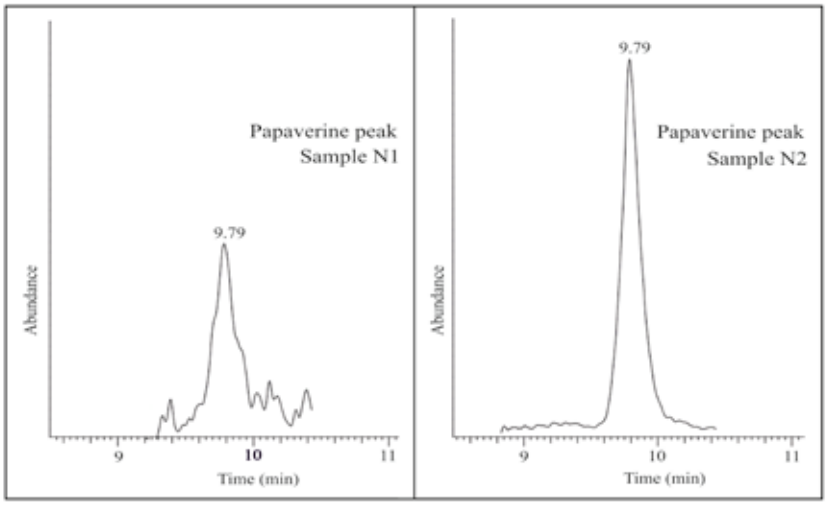


Fig. 6. Chromatograms obtained by LC-MS/MS analysis showing the detection of papaverine (figure by the authors).

parative analysis employed in our protocol confirmed the presence of papaverine in samples N1 and N2, confirming the reliability of the identification (Fig. 6).

Discussion

Papaverine, identified in three samples, is an opiate alkaloid, present in poppy plants of the cultivable and medical variety (*Papaver somniferum*) (Fig. 4) as well as the wild variety (*Papaver setigerum*). Identification of subfossil remains (especially palynological traces) of poppy plants is difficult, hence it rarely appears in pollen and macroremains analyses (e.g. Lityńska and Wasylikowa 2005, 129–131; Madeja 2012, tab. 3; Filipova-Marinova *et al*. 2013, fig. 3B).

Atropine and scopolamine occur in Europe, North Africa, and Western Asia in certain species of solanaceous family (*Solanaceae* Juss.) such as deadly nightshade (*Atropa belladonna* L.), black henbane (*Hyoscyamus niger* L.), henbane bell (*Scopolia carniolica*), and jimson weed (*Datura stramonium* L.). Solanaceous plants only exceptionally occur in palynological profiles (e.g. *Atropa belladonna* L. – López-Dóriga 2015, 400–401) and among archaeological macro remains (*Hyoscyamus niger* L. – Lityńska and Wasylikowa 2005, fig. IX–23: 18, item 273; Dąbrowski 2010, 48, tab. 1).

The discussed plants were used as poisons, ingredients of medicaments and, when appropriately dosed, as narcotics (e.g. Merlin 2003; King *et al*. 2018; Smith *et. al*. 2018).

Conclusions

The employed analytical procedure confirmed the presence of psychoactive substances, answering previously unsolved questions concerning the non-culinary functions of certain vessel forms. The fact that papaverine was detected with the use of two different techniques indicates the high reliability of the instrumental research, which allows the interpretation of the functions of these particular items.

Acknowledgements

The authors would like to thank the management and employees of the museums in Zamość and Chełm for granting access to the artefacts used in the research and presented in this publication; Piotr Moskała and Paweł Zagórski for their translation of the paper into English; Leszek Gawrysiak for creating the map in GIS system.

Funding statement

Project was funded by the Medical University of Lublin and Maria Curie-Skłodowska University in Lublin.

References

Bargieł B., Kapica Z. and Śmiszkiewicz-Skwarska A. 1982. Grobowiec kultury pucharów lejkowatych w Wąwolnicy, woj. lubelskie. *Wiadomości Archeologiczne* 47(2), 239–245.

Bąbel T. 2006. Środki psychoaktywne w kulturach megalitycznych Europy Środkowej. Zarys problematyki. In J. Libera and K. Tunia (eds.), *Idea megalityczna w obrządku pogrzebowym kultury pucharów lejkowatych*. Lublin, Kraków: Instytut Archeologii Uniwersytetu Marii Curie-Skłodowskiej, Instytut Archeologii i Etnologii Polskiej Akademii Nauk. Oddział Kraków, 171–193.

Dąbrowski J. 2010. Uwagi o wiedzy medycznej ludności kultury łużyckiej. *Materiały i Sprawozdania Rzeszowskiego Ośrodka Archeologicznego* 31, 45–50.

Eliade M. 1988. *Historia wierzeń i idei religijnych*, 1: *Od epoki kamiennej do misteriów eleuzyńskich*. Warszawa: Państwowy Instytut Wydawniczy.

Filipova-Marinova M., Pavlov D., Vergiev S., Slavchev V. and Giosan L. 2013. Palaeoecology and geoarchaeology of Varna Lake, northeastern Bulgaria. *Comptes rendus de l'Academie bulgare des Sciences* 66(3), 377–392.

Furst P. T. (ed.) 1972. *Flesh of the Gods. The Ritual Use of Hallucinogens*. New York: Praeger Publishers.

Harner M. (ed.) 1973. *Hallucinogens and shamanism*. New York: Oxford University Press.

King A., Powis T. G., Cheong K. F., Deere B., Pickering R. B., Singleton E. and Gaikwad N. W. 2018. Absorbed Residue Evidence for Prehistoric *Datura* Use in the American Southeast and Western Mexico. *Advances in Archaeological Practice* 6(4), 312–327. DOI: 10.1017/aap.2018.30

Krzak Z. 1994. *Megality Europy*. Warszawa: Wydawnictwo Naukowe PWN.

Kulczycka-Leciejewiczowa A. 1997. *Strachów. Osiedla neolitycznych Rolników na Śląsku*. Wrocław: Instytut Archeologii i Etnologii Polskiej Akademii Nauk.

Kulczycka-Leciejewiczowa A. 2002. *Zawarża: Osiedle neolityczne w południowopolskiej strefie lessowej*. Wrocław: Instytut Archeologii i Etnologii Polskiej Akademii Nauk.

Kutyłowski A. 1974. Zgórzyńskie, pow. Puławy. *Informator Archeologiczny. Badania 1973*, 48.

Lityńska M. and Wasylikowa K. 2005. *Przewodnik do badań archeobotanicznych*. Poznań: Sorus.

López-Dóriga I. L. 2015. *La utilización de los recursos vegetales durante el Mesolítico y Neolítico en la costa atlántica de la península ibérica* [*The Use of Plants during the Mesolithic and the Neolithic in the Atlantic coast of the Iberian Peninsula*]. Tesis doctoral. Santander: Instituto Internacional de Investigaciones Prehistóricas de Cantabria, Universidad de Cantabria.

Madeja J. 2012. Local Holocene vegetation changes and settlement history based on pollen analysis of Lake Kwiecko sediments, West-Pomeranian Lake District, NW Poland. *Acta Palaeobotanica* 52(1), 105–125.

Merlin M. D. 2003. Archaeological evidence for the tradition of psychoactive plant use in the old world. *Economic Botany* 57(3), 295–323.

Motyka R. 1985. Mental imagery cultivation as a cultural phenomena. The role of visions in shamanism. *Current Anthropology* 26, 443–461.

Motyka M. and Marcinkowski J. T. 2014. Dlaczego zażywali środki psychoaktywne? Cz. I. Rola i znaczenie środków psychoaktywnych w kulturze: od pradziejów do początku XX wieku. *Problemy Higieny i Epidemiologii* 95(2), 223–233.

Noll R. 1985. Mental imagery cultivation as a cultural phenomena. The role of visions in shamanism. *Current Anthropology* 26, 443–461.

Nowak M. 2017. Ubiquitous settlers consequent farmers, and monument builders. In P. Włodarczak (ed.), *The past societes. Polish lands from the first evidence of human presence to the early middle ages*, 2: *5500–2000 BC*. Warszawa: Instytut Archeologii i Etnologii Polskiej Akademii Nauk. Oddział Kraków, 125–170.

Röder B. 2010. Perspektiven für eine theoriegeleitete prähistorische Kindheitsforschung. *Mitteilungen der Anthropologischen Gesellschaft in Wien* 140, 1–22.

Rudgley R. 2002. *Alchemia kultury. Od opium do kawy*. Warszawa: Państwowy Instytut Wydawniczy.

Sherratt A. 1991. Sacred and Profane Substances: The Ritual Use of Narcotics in Later Neolithic Europe. In P. Garwood, D. Jennings, R. Skeates and J. Toms (eds.), *Sacred and profane. Proceedings of a conference on archaeology, ritual and religion, Oxford 1989* (= *Committee for Archaeology Monograph* 32). Oxford: University of Oxford, 33–64.

Sikora T. 1999. *Użycie substancji halucynogennych a religia. Perspektywy badawcze na przykładzie zagadnień rytuału i symbolizacji*. Kraków: Zakład Wydawniczy NOMOS.

Smith R. K., Stacey R. J., Bergströma E. and Thomas-Oates J. 2018. Detection of opium alkaloids in a Cypriot base-ring juglet. *Analyst* 143, 5127–5136.

Sochacki Z. 1988. *Zespół osadniczy kultury ceramiki promienistej w Krakowie-Zesławicach* (= *Prace Instytutu Archeologii UW* 3). Warszawa: Wydawnictwa Uniwersytetu Warszawskiego.

Steiner D. 1997. Kindheit und Spiel. Archäologische Spuren. *Archäologie der Schweiz* 20(2), 97–101.

Szajt J. and Wieczorek-Kańczura K. 2018. Naczynia ceramiczne – forma i funkcja. In J. Piekalski and K. Wachowski (eds.), *Rytm rozwoju miasta na kulturowym pograniczu. Studium strefy placu nowy targ we Wrocławiu,* 1 (= *Wratislavia Antiqua* 23). Wrocław: Instytut Archeologii Uniwersytetu Wrocławskiego, 338–378.

Szmyt M. 2018. Relikty działań obrzędowych. In M. Szmyt (ed.), *Mrowino, stanowisko 3. Późny neolit nad środkową Wartą* (= *Bibliotheca Fontes Archaeologici Posnanienses* 22). Poznań: Muzeum Archeologiczne w Poznaniu, 525–531

Szyjewski A. 2001. *Etnologia religii*. Kraków: Zakład Wydawniczy NOMOS.

Zakościelna A. and Taras H. 2019. Ceramika eneolityczna ze stanowiska 1 w Dubecznie. In H. Taras (ed.), *Dubeczno, stanowisko 1 (Pojezierze Łęczyńsko-Włodawskie). Materiały z badań archeologicznych w latach 1986–1987*. Lublin: Uniwersytet Marii Curie-Skłodowskiej w Lublinie, Ars Libri S.C.

Zakościelna A. and Taras H. 2022. Miniature pottery forms of the Funnel Beaker culture from the Polish territories. In M. Dębiec, J. Górski, J. Müller, M. Nowak, A. Pelisiak, T. Saile and P. Włodarczak (eds.), *From Farmers to Heroes? Archaeological Studies in Honor of Sławomir Kadrow* (= *Universitätsforschungen zur prähistorischen Archäologie* 376). Bonn: Verlag Dr. Rudolf Habelt GmbH, 365–383.

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

Paweł Jarosz[1], Eva Horváthová[2], Marcin M. Przybyła[3], Aleksandra Sznajdrowska-Pondel[4]

DOI: 10.15584/anarres.2023.18.7

[1] Institute of Archaeology and Ethnology, Polish Academy of Sciences, Sławkowska17, 31-016 Kraków, Poland; email: p.jarosz@iaepan.edu.pl; ORCID: 0000-0002-9481-3007

[2] Institute of Archaeology, Slovak Academy of Sciences, Hrnčiarska 13, 040 01 Košice, Slovakia; e-mail: ehorvath@saske.sk; ORCID: 0000-0003-3283-0976

[3] Dolmen S.C., E. Serkowskiego Sq. 8/3, 30-512 Kraków, Poland; email: megzyk@poczta.onet.pl; ORCID: 0000-0002-4695-0752

[4] Pracownia Archeologiczna Aleksandra Sznajdrowska-Pondel, Jazowa 25/12A, 35-326 Rzeszów, Poland; email: a.sznajdrowska@gmail.com; ORCID: 0009-0009-8261-9088

Barrow Cemetery in Zbudza in the Eastern Slovak Lowland

Abstract

Jarosz P., Horváthová E., Przybyła M.M. , Sznajdrowska-Pondel A. 2023. Barrow Cemetery in Zbudza in the Eastern Slovak Lowland. *Analecta Archaeologica Ressoviensia* 18, 103–116

The barrow site in Zbudza is located in the East Slovak Lowland. In 1980, Elena Miroššayová carried out excavations on the burial mound (no. 1) located behind the old Jewish cemetery. The central burial pit and clusters of pottery and traces of hearths were discovered. Some potsherds possess ornamentation typical for the Corded Ware culture. The charcoal found near the burial pit were radiocarbon dated to 4140±35 BP (Poz-151727), which can be correlated to the years 2866–2632 BC. At the site in Zbudza and the neighbouring Trnava pri Laborci, thanks to the LIDAR data, about 20 burial mounds in various states of preservation and different chronological positions were registered. Some of them should be associated with the presence of the Corded Ware and Yamna cultures from the 3rd millennium BC. Geophysical prospection of burial no. 2 located in the part of the village called "Imrička" was conducted in 2021.

Keywords: late Eneolithic, East Slovak Lowland, Corded Ware culture, Východoslovenské mohyly, barrow, non-invasive investigations

Received: 31.08.2023; **Revised:** 05.10.2023; **Accepted:** 17.10.2023

Introduction

Traces of the presence of inhabitants of the Corded Ware culture in the form of burial mounds are clearly visible in the cultural landscape of the 3rd millennium BC in the Carpathian basins of the Vistula, Dniester and Tisza. Mounds are located on the tops of hills, in exposed places, dominating the immediate area (Machnik 2001; Tunia 2008, fig. 1). Sometimes they form chains or small clusters (Jarosz 2011). The southern edge of this culture is also called the Východoslovenské mohyly culture (Budinský-Krička 1967). Hypotheses regarding the links between the East Slovak barrows and other areas have changed over the years. V. Budinský-Krička noted their connection with the Corded Ware and Yamna cultures (Budinský-Krička 1967, 353), while N. Kalicz linked burial mounds of north-eastern Slovakia with steppe influences (Kalicz 1968, 30). Other authors indicated the possibility of Corded Ware culture migration from the Vistula and Dniester basins, most likely through the mountain passes of the Carpathians to the Ondava Upland (Novotná 1987, 92–95; Machnik 1992, 272).

The barrows were located mainly on the high humps of Ondava Upland. Only a few of them were recorded in the northern part of the Košice Basin and in the low parts of the Čergov Mountains (Fig. 1). Graves with features of the Corded Ware culture rite also occur in the East Slovak Lowland and the neigh-

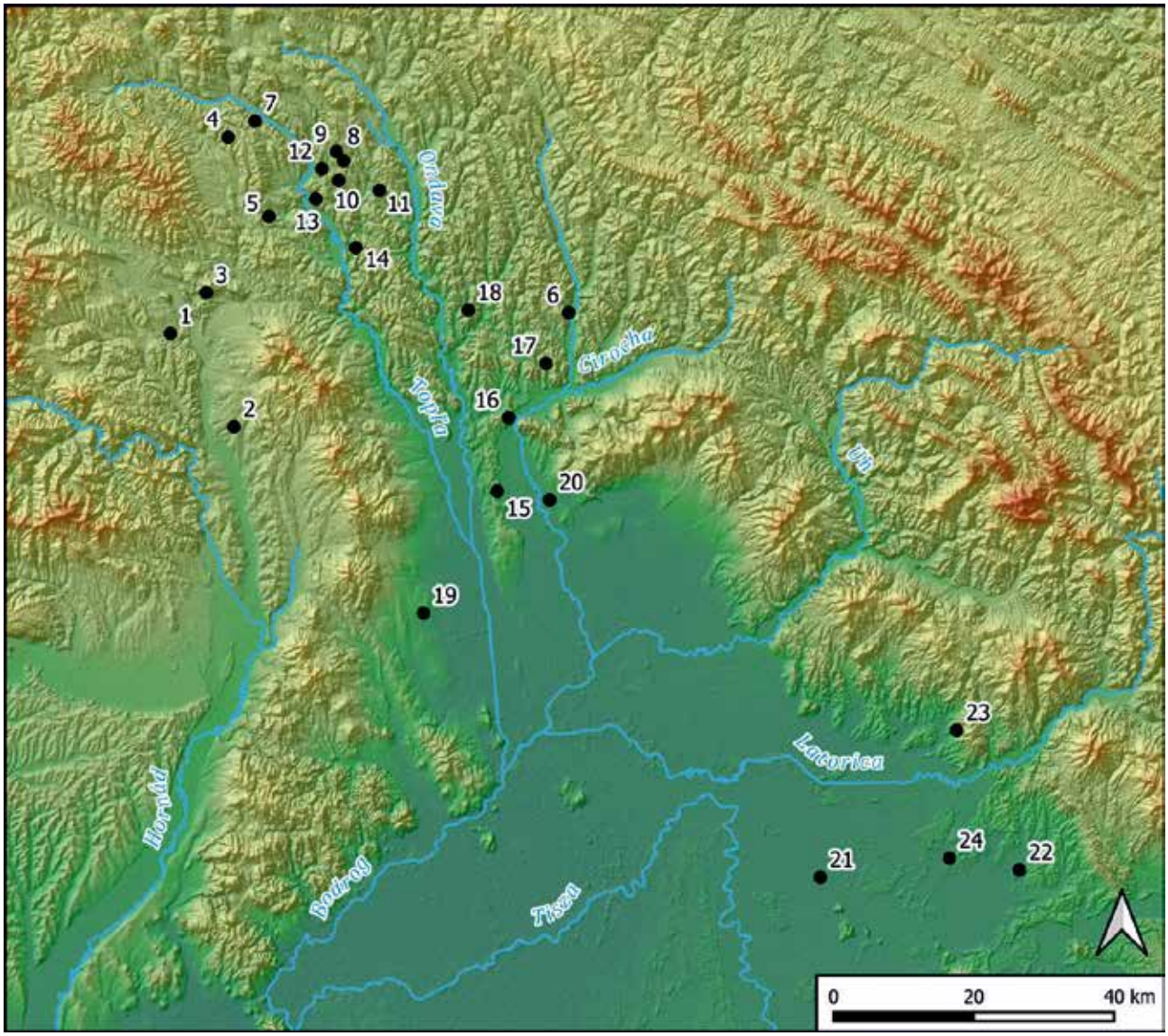


Fig. 1. Barrows from the 3rd millennium BC in eastern Slovakia and Transcarpathian Ukraine. 1. Malý Šariš. 2. Drienov. 3. Kanaš. 4. Bardejov-Klušov. 5. Buclovany. 6. Hankovce. 7. Komárov. 8. Kožany. 9. Kurima. 10. Šapinec. 11. Radoma. 12. Kučin. 13. Marhaň. 14. Giraltovce. 15. Lesné. 16. Brekov-Topolovka. 17. Brestov. 18. Košarovce. 19. Nový Ruskov. 20. Zbudza. 21 Batrad´. 22. Makar´ovo. 23. Lohovo. 24. Dercen "Malaâ Gora" (1–3: Prešov district; 4–14: Bardejov district; 15, 20: Michalovce district; 16–18: Humenné district; 19: Trebišov district; 21: Beregove district; 22–24: Mukačevo district) (prepared by A. Sznajdrowska-Pondel).

bouring Zakarpattia Lowland (Fig. 1), which are the northern part of the Great Hungarian Plain (Kondracki 1989). The East Slovak Lowland is geographically divided into Foothills and Plain. The Ondava Upland, due to its geographical location, according to the current state of knowledge, is an enclave associated with the areas located north of the Carpathians. In turn, the East Slovak Lowland, which is located north of the steppe ecumene of the Yamna culture (Ecsedy 1979; Horváth *et al*. 2013, 156, fig. 3; Kulcsár and Szeverényi 2013, 69, fig. 1), is *terra incognita* because of the small number of burial mounds which have been examined.

Research history of the site

The barrow site in Zbudza, Michalovce district is located in the East Slovak Lowland, and more precisely on the border of its subunits: Foothills and Plain, about 800 metres east of the Laborec River, which is a tributary of the Latorica. The site was discovered by K. Andel, who recorded 7 burial mounds there (Budinský-Krička 1967, 317). In 1977, the area of the site was visited by V. Budinský-Krička, who found only five embankments, two were located east of the village in a place called "Pší hurky", two more south-east of it in the area called "Imrička" and one behind the old Jew-

ish cemetery "Pod lesom" (Miroššayová 1981, 414, fig. 99). A few years later, in 1980, under the leadership of Elena Miroššayová, excavations were carried out on the burial mound located in the Jewish cemetery (marked in this article as no. 1). At that time, five burial mounds were still visible in the area, and the entire territory of the cemetery was used as a pasture. In 2021, as part of the project of the National Science Center – *Transmission of steppe influences in the Carpathian zone in 3rd millennium BC* (NCN 2020/37/B/HS3/03816), a site was prospected and only one mound in the part called "Imrička" (barrow 2) was visible. The area of the site is currently intensively cultivated.

Results of excavations in 1980

Elena Miroššayová chose the burial mound "Pod lesom" for excavation, which was located about 120 m to the right of the road from Michalovce to Zbudza (Fig. 2; Miroššayova 1981). Before the investigations,

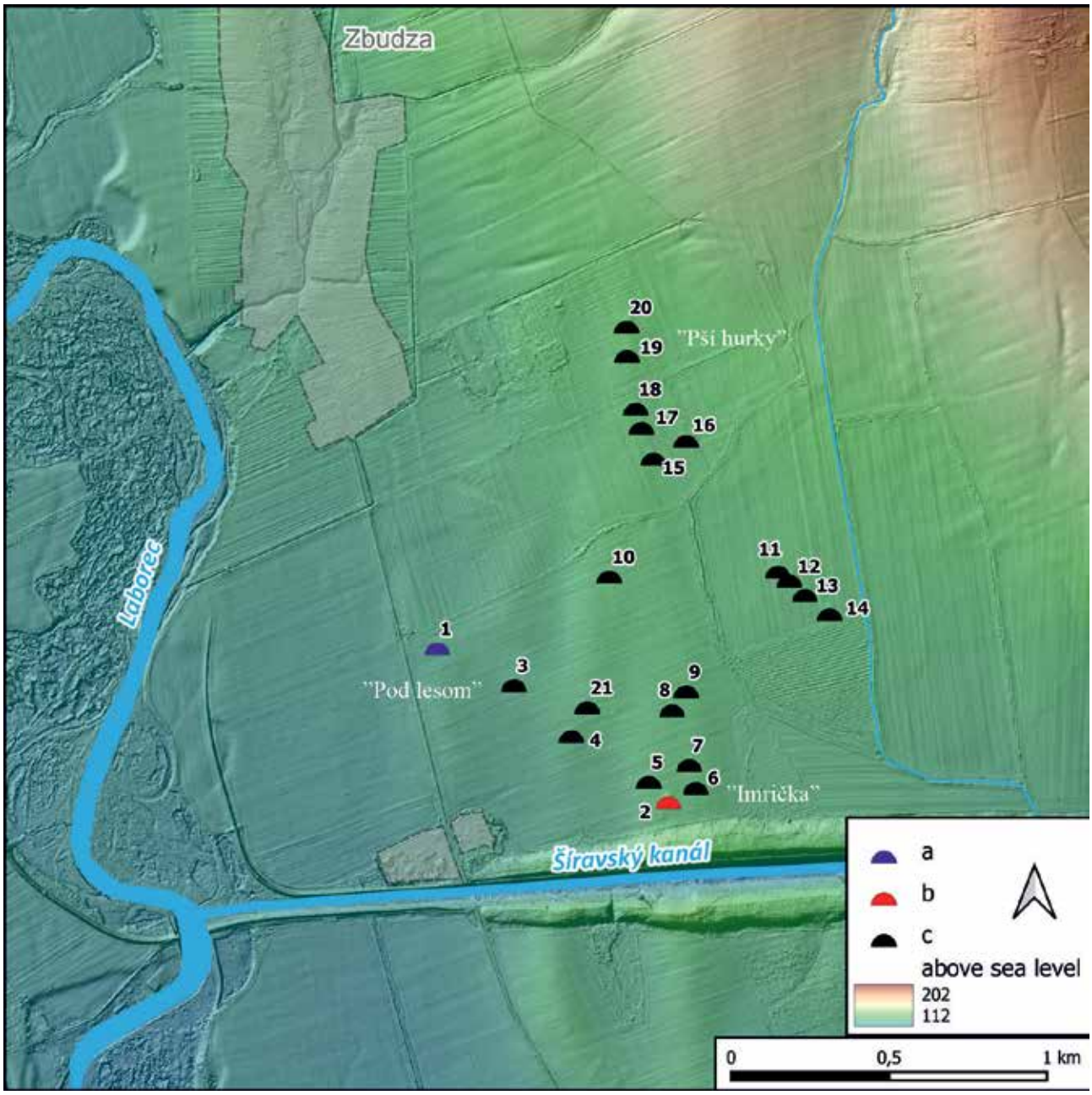
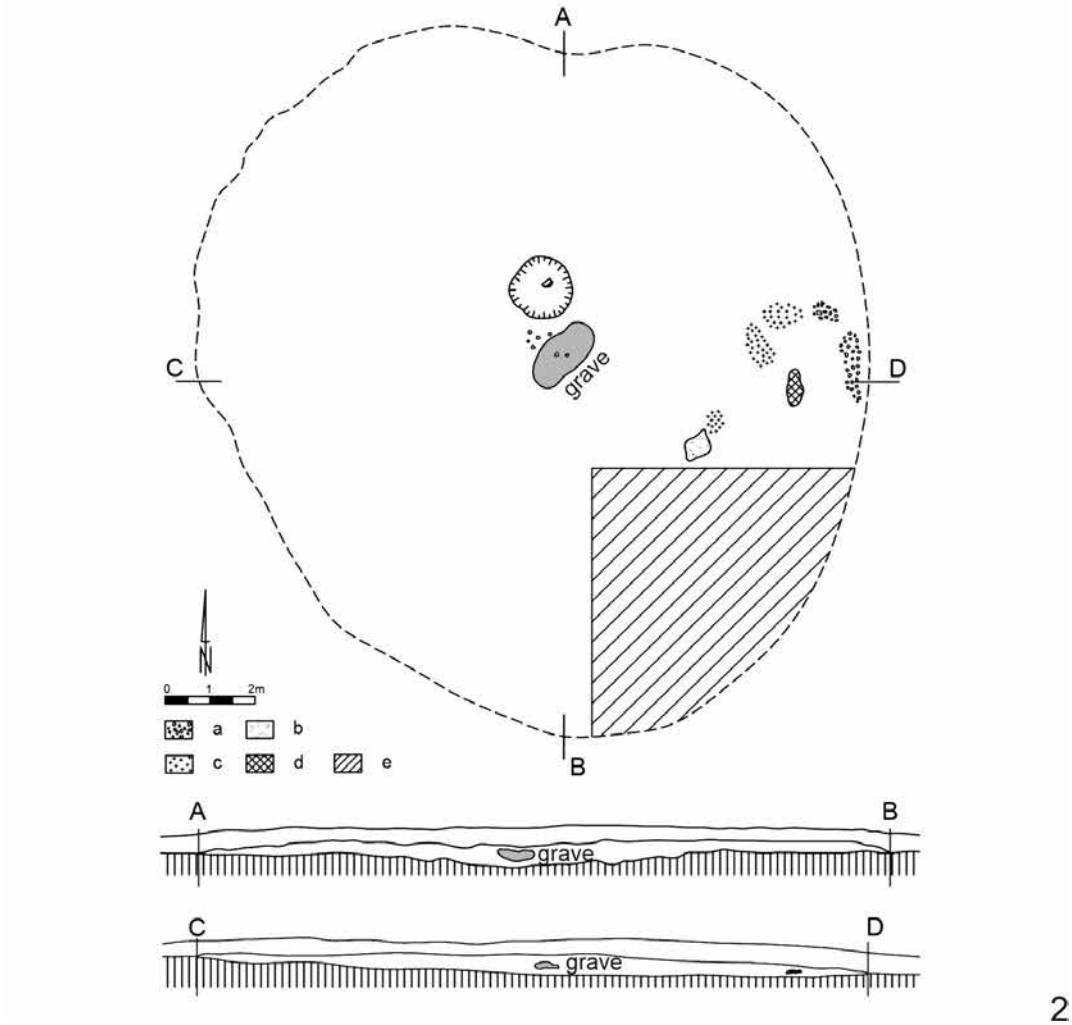


Fig. 2. Preserved burial mounds in Zbudza (1–10; 15–21) and Trnava pri Laborci (11–14).
a – barrow examined in 1980; b – barrow geophysically examined; c – preserved barrow embankments (prepared by A. Sznajdrowska-Pondel).

1



2

Fig. 3. Zbudza, "Pod lesom", Michalovce district, barrow 1.
1 – photo of the "Pod Lesom" barrow before excavations in 1980 (photo by E. Miroššayová); 2 – plane and cross-sections of the mound (a – pottery fragments, b – burnt layer, c – charcoal, d – burnt clay, e – unexplored area) (drawn by K. Rosińska-Balik).

the embankment was only 40 cm high and the diameter along the N-S axis was 15.6 m, and along the W-E line – 15.1 m (Fig. 3: 1). Under the embankment, in its central part, a burial pit and a feature which purpose is difficult to determine were found. This feature was an almost circular shape in plane, about 130 cm in diameter and 40 cm deep. It was located a short distance north of the central burial pit (Fig. 3: 2). In the middle and at the eastern border of the excavation, clusters of pottery and charcoal fragments (traces of hearths) were discovered (Fig. 3: 2). The central burial pit at the discovery level was oval in shape, measuring 170 × 80 cm and was oriented along the SW-NE axis. It was dug into the ancient level to a depth of about 30 cm (Fig. 3: 2; 4: 1, 4). Within its homogeneous fill, no traces of wooden constructions typical for barrow graves of the Corded Ware culture were found. No traces of skeleton or grave goods were found at the bottom of the pit.

Only a small part of the potsherds discovered in the mound (Miroššayova 1981, 415, fig. 100) possess ornamentation typical for the Corded Ware culture (Fig. 4: 2, 3). Others are non-characteristic fragments of vessel bellies. The characteristic fragments of the vessels include a fragment of a vessel decorated with five imprints of a Z-twisted cord (Fig. 4: 2) and the neck of the vessel with three horizontal, wide grooves

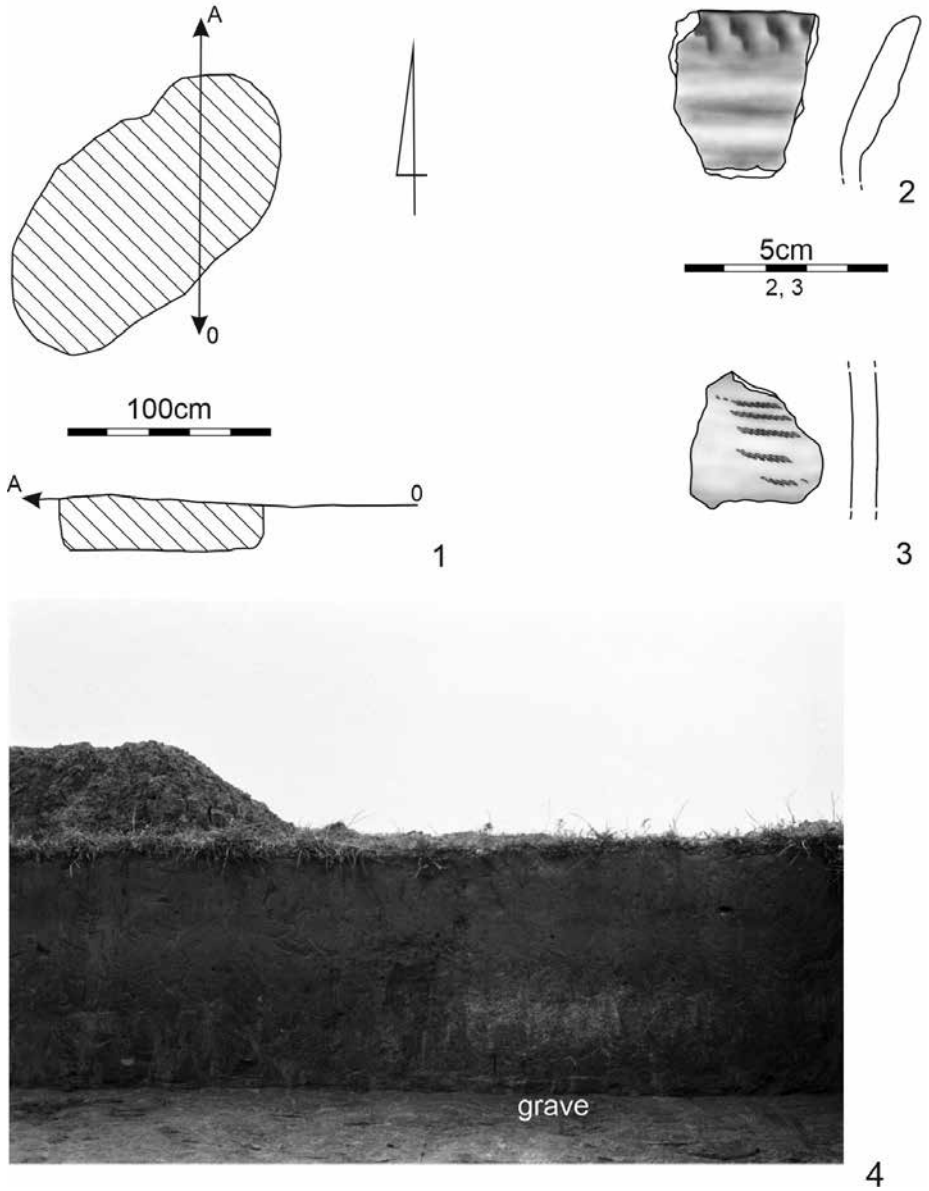


Fig. 4. Zbudza, "Pod lesom", Michalovce district, barrow 1.
1 – plane and cross-section of the central burial pit (drawn by P. Jarosz); 2–3 – fragments of vessels from the mound (drawn by M. Podsiadło); 4 – cross-section of the mound embankment and the central burial pit (photo by E. Miroššayová).

and cuts located near the rim resembling the symbol of a "lightning" (Fig. 4: 3). In the barrow embankments in the Ondava Upland, fragments of vessels with an ornament of cord impressions are often found. Finds from Šapinec, Bardejov district, barrow 1 and 2 may be mentioned here (Budinský-Krička 1967, 378–379; figs. X, XI, XIII). Analogies to the ornamentation with wide grooves can be found on vessels of the early phase of the Corded Ware culture from Kul´čicí, Sambor district [formerly Polish: Kulczyce Szlacheckie, Sambor district] barrows VII, VIII, XII and Baličí, Mostis´ska district [formerly Polish: Balice, Mościska district], barrow XV (Sulimirski 1968; Svešnìkov 1974) as well as in mounds of barrows 1 and 2 at Średnia, site 3, Przemyśl district, barrows 1 and 2 (Machnik and Sosnowska 1996; Jarosz 2002).

The charcoal found near the burial pit were radiocarbon dated to 4140±35 BP (Poz-151727), which can be correlated with a probability of 68.3% to the years 2866–2632 BC (Fig. 5: 1). This dating is similar to other AMS determinations from the Ondava Upland. In Hankovce, Bardejov district, barrow 2, two datings for hearths discovered under the embankment were obtained: 1 – 4085±35 BP (Poz-9631) and 3 – 4125±35 BP (Poz-9630). Using the R_Combine function they can be related to the years 2845–2581

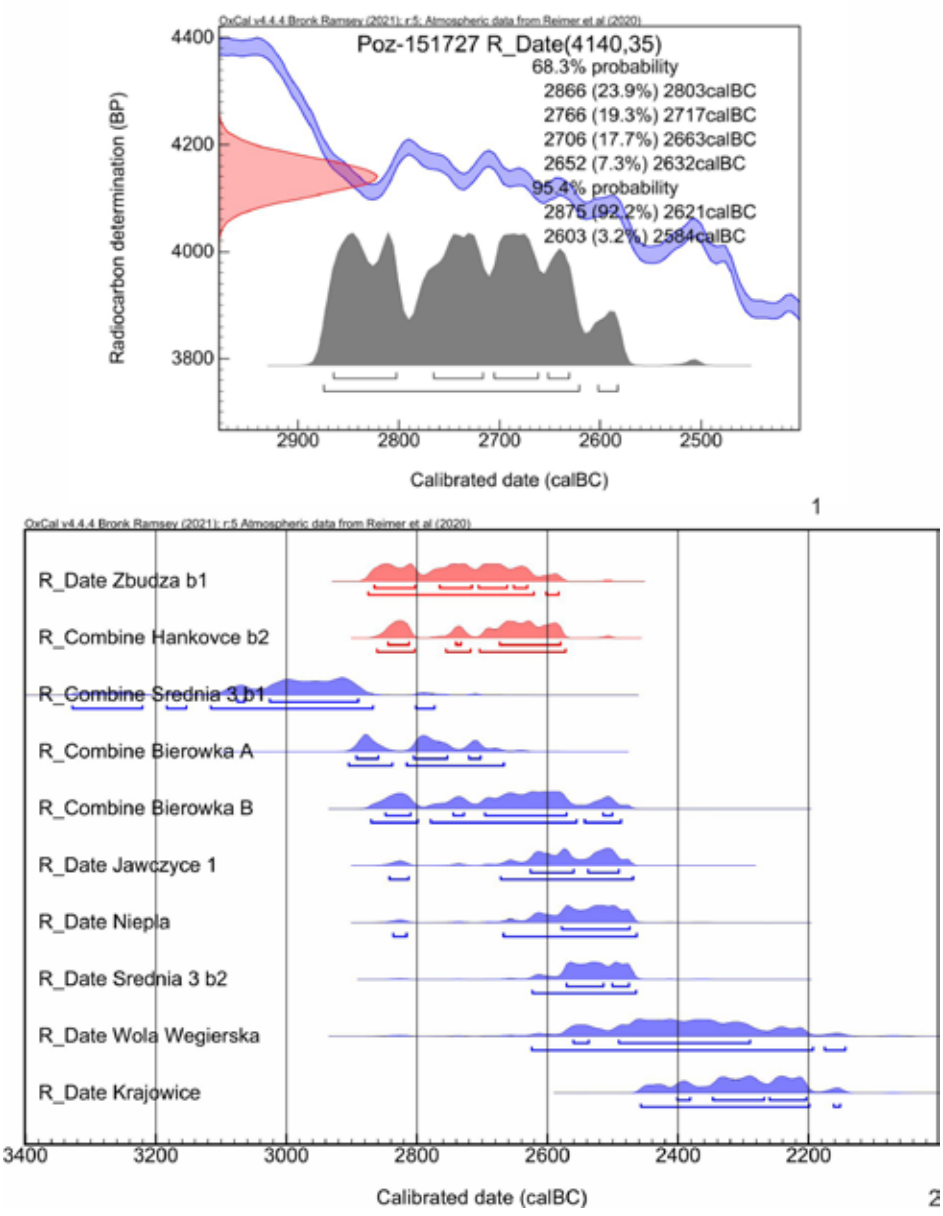


Fig. 5. Zbudza, "Pod lesom", Michalovce district, barrow 1.
1 – calibration of radiocarbon dating; 2 – dating from Zbudza on the background of other markings from Ondava Upland (red) and Polish Carpathian Foothills (blue).

BC. Dating acquired for hearths from barrow 34 in Hankovce is hampered with a large standard error (±140) and cannot be used for evaluations (Machnik *et al*. 2008, 181). The determination from Zbudza is similar to the dating obtained for the Lesser Poland burial mound in Gabułtów, site 1, Kazimierza Wielka district, grave 2, which is 4115±30 BP, i.e. 2866–2632 BC (Poz-9451) with a probability of 68.3% (Jarosz and Włodarczak 2007).

Determinants for barrow graves in Zbudza and Hankovce are older on the background of the dating of graves from the Polish part of the Carpathian foothills (Fig. 5: 2). They can be compared with the markings for burial mounds A and B in Bierówka, Jasło district, range 2891–2706 BC (function R_Combine) (Gancarski and Machnikowie 1986; 1990). They are younger than the oldest dates obtained for finds from the foothills from barrow 1 at site 3 in Średnia (Machnik and Sosnowska 1996). Two markings of charcoal samples from the construction of the central grave indicate the possibility of erecting the barrow at the turn of the 4th and 3rd millennium BC (R_Combine: 3076–2891 BC). This is an early date compared to the recent AMS markings for graves containing artifacts from horizon A and could even be synchronized with the KCS-X precord horizon (Kośko 2000; Jarosz and Włodarczak 2022; Włodarczak 2022).

The size of burial pits in the Corded Ware culture was very differentiated, the largest are 3 × 2 m – e.g. in Gabułtów, Kazimierza Wielka district and Bykiv, Drogobič district, barrow 1 (Górski and Jarosz 2006; Machnik *et al*. 2006). The smallest central pit – about 1 m long – was discovered in barrow VIII at Nižnì Gaì, Drogobič district (Machnik *et al*. 2011). The most frequently discovered features have a length of about 2.2 m and a width of about 1.5 m, they are dug into ancient level to a depth of 50–80 cm on average (Jarosz 2011). Therefore the size of the burial pit from the mound in Zbudza determines it as one of the medium-sized features associated with the Corded Ware culture. The orientation of it along the SW-NE axis is typical for the graves of the Corded Ware culture inhabitants in the Carpathian river basins of the Vistula, Dniester and Tisza, although south of the Carpathian arch, the layout of the graves along the NW-SE axis is dominant (Jarosz 2011, 260, tab. 3). About 40% of barrow graves in the Carpathian zone, similarly to the feature from Zbudza, are unequipped (Jarosz 2011, 263). Other elements of funeral rites discovered under the embankment, such as hearths, clusters of charcoal and fragments of vessels, are typical for the Corded Ware culture barrows, where traces of rituals accompanying the burial of the deceased and erection of mounds are found in the form of hearths or layers of charcoal, traces of burnt wooden structures, or red burnt earth (Jarosz 2011, 258).

Results of non-invasive investigations

In 2021, as part of the National Science Centre's project, the geophysical examination of the only one well-visible burial mound 2 at the cemetery in Zbudza was carried out. It is located in the part of the village called "Imrička". Barrow 2 is currently preserved to a height of about 80 cm and has a diameter of about 35 m (Fig. 6: 1, 3). During the excavations in 1980 conducted by E. Miroššayová, this mound was the best preserved at the site and was documented photographically (Fig. 6: 2). It was selected for geophysical research, the aim of which was to verify its anthropogenic character and to identify the internal structure of the mound. The magnetic method used for this purpose allows for the fastest and fullest measurement coverage of large spaces. The magnetometer registers the presence of anomalies with increased and decreased magnetic field values, caused by various human activities. Well-readable anomalies (usually point and linear positive anomalies) especially arise as a result of the presence of excavation-type features – pits, ditches, hearths (David *et al*. 2008, 16–21; Fassbinder 2015).

Magnetic measurements were made using a transductor magnetometer (fluxgate; Misiewicz 2006, 74–98) 4.032 DLG by Foerster Ferrex, measuring the gradient of the vertical component of the magnetic field, equipped with two probes with a resolution of 0.2 nT. During the tests, the measurement lines were 1 m apart. Measurements along the line were made every 10 cm. The data was collected in a two-way mode. The results of the investigations were presented on magnetic maps developed in the Terra Surveyor 3.0.29.3 program.

The barrow embankment in Zbudza is associated with a clearly legible zonal circular anomaly (Fig. 7). It has a diameter of approx. 17 m. Its outer part is characterized by relatively high values of magnetic susceptibility. In the central part they are clearly lower. It seems that this is caused by erosion processes taking place within the slopes of the mound, leading to the accumulation of the more strongly magnetic topsoil in the lower parts of the embankment, while removing it from the top part. A weak positive anomaly is visible around the mound embankment, related to the zone of excavation of earth for the construction of the barrow. Quite numerous minor dipole anomalies are

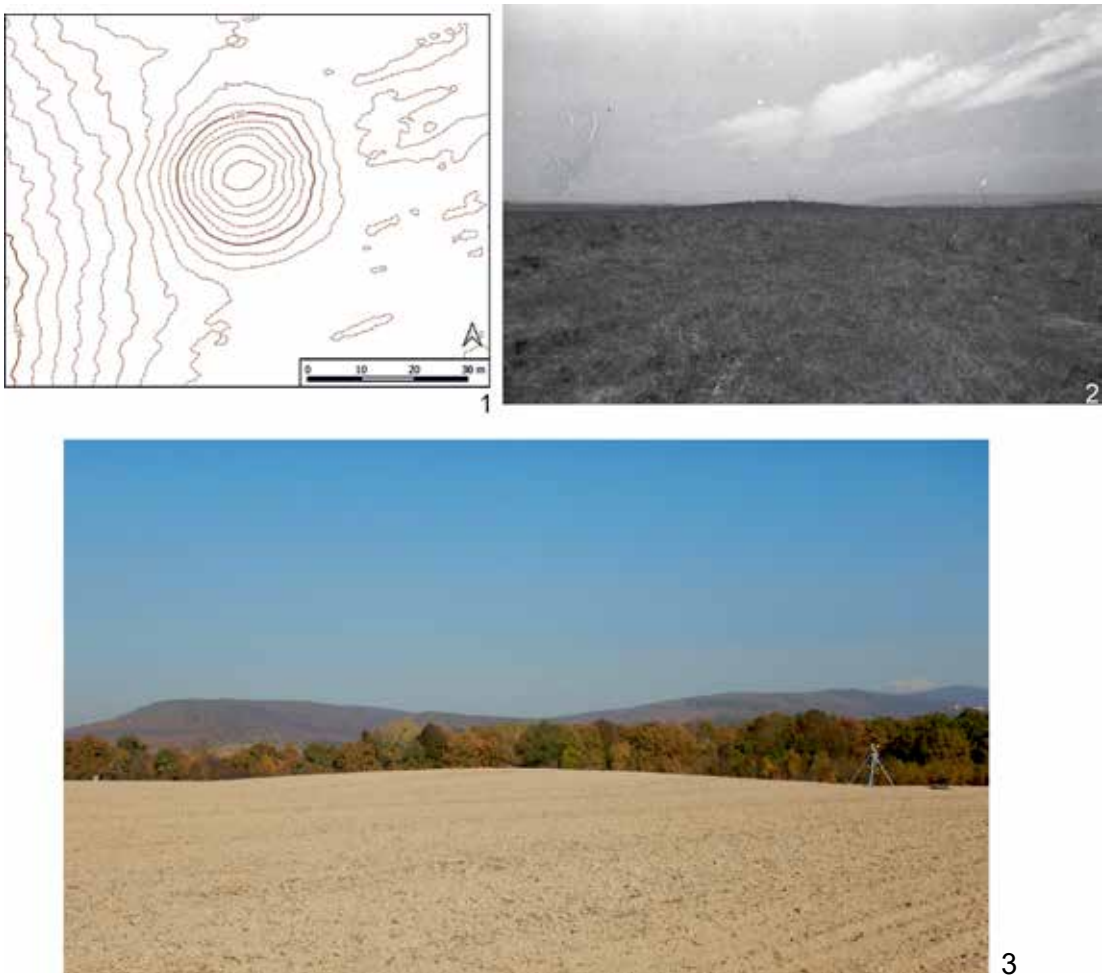


Fig. 6. Zbudza, "Imrička", Michalovce district, barrow 2.
1 – hypsometric plan; 2 – photo of the barrow in 1980 (photo by E. Miroššayová); 3 – photo of the barrow in 2021 (photo by P. Jarosz).

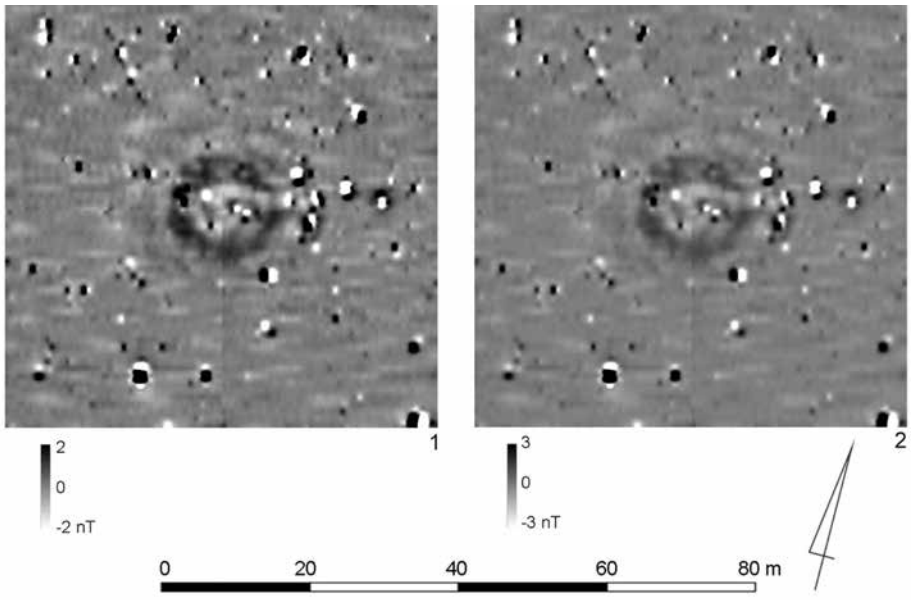


Fig. 7. Zbudza, "Imrička", Michalovce district, barrow 2. Magnetic map presented in grayscale in the -2/2 nT range (1) and -3/3 nT range (2).

also visible in the vicinity of the mound. It seems that their source is contemporary iron items lying in the topsoil layer. However, their small accumulation along the base of the eastern slope of the mound is noteworthy (Fig. 7).

In order to confirm the presence of archaeological mounds in Zbudza, an airborne laser scanning (ALS) model of the village was created and then analysed. The Digital Terrain Model (DTM 5.0) with a resolution of 1 m/pixel in the form of a .tif file was downloaded from the resources of ÚGKK SR for an area of approximately 14 km^2 (Fig. 2). Using the elevation model, a number of derivative models were made in order to expose, with selected techniques, certain terrain features and potential archaeological features. The following programs were used in the processes: SAGA GIS 2.3.1, Visualization Relief Toolbox 1.3 and QGIS 3.22.16. A number of visualizations were prepared to present the full picture of the area (e.g. Principal Component Analysis, Local Dominance, Topographic Position Index, Slope). The article, however, presents 4 processes performed using two techniques (Analytical Hillshading and simple Local Relief Model), thanks to which the discovered features were exposed as clearly as possible (Fig. 8). The shaded model (Analytical Hillshading) shows what the area illuminated by a single light source located at an infinite distance would look like, with all the rays of light illumi-

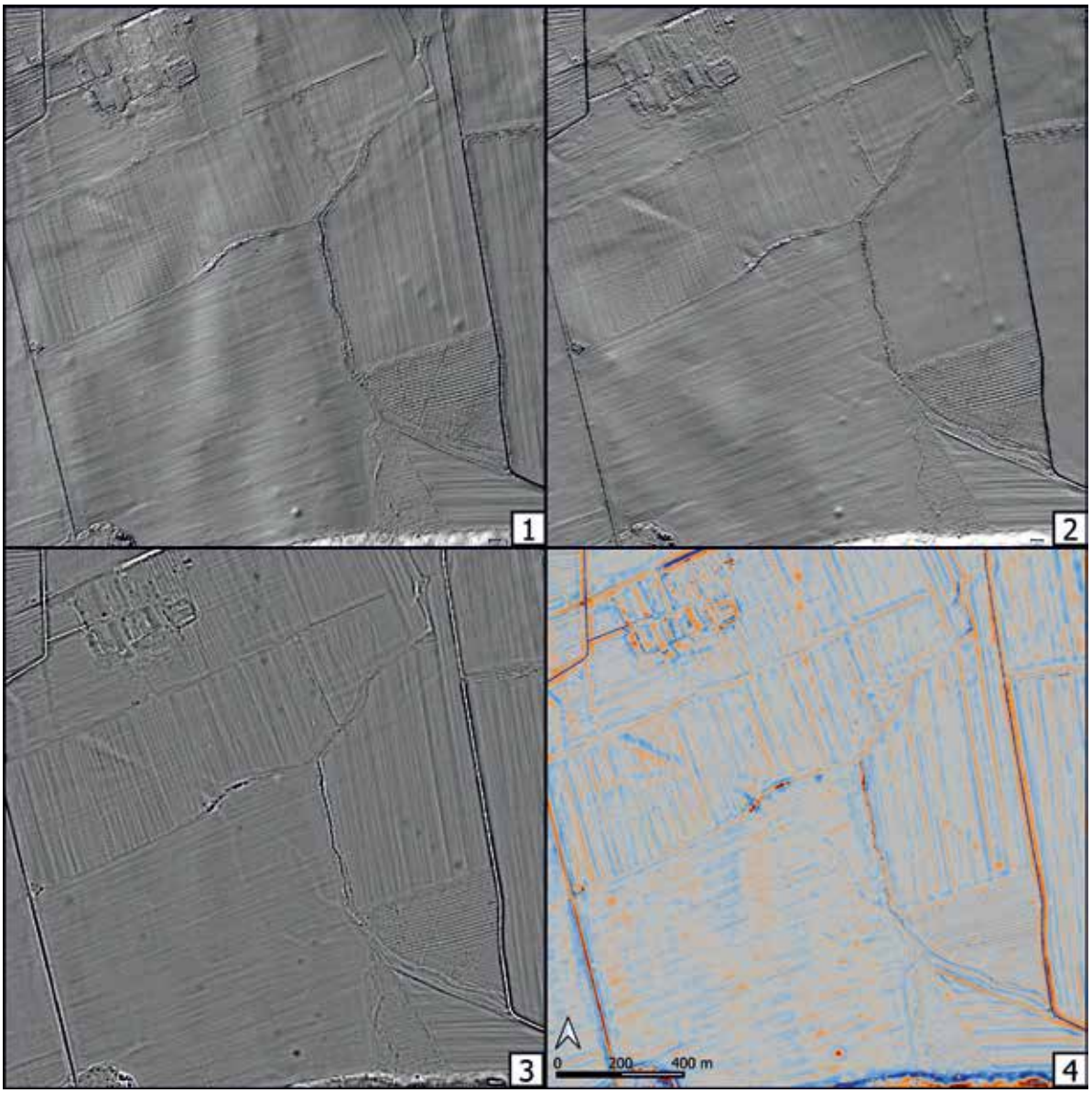


Fig. 8. Comparison of DTM processing for the investigated area: 1 – Analytical Hillshading (azimuth: 315; inclination: 45); 2 – Analytical Hillshading (azimuth: 0; inclination: 45); 3 – simple Local Relief Model (radius: 10, grey scale); 4 – simple Local Relief Model (radius: 20, symmetrical colour palette).

nating the DTM parallel to each other. The creation of this model is based on two parameters, the azimuth and the inclination (height above the horizon), which define the location of the light source. Their value is given in degrees. An azimuth of 0 degrees means that the light source is located on the north side, if there is an azimuth of 180 degrees, the light source is located on the south side. The other directions of the world can be defined similarly. Simple Local Relief Model is a differential model calculated using a round mask with different radii to show local terrain height differences. It is calculated by finding the average height around a given node of the GRID DTM, and then subtracting this average value from the original value (source: Bakuła *et al*. 2016).

In the investigated area, 7 barrows have been identified so far. The analysis showed that there are 21 mounds in this area, which are grouped in 3 clusters. In the northern cluster, there is a row of 5 barrows arranged along the N-S line (15, 17–20) and located at a distance of 30–130 m from each other. About 70 m east of barrow 15, there is another similar feature. Another cluster – the eastern one (barrows 11–14), is located in the village of Trnava pri Laborci, Michalovce district (Fig. 2). The mounds there form a row (on the NW-SE line) at a distance of 20 to 60 m from each other. In the southern part of the area, 10 mounds were found, including a barrow examined by E. Miroššayová in 1980 (no. 1) and a mound investigated with the magnetic method in 2021 (no. 2). They are located on an area of approx. 40 ha at a distance of up to 240 m from each other. The cluster also includes additional smaller groups of 4 (2, 5–7) or 2 mounds (8 and 9, 4 and 21). Between the northern and the southern cluster, there is a single mound no. 10. Outside the eastern cluster, where the terrain is quite flat, it is clearly visible that the barrows were located on small, elongated hills (Fig. 2). The state of preservation of the mounds varies. Based on the DEM, hypsometric profiles showing their shape and height were created (Fig. 9). Their diameters (Tab. 1) were also measured in one of the visualizations (sLRM – R:20). Barrow 2 is by far the best-preserved mound (Fig. 6: 1). With a height of approx. 82 cm, it clearly stands out in the field and is also very easy to spot in each of the visualizations (Fig. 8). Mound no. 8, located about 250 m to the north, is also clearly visible. Well-visible mounds were also found in the northern cluster (nos. 18, 19 and 20) and in the eastern cluster (no. 14). Barrow no. 1, examined by E. Miroššayová, also seem to stand out in the field. Mounds less than 30 cm high (Tab. 1) may be difficult to see during a field survey, but their profiles clearly indicate their function (nos. 6, 7, 9–13, 15–17) (Fig. 8, 9). Both the best-preserved mounds and the smaller ones are visible on the orthophotomap from October 2022 (Fig. 10). Among the lowest mounds, there were barrows 3, 4, 5 and 21. Their profiles are not as clear as the other profiles, and mound 21 is practically invisible in the terrain profile and shaded models. Their shapes and dimensions shown by the simple Local Relief Model suggest, however, that they also are the remains of mounds. As for these barrows, it would be worth trying to carry out additional non-invasive research to confirm their function. All the highlighted barrows are located in agricultural areas, which makes it difficult to identify them during a field survey, but they were found during DEM processing, even though their preserved height was only a few centimetres in some cases.

The necropolis in Zbudza in the cultural landscape

The location of the burial mound and the elements of the burial from Zbudza indicate that it can be considered to have been erected by the inhabitants of the Corded Ware culture. It is the easternmost explored barrow of this unit in the cluster of barrows from the basin of Ondava and Topla. It is also the only examined mound located on the left bank of Laborec (Fig. 1). At the site in Zbudza and the neighbouring Trnava pri Laborci, thanks to the LIDAR data made available in 2022, about 20 burial mounds in various states of preservation were registered. They were lo-

Table 1. Preserved height and diameter of mounds based on terrain profiles and simple Local Relief Model processing (radius 20).

Barrow No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Height (meters)	0.36	0.82	0.02	0.05	0.04	0.12	0.18	0.31	0.14	0.17	0.17	0.2	0.27	0.32	0.16	0.15	0.18	0.4	0.32	0.62	0.01
Diameter (meters)	34	35	24	30	35	23	27	28	27	20	29	22	27	31	25	22	21	25	27	28	30

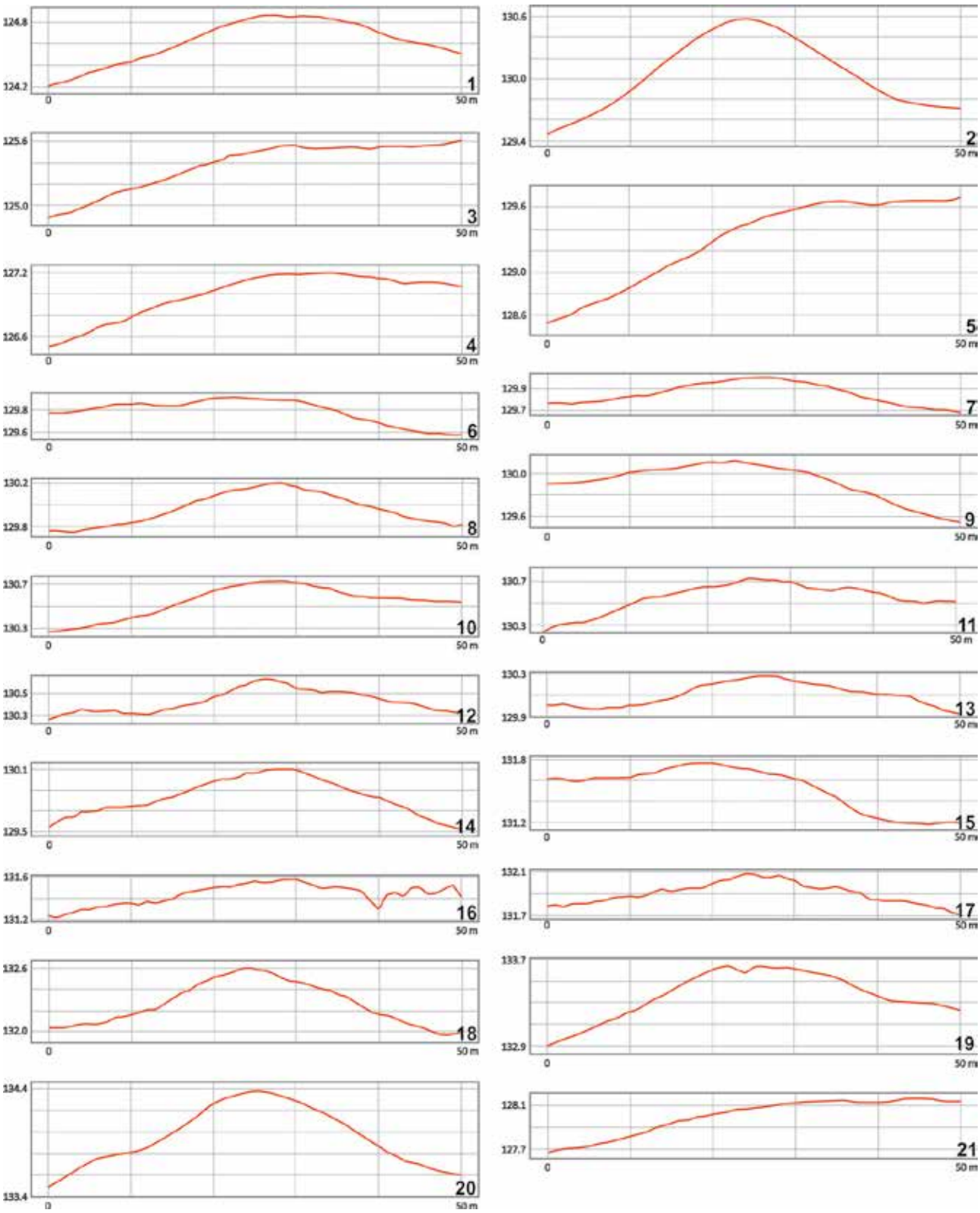


Fig. 9. Zbudza and Trnava pri Laborci, Michalovce district. Hypsometric profiles of discovered mounds (E-W axis).

Fig. 10. Zbudza and Trnava pri Laborci, Michalovce district. The state of preservation of the mounds in the eastern and southern clusters on the orthophotomap from October 2022 (data source: GKÚ Bratislava, NLC).

cated on small ridges, sometimes forming linear systems (Fig. 2; barrows 11–14 and 15–20), or groups (barrows 2, 5–7). The use of even small terrain humps to locate their burial mounds is typical for mounds located in low landscape zones (Machnik 1979).

In the East Slovak Lowland, the examined burial mounds of the Corded Ware culture from the 3rd millennium BC, apart from Zbudza, are also known from Lesné, Michalovce district which is a cemetery located about 8 km west of Zbudza. This is the site where four burial mounds were excavated, three of which contained central burials. In barrows 1 and 3, the buried were placed on their backs with their legs in the "frog fork" position (legs curled up and spread outwards). The skeleton from barrow 2 could be placed in the same way.

The arrangements of the dead recorded in these graves are typical for the Yamna culture, and extremely rare in the Corded Ware culture; e.g. Kocmyrzów, Proszowice district (Włodarczak 2006, 58), Kietrz, Głubczyce district (Chochorowski 1976). Another connection with the Corded Ware culture is the burial mound from Nový Ruskov, barrow 2, Trebišov district, which is located about 20 kilometres southeast of the cemetery in Zbudza in the interfluve of the Ondava and Chlmec rivers (Fig. 1). In the Zakarpattia Lowland, traces of barrow settlements from the 3rd millennium BC are also visible. The burial mound in Batrad´, Beregove district should be mentioned, where fragments of pottery and traces of a hearth were discovered under the northern part of the embankment in a mound about 1.6 m high and 30 m in diameter. In the centre of the barrow on the ancient level there was a burial placed in a crouched position on the left side. The deceased was folded along the W-E axis with his head towards W. Single fragments of pottery and charcoal were found near the corpse. To the northwest of the skull, animal bones have been found (Penâk *et al.* 1979; Balaguri 2001, 71–73). In a burial mound in Lohovo, Mukačevo district, a beaker and small censer were discovered in a grave (Dani 2020). The shape of the beaker refers to type II of the Corded Ware culture from Lesser Poland (Włodarczak 2006), but also to Yamna culture vessels (Włodarczak 2010, 303, fig. 3: 3–5). The small censer discovered in the grave is a typical vessel for the Catakomb culture (Jarosz and Machnik 2000, 114, fig. 4: a; Kaiser 2019, 247–253). This may indicate the interpenetration of the catacomb and corded traditions (Dani 2020, 54). It is possible that the burial mounds in Kráľovský Chlmec, Trebišov district should be associated with the 3rd millennium BC, where burials in a crouched position were to be discovered during the research (Lehoczky 1894, 251; Dani 2020, 47).

Conclusions

In the East Slovak Lowland, where the cemetery in Zbudza is located, numerous burial mounds are visible, which are shown on maps prepared on the basis of LIDAR data. In the 3rd millennium BC this area and the neighbouring Zakarpattia Lowland is an area of mutual penetration of two large cultural systems – Corded Ware

culture and Yamna culture. Currently, the northern part of the East Slovak Lowland is traditionally associated with the settlement of the Corded Ware culture, however, some features of the burial rite of the excavated burial mounds can be interpreted as elements of the Yamna, e.g. the position of the buried individuals typical of this culture and rare in the Corded Ware culture in the basins of the upper Vistula and Dniester rivers. The cemetery, identified using non-invasive methods, is part of a larger cluster of mounds with different chronological positions. The oldest of them should be associated with the presence of pastoral communities of Corded Ware and Yamna cultures from the 3rd millennium BC. In the East Slovak Lowland, barrows from Zemplin, site Paperdo with a difficult-to-determine chronology are also known (Lamiová-Schmiedlová 1973), as well as Zemplin, site Szélmalomdomb from a Roman period (Budinský-Krička and Lamiová-Schmiedlová 1990). As a result of the available LIDAR data, it is now possible to create maps of barrow cemeteries, and most importantly, to identify small embankments that are poorly visible in the terrain, which will be rapidly destroyed in areas with intensive agriculture.

References

Bakuła K., Ostrowski W., Zapłata R., Kurczyński Z., Kraszewski B. and Stereńczak K. 2016 Zalecenia w zakresie pozyskiwania, przetwarzania, analizy i zastosowania danych LIDAR w celu rozpoznania zasobów dziedzictwa archeologicznego w ramach AZP. Online publication: https://www.nid.pl/pl/Dla_specjalistow/Badania_i_dokumentacja/zabytki-archeologiczne/instrukcje-wytyczne-zalecenia/2017_instrukcja_LIDAR_NID.PDF

Balaguri È. A. 2001. *Naselenie Verhnego Potis´â v èpohu bronzy*. Užgorod: Ministerstvo obrazovania i nauki Ukrainy.

Budinský-Krička V. 1967. Východoslovenské mohyly. *Slovenská archeológia* 15(2), 277–388.

Budinský-Krička V. and Lamiová-Schmiedlová M. 1990. A late 1st century B.C. – 2nd century A.D. cemetery at Zemplín. *Slovenská archeológia* 38, 245–344.

Chochorowski J. 1976. Pochówek szkieletowy kultury ceramiki sznurowej z Kietrza, woj. Opole. *Sprawozdania Archeologiczne* 28, 125–131.

Dani J. 2020. Kurgans and their builders. The Great Hungarian Plain at the dawn of the Bronze Age. *Hungarian Archaeology* 9, 46–65.

David A., Linford N. and Linford P. 2008. *Geophysical Survey in Archaeological Field Evalu*ation. Swindon: English Heritage.

Ecsedy I. 1979. *The people of the pit-grave kurgans in eastern Hungary* (= *Fontes Archaeologici Hungariae*). Budapest: Akadémiai Kiadó.

Fassbinder J. 2015. Seeing beneath the farmland, steppe and desert soil: magnetic prospecting and soil magnetism. *Journal of Archaeological Science* 56, 85–95.

Gancarski J. and Machnikowie A. and J. 1986. Wyniki badań kurhanu A kultury ceramiki sznurowej we wsi Bierówka, gmina Jasło, w województwie krośnieńskim. *Acta Archaeologica Carpathica* 25, 57–87.

Gancarski J. and Machnikowie A. and J. 1990. Kurhan B kultury ceramiki sznurowej w Bierówce, gmina Jasło, w świetle badań wykopaliskowych. *Acta Archaeologica Carpathica* 29, 99–124.

Górski J. and Jarosz P. 2006. Cemetery of the Corded Ware and the Trzciniec Cultures in Gabułtów. *Sprawozdania Archeologiczne* 58, 401–451.

Horváth T., Dani J., Pető A., Pospieszny Ł. and Svingor É. 2013. Multidisciplinary Contributions to the Study of Pit Grave Culture Kurgans of the Great Hungarian Plain. In V. Heyd, G. Kulcsár and V. Szeverényi (eds.), *Transitions to the Bronze Age. Interregional Interaction and Socio-Cultural Change in the Third Millennium BC Carpathian Basin and Neighbouring Regions*. Budapest: Archaeolingua, 153–180.

Jarosz P. 2002. Kurhan kultury ceramiki sznurowej w Średniej st. 2, pow. Przemyśl. Wyniki badań wykopaliskowych prowadzonych w 2001 r. *Rocznik Przemyski* 38(2) (Archeologia), 3–21.

Jarosz P. 2011. Kurhany KCS na pogórzach i wysoczyznach karpackich. In A. Kowalewska-Marszałek and P. Włodarczak (eds.), *Kurhany neolityczne i wczesnobrązowe w świetle nowych i najnowszych badań*. Kraków, Warszawa: Instytut Archeologii i Etnologii Polskiej Akademii Nauk, Instytut Archeologii Uniwersytetu Warszawskiego, 255–277.

Jarosz P. and Machnik J. 2000. Nowe spojrzenie na dawne badania kurhanów w Balicach i Klimkowcach w świetle materiałów archiwalnych i zbiorów Muzeum Archeologicznego w Krakowie. In J. Rydzewski (ed.), *150 lat Muzeum Archeologicznego w Krakowie*. Kraków: Muzeum Archeologiczne w Krakowie, 109–133.

Jarosz P. and Włodarczak P. 2007. Chronologia bezwzględna kultury ceramiki sznurowej w Polsce południowo-wschodniej oraz na Ukrainie. *Przegląd Archeologiczny* 55, 71–108.

Jarosz P. and Włodarczak P. 2022. Chronologia radiowęglowa kultury ceramiki sznurowej w Małopolsce. In A. Szczepanek, P. Jarosz, J. Libera and P. Włodarczak (eds.), *Społeczności schyłkowego eneolitu w południowo-wschodniej Polsce w świetle badań archeologicznych i analiz interdyscyplinarnych*. Pękowice, Kraków: Wydawnictwo Profil-Archeo, 9–43.

Kaiser E. 2019. *Das dritte Jahrtausend im osteuropäischen Steppenraum kulturhistorische studien zu prähistorischer subsistenzwirtschaft und interaktion mit benachbarten räumen* (= *Berlin Studies of the Ancient World* 37). Berlin: Edition Topoi.

Kalicz N. 1968. *Die Frühbronzezeit in Nordost-Ungarn. Abriss der Geschichte des 19–16. Jahrhunderts v. u. Z.* (= *Archaeologia Hungarica* 45). Budapest: Akadémiai Kiadó.

Kondracki J. 1989. *Karpaty*. Warszawa: Polskie Wydawnictwa Naukowe.

Kośko A. 2000. From research into the issue of the developmental dependencies of the Corded Ware culture and Yamnaya culture. In S. Kadrow (ed.), *A Turning of Ages. Im Wandel der Zeiten. Jubilee Book Dedicated to Professor Jan Machnik on His 70th Anniversary*. Kraków: Instytut Archeologii i Etnologii Polskiej Akademii Nauk, 337–346.

Kulcsár G. and Szeverényi V. 2013. Transition to the Bronze Age. Issues of Continuity and Discontinuity in the First Half of the Third Millennium BC in the Carpathian Basin. In V. Heyd, G. Kulcsár and V. Szeverényi (eds.), *Transitions to the Bronze Age. Interregional Interaction and Socio-Cultural Change in the Third Millennium BC Carpathian Basin and Neighbouring Regions*. Budapest: Archaeolingua, 67–92.

Lamiová-Schmiedlová M. 1973. Výskum dvoch mohýl v Zemplíne roku 1969. *Nové obzory* 15, 167–172.

Lehoczky T. 1894. A királyhelmeczi sírhalmokról. *Archaeologiai Értesítő* 14, 250–252.

Machnik J. 1979. Ze studiów nad kulturą ceramiki sznurowej w dorzeczu Górnego Dniestru. *Acta Archaeologica Carpathica* 19, 51–71.

Machnik J. 1992. Neue Daten zur Problematik der Schnurkeramikkultur in Südostpolen. In M. Buchvaldek and C. Strahm (eds.), *Die kontinentaleuropäischen Gruppen der Kultur mit Schnurkeramik. Schnurkeramik – Symposium 1990* (= *Praehistorica* 19). Praha: Univerzita Karlova, 265–274.

Machnik J. 2001. Kultura ceramiki sznurowej w strefie karpackiej (stan i perspektywy badawcze). In J. Gancarski (ed.), *Neolit i początki epoki brązu w Karpatach polskich*. Krosno: Muzeum Podkarpackie w Krośnie, 115–137.

Machnik J., Mačalová H., Tunia K. and Jarosz P. 2008. Kurhan nr 34 kultury ceramiki sznurowej w miejscowości Hankovce, okr. Bardejov, stanowisko 1. In J. Machnik (ed.), *Archeologia i środowisko naturalne Beskidu Niskiego w Karpatach*, 2: *Kurimská Brazdá* (= *Prace Komisji Prehistorii Karpat* 4). Kraków: Polska Akademia Umiejętności, 157–186.

Machnik J., Pavliv D. and Petehyryč V. 2006. Barrow of the late Corded Ware Culture from Bikiv, Drohobyč district. In K. Harmata, J. Machnik and L. Starkel (eds.), *Environment and Man at the Carpathian Foreland in the Upper Dnister Catchment from Neolithic to Early Mediaeval Period* (= *Prace Komisji Prehistorii Karpat* 3). Kraków: Polska Akademia Umiejętności, 195–227.

Machnik J., Pavliv D. and Petehyryč V. 2011. *Prahistoryczne kurhany we wsi Haji Nyźni koło Drohobycza*. Kraków: Polska Akademia Umiejętności.

Machnik J. and Sosnowska E. 1996. Starożytna mogiła z początku III tysiąclecia przed Chrystusem, ludności kultury ceramiki sznurowej w Średniej, gm. Krzywcza. *Rocznik Przemyski* 32(3) (Archeologia), 3–28.

Miroššayová E. 1981. Záchranný výskum eneolitickej mohyly v Zbudzi. *Archeologické výskumy a nálezy na Slovensku v roku 1980*, 175–177, 414–415.

Misiewicz K. 2006. *Geofizyka archeologiczna*. Warszawa: Instytut Archeologii i Etnologii Polskiej Akademii Nauk.

Novotná M. 1987. Die Kultur der ostslowakischen Hügelgräber und ihre Beziehungen zu den benachbarten Gebieten. In D. Srejović and N. Tasić (eds.), *Hügelbestattung in der Karpaten-Donau-Balkan-Zone während der Äneolithischen Periode. Internationales Symposium*. Beograd: Univerzitet u Beogradu, Filozofski fakultet, Centar za arheološka istraživanja, 91–98,

Penâk S. I., Popovič I. I. and Potušnâk M. F. 1979. Raboty na novostrojkah Zakarpat´â. *Arheologičeskie otkrytiâ 1978*. 386–387.

Sulimirski T. 1968. *Corded Ware and Globular Amphorae North-East of the Carpathians*. London: Athlone Press.

Svešnìkov Ì. K. 1974. *Ìstorìâ naselennâ Peredkarpattâ, Podìllâ ì Volinì v kìncì III – na počatku II tysâčolìttâ do našoï eri.* Kiïv. Naukova dumka.

Tunia K. 2008. Słowacko-polskie archeologiczne badania powierzchniowe w górnym dorzeczu Topli, Słowacja. In J. Machnik (ed.), *Archeologia i środowisko naturalne Beskidu Niskiego w Karpatach*, 2: *Kurimská Brazdá* (= *Prace Komisji Prehistorii Karpat* 4). Kraków: Polska Akademia Umiejętności, 41–138.

Włodarczak P. 2006. *Kultura ceramiki sznurowej na Wyżynie Małopolskiej*. Kraków: Instytut Archeologii i Etnologii Polskiej Akademii Nauk.

Włodarczak P. 2010. Dunajski szlak kultury grobów jamowych a problem genezy kultury ceramiki sznurowej. In S. Czopek and S. Kadrow (eds.), *Mente et rutro, Studia archaeologica Johanni Machnik viro doctissimo octogesimo vitae Anno ab Amicis, Collegia et discipulis oblate*. Rzeszów: Mitel, 299–325.

Włodarczak P. 2022. Schyłkowy eneolit Małopolski w świetle badań XXI wieku. In A. Szczepanek, P. Jarosz, J. Libera and P. Włodarczak (eds.), *Społeczności schyłkowego eneolitu w południowo-wschodniej Polsce w świetle badań archeologicznych i analiz interdyscyplinarnych*. Pękowice, Kraków: Wydawnictwo Profil-Archeo, 375–419.

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

Katarzyna Trybała-Zawiślak[1], Leszek Potocki[2],
Sylwester Czopek[3], Tomasz Ząbek[4]

DOI: 10.15584/anarres.2023.18.8

[1] Institute of Archaeology, University of Rzeszów, Moniuszki 10, 35-015 Rzeszów, Poland;
e-mail: ktrybala@ur.edu.pl; ORCID: 0000-0002-1482-0072

[2] Department of Biotechnology, University of Rzeszow, Pigonia 1, 35-310 Rzeszow, Poland;
e-mail: lpotocki@ur.edu.pl; ORCID: 0000-0002-2842-6877

[3] Institute of Archaeology, University of Rzeszów, Moniuszki 10, 35-015 Rzeszów, Poland;
e-mail: sczopek@ur.edu.pl; ORCID: 0000-0003-3762-4215

[4] Molecular Biology Department, National Research Institute of Animal Production, Krakowska 1, 32-083 Balice, Poland;
e-mail: t.zabek@izoo.krakow.pl; ORCID: 0000-0002-9795-3232

Bacterial Endospores as an Additional Source of Archaeological Knowledge in the Analysis of a Burial Cemetery of the Tarnobrzeg Lusatian Culture in Dębina (SE Poland)

Abstract

Trybała-Zawiślak K., Potocki L., Czopek S., Ząbek T. 2023. Bacterial Endospores as an Additional Source of Archaeological Knowledge in the Analysis of a Burial Cemetery of the Tarnobrzeg Lusatian Culture in Dębina (SE Poland). *Analecta Archaeologica Ressoviensia* 18, 117–129

Archaeological studies need to use laboratory techniques, including analytical methods like Atomic Absorption Spectrometry, gas chromatography – mass spectrometry, and high-performance liquid chromatography, as well as genetic methods to resolve and verify scientific hypotheses. However, additional tools are still needed in the case of the cultural practices and traditions of ancient societies. Archaeological examinations of cultural practices have made significant progress in recent years, but additional tools are still needed to fully understand the complexity and diversity of these practices. In this work, we demonstrate how the genotyping of soil bacteria that can produce endospores is a potentially additional method for discovering past funeral rituals in various human populations who used food during their ceremonies. Endospores were isolated from soil samples taken from inside earthenware cup and pot-type vessels from a burial ground identified with the Tarnobrzeg Lusatian culture (SE Poland). The detected species of spore-forming bacteria strains were mostly environmental (originating from soil and / or water). However, the presence of some of the taxa i.e. (*Peanibacillus, Bacillus*) may provide a valuable source of archaeological information. We found that a combination of molecular and microbiological analysis can support archaeological studies of burial grounds and – in particular – individual graves, especially when they are characterized by a complete lack of bones.

Keywords: archaeology studies, microbiological analyses, endospores, Tarnobrzeg Lusatian culture

Received: 26.09.2023; **Revised:** 16.10.2023; **Accepted: 05**.12.2023

1. Introduction

Archaeological studies of burial grounds provide an invaluable source of information about human history, capturing details of migrations, habits, religions, and various tragedies such as wars and epidemics (Cano *et al.* 2000; Zink *et al.* 2003; Fernández 2012; Stantis *et al.* 2015). Unfortunately, one of the major problems of burial ground studies is their poor quality or lack of sufficiently preserved bones. This problem has often been described in the case of burial graves belonging to the Lusatian culture (Czopek and

Trybała-Zawiślak 2014) therefore, some alternative methods are still helpful in archaeological studies. The use of biological methods, including microbiological techniques, in the analysis and interpretation of studied samples from archaeological sites has changed research strategies in archaeology (Acinas *et al*. 2004; Andersen *et al*. 2012; Margesin *et al*. 2017). Currently, analysis of soil microorganisms is used to follow the variation in usable areas of archaeological sites, in the reconstruction of diachronic soil layers, the population density of an area, and also in determining the diet of a given ancient society, etc. (Mitusov *et al*. 2009; Moodley *et al*. 2009; Grund *et al*. 2014).

Another approach relies on the presence of microorganism species as a complementary technique in the dating of archaeological samples taken from the soil (Grund *et al*. 2014). Of particular interest is the use of microbiological tests to reconstruct the health of ancient populations (Spyrou *et al*. 2019). The isolation of microbial DNA from well-preserved soft tissue remains of humans and animals can constitute direct evidence of the presence of infectious diseases, the spatial distribution of the disease, the mutual relationship between host and pathogen, and allow the study of the evolution of pathogens (Rollo *et al*. 2006; Devault *et al*. 2014). In our analysis, we paid special attention to endospore-forming bacteria. In addition to their survival function under adverse environmental conditions, endospores can also play an important role in the long-term survival of a species (Nilsson and Renberg 1990). Bacterial endospores are very resistant cell structures of Gram-positive bacteria of the phylum *Firmicutes* (Onyenwoke *et al*. 2004; Wunderlin *et al*. 2013; 2014). Bacterial endospores are used in particular in paleoecology to investigate environmental changes by analyzing river sediments or samples taken from lakes (Lomstein *et al*. 2012; Wunderlin *et al*. 2014). Therefore, it seems reasonable to use microbial taxa capable of producing endospores as a complement to traditional archaeology methods based on artefact detection in order to obtain more information on ritualistic behavior concerning not only the Tarnobrzeg Lusatian culture (SE Poland), but also in detecting the anthropogenic activities of other cultures. A working hypothesis was that bacterial endospores embedded in the porous structure of ceramic vessels permanently altered the microbial content of the vessel (vascular microbiome). The research hypothesis was verified using the genetic analysis of bacteria capable of producing spores as a method that supports the archaeological research of boneless cemeteries. For this purpose, a comparative analysis of microorganism communities isolated from samples taken from archaeological vessels and environmental sources were performed. A soil sample taken from the vicinity of the grave was used as a control. Furthermore, Klindworth's designed degenerate primers were used for the detection of the 16S ribosomal RNA gene to reduce errors in the detection of microbial diversity during PCR studies (Klindworth *et al*. 2013).

2. Materials and Methods

2.1. Site Description and Soil Sampling

The samples were collected from the burial ground discovered in Dębina 6 (SE Poland) belonging to the Tarnobrzeg Lusatian culture. The date of the burial ground in Dębina was described as early $13^{th}/12^{th}$ century BC on the basis of the ^{14}C analysis with a probability of 2 sigma after calibration in some of the wood balk that was also found in the grave cavity (data not presented). We chose one of the graves, no. 47 (Fig. 1), of a typically irregular form situated along a N-S axis and 2.4–0.45/0.8 m dimension. Unfortunately, no skeletal bones were preserved, but the following burial accessories were found in skeletal grave no. 47: an undefined brown pin, two earthenware s-shaped pot-type vessels, one earthen bowl, one earthen cup, and one small earthen vase. All the burial accessories were located in the south part of skeletal grave no. 47, probably near the head (Fig. 2). The organization of burial no. 47 was characterized by a similar ceramic typology to other burials, as previously described by Czopek and Trybała-Zawiślak (2014). To increase the probability of the isolation of bacterial species from ancient endospores, it was assumed that bacterial spores could have been absorbed into the clay matrix of vessels, and therefore soil samples were taken directly from the bottom of the cup and pot-type vessel. Soil samples were kept at 4°C and were used for research several days after sampling. In the vicinity of the tomb, soil samples were also collected from four sites (at a distance of 1 meter from the grave) and used as controls.

2.2. Isolation of pure bacterial cultures from bacterial endospores and associated environmental bacteria from soil

All analyses were performed under sterile conditions. A soil solution was prepared by dissolving 1 g of the soil sample in 90 mL of physiological saline supplemented with the emulsifying agent Tween 80

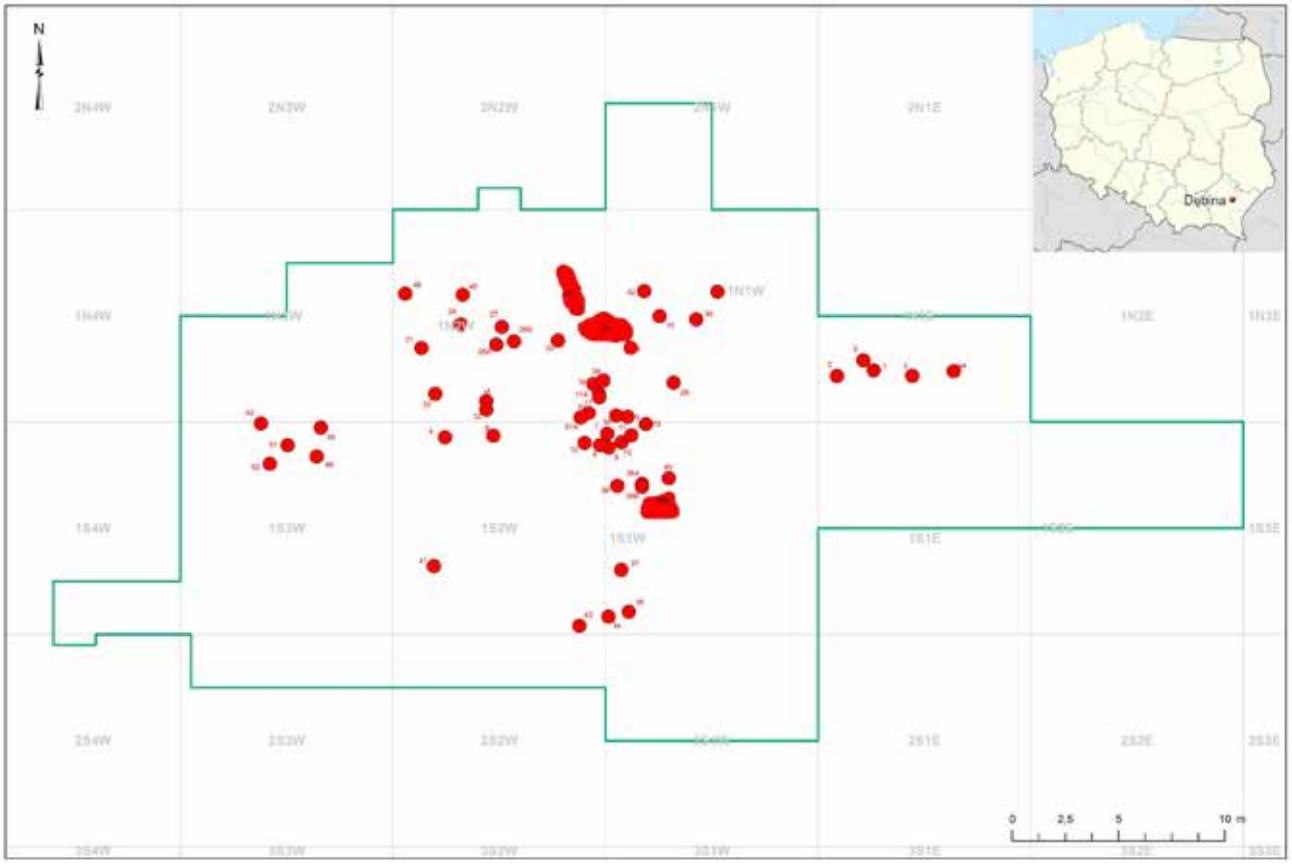


Fig. 1. Dębina, site 6, Poland – site localization and plan of cemetery with grave 47 (prepared by M. Jabłkowski).

(Sigma Aldrich, USA). The samples were shaken for 3 hours to elute the endospores and vegetative cells of soil microorganisms. In the next step, a serial dilution method was used to obtain single bacterial colonies. For this purpose, the obtained soil extract was then used to prepare fourteen-fold serial dilutions. Each 0.1 mL dilution was plated into Petri dishes with the nutrient agar in three repeats. To verify the presence of endospores in the soil solution, microbiological preparations were prepared and stained using the Schaeffer-Fulton method and observed under an Olympus BX43 light microscope at 1000x in oil immersion. In the next step, a soil solution was also used to prepare a spore extraction. Most bacteria cannot survive heating at 80°C for 10 minutes (pasteurization), unlike spores, which are thermally resistant and can survive for hours in boiling water. To do this, 1mL of the dilution (1:10, 1:100) was placed in tubs and incubated in the thermoblock for 15 minutes at 80°C to activate germination. To verify the presence of sporulation bacteria, 0.1 mL portions of each dilution were taken and spread on nutrient agar plates. Furthermore, inoculations on NA nutrient agar (meat extract – 10 $g \cdot L^{-1}$, peptone – 10 $g \cdot L^{-1}$, sodium chloride – 5 $g \cdot L^{-1}$, agar – 20 $g \cdot L^{-1}$, pH – 7.0) and Streptomyces GYM agar (glucose – 4.0 $g \cdot L^{-1}$; yeast extract – 4.0 $g \cdot L^{-1}$g; malt extract – 10.0 $g \cdot L^{-1}$; CaCO3 – 2.0 $g \cdot L^{-1}$; agar – 12.0 $g \cdot L^{-1}$, pH – 7.2) were used as controls to differentiate vegetative bacterial species from the growth of bacterial species after the activation of the endospore germination process. Plates were incubated at 37°C for saprophytic and sporulation bacteria for 48 h and at 26°C for *Actinomycetes* for a period of 7 days. Colonies were chosen for the isolation DNA procedure on the basis of their morphological characteristics, therefore, picking similar colonies that developed on the plates at the same time was avoided. The isolated bacterial colonies were multiplied in nutrient broth at 37°C for 24 h. Furthermore, bacterial stocks of 40% v/v glycerol were taken from the prepared cultures and maintained at –80°C.

2.3. Preparation of genomic DNA from bacteria

Genomic DNA from each sample was isolated using a standard kit -GeneJet™ Genomic DNA purification Kit from Fermentas. The quality control of the isolated DNA was performed on 1% agarose gel.

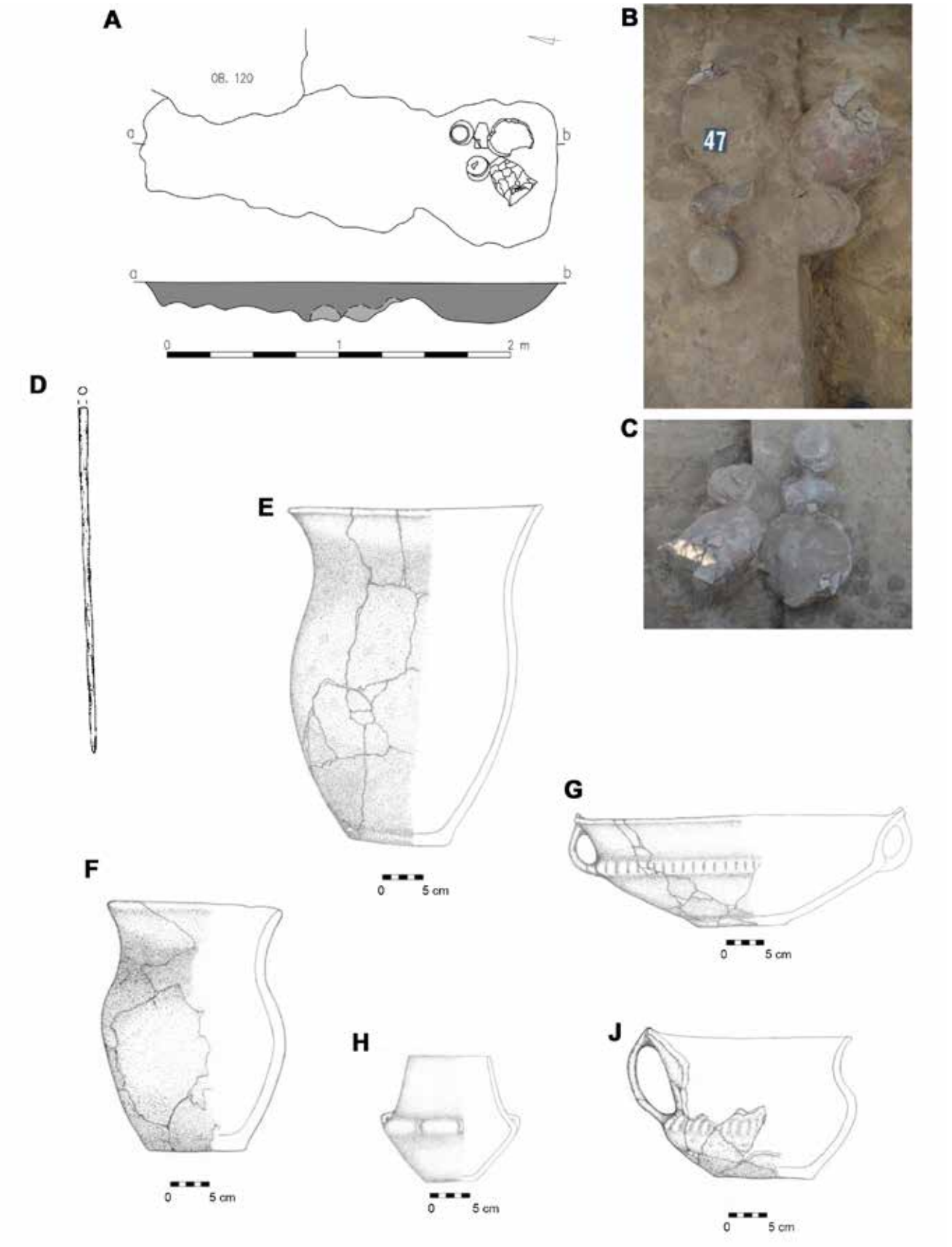


Fig. 2. Dębina, site 6, Poland – skeletal grave 47.
A – plan view and grave profile; B–C – vessels from the skeletal grave *in situ* (photo by K. Trybała-Zawiślak);
D–J – inventory of the skeletal grave (drawn by K. Trybała-Zawiślak).

2.4. Identification of isolated bacteria

To examine the microbial community specific to the archaeological samples, including activated bacterial species from endospores, we used sequence haplotyping in the locus encoding the 16S rRNA gene. For this purpose, we used specially designed degenerate primers, according to Klindworth *et al.* (2013). The most promising pair of bacterial primers proposed in population studies (SD-Bact-0341-bS-17(5'-CCTACGGGNGGCWGCAG-3')/SD-Bact-0785-aA-21(5'-GACTACHVGGGTATCTAATCC-3'), with an amplicon size of 464 bp, where the taxonomic distribution of 16S rDNA amplicons with 16S rDNA fragments was experimentally compared directly from the sequenced metagenomes. The PCR was carried out in 50 µL reaction volumes using 5 µL PCR buffer (10x) (Sigma Aldrich, USA), 1 µL $MgCl_2$ (100 mM) (Sigma Aldrich,USA), 1 µL dNTPs (10 mM each) (Sigma Aldrich, USA), 2 µL each of forward and reverse primers (10 µM) (Genomed, Poland), 0.5 µL Taq polymerase (5 U μL^{-1}) (Sigma Aldrich, USA), 2–3 µL DNA solution, and made up to the final volume with ddH_2O. The thermal cycling program was as follows: initial denaturation at 95°C for 5 min, followed by 25 cycles consisting of denaturation (95°C for 40 s), annealing (2 min) and extension (72°C for 1 min) and a final extension step at 72°C for 7 min. The PCR products were purified using the GENEJET PCR purification kit (Thermo Fisher Scientific Inc., USA), and the cleaned PCR products were sequenced using Big Dye Terminator Cycle Sequencing Chemistry (Life Technologies, Poland) using PCR primers. The cleaned products of Sanger sequencing were subjected to capillary electrophoresis (Genomed, Poland). Sequencing reads were analyzed using the NCBI nucleotide sequence database search (BLASTN option) and interpreted using MEGA6.0 software. The phylogenetic tree was inferred using the maximum likelihood method based on the K2 model in MEGA software with 1000 bootstrap replicates. The image of a species-based phylogenetic tree was generated using the ETE toolkit (http://etetoolkit.org/treeview/) (Huerta-Cepas *et al.* 2016).

3. Results and Discussion

The main aim of this study was to determine whether bacterial spores of the *Firmicutes* genus can be used as "time-space capsules" to reveal past events, with potential applications in paleontology, paleoecology, and archaeology. We also focused on the following questions: which group of microorganisms grew in an environment rich in organic compounds and whether the archaeological vessels may have been filled with food and then deposited in the grave during ritual ceremonies. The last premise in particular is supported by the shapes of the archaeological vessels excavated from the grave no. 47 in Dębina. Additionally, control cultures on nutrient agar, Streptomyces GYM agar, and environmental bacteria from samples taken in the vicinity of the grave were used to identify spore-forming bacteria species that grew in an environment rich in organic compounds. Sequence analysis of 16S bacterial rDNA isolated from the bacterial soil collected from outside the earthenware vessels allowed us to identify the environmental background, which were excluded from the analysis. We also isolated species specific to archaeological samples with 99% sequence similarity to Genbank entries (Tab. 1; Fig. 3).The assignment of ambiguity for some species isolates is due to the high sequence similarity of the gene encoding 16S RNA. Our research also shows that the species composition of the bacteria isolated from the samples is fundamentally different. As a result, the comparative analysis showed that the most characteristic types of bacteria in the soil sample taken from the cup were: *Paenibacillus* (*Paenibacillus alginolyticus*, *Paenibacillus chondroitinus*, *Paenibacillus frigoriresistens*, *uncultured Paenibacillus sp.*) and *Psychrobacillus psychrodurans*. Similarly, the most abundant bacterial species in the soil sample taken from the pot were: *Acinetobacter radioresistens* and the genus *Bacillus* (*Bacillus marisflavi*, *Bacillus aquimaris*, *Bacillus vietnamensis*) (Fig. 3, 4).

The genus *Paenibacillus*, capable of producing endospores, may be particularly important in bioarchaeological studies by providing valuable information on the contents of cult vessels. It has been suggested that the *Paenibacillus* genus may cause fatal diseases in honeybees; while other species are opportunistic pathogens associated with human infections and others cause spoilage of pasteurized dairy products (Alippi *et al.* 2002; Sáez-Nieto *et al.* 2017). In addition, the genus *Paeanibacillus* is one of the bacterial genera regularly identified in soil microbiomes and enriched in close proximity to plants. It has been documented that throughout domestication, maize seeds have maintained a common set of bacteria with wild ancestors and each other, including *Paenibacillus* (Johnston-Monje and Raizada 2011).

A study of the maize seed microbiome also showed that a member of the *Paenibacillaceae* family originates from germinating maize seeds and not from the soil (Beirinckx *et al.* 2020). Interestingly, the pres-

Table 1. Presence of different types of bacteria isolated from archaeological vessels and from environmental soil samples based on 16S rRNA gene sequences. Earth samples collected from archaeological vessels-cup and crock, assay cup1, crock1-plating on NA (Nutrient agar), cup2, crock2- inoculation samples on NA (Nutrient agar) after activation of the germination process; cup3, crock3-plating on Streptomyces GYM agar; number after the forward slash indicates the number of analysed bacterial colonies taken from the medium. BG-sample of soil taken in the vicinity of the grave. The species not detected in the control are marked in red.

Number of samples constructed based on sequence similarity	Isolate code	Maximum number of sequenced bases used in alignment.	Phylogenetic affiliation	Sequence identity (%)	The highest 16S rRNA sequence similarity (Genbank)
1	2	3	4	5	6
1	**BG3/3**	391	*Pseudomonas brassicacearum*	99	HQ242755
		391	*Pseudomonas frederiksbergensis*	99	KJ567114
		391	*Pseudomonas lini*	99	HQ242757
		391	*Pseudomonas mediterranea*	99	HQ242760
		391	*Pseudomonas putida*	99	HF545844
2	**crock2/1**	387	*Acinetobacter radioresistens*	99	KP763481
3	**crock1/4, cup1/4, crock3/5, crock3/7, crock3/9, cup3/3, cup 3/5, cup3/7, BG3/1**	370	*Arthrobacter defluvii*	99	KM203781
	crock1/4, cup1/4, crock3/1, crock3/5, crock3/7, crock3/9, cup3/3, cup3/5, cup3/7, cup3/9, BG3/1	370	*Arthrobacter globiformis*	99	KM252929
		372	*Arthrobacter humicola*	99	LK022683
		398	*Arthrobacter oryzae*	99, 100	KR233762
		398	*Arthrobacter oxydans*	99	KR085876
		398	*Arthrobacter pascens*	99, 100	KT239466
		398	*Arthrobacter phenanthrenivorans*	99,100	KR085846
		398	*Arthrobacter scleromae*	99,100	KP739254
		398	*Arthrobacter siccitolerans*	99,100	KP192022
		398	*Arthrobacter sulfonivorans*	99,100	KP192019
4	**BG3/2**	366	*Arthrobacter aurescens*	99	AB741459
		366	*Arthrobacter bambusae*	99	KP860526
		366	*Arthrobacter nitroguajacolicus*	99	HG941862
		366	*Arthrobacter gyeryongensis*	99	JX141781
		366	*Arthrobacter methylotrophus*	99	LN774207
		366	*Arthrobacter ramosus*	99	KF958504
5	**cup2/4**	391	*Paenibacillus alginolyticus*	99	NR_040893

1	2	3	4	5	6
		391	*Paenibacillus chondroitinus*	99	KP203953
		391	*Paenibacillus frigoriresistens*	99	NR_109546
		391	*Uncultured Paenibacillus sp.*	99	KJ191874
6	**BG1/4**	388	*Bacillus pumilus*	100	KT624198
		388	*Bacillus safensis*	100	KP940383
7	**cup1/6, cup 1/7.2, crock3/3, cup3/2, BG1/3**	395	*Bacillus cereus*	98, 99	LC076294
		395	*Bacillus thuringiensis*	98, 99	KP998181
		395	*Bacillus anthracis*	98, 99	CP012519
		395	*Bacillus subtilis*	98, 99	KP986945
	cup1/7.2, crock3/3, cup3/2	395	*Bacillus toyonensis*	98, 99	KM241845
	cup1/7.2, crock3/3, cup3/2, BG1/3	395	*Bacillus mycoides*	98, 99	KM251860
	cup1/6	390	*Bacillus pseudomycoides*	98	HM209758
8	**crock2/1, crock2/5**	391	*Bacillus marisflavi*	99	KJ560874
		391	*Bacillus aquimaris*	99	KP178608
		391	*Bacillus vietnamensis*	99	KC734535
9	**crock3/8, BG1/1**	386	*Bacillus aryabhattai*	99	KR006696
	crock3/8	387	*Bacillus megaterium*	99	KC595869
	BG1/1	386	*Bacillus megaterium*	99	KR822272
10	**BG1/2**	398	*Psychrobacillus psychrodurans*	97	KC354598
		399	*Actinobacterium*	97	EU810854
		399	*Bacillus cereus*	97	KJ922989
11	**cup1/1**	400	*Psychrobacillus psychrodurans*	99	KM036085
12	**cup2/3, BG2/3**	388	*Azorhizophilus paspali*	96,100	LN874287
		388	*Bacillus arbutinivorans*	96,100	KR131862
		388	*Bacillus drentensis*	96,100	KJ589539
		388	*Bacillus fumarioli*	96,100	KC354687
		388	*Bacillus senegalensis*	96, 100	AB795570
		388	*Bacillus thermocopriae*	96,100	KP010244
13	**crock3/10, crock1/2, crock1/6, crock2/2**	427	*Uncultured bacterium*	98,99	AB929995
	cup1/3	414	*Bacillus sp.*	99	LC065250
14	**cup3/10**	416	*Brevibacterium frigoritolerans*	98,99,100	KR085896
		416	*Bacillus megaterium*	98,99,100	KP717948
		416	*Bacillus muralis*	98,99,100	KM678279
		416	*Bacillus simplex*	98,99,100	KP993465
		416	*Bacillus thuringiensis*	98,99,100	KP966473

1	2	3	4	5	6
		416	*Marine bacterium*	98,99,100	KJ814538
		392	*Paenibacillus sp.*	100	KT200444
		416	*Psychrobacillus psychrodurans*	98,99,100	KR088747
15	**cup2/1**	425	*Bacillus muralis*	99	EU977778
	cup2/1, cup2/2, crock3/4	425	*Bacillus simplex*	99	JF683660
	cup2/1, cup2/2, crock2/2, cup1/3, cup2/4, cup1/3, crock3/11, crock3/4, cup3/1, cup3/6, cup3/8, BG1/6	424	*Paenibacillus sp.*	98, 99, 100	KT200444
		424	*Psychrobacillus psychrodurans*	98, 99, 100	KR088747
		424	*Brevibacterium frigoritolerans*	98, 99, 100	KR085896
		424	*Bacillus megaterium*	98, 99, 100	KP717948
	cup1/3.1, cup2/4, cup1/5, crock3/11, crock3/4, cup3/1, cup3/6, cup3/8, BG1/6	416	*Bacillus thuringiensis*	98, 99, 100	KP966473
	cup1/3.1, cup2/4, cup1/5, crock3/4, cup3/1, cup3/6, cup3/8, BG1/6	416	*Marine bacterium*	98, 99, 100	KJ814538

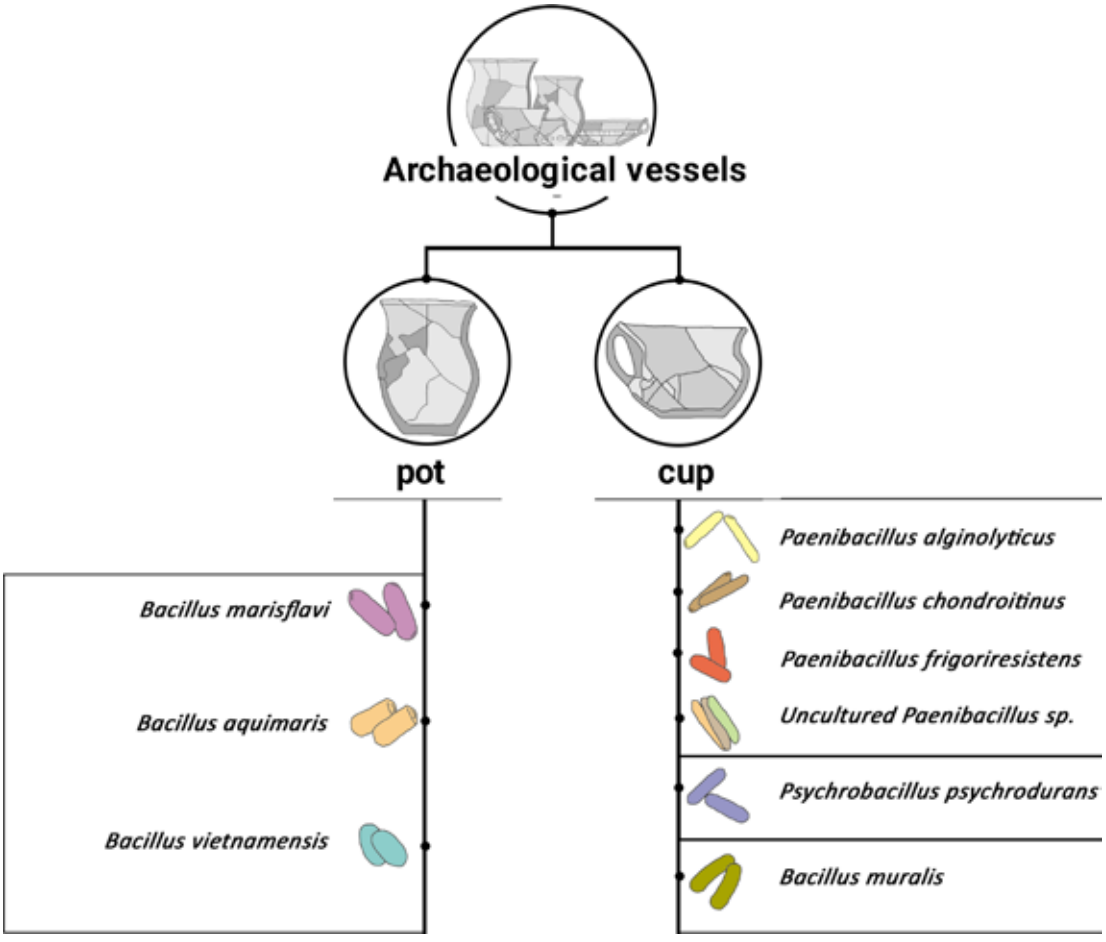


Fig. 3. Site-specific culture-based bacterial communities in a) crock; b) cup sampling locations (figure created with Biorender.com; prepared by L. Potocki).

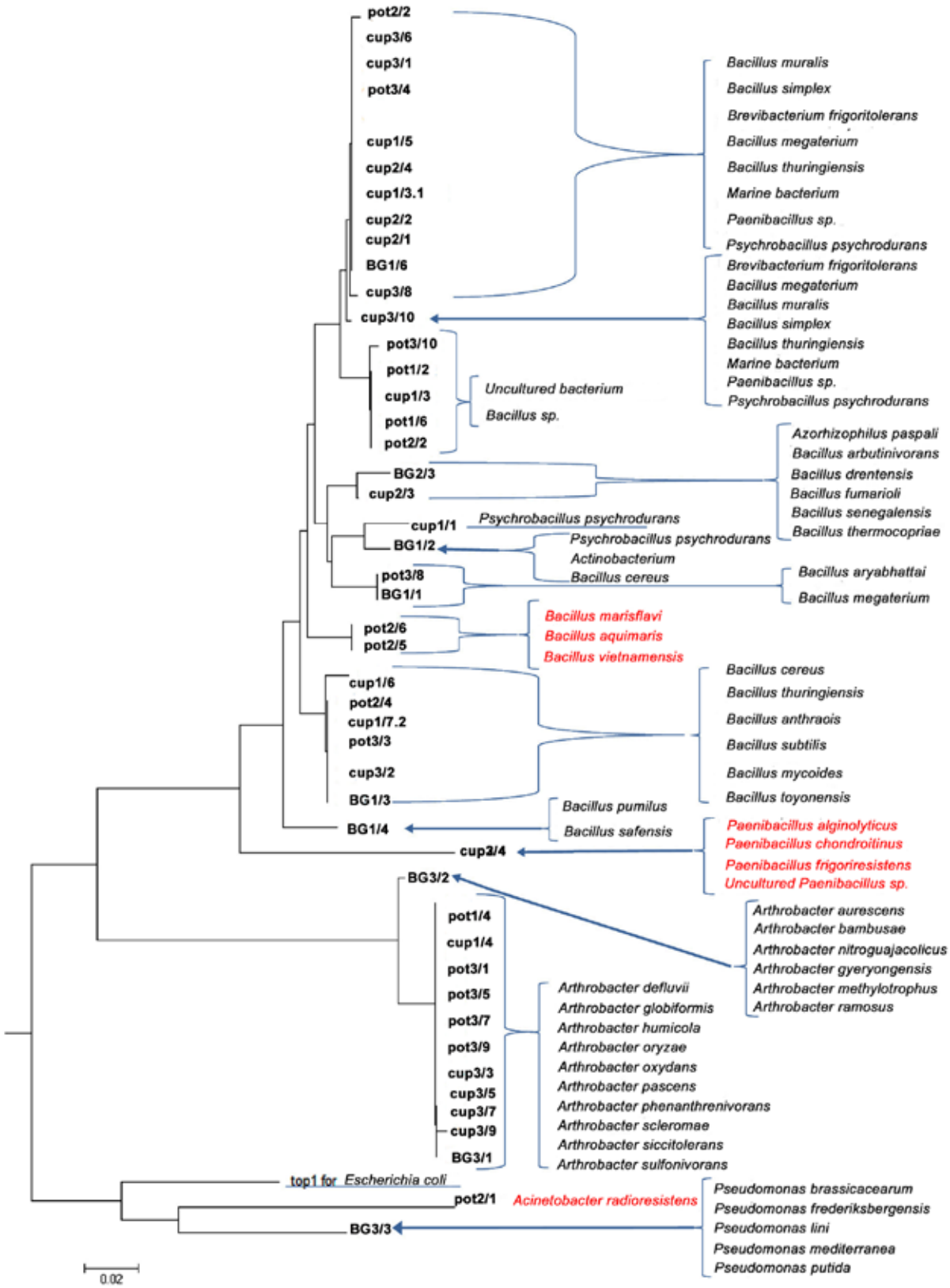


Fig. 4. Phylogenetic relationships of bacteria isolated from archeological vessels and from environmental soil samples based on 16S rRNA gene sequences. Scale bar represents 0.02 substitutions per nucleotide position. *Escherichia coli* strain Top 10 is used as outgroup. The species not detected in the control are marked in red. Earth samples collected from archaeological vessels-cup and crock, assay cup1, crock1-plating on NA (Nutrient agar), cup2, crock2-plating on Streptomyces GYM agar, cup3, crock3- inoculation samples on NA (Nutrient agar) after activation of the germination process; number after forward slash indicates number of analyzed bacterial colony taken from the medium. BG-sample of soil taken in the vicinity of the grave (prepared by L. Potocki).

ence of this genus is dominant in the microbiome of archaeological vessels. Therefore, it seems reasonable to ask whether the isolated bacteria are descendants of ancient bacteria that may have thrived in the nutrient-rich medium found in the vessels. According to a well-established view in archaeology, it is assumed that vessels discovered in graves (if they had no other function, such as being used as urns filled with bones), including additional ceramic grave goods, were originally filled with food (Malinowski 1985). Despite the lack of evidence for the presence of organic compounds in vessels from Dębina, this relationship was confirmed in another research work, where the presence of potassium (K) compared to the values of sodium (Na) was considered an indicator of the presence of organic substances; also the case in the analyzed sand samples that fill the vessels discovered in graves (Bulska and Wróbel 1992). The approach presented here may be promising in determining whether certain bacterial taxa can be indirect evidence indicating that the above vessels were filled with food, cereal seeds or beverages (wine, oil, milk, honey) deposited in an act of worship (Alippi *et al*. 2002; De Graaf *et al*. 2006). Analyzes of grave fillings and traces on the inner walls of vessels carried out at the late Bronze Age and early Iron Age cemetery in Cottbus (Brandenburg, Germany) using a mass spectrometer and gas chromatograph revealed traces of fatty acids, monostearates and sterols in one vessel. The analyzed vessel was originally filled with a liquid substance containing fat (Hofmann *et al*. 2013). Other analyses (including material from other periods), using atomic absorption spectrometry (with indicators – the presence of copper in the samples and the potassium to sodium ratio), also indicate that vessels placed in graves were filled with organic products of animal origin (Bulska *et al*. 1996). Furthermore, analysis of the sand from vessels from the Lusatian culture cemetery in Maciejowice (Mazovia voivodeship) also revealed the presence of organic substances (Mogielnicka-Urban 1992).

Does the microbiological profile obtained in our study, in which the genus *Paeanibacillus* as well as other sporulation species belonging to the genus *Bacillus* dominate in the spore fraction, constitute an indication of the presence of organic substances in vessels from the grave in the Bronze Age cemetery in Dębina? There are confirmations that the use of bee products by communities at that time were used in the production of bronze objects. For example, bronze objects were cast using the "lost wax" method, and required large amounts of beeswax (Dąbrowski 1992). There are also data that indicate that honey in funerary rituals had a symbolic meaning, signifying rebirth and representing a sacrifice to certain deities (Cirlot 2007). Therefore, its presence in funerary rituals should not be surprising, especially in the Bronze Age, when its "abundance favoured ritual use" (Mierzwiński 2012). In the culture of the Urnfield cultural circle, the custom of libation feasts over the grave of the deceased became widespread in the late Bronze Age and Early Iron Age, as evidenced by significant archaeological evidence, the number and assortment of small vessels in graves. Consumption of a honey-based drink seems to have been a common ritual and cases of filling bronze grave vessels with honey are also known (Rösch 1999; Mierzwiński 2012). The fact that bee products were used in the production of bronze objects and funerary rituals in the Bronze Age further supports the hypothesis that the vessels from Dębina may have contained honey. Honey is a sticky substance that can leave a residue on surfaces even after it has been removed. These residues can be ideal breeding grounds for bacteria such as *Paenibacillus* and *Bacillus*. Data indicates that contaminated honey may serve as an environmental reservoir of *Paenibacillus* larvae spores. Their detection in archaeological vessels may provide evidence of organic residues, such as fermented beverages like beer and mead-honey wine (Lindström *et al*. 2008). Despite the lack of detection of *Paeanibacillus larvae* and *Paeanibacillus alvei* in our research, the identification of species of the genus *Bacillus* (*B. megaterium*, *B. cereus*, *B. brevis*, *B. coagulans*, *B. subtilis*) does not necessarily indicate their environmental origin. The literature has reported that these species were widespread, as were *Brevibacillus* and *Virgibacillus* from bee nests (Gilliam 1985; Sáez-Nieto *et al*. 2017). Thus, the species composition of the control samples may not always reflect the environmental isolates but can also provide valuable information regarding the presence of species common to test and control samples.

The microbiological analysis also showed the presence of *Bacillus muralis*, which has been detected on the murals of churches, and decorated entrances to the graves (Heyrman *et al*. 2005*)*. In this case, the identification of the species in the microflora of the soil sample taken from the cup may suggest the presence of dyes that might have come from the decorated dish.

In order to confirm the research hypothesis presented in the paper, further research could include conducting chemical analysis of the vessels to search for the residue of honey or other organic substances. Organic sediment analysis of ceramics is a relatively new research method that is gaining popularity among archeologists. This method allows the detection and identification of

organic residues, such as fats, proteins, carbohydrates, and DNA, which can be preserved in sediments on the surface or inside ceramic vessels (Evershed 2008; Mayyas *et al*. 2013; Bondetti *et al*. 2020).

In summary, we have shown that the characterization of DNA sequence haplotypes of soil bacteria derived from endospores can provide an additional source of information in the archaeological discovery of past funeral rituals in various human populations that used food during their ceremonies. The proposed method also has some advantages over other analytical methods such as eAAS, GC-MS and HPLC, because it is based on the analysis of bacterial composition, which depends strictly on the availability of specific organic and inorganic compounds, e.g., derived from animal and food pigments and human bodies.

Moreover, the presented method of using degenerate primers to study the diversity of microorganisms obtained from archaeological samples may be an alternative to more expensive metagenomic analyses.

4. Conclusions

The conducted microbiological analysis showed a variable composition of spore bacteria collected from archaeological vessels from a grave. Detection of taxa of the genus *Paeanibacillus* or *Bacillus* may be evidence of anthropogenic rites of burying the dead in the Tarnobrzeg Lusatian culture. The presented bioindication of microorganisms may be a valuable new method supplementing traditional archaeological methods. A very interesting development of the analysis was the isolation of a species of *Bacillus muralis*, often detected as a component of the heterotrophic microflora present on the surface of ancient frescoes or wall paintings. The presented approach of using degenerate primers to study microbial biodiversity in archaeological samples may be an alternative to more expensive metagenomic analysis.

References

Acinas S. G., Marcelino L. A., Klepac-Ceraj V. and Polz M. F. 2004. Divergence and redundancy of 16S rRNA sequences in genomes with multiple rrn operons. *Journal of Bacteriology* 186(9), 2629–2635.

Alippi A. M., López A. C. and Aguilar O. M. 2002. Differentiation of Paenibacillus larvae subsp. larvae, the cause of American foulbrood of honeybees, by using PCR and restriction fragment analysis of genes encoding 16S rRNA. *Applied and Environmental Microbiology* 68(7), 3655–3660.

Andersen K., Bird K. L., Rasmussen M., Haile J., Breuning-Madsen H., Kjaer K. H., Orlando L., Gilbert M. T. and Willerslev E. 2012. Meta-barcoding of "dirt" DNA from soil reflects vertebrate biodiversity. *Molecular Ecology* 21(8), 1966–1979.

Beirinckx S., Viaene T., Haegeman A., Debode J., Amery F., Vandenabeele S., Nelissen H., Inzé D., Tito R., Raes J., De Tender C. and Goormachtig S. 2020. Tapping into the maize root microbiome to identify bacteria that promote growth under chilling conditions. *Microbiome* 8(1), 54–54.

Bondetti M., Scott S., Lucquin A., Meadows J., Lozovskaya O., Dolbunova E., Jordan P. and Craig O. E. 2020. Fruits, fish and the introduction of pottery in the Eastern European plain: Lipid residue analysis of ceramic vessels from Zamostje 2. *Quaternary International* 541, 104–114.

Bulska E. and Wróbel K. 1992. Oznaczanie sodu i potasu w próbkach piasku. *Przegląd Archeologiczny* 39, 120–121.

Bulska E., Wrzesińska A. and Wrzesiński J. 1996. Zawartość naczyń grobowych – próba analizy i interpretacji. *Studia Lednickie* 4, 345–356.

Cano R. J., Tiefenbrunner F., Ubaldi M., Del Cueto C., Luciani S., Cox T., Orkand P., Künzel K. H. and Rollo F. 2000. Sequence analysis of bacterial DNA in the colon and stomach of the Tyrolean Iceman. *American Journal of Physical Anthropology* 112(3), 297–309.

Cirlot J. E. 2007. *Słownik symboli*. Kraków: Znak.

Czopek S. and Trybała-Zawiślak K. 2014. Wybrane aspekty obrządku pogrzebowego we wczesnej fazie tarnobrzeskiej kultury łużyckiej na przykładzie stanowiska 6 w Dębinie, pow. łańcucki. In D. Kozak (ed.), *Naukovì studìï*, 7: *Kul´toví ta pohoval´ní pam'âtki u Vísло-Dníprovs´komu regíoní: problem íinterpretacï*. Vinniki, L'vìv: Vidavnictvo Aprìorì, 118–130.

Dąbrowski J. 1992. Uwagi o handlu brązem. In S. Czopek (ed.), *Ziemie polskie we wczesnej epoce żelaza i ich powiązania z innymi terenami*. Rzeszów: Muzeum Okręgowe w Rzeszowie, 81–89.

De Graaf D. C., Alippi A. M., Brown M., Evans J. D., Feldlaufer M., Gregorc A., Hornitzky M., Pernal S. F., Schuch D. M., Titera D., Tomkies V. and Ritter W. 2006. Diagnosis of American foulbrood in honey bees: a synthesis and proposed analytical protocols. *Letters in Applied Microbiology* 43(6), 583–590.

Devault A. M., McLoughlin K., Jaing C., Gardner S., Porter T. M., Enk J. M., Thissen J., Allen J., Borucki M., DeWitte S. N., Dhody A. N. and Poinar H. N. 2014. Ancient pathogen DNA in archaeological samples detected with a Microbial Detection Array. *Scientific Reports* 4, 4245–4245.

Evershed R. P. 2008. Experimental Approaches to the Interpretation of Absorbed Organic Residues in Archaeological Ceramics. *World Archaeology* 40(1), 26–47 (http://www.jstor.org/stable/40025312, access: 24.10.2023).

Fernández P. L. 2012. Palaeopathology: The Study of Disease in the Past. *Pathobiology* 79(5), 221–227.

Gilliam M. 1985. Microbes from apiarian sources: Bacillus spp. in frass of the greater wax moth. *Journal of Invertebrate Pathology* 45(2), 218–224.

Grund B. S., Williams S. E. and Surovell T. A. 2014. Viable paleosol microorganisms, paleoclimatic reconstruction, and relative dating in archaeology: a test case from Hell Gap, Wyoming, USA. *Journal of Archaeological Science* 46, 217–228.

Heyrman J., Logan N. A., Rodríguez-Díaz M., Scheldeman P., Lebbe L., Swings J., Heyndrickx M. and De Vos P. 2005. Study of mural painting isolates, leading to the transfer of "Bacillus maroccanus" and "Bacillus carotarum" to Bacillus simplex, emended description of Bacillus simplex, re-examination of the strains previously attributed to "Bacillus macrolides" and description of Bacillus muralis sp. nov. *International Journal of Systematic and Evolutionary Microbiology* 55(1), 119–131.

Hofmann K. P. 2012. (review) Alexander Gramsch, Ritual und Kommunikation. Altersklassen und Geschlechterdifferenz im spätbronze- und früheisenzeitlichen Gräberfeld Cottbus Alvensleben-Kaserne (Brandenburg), 2010. *Archäologische Informationen* 35, 297–302.

Huerta-Cepas J., Serra F. and Bork P. 2016. ETE 3: Reconstruction, Analysis, and Visualization of Phylogenomic Data. *Molecular Biology and Evolution* 33(6), 1635–1638.

Johnston-Monje D. and Raizada M. N. 2011. Conservation and diversity of seed associated endophytes in Zea across boundaries of evolution, ethnography and ecology. *PLoS One* 6(6), 1–22. DOI: 10.1371/journal.pone.0020396.

Klindworth A., Pruesse E., Schweer T., Peplies J., Quast C., Horn M. and Glöckner F. O. 2013. Evaluation of general 16S ribosomal RNA gene PCR primers for classical and next-generation sequencing-based diversity studies. *Nucleic Acids Research* 41(1), 28.

Lindström A., Korpela S. and Fries I. 2008. The distribution of Paenibacillus larvae spores in adult bees and honey and larval mortality, following the addition of American foulbrood diseased brood or spore-contaminated honey in honey bee (Apis mellifera) colonies. *Journal of Invertebrate Pathology* 99(1), 82–86.

Lomstein B. A., Langerhuus A. T., D'Hondt S., Jørgensen B. B. and Spivack A. J. 2012. Endospore abundance, microbial growth and necromass turnover in deep sub-seafloor sediment. *Nature* 484(7392), 101–104.

Malinowski T. 1985. *Wielkopolska w otchłani wieków*. Poznań: Wydawnictwo Poznańskie.

Margesin R., Siles J. A., Cajthaml T., Öhlinger B. and Kistler E. 2017. Microbiology Meets Archaeology: Soil Microbial Communities Reveal Different Human Activities at Archaic Monte Iato (Sixth Century BC). *Microbial Ecology* 73(4), 925–938.

Mayyas A., Douglas K., Hoffmann T., Thorenz U., Yaseen I. B. and Mohammed E. K. 2013. Organic residues preserved in archaeological ceramics from the early bronze age site of khirbet al-batrawy in north-central Jordan. *Mediterranean Archaeology and Archaeometry* 13(2), 189–206.

Mierzwiński A. 2012. *Biesiady w rytuale pogrzebowym nadodrzańskiej strefy pól popielnicowych*. Wrocław: Instytut Archeologii i Etnologii Polskiej Akademii Nauk.

Mitusov A. V., Mitusova O. E., Pustovoytov K., Lubos C. C.-M., Dreibrodt S. and Bork H.-R. 2009. Palaeoclimatic indicators in soils buried under archaeological monuments in the Eurasian steppe: a review. *The Holocene* 19(8), 1153–1160.

Mogielnicka-Urban M. 1992. Próba interpretacji naczyń nie zawierających kości z cmentarzyska kultury łużyckiej w Maciejowicach, woj. Siedlce. *Przegląd Archeologiczny* 39, 101–120.

Moodley Y., Linz B., Yamaoka Y., Windsor H. M., Breurec S., Wu J. Y., Maady A., Bernhöft, S., Thiberge J. M., Phuanukoonnon S., Jobb G., Siba P., Graham D. Y., Marshall B. J. and Achtman M. 2009. The peopling of the Pacific from a bacterial perspective. *Science* 323(5913), 527–530.

Nilsson M. and Renberg I. 1990. Viable endospores of Thermoactinomyces vulgaris in lake sediments as indicators of agricultural history. *Applied and Environmental Microbiology* 56(7), 2025–2028.

Onyenwoke R. U., Brill J. A., Farahi K. and Wiegel J. 2004. Sporulation genes in members of the low G+C Gram-type-positive phylogenetic branch (Firmicutes). *Archives of Microbiology* 182(2–3), 182–192.

Rollo F. U., Ermini L., Luciani S., Marota I. and Olivieri C. 2006. The study of bacterial DNA in ancient human mummies. *Journal of Anthropological Sciences* 84, 53–64.

Rösch M. 1999. Evaluation of honey resideus from Iron Age hill-top sistes in south-western Germany: implications for local and regional land use and vegetation dynamics. *Vegetation History and Archaeobotany* 8, 105–112.

Sáez-Nieto J. A., Medina-Pascual M. J., Carrasco G., Garrido N., Fernandez-Torres M. A., Villalón P. and Valdezate S. 2017. Paenibacillus spp. isolated from human and envi-

ronmental samples in Spain: detection of 11 new species. *New Microbes and New Infections* 19, 19–27.

Spyrou M. A., Bos K. I., Herbig A. and Krause J. 2019. Ancient pathogen genomics as an emerging tool for infectious disease research. *Nature Reviews Genetics* 20(6), 323–340.

Stantis C., Kinaston R. L., Richards M. P., Davidson J. M. and Buckley H. R. 2015. Assessing Human Diet and Movement in the Tongan Maritime Chiefdom Using Isotopic Analyses. *PLoS One* 10(3), 1–27. DOI: 10.1371/journal.pone.0123156.

Wunderlin T., Junier T., Roussel-Delif L., Jeanneret N. and Junier P. 2013. Stage 0 sporulation gene A as a molecular marker to study diversity of endospore-forming Firmicutes. *Environmental Microbiology Reports* 5(6), 911–924.

Wunderlin T., Junier T., Roussel-Delif L., Jeanneret N. and Junier P. 2014. Endospore-enriched sequencing approach reveals unprecedented diversity of Firmicutes in sediments. *Environmental Microbiology Reports* 6(6), 631–639.

Zink A. R., Sola C., Reischl U., Grabner W., Rastogi N., Wolf H. and Nerlich A. G. 2003. Characterization of Mycobacterium tuberculosis complex DNAs from Egyptian mummies by spoligotyping. *Journal of Clinical Microbiology* 41(1), 359-67. DOI: 10.1128/JCM.41.1.359-367.2003.

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

Agnieszka Půlpánová-Reszczyńska[1], Jana Kuljavceva Hlavová[2], Lenka Ondráčková[3], Radka Černochová[4], Roman Křivánek[5], Miroslav Radoň[6], Marek Půlpán[7]

DOI: 10.15584/anarres.2023.18.9

[1] Institute of Archaeology, University of Rzeszów, Moniuszki 10, 35-015 Rzeszów, Poland;
e-mail: apulpanova@ur.edu.pl; ORCID: 0000-0002-7834-5979

[2] Institute for Preservation of Archaeological Heritage of northwest Bohemia in Most, Jana Žižky 835/9, 434-01 Most, Czechia;
e-mail: hlavova@uappmost.cz; ORCID: 0009-0006-8413-1586

[3] Regional Museum in Chomutov, Palackého 86, 430-01 Chomutov, Czechia;
e-mail:ondrackova@muzeumchomutov.cz; ORCID: 0000-0002-7749-3128

[4] Institute of Archaeology of the CAS, Prague, Letenská 4, 118-01 Prague 1, Czechia;
e-mail: cernochova@arup.cas.cz; ORCID: 0009-0002-2894-0910

[5] Institute of Archaeology of the CAS, Prague, Letenská 4, 118-01 Prague 1, Czechia;
e-mail: krivanek@arup.cas.cz; ORCID: 0000-0003-1878-7748

[6] Regional Museum in Teplice, Zámecké náměstí 517/14, 415-01 Teplice, Czechia;
e-mail: rmtep@seznam.cz; ORCID: 0009-0002-1455-7427

[7] Institute for Preservation of Archaeological Heritage of northwest Bohemia in Most, Jana Žižky 835/9, 434-01 Most, Czechia;
e-mail: pulpan@uappmost.cz; ORCID: 0000-0002-9743-1506

A Grave from Nezabylice, Chomutov District. On the Phenomenon of Inhumation in Stage B1 of the Early Roman Period in Bohemia

Abstract

Půlpánová-Reszczyńska A., Kuljavceva Hlavová J., Ondráčková L., Černochová R., Křivánek R., Radoň M., Půlpán M. 2023. A Grave from Nezabylice, Chomutov District. On the Phenomenon of Inhumation in Stage B1 of the Early Roman Period in Bohemia. *Analecta Archaeologica Ressoviensia* 18, 131–158

The article describes the discovery of a skeletal grave in 2015 in Nezabylice (NW Bohemia, Chomutov district) at a cremation burial ground, which was dated to stage B1 of the early Roman period according to characteristic metal objects. Today, only four dozen similarly dated skeletal graves are registered in Bohemia, which, together with the early date of acquisition, makes them one of the rarest and most difficult to recognize archaeological monuments in this area. In the given situation, every recently researched skeleton grave from the early Roman period brings a wealth of new and important information about this distinctive phenomenon of burial rite among the Elbe-Germanic tribes.

Keywords: Bohemia, early Roman period, inhumation grave, arrangement and equipment of graves

Received: 19.09.2023; **Revised:** 11.10.2023; **Accepted:** 18.10.2023

1. Introduction

A peculiar phenomenon of the funeral rite is the distinctly rare occurrence of the skeletal method of burying the deceased in the early Roman period in Bohemia. A substantial part of the finds of skeletal graves were already made in the 19th century, and the lack of any documentation fundamentally reduces their informative value (cf. Břeň 1953; Lichardus 1984; Droberjar 2011). The unsatisfactory situation of the source base is significantly improved by the presented skeletal grave from the early Roman period, explored in 2015 at the contemporary cremation cemetery in Nezabylice in northwestern Bohemia. The find brings

new knowledge not only with regard to the geographical or spatial distribution of the Elbe-Germanic burial grounds, but also with regard to the construction arrangement and artefact equipment of the skeletal graves of the given period.

2. Location and natural environment of the site

The necropolis from the Roman period is located less than 2 km southeast of the village of Nezabylice (Chomutov district, NW Bohemia) at an altitude of 320 m above sea level on the hill of a long and slightly elevated terrace of the Chomutovka River, flowing approximately 1.2 km north of the site, with settlements from the early Roman period concentrated along its course and the right-bank tributary Hačka (cf. Blažek *et al.* 2014, 800–801; Půlpánová-Reszczyńska *et al.* 2018, fig. 8). The exposed landscape position provides good visual control of the surrounding area. The Ore and Doupov Mountains, Džbán Uplands and the volcanic hills of the Central Bohemian Highlands are in viewing distance of the locality (Fig. 1).

Locality lies in the area of Žatecká pánev and in the Blažimská plošina district. It is a rugged upland formed by erosion-accumulation processes of the Eger River and its left tributaries (Lorber 1998, 18–28; Demek and Mackovčin (eds.) 2006, 72; Bína and Demek (eds.) 2012, 121–123). 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 soils are among the heavy soil types, from brown to black ground. The area falls between the beech-oak and oak-beech vegetation stages with the occurrence of thermophilus plant species. With regard to the climatic conditions, it is a warm area with low summer precipitation (Lorber 1998, 26, 29; Demek and Mackovčin (eds.) 2006, 17–18, 72).

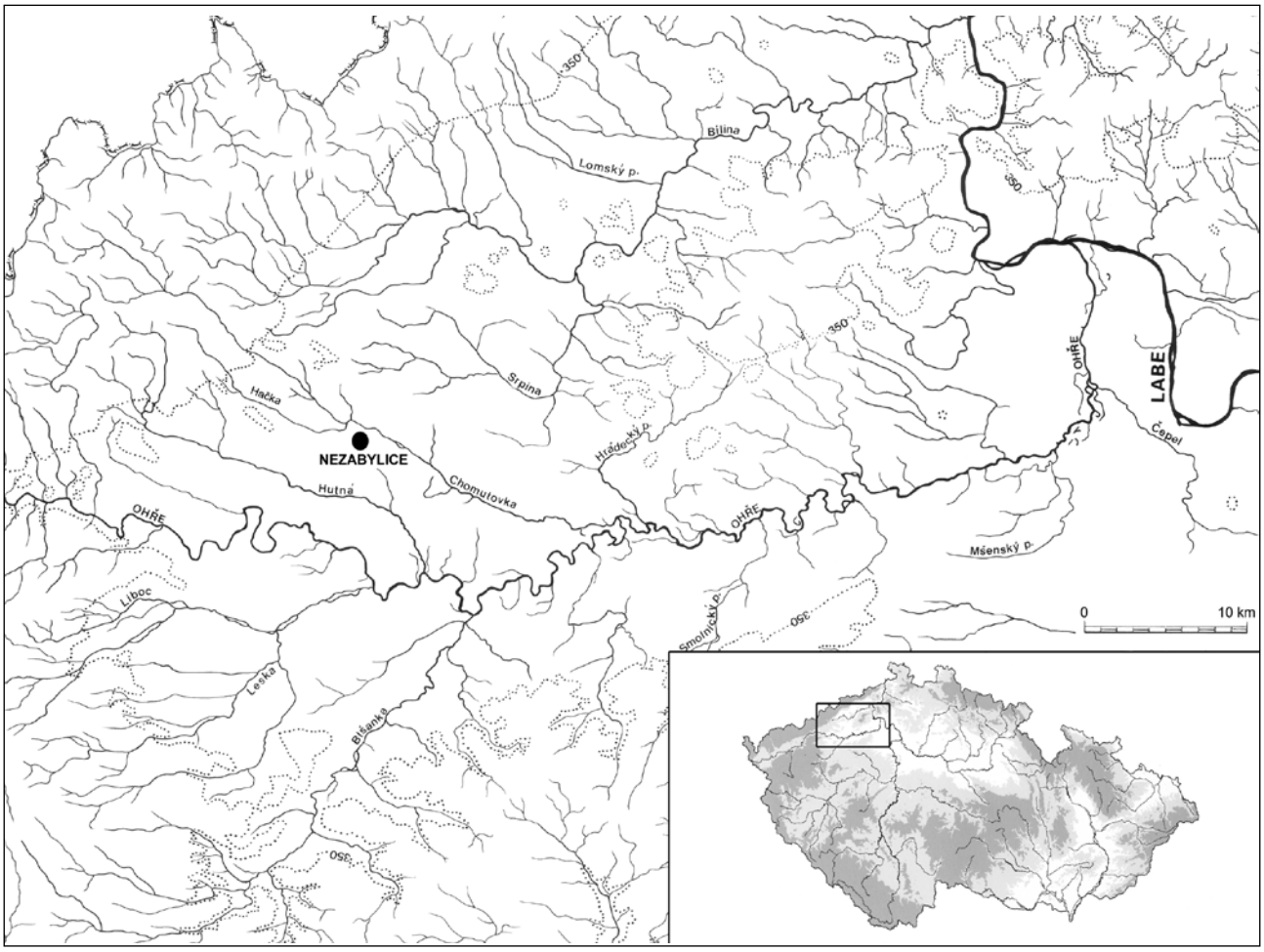


Fig. 1. Location of Nezabylice, Chomutov district, north-west Bohemia (map modified by M. Sýkora).

3. Circumstances of the finding

The cemetery of the Roman period at Nezabylice was discovered by two amateurs in October 2010, during an illegal survey with metal detectors (Blažek *et al.* 2014, 801). Subsequently, an extensive geophysical survey was carried out, which documented the presence of many dozens of well-defined anomalies, i.e. graves and metal artefacts (Křivánek 2012, 17; 2016, 11; 2017, 14). Since 2012, a systematic field excavation of the burial site has taken place every year, as part of an international Czech-Polish project (Blažek *et al.* 2014; 2015; 2016; 2017; 2018). The total area measured by magnetometers is 3.3 ha. The archaeologically explored area is 28.2 ares, which represents roughly 8.5% of the assumed area of the necropolis (Půlpánová-Reszczyńska *et al.* 2017a, 112–114; Půlpán *et al.* 2018, 646).

Nezabylice represents the first modern and systematically investigated burial site from the early Roman period discovered in northwestern Bohemia in the last 50 years (cf. Kruta 1967). By 2023, over 260 archaeological objects have been explored here, roughly half of which date back to the early Roman period. More than 100 cremation urn graves, pit cremation graves and several other objects are dated to this period. Graves with warrior armor and equipment play a prominent role among them (cf. Blažek *et al.* 2014; 2015; 2016; 2017; 2018; Půlpánová-Reszczyńska *et al.* 2017a, 115–123; 2017b; Ondráčková *et al.* 2018; Půlpán *et al.* 2018, 646–650; Dobeš *et al.* 2020, 4–5). The skeletal grave presented below, published only tentatively so far (Půlpánová-Reszczyńska 2018, 89–96), represents a rare find at the cremation ground.

4. Finding situations

A skeleton grave from the early Roman period (feature 69) was manifested during geophysical measurement as a distinct, extensive and irregular anomaly with varied values of measured magnetic field intensity gradient (Fig. 2). An additional survey using geo-electrical resistivity measurements confirmed the presence of several other objects in its vicinity. However, non-destructive surveys and field research have not yet confirmed the presence of another skeletal grave from the Roman period (Fig. 3).

Feature 69 was uncovered in 2015 as part of probe IX with an area of 0.6 acre. The analyzed feature was

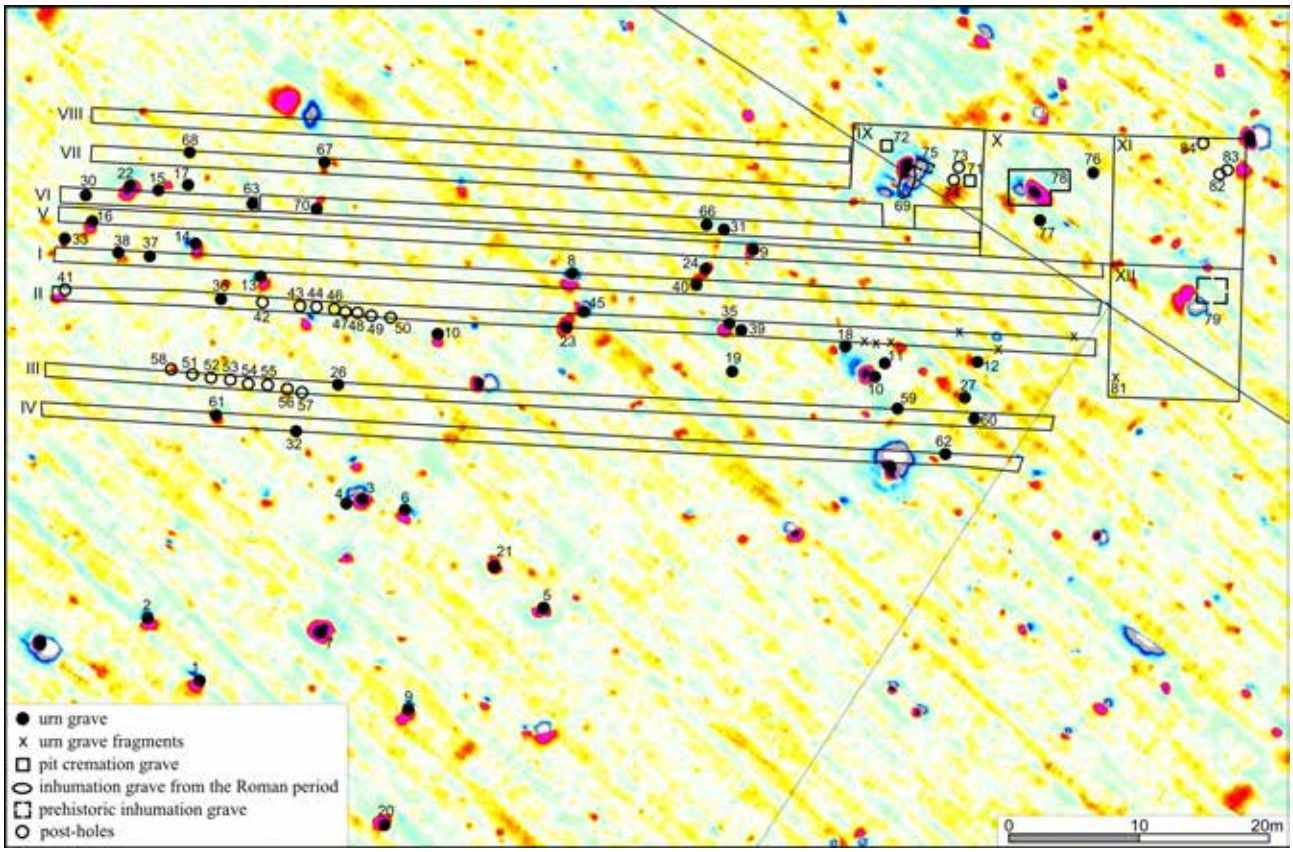


Fig. 2. Nezabylice, Chomutov district. Geophysical measurements and soundings from 2011–2016 on the area of the burial ground (prepared by J. Šály).

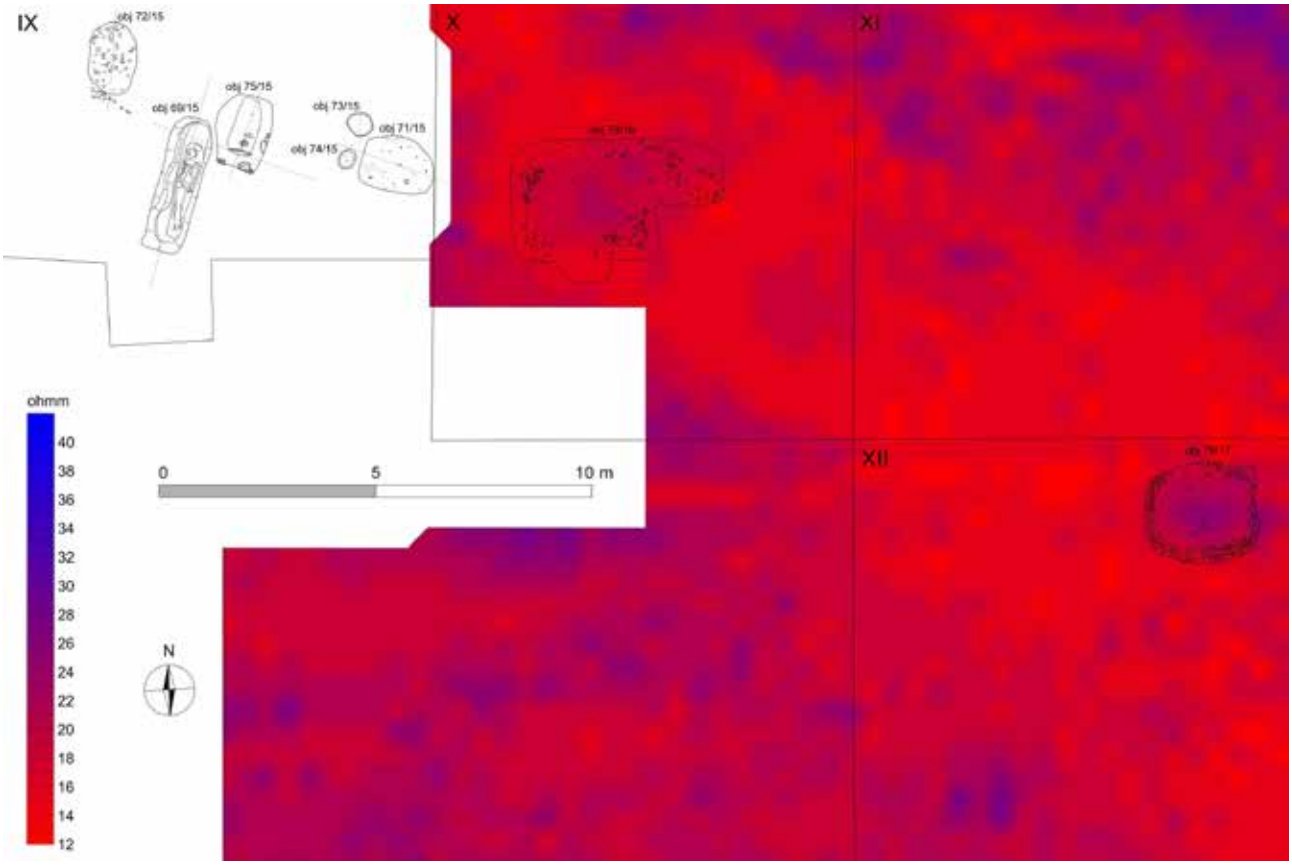


Fig. 3. Nezabylice, Chomutov district. Geo-electrical resistance measurement and spatial distribution of funeral objects in the vicinity of feature 69 (measured by R. Křivánek; prepared by J. Šály).

in close contact with a skeleton grave from the Middle Bronze Age stored in a stone box (feat. 75), respecting its course at a distance of about 20 cm. Several pit graves from the Roman period were also concentrated in its vicinity – features 71 to 74 (Fig. 3).

Grave-pit: Feature 69 consisted of a regular oblong grave-pit with dimensions of 320 × 95/105 cm, which was oriented in the N-S direction with a slight deviation to the NE-SW. The walls of the structure sloped sharply towards the bottom to the final dimensions of the grave-pit 285 × 50/60 cm. From the existing surface of the field, the depth of the feature reached 107–110 cm (Fig. 4).

Stratigraphy: The overlay consisted of a 37 cm thick layer of topsoil. The contours of items 69 and 75 were lined on the surface by a clayey dense and very compact black-brown layer. The filling of the feature was a clayey brownish-rusty, heavily mixed, in places rather speckled layer. A deep brown clay layer was at the bottom. The feature was buried in the underlying dense, compact, orange-rusty clay. The longitudinal profile was tub-shaped, the transverse profiles were bowl-shaped and showed the massive stone lining of the grave (Fig. 4).

Modification of the grave-pit: The interior of the feature was carefully lined with several (at least eight) continuous layers of stones from the surface to the level of the skeleton. The stones were mostly spread over the entire surface of the grave, with the largest concentrations mainly in the northern half and central part of the grave (Fig. 5, 6).

Human skeleton: The human skeleton was laid at the bottom of the burial pit (at a depth of 106 cm) in an extended position on its back, with the head pointing to the north, the feet to the south, the face to the west. The whole body was slightly turned on its axis towards the right side, i.e. towards the western wall of the grave. The upper limbs were placed alongside the body: the left limb, however, considerably higher than the right, which rested partly under the body (wrist and knuckles under the right pelvis). Left radius turned towards the body. The lower limbs, slightly bent outside the body axis, were placed parallel to the SE (Fig. 7).

Anthropological analysis: The examined individual is very poorly preserved and the bones are fragmentary. Based on the dental abrasion, the age was estimated at 30–40 years (adultus II), the sex was not determined

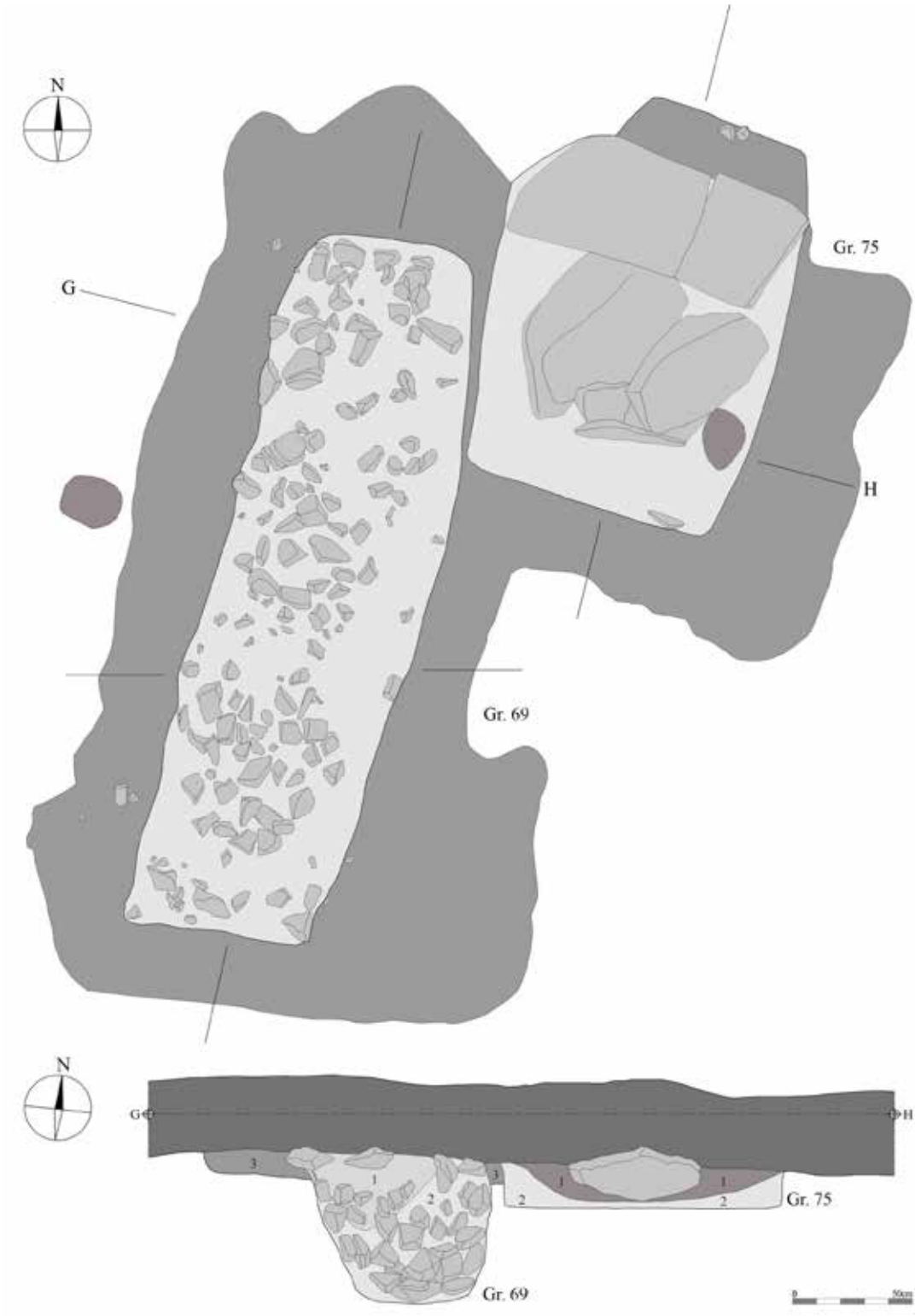


Fig. 4. Nezabylice, Chomutov district. Ground plan and profile of a grave from the early Roman period (feature 69) and ground plan of a grave from the Bronze Age – feature 75 (drawn by Š. Cmunt Martinková).

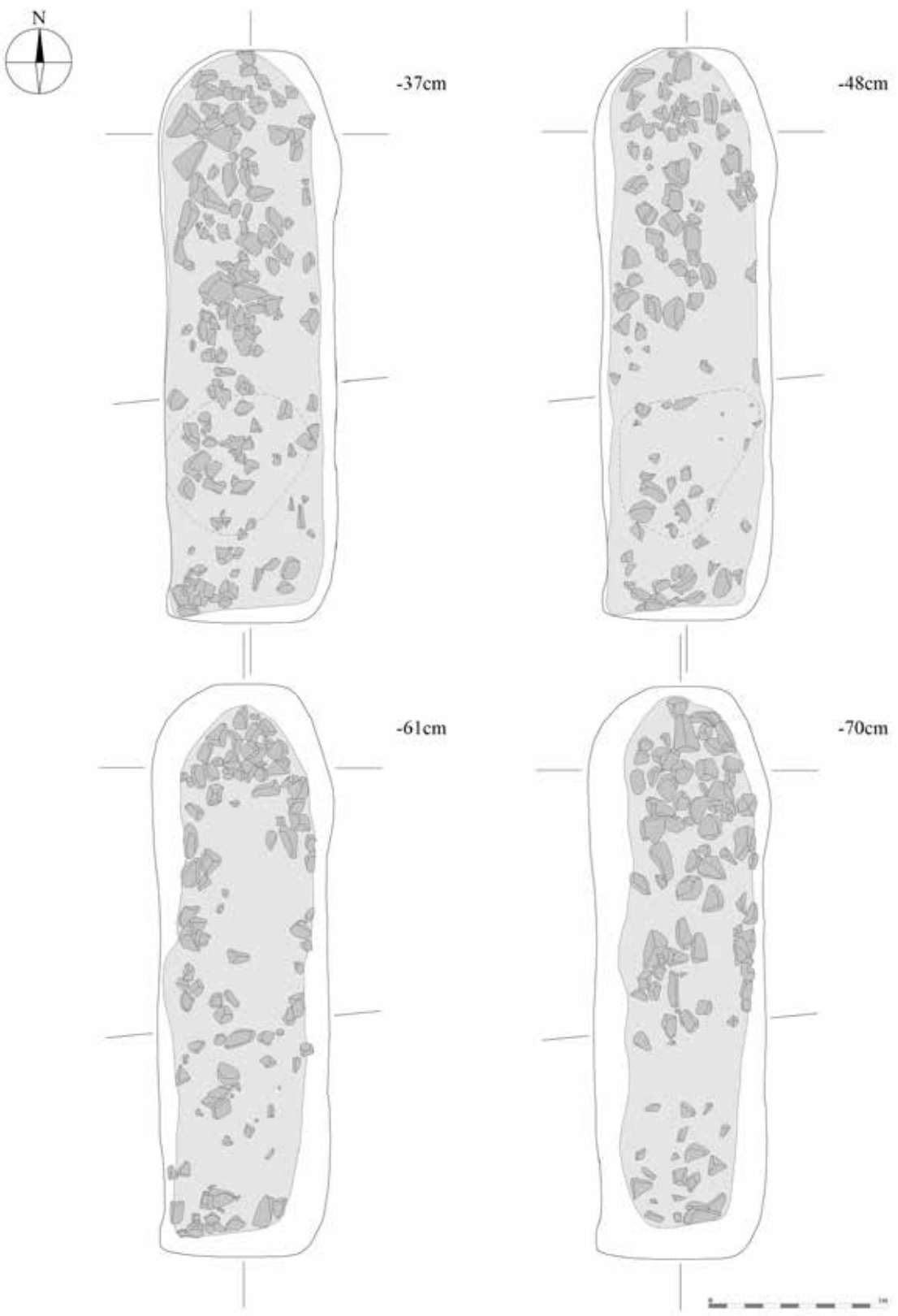


Fig. 5. Nezabylice, Chomutov district, feature 69. Ground plans of inhumation grave in levels 37–70 cm (drawn by Š. Cmunt Martinková).

Fig. 6. Nezabylice, Chomutov district, feature 69. Ground plans of inhumation grave in levels 80–104 cm (drawn by Š. Cmunt Martinková).

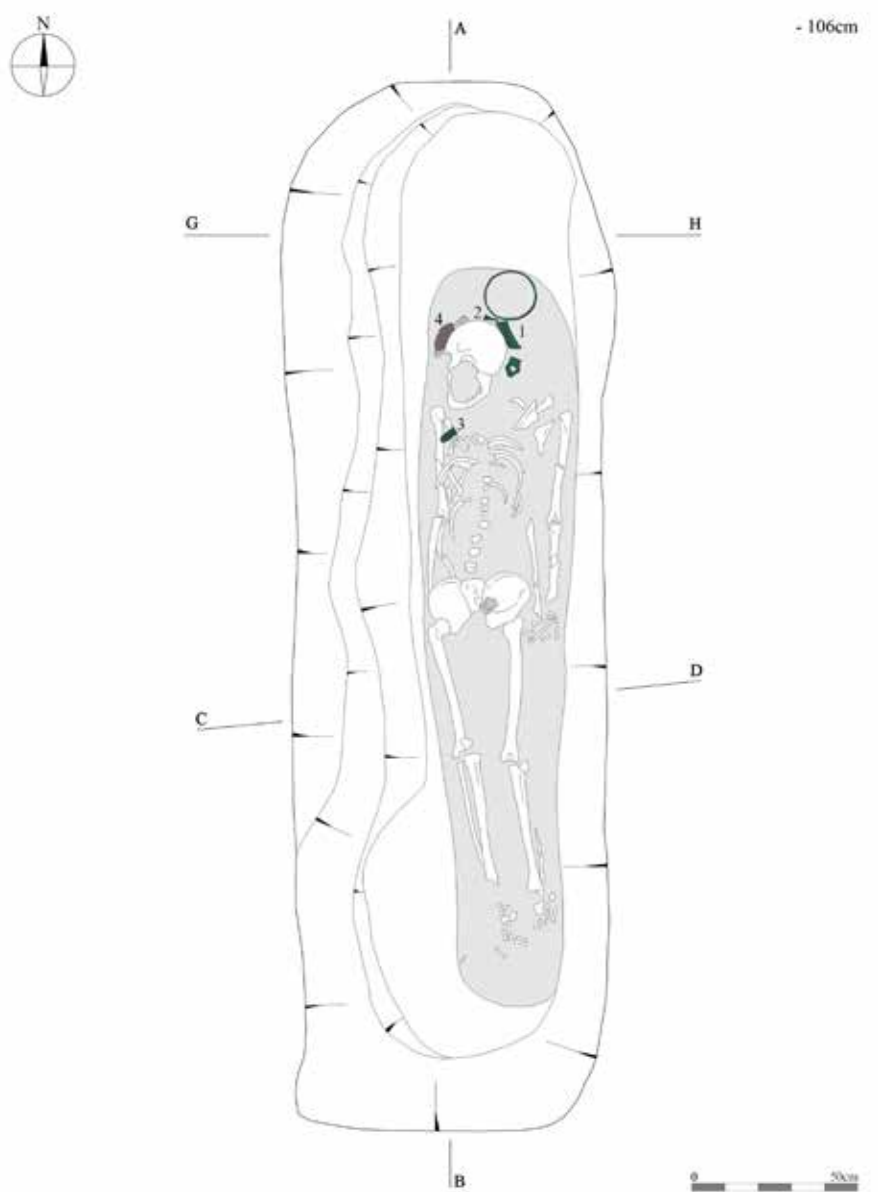


Fig. 7. Nezabylice, Chomutov district, feature 69. Grave-pit with a skeleton and finds. 1 – pan; 2 – brooch; 3 – buckle; 4 – vessel (the numbering of the finds also corresponds to the other images; drawn by Š. Cmunt Martinková).

(according to metric methods, it is more likely a man). Pathological changes were not registered.

Distribution of finds: The grave equipment consisted of four artefacts concentrated in a small area in the northern part of the grave, or around the head and on the chest of the human skeleton (Fig. 8). Between the skull and the northern wall of the grave, a metal pan (1) was placed at the bottom of the grave. The handle was broken into two parts that were located close to the skull. In the gap between the broken off handle and the body of the vessel rested a brooch turned with the winding upwards (2). A belt buckle (3) lay wide open at the right shoulder joint of the skeleton. Fragments of a small ceramic vessel (4) adjoined the skull in the western direction.

Finds: **1.** Bronze pan of Eggers 131 type, preserved almost intact, before reconstruction the edge of the vessel was slightly broken, the body corroded and broken into several smaller and larger pieces, the handle was broken off from the body of the vessel and broken into two pieces, bottom pierced. The handle is decorated around the perimeter with a double engraved line and ends with two feathered bird (duck) heads, between which there is an oval-shaped opening, which is decorated at the bottom with six engraved semi-arches. The obverse of the handle is decorated with a stylized thyrsus, topped with pine cones

Fig. 8. Nezabylice, Chomutov district, feature 69. Distribution of grave goods near the skull and on the upper half of the skeleton. 1 – pan; 2 – brooch; 3 – buckle; 4 – vessel (photo by M. Půlpán; modified by Š. Cmunt Martinková).

at both ends. On both sides of the thyrsus, tendrils in the motif of ribbons made with the dotting technique (min. 3 × 2). A pair of stamped rings (2 × 2) symmetrically distributed between the tendrils. The reverse of the handle is undecorated, without a stamp (cf. Sakař 1965; 1970).

Tinning: a) irregular on the outside of the vessel, a strip 1.7–2.2 cm wide below the edge; b) all-over on the inner side (Černochová 2016, 6, tab. 1). Engraved and pitted decoration: in the upper part of the vessel, from the outside (on the tin strip) and from the inside, several thin and irregularly engraved single and double lines; on the bottom of the vessel, from the inside and outside, a central dimple and turned concentric circles formed by single and double lines. Total height 10.3 cm; outer diameter of rim 16.5 cm; inner diameter of rim 15.5 cm; bottom diameter 11.3 cm; handle length 15 cm; total length of container with handle 31.3 cm; thickness of the tin plate 1 mm; no. 17/15 (Fig. 9: 1; 10).

2. Brooch A 45a, preserved almost completely, catch slightly broken, its part missing, with a broken but preserved needle, winding 3 × 2, open eyelets, decoration: belt engraved on the trigger, brooch very corroded. Length 46 mm; weight 14 g; no. 19/15 (Fig. 9: 2).

3. Eight-shaped bronze belt buckle similar to the Madyda-Legutko type AA4, practically intact, only slightly damaged, originally broken into two pieces, with a square clamping plate and a rhombic projection ending in a circular rivet hole, plate undecorated. Dimensions: frame length 74 mm, frame width 27 mm, frame cross-section 3 mm, plate length 60 mm; weight 19 g; no. 18/15 (Fig. 9: 3).

4. Ceramic miniature vessel – most likely a terrine, approx. 1/4 of the upper part preserved, the greater part of the vessel preserved only in individual and very small non-reconstructable fragments, with a reinforced and sharply edged rim, a higher cylindrical neck, which is offset from the body by a sharply edged strip highlighted with an engraved groove, the surface is smooth black matte to shiny, the material is coarse sandy with a greater admixture of mica. Preserved height 3.5 cm; rim diameter approx. 7.5 cm; no. 16/15 (Fig. 9: 4).

5. Evaluation of finds

A set of three metal objects and a fragment of a ceramic object were preserved in skeleton grave 69 from Nezabylice. Significant finds from the early Roman period include mainly metal artefacts made of copper alloy, i.e. a pan, a brooch and a belt buckle. Approximate dating of the analyzed grave is also confirmed by the torso of a miniature ceramic vessel.

The most prestigious find from the grave is undoubtedly the Eggers 131 type metal pan (Fig. 9: 1; 10). Its handle is finished with feathered bird's heads. It is decorated with a thyrsus/thyrsos with pine cones and ribbons, there are a total of four rings on both sides. This motif represents the most lavish way of decorating this type of vessel (Droberjar 2014, 415, fig. 14). In addition to the way the handle is decorated, its sophisticated surface treatment also testifies to the technological sophistication and care with which the vessel was made. The outer and inner surfaces of the vessel were for the most part meticulously tinned (cf. Droberjar and Frána 2004).

Pans of type E 131 (in German: *Kasserollen mit Schwanenkopfbügel* after Motyková-Šneidrová 1963, 45; "bronze dipper with duck's head" after Sakař 1970, 33) belong to the most widespread types of bronze vessels in Bohemia from the 1st half of the 1st century

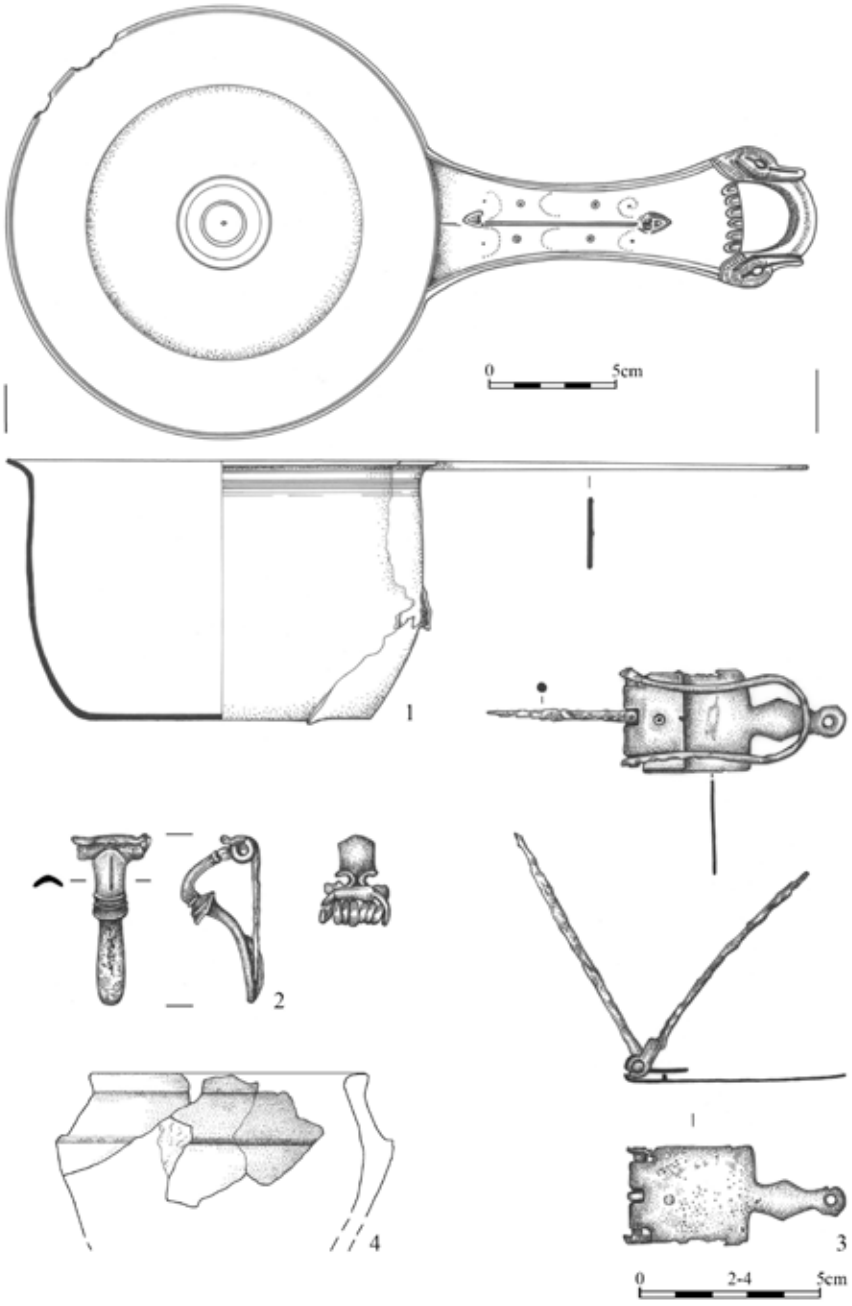


Fig. 9. Nezabylice, Chomutov district, findings from feature 69.
1 – pan; 2– brooch; 3 – buckle; 4 – vessel. 1–3: bronze; 4: ceramics (1–3: drawn by A. Waldhauserová; 4: drawn by H. Jonášová; modified by Š. Cmunt Martinková).

AD (Eggers 1965, 31, 34–35, fig. 5; Sakař 1965; 1970; Karasová 1998, 29–32, map XII; Droberjar 2014, 415). Recently, a total of 32 vessels of this type at 13 locations were known from Bohemia (Droberjar 2007, 45, 62–63, tab. 4, 5; 2014, 415). Within the Central European Barbaricum, pans of type E 131 are also relatively common, and their greatest occurrence is concentrated mainly in the regions of the Czech basin (Eggers 1951; Motyková-Šneidrová 1963a, 404, 406; Eggers 1965, 31, 34–35, fig. 5; Tejral 1967, 122; 1970, fig. 24; Karasová 1998, 29–32, map XII; Jílek 2012, 70–72; Droberjar 2014, 415; Schuster 2016, 129–133, fig. 9). In addition to Bohemia, the course of the Elbe and the lower course of the Odra, individual specimens are found in SW Slovakia or, quite rarely, in Polish Mazovia (cf. Schuster 2016, 130, 133, fig. 9).

Pans of type E 131 found in Central European Barbaricum are mainly from stage B1 of the early Roman period (e.g. Karasová 1998, 29–32; Jílek 2012, 70–72; Schuster 2016, 129). Pans of this type from cre-

mation graves 34 and 69 in Sládkovičovo (Galanta district) together with brooches with eyelets of type A 45 were considered by T. Kolník to be accompanying finds defining the earliest stage B1a in southwestern Slovakia (Kolník 1971, 511, 513, fig. 12, 14; 1980; also Kraskovská 1976, 431, fig. 2: 12). According to J. Tejral (1967), the E 131 type pans were dated to the 1st half of the 1st century AD and were included in the first phase of imports flowing into Czech territory (Tejral 1967, 93–94, 121–122, fig. 6: 1–3). The pans became an important find, which made it possible to compare Moravian finds with Czech ones, i.e. with phase II of stage B1 according to K. Motyková-Šneidrová (according to Tejral 1970, 138, 146; cf. Motyková-Šneidrová 1963b; Kolník 1971, 513). Most often, authors date them more precisely to the Augustan-Tiberian period (cf. Sakař 1994, 24; Karasová 1998, 31; Jílek 2012, 71; Schuster 2016, 129). On the other hand, it must be mentioned that some specimens of E 131 pans may have had – like other Roman imports – relatively long periods of circulation in the regional areas of Barbaricum (Schuster 2010, 215–223; 2016, 129–130).

However, the ornament on the handle of the vessel from Nezabylice belongs to one of the most impressive ways of decorating this type of vessel in Bohemia (Fig. 11: 9; cf. Droberjar 2014, 415–417, fig. 14). Pans with the motif of Dionysus's stick – i.e. thyrsus – are classified as type E 131b, which is documented in Bohemia only in the case of 11 vessels (list of localities by Droberjar 2014, 417). On the other hand, the identical motif finished with pine cones, ribbons and rings is documented only in two Czech specimens. The first comes from urn grave 63 from Tišice, district Mělník (Fig. 11: 5; cf. Motyková-Šneidrová 1963a, fig. 19: 8; Droberjar 2014, 416, fig. 14: 5); the other from skeleton grave III/1948 from Prague-Bubeneč (Fig. 11: 1; cf. Droberjar 2014, fig. 14: 1). The last-mentioned specimen is most similar to the vessel from Nezabylice, which is similarly tinned inside and out and also decorated with concentric circles on the bottom (Droberjar 2014, 415, fig. 7). The aforementioned find from Prague-Bubeneč 1948 was included by the author of the last study (Droberjar 2014) in the elite group of graves of the Lubieszewo/Lübsow type and dated to phase B1b of the early Roman period (Droberjar 2014, 425–426, 428–431).

The deceased individual buried in the Nezabylice grave had two parts of their costume made of bronze, namely a brooch near the head and a belt buckle lying on their right shoulder. The brooch has been preserved intact. It has two open eyelets on the head and a wide hook for attaching the string. The brooch bow is banded without accentuated edges in the upper part, decorated with a notched band in the middle. A knot (ring) is placed on top of the bow and the end is slightly rounded (Fig. 9: 2).

This type of brooch belongs to the group of brooches with eyelets identified in the literature by

Fig. 10. Nezabylice, Chomutov district. Bronze tinned pan type E 131 after restoration and conservation and detail of the handle (photo by R. Černochová).

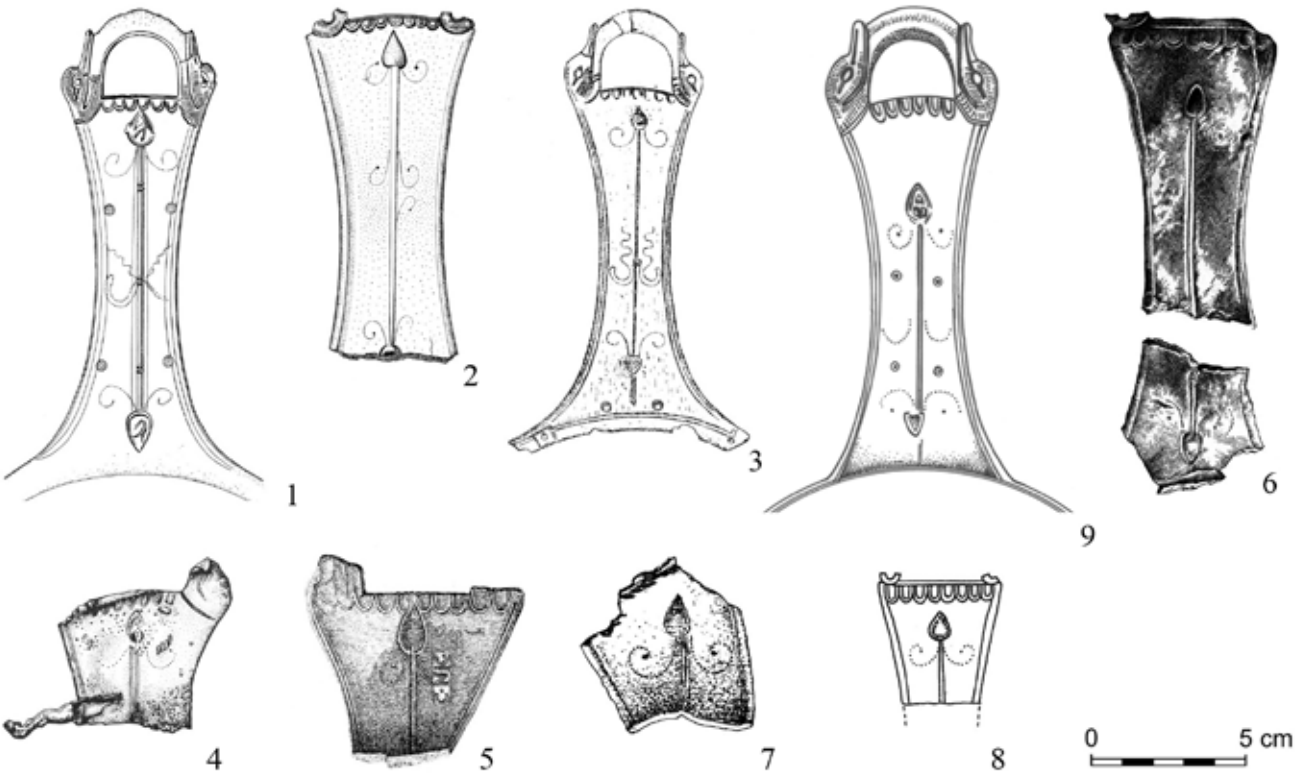


Fig. 11. Thyrsus motif on vessels of type E 131.
1. Prague-Bubeneč, gr. 1948; 2. Holubice; 3. Sládkovičovo, gr. 34; 4. Dobřichov-Pičhora, gr. V; 5. Tišice, gr. 63; 6. Třebusice, gr. 560; 7. Třebusice, gr. 587; 8. Hořín; 9. Nezabylice, gr. 69 (amended and modified by Š. Cmunt Martinková according to Droberjar 2014, fig. 14).

the symbol A 45a. It was distinguished by P. Glüsing from Almgren's type A 45 (Glüsing 1968, 59). In later literature it also appears under the name *böhmische Augenfibel*n (Cosack 1979, 59-63) or *klassische Augenfibeln* (Kunow 1980, 160). These brooches are an earlier variant of the A 45 type and are characterized by a less massive and less rounded bow than the younger A 45b buckles. In earlier specimens, the decoration is found less frequently and is at the same time less ornate than in the case of the A 45b brooches (Kunow 1998, 100; Droberjar 1999, 73). For the specimen from the Nezabylice grave, we find many analogies not only in Bohemia, but also in the whole of Barbaricum. In the Bohemian basin there is a significant concentration of brooches of type A 45 and especially variant A 45b, which is why most researchers believe that the production center of these brooches could have functioned on Bohemian territory (Kunow 1998, 101). Their production probably began in phase B1a of the early Roman period, but we can see their greatest expansion in the following phase B1b (Droberjar 1999, 75). From graves in northwestern Bohemia, we know type A 45 from the localities of Louny, Prosmyky, Radovesice, Tvršice and Litoměřice (Kunow 1998, 114, fig. 6). In addition to Bohemia, the given type is recorded in almost the entire territory of Barbaricum from southern Sweden and the islands of Gotland and Öland, through the Rhineland in the west, the Danube in the south to the Przeworsk culture in the east. Individual specimens are also found in northern Italy (Cosack 1979, map 13; Kunow 1998, fig. 6; Mączyńska 2004, 216, map 1; Droberjar 2014, 420–421). Specimens of type A 45a, which were singled out by E. Droberjar (1999, 74), are represented both in Bohemia and in the whole Barbaricum. As an example, the author of the study cites specimens from graves 126 and 147 from Dobřichov-Pičhora (Droberjar 1999, 74, tab. 71: 126/2, 80: 147/5; 2006, 617, fig. 12: 10).

Analyzes of the co-occurrence of A 45 brooches along with other grave equipment elements showed that this type of find cannot be included either among objects providing the function of a gender marker, or among attributes of social status (Kunow 1998, 111; Łuczkiewicz 2010, 348–349; Černý 2013, 44–45). They occur in both female and male burials, as well as in urn and skeleton graves (Łuczkiewicz 2010, 348–350, 354–356; Černý 2013, 44–45).

Another part of the outfit found in the analyzed grave is a bronze belt buckle with an eight-shaped frame. The buckle was preserved intact, but has an unusually curved frame in relation to the clamping plate, which may indirectly indicate an unusual placement of the belt in the shoulder area. The square-shaped clamping plate is connected to the frame by a single rivet, from which a profiled tab with a rivet hole at the end protrudes (Fig. 9: 3).

The mentioned buckle can be classified in group A according to the R. Madyda-Legutko classification (1986), which is characterized by an eight-shaped frame. It is closest to type 4, which consists of bronze buckles with an elongated, eight-shaped and two-part frame with rhombic cross-section, which is connected to the leather part of the belt with a profiled clamping plate (Madyda-Legutko 1986, 5, fig. 1). The length of the frame varies between 80 and 105 mm, the width 30 mm and the length of the plate reaches 70–80 mm. They can have two or four rivets. R. Madyda-Legutko (1986, 5) included two buckles from Zliv in Bohemia, supplemented by brooches of type A 67, A 26 and bronze vessels E 24, E 30, E 124, E 131 and E 154 (Schulz 1885, tab. III: 1–12; IV: 13–15, 20, 21). Another specimen of this type was discovered in the burial ground at Putensen in grave 150, where it was found together with brooches A 24, A 37 and A 67, and with a late La Tène pointed shield boss (Wegewitz 1972, 84, fig. 35: 188; Madyda-Legutko 1986, 5). The author of the typology places them in phase II of stage B1 (Madyda-Legutko 1986, 5). Belt buckles with eight-shaped frame are known from Bohemia mainly from richly equipped urn and skeleton graves (cf. Droberjar 2006, 626, fig. 20: 8–9, 12, 14; 2014, fig. 11: 1, 16).

The last item from the grave is a fragmented part of a miniature ceramic vessel (Fig. 9: 4). Its more precise typological determination is rather problematic due to the poor state of preservation – it could have been either a small terrine, or a cup (cf. e.g. Droberjar 2006, 610–617, fig. 4–6, 10, 11). Although miniature vessels are certainly not among the common finds of the Roman period, they are confirmed in Central Europe throughout this period, by partial finds in settlements and burial grounds (Krekovič 1979, 414; Droberjar 1999, 48). In Bohemia, they are mainly found in early Roman settlements (Krekovič 1979, 414), cremation burial grounds (Droberjar 1999, 48), but also as part of the equipment of skeleton graves. We have reports of these findings from skeletal graves from Prague-Bubeneč 1929, where a miniature vessel – just like in the case of Nezabylice – rested next to the skull of a skeleton (Horáková-Jansová 1931, 80–82) and recently also in the case of the burial of a most likely adult woman from Prague-Modřany (Zemanová 2016, 914). A general analogy to the vessel from Nezabylice can be found at the Dobřichov-Pičhora site in urn grave 52, where a rare miniature terrine (Droberjar type 20) was dated to stage B1, or to phase B1a (Droberjar 1999, 48, fig. 47: 52/2). The purpose of such small vessels is not exactly known. It is considered that they could have been children's toys/products, drinking vessels, symbolic grave goods, or in women's graves they could have been used to store cosmetic products (Krekovič 1979, 416–417; Droberjar 1999, 48).

6. Construction of the grave

Feature 69 from Nezabylice provides interesting insights into the construction of skeleton graves in the early Roman period. The external surface and above-ground form of the grave can be indicated by the black-brown clay layer that lined the outline of feature 69 along the perimeter (Fig. 4). In addition to the possibility that it was a natural terrain depression, it could be either the remains of a flooded and partly plowed mound embankment or a smaller above-ground grave cover created by piling up excess soil. Unfortunately, due to the close proximity of a grave from the Bronze Age (feature 75), the perimeter of which was lined with the same layer, it cannot be ruled out that this eventual surface treatment belonged rather to a grave from an earlier period (Fig. 4).

Somewhat more clues were found regarding the internal arrangement of the grave-pit. The most striking element in this context is the massive and compact stone lining, recorded practically over the entire surface of the grave in at least eight successive height levels. According to the finding situation in the grave, we believe that the stones were not found in random groupings (formed, for example, when a wooden ceiling and a possible mound embankment collapsed into the inner parts of the grave) but, on the contrary, they clearly show an intentional method of storage. The stones were selected according to their size and shape and regularly laid out in such a way that they fit together as tightly as possible, apparently making their easy removal impossible. This observation concerns mainly the northern half and the central part of the grave (cf. Figs. 5 and 6). The total volume of the stones in the grave was approximately 0.75 m^3. According to the geological assessment, these were mainly whitish, yellowish or reddish quartz boulders (pebbles) with a size of 10–15 cm. The source of the boulders was

most likely local fluvial sediments of young Tertiary to Quaternary age. The relic of this early Tertiary terrace lines the entire length of the northern slope of the elevation with the burial ground (Radoň 2015).

The method of storing the deceased and goods brings interesting findings. First of all, the skeleton gives the impression that the deceased was considerably "crammed" into the narrow interior of the grave-pit. The discovered position of the skeleton further indicates that the grave was not filled with earth at the time of the individual's burial, but was formed by a primary hollow space. This is evidenced not only by the position of the torso slightly turned towards the right side, but also by the left arm with a rotated radius resting significantly higher than the right arm lying under the pelvis, as well as by the lower limbs turned out of the axis of the torso. Based on the situation, it can be concluded that the dislocation of the skeleton most likely occurred as a result of taphonomic processes in the original hollow space (cf. Černý 1995).

Another indication that indirectly suggests the original presence of the hollow space is the distribution of goods in the grave. In the case of the belt buckle and the brooch, their original functional storage can be seriously doubted. Similarly, a damaged bronze vessel with a broken and broken handle and sunken bottom does not clearly reflect the original archeological situation. However, the detected position of the artefacts can probably be explained by the effect of post-depositional and transformation processes (Kruťová 2003; Droberjar and Waldhauser 2012, 899). In essence, there are only two possible explanations for how these processes took place – either it can be proof of the collapse of the cover (the wooden ceiling of the burial chamber or rather the lid of the coffin) together with the stone lining into the inner parts of the grave, or it can be proof of a secondary intervention in the grave. At the same time, we have certain knowledge for both options. The deep brown clay layer recorded at the bottom of the grave-pit suggests the presence of an internal case made of organic matter in which the deceased was buried. Eight fragments of metal-preserved wood, which were found on the handle of a bronze vessel, attest to it in an exact way. On the basis of the dendrological analysis, pine wood (Pinus) and several unidentifiable conifer wood fragments, probably also pine wood (after Kočárová and Kočár 2016), were identified. Unfortunately, we have no clues about the actual form of this box. In theory, it could only be simple slabs on which the deceased could be placed or a monoxylous coffin. However, due to the fact that pine is a quality soft to medium hard wood, easy to process and usable for construction purposes, we rather assume that it was a closed coffin with a lid, which was assembled from narrow slats, or wider planks. At a certain stage, the lid of the coffin must have either decomposed due to natural processes, or cracked under the weight of the stones and fallen into the inner parts of the coffin, causing the aforementioned movement and damage to the artefacts. The slight shift of the stone lining from the upper parts of the grave downwards is also confirmed by the longitudinal profile of the grave, where we recorded a roughly 20 cm wide and arc-shaped gap between the stone layers.

However, there are also observations indicating a possible secondary intervention in the grave. In the two upper layers of the filling, indistinct traces of a possible secondary intervention were recorded in the area towards the lower limbs of the skeleton (cf. Fig. 5). The disturbance of the grave is also evidenced by the much looser arrangement of stones found in the southern part of the grave, where, compared to its central and northern part, the stones are distributed in less systematic and less dense groups (cf. Fig. 6). Furthermore, given that it is a space where bronze vessels are usually stored in other skeleton graves from the early Roman period (cf. Droberjar 2006, fig. 43; 2014, 401, fig. 4), the possibility remains that it is part of a looter's shaft, or at least an attempt to secondarily damage or loot the grave. If we take into consideration the deposition of goods in the grave from Prague-Bubeneč 1948 (cf. Droberjar 2014, fig. 4), we find that bronze dipper/pan of E 131 type is placed behind the head of the skeleton, similarly to the case of Nezabylice. At the feet of the skeleton in the Bubeneč grave, there were another three bronze vessels (cf. Droberjar 2014, fig. 4). In the case of grave IV from Straky, a bronze strainer was placed near the head, and a pan of E 131 type together with another bronze vessel rested at the feet of the skeleton (cf. Píč 1905b, 338, fig. 9; Motyková-Šneidrová 1963b, 59; Droberjar 2006, fig. 43). The abovementioned fact suggests that in the richly equipped graves with pans/dippers of E 131 type, the concentration of bronze vessels is typically higher near the lower limbs of the skeletons. Therefore, it cannot be completely ruled out that we could have been dealing with a similar situation in the case of the grave from Nezabylice, part of which could have been robbed already in prehistoric times.

The relatively common presence of stones in skeleton graves from the early Roman period is confirmed in Bohemia by relatively frequent but rather fragmentary mentions from field excavations. It turns out that

it was not a geographically limited phenomenon. On the contrary, graves lined with stones cover a substantial part of northwestern Bohemia (documented in the districts of Litoměřice, Teplice, Louny and Chomutov). Thanks to this, we know a large number of graves from the localities of Býčkovice (Michálek 1999, 33, tab. 29), Liběšovice (Franz 1935, 95), Lysec (Anonymous 1858, 140), Radovesice (Píč 1905a, 303; Preidel 1930, 246), Trnovany (Břeň 1953, 526) and Tvršice (Preidel 1930, 264; Motyková-Šneidrová 1963b, 64). On the other hand, stone fillings and linings in central Bohemia occur exclusively in the Prague Basin and its vicinity. This is confirmed by excavations in the Prague districts of Bubeneč, Ďáblice (Motyková-Šneidrová 1963b, 13; Droberjar 2014, 398), Modřany (Zemanová 2016, 913–914) and Nové Butovice (Petriščáková 2014, 272, tab. I), or in Noutonice (Felcmann 1900, 17–18). Probably the best building analogy to the find from Nezabylice was provided by the grave from Prague-Nové Butovice, where a stone case was documented (Petriščáková 2014, 272) and the grave from Prague-Bubeneč 1948, where a stone-filling was preserved (Droberjar 2014, 398).

While stones in ancient Roman graves appear to be a relatively common issue, we only have weak evidence for wooden coffins. A written mention of possible existence of a coffin or plates comes from a grave in Liběšovice (Franz 1935, 95; Břeň 1953, 525–526). According to indirect indications, the presence of a wooden chamber is considered in the grave from Prague-Bubeneč 1948, but no traces of the wooden structure were preserved (after Droberjar 2014, 398). The combination of a pine coffin covered with a lid and a stone lining intentionally placed in several continuous layers in the Nezabylice grave represents one of the most sophisticated structures ever documented in the interior of a skeleton grave of stage B1 of the early Roman period in Bohemia.

7. The phenomenon of inhumation in stage B1 of the early Roman period in Bohemia

The phenomenon of skeleton burials in the early Roman period in the region of Bohemia has been dealt with by a number of authors. Its occurrence was first pointed out at the beginning of the last century by J. L. Píč (1905a, 305). H. Preidel (1930; 1935) contributed to significant expansion of the source base of the prewar period. The equipment of these graves was described by J. Břeň (1953) and K. Motyková-Šneidrová (1963b; 1967). Detailed analyses were presented, for example, by R. Köhler (1975a; 1975b) and J. Lichardus (1984). In recent years, E. Droberjar (2006, 650–652, 695–697; 2011; 2014; Droberjar and Waldhauser 2012) has intensively focused on the phenomenon of skeletal burials in Bohemia, as well as, marginally, on the compendium of Bohemian prehistory (Pleiner and Rybová (eds.) 1978, 689; Salač 2008, 93–94).

The genesis of inhumation in Bohemia has not yet been sufficiently explained (cf. Pleiner and Rybová (eds.) 1978, 689–690, 737; Lichardus 1984; Margos 2000, 255, 261; Droberjar 2006, 650). Traditionally, explanations for this phenomenon have been sought in either the cultural-ethnic, socio-economic or ritual-religious spheres (Břeň 1953, 516; Krekovič 1996). The most common consideration in the case of skeletal burials is whether they may have been wealthy individuals, foreigners, envoys, traders, craftsmen, possibly scattered remnants of the native Celtic population, or whether they were an adopted post-Celtic tradition (cf. Břeň 1953, 516; Pleiner and Rybová (eds.) 1978, 689–690, 737; Lichardus 1984, 88–89; Krekovič 1996, 36; Droberjar 2002, 137; 2006, 652; 2011, 16; 2014, 428–431). However, many of these hypotheses have recently been refuted. For the time being, the question of what caused the spread of inhumation in the Central European Barbaricum in the early Roman period cannot be adequately answered (cf. Margos 2000, 261; Ibragimow 2008, 126–128; 2011, 178).

7.1. Criticism of the source base

At the outset, it should be pointed out that a deeper understanding of the issue of skeletal burial and the results of the analyzes is complicated by the a priori incomplete or uncertain context of the findings, stemming primarily from the method of research and documentation, which primarily depend on the date of acquisition of the findings (cf. Droberjar 2006, 651). Frequently, we do not even have very basic data, such as when or under what circumstances the find was obtained (e.g. Pečky: Břeň 1953, 526; Motyková-Šneidrová 1963b, 42). We do not even know the approximate date of acquisition for seven graves (17.5%). As shown by the histogram of the development of the source base (Fig. 12), a substantial part of the finds (11 graves; i.e. 27.5%) were made until the end of the 19th century. The largest part of the graves (15; i.e. 37.5%) dates from the 1st half of the last century. In younger periods, we observe a significant decline in them. In the 2nd half of the last century, we record 3 graves (7.5%) and in the new millennium only another 4 graves (10%).

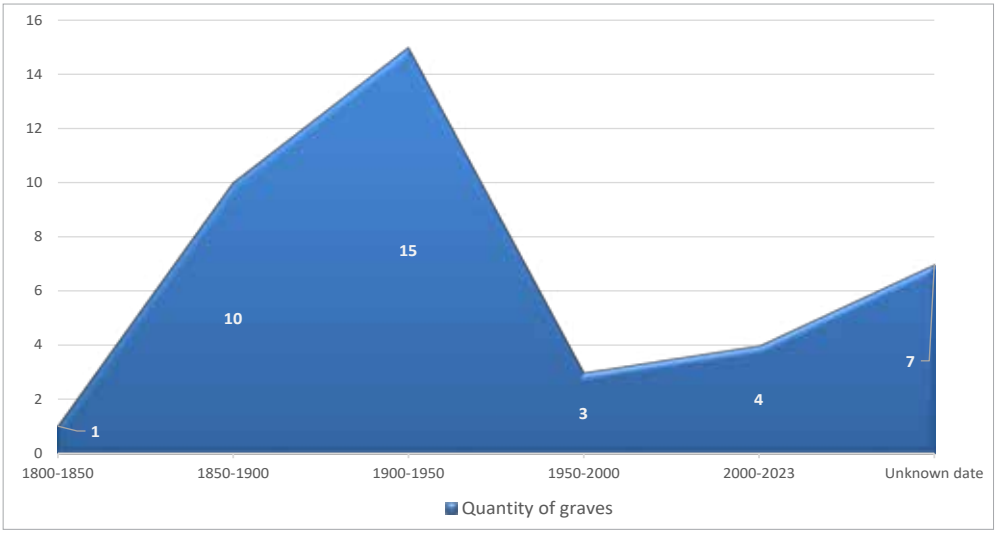


Fig. 12. Histogram of the development of the source base of skeletal graves in Bohemia (prepared by A. Půlpánová-Reszczyńska).

Unfortunately, we have to assess the research method and the method of obtaining most of the findings as unsatisfactory. The vast majority of older finds were made during various construction or mining activities, during which the graves were significantly disturbed and, moreover, largely un-expertly examined (cf. Droberjar 2006, 651). A typical example is Záluží near Čelákovice, where a larger part of the grave in the Líman's brickyard had already been destroyed by mining and the findings were handed over by quarry workers (cf. Motyková-Šneidrová 1963b, 67). However, the disturbance by the construction also applies to some later (e.g. Prague-Bubeneč, Prague-Ďáblice), as well as recently conducted research (Semčice). In recent times, the finds of graves are either related to rescue archaeological research on construction sites (Semčice, Prague-Modřany) or to systematic research of an endangered site (Nezabylice). In 2002, a pair of damaged skeleton graves were examined in Semčice and evaluated in detail (Waldhauser 2004; Droberjar 2006, 696; Droberjar and Waldhauser 2012). The year 2015 also brought an identical increase, when skeleton graves from the early Roman period were examined near Nezabylice (Blažek *et al.* 2016; Půlpánová-Reszczyńska 2018) and during rescue research in Prague-Modřany, about which basic information was provided (Zemanová 2016).

The low level of field documentation is also related to the early dates of acquisition of the finds, while we lack it for the vast majority of older finds. Exceptionally, we have a partial drawing reconstruction of the original find situation (Prague-Bubeneč 1948: Droberjar 2014, fig. 4), or a rough reconstructed sketch (Noutonice: Droberjar 2002, fig. on p. 216; 2011, fig. 3: 2). If we leave aside the presented grave from Nezabylice and the grave from Prague-Modřany (Zemanová 2016), then only three drawings of terrain situations are known from publications (Poplze: Zápotocký 1969, fig. 12; Salač 2008, fig. 59: A; Semčice: Droberjar and Waldhauser 2012, fig. 3; Prague-Nové Butovice: Petriščáková 2014, tab. I), with photographs from two sites (Prague-Bubeneč: Svoboda 1955, fig. 1; Droberjar 2005, fig. on p. 817; 2014, fig. 2, 3; Prague-Modřany: Zemanová 2016, fig. 15). All the parameters of the graves, the position of the skeletons, including the spatial distribution of grave goods, are therefore either not known at all in older researches, or we can only deduce them on the basis of diary entries or written references.

A slightly better situation concerns the geographical data of cemeteries and graves. Most often we know the verbal description of a partial location, but sometimes the findings can only be located within the given cadastral territory. However, regarding the physical orientation of the graves and their spatial arrangement, the situation is again quite unfavorable. Plans or approximate sketches of the distribution of graves within the funerary grounds are known from older research only in the case of graves from Býčkovice (Michálek 1999, sketch on tab. 28) and two graves from Prague-Bubeneč (Droberjar 2014, fig. 1), and later on only for the recent research (Semčice, Nezabylice). A number of other problems arise from this situation. Sometimes there are uncertainties in the localities not only in the number of examined graves (Duchcov, several graves: Glott 1935, 24–25; Straky, 3–4 graves:

cf. Píč 1905a, 305; 1905b, 337–338; Preidel 1930, 258; Novotný 1955, 230; Motyková-Šneidrová 1963b, 43; Droberjar 2006, 696–697, tab. 3; Salač 2008, 93), but also whether the graves without equipment belong to the early Roman period at all (Tvršice, gr. IV: cf. Motyková-Šneidrová 1963b, 64; Droberjar 2006, 697; Straky, gr. III: cf. Píč 1905a, 305; 1905b, 337–338; Motyková-Šneidrová 1963b, 59; Lichardus 1984, 124; Droberjar 2006, 696–697, tab. 3), or whether they come from funerary or other find contexts (Lysec: cf. Anonym 1858, 140; Břeň 1953, 520). Sometimes it is not possible to decide whether the preserved inventories originate from one or more graves (Kutná Hora-Sedlec: cf. Čižmář and Valentová 1979, 146). At the sites where skeleton and cremation burials are recorded (Radovesice, Prague-Bubeneč, Tvršice), we lack certainty as to whether they belong to specific types of graves (Motyková-Šneidrová 1963b, 43, 45, 48, 50, 64; Prague-Michle – brooch with eyelets: Břeň 1953, 526; cf. Neustupný 1930; Motyková-Šneidrová 1963b, 46).

The documentation methods are also related to the not entirely satisfactory level of visual recording of movable finds. Most of the time, individual objects are depicted only in a relatively small format on photographic tables and without a corresponding scale (cf. e.g. Preidel 1930; Horáková-Jansová 1931; Glott 1935; Franz 1935; Novotný 1949; 1955; Motyková-Šneidrová 1963b), and sometimes there we lack them at all. Detailed drawings of finds on an adequate scale are thus only known from more recent works (cf. Zápotocký 1969; Michálek 1999; Droberjar and Waldhauser 2012; Droberjar 2014; Petriščáková 2014).

The last problem with analyzes is the sometimes quite uncritical acceptance of some information. As a typical example, in this context, is the alleged skeleton grave from Prague-Bubeneč originally marked as III/1944 (Lichardus 1984, 123), in which the kettle of type E 124, cited and analyzed by many authors, should have been found (cf. Břeň 1953, 519; Novotný 1955, 230, 254–255, fig. 15; Motyková-Šneidrová 1963b, 45; Sakař 1970, 30; Lichardus 1984, 123; Droberjar 2006, 696). It was only during the revision of J. A. Jíra's find fund that the origin of the vessel was found at the Austrian site of Wels (Hlava 2010, fig. 21), and therefore this alleged grave was canceled in the last analysis by E. Droberjar (2014, 397, note 1). Although the outlined state of the source base cannot be evaluated other than as unsatisfactory (cf. Droberjar 2006, 651; Droberjar and Waldhauser 2012, 899), we will try to evaluate it in the following paragraphs.

7.2. Geographical distribution of stage B1 skeletal graves in Bohemia

When looking at the Bohemian basin, two significant concentrations with the occurrence of skeletal graves from stage B1 of the early Roman period emerge. The first is located in northwestern and the second in central Bohemia (Fig. 13).

In northwestern Bohemia, we currently have 13–16 skeletal graves in 12 locations. The sites are accumulated within a radius of 25 to 35 km and are concentrated in three separate micro-regions, between which there are relatively large landscape hiatuses (cf. Lichardus 1984, 73, fig. 28). The structure of the sites is determined by the natural geomorphology of the terrain (sites avoid elevations above 300 m above sea level), the main hydrological backbone (the Eger, Bílina and Elbe rivers), but also a dense network of lower-order streams (e.g. Blšanka, Chomutovka, Hačka, Modla etc.). Micro-regions are represented in an even, or in a practically identical way, which concerns not only the number of graves (4–6), but also the number of sites found within them (4).

The second important area with the occurrence of skeletal graves is the central regions of Bohemia, from where we currently record a total of 13 localities with 22–24 skeletal graves from stage B1 of the early Roman period. The core of the area is the Prague plateau with the largest concentration of sites (center A according to Lichardus 1984, 72, fig. 28). This includes localities from both banks of the Vltava from Prague city districts (Bubeneč, Ďáblice, Modřany and Nové Butovice) and municipalities from the northern suburbs (Líbeznice, Noutonice). In total, 10 skeletal graves were examined at these six sites. The last area is located east of Prague in the central Bohemian plateau, within which we recorded finds on the left and right banks of the Elbe (cf. center B according to Lichardus 1984, 72, fig. 28). There are 4 sites spreading along the left bank of the Elbe (Nehvizdy, Záluží, Pečky, Kutná Hora-Sedlec) with the finds of 6–7 graves. The same number of sites (Kropáčova Vrutice, Lysá nad Labem, Semčice, Straky) with the finds of 7–8 graves are located in the area between the Central Bohemian and Jizera plateau on the right bank of the Elbe.

The geographical distribution of individual skeletal graves and small inhumation cemeteries in Bohemia (Fig. 13) is broadly correlated with the situation of cremation necropolises of stage B1 (cf. Droberjar 2006, fig. 62). It is not without interest that many of the skeletal graves lie on the edges of the oikumene of contemporary cremation necropolises (e.g. Kutná Hora-Sedlec, Kropáčova Vrutice, Semčice, Trnovany,

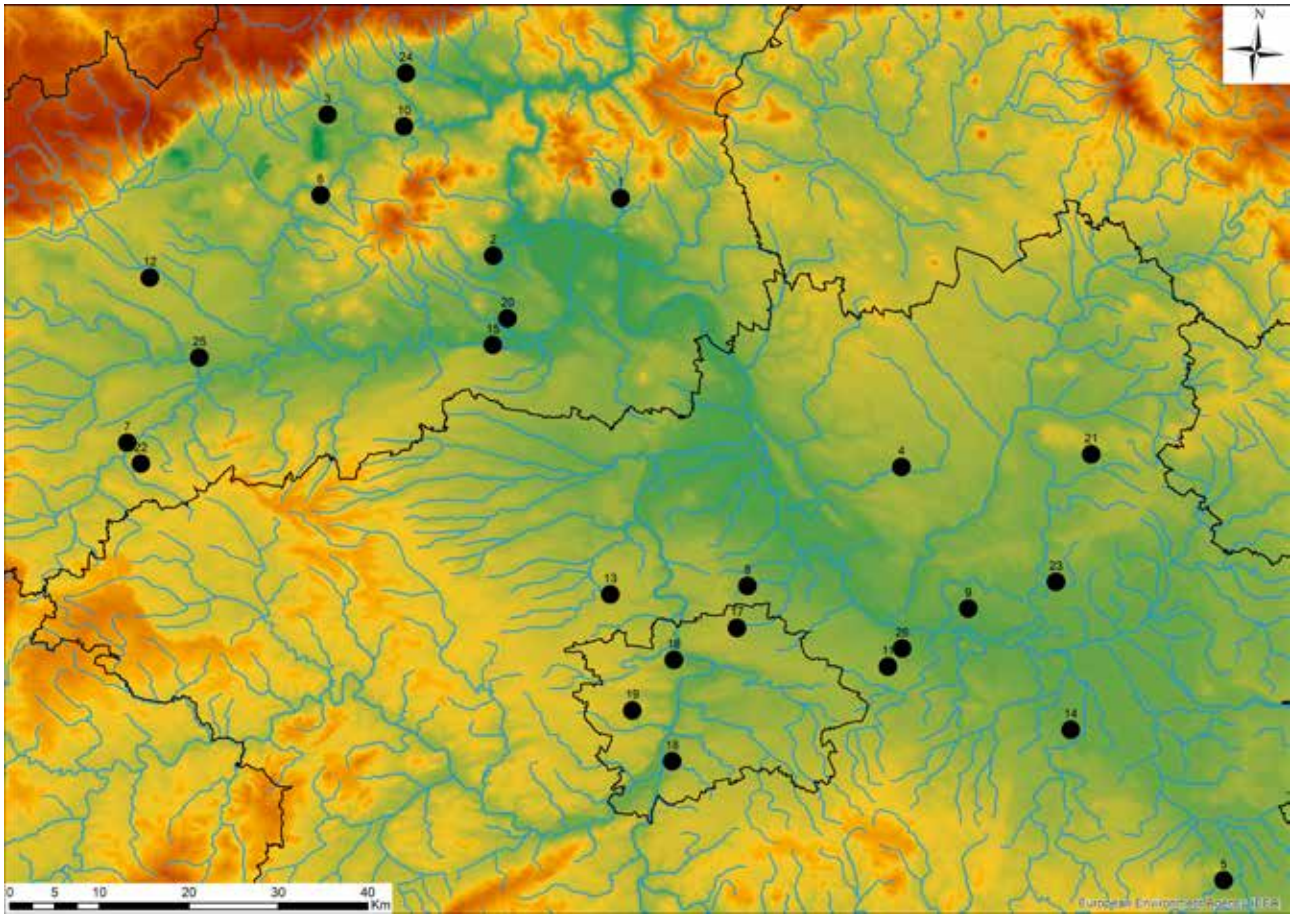


Fig. 13. Spatial distribution of skeleton graves of stage B1 of the early Roman period in Bohemia (the numbering of sites corresponds to the serial numbers in Tab. 1; background map by the European Environment Agency; prepared by J. Šály).
1. Býčkovice (Litoměřice district); 2. Čížkovice (Litoměřice district); 3. Duchcov (Teplice district); 4. Kropáčova Vrutice (Mladá Boleslav district); 5. Kutná Hora-Sedlec (Kutná Hora district); 6. Liběšice (Most district); 7. Liběšovice (Louny district); 8. Líbeznice (Prague-East district); 9. Lysá nad Labem (Nymburk district); 10. Lysec (Teplice district); 11. Nehvizdy (Prague-East district); 12. Nezabylice (Chomutov district); 13. Noutonice (Prague-West district); 14. Pečky (Kolín district); 15. Poplze (Litoměřice district); 16. Prague-Bubeneč (Prague 6 district); 17. Prague-Ďáblice (Prague 8 district); 18. Prague-Modřany (Prague 4 district); 19. Prague-Nové Butovice (Prague 13 district); 20. Radovesice (Litoměřice district); 21. Semčice (Mladá Boleslav district); 22. Sířem (Louny district); 23. Straky (Nymburk district); 24. Trnovany (Teplice district); 25. Tvršice (Louny district); 26. Záluží (Prague-East district).

Nezabylice). However, the question remains of how to interpret this phenomenon – whether to consider it as a reflection of the structure of funeral grounds or rather the current state of research.

The Nezabylice find represents the westernmost inhumation grave of the given period within the Bohemian basin (Fig. 13: 12). In the immediate vicinity of the analyzed locality there is a grave/graves in Tvršice (Fig. 13: 25; Preidel 1930, 264; Motyková-Šneidrová 1963b, 64; 1965; Lichardus 1984, 124; Droberjar 2006, 697), Liběšovice (Fig. 13: 7; Franz 1935, 95, fig. VI; Břeň 1953, 525–526; Motyková-Šneidrová 1963b, 29; Lichardus 1984, 123; Droberjar 2006, 696) and in Sířem (Fig. 13: 22; Motyková-Šneidrová 1963b, 53; Lichardus 1984, 124; Droberjar 2006, 696). An equally important finding is that the inhumation grave from Nezabylice – similarly to the grave/graves in Tvršice or Býčkovice – was located near cremation graves (cf. Motyková-Šneidrová 1963b, 64; 1965; Michálek 1999, tab. 29). The mentioned sites prove that stage B1 skeletal graves are also found in contemporary cremation necropolises in some cases, which has long been disputed (cf. Droberjar 2006, 650; 2014, 430–431). No less important is the fact that the graves at three nearby locations (Liběšovice, Tvršice, Nezabylice) have an analogous construction, the common feature of which is stone lining and sometimes the presence of a wooden coffin (Liběšovice: cf. Franz 1935, 95). The mentioned findings indicate that the area of the middle course of the Eger (Ohře) represents an important micro-region of the early Roman period, which may have some specific manifestations of funeral rites.

7.3. Basic parameters of the graves

Until now we have recorded approximately 40 finds of skeletal graves from stage B1 of the early Roman period, originating from 26 sites (Tab. 1). After deducting the uncertain assemblages without equipment (Straky gr. III, Tvršice gr. IV, Liběšovice second burial) we can count 37 sets (cf. Droberjar 2006, 650, 695–697). Compared to previously recorded finds, there was a slight increase in the source base. If we take into consideration that roughly 566 cremation graves from stage B1 were recorded in Bohemia (Droberjar 2006, 645–649), then in comparison to the recently recorded 6.4% (Droberjar 2006, 650), nowadays inhumation is represented by roughly 7% of the total number of all graves of the period found so far (cf. Salač 2008, 93).

Based on the preserved data, it can be concluded that grave-pits with skeletal burials take on either regular rectangular shapes with rounded corners (cf. Novotný 1955, fig. 1; Droberjar 2014, fig. 2; Petriščáková 2014, tab. I), or slightly irregular up to slightly oval shapes (cf. Zápotocký 1969, 194, fig. 12; Zemanová 2016, fig. 15). A regular narrow and elongated pit was discovered in Nezabylice. In most cases, however, we do not have data on their shape. The documented length of grave-pits ranges from 210 cm (Býčkovice) to 320 cm (Nezabylice), most often falling within the range of 210–220 cm (3×) or 250–280 cm (3×). The width of the graves ranges from 70 cm to 92 cm (4×), then from 95 cm to 110 cm (3×) and only in one case it reaches up to 160 cm (Prague-Bubeneč 1948). If we take into consideration the total surface area of the objects, three categories emerge among them: a) smaller graves with an area of approx. 1.5 to 2.25 m^2 (Poplze, Býčkovice, Prague-Modřany 2015, Prague-Nové Butovice); b) medium-sized graves with an area of around 3 m^2 (Liběšovice, Nezabylice); c) large grave chamber, a grave with an area of more than 4 m^2 (Prague-Bubeneč 1948).

Depending on the depth, the following categories of graves can be distinguished: a) shallow graves deepened to a level of 30–40 cm (4×); b) the most numerous group is represented by moderately sunken graves with levels of 50–75 cm (7×); c) deep graves with a bottom at a level between 100–150 cm (4×). We do not include here the uncertain case from Záluží, where the bottom of the grave was supposed to reach up to 285 cm.

A very variable parameter is the orientation of grave-pits, which can be divided into at least three groups: a) graves oriented along the longer wall in the E-W direction (11×); b) graves with direct north-south orientation (5×); c) graves with a north-south orientation with a deviation to NNE-NE (7×). The orientation of burials, which naturally depends on the overall orientation of the grave-pit, is even more varied: a) skeleton with head to the west (at least 7×); b) head to the east (Kutná Hora-Sedlec); c) head to the north/northeast (4×); d) head to the southwest (2×). The variability of differently oriented graves (W-E; N-S) is documented even within one burial ground (Noutonice).

De facto in all graves, a typical stretched position of the skeletons was found, resting on their backs with the upper limbs laid mostly along the body (cf. Droberjar 2014, 400). Only in probably two cases was the left upper limb bent at the elbow (Horáková-Jansová 1931, 80). The lower limbs also mostly lay stretched, only in one case they were found in crossed position (Noutonice, gr. 7: Felcman 1900, 18; Motyková-Šneidrová 1963b, 6). A special way of depositing the deceased is mentioned in the case of Radovesice, where the skull was supposed to have been placed in a bronze bowl (Píč 1905a, 303) and Noutonice gr. 7, where the fingers of the lower limbs were supposed to be reaching into a ceramic container (Felcman 1900, 18).

Vast majority of graves were prepared for just one individual. Only in the case of Liběšovice it can be considered whether it was a simultaneous double burial (the second individual without goods was placed in some kind of niche?) or rather an additional burial in superposition with the older one (cf. Franz 1935, 95). The situation in Býčkovice is sometimes interpreted as a bi-ritual burial (Droberjar 2011, 14, fig. 2; 2014, 430–431), however, the direct connection of the urn together with the skeleton burial seems rather problematic (compare the original description of the finding situation of gr. 4/ 1902 from J. Szombathy's diary no. 66 of 16 October 1902: see Michálek 1999, 33).

On the question of who was buried in the skeletal graves of the early Roman period, we would primarily expect useful data from anthropological analyses. However, we must consider that there are currently only eight specialized analyzes conducted, representing only 20% of all identified skeletal burials. On this basis, it can be claimed that in the graves analyzed, mostly adult male (up to 6×) and female (up to 3×) individuals were buried, exceptionally also an infant (1×). Individuals buried in Nezabylice, Prague-Bubeneč 1948 (Kuželka 2014), Semčice gr. 16/02 (Stránská 2012), a robust individual from Prague-Nové Butovice (Petriščáková 2014), in the Noutonice gr. 6 (Droberjar 2002; 2015), and perhaps also an individual from Kutná Hora-Sedlec (Leminger 1909, 78–79)

Table 1. Basic data on skeletal graves of stage B1 of the early Roman period in Bohemia.

No.	Location	Feat./ date	Dimension [cm]	Depth [cm]	Orientation	Position/ head	Sex/Age	Bronze wessel	Belt	Brooch	Bibliography
1	2	3	4	5	6	7	8	9	10	11	12
1	Býčkovice	4	210 × 80	?	W-E	dorsal W	?			2× A54a; A2aI	Michálek 1999; Droberjar 2006
2	Čížkovice	1898	?	?	?	?	?			eyelets	Preidel 1930; Motyková-Šneidrová 1963b; Lichardus 1984; Droberjar 2006
3	Duchcov	few graves	?	?	?	?	?			A236	Glott 1935; Břeň 1953; Motyková-Šneidrová 1963b; Lichardus 1984; Droberjar 2006
4	Kropáčova Vrutice	1882	?	?	W-E	W	?	E 131	buckle AA17	4× A45; A19aII; 2× stolen	Červinka 1884; Píč 1905a; Břeň 1953; Motyková-Šneidrová 1963b; Lichardus 1984; Waldhauser and Košnar 1997; Droberjar 2006
5	Kutná Hora-Sedlec	1887	?	?	E-W	dorsal E	male?		5× fittings	2× A45	Píč 1905a; Leminger 1909; Břeň 1953; Motyková-Šneidrová 1963b; Droberjar 2006
		1887?	?	?	?	?	?		buckle AA5		Čižmář and Valentová 1979; Droberjar 2006
6	Liběšice	?	?	?	?	?	?			2× A19a	Preidel 1930; Motyková-Šneidrová 1963b; Lichardus 1984; Droberjar 2006
7	Liběšovice	1933	280 × 110	60	?	dorsal	two individuals			A2b	Franz 1935; Břeň 1953; Motyková-Šneidrová 1963b; Lichardus 1984; Droberjar 2006
8	Líbeznice	?	?	?	?	?	?			A19aII; A24	Břeň 1953; Motyková-Šneidrová 1963b; Lichardus 1984; Droberjar 2006
9	Lysá nad Labem	?	?	?	?	?	?			A 237c	Břeň 1953; Motyková-Šneidrová 1963; Sakař 1970; Lichardus 1984; Droberjar 2006
10	Lysec	1858	?	?	?	?	?	E131, 124			Anonymous 1858; Břeň 1953; Motyková-Šneidrová 1963b; Sakař 1970; Lichardus 1984; Droberjar 2006
11	Nehvizdy	1	?	?	?	1×dorsal 2×on the side	?			A236b; A19aII	Preidel 1930, 203; Břeň 1953; Motyková-Šneidrová 1963b; Lichardus 1984; Droberjar 2006
		2	?	?	?		?			A45b; A67	
		3	?	?	?		?			A236b	
12	Nezabylice	69/2015	320 × 105	110	NE-SW	dorsal N	>male 30–40	E 131	buckle AA4	A45a	Blažek *et al.* 2016; Půlpánová-Reszczyńska *et al.* 2017aPůlpán *et al.* 2018; Půlpánová-Reszczyńska 2018
13	Noutonice	6	?	60	W-E	dorsal	male 40–50			A48; Vippachedelh.	Felcman 1900; Píč 1905a; Břeň 1953; Motyková-Šneidrová 1963b; Lichardus 1984; Droberjar 2002; 2006
		7	?	40	W-E	dorsal	?			A2b	
		8	?	30	N-S	dorsal	?				

1	2	3	4	5	6	7	8	9	10	11	12
14	Pečky	?	?	?	?	?	?			eyelets	Břeň 1953; Motyková-Šneidrová 1963b; Lichardus 1984; Droberjar 2006
15	Poplze	VI/1962	217 × 92	50/55	W-E	dorsal W	female			2× A2aII	Zápotocký 1969; Lichardus 1984; Droberjar 2006
16	Prague--Bubeneč	1929	?	60	SW-NE	dorsal SW	female?		buckle G9	3× A49	Horáková-Jansová 1931; Novotný 1955; Motyková-Šneidrová 1963b; Lichardus 1984; Droberjar 2005; 2006
		1942	?	?	?	?	?	bowl	buckle AA1 end B1	A45; A19aII	Novotný 1955; Břeň 1953; Motyková-Šneidrová 1963; Lichardus 1984; Droberjar 2005; 2006; 2014
		1948	260 × 160	120	SW-NE	dorsal SW	>male 30–40	E 92, 124, 131, 154	2× belts	3× A45, A24, 2× TKF Ib1-2	Novotný 1949; 1955; Břeň 1953; Motyková-Šneidrová 1963b; Lichardus 1984; Droberjar 2005; 2006
17	Prague--Ďáblice	1955	?	150	N-S	dorsal N	?			eyelets	Motyková-Šneidrová 1963b; Lichardus 1984; Droberjar 2005; 2006
18	Prague--Modřany		?	?	?	?	?		end Rad-datz JV	Kost. N-c	Břeň 1953; Motyková-Šneidrová 1967; Droberjar 2005; 2006
		24/2015	220 × 95	?	W-E	dorsal W	female?			3×	Zemanová 2016
19	Prague--N. Butovice	10	250 × 90	?	W-E	dorsal W	male maturus			A 45b	Petriščáková 2014
20	Radovesice	1839	?	?	?	?	?	E 69	Voigt C		Píč 1905a; Preidel 1930; Motyková-Šneidrová 1963b; Sakař 1970; Lichardus 1984; Sklenář 1992; Droberjar 2006
		1914	?	75	?	dorsal	?		Voigt B	4× (2× A19aII)	Preidel 1930; Břeň 1953; Motyková-Šneidrová 1963b; Lichardus 1984; Blažek and Kotyza 1990; Droberjar 2006
21	Semčice	16/2002	?	35	W-E	dorsal W	male? 45–60			A 45	Waldhauser 2004; Droberjar 2006a; Droberjar and Waldhauser 2012
		18/2002	? × 85	40	W-E		juvenis 15–17				
22	Sířem	1911	?	?	NE-SW	?	?		buckle AA1?	eyelets	Motyková-Šneidrová 1963b; Lichardus 1984; Droberjar 2006
23	Straky	I 1904	?	?	N-S	?	?		buckle AA15	2× TKFIa; Kost N-c	Píč 1905a; 1905b; Preidel 1930; Břeň 1953; Motyková-Šneidrová 1963b; Sakař 1970; Lichardus 1984; Droberjar 2006
		II 1904	?	?	?	?	?				
		III 1904	?	?	N-S		?			eyelets	
		IV 1905	?	75	N-S	N	?	E 69, 131, 163		A24	
24	Trnovany	?		60	SW-NE	dorsal	?			Kostrz. N-c	Břeň 1953, 526; Motyková-Šneidrová 1963b; Lichardus 1984; Droberjar 2006
25	Tvršice	III?	?	?	W-E	dorsal	?			2× A45	Preidel 1930; Motyková-Šneidrová 1963a; 1963b; 1965; Lichardus 1984; Droberjar 2006
		IV/?	?	100	NE-SW	?	?				
26	Záluží		?	285	NE-SW	NE	?			2× eyelets	Motyková-Šneidrová 1967; Lichardus 1984; Droberjar 2006

can be considered male or rather male. All recognized deceased lived to adulthood (category adultus) most often in the range of 30–40 years (Prague-Bubeneč, Nezabylice), 40–50 years (Noutonice), or to senile age in the range of 45–60 years (Semčice). As the youngest of the whole set, there is an undetermined adolescent aged 15–17 years old buried in the grave 18/02 from Semčice (after Stránská 2012, 902), which according to the preserved Jahn 20 type spur is rather considered to be male (Droberjar and Waldhauser 2012, 894).

In the other three anthropologically determined cases, we have confirmed female burials. The first comes from Poplze, Litoměřice district (Zápotocký 1969, 194). The gracile bones, the height of the skeleton of 160 cm and the goods suggests that a woman could have been buried in Prague-Bubeneč 1929 (according to Horáková-Jansová 1931, 80). The skeleton in Prague-Modřany was tentatively determined to be probably an adult woman (Zemanová 2016, 913–914).

From the overview it is clear that in the case of 80% of the finds determining the gender and age of the deceased is basically dependent solely on the analysis of preserved personal equipment or goods, which is certainly not optimal. In the given situation, it is obvious that we will probably not be able to do without DNA analyzes when resolving this issue in the future.

7.4. The equipment of skeletal graves and its storage

The range of objects represented in skeleton graves is very varied and in principle (perhaps with the exception of weapons) reflects similar functional composition as cremation graves (cf. e.g. Droberjar 2006). The predominant category is personal equipment represented by components of clothing (brooches: 65 items in 33 graves), body or clothing ornaments (pins: 14 items in 8 graves) and belt components (13 items in 12 graves). Exceptionally, shoe parts are also documented (Prague-Bubeneč 1948). Bronze vessels (13 pieces in 7 graves) slightly prevail over ceramic vessels (up to 12 pieces in 10 graves) among grave goods. Very abundantly (in 5 graves) drinking horns, or their partial fittings and ends are also recorded. The occurrence of tools and objects of daily use is also more common, among them we record iron knives (4×), iron (2×) or bronze scissors (1×) and a razor (1×). Two graves contained parts of outfit (spurs: Semčice, Prague-Bubeneč 1948) and, quite rarely, a weapon (spearhead: Býčkovice). Other metal objects include bronze and iron rings. Rare finds include a bone comb, playing stones, a lump of resin, a ceramic spindle whorl, an amber bead and a shell. In the following part of the analysis, we focus mainly on similar finds preserved in the analyzed grave from Nezabylice – i.e. a bronze pan, a belt buckle, a brooch and a ceramic vessel.

Clothing fasteners are recorded in Czech skeleton graves in the number of 1 to 7 specimens (Tab. 1). The highest number of them was found in Kropáčova Vrutice, where there were supposed to be up to seven brooches, with only five of them remaining (Červinka 1884, 459). Six fasteners were recorded in Prague-Bubeneč in 1948 (Novotný 1949, 53; 1955, 228; Droberjar 2014, 407, 409, fig. 10), four were part of a grave in Radovesice from 1914. Three pieces of brooches were recorded in four graves (Straky I, Býčkovice, Prague-Bubeneč II/1929, Prague-Modřany 2015). The occurrence of an identical pair in graves was relatively frequent (2× type A 2aII: Poplze; 2× A 19a: Liběšice; 2× A 45: Kutná Hora-Sedlec and Tvršice III; 2× brooch with eyelets: Záluží), also two fasteners of various types. The type A 19aII occurs most often (3×) in this context together with type A 24 (Líbeznice), A 236b (Nehvizdy 1) or A 45 (Prague-Bubeneč 1942). Among other combinations, we can mention the brooch with eyelets of type A 45b appearing together with type A 67 (Nehvizdy 2) or Noutonice grave 6, where brooch A 48 was found together with type Vippachedelhausen. However, most often (15×), we find only a single fastener in the analyzed graves – as is the case in Nezabylice.

Although the brooches are mainly found in a functional position on the shoulders or chest of the skeletons (e.g. Noutonice 6, Poplze, Tvršice, Straky IV, two brooches in Prague-Bubeneč 1929), their location shows a certain variability, which can be attributed to the action of post-depositional and transformation processes (cf. Droberjar and Waldhauser 2012, 899; Droberjar 2014, 419). Probably for these reasons, in some graves the brooches rested on the head (Noutonice 7) or behind the heads of the skeletons (Nezabylice, Semčice, Prague-Bubeneč 1948), or between the lower limbs (Liběšovice). Grave III/1948 from Prague-Bubeneč shows other possibilities of their storage, where two specimens lay near the collarbones, one on the left side of the ribcage, other two next to the right shoulder and the last one behind the head of the skeleton (cf. Novotný 1949, 53; 1955, 228; Droberjar 2014, 401, 403, fig. 4). In this unusual case, it is possible that the deceased man was dressed in a ceremonial costume with more brooches than was otherwise common during the burial ceremony (after Droberjar 2014, 419). A trio of fibulae was a more common part of women's costume, as evidenced by the graves from

Prague-Bubeneč 1929 and Prague-Modřany 2015. Pair occurrence of identical brooches worn on the shoulders, which is one of the typical features of women's Elbe-Germanic costume (Gebühr 1976, 146–147, fig. 130, 131), is confirmed in the Czech context by the grave from Poplze (Zápotocký 1969, fig. 12).

Among the significant finds from stage B1 of the early Roman period are various parts of belts. Including the typical bronze belt buckles with an eight-shaped frame of the Madyda-Legutko type AA1–AA5, or Madyda-Legutko AA15–AA17 (cf. Tejral 1970, 120; Droberjar 2006, 626), which are found in Bohemia mainly in skeletons (Prague-Bubeneč 1942 and 1948; Kropáčova Vrutice; Straky gr. I; Kutná Hora-Sedlec), but even in cremation graves (Zliv: Schulz 1885). Belt buckles in skeletal graves rest most often in their original functional position at the waist of the buried individual (Prague-Bubeneč 1929). In the grave from 1948 in Prague-Bubeneč there was even a pair of belts at the waist, the first was fastened with a belt hook and the second with a buckle (Novotný 1955, 228, fig. 1; Droberjar 2014, 421, 423, 426–427, fig. 3, 11, 16). An atypical storage method was newly discovered in Nezabylice, where the belt buckle rested on the skeleton's right shoulder.

Among the most spectacular finds are primarily bronze vessels, evidenced by 13 specimens in seven skeletal graves. The most numerous ones are bronze or tinned pans of type E 131 documented in five graves (Kropáčova Vrutice, Lysec, Nezabylice, Prague-Bubeneč 1948, Straky IV). This type of vessel can be considered typical toreutics of skeletal graves of stage B1 (e.g. Sakař 1970; Karasová 1998, 29–32). Two specimens are documented as containers of type E 69 (Radovesice 1839, Straky IV) and E 124 (Lysec, Prague-Bubeneč 1948). By individual specimens are represented containers of type E 92, E 154, E 163 and a bowl with a spout (Sakař 1970; Karasová 1998).

The storage positions of bronze vessels are most often concentrated in the space either behind the skeletons' heads or at their feet. In the 1948 grave from Prague-Bubeneč, a trio of vessels were placed at the feet of the skeleton, and behind the head, as in Nezabylice, was a type E 131 pan (Droberjar 2014, fig. 2, 4). In contrast, in grave IV from Straky, a bronze strainer was placed near the head, and a pan of type E 131 together with another bronze vessel rested at the feet of the skeleton (cf. Píč 1905b, 338, fig. 9; Motyková-Šneidrová 1963b, 59; Droberjar 2006, fig. 43).

Seemingly less attractive, but no less important, are ceramic vessels. Their presence can be assumed in the case of 10 graves (i.e. 25% of all skeleton graves) and can thus be considered as one of the accompanying finds. Most often they are vase-shaped terrines or vases and, in three cases, miniature vessels (Nezabylice, Prague-Bubeneč 1929, Prague-Modřany). Ceramics are most often – as in Nezabylice – found near the head, specifically on its right side (Prague-Bubeneč 1929: Horáková-Jansová 1931, 80; Noutonice 6: Felcman 1900, 17), or to the right behind the head near the corner of the grave-pit (Prague-Bubeneč 1948: Droberjar 2014, 401, fig. 4). In two cases, the occurrence of a ceramic vessel resting at the feet of the skeleton is documented (Noutonice 7: Felcman 1900, 18; Straky IV: Píč 1905b, 338; cf. Droberjar 2006, fig. 43). A unique ceramic specimen is a spindle whorl from Prague-Modřany (Zemanová 2016, 914).

The equipment listed above shows a high degree of variability, which can be considered one of the accompanying phenomena of skeletal graves. At first glance, the vast difference in their inventory is obvious. Thus, on the one hand, we find outright poor graves, or normally equipped, and on the other hand graves very rich. The recorded graves are: a) without equipment; b) with one brooch; c) with two brooches; d) other types of sparsely equipped graves. On the other side of the spectrum are graves richly equipped – apparently elite – with, among other things, bronze vessels (Straky IV/1905: 3 vessels; Lysec: 2 vessels; Kropáčova Vrutice: 1 vessel). A group of graves with forged drinking horns also appears to be quite distinctive. The richest and most elite group is traditionally referred to as "princely graves" or "Lubieszewo/Lübsow type" graves (here Prague-Bubeneč 1948; cf. e.g. Gebühr 1974; 2009; Köhler 1975a; 1975b; Lichardus 1984). As recent precise analyzes of these elite graves in Central European Barbaricum show, this is a complex cultural-social phenomenon (Droberjar 2006, 650–652; 2014, 428–433, fig. 20; Bemmann and Voß 2007; Schuster 2010; 2013; 2014a; 2014b; 2016; Schuster and Cieśliński 2009; von Carnap Bornheim 2015; Voß 2017). Although the grave from Nezabylice has some features of a prestigious burial (imported vessel, luxurious belt, sophisticated grave construction), its inclusion among the most elite group would require a significantly deeper study in the Central European context. Ideally, we should subject the individuals from Nezabylice to natural science analyses, which would help us solve some current problems. For example, the analysis of oxygen, strontium, nitrogen, and other elements' isotopes should not only provide us with relevant answers to the questions of the origin of skeletally buried individuals, but also to their nutrition.

8. Conclusion

The article presents a skeletal grave from the early Roman period explored in 2015 at the cremation burial grounds in Nezabylice (Chomutov district, Ústí region, northwestern Bohemia). The anthropological analysis describes the buried individual as an adult, probably male, who lived to be 30–40 years old (adultus II). Their outfit included a bronze belt buckle similar to the Madyda-Legutko type AA4 and a brooch with eyelets of type A 45a. The grave goods consisted of a bronze tinned pan of type E 131 and a miniature ceramic terrine. The assemblage can be dated to the B1b phase of the early Roman period.

A significant feature of the grave was the stone lining, which consisted of several horizontally placed layers of smaller quartz boulders obtained from the local gravel-sand terrace. The benefit of the explored grave is the presence of an organic container that has been precisely documented for the first time in the Bohemian context. According to the preserved traces of a pine tree (Pinus), it was probably a wooden coffin, inside which the buried individual was placed. The combination of a wooden coffin and stone lining represents the most sophisticated way of modifying a grave-pit that has been documented in the territory of Bohemia.

Field research and a non-destructive survey in Nezabylice proved that the presented skeleton grave has a demonstrable spatial relation to the extensive contemporary cremation necropolis. In this regard, only burial sites from Tvršice in Louny district and Býčkovice in Litoměřice district were mentioned as exceptions (Michálek 1999, 33; cf. Droberjar 2006, 650), where, however, the detailed relation between these types of graves is not exactly known (Motyková-Šneidrová 1963b, 64; 1965; cf. Droberjar 2006, 650). The relation between the graves of both rites has not yet been documented even in the large Central Bohemian burial grounds (Třebusice: Droberjar 2002, 342–343; Dobřichov-Pičhora: Droberjar 1999; Tišice: Šneidrová 1957; Motyková-Šneidrová 1963a; Stehelčeves: Motyková 1981). Nezabylice therefore represents the first cremation necropolis of stage B1 in Bohemia, where a chronologically contemporary skeleton burial can be proven to be located. The contribution of the find is unprecedented and sheds new light on existing knowledge about the organization of Germanic necropolises.

The geographical location of Nezabylice and the adjacent sites proves that one of the important regional centers with a concentration of skeletal graves is located in the area of the middle course of the Eger (Ohře) in north-western Bohemia. In the case of Nezabylice, it is at the same time the most western location, thanks to which the hitherto known oikumene with the occurrence of skeleton graves in Bohemia has expanded.

Today, only forty skeleton graves from stage B1 of the early Roman period are known in Bohemia. However, a significant part of these findings were inexpertly examined before the middle of the last century, and we lack comprehensive information about them, which significantly complicates their more detailed study. How can we expand our knowledge and interpretive possibilities of this phenomenon given the limited find fund? Apparently, the only way will be to include the results of natural science analyzes in our considerations. First of all, isotope analyzes (oxygen, strontium, nitrogen, etc.), which should provide us with relevant answers to questions regarding not only the origin of skeletally buried individuals, but also the composition of their diet. An ideal model for the future would be an open access Internet database created within the Central European area, where individual institutions or researchers of the Roman era could contribute the results of natural science expertise (DNA, active isotopes, bio-archaeology, etc.), similar to those for the period of earlier prehistoric times, for example the Neolithic or the Bronze Age.

References

Anonymous. 1858. Zprávy o schůzkách archaeologického sboru Musea kr. Českého. Schůzka dne 22. května 1858. *Památky archeologické* 3, 139–140.

Bemmann J. and Voß H.-U. 2007. Anmerkungen zur Körpergrabsitte in den Regionen zwischen Rhein und Oder vom 1. bis zur Mitte des 5. Jahrhunderts n. Chr. In A. Faber, P. Fasold, M. Struck and M. Witteyer (eds.), *Körpergräber des 1.–3. Jahrhunderts in der Römischen Welt* (= *Schriften des Archäologischen Museums Frankfurt* 21). Frankfurt am Main: Archäologisches Museum, 153–183.

Bína J. and Demek J. (eds.) 2012. *Z nížin do hor. Geomorfologické jednotky České republiky*. Praha: Academia.

Blažek J. and Kotyza O. 1990. *Archeologická sbírka Okresního vlastivědného muzea v Litoměřicích I. Fond Libochovice* (= *Archeologický výzkum v severních Čechách* 18). Teplice: Krajské muzeum v Teplicích.

Blažek J., Ondráčková L., Půlpán M. and Půlpánová-Reszczyńska A. 2015. Výzkum pohřebiště z doby římské v Nezabylicích, okr. Chomutov. In K. Sklenář (ed.), *Zprávy České archeologické společnosti – Supplément 97. Archeologické výzkumy v Čechách 2014*. Praha: Česká archeologická společnost, 35–36.

Blažek J., Ondráčková L., Půlpán M. and Půlpánová-Reszczyńska A. 2016. Výzkum pohřebiště z doby římské v Nezabylicích (okr. Chomutov) v roce 2015. In K. Sklenář (ed.), *Zprávy České archeologické společnosti – Supplément 101. Archeologické výzkumy v Čechách 2015*. Praha: Česká archeologická společnost, 23–24.

Blažek J., Ondráčková L., Půlpán M. and Půlpánová-Reszczyńska A. 2017. Výzkum pohřebiště z doby římské v Nezabylicích (okr. Chomutov) v roce 2016. In K. Sklenář (ed.), *Zprávy České archeologické společnosti – Supplément 105. Archeologické výzkumy v Čechách 2016*. Praha: Česká archeologická společnost, 23–24.

Blažek J., Ondráčková L., Půlpán M. and Půlpánová-Reszczyńska A. 2018. Výzkum pohřebiště z doby římské v Nezabylicích (okr. Chomutov) v roce 2017. In K. Sklenář (ed.), *Zprávy České archeologické společnosti – Supplément 109. Archeologické výzkumy v Čechách 2017*. Praha: Česká archeologická společnost, 27–28.

Blažek J., Ondráčková L., Půlpán M. and Reszczyńska A. 2014. Nové žárové pohřebiště z doby římské v Nezabylicích, okr. Chomutov. *Archeologie ve středních Čechách* 18, 799–811.

Břeň J. 1953. Kostrové hroby starší doby římské v Čechách. *Archeologické rozhledy* 5, 515–529.

von Carnap-Bornheim C. 2015. Między adaptacją a oporem? Uwagi o grobach „książęcych" z okresu wpływów rzymskich w Barbaricum. *Wiadomości Archeologiczne* 66, 183–200.

Černochová R. 2016. Bronzová výbava kostrového hrobu 69 v Nezabylicích (starší doba římská) Oblastního muzea v Chomutově 2015. Konzervátorská a restaurátorská zpráva př. č. TP-2016-4053, unpublished manuscript in the archive of the Institute of Archaeology of the Czech Academy of Sciences, Prague, Museum in Chomutov.

Černý V. 1995. Význam tafonomických procesů při studiu pohřebního ritu. *Archeologické rozhledy* 47, 301–313.

Černý M. 2013. Germánské spony starší doby římské v Čechách. Germanic Brooches of the Early Roman Period in Bohemia, unpublished manuscript of diploma thesis in the archive of the Faculty of Philosophy of Charles University, Praha.

Červinka O. 1884. Dvě naleziště starožitností u Vrutice Kropáčovy. *Památky archeologické* 12, 457–464.

Čižmář M. and Valentová J. 1979. Příspěvek k poznání doby římské na Kutnohorsku. *Archeologické rozhledy* 31, 144–150.

Cosack E. 1979. *Die Fibeln der Älteren Römischen Kaiserzeit in der Germania libera (Dänemark, DDR, BRD, Niederlande, ČSSR). Eine technologisch-archäologische Analyse*, 1: *Armbrustfibeln, Rollenkappenfibeln, Augenfibeln* (= *Göttinger Schriften zur Vor- und Frühgeschichte* 19). Neumünster: Karl Wachholtz.

Demek J. and Mackovčin P. (eds.) 2006. *Zeměpisný lexikon ČR. Hory a nížiny*. Brno: Agentura ochrany přírody a krajiny České republiky.

Dobeš M., Limburský P. and Půlpánová-Reszczyńska A. 2020. Hrob kultury se šňůrovou keramikou z Nezabylic v severozápadních Čechách. Ke konstrukcím komorových hrobů mladšího eneolitu ve střední Evropě. *Archeologické rozhledy* 72, 3–25.

Droberjar E. 1999. *Dobřichov-Pičhora. Ein Brandgräberfeld der älteren römischen Kaiserzeit in Böhmen (Ein Beitrag zur Kentniss des Marbod-Reichs)* (= *Fontes Archaeologici Pragenses* 23). Pragae: Museum Nationale Pragae.

Droberjar E. 2002. *Encyklopedie římské a germánské archeologie v Čechách a na Moravě*. Praha: Nakladatelství Libri.

Droberjar E. 2005. Praha germánská. Doba římská a doba stěhování národů (konec 1. století před Kristem až 6. století po Kristu). In M. Lutovský and L. Smejtek (eds.), *Pravěká Praha*. Praha: Nakladatelství Libri, 777–841.

Droberjar E. 2006. Hornolabští Svébové – Markomani. K problematice dalšího vývoje groβromstedtské kultury ve stupni Eggers B1 („Zeitgruppe 3") v Čechách (dobřichovská skupina). *Archeologie ve středních Čechách* 10, 599–712.

Droberjar E. 2007. „Veteres illic Sueborum praedae et nostris e provinciis lixae ac negotiatores reperti…" (Tacitus, Ann. II, 62, 3). K interpretaci římských importů u českých Svébů v době Marobudově. In E. Droberjar and O. Chvojka (eds.), *Archeologie barbarů 2006* (= *Archeologické výzkumy v jižních Čechách – Supplementum* 3). České Budějovice: Jihočeské muzeum v Českých Budějovicích, 41–91.

Droberjar E. 2011. Einige Bemerkungen zur Körperbestattung bei den bömischen Sueben in der älteren römischen Kaiserzeit. In E. Droberjar (ed.), *Archeologie barbarů 2010. Hroby a pohřebiště Germánů mezi Labem a Dunajem* (= *Studia Archaeologica Suebica* 1). Lublin: Instytut Archeologii Uniwersytetu Marii Curie-Skłodowskiej, 13–22.

Droberjar E. 2014. Bohatý labsko-germánský kostrový hrob lübsowského typu z Prahy-Bubenče (hrob III). Nové poznatky k interpretaci nálezu z roku 1948. *Archaeologica Pragensia* 22, 397–443.

Droberjar E. and Frána J. 2004. Antická mosaz (aurichalcum) v českých nálezech doby římské. *Archeologie ve středních Čechách* 8, 441–462.

Droberjar E. and Waldhauser J. 2012. Birituální hroby ze starší doby římské v Semčicích, okr. Mladá Boleslav. *Archeologie ve středních Čechách* 16, 893–905, fig. 19: B.

Eggers H. J. 1951. *Der römische Import im Freien Germanien*, 1 (= *Atlas der Urgeschichte* 1). Hamburg: Museum für Völkerkunde und Vorgeschichte.

Eggers H. J. 1965. Eine römische Kasserolle aus der Weser bei Bremen und ihr Kreis. *Bremer Archäologische Blätter* 4, 18–38.

Felcman J. 1900. Archaeologický výzkum „Údolí Svatojiřského" a okolí. Pohřebiště Noutonické. *Památky archeologické* 18, 13–40.

Franz L. 1935. Neue Germanenfunde in Saaz. *Sudeta* 11, 91–96.

Gebühr M. 1974. Zur Definition älterkaiserzeitlichen Fürstengräber vom Lübsow-Typ. *Prähistorische Zeitschchrift* 49, 82–128.

Gebühr M. 1976. *Der Trachtschmuck der älteren römischen Kaiserzeit im Gebiet zwischen unterer Elbe und Oder und auf den westlichen dänischen Inseln: Brandenburg, Mecklenburg, Fünen, Langeland, Lolland* (= *Göttinger Schriften zur Vor- und Frühgeschichte* 18). Neumünster: Karl Wachholtz.

Gebühr M. 2009. Reiche Bauern oder Fürsten? Germanische Eliten in der älteren Römischen Kaiserzeit. In S. Burmeister and H. Derks (eds.), *2000 Jahre Varusschlacht – Konflikt*. Stuttgart: Theiss, 342–351.

Glott J. 1935. Die germanischen Funde im Duxer Heimatmuseum. *Sudeta* 11, 24–25.

Glüsing P. 1968. Studien zur Chronologie und Trachtgeschichte der Spätlatènezeit und der frühen römischen Kaiserzeit, unpublished manuscript of dissertation (1972) in the archive of the Kiel University.

Hlava M. 2010. Archeologická sbírka J. A. Jíry a její osudy. *Archaeologica Pragensia* 20, 155–220.

Horáková-Jansová L. 1931. Nové provinciálně římské nálezy z Prahy XIX. *Zprávy Československého státního archeologického ústavu* 2–3, 80–84.

Ibragimow K. 2008. Cmentarzysko szkieletowe z wczesnego okresu wpływów rzymskich w Stogach, pow. Strzelin, woj. dolnośląskie. In A. Błażejewski (ed.), *Labor et Patientia. Studia Archaeologica Stanislao Pazda Dedicata*. Wrocław: Instytut Archeologii Uniwersytetu Wrocławskiego, 101–130.

Ibragimow K. 2011. Szkieletowy obrządek pogrzebowy kultury przeworskiej na Dolnym Śląsku we wczesnym okresie rzymskim. In E. Droberjar (ed.), *Archeologie barbarů 2010. Hroby a pohřebiště Germánů mezi Labem a Dunajem* (= *Studia Archaeologica Suebica* 1). Lublin: Instytut Archeologii Uniwersytetu Marii Curie-Skłodowskiej, 163–182.

Jílek J. 2012. *Bronzové nádoby z doby římské na Moravě a naddunajské části Dolního Rakouska*. Pardubice: Univerzita Pardubice.

Karasová Z. 1998. *Die römischen Bronzegefässe in Böhmen* (= *Fontes Archaeologici Pragenses* 22). Pragae: Museum Nationale Pragae.

Kočárová R. and Kočár P. 2016. Nezabylice (okr. Chomutov). Zpráva o analýze dřevěného artefaktu. Č. analýzy 24/16, unpublished manuscript in the archive of the Institute of Archaeology of the Czech Academy of Sciences in Prague, Museum in Chomutov.

Köhler R. 1975a. *Untersuchungen zu Grabkomplexen der älteren römischen Kaiserzeit in Böhmen unter Aspekten der religiösen und sozialen Gliederung* (= *Göttinger Schriften zur Vor- und Frühgeschichte* 13). Neumünster: Karl Wachholtz.

Köhler R. 1975b. Zur Problematik der älterkaiserzeitlichen „Fürstengräber" in Böhmen. *Zeitschrift für Ostforschung* 24(3), 457–463.

Kolník T. 1971. Prehľad a stav bádania o dobe rímskej s sťahovaní národov. *Slovenská archeológia* 19(2), 499–558.

Kolník T. 1980. *Römerzeitliche Gräberfelder in der Slowakei*, 1 (= *Archaeologica Slovaca. Fontes* 14). Bratislava: Veda, Vydavaťelstvo Slovenskej akadémie vied.

Kraskovská Ľ. 1976. Rímske bronzové nádoby na Slovensku. *Slovenská archeológia* 24(2), 429–440.

Krekovič E. 1979. Hrobové nálezy z doby rímskej v Šoporni, okr. Galanta. *Archeologické rozhledy* 31, 413–419.

Krekovič E. 1996. Kostrové hroby z rímskej doby na Slovensku z aspektu teoretických otázok pohrebného rítu. *Musaica* 23, 33–44.

Kruta V. 1967. Lomazice, o. Chomutov. *Bulletin záchranného oddělení* 5, 23–24, no. 63.

Kruťová M. 2003. Transformační procesy a problém intruzí v archeologii. In L. Šmejda and P. Vařeka (eds.), *Sedmdesát neustupných let. Sborník k životnímu jubileu prof. Evžena Neustupného*. Plzeň: Katedra archeologie, Fakulta humanitních studií Západočeské Univerzity v Plzni, 99–120.

Křivánek R. 2012. Geofyzikální měření ARÚ Praha na archeologických lokalitách v roce 2011. In K. Sklenář (ed.), *Zprávy České archeologické společnosti – Supplément 85. Archeologické výzkumy v Čechách 2011*. Praha: Česká archeologická společnost, 16–18.

Křivánek R. 2016. Geofyzikální měření ARÚ Praha na archeologických lokalitách v roce 2015. In K. Sklenář (ed.), *Zprávy České archeologické společnosti – Supplément 101. Archeologické výzkumy v Čechách 2015*. Praha: Česká archeologická společnost, 9–12.

Křivánek R. 2017. Geofyzikální měření ARÚ Praha na archeologických lokalitách v roce 2016. In K. Sklenář (ed.), *Zprávy České archeologické společnosti – Supplément 105. Archeologické výzkumy v Čechách 2016*. Praha: Česká archeologická společnost, 13–16.

Kunow J. 1980. Der Leithorizont der Augenfibeln und die Stufe Eggers B_1. *Archäologisches Korrespondenzblatt* 10, 157–161.

Kunow J. 1998. Die Hauptserie der Augenfibeln: Gruppe III, Fig. 45–54. In M. Goßler, P. Woidt and M. Aufleger (eds.), *100 Jahre Fibelformen nach Oscar Almgren. Internationale Arbeitstagung 25.–28. Mai 1997, Kleinmachnow, Land Brandenburg* (= *Forschungen zur Archäologie im Land Brandenburg* 5). Wünsdorf: Brandenburgisches Landesmuseum für Ur- und Frühgeschichte, 93–118.

Kuželka V. 2014. Antropologické zhodnocení kosterních pozůstatků z hrobu nalezeného na lokalitě Praha-Bubeneč v roce 1948. *Archaeologica Pragensia* 22, 433.

Leminger E. 1909. Praehistorické hroby s kostrami na Kutnohorsku. *Památky archeologické* 23, 75–80.

Lichardus J. 1984. *Körpergräber der frühen Kaiserzeit im Gebiet der südlichen Elbgermanen* (= *Saarbrücker Beiträge zur Altertumskunde* 43). Bonn: Rudolf Habelt.

Lorber J. 1998. *Zeměpisná vlastní jména Chomutovska a Kadaňska*, 2: *Pomístní jména 1 (oronyma a hydronyma)*. Chomutov: Okresní muzeum.

Łuczkiewicz P. 2010. Rzadki okaz fibuli oczkowatej typu A 45 z Lubelszczyzny: Drążgów, pow. Ryki, woj. lubelskie. In A. Urbaniak, R. Prochowicz, I. Jakubczyk, M. Levada and J. Schuster (eds.), *Terra Barbarica. Studia ofiarowane Magdalenie Mączyńskiej w 65. rocznicę urodzin* (= *Monumenta Archaeologica Barbarica. Series Gemina* 2). Łódź, Warszawa: Instytut Archeologii Uniwersytetu Łódzkiego, Fundacja Uniwersytetu Łódzkiego, Fundacja Monumenta Archaeologica Barbarica, Państwowe Muzeum Archeologiczne w Warszawie, 347–356.

Madyda-Legutko R. 1986. *Die Gürtelschnallen der römischen Kaiserzeit und der frühen Völkerwanderungszeit im mitteleuropäischen Barbaricum* (= *BAR International Series* 360). Oxford: British Archaeological Reports.

Margos U. 2000. Uwagi na temat genezy obrządku szkieletowego na Pomorzu na przełomie młodszego okresu przedrzymskiego i okresu wpływow rzymskich. In R. Madyda-Legutko and T. Bochnak (eds.), *Superiores Barbari. Księga pamiątkowa ku czci Profesora Kazimierza Godłowskiego*. Kraków: Instytut Archeologii Uniwersytetu Jagiellońskiego, 255–267.

Mączyńska M. 2004. Bemerkungen über einige Typen der Augenfibeln in Barbaricum. In H. Friesinger and A. Stuppner (eds.), *Zentrum und Peripherie – Gesellschaftliche Phänomene in der Frühgeschichte* (= *Mitteilungen der Prähistorischen Kommission* 57). Wien: Verlag der Österreichischen Akademie der Wissenschaften, 211–240.

Michálek J. 1999. *Archeologické nálezy ze středních a severozápadních Čech ve sbírce Naturhistorisches Museum ve Vídni* (= *Příspěvky k pravěku a rané době dějinné severozápadních Čech* 7). Most: Ústav archeologické památkové péče SZ Čech.

Motyková K. 1981. Das Brandgräberfeld der römischen Kaiserzeit von Stehelčeves. *Památky archeologické* 72, 340–415.

Motyková-Šneidrová K. 1963a. Žárové pohřebiště ze starší doby římské v Tišicích ve středních Čechách. *Památky archeologické* 54, 343–437.

Motyková-Šneidrová K. 1963b. *Die Anfänge der römischen Kaiserzeit in Böhmen – Počátky doby římské v Čechách* (= *Fontes Archaeologici Pragenses* 6). Pragae: Museum Nationale Pragae.

Motyková-Šneidrová K. 1965. Žárové pohřebiště z Tvršic na Žatecku. *Památky archeologické* 56, 115–148.

Motyková-Šneidrová K. 1967. *Weiterentwicklung und Ausklang der älteren römischen Kaiserzeit in Böhmen* (= *Fontes Archaeologici Pragenses* 11). Pragae: Museum Nationale Pragae.

Neustupný J. 1930. Římský kostrový hrob v Praze-Michli. *Památky archeologické* 36, 114–115.

Novotný B. 1949. Hrob velmože z doby římské z Prahy-Bubenče. *Archeologické rozhledy* 1, 52–54.

Novotný B. 1955. Hrob velmože z počátku doby římské v Praze-Bubenči. *Památky archeologické* 46, 227–257.

Ondráčková L., Půlpán M. and Půlpánová-Reszczyńska 2018. Nezabylice – germánské pohřebiště. Sedm sezón záchranného archeologického výzkumu. *Památky, příroda, život* 50, 29–46.

Petriščáková K. 2014. Hrob ze starší doby římské z Prahy-Nových Butovic. In M. Popelka, R. Šmidtová and Z. Beneš (eds.), *Od Skandzy k Dunaji, od Rýna k Pasłęce. Sborník k 70. narozeninám Lubomíra Košnara* (= *Praehistorica* 32/2). Praha: Univerzita Karlova v Praze, Nakladatelství Karolinum, 271–276.

Píč J. L. 1905a. *Starožitnosti země České*, 2/3: *Čechy na úsvitě dějin. Žárové hroby v Čechách a příchod Čechů*. Praha: Nákladem vlastním.

Píč J. L. 1905b. Z archaeologického bádání r. 1904. Kostrové hroby z doby císařství římského. *Památky archeologické* 21, 337–338.

Pleiner R. and Rybová A. (eds.) 1978. *Pravěké dějiny Čech*. Praha: Academia.

Preidel H. 1930. *Die germanischen Kulturen in Böhmen und ihre Träger*, 1: *Die Kulturen*, 2: *Die Träger*. Kassel, Wilhelmshöhe: Johannes Stauda.

Preidel H. 1935. *Heimatkunde des Bezirkes Komotau*, 4: *Geschichte*, 1: *Urgeschichte*. Komotau: Deutscher Bezirkslehrerverein.

Půlpán M., Půlpánová-Reszczyńska A. and Křivánek R. 2018. Přínos nedestruktivních průzkumů pro poznání

dílčích struktur polykulturního funerálního areálu v Nezabylicích, okr. Chomutov. *Archeologie ve středních Čechách* 22(2), 645–654.

Půlpánová-Reszczyńska A. 2018. Cmentarzysko w Nezabylicach (okr. Chomutov, Ústecký kraj). Nowe materiały do poznania obrządku pogrzebowego na obszarze północno-zachodnich Czech w okresie rzymskim. In B. Niezabitowska-Wiśniewska, P. Łuczkiewicz, S. Sadowski, M. Stasiak-Cyran and M. Erdrich (eds.), *Studia barbarica. Profesorowi Andrzejowi Kokowskiemu w 65. rocznicę urodzin*, 2. Lublin: Uniwersytet Marii Curie-Skłodowskiej, 86–99.

Půlpánová-Reszczyńska A., Půlpán M. and Křivánek R. 2017a. Geophysical Survey and Archaeological Excavations at the Roman Period Cemetery in Nezabylice (Chomutov District, Northwest Bohemia). *Analecta Archaeologica Ressoviensia* 12, 109–131.

Půlpánová-Reszczyńska A., Půlpán, M. and Ondráčková L. 2017b. Bronzové vědro s obličejovými atašemi typu E 28 z pohřebiště doby římské v Nezabylicích, okr. Chomutov. *Archeologie ve středních Čechách* 21(1), 347–360.

Půlpánová-Reszczyńska A., Půlpán M. and Ondráčková, L. 2018. Depot zbraní z doby římské v krušnohorské Hrádečné, okr. Chomutov. *Archeologické rozhledy* 70, 554–595.

Radoň M. 2015. Geologický materiál v archeologických objektech germánského pohřebiště u obce Nezabylice, unpublished manuscript in the archive of the Institute for Preservation of Archaeological Heritage of northwest Bohemia in Most.

Sakař V. 1965. Značky na bronzových nádobách starší doby římské v Čechách. *Památky archeologické* 56, 149–160.

Sakař V. 1970. *Roman Imports in Bohemia* (= *Fontes Archaeologici Pragenses* 14). Pragae: Museum Nationale Pragae.

Sakař V. 1994. Čechy a podunajské provincie Římské říše. *Sborník Národního Muzea v Praze.* Řada A 45, 1–66.

Salač V. 2008. Starší doba římská. In V. Salač (ed.), *Archeologie pravěkých Čech*, 8: *Doba římská a stěhování národů*. Praha: Archeologický ústav Akademie věd České republiky, 17–126.

Schulz V. 1885. Hrob u Zlivi. *Památky archeologické* 13, 65–80.

Schuster J. 2010. *Lübsow. Älterkaiserzeitliche Fürstengräber im nördlichen Mitteleuropa* (= *Bonner Beiträge zur Vor- und Frühgeschichtlichen Archäologie* 12). Bonn: Rheinische Friedrich-Wilhelms-Universität.

Schuster J. 2013. Byrsted – Lübsow – Mušov: Der Gebrauch von Edelmetall in germanischen Fürstengräbern der älteren Römischen Kaiserzeit. In M. Hardt and O. Tamáska (eds.), *Macht des Goldes, Gold der Macht. Herrschafts- und Jenseitsrepräsentation zwischen Antike und Frühmittelalter im mittleren Donauraum*. Weinstadt: Bernhard Albert Greiner, 151–170.

Schuster J. 2014a. Dobór i układ darów w inhumacyjnych grobach książęcych z pierwszej połowy I tysiąclecia po Chr. w północnej i środkowej Europie. *Wiadomości Archeologiczne* 65, 5–44.

Schuster J. 2014b. Bestattungen vom Lübsow-Typ als Kammergräber – ein Phantom? In A. Abegg-Wigg and N. Lau (eds.), *Kammergräber im Barbaricum – Zu Einflüssen und Übergangsphänomenen von der vorrömischen Eisenzeit bis in die Völkerwanderungszeit. Internationale Tagung, Schleswig, 25.–27. November 2010*. Neumünster, Hamburg: Karl Wachholtz, 31–54.

Schuster J. 2016. Der arme Fürst. Ein bescheiden ausgestattetes Prunkgrab der älteren Kaiserzeit von Zgliczyn Pobodzy, Nordmasowien (Polen). *Germania* 94, 117–156.

Schuster J. and Cieśliński A. 2009. Der älterkaiserzeitliche Fürstengräberfundplatz Lübsow-„Tunnehult". Neue Geländeforschungen. *Germania* 87, 569–587.

Sklenář K. 1992. *Archeologické nálezy v Čechách do roku 1870. Prehistorie a protohistorie*. Praha: Národní muzeum.

Stránská P. 2012. Semčice, okr. Mladá Boleslav: antropologický posudek. *Archeologie ve středních Čechách* 16(2), 901–902.

Tejral J. 1967. K otázce importu bronzových nádob na Moravu ve starší době římské. *Památky archeologické* 58, 81–134.

Tejral J. 1970. Počátky doby římské na Moravě z hlediska hrobových nálezů. *Študijné zvesti* 18, 107–192.

Voß H.-U. 2017. Germanische „Fürstengräber" und das „Corpus der römischen Funde im europäischen Barbaricum". *Bericht der Römisch-Germanischen Kommission* 98, 285–308.

Waldhauser J. 2004. Semčice, okr. Mladá Boleslav. *Výzkumy v Čechách 2002*, 256, no. 1217.

Waldhauser J. and Košnar L. 1997. *Archeologie Germánů v Pojizeří a v Českém ráji*. Praha, Mladá Boleslav: Nakladatelství Libri.

Wegewitz W. 1972. *Das langobardische Brandgräberfeld von Putensen, Kreis Harburg* (= *Die Urnenfriedhöfe in Niedersachsen* 10). Hildesheim: Lax.

Zápotocký M. 1969. Materiály k osídlení Litoměřicka v době římské I. Dolní Poohří. *Archeologické rozhledy* 21, 178–201.

Zemanová P. 2016. Praha-Modřany. *Archeologie ve středních Čechách* 20(2), 913–914, no. 54.

https://mapy.geology.cz/geocr50/#; access: 12.08.2023.

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

Andrzej Janowski

DOI: 10.15584/anarres.2023.18.10

Institute of Archaeology and Ethnology Polish Academy of Sciences, Kuśnierska 12/12a, 70-536 Szczecin, Poland;
e-mail: a.janowski@iaepan.edu.pl; ORCID: 0000-0002-3272-3444

A Surprise from the East. A Quiver or Bowcase Loop from the Ancillary Settlement in Gdańsk

Abstract

Janowski A. 2023. A Surprise from the East. A Quiver or Bowcase Loop from the Ancillary Settlement in Gdańsk. *Analecta Archaeologica Ressoviensia* 18, 159–165

Archaeological explorations carried out between Tartaczna and Panieńska streets in Gdańsk has provided a wealth of movable historical artefacts. One of them is a quiver/bowcase loop made of antler. The article discusses typological classification, comparative analysis, dating and ethnocultural characteristics of the artefact. Antler and iron elements of quivers and bowcases are very rare in Poland and all of them are considered to be elements of foreign culture: Rus' or Hungarian.

Keywords: Gdańsk, Early Middle Ages, armament, quiver, bowcase, loops, antler and bone objects

Received: 10.10.2023; **Revised:** 26.10.2023; **Accepted:** 27.10.2023

Archaeological excavations carried out between Tartaczna and Panieńska streets in Gdańsk between 2008 and 2010 yielded a range of rare, unexpected and precious artefacts (cf. Drozd 2013; Misiuk 2013; 2016; Rapiejko 2013; Szczepanowska 2013; 2019). A small, unidentified earlier artefact made of antler uncovered in layer 1196 and which can be dated to the 2nd half of the 13th century (Fig. 1), is undoubtedly one of them (currently in the collection of Archaeological Museum in Gdańsk, SAZ 255/04/04, cat. no. 1606). The object is slightly damaged and its preserved extent is 127.22 mm long and 5.1–5.6 mm thick. Its base is straight, and the top is arched and profiled. The maximum width is 21.63 mm. The top part of the object is smooth and polished while the bottom part is rough. There is quite a deep and narrow grove running along the top edge. There are three holes in the artefact at its current level of preservation; however, it is possible that originally there were more. The biggest hole is located in the middle and has an irregular oval shape measuring 14.4 × 8.8 mm, while to the left and right there are two smaller ones whose diameter measures 4.3 mm each. In the central hole on the upper and the bottom side there is visible abrasion which forms ca 45° angle with the longer edges of the object. On the basis of the general shape and characteristic features, such as the abrasion visible at the central hole which is the trace of a thong which was attached to it, the object can be identified as a quiver or bowcase loop (in Russian *петли*).

The bow was a popular weapon in the early Middle Ages in Poland, evidenced not only in written and iconographic sources but also by the arrowheads which have been uncovered *en masse* (cf. Nadolski 1954, 60; Nowakowski 1991, 75). However, the situation is worse with the preserved relics of the bows, and only a few surviving remains of so-called selfbows (a bow made entirely of one piece of wood), a perishable raw material, are known to us (cf. Dmochowski and Wrzesiński 2004, 313–314). There is a general agreement among weapons experts that reflex bows, called eastern bows, were also used in Poland. However, the issues at stake are how often this was the case, when this type of bow appeared in Poland, and finally who used them (Nadolski 1954, 61; Nowakowski 1991, 76). It needs to be considered that the reflex bow was an almost iconic weapon of nomadic tribes of the Eurasian Steppe (cf. for example: Świętosławski 1996,

Fig. 1. Quiver or bowcase loop from Gdańsk (photo by A. Janowski).

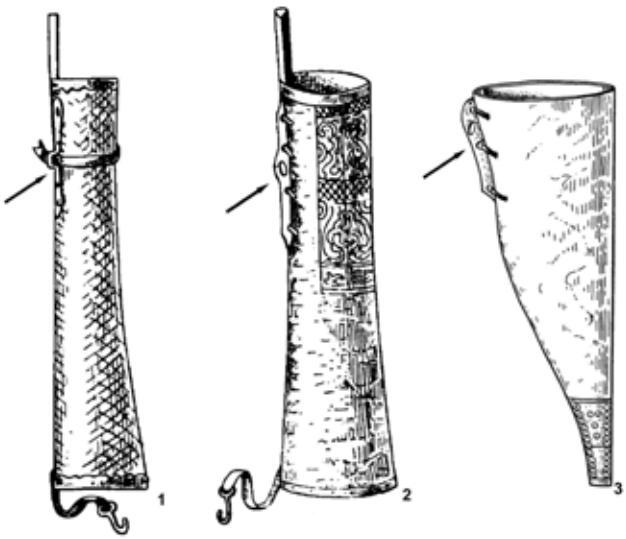


Fig. 2. Quiver with iron fittings (1), with a loop made of antler (2) and bowcase with loop made of antler (3) (according to: Medvedev 1966, pl. 1: 8, 9; fig. 3).

39–44; Karpowicz 2007; Biró 2013; Loades 2016), and which could have been brought to the Polish territory through the Rus' or Hungarians. Its other name – the composite bow – reflects its complicated construction being a combination of the right species of wood, horn, bone, animal tendon and birch bark joined with glue made of swim bladder. The presence of bows made only of layers of wood called "northern bows" in the territory of Poland inhabited in the past by the Baltic tribes is a separate problem (cf. Juszyński 2018). Not long ago, only individual remains of composite bow had been uncovered in eastern Poland and were clearly a foreign element. However, Piotr Dmochowski and Jacek Wrzesiński (2004) noted the possibility of the reinterpretation of the function of some unidentified or misidentified finds from central Poland. Nevertheless, they remain very rare finds.

Quiver finds, portable cases for holding bows and arrows, are even scarcer. They are practically unknown not only in the material culture in Poland but also in more general terms, in territories inhabited by West Slavs such objects are practically unknown; they are, however, to be found among artefacts uncovered in the territory inhabited by East Slavs and nomadic tribes. The shape of such objects was similar, but some construction details were different. The quivers and bowcases used by Avars and Hungarians were fastened with fittings made of bronze and iron (cf. Holeščák 2019, 59–67), while elements of antlers and bone were used in territories of the Rus' and other nomads, in particular Volga Bulgars and Khazars (cf. for example Fedorov-Davydov 1966, 31–32, fig. 2; Medvedev 1966, 19–25; Malinovskaâ 1974; Flerova 2000; 2001, 49–50; Rudenko 2005, 70, fig. 5–7; Ilůšin and Sulejmenov 2022). In the opinion of Aleksander Filipovič Medvedev (1966, 20) two types of bowcases were used in Eastern Europe. One was made of leather or wood and strengthened with metal fittings while the other was made of birch bark and elements of antler and bone (Fig. 2). A. F. Medvedev (1966, 20–23, pl. 8, 9) also proposed a classification of bone elements based on their shape: he classified objects with a straight base as quiver loops (Fig. 3), and curved ones as elements of bowcases (Fig. 4). He also introduced a further classification (numbers on artefacts refer to types), however, characteristic features were not defined.

Such an arbitrary classification of elements of straight bases as quiver loops has been contested recently on the basis of finds from graves in the burial site in Sarkel upon Don. In the grave located in tumulus 18, kurgan 49 and cenotaph 1 in kurgan 15, objects of such a form were relevant to a quiver, and their ar-

rangement suggests that together with a curved base loop they could have formed a set. A straight loop was placed at approximately half the length of the bowcase, while the curved ones in the upper part (Fig. 5). An example from kurgan 49 shows that both these elements could also have had straight bottoms (Fig. 6) (see Flerova 2000, 109; 2001, 53–54). In the opinion of Valentina Evgen'evna Flerova (2000, 109; 2001, 53–54) finds uncovered in burial sites excavated at the end of the 19th century in Ûzefovka, district Kiev burial sites (grave 247/1) and Cozarovka, district Kiev (grave 269) located south of Kiev which belonged to nomadic Chorni Klobuki tribes could be interpreted in a similar fashion (cf. Pletneva 1973, fig. 20, 22). The variety of functions of the element from Tartaczna suggested in the title of this paper is a result of the above doubts. Nevertheless, among the materials presented by A. F. Medvedev (1966, pl. 9: 8), it is closest in shape to the type 8 quiver loop, which stands for an artefact uncovered in *Bilär* (Bilyarsk in today's Tatarstan) in the territory of Volga Bulgaria and very broadly dated to the period between the 9th and the 14th centuries. It is also the only artefact of such a type in the collection of 62 objects in Eastern Europe discussed in this paper (cf. Fig. 3: 8; Medvedev 1966, 42–44, pl. 9: 8). Later weapons from *Bilär* were subject to a separate study. Its author, Faâz Šaripovič Huzin (1985, 135–137), created an independent typology of 40 quiver and bowcase

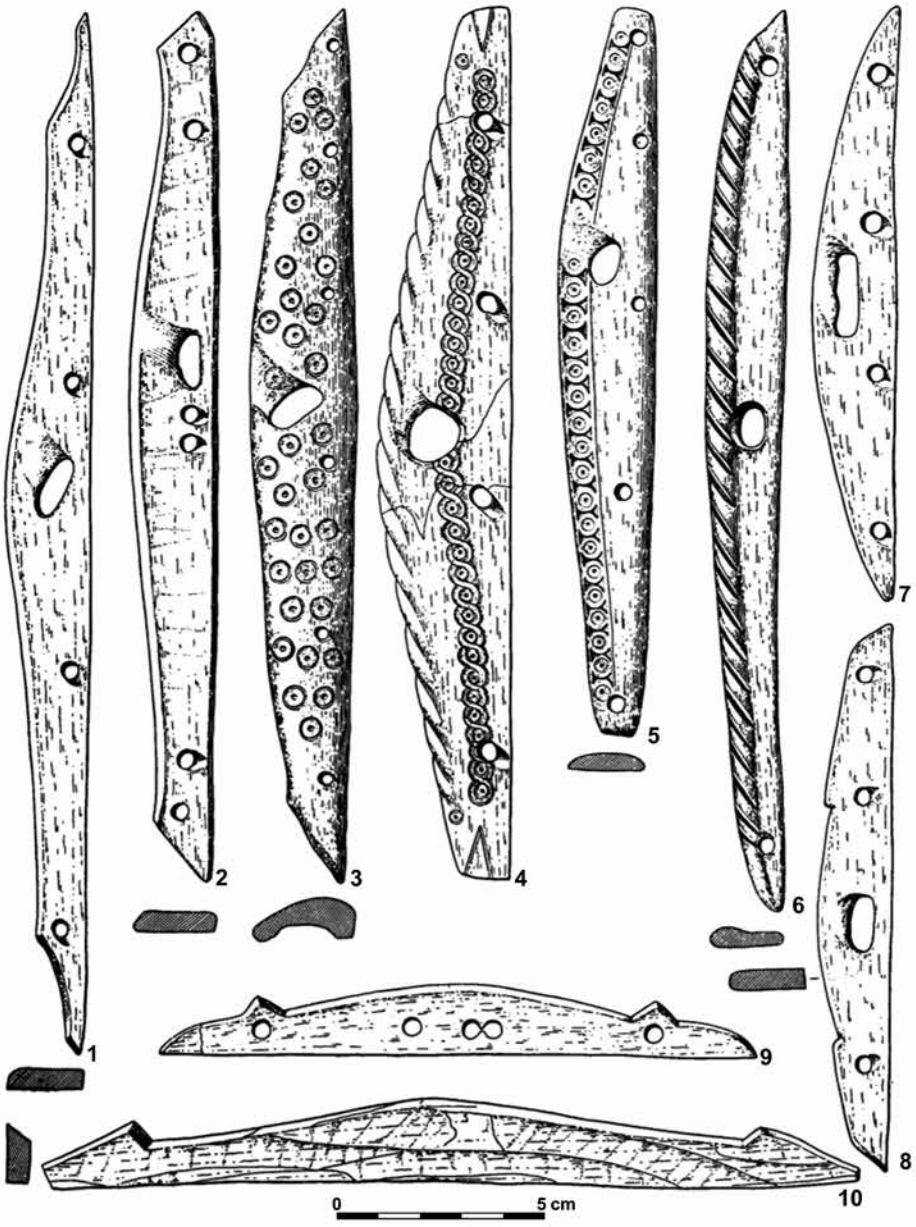


Fig. 3. Quiver loops made of antler (according to: Medvedev 1966, pl. 9).

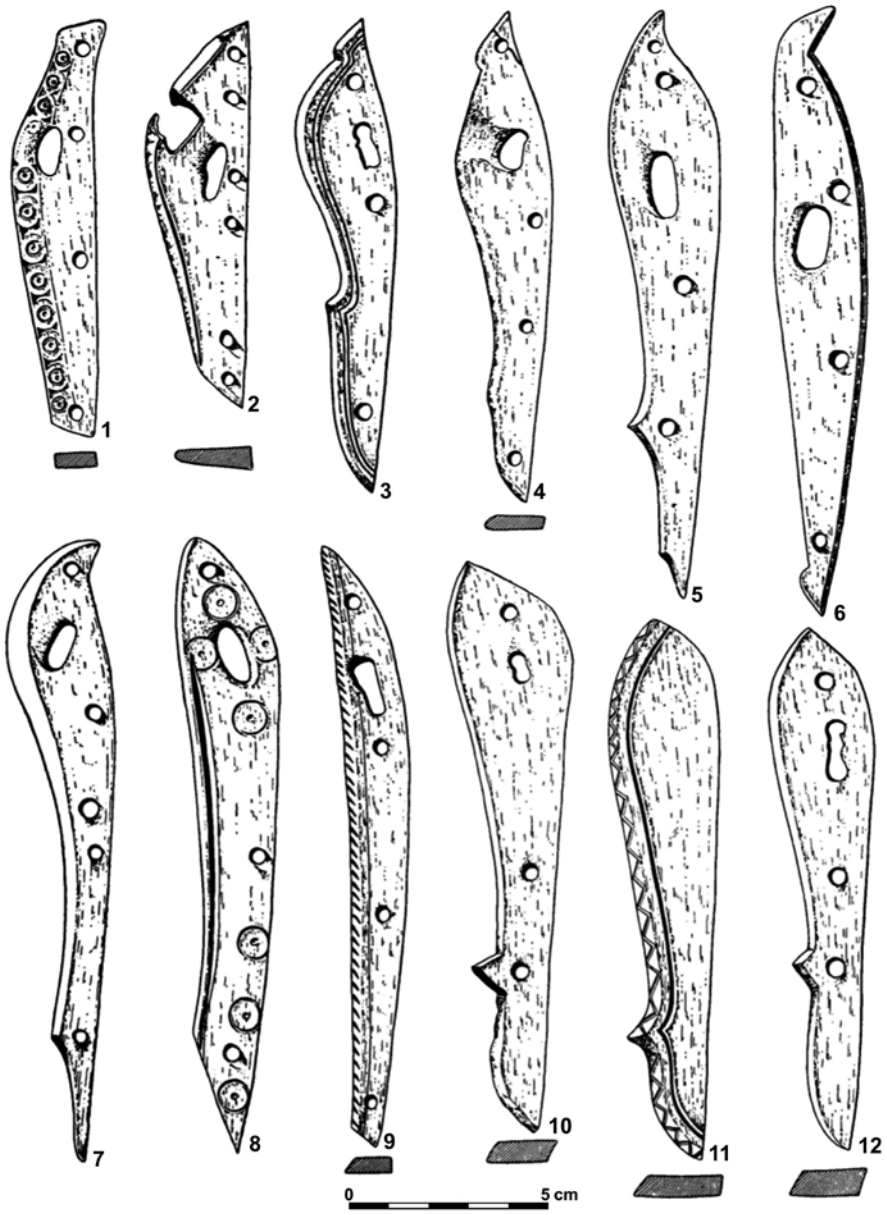


Fig 4. Bowcase loops made of antler (according to: Medvedev 1966, pl. 8).

loops from the capital of the Volga Bulgarians which were known to him. In this three-stage classification (division – group – type) type 8 by A. F. Medvedev was an element of classification identified with loops A.I.3: division A ("wide and thickened" loops), group I ("with flat bottoms"), type 3 ("with arched back and cut in the middle"). F. Š. Huzin knew of only one such artefact from *Bilär* (the one mentioned by A. F. Medvedev), however, he indicated that the object uncovered in Beloozere and dated to the mid and the 2nd half of the 13th century was analogous to it. In fact, the artefact is similar in terms of the general shape, however, the profiling of the upper part is definitely much more expressive (see Golubeva 1973, fig. 46: 10).

Quite recently, the loops uncovered in *Bilär* have become the subject matter of a further study. Dinara Ummetzânovna Pal´ceva, Zufar Gumarovič Šakirov and Aleksej Viktorovič Hudâkov (2012, 324–325, fig. 2) adapted the classification developed by F. Š. Huzin, only changing the nomenclature (type instead of division, sub-type instead of group and category instead of type). Among the 53 artefacts included in the study, two represent type I.1.3. of interest to us, hence it is just one artefact more than in the study by F. Š. Huzin.

As I mentioned above, finds of elements of quivers and bowcases made of antler and bone uncovered in the territories inhabited by West Slavs are unique and it is certain that they have not been identified in

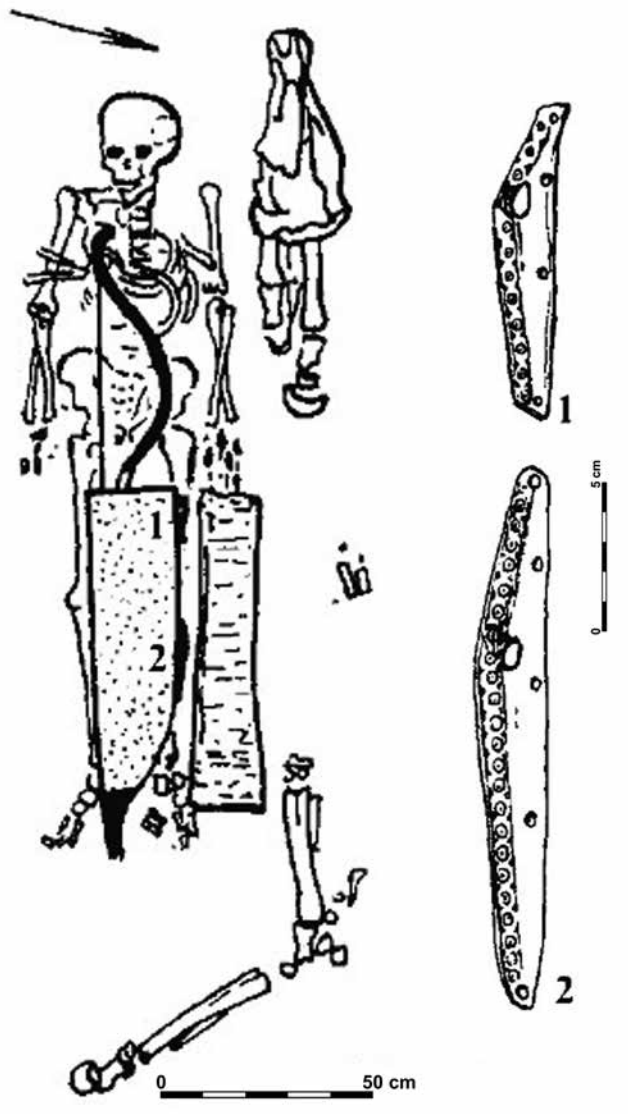


Fig. 5. Sarkel. Burial in mound 18 and bowcase loops made of antler (according to: Flerova 2000, fig. 6).

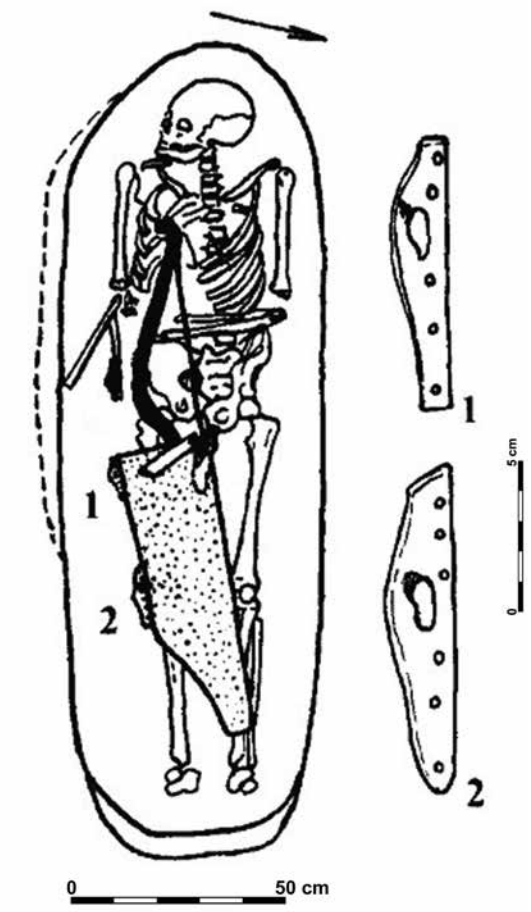


Fig. 6. Sarkel. Burial in mound 49 and bowcase loops made of antler (according to: Flerova 2000, fig. 6).

large numbers. As a matter of fact, the only such find in Poland comes from an excavation in Gródek, Hrubieszów district, on the River Bug. In 1983, during excavations in a cemetery (site 1C) a grave was uncovered (object 14), in which a man in age of *maturus* (45–50 years old) was buried. The complex has already been subject to numerous studies (cf. for example Jastrzębski and Maciejczuk 1988; Wołoszyn 2005; Kuśnierz 2006, 92–95; Strzyż 2006, 77, 78, tab. IX, nos. 2–10, fig. 15.11) so I will just mention that apart from a sword of Oakeshott's type XI, a fragment of an iron knife, an iron ring, and 10 objects made of antler, which were the remains of a composite bow, a quiver and bowcase were uncovered. The unanimous opinion is that it is a burial of a Rus' warrior. This grave contained an inventory which was of both Western (sword) and Eastern European (composite bow) origin. The authors of the source publication dated the find to the 12th century (Jastrzębski and Maciejczuk 1988, 60), Marcin Wołoszyn (2005, 96) to the period between the 2nd half of the 11th and the 1st half of the 12th century, while Jerzy Kuśnierz (2006, 95) dated the burial to the period between the 2nd half of the 12th and the beginning of the 13th centuries.

Further examples of remains of quivers and bowcases uncovered in Poland are of iron. The most numerous collection is the result of excavations carried out in Rycerska Street in Przemyśl between 1976 and 1981, where a burial site of 16 skeleton graves was uncovered. In three of them (graves nos. 1, 6 and 13) men were buried together with horses (partial burials: skull and a limb) as well as sets of weapons and horse harness. In graves 1, 6 and 13 they included *inter alia* arrows in quivers, of which only scarce remains survived: two elements of loops and a few plates. In the opinion of the archaeologists on the dig, it was a small family burial site of nomadic Hungarians, which can be dated to the end of the 9th and the beginning of the

10th centuries (Koperski and Parczewski 1978; Koperski 2003; 2010). Such an interpretation and timeline has recently been contested by Marek Florek (2013, 458–459), who suggested an earlier timeline, i.e. the 1st half of the 11th century, and considers the dead to have been a group of Hungarians exiled by King Stephen I of Hungary and offered refuge by Bolesław the Brave.

The other two finds come from settlement digs. It is possible that iron quiver fittings which date to the period between the 7th/8th centuries and the 2nd half of the 9th century were uncovered in feature 13 in an ancillary settlement in Szczaworyż (Strzyż 2006, 79). The reinterpretation of older finds has recently allowed the identification of an element of a quiver loop in Wrocław. The object which survived in about half its original length (length: 23 cm) was uncovered in an ancillary settlement in Ostrów Tumski in dig I-II/K, layer P dated to the second quarter of the 11th century (Pankiewicz 2023, 253, fig. 157).

The examples referred to in this paper exhaust the list of Polish finds of elements of quivers and bowcases. To date, we know of them from the territories of Lesser Poland, Lower Silesia, and the area around Chełm, hence from the territories of southern and eastern Poland and all of them are considered elements of foreign culture: Rus' or Hungarian. Hence the discovery of such an object so far north in Gdańsk comes as a great surprise, even more so considering that the most similar objects in terms of shape were uncovered in *Bilär* located 2500 km to the east. The object was uncovered in Gdańsk in a layer dated to the 2nd half of the 13th century. Antler loops appear in the Sarkel fortress built by the Khazars, which was conquered by Sviatoslav, Prince of Kiev in 965 and at the beginning of the 12th century by the Cumans as early as in layers which date to the 930s–960s but most numerously in layers which date to the period between the 2nd half of the 11th and the beginning of the 12th century. Regarding Volga Bulgaria, they are especially numerous in the 12th century (cf. Flerova 2000, fig. 4; 2001, 49–51; Rudenko 2005, 70), however, the *Bilär* fortress never recovered its former glory after being conquered in 1236 by the army of Batu Khan. Thus it seems possible that the place of its origin needs to be sought in Novgorod from which a considerable number of antler loops come, including ones dated to the 13th–14th centuries (see Medvedev 1966, 43). Although it is not possible to indicate precisely the place in which it was made, undoubtedly the artefact is not of local origin, but was made in Eastern Europe.

Acknowlegements

I would like to thank the Management of the Archaeological Museum in Gdańsk for the permission to publish the artefact.

References

Biró A. 2013. Methodological considerations on the archaeology of rigid, reflex, composite bows of Eurasia in the pre-Mongol period. *Acta Militaria Mediaevalia* 9, 7–38.

Dmochowski P. and Wrzesiński J. 2004. W poszukiwaniu łuku refleksyjnego – możliwości interpretacji na przykładzie znaleziska z Ostrowa Lednickiego. In S. Moździoch (ed.), *Wędrówki rzeczy i idei w średniowieczu* (= *Spotkania Bytomskie* 5). Wrocław: Instytut Archeologii i Etnologii Polskiej Akademii Nauk, 313–333.

Drozd E. 2013. Zabytki bursztynowe z grodu i osady pozyskane podczas badań przy ulicy Czopowej, Grodzkiej i Tartacznej w Gdańsku, w latach 2006–2010. In E. Fudzińska (ed.), *XVIII Sesja Pomorzoznawcza*, 2. Malbork: Muzeum Zamkowe w Malborku, 105–113.

Fedorov-Davydov G. A. 1966. *Kočevniki Vostočnoj Evropy pod vlast'û zolotoordynskih hanov. Arheologičeskie pamâtniki*. Moskva: Izdatel'stvo Moskovskogo universiteta.

Flerova V. E. 2000. Kostânye detali lukov, kolčanov i nalučij Beloj Veži. In A. V. Evglevskij (ed.), *Stepi Evropy v èpohu srednevekov'â,* 1. Doneck: Institut arheologíï Nacíonal´na akademíâ nauk Ukraïni, Doneckij Nacional´nyj Universitet, 101–116.

Flerova V. E. 2001. *Reznaâ kost' Ûgo-Vostoka Evropy IX–XII vv.: iskusstvo i remeslo. Po materialam Sarkela-Beloj Veži iz kollekcii Gosudarstvennogo Èrmitaža*. Sankt-Peterburg: Aletejâ.

Florek M. 2013. Węgrzy w Przemyślu. Historia alternatywna. In J. Gancarski (ed.), *Transkarpackie kontakty kulturowe w okresie lateńskim, rzymskim i wczesnym średniowieczu*. Krosno: Muzeum Podkarpackie w Krośnie, 453–492.

Golubeva L. A. 1973. *Ves´ i slavâne na Belom ozere X–XIII vv*. Moskva: Nauka.

Holeščák M. 2019. *Medieval archery equipment from the territory of Slovakia* (= *Archaeologica Slovaca Monographiae* 31). Nitra: Institute of Archaeology. Slovak Academy of Science.

Huzin F. Š. 1985. Predmety vooruženiâ. In A. H. Halikov (ed.), *Kul´tura Bilâra. Bulgarskie orudiâ truda i oružie X–XIII vv*. Moskva: Nauka, 130–192.

Ilûšin A. M. and Sulejmenov M. G. 2022. Predmety krepleniâ kolčana k poâsu iz pogrebenij razvitogo sredneve-

kov´â v Kuzneckoj kotlovine. *Arheologiâ Evrazijskih stepej* 3, 28–35.

Jastrzębski S. and Maciejczuk J. 1988. Grób wczesnośredniowieczny z Gródka nad Bugiem, stan. 1C, woj. zamojskie. In G. Labuda and S. Tabaczyński (eds.), *Studia nad etnogenezą Słowian i kulturą Europy wczesnośredniowiecznej*, 2. Wrocław, Warszawa, Kraków, Gdańsk, Łódź: Zakład Narodowy im. Ossolińskich, 55–61.

Juszyński J. 2018. Łuk bałtycki jako odmiana północnego łuku refleksyjnego. Próba charakterystyki. *Pruthenia* 11, 11–46.

Karpowicz A. 2007. Ottoman bows – an assessment of draw weight, performance and tactical use. *Antiquity* 81(313), 675–685.

Koperski A. 2003. Groby wojowników z koniem na cmentarzysku „staromadziarskim" w Przemyślu. In M. Dulinicz (ed.), *Słowianie i ich sąsiedzi we wczesnym średniowieczu*. Warszawa, Lublin: Instytut Archeologii i Etnologii Polskiej Akademii Nauk, Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej, 365–375.

Koperski A. 2010. Cmentarzysko staromadziarskie z X w. w Przemyślu. In E. Sosnowska (ed.), *Przemyśl wczesnośredniowieczny* (= *Origines Polonorum* 3). Warszawa: Instytut Archeologii i Etnologii Polskiej Akademii Nauk, 365–387.

Koperski A. and Parczewski M. 1978. Wczesnośredniowieczny grób Węgra-koczownika z Przemyśla. *Acta Archaeologica Carpathica* 18, 151–201.

Kuśnierz J. 2006. Z badań nad militarnym znaczeniem Gródka nad Bugiem (Wołynia) we wczesnym średniowieczu. *Acta Militaria Mediaevalia* 2, 79–102.

Loades M. 2016. *The composite bow* (= *Weapon* 43). Oxford: Osprey Publishing.

Malinovskaâ N. V. 1974. Kolčany XIII–XIV vv. s kostânymi ornamentirovannymi obkladkami na territorii evrazijskih stepej. In A. P. Smirnov and G. A. Fedorov-Davydov (eds.), *Goroda Povolž´â v srednie veka*. Moskva: Nauka, 132–175.

Medvedev A. F. 1966. *Ručnoe metatel´noe oružie (luk i strely, samostrel) VIII–XIV vv*. Moskva: Nauka.

Misiuk Z. 2013. Wstępne wyniki badań archeologicznych prowadzonych na obszarze protomiasta gdańskiego pomiędzy dzisiejszymi ulicami Tartaczną i Panieńską w Gdańsku w latach 2008–2009. In M. Fudziński and H. Paner (eds.), *XVII Sesja Pomorzoznawcza*, 2: *Od późnego średniowiecza do czasów nowożytnych*. Gdańsk: Muzeum Archeologiczne w Gdańsku, 337–370.

Misiuk Z. 2016. Wstępne wyniki badań archeologicznych pomiędzy ulicami Tartaczną i Panieńską w Gdańsku, prowadzonych przez Fundację Ochrony Zabytków w latach 2008–2010. In M. Fudziński (ed.), *I Pomorska Sesja Sprawozdawcza*. Gdańsk: Muzeum Archeologiczne w Gdańsku, 115–132.

Nadolski A. 1954. *Studia nad uzbrojeniem polskim w X, XI i XII wieku* (= *Acta Archaeologica Universitatis Lodziensis* 3). Łódź, Wrocław: Zakład Narodowy im. Ossolińskich.

Nowakowski A. 1991. *Uzbrojenie średniowieczne w Polsce (na tle środkowoeuropejskim)* (= *Skrypty i Teksty Pomocnicze*). Toruń: Uniwersytet Mikołaja Kopernika.

Pal´ceva D. U., Šakirov Z. G. and Hudâkov A. V. 2012. Predmety vooruženiâ i snarâženiâ Bilâra iz kosti. *Filologiâ i kul´tura* 4(30), 324–330.

Pankiewicz A. 2023. *Wrocław. Gród na Ostrowie Tumskim we wczesnym średniowieczu* (= *Origines Polonorum* 18). Warszawa, Wrocław: Instytut Archeologii i Etnologii Polskiej Akademii Nauk.

Pletneva S. A. 1973. *Drevnosti Čërnyh Klobukov* (= *Arheologiâ SSSR. Svod arheologičeskih istočnikov* E1-19). Moskva: Nauka.

Rapiejko A. 2013. Średniowieczne i nowożytne elementy uzbrojenia z badań przy ul. Tartacznej. In E. Fudzińska (ed.), *XVIII Sesja Pomorzoznawcza*, 2. Malbork: Muzeum Zamkowe w Malborku, 115–122.

Rudenko K. A. 2005. Bulgarskie izdeliâ iz kosti i roga. In K. A. Rudenko (ed.), *Drevnosti Povolž´â: èpoha srednevekov´â*. Kazan´: Škola, 67–97.

Strzyż P. 2006. *Uzbrojenie we wczesnośredniowiecznej Małopolsce* (= *Acta Archaeologica Lodziensia* 52). Łódź: Łódzkie Towarzystwo Naukowe.

Szczepanowska K. 2013. Kafle miniaturowe w badań archeologicznych przy ulicy Tartacznej w Gdańsku. In M. Fudziński and H. Paner (eds.), *XVII Sesja Pomorzoznawcza*, 2: *Od późnego średniowiecza do czasów nowożytnych*. Gdańsk: Muzeum Archeologiczne w Gdańsku, 457–470.

Szczepanowska K. 2019. Kafle piecowe z badań archeologicznych przy ulicy Tartacznej w Gdańsku. Uwagi na temat statusu ekonomicznego ich użytkowników. *Gdańskie Studia Archeologiczne* 7, 130–155.

Świętosławski W. 1996. *Uzbrojenie koczowników Wielkiego Stepu w czasach ekspansji Mongołów (XII–XIV w.)* (= *Acta Archaeologica Lodziensia* 40). Łódź: Łódzkie Towarzystwo Naukowe.

Wołoszyn M. 2005. Między wschodem a zachodem: pochówek wojownika ze stanowiska 1C w Gródku, pow. hrubieszowski, woj. lubelskie. *Acta Militaria Mediaevalia* 1, 87–105.

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

Waldemar Ossowski

DOI: 10.15584/anarres.2023.18.11

Institute of Archaeology, University of Gdańsk, Bielańska 5, 80-851 Gdańsk, Poland;
e-mail: waldemar.ossowski@ug.edu.pl; ORCID: 0000-0003-2928-8856

Shipyard Archaeology in the Southern Baltic

Abstract

Ossowski W. 2023. Shipyard Archaeology in the Southern Baltic. *Analecta Archaeologica Ressoviensia* 18, 167–181

In the past two decades, the topic of archaeological studies of shipyard sites has regularly appeared in research devoted to maritime archaeology around the world. The closer attention of archaeologists to shipyard sites is due to the increased interest in studies of the maritime cultural landscape, ship graveyards, and coastal archaeology. The purpose of this paper is to review the problems of archaeological research of shipyard sites in the southern Baltic Sea and to compare these problems with previous research results from other regions. Seasonal or occasional sites for the building or repair of boats and ships have been created since the earliest times. Isolating such sites is often problematic since sleepers or simple wooden supports were sufficient for the construction of plank boats and the work was carried out in the open air. In the coastal cities of the southern Baltic, there is evidence for the existence of designated permanent shipbuilding yards, although without permanent shipbuilding structures, since the late Middle Ages. These were places in which a ship's carpenter received permission from the city authorities to use a particular section of the yard for shipbuilding in return for an appropriate fee. Structures used for construction were assembled each time to a specific order from the builder's materials and they could be dismantled after completion of the project. Archaeological research of the Gdansk Lastadia site remains the best recognized shipyard providing a more complete picture of the maritime cultural landscape of this southern Baltic city from the late Middle Ages to the 19th century.

Keywords: shipyard archaeology, maritime archaeology, logboats, slipway, launching method, Lastadia

Received: 12.09.2023; **Revised:** 19.10.2023; **Accepted:** 08.11.2023

Introduction

Over the past two decades, shipyard archaeology has become a frequent subject of maritime archaeology studies around the world. The numerous traces of these sites in archaeological material, both on land and underwater, typically include wharves, slipways, docks, warehouses, and the equipment and tools associated with the shipbuilding process. The increased interest of archaeologists in shipbuilding sites is due to a growing number of projects exploring the maritime cultural landscape, ship graveyards, and coastal sites. Consequently, shipyard archaeology has been discussed in both textbooks (Moser 2011) and in encyclopaedic studies of maritime archaeology (Harris 2014).

To date, research at these sites has produced a wide variety of data, making it difficult to contextualise the results of most of the excavations (Moser 2011, 834). This is partly due to the fact that quay areas have undergone complete redevelopment and changes in function or urbanisation, as well as being exposed to the continuous dredging and widening of the channels to accommodate larger ships. Most of the shipyards explored by researchers are located close to ports in urban areas that are still in use.

Attempts to define shipyard archaeology have shown that there was great variation in the size of shipyards, the organisation of the boat- and shipbuilding process, and other ancillary functions performed by individual sites over the centuries. Some were located inland on rivers in smaller towns, while others served larger port cities and long-distance shipping. According to the definitions proposed in the archaeological literature to date, a shipyard, usually located

close to water and building resources, is an industrial site closely associated with labour history and contemporary socio-economic events. It is the vital link between the product – the ship – the manufacturer or shipbuilder, the community, and the environment in which the ship was designed to operate. There has been considerable variation in the sizes of shipyards, the services they provided, and the ways they carried out the primary functions of shipbuilding over time. Some were located inland on rivers in small towns, while others served larger cities and ports (Harris 2014, 6614). However, it is difficult to agree with the limited understanding that a shipyard was a place where ships were produced industrially. The dictionary definitions of the term "shipyard" suggests that it was a place where ships were built, rebuilt, repaired, or dismantled, whether this was done on an industrial scale or by skilled carpenters. A variety of factors resulted in the transformation of traditional building sites into permanent production yards.

Thus far, studies of historical shipbuilding in Poland have emphasised that, apart from the aquatic conditions, access to building materials, or technological advancements, other factors such as the organisation of shipping and transport needs significantly influenced the design of ships. The issue of boat- and shipbuilding, i.e. the construction centres and their location, the level and methods of production, has not been elaborated further.

The aim of this paper is to review archaeological research of shipbuilding sites in the southern Baltic Sea region and to compare it with the results of research in other regions. The choice of the geographical area is due to the fact that changes in boat- and shipbuilding and maritime exchange followed a similar pattern along the coast from the Bay of Lübeck to the Vistula Lagoon, and thus far there have been no attempts to conceptualise the archaeological research of shipyards.

Logboat building sites

Among the oldest boat finds from this area are boats made from a single tree trunk – logboats. Although the importance of this type of boat in maritime transport since the earliest times, i.e. the formation of the Baltic Sea after the last glaciation, is widely recognised, there are few finds of this type dating from before the early centuries of the common era (Szymczak 1997; Lanting 1998; Ossowski 1999). A complete account of discoveries, published in the late 20th century, has been supplemented by a few recent discoveries (Kontny 2021).

Nevertheless, some isolated sites have been identified as dugout building sites, allowing us to better understand how those vessels were made.

A stone axe-making site was discovered during excavations in the town of Rzucewo, Puck district on the shore of what used to be a lake and is now the Bay of Puck. The site consisted of a cobbled yard paved with medium-sized pebbles and large boulders used for grinding. Situated by the former shoreline, it was 70 metres long and 10 metres wide. The boulders bore traces of the grinding of pebbles into axes and hatchets. About 100 pre-processed stone axes and fragments of axes were found at the site. The accumulation of boulders and grinding stones and large quantities of wood chips suggest that the site was used to make dugout boats. Horizontal beams used to access the lake were uncovered next to the yard, as well as poles vertically installed in the ground, possibly for mooring boats closer to the settlement. ^{14}C dating suggests that site may have been used by the first fishermen and hunters to settle on the Rzucewo Cape in 3800–3700 BCE (Król 2016; 2018).

Another example is the Early Iron Age site in Luzino, district Wejherowo. During the archaeological excavations of a Pomeranian settlement from the 7th/6th–5th centuries BCE, archaeologists came across an oval object 6.28 m long and 0.64–1.08 m wide. It was identified as the remains of a dugout canoe with a slightly rounded, truncated stern and a narrow bow (Wiącek 1974). Next to it, there were hearths and pits, probably used for storing water, which was necessary to control the firing process. These finds suggest that heated water may have been applied to forcibly bend the sides of boats (Wiącek 1974, 270).

The oldest plank boats

As well as log boats, plank boats similar to the Nydam boats and associated with the presence of Germanic tribes, were already in use on the southern Baltic coast in the early centuries of the common era. Frames discovered during a survey of the underwater archaeological site at Puck (Fig. 1) shed new light on the discussion about the oldest plank boats on the southern Baltic Sea (Stępień 1986, 82–83). The frames are two oak ribs with a worn, tattered outer edge, and a sharply-edged cross-section with hole marks. These items are probably fragments of ribs cut from curved branches and lashed to hewn plank cleats with withes. This technique was characteristic of Scandinavian

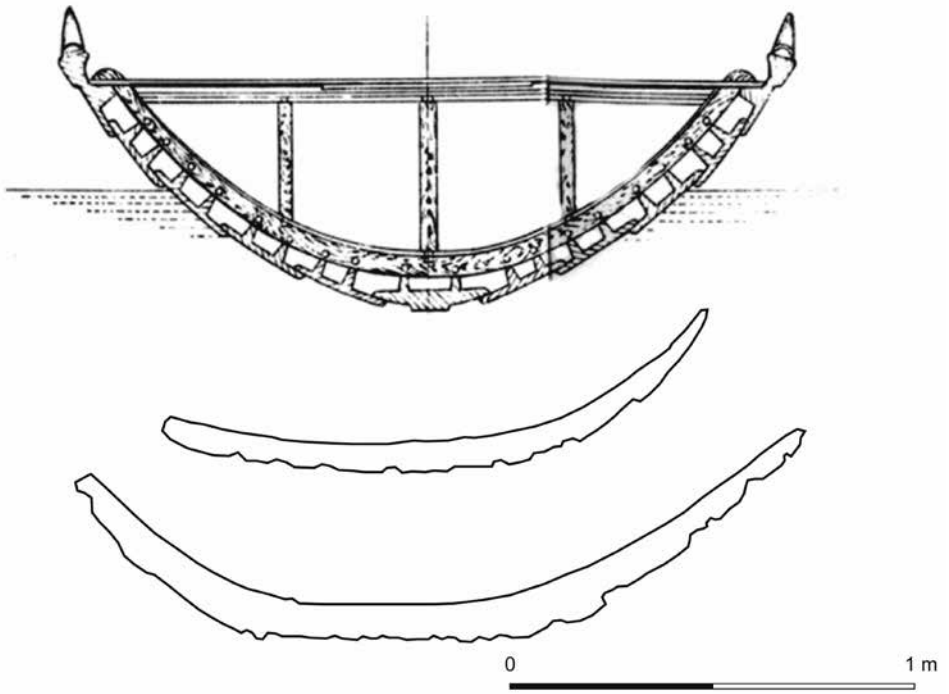


Fig. 1. Cross-section of a boat from Nydam from the 4th century BCE. (top) and outline of two Roman period frames discovered in the Bay of Puck (bottom) (drawn by W. Ossowski).

boatbuilding that originated in the 4th century BCE and continued to be applied until its gradual decline in late 8th/early 9th century CE (Kontny 2023). Radiocarbon dating indicates that the finds come from the Roman period (Ossowski 2010, 169).

It is currently difficult to say anything more about the context of these two isolated finds, whether they come from the wreck of a plank boat, a site where such boats were made or repaired, or, as at Nydam, they are a destroyed sacred deposit. Due to the progressive destruction of the underwater cultural layers of the Puck Bay site in recent decades, it is impossible to determine the context of the finds.

In connection with the discovery of frames, it cannot be ruled out that they are evidence of shipbuilding or ship repair on the coast. Studies from other regions of the Baltic Sea indicate that such shipbuilding and commercial activities were located in the same place during this period. Denmark's oldest trading centre at Lundeborg on Funen is worth mentioning in this respect. The small trading centre of Lundeborg was strategically placed on the coast of Funen, where the River Tange runs out into the Great Belt, around 3.5 km from the halls at Gudme. Traders could easily come directly to the site, then set up camp and trade. The trading place was only used in particular seasons (spring, summer, and early autumn). No traces of all-year-round habitation, such as post holes from dwellings, have been found. It is assumed that instead the traders lived in tents during "the market period". The archaeological evidence indicates that various activities took place in and around the marketplace at Lundeborg in the 3rd and 4th centuries CE. In all, around 180 Roman coins were found at the trading centre, together with a number of gold and silver bars, silver fragments, and weights. These are all items that must have been used by the traders at Lundeborg. Presumably many traders sailed to the site and several thousand new and used ship rivets from clinker-built ships have been found at Lundeborg. It may be that the location included a shipyard for the repair and building of ships (Grimm and Pesch (eds.) 2011).

The Early Middle Ages

In the early Middle Ages, Slavs developed boat- and shipbuilding on the coasts of the southern Baltic Sea. To date, more than a dozen wrecks of early medieval vessels, now identified as Slavic boats, have been discovered in Poland. These finds, as well as numerous similar boats excavated in the Baltic coastal areas of present-day Germany and Scandinavia, prove that shipping was important for Slavic people in that period. Their boats had low keels, flat bottoms, overlapping planks joined with wedged treenails and caulked with moss. This is different than Scandinavian boats

and ships, in which the planks were caulked with strips of animal hair and the planks were fastened together with iron rivets. The structural features of the wrecks suggest that they were used in both local shipping and military operations (Indruszewski 2004).

Archaeological discoveries also confirm permanent Scandinavian settlement in the southern Baltic Sea – excavations of trade and harbour settlements in Truso and Wolin uncovered numerous boat-building remains such as fragments of staves, frames, rivets or boat outlines in archaeological trenches (Jagodziński 2010, 115–126; Filipowiak 2022).

The largest number of artefacts confirming the existence of a permanent site for the repair and construction of plank boats were discovered during the excavation project of a trading emporium in Wolin. The coastal area of the main settlement on the Dziwna River is believed to be the location of the oldest shipyard on the Baltic Sea, dating back to the late 9th century (site no. 1, dig 4). This is evidenced by the discovery of unique items at the site such as: the base of the winch to haul vessel ashore, as well as fragments of planks, an anchor, and a thick layer of wood waste (Filipowiak 1994, 84–91). Boats may have been built at that location for generations, judging by the discovery of an unused mast step from the early 10th century, an unfinished stem from the early 11th century and a thick layer of wooden waste from the early 12th century (Filipowiak and Filipowiak 2014, 369). Admittedly, these finds seem to be strong evidence that there was a shipyard at this site, despite the dense development in the centre of the emporium.

More recent studies indicate that the inhabitants of Wolin built plank boats as early as in late 9th century, somewhere in the area of digs 4 and 8, whereas the main construction yard was probably closer to the riverbank. It is likely that two types of storage methods were used in Wolin: pre-processed elements were kept in the water and, after processing, they were stored in the space between the huts (Filipowiak 2022, 216–220).

An extremely interesting discovery was made on the Danish island of Falster in 1981. In the town Fribrødre Å, known in the 17th century as Pribrod, meaning 'by the ford', traces of a Slavic settlement and remains of a permanent ship-repair yard dating back to the 11th century have been found. To date, only a section of the shipyard closest to the river – right by the ford – has been uncovered. Various construction elements and tools have been found there, as well as cuttings, wood chips, etc. The site may have been used to repair ships in Scandinavian fleets before a naval invasion of the southern Baltic. Rather than serving as a permanent site for the production of ships, it was used now and again to prepare naval fleets (Skamby Madsen and Klassen 2010).

Although not many sites are identified as permanent shipyards, numerous finds related to the production of boats and ships have been found in coastal pre-urban settlements of the 10th to 12th centuries, located at the estuaries in the Baltic Sea, such as Szczecin, Kołobrzeg, and Gdańsk. Large quantities of detached planks, frames, keels, treenails, caulking material, or ceramic vessels with traces of tar found near the houses suggest that their inhabitants engaged in boat building. Most of them probably just repaired their vessels, but it is likely that the more experienced among them knew how to construct larger boats, which were not only used for fishing but also for inland and sea transport. The clinker boats of the time, made of overlapping planks, could also have been used for a variety of purposes.

Apart from boat fragments, various boat-making tools serve as additional evidence for shipyard activity. Most of the tools discovered there, such as axes of various types and sizes, hatchets, skewers, carpentry clubs, wedges, augers, or knives, can be classified as general-purpose carpentry tools. However, during archaeological excavations in Gdańsk in the 1950s, three specialist boatbuilding utensils were discovered, namely wooden clamps that supported the planks as they were fastened together with wooden pegs or iron rivets during the hull formation stage using the shell method (Fig. 2). The boatbuilders' work, due to its nature, was done outside the town, although some things, such as cutting the wooden pegs needed in large quantities for boat building, could be done within (Ossowski 2010, 149–150).

The same was the case in Szczecin, where a considerable number of remains of plank boats, fastened with wooden pegs and sealed with moss, were excavated. Because of the substantial volume of the finds of this type, researchers believe that boatbuilding was one of the production areas that developed on the outskirts of the early urban centre of Szczecin. According to E. Cnotliwy, recent discoveries suggest that at least some of the inhabitants of the riverside district were hired as boatbuilding labourers or manufactured some of the components necessary for the construction of vessels. This can be inferred from the discovery of piles of wooden treenails used to fasten vessel planks in two adjacent buildings exposed in settlement levels dating from 1170–1189. In one of them, there were 170 such treenails. Cnotliwy assumes that

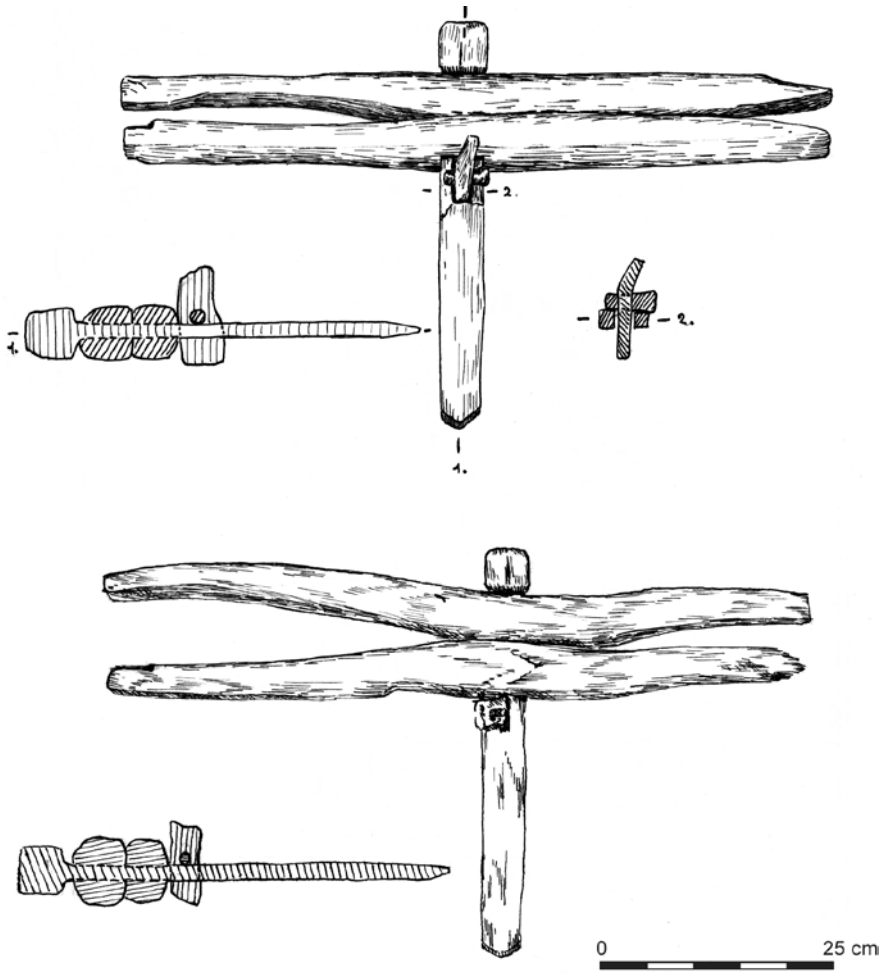


Fig. 2. Boat-building clamps from the 12th century discovered in Gdańsk stronghold.
1 – inv. no. 2928/50, 2 – inv. no. 3738/50 (from the collections of the Archaeological Museum of Gdańsk).

during low season boatbuilders stocked up on pegs for their own use, but they may also have been ordered by someone else (Cnotliwy 1996, 18–19). Ethnographic analogies attest to the fact that pegs, which continued to be used until recently, were carved with a knife, and this work was very often done by men in the household in wintertime when there were fewer chores to attend to (Christensen 1996, 20).

In the 12th and 13th centuries, the *ius ducale* system developed, in which men were assigned to perform specific manufacturing and service roles. The system came with a number of burdens, such as tributes and monopolies, which also applied to the builders and users of plank boats. Since the duke was the sovereign of all watercourses and there was no mass trade, boats at that time were probably built and used to serve the master or his deputies.

It should be emphasised that during this period boats were not built by professional craftsmen but rather by villagers or town dwellers as part of their additional servile work. Archaeological research shows that people of the period were skilled in all kinds of occupations. Therefore, plank boats were built using similar techniques as those applied in carpentry of the time, i.e. caulked with moss and fastened with treenails.

There are records of servile boatbuilders, so-called *korabnicy*, who constructed larger river vessels outside of Pomerania in central Poland, namely in medieval Płock and Włocławek. Three Polish villages are called Korabniki to this day, which is another reference to that particular group of labourers (Buczek 1958, 61).

In the 10th to 12th centuries, boats were mostly built on the banks of rivers, near forests. It is possible that certain places, convenient for the production of boats, may have become more or less permanent building sites. The fact that several villages were called Korabniki supports this suggestion – although they could also have been occupied by professional boatbuilders rather than servile labourers.

First ships

An important moment in shipping history was the appearance of the first merchant ships and maritime merchant vessels in the western Baltic coast in the late 10th century and early 11th century. According to the available data, the first ships were between 14 and 20 metres long, or even longer, and could carry about 60 tonnes of cargo. The oldest ships discovered so far in northern Europe are: the Klåstad wreck – discovered off the south-east coast of Norway, built around 990 (Christensen and Leiro 1976; Hylleberg 1993) and the wreck of Äskekärr 1 found in the Gota River in Sweden, made of local timber in around 1000 (Borg *et al.* 2000). This type of vessel appeared in the Baltic soon after, with one of them being the wreck from Hedeby (Crumlin-Pedersen 1997).

Merchant ships started to be used with the development of Atlantic shipping and the socio-economic changes that took place in the emerging early feudal Scandinavian states. At that time, rulers extended control over the shipping routes, gaining profits in return for a guarantee of safety. Another factor that stimulated the development of cargo shipping was the growth of urban centres with access to shipping routes. To date, 16 Scandinavian shipwrecks have been discovered, suggesting an intensification of maritime trade in the Baltic in the 11th and 12th centuries. Partnerships of owners and users of merchant ships, who probably joined together because of the high costs of their construction and operation, already existed but the process of the formation of a group of independent sea merchants living exclusively off maritime trade had not yet been completed. The development of monetary exchange, the emergence of specific tax regulations, and the codification of maritime law were necessary for this social group to fully form. In the Baltic region, sea merchants continued to engage in other occupations besides shipping. According to written sources, groups of professional sea merchants whose only source of profit was maritime trade become active in the entire Baltic region in late 12th century. This was when larger sized cargo vessels began to be constructed in local boatbuilding workshops on the southern Baltic coasts. At the same time, new types of ships were designed, one of them being the cog ship, which became popular in the Baltic (Englert 2015). To launch those vessels was often a major problem for their builders. While medieval vessels with hull lengths of up to 30 metres could be launched using the simplest solutions, such as pulling along wooden rollers or pushing over greased planks, chronicles from 1170–1175 describe a number of challenges encountered while pushing a larger ship into the water near Schleswig (Englert 2015, 13). The bigger and heavier the vessels became, weighing several hundred tonnes and measuring more than 30 metres in length, the more problematic it was to launch them.

Urban shipyards

From the 13th century onwards, port towns belonging to the Hanseatic League began to develop on the southern Baltic coast. The citizens of these towns owned a wide variety of merchant ships used for the highly profitable maritime trade, and the scale of their operations led to the Hanseatic League's trade monopoly in the Baltic and North Seas in the 14th and 15th centuries.

When new port cities were created, plots of land on the coastal areas of rivers, near their estuaries, were designated as permanent sites for the construction and repair of ships. In the southern Baltic, these sites were called Lastadia and they existed in: Lübeck, Wismar, Rostock, Stralsund, Szczecin, Gdańsk, Elbląg, Braniewo, Königsberg and Riga (Binerowski 1963, 49).

Initially, the name meant yards that were used for loading or unloading of cargo or ballast on and from ships (Löschin 1836, 47; Binerowski 1963, 49). Later, Lastadia were permanent sites for the production of new ships functioning with varying degrees of intensity until the 19th century.

In 2004, the Gdańsk Lastadia was excavated. It was the first and to date only systematically explored post-shipyard site in Poland. Excavations covered a total area of 3,000 m^2, making it a major project of shipyard archaeology (Kocińska 2020). Compared to English shipyards, which ranged from 423 m^2 up to 24,280 m^2 in size (Stammers 1999), the Gdańsk Lastadia can be classified as medium-sized, with the area of the proper shipyard in the 17th century being 4,240 m^2 (Maciakowska 2020, 59).

The excavations mainly uncovered the remains of buildings of simple construction, made up of planked posts and serving as workshops or storage rooms. Among them, there was one different building from the 18th century, designed like residential buildings of the period, with a considerable usable area, belonging to the guild of Vistula carriers and used for guild activities, but also for rent. A number of small or very damaged tools were also found in the post-production layers. This should come as no surprise, since specialised tools were expensive and well cared for. The items

include measuring instruments, woodworking, metalworking, and textile tools as well as accessories for sealing and finishing work (Ignasiak 2020).

A 16th century slipway

One of the most interesting discoveries at Lastadia are the remains of two wooden slipways (Fig. 3). The older one, poorly preserved, served as a substructure for the construction or repair of ships. It consisted of a row of several massive blocks up to 2.4 m long, 40 cm thick and 30 cm wide, positioned perpendicular to the shoreline. It is difficult to determine whether the beams constituted a substructure for the keel or for the chine. The beams could support a keel up to 16 metres long. Thus, the slipway could have been used to build medium-sized ships with a total length of more than 22–24 metres. On the basis of available records, it can be estimated that the slope angle was approximately 5.5%. The fact that there indeed was a slipway at this place is also confirmed by a break in the quay and remains of a wall enclosing the slipway pit. Two samples taken from these elements are dated to 1536/37 and 1554, respectively (Ossowski 2020).

The slipway was constructed towards the end of the greatest development of shipbuilding in Gdańsk, lasting from the 15th to the middle of the 16th century (Bogucka 1962, 49, 53–54). In the late 15th century, ships constructed in Gdańsk could carry up to 200 lasts of cargo. Archival sources suggest that Gdańsk Lastadia must have been very busy in the 15th century (up to 12 hulls could be built there at the same time), because in another place – known as Brabank – an inclined platform was built to pull ships ashore for repairs. The keels of the largest vessels built in Gdańsk during this period reached up to 20 metres in length, if they had the traditional clinker planking (Overmeer 2017, 200), and up to 31 metres in length, if they had carvel planking.

Fig. 3. Location of the two slipways from the Gdańsk Lastadia site. Construction plan including outline of archaeological excavations (prepared by B. Kościński, K. Dyrda).

The slipway can be linked to the Dutch method of launching ships by means of lowering the hull with the bow towards the water on planks propped along the substructure. The technique, already described in 17th century Dutch texts (Witsen 1690; van Yk 1697) and represented in many engravings, was still used to launch smaller vessels in the 20th century. Given that wood has the tendency to push the grease out and tear into pieces, causing additional resistance, it can be assumed that, despite causing certain difficulties in the actual launching process, the technique had many advantages when it comes to the overall construction process. The ship would be launched half-finished, with only the lower section of the hull covered in planks for it to be able to float. The rest of the hull would be planked up when already on the water, and often the loading was done through the unfinished stern. In this way, it took much less time to finish the work before the launching stage. Another advantage of that technique was that a partially covered skeleton of the ship was much lighter, making it easier to slide it down the slipway skids without overloading the longitudinal reinforcements, and it did not require a deep shipyard basin or a more robust and longer slipway structure.

A number of iconographic sources relating to Lastadia and depicting ships under construction reinforces our belief that the Dutch launching system was used in Gdańsk in the 17th and 18th centuries. The main rationale behind this theory is the large influx of Dutch specialists to Gdańsk in the period. Obviously, Dutch shipbuilders, known for being the best in their craft at the time, would use the same building techniques in Gdańsk that were popular in their own country.

Lastadia in the 17th and 18th centuries

At the beginning of the 17th century, there was a slowdown in production at the Gdańsk shipyard. During this period, an area of 3,429 m^2 in the southern part of the Gdańsk Lastadia, called *Kahn[en]feld,* was adapted for the construction and repair of river vessels and leased to the guild of Vistula carriers (Maciakowska 2020, 75–76). Around a thousand boatbuilding brackets associated with this activity were discovered on practically all usable levels of the shipyard. Such artefacts are found in large numbers in port centres, serving as evidence for the construction, use or repair of inland vessels. The brackets discovered at the Gdańsk Lastadia are of different types and have been preserved in varying conditions. The vast majority of them are deformed, which suggests that they came from vessels that required the replacement of their sealing or were being taken apart.

No testimony has survived concerning the organisation, construction methods, or launching technique of the Vistula vessels built in Gdańsk. On the other hand, information available on similar sites located elsewhere in Poland suggests that small inland ports did not have specifically designated areas for the construction or repair of river vessels, nor any fixed structures to launch or pull them ashore. Larger ships were assembled wherever there was timber available or launching was convenient. Ships would be built in winter and then high spring waters would lift them from the shore (Burszta 1955, 762). Based on this, we can assume that in this part of the Gdańsk shipyard, after the *Kahn[en]feld* had been designated in early 17th century, there was no need to build special facilities to support the building or launching of river vessels. Earlier, seagoing ships were built on the same yard in the 16th century, as evidenced by the remains of the second slipway discovered on that site.

Later, in the 18th century, the so-called *Bordingsfeld* was designated in the northern part of Lastadia (Maciakowska 2020, 67–75). Bordings were lighters that were used to transport cargo between the port, waterway and harbour and they played an important role in Gdańsk ports until the 19th century. The waterways constantly changed their course, which made it difficult to enter the shallow port on the Motława River. Because of that, larger ships did not enter the inner harbour and cargo was transhipped onto lighters at the harbour.

During the long period when river ships and lighters were built at the local shipyard, the craftsmanship was passed down from generation to generation orally rather than through written technical records. In such system, the secrets of the trade were carefully preserved, turning shipbuilding into a kind of secret art (Olechnowitz 1960, 21). To build a ship was very costly and no one could afford to experiment with it, as a result of which the technology was slow to develop and the same building methods were used for a long time.

A 19th century slipway

In the 19th century, judging by the second slipway discovered at the local Lastadia, the shipbuilding industry in Gdańsk was completely different. Also uncovered in 2004, the structure had considerable dimensions: it was at least 48 m long and 11 m wide (Fig. 4, 5). The

Fig. 4. Archaeological excavation of the remains of a slipway from the 19th century (photo by B. Kościński, K. Dyrda).

structure sloped towards the Motława River at an angle of approximately 6%, according to the records. Ten digs with a total surface area of more than 290 m^2 uncovered quite well preserved remains of the eastern part of the working slipway, where the hull was drawn up, and part of the run-up slipway that plunged into the water. The wooden structures found in the digs were elements of the foundations for the placement of the fixed substructure and keel support, as well as the tracks along which the hull was launched (Fig. 6). No other items were discovered, such as poppets, cradles, or sleds that were made before launching and mounted directly to the hull.

When viewed from above, the exposed structure is visibly made up of three parallel rows of tracks: the central track, which we will also refer to as the keel track, and the two side tracks, which we will also call the chine tracks. The outer tracks were narrower than the central – keel – track.

The structure of the slipway was made of coniferous wood, mostly Baltic pine. On the basis of dendrochronological studies, we can distinguish two phases in the functioning of the wooden structure of the slipway. The first phase is the period after the winter of 1806/1807, when the trees used for the foundation piles were felled. The second phase is the winters of 1851/1852 and 1853/1854, when the trees used to make the structural beams were felled. On this basis, we can assume that the slipway was built after 1807. Most of the surviving foundation piles come from that phase. After 1854, the structure was renovated and the foundation beams were replaced. At around the same time, the plot was bought by the Gdansk merchant and shipowner Friedrich Heyna, who ran the shipyard between 1855 and 1874. Archaeological analogies indicate that the technologies used in the 19th century Gdańsk slipway were transferred from other countries that were more advanced in shipbuilding (Ossowski 2020). A well-known representative of this process is one of the pioneers of modern shipbuilding in Gdańsk, Johann Wilhelm Klawitter, who, having spent a number of years in England after 1814, became proficient

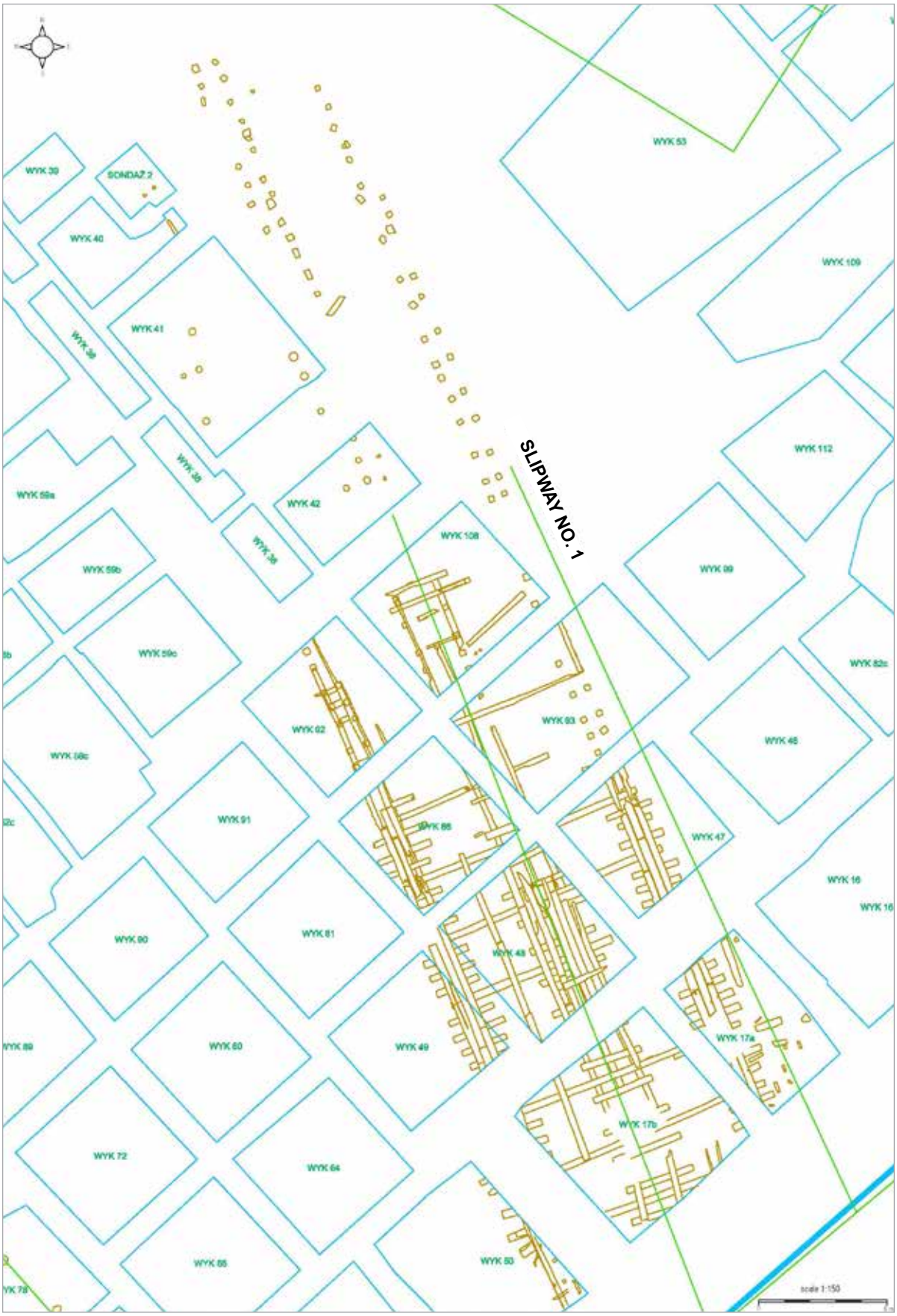


Fig. 5. Plan of the slipway's structure from the 19th century from the Gdańsk Lastadia site, including the outlines of the excavations (prepared by B. Kościński, K. Dyrda).

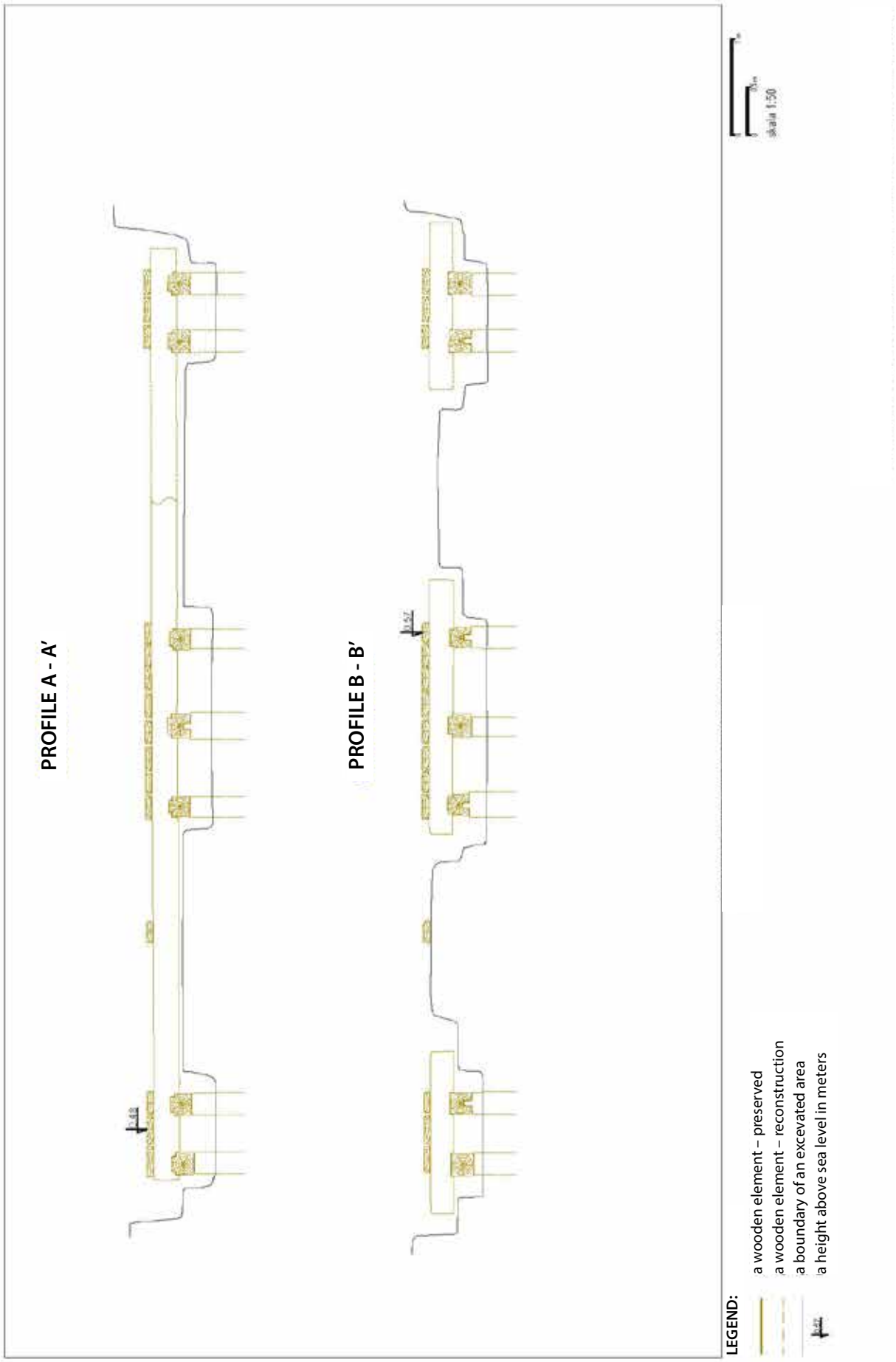


Fig. 6. Cross-sections of the 19th launching way from the Gdańsk Lastadia site (prepared by B. Kościński, K. Dyrda).

Fig. 7. Engraving from 1846 showing the *Bordingfeld* – a part of the Gdańsk Lastadia presenting the moment of construction of a wooden ship being prepared for launch with the bow towards the water (from the collections of the National Museum of Gdańsk).

in modern shipbuilding technologies. On his return to the Gdańsk Lastadia, he took charge of the construction of the wooden rowing and sailing gunboat "Thorn", with a length of just over 16 metres, which was ordered Prussian navy in 1819 and launched in 1823. In 1827, he established a modern shipyard at Brabank, where iron and steam-powered ships were built from 1840 onwards. The first iron and steam-powered ships made in Gdańsk were largely fitted out with equipment imported from England, and they were built by English specialists hired by J. W. Klawitter (Ruhnau 1983).

Johann Wilhelm's younger and prematurely deceased brother, Gustav David Klawitter (1805–1837), master shipwright and teacher at the Royal Shipyard School in Szczecin, wrote a book on shipbuilding in which, among various other aspects, he also discussed ship launching methods that were used at the time (Klawitter 1835). Among other things, the book describes a slipway, the lower part of which – the actual slipway – was permanent. It consisted of massive oak piles driven 4 to 6 feet deep into the ground at specific intervals. On those piles were laid thicker oak beams in such a way that they formed a platform sloping towards the water. The slope was ½ inch per foot, which is ca. 4% (Klawitter 1835, 1). According to the book, there were three main methods of ship launching in the first decades of the 19th century: the French, the Danish and the English. Their choice in any particular case depended largely on the size of the vessel being built. While the French method, of relatively simple design, was used for smaller vessels, the other two were applied to the largest ships. The first method, according to the author, was the best for launching vessels with sharply shaped hulls.

The 19th century slipway discovered at Lastadia most closely resembles the construction described in the textbook as the French launching method (Ossowski 2020) . We can see the resemblance not only in the construction of the fixed lower section but also in the fact that the hull was supported at three points: under the keel and under the sides. For launching, a cradle was mounted to the hull of the ship, the skids of which moved along the three launching tracks.

On the basis of the surviving elements, we can attempt to estimate the size of ships that were built on the slipway (Fig. 7). Of course, such attempt is only an approximation, as we are not able to determine the exact width of the hull without knowing the spacing of the tracks or the construction and size of the

launching cradles or poppets. Nevertheless, the width between the axes of the outer tracks was about 9 metres and, assuming that the outer tracks indeed served as support for the chine where the launching cradles were attached, we can estimate that the width of the hulls of the ships under construction was the same or larger. Considering the sizes and proportions of merchant ships from late 18th century, we can estimate that the largest hulls built on the slipway were 32 metres long or more. According to historical data, F. Heyna's shipyard built three-masted ships of up to 650 tonnes of carrying capacity. Since ship types at that time were determined by the type of sails, we can conclude that the largest barges and fuller-rigged ships were constructed at the shipyard, counting among the biggest types of ships built in the period.

Conclusion

From the earliest to the modern times, there were seasonal or occasional sites on the southern Baltic for the construction or repair of boats and ships. Identifying such sites is difficult, because the construction of plank boats required nothing more than sleepers or simple wooden supports and the work was done in the open air. What remained were piles of shavings, small pieces of wood, traces of hull sealing, tarring residue, and fasteners in the form of wooden treenails, pegs, iron rivets, or nails. Also, such sites were located at some distance from dwellings, where timber was available, and where there was a convenient shoreline to launch new or repaired hulls of vessels.

In the pre-industrial period, beginning with the late Middle Ages, there existed designated, permanent shipbuilding yards within the coastal cities of the southern Baltic which did not have any fixed shipbuilding facilities. These areas, called Lastadia, were divided into yards where, in addition to the shipbuilding workshops, there were storage yards for construction timber, and wooden sheds at the back for storing the equipment and tools needed during construction. Shipbuilders would pay a fee to the city authorities for permission to use a specific section of the yard to build a vessel. The builders would set up the facilities used for the construction of ships on a job-by-job-basis, using their own materials and dismantled them upon completion. The launching of smaller vessels using the "forward bow" method was not technically complicated and the structures required for launching were easy to dismantle. Although the Gdańsk Lastadia remains the best explored shipbuilding site today, in all probability other maritime cities from Lübeck to Braniewo had similar sites, creating a uniform picture of the maritime cultural landscape of the region.

The material collected makes it possible to respond to the attempts made in archaeological publications to classify archaeological sites associated with shipyard production.

Moser (2011) proposed a typology dividing shipyards into five broad categories: (1) large state-owned shipyards like the British naval shipyards of the 18th and early 19th century, (2) well-organised private shipyards with a substantial workforce, such as the Dutch East India Company in Amsterdam, (3) private shipyards with a large number of labourers that could build many ships at the same time, (4) smaller private shipyards with single slipways that could build only one ship at a time, and (5) shipyards with limited fixed infrastructure, which built or repaired only a few ships and were often in financial difficulties.

With regard to the southern Baltic, this classification is only exhaustive for the modern period and can be linked to industrial development. From the perspective of changes in shipping and shipbuilding methods, these types of shipyards first appeared in the area in early 19th century. At that time guild regulations were abolished, and large and small private shipyards began to emerge in major Baltic cities as well as large state-owned facilities serving the growing needs of the Prussian fleet and large shipping companies. These shipyards were usually established outside urban ramparts and fortifications and were built from scratch.

The findings so far, mainly from Poland, allow the following types of archaeological sites associated with shipbuilding activities to be identified: (1) occasional/temporary sites of boatbuilding activity from the Stone Age onwards, (2) permanent shipbuilding sites in maritime towns, without developed infrastructure operating from the late Middle Ages to the 19th century, (3) small, private shipyards operating in the 19th/20th century and (4) large industrial shipyards developing from the 2nd half of the 19th century onwards.

Shipyards are of little interest to archaeologists. If necessary, pre-development archaeological excavations are done at such sites, but their results usually go unpublished. This is not only the case in the southern Baltic region and many authors point to the lack of training of cultural resource managers in identifying or documenting shipyard sites in other locations across the world (Stammers 1999; Ford 2006; Richards 2008; Harris 2010). Shipbuilding archaeology offers

the opportunity to develop a more comprehensive and accurate model of changes in economy, trade, and technology in the southern Baltic region.

References

Binerowski Z. 1963. *Gdański przemysł okrętowy od XVII do początku XIX wieku* (= *Studia i Materiały do Dziejów Gdańska* 1). Gdańsk: Gdańskie Towarzystwo Naukowe.

Bogucka M. 1962. *Gdańsk jako ośrodek produkcyjny w XIV–XVII wieku*. Warszawa: Państwowe Wydawnictwo Naukowe.

Borg J., Gustafsson M. and Sjölin M. 2000. *The Story of the Viking-Age Ship from Äskekärr*. Göteborg: Göteborgs Stadsmuseum.

Buczek K. 1958. *Książęca ludność służebna w Polsce wczesnofeudalnej* (= *Prace Komisji Nauk Historycznych* 1). Wrocław, Kraków: Zakład Narodowy im. Ossolińskich.

Burszta J. 1955. Materiały do techniki spławu rzecznego na Sanie i średniej Wiśle z XVII i XVIII wieku. *Kwartalnik Historii Kultury Materialnej* 3(4), 752–828.

Christensen A. E. 1996. Treenails – an important fastening's detail. *Maritime Archaeology Newsletter* 7, 20–21.

Christensen A. E. and Leiro G. 1976. Klåstadskipet. *Vestfoldminne*, 2–17.

Cnotliwy E. 1996. Szczecin w drugiej połowie XII i w XIII wieku w świetle badań archeologicznych. *Przegląd Zachodniopomorski* 11(1), 7–41.

Crumlin-Pedersen O. 1997. *Viking-age ships and shipbuilding in Hedeby/Haithabu and Schleswig*. Schleswig and Roskilde: Archaologisches Landesmuseum der Christian-Albrechts-Universitat, Wikinger Museum Haithabu, The National Museum of Denmark, and The Viking Ship Museum in Roskilde.

Englert A. 2015. *Large Cargo Ships in Danish Waters 1000–1250* (= *Ships and Boats of the North* 7). Roskilde: The Viking Ship Museum.

Filipowiak W. 1994. Shipbuilding at the mouth of the river Odra (Oder). In C. Westerdahl (ed.), *Crossroads in Ancient Shipbuilding. Proceedings of the Sixth International Symposium on Boat and Ship Archaeology, Roskilde 1991*. Oxford: Oxbow Press, 83–96.

Filipowiak W. 2022. *Korabnictwo Wolina 800–1200. Studium archeologiczne*. Warszawa: Instytut Archeologii i Etnologii Polskiej Akademii Nauk.

Filipowiak W. and Filipowiak W. 2014. Korabnictwo, port i żegluga wczesnośredniowiecznego Wolina. In B. Stanisławski and W. Filipowiak (eds.), *Wolin wczesnośredniowieczny*, 2 (= *Origines Polonorum* 6). Warszawa: Instytut Archeologii i Etnologii Polskiej Akademii Nauk, 350–385.

Ford B. 2006. Down by the water's edge: modelling shipyard locations in Maryland, USA. *International Journal of Nautical Archaeology* 36(1), 125–137.

Grimm O. and Pesch A. (eds.) 2011. *The Gudme/Gudhem Phenomenon* (= *Schriften des Archäologischen Landesmuseums Ergänzungsreihe* 6). Neumünster: Wachholtz Verlag.

Harris L. 2010. South Carolina shipyards: labour, logistics, lumber and ladies. *Journal of Maritime Archaeology* 5(1), 17–35.

Harris L. 2014. Shipyard Archaeology. In C. Smith (ed.), *Encyclopedia of Global Archaeology*. New York: Springer Press, 6613–6620.

Hylleberg E. 1993. *Dendrokronologisk under sogelse af skibsvrag ra Klastad, Norge* (= *Nationalmuseets Naturvidenskabelige Undersogelser* 21). Copenhagen: National Museum of Denmark

Ignasiak M. 2020. Czy te przedmioty pogubili stoczniowcy? Wybrane narzędzia z Lastadii. In B. Kościński (ed.), *Lastadia najstarsza stocznia Gdańska w świetle badań archeologicznych* (= *Archeologia Gdańska* 7). Gdańsk: Muzeum Archeologiczne w Gdańsku, 165–188.

Indruszewski G. 2004. *Man, Ship, Landscape. Ships and Seafaring in the Oder Mouth Area AD 400–1400. A Case Study of an Ideological Context*. Copenhagen: National Museum of Denmark.

Jagodziński M. F. 2010. *Truso. Między Weonodlandem a Witlandem*. Elbląg: Muzeum Archeologiczno-Historyczne.

Klawitter G. D. 1835. *Vorlege-Blätter für Schiff-Bauer*. Berlin: Hamecher.

Kocińska K. 2020. Przebieg badań. In B. Kościński (ed.), *Lastadia najstarsza stocznia Gdańska w świetle badań archeologicznych* (= *Archeologia Gdańska* 7). Gdańsk: Muzeum Archeologiczne w Gdańsku, 13–26.

Kontny B. 2021. Logboat discovered in Lake Lubanowo, Western Pomerania. *Sprawozdania Archeologiczne* 73(2), 203–220.

Kontny B. 2023. Maritime contacts across the Baltic Sea during the Roman and Migration Periods (1st–7th centuries AD) in the light of archaeological sources from the central-European perspective. In A. Richardson, M. Bintley, J. Hines and A. Seamen (eds.), *Transitions and Relationships over Land and Sea in the Early Middle Ages of Northern Europe*. Canterbury: Canterbury Archaeological Trust, 103–130.

Król D. 2016. Od osady z epoki kamienia do Parku Kulturowego. Osada łowców fok w Rzucewie, gmina Puck.

In J. P. Dettlaff (ed.), *Gmina Puck. Rytm życia, nowe perspektywy*. Puck: Urząd Gminy Puck, 83–102.

Król D. 2018. Osadnictwo neolityczne. In D. Król (ed.), *Zespół osadniczy z epoki kamienia – Rzucewo, gmina Puck, stanowisko 1*. (= *Fontes Commentationesque ad Res Gestas Gedani et Pomeraniae*). Gdańsk: Muzeum Archeologiczne w Gdańsku, 115–125.

Lanting J. N. 1998. Dates for origin and diffusion of the European logboat. *Paleohistoria* 39–40, 627–650.

Löschin G. 1836. *Danzig und seine Umgebung*. Danzig.

Maciakowska Z. 2020. Od średniowiecznej stoczni po fabrykę papierosów „Stambul". In B. Kościński (ed.), *Lastadia najstarsza stocznia Gdańska w świetle badań archeologicznych* (= *Archeologia Gdańska* 7). Gdańsk: Muzeum Archeologiczne w Gdańsku, s. 57–84.

Moser J. D. 2011. Shipyard archaeology. In A. Catsambis, B. Ford and D. L. Hamilton (eds.), *The Oxford handbook of maritime archaeology*. Oxford: Oxford University Press, 834–855.

Olechnowitz K.-F. 1960. *Der Schiffbau der hansischen Spätzeit. Eine Untersuchung zur Sozial- und Wirtschaftsgeschichte der Hanse*. Weimar: Böhlau.

Ossowski W. 1999. *Studia nad łodziami jednopiennymi w Polsce.* Gdańsk: Centralne Muzeum Morskie.

Ossowski W. 2010. *Przemiany w szkutnictwie rzecznym w Polsce. Studium archeologiczne*. Gdańsk: Centralne Muzeum Morskie.

Ossowski W. 2020. *Pochylnie, statki wiślane i bordyny – działalność stoczniowa gdańskiej Lastadii w świetle badań archeologicznych*. In B. Kościński (ed.), *Lastadia najstarsza stocznia Gdańska w świetle badań archeologicznych* (= *Archeologia Gdańska* 7). Gdańsk: Muzeum Archeologiczne w Gdańsku, 115–140.

Overmeer A. 2017. A Missing Link in a Period of Change? Preliminary Results of Shipwreck U34 in Flevoland, the Netherlands. In J. Litwin (ed.), *Baltic and beyond. Change and continuity in shipbuilding. Proceedings of the 14th International Symposium on Boat and Ship Archaeology*. Gdańsk: Narodowe Muzeum Morskie, 199–206.

Richards N. 2008. S*hips graveyards: abandoned watercraft and archaeological site formation process*. Florida: University of Florida Press.

Ruhnau R. 1983. Der Schiffbau in Danzig und die Entwicklung der Werft-Industrie. *Danziger Berichte* 3, 24–37.

Skamby Madsen J. and Klassen L. 2010. *Fribrødre Å. A late 11th Century Ship-handling site on Falster*. Arhus: Aarhus University Press.

Stammers M. 1999. Slipways and steamchests: the archaeology of 18th and 19th-century wooden merchant shipyards in the United Kingdom. *International Journal of Nautical Archaeology* 28(3), 253–264.

Stępień W. 1986. Odkrycia archeologiczne w Zatoce Puckiej. *Nautologia* 21(1), 79–83.

Szymczak A. 1997. W sprawie najstarszych łodzi w Polsce. *Materiały Zachodniopomorskie* 43, 99–112.

Wiącek B.1974. Odkrycie dłubanki z wczesnej epoki żelaza na stanowisku produkcyjnym w Luzinie, pow. Wejherowo. *Pomorania Antiqua* 5, 253–273.

Witsen N. 1690. *Architectura navalis et reginem nauticum*. Amsterdam: Graphic.

van Yk C. 1697. *De Nederlandsche Scheepsbouwkonst open gestelt*. Amsterdam: Langerveld.

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

Tomasz Kozłowski[1], Wiesław Nowosad[2],
Filip Nalaskowski[3], Dawid Grupa[4], Małgorzata Grupa[5]

DOI: 10.15584/anarres.2023.18.12

[1] Institute of Archaeology, Nicolaus Copernicus University in Toruń; Szosa Bydgoska 44/48, 87-100 Toruń, Poland;
e-mail: kozlow@umk.pl; ORCID: 0000-0001-5242-6095

[2] Faculty of History, Nicolaus Copernicus University in Toruń, Bojarskiego 1, 87-100 Toruń, Poland;
e-mail: wnowosad@umk.pl; ORCID: 0000-0002-9144-6352

[3] Faculty of Philosophy and Social Sciences, Nicolaus Copernicus University in Toruń, Yuri Gagarin 11, 87-100 Toruń, Poland;
e-mail: filipn@umk.pl; ORCID: 0000-0001-6973-9960

[4] (private);
e-mail: d.m.grupa@gmail.com; ORCID: 0000-0002-6393-8528

[5] Institute of Archaeology, Nicolaus Copernicus University in Toruń, Szosa Bydgoska 44/48, 87-100 Toruń, Poland;
e-mail: m.grupa@wp.pl; ORCID: 0000-0001-5128-9754

The "Cow-mouth" Footwear from Coffin no. 7 in the Presbytery of the St Nicholas Church in Gniew (Poland)

Abstract

Kozłowski T., Nowosad W., Nalaskowski F., Grupa D. 2023. The "Cow-mouth" Footwear from Coffin no. 7 in the Presbytery of the St Nicholas Church in Gniew (Poland). *Analecta Archaeologica Ressoviensia* 18, 183–203

This article presents a comprehensive analysis of a pair of shoes excavated during archaeological research in the chancel of the St. Nicholas Church in Gniew, found on the feet of a man over 60. It is the first pair of Renaissance "cow-mouth" type shoes excavated from a grave. The results of the study of both archaeological material (footwear, velvet headgear covered with embroidery using threads in a metal braid) and iconography – portrait depictions, group scenes, and archival sources – confirmed the high social status of the deceased.

Keywords: Renaissance, footwear, markers, social differentiation, Gniew, Poland

Received: 21.08.2023; **Revised:** 20.09.2023; **Accepted:** 24.10.2023

Introduction

The Church of St Nicholas in Gniew is a Gothic, three-nave hall church, the main body having been built in the 2nd half of the 14th century in a town which, during the reign of the Teutonic Order, was the seat of a commandery residing in a nearby castle. After the Thirteen Years' War (1454–1466), the whole area came under Polish rule, and the former commandery became the seat of a non-city starosty governed by an official nominated by the king – the starost. From that time until the First Partition of Poland in 1772, Gniew was regarded as a royal town, and successive starosts had an overwhelming influence on its development (Strzelecka 1982, 54–55; Mross 1997, 53; Grupa *et al*. 2015, 11).

The research at St. Nicholas Church in Gniew was conducted by a team led by Małgorzata Grupa from the Nicolaus Copernicus University in Toruń between 2009 and 2016. The stone floor (cracked in many places, with large cavities in the outer layer) was systematically removed. The layered graves were inventoried, as well as the crypts found – the northern, southern and south-western part of the chancel (Majorek and Grupa 2014; Grupa *et al*. 2015; Nowak *et al*. 2015, 425–438; Grupa 2016, 183; 2023a, 234–248; Grupa and Nowak 2017; Grupa and Warecka 2018, 31–40; Grupa and Łukaszewicz 2019, 137–152; Kozłowski and Grupa 2019, 33–49; Jarzęcki and Grupa 2020, 245–262).

Trench 1/13 was opened in the northeastern part of the chancel, next to the Gothic altar. Its dimensions

were 300 × 460 cm and were adapted accordingly to the previously conducted research. In this section, 14 burials in wooden coffins were discovered. Subsequently, an extension was made in the central part of the chancel just in front of the contemporary altar table and marked as trench 1a/13 (Fig. 1), measuring 170 × 300 cm. Nine coffins were discovered in this space. The burial furnishings from the chancel were varied and rich. Here, leather prayer book covers were discovered in addition to fragments of silk fabrics, shoe elements, flowers and graves wreaths. Burials preserve only artificial variants (Wojciechowska 2014; Grupa *et al*. 2015, 117–122; Grupa 2023b, 232–252).

After examining the individual burials in trench 1a/13, it was found that they were intact and undisturbed by the subsequent actions of the gravediggers. The layering of the discovered coffins consisted of the addition of new coffins. This was done by digging into an earlier burial and placing a new coffin with the body of the deceased on top. Natural taphonomic processes led to the decomposition of the coffin boards, so coffin 4, placed on top of coffin 7, collapsed into the lower coffin (Fig. 2). This was a situation repeated quite often under the floor of the Gniew church, and it was not always possible to separate the furnishings of the two coffins. In this case, however, it was easier. Coffin 4 contained the remains of a child (deceased in age category *infans I*), while coffin 7 contained the bones of an adult male (age category *senilis*). In addition, the lower boards from the lid of the child's coffin were preserved well enough to remove the child's burial from the contents of the older man's burial. Therefore, there was no problem in separating his grave furnishings, which consisted of fragments of silk fabric decorated with inlaid embroidery using silk thread wrapped with metal tape (Fig. 3) and dismembered elements of leather shoes with a very characteristic cut (Fig. 4), not found in graves investigated so far by the archaeology team from Nicolaus Copernicus University in Torun.

Characteristics of the footwear of the deceased from coffin No. 7

In the uncovered pair of footwear, the right and left foot coverings could be seen with relatively wide, flat toes; a unique discovery in grave research. The preservation of the shoes can generally be described as average. The leather is non-uniform, i.e. brown, dark brown and brown. On the preserved soles and fragments of the vamp and uppers, there is surface discolouration, loss of grain, tiny missing pieces of leather, perforations, cracks and heavy rubbing, and compression of the leather and deformations (creases). Undoubtedly, the greater part of this damage is due to taphonomic processes – damage due to insect activity is visible in some parts – although some marks and damage can undoubtedly be linked to quite intensive human use of this footwear. There can therefore be no doubt that the deceased was buried in the shoes worn when he was alive. Despite the destruction of some parts of the shoes, it was possible to reconstruct their appearance, the way they were fastened, and their construction.

The inner side of the footwear was constructed "in the turnover" manner, which was still used in shoemaking in the 2nd half of the 15th century. The stud marks in the metatarsal, heel, and forefoot area show that the sewing process was no different to that of the Middle Ages. The soles were punched with a distinction between the right and left foot. The outer soles were made of cowhide (Fig. 5). The length of the soles (a layer of subcutaneous tissue that has not been entirely removed from the leather that is the inner part of the shoe sole – Fig. 6) is 262 mm and corresponds to a contemporary size 40–41 EU (6.5–7 UK). In contemporary terms, the shoes' owner, for a man, did not have an exceptionally large foot. The widths of the toe forefoot, metatarsal and heel are: 85, 92, 45 and 53 mm, respectively. The metatarsal is softly trimmed on both sides, and the heel is rounded. The bottom construction is reinforced with a multi-part rand sewn between the shoe's sole and top. The most abrasion-prone area of the sole – the heel – has been reinforced by sewing a heel reinforcement.

The upper of the footwear was cut in a single-cut system, although it should be noted that the construction inserts are extensive in size. The right and left copies were not cut from the same template. They differ in the size of the inserts used in one and the other. On the left, one of the vertical seams connecting the parts of the vamp and the upper falls in the middle of the heel. On the right, it is moved towards the foot's inner (medial) side, and the other two diagonal seams are made in the same place – on the inner side of the forefoot. The shoe's upper was reinforced at the heel by sewing a triangular heel counter 65 mm high and 143 mm wide, and at the upper edge by sewing a 10 mm wide leather top band folded in half. The front of the footwear was built-up, which is not the most common solution in this category of footwear. An approximately eight-centimetre-long slit was situated on the instep, allowing the foot to be inserted freely. Four round holes were made on its sides for tying the shoe with a thong. Single traces of stitching in the forefoot

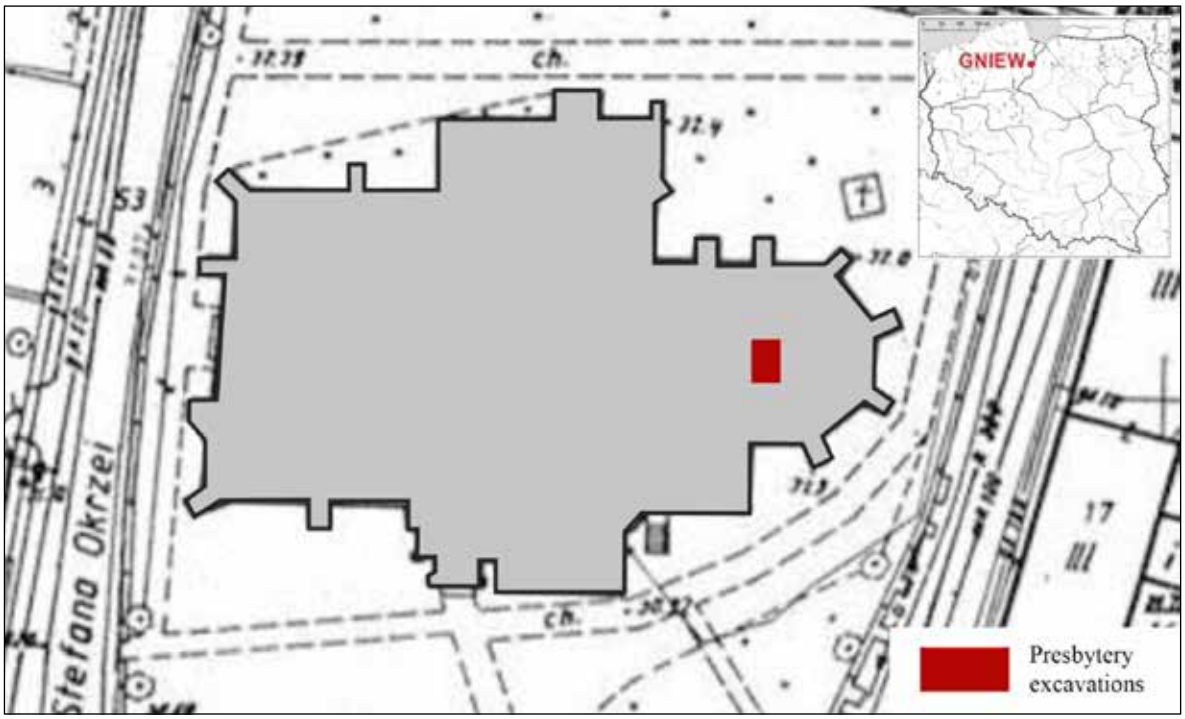


Fig. 1. Gniew, St Nicolas church. The trench location inside the church.
Gniew's location on a map of Poland (digitalization by D. Grupa).

Fig. 2. Gniew, St Nicolas church. Situation in trench 1a/2013 after exposing the outlines of coffins 4 and 7 (photo by M. Nowak).

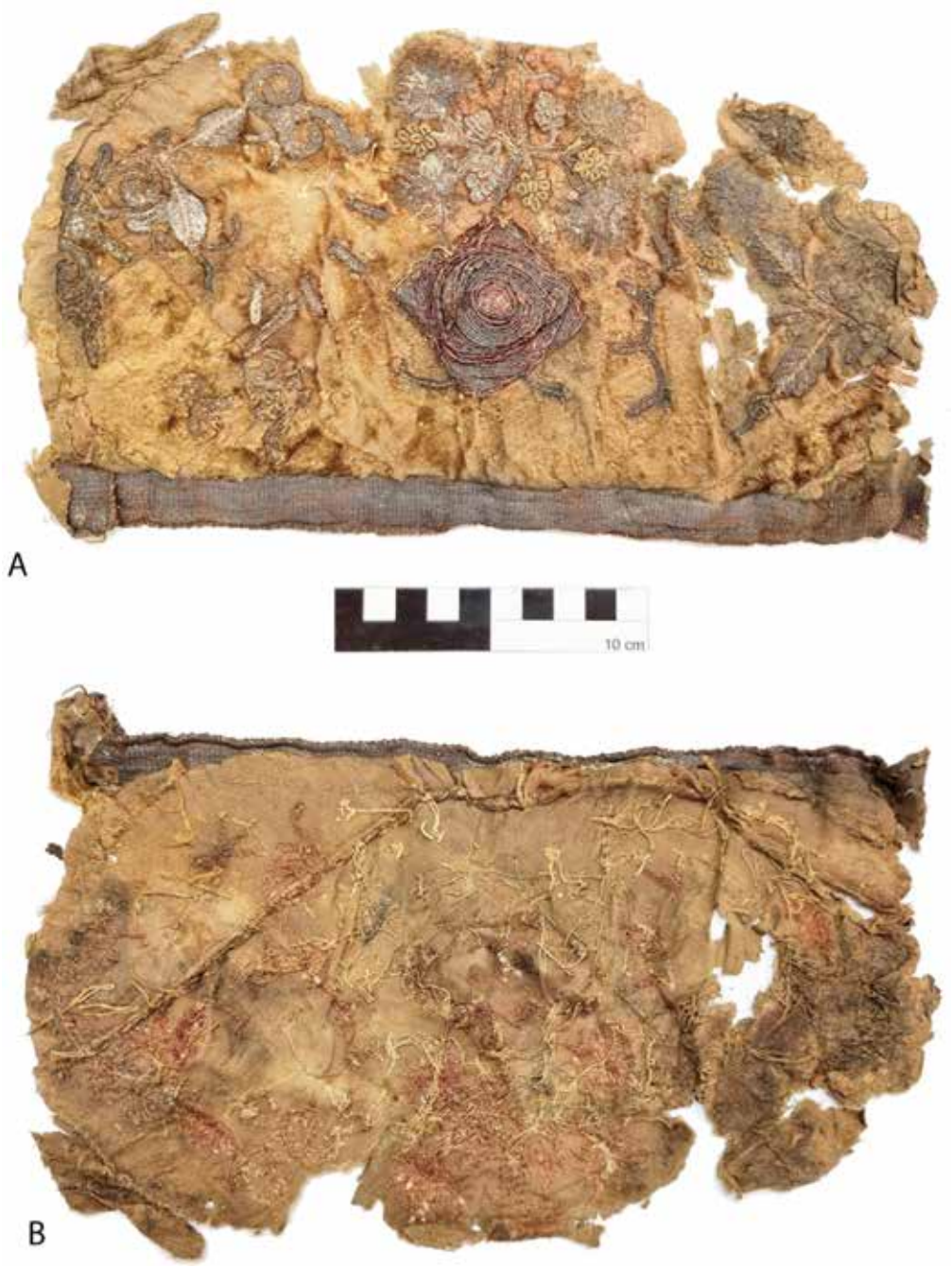


Fig. 3. Fragment of silk fabric decorated in the inlaid embroidery technique (photo by D. Grupa).

area, located on the flesh side, may indicate that the toe was reinforced with some form of lining. However, the poor state of object preservation does not allow us to unequivocally confirm this observation. The pair of shoes discovered in Gniew reached just above the ankle (the height of the upper at the heel: 90 mm).

All of the described features raised doubts about whether the two shoes could be attributed to a single pair. It was decided to take a closer look at the utilitarian damage because these traces are linked to the form and function of the footwear analysed, the quality of the material from which the shoes were made and the intensity and duration of their use, as well as the structure and biomechanics of the foot that the footwear analysed protected. Consequently, these traits can provide us with a great deal of valuable information, not only about the form and construction of historical footwear but can also be an indirect source of knowledge about their owner (Grupa and Kozłowski 2023, in print; Kozłowski *et al*. 2023, in print).

From the point of view of footprint analyses, it is the soles that seem to be of most interest. On the soles

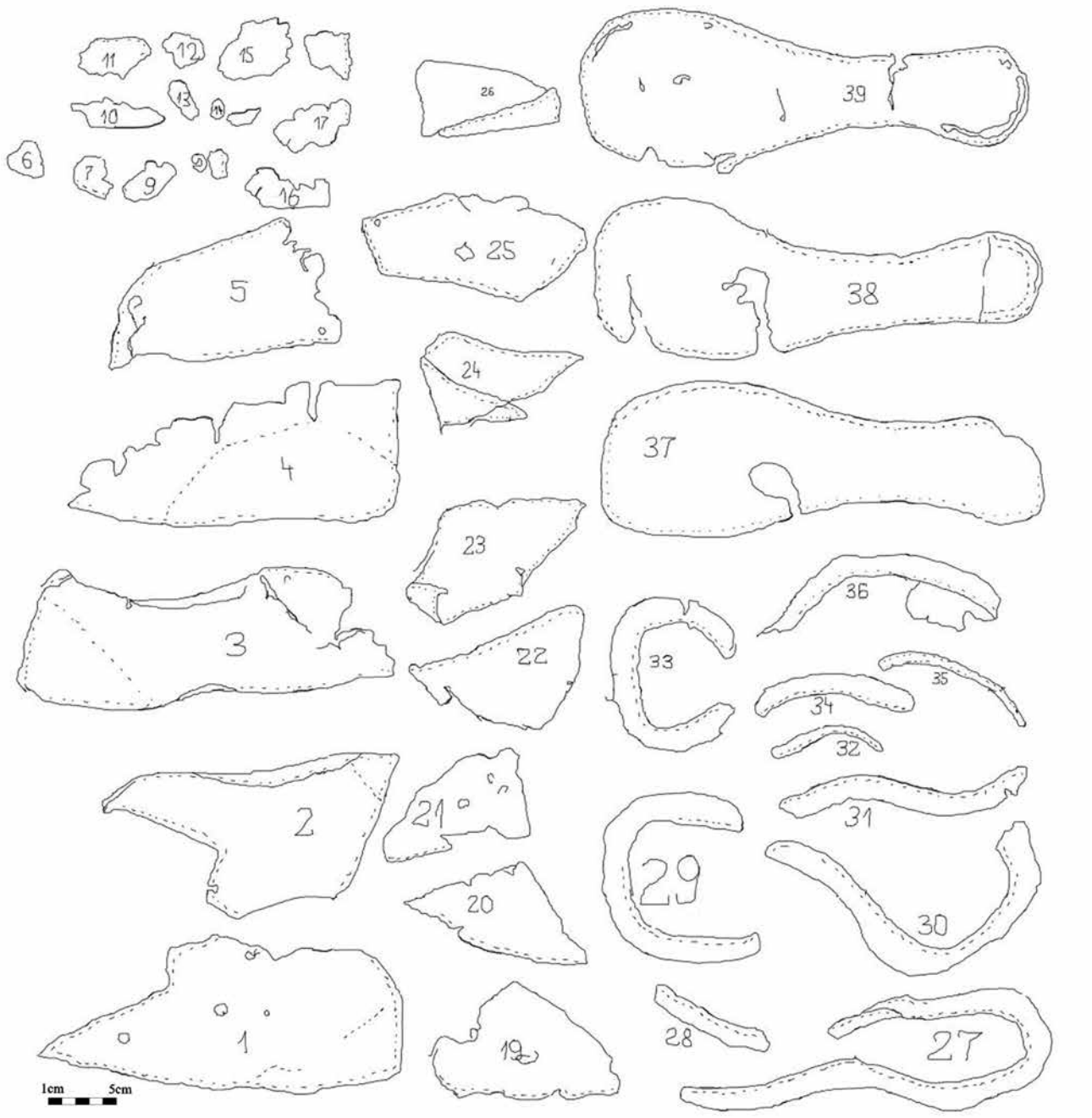


Fig. 4. Elements of footwear found from coffin 7 (drawn by F. Nalaskowski).

of the shoes, traces of contact with the foot and the ground are visible. Certain areas of the sole are also subject to the most significant forces: pressure – compression, tension, friction, bending, and straightening. The chemical environment (e.g. the effect of perspiration) may also be mentioned. In the case of the footwear analysed, both soles are preserved (Fig. 7). They have an asymmetrical shape in the sagittal plane. They also appear to be mirror images of each other. Together with the asymmetry, this indicates that the soles were parts of a left (Fig. 7: A) and a right shoe (Fig. 7: B). Although the soles are relatively similar in shape, length, and width, it is possible to observe differences between them (Fig 7: C). We considered these dissimilarities to be significantand this has already been mentioned earlier.

The main difference concerns the outline (shape) of the soles, above all in their front part and in the course of the carving line on the foot's medial (inside) side. The right sole is, in the area of the so-called shoe nose (its front edge), more rounded than the one on the opposite side, which seems to be "angular". The

Fig. 5. Area of bare skin on the outer sole (photo by D. Grupa).

Fig. 6. Layer of subcutaneous tissues not removed during tanning – inner sole (photo by D. Grupa)

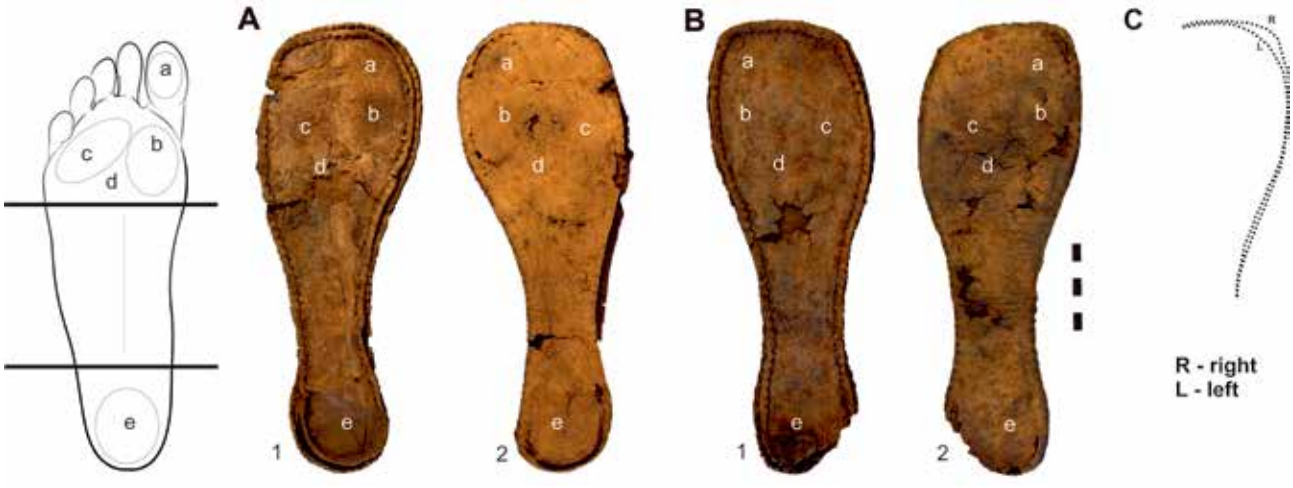


Fig. 7. Human foot from the sole side and its regions.
a – surface of the first toe pad, b – surface of the thenar, c – plantar region of toes II–V, d – beginning of the longitudinal arch of the foot, e – area of the heel surface; A – left sole, B – right sole (1 – "obverse" sole, 2 – "reverse" sole), C – course of the longitudinal arch of the foot between its approximate borders (photo by T. Kozłowski).

left sole is a slightly deeper cut on the medial side. Two hypotheses can be made here regarding this state of affairs. The first would relate to the inaccuracy of the cobbler who constructed these shoes. He may have been using a pattern for the left and right sides, which did not maintain the proper symmetry. On the other hand, it also cannot be ruled out that the deceased had shoes on his feet that were not from the same pair. This may be suggested by the different course of stitches on the uppers of the shoes (Fig. 8). In one case, it is a single seam that runs at the back of the heel (in the sagittal plane of the limb) in the other it is laterally located and has an oblique course (Fig. 9). Given that the shoes analysed were generally quite worn, it does not seem entirely improbable that two shoes (here less worn) from two pairs of similar footwear were completed for the coffin. It can also be assumed that custom-made shoes did not have to be symmetrical at all, they could have a slightly different cut for the left and right foot. These are nuances that are rather impossible to grasp in shredded leather materials.

Both soles are damaged by use in a fairly similar manner and to a relatively similar degree (Fig. 7), although, on the grain surface, slightly more damage characterises the left sole. Both on the side adjacent to the foot (flesh surface) and in contact with the ground ("reverse side of the sole"), the marks left by the different areas of the shoe owner's foot are evident: the first ("great") toe, the ball of the first toe (head of the Ist metatarsal bone), the balls region of the head of the II–V metatarsal bones and the heel (Grdzelidze 2017, 3). These marks take the form of discolouration, abrasion of the skin surface, and compression. On the reverse side, additionally, there are convexities and cracks. Damage to the soles occurring just below the head of the metatarsal bones is the most visible, mainly in the area of contact with the ball of the first toe (head of the Ist metatarsal bone). The same is true in the heel area, and these are the areas where the human foot exerts the most pressure. Below the area of the heads of the metatarsal bones, at the beginning of the foot's longitudinal arch, the flesh surface is severely cracked and characterised by cavities. This section of the sole is particularly exposed to bending and straightening as well as friction during gait and the foot's detachment from the ground (propulsion), which, over time, must lead to fatigue of the material and its mechanical destruction. The degree of expression of the marks indicates that the shoes were undoubtedly used intensively. As a result of this damage, the soles, and therefore more broadly the shoes, lost some of their protective qualities, which may also have been reflected in the comfort of the shoes.

The soles are least damaged in the area corresponding to the longitudinal arch of the foot up to the limit of the arch in the posterior section (just near the surface of the heel). This corresponds to the natural anatomy of the human foot. It can also be inferred from this that the wearer of the shoes most likely did not suffer from flat feet; on the contrary, the longitudinal arch of the foot was high. At the border of the longitudinal arch and the heel zone, cracks and breaks in the skin are again visible, in this case mainly on the grain surface of the sole. It can be suspected that

Fig. 8. Joining of heel counter elements – left shoe (photo by D. Grupa).

Fig. 9. Joining the side elements of the insole – right shoe (photo by D. Grupa).

Fig. 10. A fragment of the left shoe on the medial side of the foot with a characteristic deformation (fold) of the skin suggesting varus ankle joint positioning (photo by T. Kozłowski).

these are due to solid ground contact and bending and straightening, although somewhat less amplitude than the location of parts of the foot: the toes and next area (area of the heads of the metatarsal bones) – the beginning of the longitudinal arch of the foot.

On the left rear part of the upper on the medial side of the foot (tibial side), there are characteristic traces of stretching of the skin and its considerable creasing by the pressure of the heel area against the skin (Fig. 10). A characteristic large fold has even formed here. This is also indicative of relatively prolonged and/or intensive footwear wear. In addition, it may indicate that the deceased's right foot may have tended to be slightly different at the ankle joint, which should be considered a kind of postural defect.

The characteristic wide, slightly square front of the sole indicates that this shoe belongs to the group of so-called Tudor footwear, type 125, according to Goubitz (Goubitz *et al.* 2001, 275–280), and thus is recognisable due to the strongly widened front part. The specimen discovered in Gniew is classified as the "cow-mouth" (German: *Kuhmaulschuh*) subtype.

Cow-mouth footwear in Europe as seen in archaeological and iconographic sources

Archaeological research carried out in the urban areas of Europe confirms the finding of footwear of this type in layers dating to the 16th century. They not only occur in its western part but also in its eastern part. They are known from Britain (Pratt and Woolley 2008, 14–15), Belgium and the Netherlands (Goubitz *et al.* 2001, 276–78), Germany (Durian-Ress 1991, 25–27), and Finland (Harjula 2008, 67–74, 112). The most numerous collection from a single site and with the same date of deposit, this time underwater, is footwear from the English flagship Mary Rose, which sank on 19 July 1545. Among the footwear, specimens known as the "cow-mouth" type were also found. After conservation, along with other artefacts (some 20 000 pieces), they were displayed for the first time at the Portsmouth Maritime Museum (https://pl.pinterest.com/pin/742390319813821929/, access: 13.08.2023).

Renaissance footwear, including cow-mouth shoes, are discovered sporadically in Poland. Such finds have so far been reported in Warsaw (Blusiewicz 2009, 134–147) and Gdańsk (Ceynowa 2009, 389–399). They have also been found in Vilnius (Puškorius 2012, 162–168), which at the time belonged to the Polish-Lithuanian Commonwealth (a state consisting of the Kingdom of Poland and the Grand Duchy of Lithuania). Few museum specimens have also survived, such as the coronation shoes of Sigismund Augustus in the Wawel collection (Ceynowa 2009, 389; Drążkowska 2011, 169).

Leather archaeological artefacts are rarely preserved, so the search for patterns and references associated with this type of footwear has been extended to analyses of selected iconographic sources. For example, Renaissance tiles, on which numerous representations of figures in scenes with mythological, allegorical and everyday life motifs and portraits are present, sometimes with the possibility of identifying specific individuals. It is tiles from this period that also form, in today's terms, the "journals" of the fashion of the time. Their quality and detail vary greatly, but scholars familiar with costume issues can quickly characterise the clothing and footwear found as images on their surface. Of course, it is impossible to present all of the tiles found during the archaeological investigations in this article, and it would go far beyond the scope of this work. Therefore, only single sites from selected European countries with depictions of "cow-mouth" shoes will be mentioned. We consider the tiles particularly important because they are made of an environmentally resistant ceramic material, which means they have a good chance of being preserved in the cultural layers discovered by archaeologists.

Undoubtedly, tile relics have a very different informational potential, as they are mostly preserved fragmentarily. An excellent example is a tile found in Kołobrzeg, associated with the figure of the Saxon Elector John Frederick I, who lived in 1503–1554. Analysis of a fragment of a standing figure, attire, and armament elements allowed us to compare these elements with a portrait engraving of the Saxon Prince by Lucas Cranach the Younger (Majewski 2015, 207–208). In both the engraving and the fragment of the tile (with the right foot visible), the footwear of the type described in this article is perfectly visible. It also shows that footwear of this type was also worn by people at the top of the social hierarchy of the time, from at least the 1st half of the 16th century. However, such personal identifications are rare. For the most part, however, the figures in the tiles are anonymous, and the scene carries the main cognitive load set in a specific context and time. These include the very popular early 16th century battle between David and Goliath symbolising the struggle between good and evil. These scenes can be seen on tiles from Stargard, Poznan, Frankfurt or Lubeck (Majewski 2015, 134). They were not associated with a specific figure of a local ruler but had religious connotations. The struggle between good and evil was a recurring theme in Christian themes of the medieval and Re-

naissance periods (Grupa 2005, 32), and the scene described was a relatively simple message about the struggle between God and Satan. Specific scenes can also be found in various editions of the Bible – Anton Koberger, Nuremberg 1518; Hans Lufft, Witenberg 1550 – and the illustrations contained therein may have served as the prototype for graphic underpinnings for compositions on tile face plates (Majewski 2015, 134, 137).

It was crucial to find form and shape for our fashion research, including precise footwear as an essential part of it and the new elements introduced into it. Identifying figures or specific scenes with their description in various publications sets the "cow-mouth" in a specific social time and space. For example, on the tiles in the series with Salome, the images of soldiers, overwhelmingly landsknechts, are clad in "cow-mouth" type shoes. These depictions are similar elsewhere – e.g. Dobra, Grajswald, Stargard, Stralsund, Wolgast, Salzburg. They show landsknechts in various situations: Salome with an image of a man playing a flute, a drummer, a musician or men and women on a journey (Wegner 2012, 231–232; Majewski 2015, 146, 212; Ansorge 2018, 416; Schäfer 2021, 147). It should also be noted that the landsknechts were not elite. The juxtaposition of the "cow-mouth" shoes worn by rulers and ordinary soldiers and mercenaries may indicate to us that the patterns of this fashion were relatively widespread in the society of the time. This could even be described as a kind of egalitarianism in this fashion.

Moving beyond Poland's southern border, Renaissance tiles generally do not differ in iconography from what we find elsewhere. There are still tiles with religious themes, such as the Pharisee and the tax collector or the two tiles with the prodigal son's return motif found in Prague (Žegklitz 2014, 525, 526). These are also scenes as if taken from real life. In a collection of tiles from an exhibition at the Budapest Museum, there is a tile with a scene from a potter's workshop (Kiss *et al.* (eds.) 2018, 61–62). Two craftsmen are seated at the potter's wheels, and the men standing at the sides are presumably buyers, as suggested by the gestures of the men striking a bargain (the catalogue note informs us that the tile comes from Salzburg and is dated 1561). The men are all dressed in classical Renaissance kit of Western European provenance – wams (doublet), pluders – hose (Fig. 11: A, B), and "cow-mouth" type shoes on their feet. Some confusion in the chronology of this footwear is introduced by a tile from the collection of the Bratislava City Museum (Kiss *et al.* (eds.) 2018, 166, 174). It dates to the late 15th/16th century. However, the king's attire: a long robe and a knee-length tunic may point to the 15th cen-

Fig. 11. A contemporary copy of the vamps and pluders (photo by D. Grupa).

tury, which means that could be one of the earliest depictions of the "cow-mouth" shoes. This dating would also indicate the creation of a fashion for this type of footwear instead by the royal and magnate courts and the subsequent penetration of these patterns into the lower social strata (Turnau 1986, 76–77; Grupa 2005, 74; 2023a, 230–233). This would only explain the later "extravagance" in the attire of the landsknecht, who perhaps wanted to raise their prestige in the eyes of society in this relatively cheap way only by using the form of leather footwear.

The discovery of an almost complete pair of footwear of the type in question undoubtedly makes it possible to supplement the history of footwear in the Polish lands, mainly when a comparative approach is applied here. The closest analogy to the footwear discovered in Gniew is found in the Netherlands. This is a specimen from Breda, which differs only in the formation of the distal part of the sole (toe), which was further widened, giving the impression of a form similar to horned shoes (Goubitz *et al.* 2001, 277).

The fashion for wearing this type of footwear was said to have developed in the German-Austrian borderlands and become widespread thanks to the landsknechts – the German heavy infantry. The landsknechts lived off their pay, looted the enemy's property, and were not held in high esteem. They often spent the money they earned on extravagant costumes, which included shallow footwear with a wide front (Ceynowa 2009, 392; Kozina 2017, 199). In our opinion, this is not necessarily the correct hypothesis, as at least a random analysis of the iconography from manuscripts from the late 15th and 1st half of the 16th century indicates that this type of footwear was also worn by people not associated with military service. Miniatures from around 1490 show footwear similar to the "cow-mouth" type. Young men walking with women on a boulevard have footwear with a free heel with a vamp that widens considerably in the toe section. In a scene illustrating a pair of peasants warming their feet in front of a fireplace, we see a man standing next to them wearing an exclusive coral knee-length shoe and black shoes of this type (Véniel 2008, 99, 165).

However, it seems that the design of this footwear may have originated at some court. Its cut differed from *poulaine* footwear, characterised by an unusually long pointed toe. This may have been linked to a change in the design of the viscera in parade armour, which is apparent in the iconography and on tombstones (Kozakiewicz 1978, 43, fig. 28; Kozina 2017, 119–120), as well as in the literature of the time. In the *Liber geneseos illustris familiae Schiddloviciae* kept in the Library of the Polish Academy of Sciences in Kórnik [Polish: Biblioteka Kórnicka Polska Akademia Nauk] (ref. MK 3641-3651), illustrated most probably by the Polish painter Stanisław Samostrzelnik (before 1532), the family of the chancellor Krzysztof Szydłowiecki in the male line are knights depicted in armour with metal visors of the "cow-mouth" type (*Żołnierz* 1960, 152–153; Kozina 2017, 133–134). It seems logical that the underside of the leather footwear must have been of a similar shape to the steel lining. This is primarily evident on tombstones dating from the 15th to the 1st half of the 17th century throughout Europe (Kozakiewicz 1978, 14–50; Grupa 2022, 31–32). Here, the knights are depicted primarily in armour, which offers excellent interpretative possibilities for weapon scholars but is also sometimes useful if only in analysing the form of footwear. The most significant examples are armour viscera with a widened front on the tomb slabs.

One of the earliest examples of this is the figure of Emeram Salomon (starosta of Drohobych), who died in 1504, depicted on a bronze plate from the Church of the Virgin Mary in Kraków (*Żołnierz* 1960, 128–129). The viscera of the armour already have widened fronts. Even more legible are the viscera from the armour of Andrzej Szamotulski, who died in 1511. The tombstone was made as early as 1505 (*Żołnierz* 1960, 134–135), possibly on his order. Later tombstones did not deviate much from the pattern of the knight in armour. Near Gniew in Pieniążkowo, there is a tombstone of Jerzy Oleski, who died in 1569, and his wife Zofia, who died in 1593 (Nowosad 2014, 83–85). The armour's viscera are shaped like "cow-mouth" boots (Fig. 12). This type of representation is also known as the Commonwealth style. A gravestone from the Holy Trinity Church in Radzyń Podlaski (northern chapel), attributed to the Mniszech family, made of red marble, depicts a man in armour with the viscera described above (Fig. 13).

An exciting juxtaposition is the groups of knights participating in the *Battle of Orsha* in 1514 (the Polish army triumphed over the Muscovites). The number and variety of armour and clothing is probably one of the best studies of that period due to the painter's detailed recreation of clothing elements. Furthermore, in addition to the knights appearing in Polish costumes, we find knights in full armour with very different viscera (*Żołnierz* 1960, 142–151, 196–197; Grupa 2022, 34). However, here, too, we find boots of the "cow-mouth" type. We see knights who, after crossing the river, began to pour water out of their boots by adopting convenient positions. For example, one of them,

Fig. 12. A tombstone of Jerzy Oleski, the church in Pieniążkowo near Gniew (photo by W. Nowosad).

lying on his stomach, tried to remove the water from his boots by bending his lower limbs at the knees. The distinctive sole of the cowhide he was wearing is visible. On the other hand, in other parts of this image, the shoes are also visible from above, and in this way, the typical front width for the type of footwear described can be seen.

Another source introducing new designs was sacred art, showing the rich and poor images. Probably the quickest and most durable way to convey innovations of this type was in frescoes and altar settings commissioned for churches, as they could be seen and admired by the crowds of the faithful coming to services. The closest example of footwear with a "cow-mouth" is that of the men depicted in a wall painting from 1500 (St. George's Chapel in St. Mary's Church in Gdansk), which shows a panorama of the city with dense buildings (townhouses, towers, gates, drawbridge over the moat). Four armed men (a horseman and three pedestrians) are depicted on the edges on the city's right side. The men have footwear on their feet, one in a cow-mouth type and two in so-called horned shoes (Fig. 14). This is probably one of the earliest depictions of the new type of Renaissance footwear in Royal Prussia. The second chapel of the Holy Cross contains an Antwerp altarpiece from around 1520.

The Resurrection scene is painted of soldiers wearing "cow-mouth" type footwear, which differs in overall appearance only in detail, while the fronts of the shoes in both pairs are clearly widened. This altar was already a time when the footwear described was well established in the production of European shoemakers. How much earlier this model came into use is difficult to say unequivocally. As noted earlier, it probably happened in the last decades of the 15th century, evidenced by the earlier altar settings.

In a triptych commissioned in 1498 by the Paumgartner family for St Catherine's Church in Nuremberg, Dürer painted St Eustatius wearing "cow-mouth" type footwear. This setting was made after 1500. The painter was already entering the period of mature painting, where the whole is rigorously subordinated to the lines of perspective (Zuffi 2017, 46–47). Another saint in the shoes described is on an altarpiece originally intended for the family chapel of the condottiere Tuzio Costanzo, originally located in the church of San Liberali in Castelfranco Veneto, by Giorgone (now in the Prado Museum in Madrid; Buricchi 2011, 117, 120–121). In the central part sits the Virgin Mary with the child Jesus, and to her right stands a slightly stooped St Liberalis wearing black shoes with much-widened fronts for the toes with a tied seam, almost perfectly in line with the Gniew copy. The altarpiece was created between 1504 and 1505.

The analysis of the whole figure portraits of the powerful and mighty is also noteworthy. Unfortunately, it provides limited information, as only men's footwear can be discussed in this case. Women belonging to the elite walked in dresses not only covering their ankles (most common and plebeian women, if possible, walked barefoot, as can sometimes be seen in illustrations of women doing various types of physical work) but also covering their feet (Pérez Sánchez 1999, 74–75; Boucher 2012, 254; Grupa 2012, 79; Nowosad and Grupa 2020, 236; Nowosad *et al*. 2021a, 71). Perhaps the clearest example of this is the *Portrait*

Fig. 13. Statue of Mikołaj Mniszech in armour, tombstone in the parish church of the Holy Trinity in Radzyń Podlaski (photo by W. Nowosad).

Fig. 14. Epitaph of Jan and Zofia Konopacka Oleski in the parish church in Pieniążkowo near Nowe over the Wisłą (photo by W. Nowosad).

of the Duke of Saxony (Henry the Pious) *and his wife Catherine of Mecklenburg* (Gemäldgalerie Museum Dresden), by Lucas Cranach the Elder, 1514 (Fig. 15). It is an original representation of the princely couple, both a portrait and a heraldic image. The period costumes are in the heraldic colours of gold, blue, and red (Zuffi 2006, 110; Kozina 2017, 199). The prince's shallow, black shoes with a wide front are clearly distinguished from the red, smooth-fitting calf-length stockings (presumably silk). In this case, one can only guess that the Duchess may have worn shoes of a similar cut. The scenes when the women are seated are no different. The voluminous bottom of the dress, which often ranged from 3 to 6 m in circumference (these data are derived from reconstructions of grave dresses from studies conducted in Poland), always covered the feet (Grupa 2012, 65, 95, 98, 156–157; Nowosad *et al*. 2021a, 71).

The same is true of the woodcuts by the German painter Hans Burgkmaier the Elder (1473–1531) and many other artists of the period. Different social groups (royal courts, patricians, craftsmen, commoners) are depicted in genre scenes (battles, at royal courts, in the park, in the craftsmen workshops), revealing the clothing of adults and children. The rich usually have "cow-mouth" shoes, with rounded toes or a free heel. The poor, on the other hand, have either footwear still made in medieval design or simply bare feet – *Die*

Fig. 15. Double portrait of Duke Heinrich the Fromme and Mistress Duchess Katharina of Mecklenburg – 1514, Cranach Lucas senior (source: Zuffi 2006, 110).

Spiele der Weisskunig, woodcut printed c. 1520–1530 (https://www.alamy.com/stock-photo/weisskunig.html?sortBy=relevant), *Minting coins*, c. 1515 (https://www.posterazzi.com/minting-coins-c1515-nthe-minting-of-coins-woodcut-german-by-hans-burgkmair-c1515-poster-print-by-granger-collection-item-vargrc0091729/, access: 23.07.2022), *The Brown and White Party asking mercy from the Old White King From Weisskunig*, *Battle of Hullein 1514*, *The Swiss Embassy against the Blue King* and many others.

The iconography contained in the so-called Trachtenbuchs or otherwise Frauentrachtenbuchs also complements the consideration of "cow-mouth" shoes. These were usually generic scenes from real life together with short descriptions. Most importantly, they also provided information about lower social groups. The prototypes of these albums were created by Albrech Dürer, Hans Holbain, Ures Graf, among others (Tylicki 2005, 50–51; Grupa 2012, 245). In later periods, it was a very popular form of recording events in the city or countryside and, on occasion, an overview of the clothing worn in each century. In the Trachtenbuch of Matius Schwarz of Augsburg, created between 1520 and 1560, it is possible to trace the different modes of dress of virtually all social groups (Rublack *et al.* (eds.) 2015). This is also true for footwear, where "cow mouth" is extremely popular. This type of footwear was worn with a shoulder-widening coat (Elector of the Rhenish Palatinate Otto Henry Wittelsbach, Henry VIII – Kozina 2017, 77) and a doublet with pants (Duke Henry the Pious – Fig. 15).

Associating this type of footwear primarily with the landsknechts is, therefore, misleading when looking for the origins of this design in the history of footwear. It is likely that the landsknechts, like most lower social groups, adopted the design introduced at some Burgundian or Spanish court, as these were the places where new fashion trends were created. In addition, soldiers from various European countries wearing a doublet and pants did the same. This is indicated by examples of Polish knighthood, or the painting *The Argonauts' Expedition* located in the National Gallery, London, *circa* 1510, by Giovanni Luteri, working under the pseudonym Doso Dossi (Fregolent 2006, 128–129). They provide evidence that shoes of this type became popular in Western Europe but never predominated amongst the clothing of simple people and the military. This is also illustrated by the copperplates by Hans Sebald Beham in the National Museum in Gdansk (Zabuska 2009, 62). They give an overview of the clothing of various figures, including soldiers, wearing footwear with both high uppers with rounded toes and shoes with a widened front of the "cow-mouth" type.

It is also important to note the presence of Hanseatic merchants in many port cities, and beyond, who skilfully instilled innovations in the countries they visited. Their presence, fashionable, elegant clothing must have aroused the curiosity and interest of the inhabitants of the European cities they visited. Their mobility and liveliness may have contributed significantly to the spread of this type of footwear. The movement of diplomats with entire courts across Europe, pilgrimages to the Holy Land, or journeys abroad by young men from wealthy families must not be forgotten in these considerations either (Loret 1929, 131–172; Pawlak 1988, 19, 45; Gutaker 1993, 49–77, 110; Nowosad 2014, 308–313). Due to this mobility, travelers often brought novelties from the world of fashion to their homelands or perhaps gifts even in the form of shoes with new designs or prints or richly illustrated printed books, e.g. a Bible from 1518 with a graphic depicting the battle between David and Goliath published by Anton Koberger in Nuremberg, which features this type of footwear (Majewski 2015, 137).

An attempt to personalise the man from burial 7 in Gniew

Exploring modern archaeological sites opens up broader possibilities for interpretation, this time using preserved historical sources. However, in the Polish reality, the state of preservation of archival sources is unsatisfactory. The complicated history of the country, numerous conflicts, changes in nationality, and finally, simple random events mean that these sources are usually missing in many cases. It is no different with the sources from Gniew. Town records have survived to the present day in a residual state, while parish records from the turn of the Middle Ages and modern times are practically non-existent. Research can therefore be carried out on the basis of indirect sources, with a particular focus on material written down in the royal chancelleries, e.g. with the Crown Metrics (Metrical Regni Poloniae) at the forefront.

St Nicholas Church was the only church in the town in modern times (until the beginning of the 19th century). The church and its immediate surroundings were also the central burial place for all the town's inhabitants and the inhabitants of the nearby castle. The most prominent place to lay the deceased was in the chancel with a location in front of the altar. As the town was the seat of the starosta – the representative

of the royal authority – it should hardly come as a surprise that the starosta, his family, and – less likely – his closest associates are the ones who were buried in this prominent place.

The preserved footwear, the subject of this article, is at the same time a chronological clue, locating in time the funeral ceremonies and the laying in the grave of the shoes' owner. Moreover, these must have occurred in the late 15th to the 2nd half of the 16th century. The sex of the deceased and his age at death, as determined by anthropologists from the skeleton, point to a man whose death occurred at an advanced age (category *senilis*: *>60 years*). This information narrowed the search field quite significantly. From this period, we know all the starosts of Gniew. They were, therefore, Sebastian Mgowski (Legendorff), holding the starosty from about 1493 to 1503; Michał Żelisławski, starost in 1504–1517, later chamberlain of Malbork and Chełmno; Jerzy Bażyński, starost in 1517–1546, at the same time starosta of Malbork; and his son Jan, starost in 1546–1548, at the same time castellan of Gdańsk. The next starosta of Gniew – the Malbork voivode Achacy Czema rested in the chapel of this temple built for him – (Czaplewski 1921, 80–82). Sebastian Mgowski and Jan Bażynski probably died before their fortieth year. Michał Żelisławski, having left Gniew in 1517, died in 1547 having had no connection with Gniew for thirty years, so there was no reason to bury his body in the local church. Of this list, only the starosta of Malbork, Jerzy Bażyński, who, according to his biographer, was born in 1469, remains likely (Czaplewski 1935); he was, therefore, about 77 years old at the time of his death. Nothing is known about his childhood. He was the son of Jan, castellan of Elbląg, and grandson of Ścibor, governor of Royal Prussia, the most important provincial official. The family stood at the head of the wealthiest families in the area. Its representatives belonged to the close circle of those who initiated the creation of the Prussian Union and led to the declaration of obedience to the Teutonic Order and the outbreak of the Thirteen Years' War. If we accept Jerzy's date of birth as accurate, his father died when he was 11. It is unlikely that the minor son was left in the care of his mother. It is more likely that he was given to one of his relatives for upbringing, such as his uncle Mikołaj, the starosta of Malbork, or to the royal court or one of the magnates in the Crown at that time. It is unknown whether his guardians sponsored him to travel abroad or study. We find no trace of him in the university records that have survived.

In the sources, Jerzy appears in 1492 already as starosta of Tolkmicko and remained so until 1504. In that year, he holds the starosties of Dzierzgoń, Straszewo and Sztum, and a little later, for a while, those of Międzyłęcz and Nowe. At the beginning of 1512, he received the starosties of Skarszewy and Sobowidz from the king, and from 1517 he was also starost of Gniew, holding all of the above until his death. His only son John inherited these estates (Czaplewski 1921, 81, 135, 173, 184, 193, 201). These three locations: Skarszewy, Sobowidz, and Gniew, and several of his extensive estates, could have been potential burial sites. He was associated with all of them in some way. It is known that there were at least a few tombstones of Bażyńskis in the Skarszewy church. Dachnowski mentions this in his heraldry without mentioning their names (Dachnowski 1995, 4). He built a castle from scratch in Sobowidz, which was the reason for his conflict with the Gdanskers (Czaplewski 1921, 173). However, it was probably Gniew that was his primary residence. Most of Jerzy Bażyński's surviving letters to Gdańsk were issued in Gniew (APGd 300, D/54, sig. 525, 527, 529, 543, 544, 548, 573, 576, 579, 580, 584, 586. He carried out a major renovation of the castle, leaving an appropriate inscription to his memory which was still visible in the 17th century. There was also a tombstone of a relative in the local church, probably erroneously identified with his wife, also buried in front of the great altar (Dachnowski 1995, 6). It was in Gniew that Bażyński received the Prussian Prince Albrecht Hohenzollern for informal talks in 1534 (Małłek 1976, 86).

There Bażyński was mobile in his adult life. From 1512 until his death, he held the office of Voivode of Malbork (Mikulski (ed.) 1990, no. 624), which gave him the right to sit in the Senate of the Republic. For this reason, he participated in the Sejm and may have stayed at the royal court on other occasions. For example, he was in Krakow at the royal court in May 1518. In 1525 he was one of the signatories of the peace treaty signed in Krakow, ending the war with the Teutonic Order and the document granting Ducal Prussia to Albrecht as a fief (CIP 1910, 164, 177). Immediately afterwards he travelled as an envoy to Königsberg to the local Diet for further negotiations (*Acten* 1886, 771, 772). Immediately afterwards he went to the Diet of Königsberg for further negotiations (*Acten* 1886, 771, 772). On behalf of the king, he was one of the commissioners overseeing the transfer of the Duchy of Prussia as a fief to Albrecht Hohenzollern in 1526 (MRPS 1910, nos. 2951, 4975). In each of these cases, Bażyński had the opportunity to familiarise himself with the latest trends, also in fashion,

prevailing at the courts of Kraków and Königsberg. In addition, through his marriage to Dorota Kunheim, sister of Prince Albrecht's friend Jerzy Kunheim, he could be relatively close to the Königsberg court. He could even be a part of its political circle (Małłek 1976, 66). In this case, the financial capacity to fulfil even the most sophisticated orders is obvious. It seems justified to say that Bażyński could afford almost anything. His political and social position, his direct authority over Gniew, and his influence on the staff of the presbytery of the local church naturally predisposed him to be buried in such a prominent place as the presbytery. The question remains, however, was this his will?

If this was not Bażyński, then who might it have been? The list is relatively short. It could have been any of his relatives who died when Gniew was in the hands of the Bażyński family. For example, it could have been his brother Franciszek, who was still alive in 1545. One of the town's councillors or mayors could have obtained the starost's permission for burial there. However, none are known by name due to the lack of relevant sources.

Summing up our discussion, it should still be mentioned that the method of making the footwear (discovered in the burial from the Gniew church) sheds new light on the problem of "cow-mouth" shoes and perhaps the history of footwear in general. Earlier studies assume these shoes were imported into the Commonwealth (Ceynowa 2009, 390). However, after the analyses of "pile taxes", this appears to be an erroneous assumption, as no shoes were recorded in the imported goods (Zins 1967; Groth 1990). Rather, we believe the local craftsmen must have started to imitate imported fashions, most likely from journeyman wanderings. Another possibility is that youths or members of the messenger class individually brought shoes from their peregrinations and gave them to local shoemakers to create copies based on their designs. Local craftsmen may have initially used outdated techniques (cutting with a distinction between right and left soles, single-cutting, sewing "on the tippet") to produce new designs, but according to skills acquired in the past and using old technologies. In light of the iconographic sources and the repetitive nature of the depictions of this type of footwear in the early 16th century, it should be assumed that the fairly widespread adoption of the designs (in the larger cities) must have occurred by the end of the 15th century at the latest. Over time, they simply became one of the available types made perhaps only to order for court and military use. It is generally assumed that this footwear was in use between 1500 and 1550, with the peak of its popularity beginning in the second decade of the 16th century (Goubitz *et al*. 2001, 275). However, from a review of various sources, both written and iconographic, we believe that the time of use was much longer, and one should assume roughly the years 1475 to the end of the 16th century unless the images on the tombstones are just a memory of a passing era and not reality.

Conclusions

The numerous iconographic examples of the described pair of "cow-mouth" shoes and grave clothes sewn from silk red velvet fabric covered with inlaid embroidery using gold thread, and the location of the grave in the chancel suggests that the deceased man (abstracting from his presumed identity) belonged to the secular social elite of the time.

Considering the furnishings from Tomb 7, it is clear that footwear could be freely copied by any social group with the right piece of leather. Luxury headgear, on the other hand, was already beyond the reach of most of society. This type of headgear is known from the grave furnishings of princes and kings.

The analysed footwear of the "cow-mouth" type, discovered in the burial of a man in the presbytery of the church of St Nicholas in Gniew, is an example of a fashion prevalent in Europe during the Renaissance. Thus, it should be considered that some centres located on Polish soil were also under its influence.

The shoes we analysed bear visible signs of intensive use and they can even be described as worn. As a result of significant damage in the form of abrasions, creases, folds, cracks and fractures in the leather, mainly present on the soles, but not only, they have certainly lost some of their protective and aesthetic qualities. They may not even be very comfortable to wear anymore. They were, therefore, not shoes sewn for the coffin and may have been everyday footwear belonging to the deceased. Despite his high social status, the deceased was given shoes for his last journey, which may have been considered useless.

Some of the features of the traces of shoe use that we have noted may indicate the existence of a certain defect of the right foot (valgus, hollow foot) in its owner. Thus, the analysis of the grave furnishings (here, shoes) may even provide us with unique information about the physical characteristics of the buried person, assuming, of course, that the garments belonged to the deceased during his lifetime. Alternatively, perhaps they were his favourite footwear, and he wanted to be buried wearing them.

Specific differences in the cut of the soles and the sewing of the vamps, which we considered significant, found between the left and right shoes may suggest that the footwear buried with the deceased may have come from two different pairs. It seems unlikely that such separations (defects) could have been accepted by their owner, who ordered or bought the shoes. It seems more likely that, for example, from two pairs of relatively heavily used shoes, copies in slightly better condition were selected. This confirms the existence of a kind of "economy of death" (Kozłowski and Grupa 2019, 69), the manifestations of which are often observed during archaeological investigations of modern sites, especially church crypts. In clerics burials we often find an evidence for that such as a kontush sashes cut lengthwise in half, the lack of a back in the silk żupan of the deceased, decorative buttons cut off from clothing, a mended grave robe bearing traces of intensive use, or an old and tattered chasuble (Grupa 1998, 277–279; 2005, 57–58, 96; 2019, 181–184; 2022, 118–119, 162–164, 173–178, 189–190; Grupa *et al*. 2015, 109–112; Dudziński *et al*. 2017, 49–72, 90–96; Nowosad and Grupa 2020, 252). This testifies to remarkable economic rationality and frugality even in representatives of the highest rungs of the social ladder.

Finally, we would like to refer to the commonly used nomenclature, including in the scientific literature. Are the shoes referred to as "cow-mouth" really, in their form, like cow-mouths? We have also used this term systematically in our article for formal reasons, however, without conviction. Guided by our intuition, associations and analogies, as well as our experience gained in researching the past of past elites, in our opinion, however, the "cow-mouth" is more reminiscent of a "lion's paw", albeit with the claws hidden. We find such elements in heraldry (lions and griffins), funerary culture (coffins and sarcophagi on so-called "lion's feet"), and even allegorical art. "Lion's paw", in which the foot of a monarch or a brave (brave as a lion!) battle-hardened knight is clad – there are also the viscera of armour in this shape (Fig. 12, 13), more fitting than the typical "cow-mouth". One can go even further. Pludry, stocking and boot in this form, as a whole, can even be associated with the hind limb of just this great cat. In our view, this is not just a matter of semantics but of symbolism, mentality and mindset of Europe's ancient elites. This issue still requires much more comparative research, but it is certainly worth looking into.

The presentation of examples (e.g. iconography from a variety of objects and sources, from tiles, prints and canvases of well-known master painters) in fairly widely available artefacts is intended to make researchers aware of the directions of exploration not only in footwear but also in many other aspects of everyday and religious life in Europe. Aiming only at a search focused on one aspect can undoubtedly lead one astray and prone to interpretation errors. A complete analysis of all available sources and confronting them with the way of approaching life (dependencies and differences between social groups), religion and generally accepted symbolism (e.g. flowers, pearls, the hourglass, the scythe, the skull) only gives the possibility to describe them correctly and to set them in a specific epoch – among the material and spiritual culture and even the mentality of the people of the time. It should also be emphasised that one cannot abstract from written sources when analysing modern material. This is because they can shed new light and even be a signpost leading to discovering the truth about the past. In some cases, they can allow for the personalisation of a narrative by linking it to circles of people or even specific characters (Grupa 1998, 287; 2005, 54–56, 103–106; 2023, 72–77; 91–97; Grupa *et* al. 2014, 23, 60–64, 113–114; Dudziński *et al*. 2015, 16–17, 48–59, 62–66; 2017, 23–48; Grupa 2015, 194–198; 2016, 175–179; 2018, 218–222; Majewski 2015, 135, 181–203; Dudziński 2016, 184–193; Nowosad *et al*. 2021a, 50–81, 81–91; 2021b, 131; Jarosz and Grupa 2022, 82–87). However, "history is the sum of human biographies", as the British philosopher and Victorian-era historian Thomas Carlyle wrote (Jankowski 1995, 7).

References

Acten 1886 = *Acten der Ständetage Preussens unter der Herschafft des Deutschen Ordens*, 5: *(1458–1525)*, M. von Toeppen (ed.). Lepizig: Duncker and Humblot.

Ansorge J. 2018. Wolgast, Lkr. Vorpommern-Greifswald. Fpl. 93. *Bodendenkmalpflege in Mecklenburg-Vorpommern* 64, 411–425.

APGd = Archiwum Państwowe w Gdańsku

Blusiewicz K. 2009. *Warsaw footwear in the 14th–18th century. From the archaeological collection in the Historical Museum of the city of Warsaw* (= *Archeologia Dawnej Warszawy* 1). Warszawa: Muzeum Historyczne m.st. Warszawy.

Boucher F. 2012. *Historia mody. Dzieje ubiorów od czasów prehistorycznych do końca XX wieku*. Warszawa: Arkady.

Buricchi S. 2011. *Dojrzały renesans i manieryzm* (= *Wielka Historia Sztuki* 4). Warszawa: Arkady.

Ceynowa B. 2009. Problem importu obuwia w Gdańsku w 1. poł. XIV w. na przykładzie znalezisk części butów ze stan. Lastadia. In H. Paner and M. Fudziński (eds.), *Stan badań archeologicznych miast w Polsce*. Gdańsk: Muzeum Archeologiczne w Gdańsku, 389–401.

CIP 1910 = *Corpus Iuris Polonici*, 1: *Privilegia, statuta, constitutiones, edicta, decreta, mandata regnum Poloniae spectantia comprehendentis*, 4: *Annos 1523–1534 continentis*. Fasciculus 1, O. Balzer (ed.). Cracoviae: Academia Litterarum.

Czaplewski P. 1921. *Senatorowie świeccy, podskarbiowie i starostowie Prus Królewskich, 1454–1772* (= *Roczniki Towarzystwa Naukowego w Toruniu* 26–28). Toruń: nakładem Toruńskiego Towarzystwa Naukoweo, zasiłkiem Kasy im. Mianowskiego.

Czaplewski P. 1935. P. Bażyński (Baisen) Jerzy (1469–1546), wojewoda malborski. In W. Konopczyński (ed.), *Polski słownik biograficzny*, 1. Warszawa, Kraków, Łódź, Poznań, Wilno, Zakopane: Polska Akademja Umiejętności, 377.

Dachnowski J. K. 1995. *Herbarz szlachty Prus Królewskich z XVII wieku*, E. Pentek (ed.). Kórnik: Polska Akademia Nauk Biblioteka Kórnicka.

Drążkowska A. 2011. *Historia obuwia na ziemiach polskich od końca IX do końca XVIII wieku*. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika.

Dudziński T. 2016. The children of Stanisław Antoni Szczuka buried in the crypt of the Holy Virgin Mary's Church in Szczuczyn. *Archaeologia Polona* 51–52, 183–195.

Dudziński T., Grupa M., Grupa D., Krajewska M., Majorek M., Nowak M., Nowak S., Przymorska-Sztuczka M. and Wojciechowska A. 2015. *Tajemnice szczuczyńskich krypt*, 3. Grajewo, Toruń: Towarzystwo Przyjaciół 9 Pułku Strzelców Konnych w Grajewie, Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika.

Dudziński T., Grupa M. and Nowosad W. 2017. *Tajemnice szczuczyńskich krypt*, 4: *Pochówki pijarów*. Grajewo, Toruń: Towarzystwo Przyjaciół 9 Pułku Strzelców Konnych w Grajewie, Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika.

Durian-Ress S. 1991. *Schuhe. Vom späten Mittelalter bis zur Gegenwart*. München: Hirmer.

Fregolent A. 2006. *Giorgione* (= *Klasycy Sztuki* 29). Warszawa: HPS.

Goubitz O., van Driel-Murray C. and Groenman-van Waateringe W. 2001. *Stepping through the Time. Archaeological Footwear from Prehistoric Times until 1800*. Zwolle: Stiching Promotie Archaeology, Uitgevers.

Grdzelidze M. 2017. *A statistical evaluation and analysis of the results of shoes wear test metod for pilot study*, 30–34. Online publication: https://www.researchgate.net/publication/325359275_a_statistical_evaluation_and_analysis_of_the_results_of_shoes_wear_test_method_for_a_pilot_study, access: 13.10.2023.

Groth A. 1990. *Statystyka handlu morskiego portów Zalewu Wiślanego w latach 1581–1712*. Wrocław, Warszawa, Kraków: Zakład Narodowy im. Ossolińskich.

Grupa D. 2015. Silk Liturgical Garments from Priests' Graves, Excavated in St. Nicolas Parish Church in Gniew. In K. Grömer and F. Pritchard (eds.), *Aspects of the Design, Production and Use of Textiles and Clothing from the Bronze Age to the Early Modern Era. XII NESAT. The North European Symposium for Archaeological Textiles, 21st–24th May 2014 in Hallstatt, Austria*. Budapest: Archaeolingua, 193–199.

Grupa D. 2016. Grave gowns from children burials from the 16th–18th centuries. *Archaeologia Polona* 51–52, 173–181.

Grupa D. 2018. Pochówki księży w kościele pw. św. Mikołaja w Gniewie – badania archeologiczne 2014 r. In M. Fudziński (ed.), *II i III Pomorska Sesja Sprawozdawcza za rok 2012 i 2014*. Gdańsk, Łódź: Muzeum Archeologicne w Gdańsku, Instytut Archeologii Uniwersytetu Łódzkiego, 217–224.

Grupa M. 1998. Textiles from the 16th–18th century from the benedictine in Lubiń, Leszno voivodeship. In L. Bender Jørgensen and Ch. Rinaldo (eds.), *Textiles in European Archaeology. Report from the 6th NESAT Symposium, 7–11th May 1996 in Borås* (= *Gotarc Series A*, 1). Göteborg: Göteborg University, 277–281.

Grupa M. 2005. *Ubiór mieszczan i szlachty z XVI–XVIII wieku z kościoła p.w. Wniebowzięcia Najświętszej Marii Panny w Toruniu*. Toruń: Wydawnictwo Uniwersytetu Mikołaja Kopernika.

Grupa M. 2012. *Wełniane tekstylia pospólstwa i plebsu gdańskiego (XIV–XVII w.) i ich* konserwacja. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika.

Grupa M. 2016. Koronki i wstążki – moda czy prestiż? In E. Wółkiewicz, M. Saczyńska and M. R. Pauk (eds.), *Habitus facit hominem. Społeczne funkcje ubioru w średniowieczu i w epoce nowożytnej*. Warszawa: Niemiecki Instytut Historyczny, Instytut Archeologii i Etnologii Polskiej Akademii Nauk, 179–190.

Grupa M. 2019. Not only socks were darned – secondary textile usage as a source of material culture studies. *Fasciculi Archaeologiae Historicae* 32, 165–187.

Grupa M. 2022. *Czas żupanów, czas czechmanów. Strój polski w źródłach archeologicznych, ikonograficznych i pisanych*. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika.

Grupa M. 2023a. Jedwab w Polsce – od Wikingów po rozbiory. In S. Galij-Skarbińska and M. Damazyn (eds.), *Historia zawsze bliska. Księga pamiątkowa ofiarowana*

Profesorowi Wojciechowi Polakowi. Toruń: Wydawnictwo Adam Marszałek, 219–258.

Grupa M. 2023b. Relikty nowożytnych modlitewników z badań archeologicznych w kościele św. Mikołaja w Gniewie. In W. Zawadzki (ed.), *Książka w Prusach Królewskich*. Pelplin: Bernardinum, 231–257.

Grupa M., Grupa D., Kozłowski T., Krajewska M., Majorek M., Nowak M., Nowak S., Przymorska-Sztuczka M., Wojciechowska A. and Dudziński T. 2014. *Tajemnice szczuczyńskich krypt*, 2. Grajewo, Toruń: Towarzystwo Przyjaciół 9 Pułku Strzelców Konnych w Grajewie, Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika.

Grupa M. and Kozłowski T. 2023 [in print]. Two children and two pairs of shoes. Analysis of footwear relics from the crypt in the church in Radzyń Podlaski (18th –19th c. Poland).

Grupa M., Kozłowski T., Jankauskas R., Grupa D., Krajewska M., Krakowska S., Majorek M., Mosiejczyk J., Nowak M., Nowak S., Przymorska-Sztuczka M. and Wojciechowska A. 2015. *Tajemnice krypty w kaplicy św. Anny* [*Secrets of the crypt in St. Ann chapel*]. Gniew: Centrum Aktywnych Gniew.

Grupa M. and Łukaszewicz J. 2019. Silk band and metal appliqués of a child bonnet from the northern crypt of the parish church in Gniew. *Analecta Archaeologica Ressoviensia* 14, 137–153.

Grupa M. and Nowak M. 2017. Wianki jako element wyposażenia grobowego. *Acta Universitatis Nicolai Copernici. Archeologia* 35, 159–172.

Grupa M. and Warecka O. 2018. Wybrane różańce z badań w kościele parafialnym pw. św. Mikołaja w Gniewie. *Rydwan* 13, 31–42.

Gutaker K. 1993. *Tęczyński. Dramatyczne dzieje bałtyckiego dyplomaty*. Warszawa: Wydawnictwo Naukowe PWN.

Harjula J. 2008. *Before the Heels. Footwear and Shoemaking in Turku in the Middle Ages and at the Beginning of the Early Modern Period* (= *Archaeologia Medii Aevi Finlandiae* 15). Turku: Suomen keskiajan arkeologian seura.

Jankowski J. 1995. *Monarsze sekrety*. Wrocław: Toporzeł.

Jarosz J. and Grupa M. 2022. Kontush Sashes from the Northern Crypt of the post-Bernardine Church of the Elevation of the Cross in Łuków (Lublin Province). *Analecta Archaeologica Ressoviensia* 17, 81–88.

Jarzęcki K. and Grupa D. 2020. Szelągi miejskie w Prusach Królewskich w latach 1658–1766 w świetle badań archeologicznych kościoła pw. św. Mikołaja w Gniewie. *Pomorania Antiqua* 29, 245–266.

Kiss V., Spekner E. and Végh A. (eds.) 2018. *Szívmelengető középkor. Kályhák és kályhacsempék a középkori Magyarorszaágon, 14–16. század. Kiállítási katalógus*. Budapest: Történeti Múzeum és szerzők.

Kozakiewicz H. 1978. *Renesans i manieryzm w Polsce*. Warszawa: Wydawnictwa Artystyczne i Filmowe.

Kozina I. 2017. *Historia mody*. Warszawa: Wydawnictwo SBM.

Kozłowski T. and Grupa M. 2019. Cognitive Values of Ossuaries from the Cemetery and the Church of St. Nicolas in Gniew, Poland. *Fasciculi Archaeologiae Historicae* 32, 33–51.

Kozłowski T., Grupa M. and Dabralet I. 2023 [in print]. Shoes and feet – size, shape and traces of wear on leather soles from old Elbląg (15th c. Poland).

Loret M. 1929. Polskie pielgrzymstwo naukowe w Rzymie od XVI–XVIII w. (Karta z dziejów kultury i nauki w Polsce). *Nauka Polska* 11, 131–173.

Majewski M. 2015. *Renesansowe kafle zachodniopomorskie. Studium z historii ogrzewania wnętrz mieszkalnych*. Stargard, Szczecin: Muzeum Archeologiczno-Historyczne w Stargardzie.

Majorek M. and Grupa D. 2014. Wybrane nowożytne pasamony z krypty południowej kościoła pod wezwaniem św. Mikołaja w Gniewie. In M. Bis and W. Bis (eds.), *Rzeczy i ludzie: kultura materialna w późnym średniowieczu i w okresie nowożytnym. Studia dedykowane Marii Dąbrowskiej*. Warszawa: Wydawnictwo Instytutu Archeologii i Etnologii Polskiej Akademi Nauk, 335–348.

Małłek J. 1976. *Prusy Książęce a Prusy Królewskie w latach 1525–1548. Studium z dziejów polskiej polityki księcia Albrechta Hohenzollerna*. Warszawa: Państwowe Wydawnictwo Naukowe.

Mikulski K. (ed.). 1990. *Urzędnicy Prus Królewskich XV–XVIII wieku. Spisy* (= *Urzędnicy Dawnej Rzeczypospolitej XII–XVIII wieku* 5/2). Wrocław, Warszawa, Kraków: Zakład Narodowy im. Ossolińskich, Wydawnictwo Polskiej Akademii Nauk.

Mross H. 1997. *Dzieje parafii Gniew od XIII wieku do 1939 r*. Pelplin: Bernardinum.

MRPS 1910 = *Matricularum Regni Poloniae summaria, excussis codocibus, qui in Chartophylacio Maximo Varsoviensi asservantur*, 4: *Sigismundi I regis tempora complectens (1507–1548)*, 1: *Acta Cancellariorum, 1507–1548*, T. Wierzbowski (ed.). Varsoviae: typis Officinae C. Kowalewski.

Nowak S., Grupa M. and Wojciechowska A. 2015. Prezbiterium kościoła pw. św. Mikołaja w Gniewie miejscem pochówku elity gniewskiej. In A. Janowski, K. Kowalski, B. Rogalski and S. Słowiński (eds.), *XIX Sesja Pomorzoznawcza, Szczecin 21–22 listopada 2013 r.* (= *Acta Archaeologica Pomoranica* 5). Szczecin: Stowarzyszenie Naukowe Archeologów Polskich. Od-

dział w Szczecinie, Muzeum Narodowe w Szczecinie, Muzeum Archeologiczno-Historyczne w Stargardzie, 425–439.

Nowosad W. 2014. *Konopaccy herbu Odwaga – dzieje pomorskiej rodziny senatorskiej w XV–XVIII wieku* (= *Szlachta i Ziemiaństwo na Ziemiach Dawnej Rzeczypospolitej*). Warszawa: DiG.

Nowosad W. and Grupa M. 2020. Ubiory kobiece z terenu Prus Królewskich z XVI–XVIII w. – źródła pisane i archeologiczne. In W. Zawadzki (ed.), *Kobiety w Prusach Królewskich*. Pelplin: Bernardinum, 235–267.

Nowosad W., Grupa M., Kozłowski T., Nalaskowski F., Grupa D., Kulesz A., Openkowski R., Dobek M., Majorek M. and Michalik J. 2021a. *W źródłach utrwalone – krypty w Końskowoli*. Końskowola, Łódź: Towarzystwo Ochrony Dziedzictwa Kulturowego Fara Końskowola, Instytut Archeologii Uniwersytetu Łódzkiego.

Nowosad W., Grupa M., Nalaskowski F. and Grupa D. 2021b. Polnische Nationalidentität im Spiegel der traditionellen polnischen und westlichen Trachten. Das Phänomen der intergenerationellen Wandlung des Modestils in der ersten Hälfte des 18. Jahrhunderts. In B. Dybaś and J. Bojarski (eds.), *Gruppenidentitäten in Ostmitteleuropa, auf der Suche nach Identität* (= *Geschichte im mitteleuropäischen Kontext* 2). Göttingen: Vandenhoeck & Ruprecht Verlage, 117–142.

Pawlak M. 1988. *Studia uniwersyteckie młodzieży z Prus Królewskich w XVI–XVIII w*. Toruń: Wydawnictwo Uniwersytetu Mikołaja Kopernika.

Pérez Sánchez A. E. 1999. *Muzeum Prado* (= *Wielkie Muzea Świata*). Warszawa: Muza.

Pratt L. and Woolley L. 2008. *Shoes*. London: V&A.

Puškorius A. 2012. Renaissance footwear as a mark of social differentiation. *Archaeologia Baltica* 17, 158–170.

Rublack U., Hayward M. and J. Tiramani (eds.). 2015. *The First Book of Fashion. The Book of Clothes of Matthäus & Veit Konrad Schwarz of Augsburg*. London: Bloomsbury Publishing.

Schäfer H. 2021. Hansestadt Greifswald – Archäologische Untersuchungen in den Hofbereichen der Grundstücke Steinbeckerstrasse 26 und 27. *Bodendenkmalpflege in Mecklenburg-Vorpommern* 67, 69–155.

Strzelecka I. 1982. *Gniew*. Wrocław, Warszawa, Kraków, Gdańsk, Łódź: Zakład Narodowy im. Ossolińskich.

Turnau I. 1986. Ubiór jako znak. *Lud* 70, 67–83.

Tylicki J. 2005. *Rysunek gdański ostatniej ćwierci XVI i pierwszej połowy XVII wieku*. Toruń: Wydawnictwo Uniwersytetu Mikołaja Kopernika.

Véniel F. 2008. *Le costume médiéval de 1320 à 1480*. Bayex: Heimdal.

Wegner M. 2012. Ein renaissanceziitlicher Kachelkomplex aus Stralsund – Rekonstruktionzatz der Kachelserien. *Bodendenkmalpflege in Mecklenburg-Vorpommern* 59, 199–249.

Wojciechowska A. 2014. Prezbiterium jako miejsce pochówku szlachty i duchowieństwa – na podstawie badań archeologicznych w kościele p.w. św. Mikołaja w Gniewie, unpublished manuscript in the archive of the Nicolaus Copernicus University in Toruń.

Zabuska K. 2009. *Kolekcja Jacoba Kabruna. Ryciny szkoły niemieckiej od końca XV do początku XIX wieku*, IV.1: 1(1) (= *Zbiory Muzeum Narodowego w Gdańsku*). Gdańsk: Muzeum Narodowe w Gdańsku.

Žegklitz J. 2014. Reformační kamna ze Špýru, Egerberku a Prahy. *Archeologické rozhledy* 66(3), 515–547.

Zins H. 1967. *Anglia a Bałtyk w drugiej połowie XVI wieku. Bałtycki handel kupców angielskich z Polską w epoce elżbietańskiej i Kompania Wschodnia* (= *Prace Wydziału Humanistycznego. Monografie – Lubelskie Towarzystwo Naukowe* 1). Wrocław, Warszawa, Kraków: Zakład Narodowy im. Ossolińskich.

Zuffi S. 2006. *Wielki słownik malarzy*, 1: *A–Dek* (= *Klasycy Sztuki* 41). Warszawa: Rzeczpospolita.

Zuffi S. 2017. *Dürer* (= *Wielcy Malarze* 16). Warszawa: Endipresse Polska S.A.

Żołnierz 1960 = *Żołnierz polski. Ubiór, uzbrojenie i oporządzenie od wieku XI do roku 1960. Wieki XI–XVII*. Warszawa: Wydawnictwo Ministerstwa Obrony Narodowej.

https://www.alamy.com/stock-photo/weisskunig.html?sortBy=relevant, access: 13.08.2023

https://pl.pinterest.com/pin/742390319813821929/, access: 13.08.2023

https://www.posterazzi.com/minting-coins-c1515-nthe-minting-of-coins-woodcut-german-by-hans-burgkmair-c1515-poster-print-by-granger-collection-item-vargrc0091729/, access: 23.07.2022

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

Beata Miazga[1], Dawid Grupa[2], Małgorzata Grupa[3]

DOI: 10.15584/anarres.2023.18.13

[1] Institute of Archaeology, University of Wrocław, Szewska 48, 50-139 Wrocław, Poland;
e-mail: beata.miazga@uwr.edu.pl; ORCID: 0000-0003-3714-1889

[2] (private);
e-mail: d.m.grupa@gmail.com; ORCID: 0000-0002-6393-8528

[3] Institute of Archaeology, Nicolaus Copernicus University in Toruń, Szosa Bydgoska 44/48, 87-100 Toruń, Poland;
e-mail: m.grupa@wp.pl; ORCID: 0000-0001-5128-9754

Results of Archaeometrical Studies on a Kontush Sash from Piaseczno (Pomorskie Province, Poland)

Abstract

Miazga B., Grupa D., Grupa M. 2023. Results of Archaeometrical Studies on a Kontush Sash from Piaseczno (Pomorskie Province, Poland). *Analecta Archaeologica Ressoviensia* 18, 205–215

Archaeometric studies on silk thread wound around with metal strips are still rarely undertaken in Poland. Their popularization seems to be necessary, however, as there are many problems to solve. In the case of a *kontush* sash manufactured in Gdańsk as archaeological finds, the main question is whether they used metal strips prepared by local craftsmen, what raw material was employed, and what methods of gilding were implemented. Only future regular studies and analyses can answer these questions. The article presents the results of tests on metal strips wound around silk threads coming from a *kontush* sash manufactured by Besch, excavated in the crypt under the presbytery of the church of the Nativity of the Blessed Virgin Mary in Piaseczno (Pomorskie voivodeship, Poland).

Keywords: silk thread with metal, *kontush* sash, crypt, Piaseczno, Poland, X-rays, SEM

Received: 16.08.2023; **Revised:** 15.09.2023; **Accepted:** 17.10.2023

Introduction

Studies on fabrics decorated with metal thread, which were initiated in the second half of the 20th century, stem from various motivations, both cognitive and conservation-based. As a result, we can observe technological and material variety in threads with metal braiding. Textiles are made of thread combined with metal wire or flat tins and bands (Rezic *et al*. 2010; Balta *et al*. 2015; Miazga *et al*. 2018, 68–76; Grupa and Łukaszewicz 2019, 141–151; Miazga and Grupa 2023, 165–169). The first were made completely of metal, while tin ones can have a metal or animal product base (leather, parchment) or vegetable (paper). The metals employed also vary, e.g. they can have an external coating of gold or silver (Enguita *et al*. 2002; Járó 2009). Techniques for making this type of thread were already known in China before they were employed in Europe, with gold ribbons being used to decorate textiles from at least the 2nd century BC. The earliest examples were found in Han tombs at Man-Ch'eng in China (Karatzani 2012, 4). In European sites, fabrics with metal braided threads can be dated to the late 5th century AD (Crowfoot and Chadwick Hawkes 1967, 44–57; Grupa 2016, 179). However, it is difficult to establish the time at which they began to be produced in Byzantium. However, the turn of the 7th/8th century seems to be acceptable in the history of the production of these luxury wares. The Byzantine Empire's trade contacts with Europe allowed peoples from the North to become familiar with silk fabrics. In Poland, silk fabrics (both plain and patterned) appeared at the turn of the 10th/11th century (Maik 1988, 86; 1991, 69; Grupa 2013, 304). They were mostly silk ribbons with a pattern shaped with thread in a metal braid found in the grave furnishings of representatives of the elite

of the time (Bielniak *et al*. 1961, 1–100; Grupa 2007a; 2009, 215–217; 2018a, 245–253; 2020, 367–375; Cybulska *et al*. 2018, 735–799; Grupa and Kozłowski 2022, 88–94). It is assumed that most of these were delivered overland via Rus by the Vikings (Grupa 2007b, 278; 2023, 226).

The most probable and frequently used route in southbound journeys and back was the land one known as the *Northern Arc*, leading from the caliphates through the Khazaria Khaganate, southern and northern Rus (with Old Ladoga as the main emporium), the Gulf of Finland and farther within the Baltic Sea basin, both north and southbound (Frankopan 2015, 136–152; Bogucki 2018, 179). Along these routes, so-called hoards were recorded in many places which included silver Arabian coins – dirhams (Bogucki 2018, 162–163; Grupa 2020, 375). The southeastern borders of the Polish-Lithuanian Commonwealth have always been the gateway to Eastern styles. Around the end of the 15th century, the typical Polish nobleman's costume began to take shape, one in which belts made of various raw materials (leather, metal, textiles) played no small role. However, it was silk belts that became the main accessory of this outfit. They were imported from Persia and Turkey, among others, and in the 2nd half of the 18th century began to be produced in the Polish-Lithuanian Commonwealth. The value of a single belt was influenced by the amount of metal thread in the silk fabric. Therefore, they were valued based on their weight (Grupa 2005, 92–94). The brilliance of these items of clothing was the best showcase of wealth and membership in the highest social group in the Polish-Lithuanian Commonwealth. Archaeometric analyses need to be carried out prior to conservation treatments in order to adopt appropriate cleaning procedures and ensure the adequate protection of corroded metal elements and textile thread cores.

Both research objectives were completed by applying physicochemical methods, often used while examining historical objects due to their non-destructive and non-invasive character. The first group includes microscopic observations with the use of stereo microscopes, or metallographic or X-ray fluorescence spectrometers (Janssens *et al*. 2000, Fitzgerald 2008; Kylafi *et al*. 2017). The same methods have been applied for many years to studies of various textiles (Good 2001; Brandt and Allentoft 2019; Suomela *et al*. 2022, Vanden Berghe *et al*. 2023). Other analytical techniques, limited by the sizes of tested samples, generally require taking about 5 mm of thread from a tested textile and frequently its further processing (e.g. plunging it in resin) (Járó 2009; Balta *et al*. 2015). Low invasive methods include observations in scanning electron microscope, SEM (thread cross sections), PIXE analyses (analyses of proton induced X-rays) or X-ray microprobes (induced by X-rays combined with SEM).

Samples and the goal of the tests

The present article describes the non-destructive measuring devices applied while studying a historical *kontush* sash from Piaseczno, Pomorskie voivodeship, in order to estimate the type of material used to wind around silk threads which shaped the pattern on the object, as well as the method of manufacturing. The aim of our research was a technological study connected with the identification of the raw materials used as well as further consideration on a number of topics, e.g. the skills of the ancient craftsman in question, past fashion, trade contact and the provenance of the *kontush* sash.

The sash was excavated during archaeological-architectonic explorations in the crypt under the presbytery of the church of the Nativity of the Blessed Virgin Mary in Piaseczno (Pomorskie voivodeship, Poland). It was found in mixed layers in the crypt pugging (human remains, fragments of clothes made of silk, wooden coffins and their metal handles, soil) (Grupa 2018b, 33–36; 2022, 157–161). The sash was probably made in the Besch tapestry workshop in Gdańsk, which operated from 1770 to 1790. The workshop differed in its production from other Polish sash ornaments, since it placed in the sash heads an image of a window divided with a vertical slat, decorated from above with a ruffled curtain (Fig. 1). The windowsill was equipped with two flower bunches in vases (Kałamajska-Saeed 1987, 42–43; Majorek 2013, 206, 208). A large part of the sash has been preserved, with particular fragments having lengths of 97, 66, 32 cm and a width 29.5 cm (Grupa 2022, 157).

Research method

Spectroscopic tests were made using a table X-ray fluorescence spectrometer with energy dispersion (ED-XRF), in a Spectro Midex device, with a molybdenum X-ray tube and semiconducting detector (SDD with Peltier cooler). The device works in the air. Excited state energy is 44.7 kV, amperage – 0.4 mA. Semi-quantitative analyses were made using analytical procedure of Fundamental Parameters and microscopic

Fig. 1. The Piaseczno *kontush* sash. Digits 1–4 mark the tested fragments (photo by B. Miazga).

observations using metallographic microscope Nikon Eclipse LV100, with magnification of 50×. Software NIS Elements makes possible to register picture and analytical procedures (thread length and diameter) (Miazga 2017, 85–88; 2018, 162).

Research results

The *kontush* sash was divided into four analytical spheres, where the first was its head with an ornament shaped with silk thread wound around a metal strip which was golden in color on a dark olive textile. The present colors can be misinterpreted, as this sash part could have originally been blue (Grupa *et al.* 2014, 60). The second – the same ornamented sash end, but clearly brighter part and very damaged textile (olive – beige color at present). The third – tassels fastened to one end and the fourth – the sash part without any decoration (Fig. 1).

In the first tested area (Tab. 1), metal braid was made of material with nearly 95% silver content (average 94.6%), with comparable amounts of gold (1.7%) and copper (1.3%). The minor participation of zinc (0.3%) and nearly 1% of iron were also identified. XRF spectrum also revealed traces of lead and no signals of mercury (Fig. 2). For threads chosen randomly in that area extra tests were made to define the method of gilding. A 5 mm strip was removed under a microscope from the thread fragment (Fig. 3). The microscopic picture presents two strip fragments, one seen from the external part and the other from the internal part. The internal part of the second fragment is magnified 200×. We identified the internal part as an arched concave surface with textile fibers attached to it. The area seen in Figure 3a–c was tested spectrally, which resulted only in qualitative data, caused by the small braid size seen in Figure 3 (on average 100-120 μm, i.e. 0.1 mm) and the volume of the X-ray beam being 0.7 mm. Spectrum picture interpretation ED-XRF certifies the presence of silver and gold, and these signals are well readable (Fig. 4), indicating two-sided strip gilding.

Table 1. Metal contents in tested sample no 1 from the *kontush* sash

Elements	Ag	Au	Cu	Zn	Fe	Other	Total
%	94.6	1.7	1.3	0.3	1.0	1.1	100

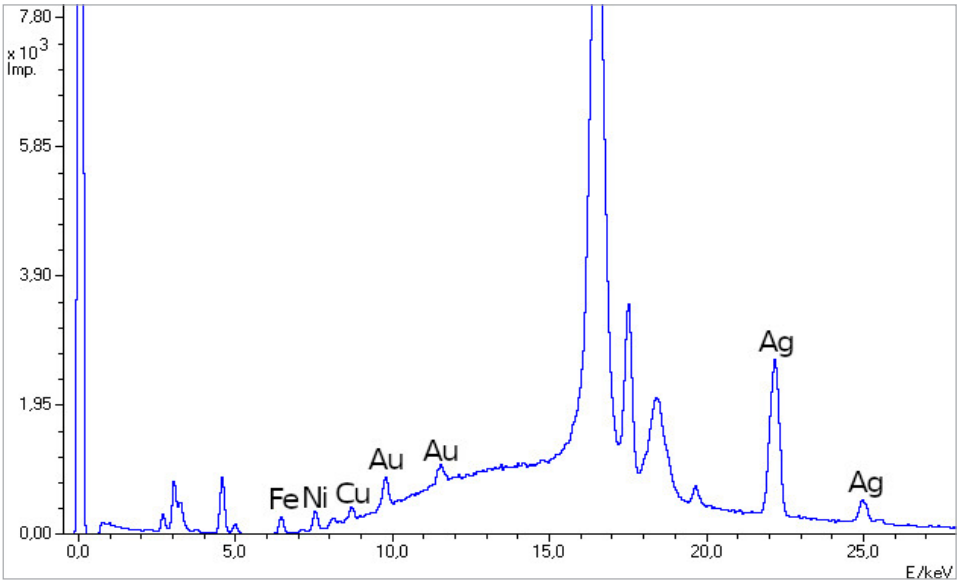


Fig. 2. ED-XRF spectrum of the metal thread ornamenting in the *kontush* sash, section no. 1 (photo by B. Miazga).

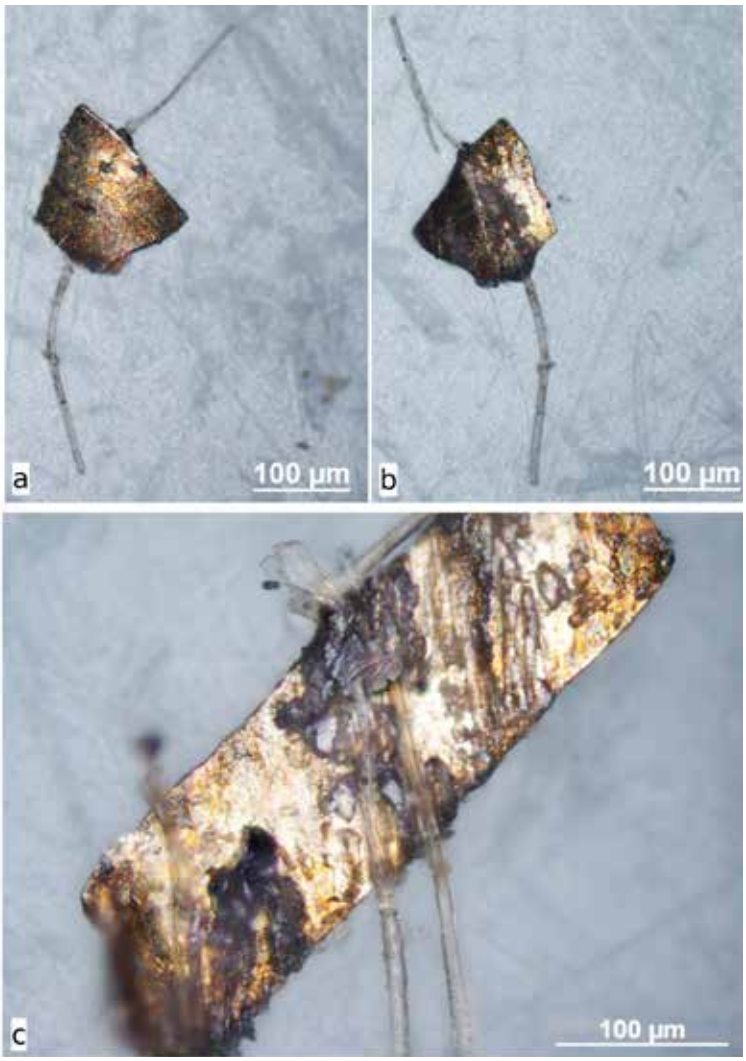


Fig. 3. Microscopic picture of the thread fragments: external (a) and internal (b, c) surface (photo by B. Miazga).

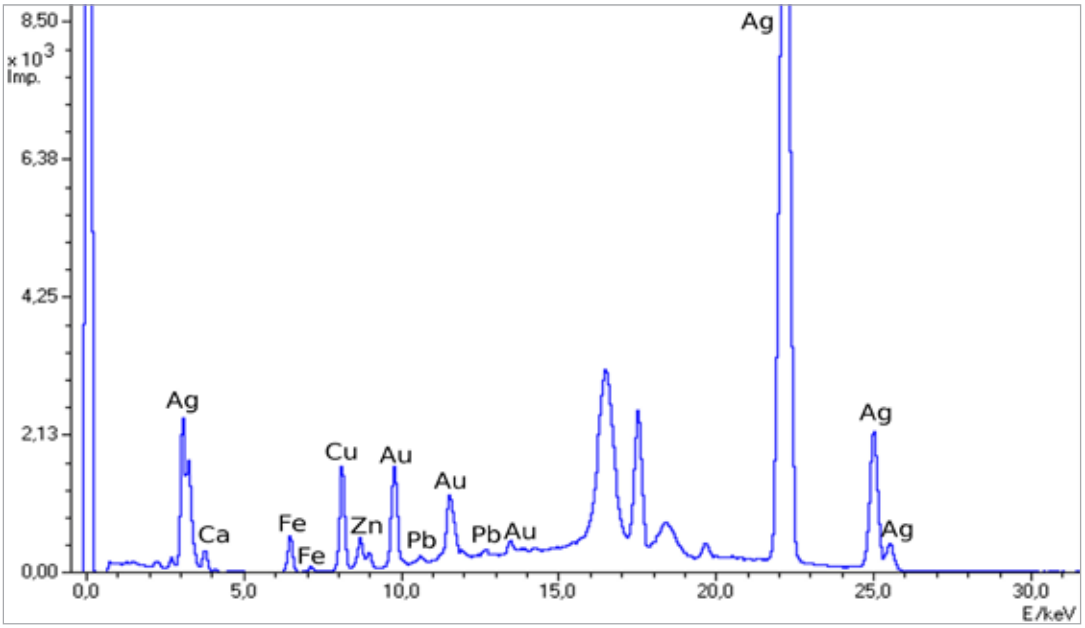


Fig. 4. ED-XRF spectrum of the metal thread (the area seen in fig. 4a–c) (photo by B. Miazga).

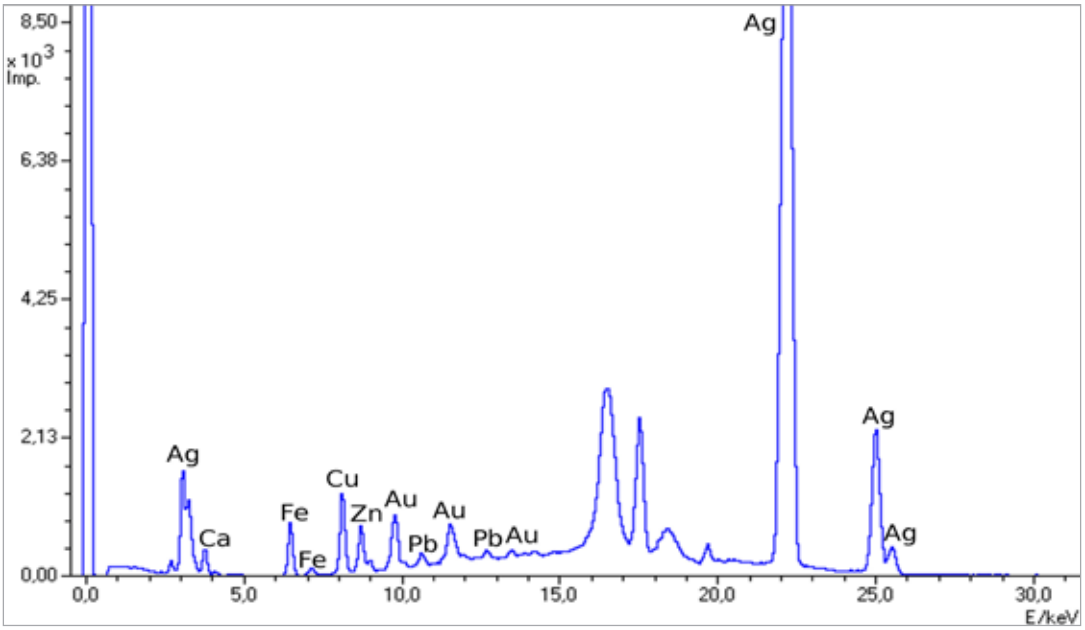


Fig. 5. ED-XRF spectrum of the metal thread ornamenting the *kontush* sash, section no. 2 (photo by B. Miazga).

Analyzing the data collected from the second section examined (Tab. 2, decoration on the bright damaged section of the textile) we obtained confirmation of the difference in the material used. Figures indicate 94.9% of silver, with 1.1% of copper contents, 0.5% of zinc, 1.3% of iron and only 0.6% of gold (Fig. 5). The comparison of the signal intensity of both tested ornaments confirms univocally semiquantitative data results: gold peaks in decoration on the thick dark olive textile are over twice that of the Kα 1line with 9.7 keV (Fig. 6). This clearly lower gold concentration was also identified by means of microscope analysis. Figure 7 compares microscopic pictures of metal wound around threads in both tested sections. When observed carefully, we can see a golden glow on the band from section 1, in particular on the thread adjacent surfaces, while metal threads ornamenting the thinner textile have a silver reflection along all the strip. Metrical exams of the strips indicated differences in metal threads from areas no 1 and 2. Average braiding width

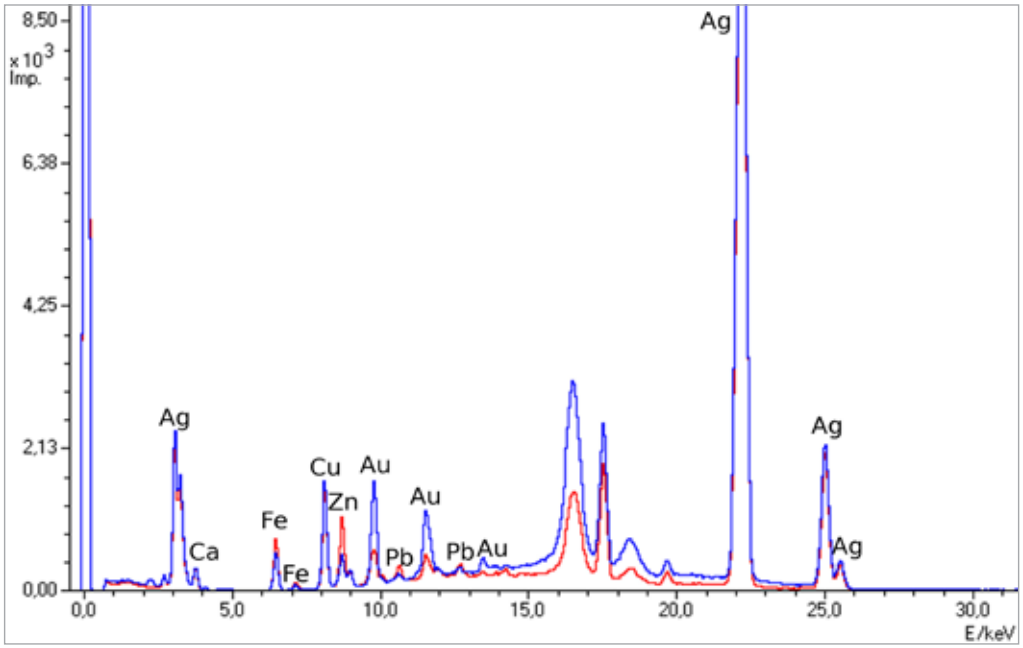


Fig. 6. Comparing ED-XRF spectra of metal threads from section no. 1 (blue line) with section no. 2 (red line). Visible differences in signals of gold and zinc intensity (photo by B. Miazga).

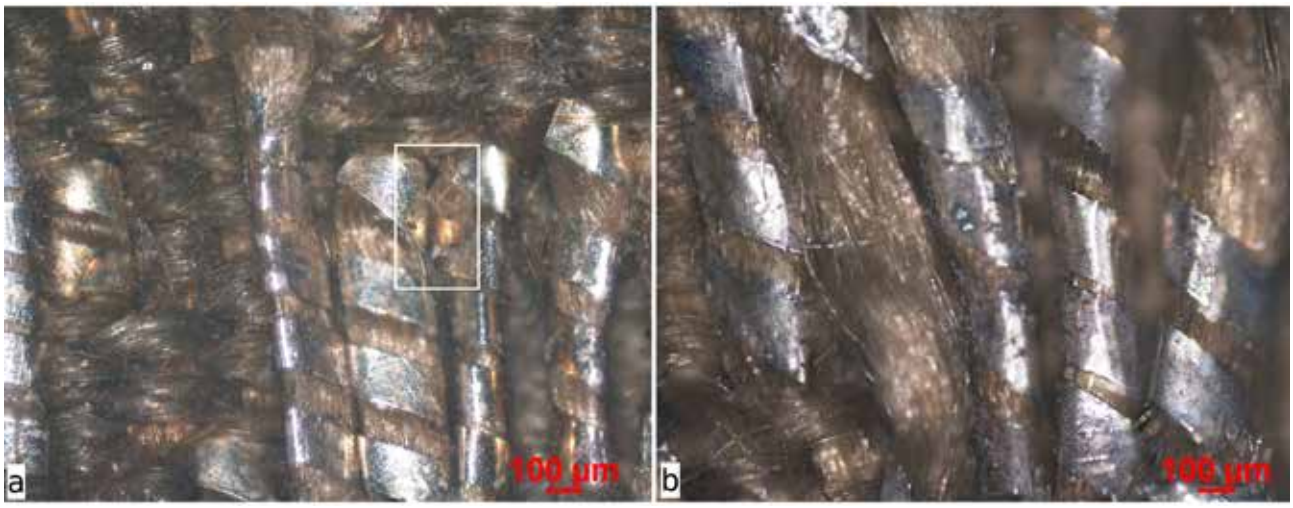


Fig. 7. Comparing thread metal braiding. The white frame matches the golden glow preserved on thread braiding in section no. 1 (a) and no. 2 (b) (photo by B. Miazga).

in fragment no 1 was 125.6 µm. Conducting analyzes of five neighboring threads, we collected the following data 134.3; 131.1; 145.8; 127.3 and 136.4 µm. Similarly, the average braid shift for the same five threads was marked, obtaining different numbers: 109.2; 43.5; 79.9; 119.5; 96.6 µm. Medium thread width was 247.3 µm (we cannot speak about thread diameter in this case, because they were rolled in a mangle and do not have a circular cross-section). Studying the second area, due to the poor state of preservation, we were not able to make analyzes of five neighboring threads (Fig. 8). Collected data was averaged: braiding width – 213 µm; braiding shift – 75.9 µm (for threads without braid loss) and 136.9 µm (for threads with two braids loss identified). The width of thread with braiding was 189.4 µm.

Table 2. Metal contents in tested sample no 2 from the *kontush* sash

Elements	Ag	Au	Cu	Zn	Fe	Other	Total
%	94.9	0.6	1.1	0.5	1.3	1.6	100

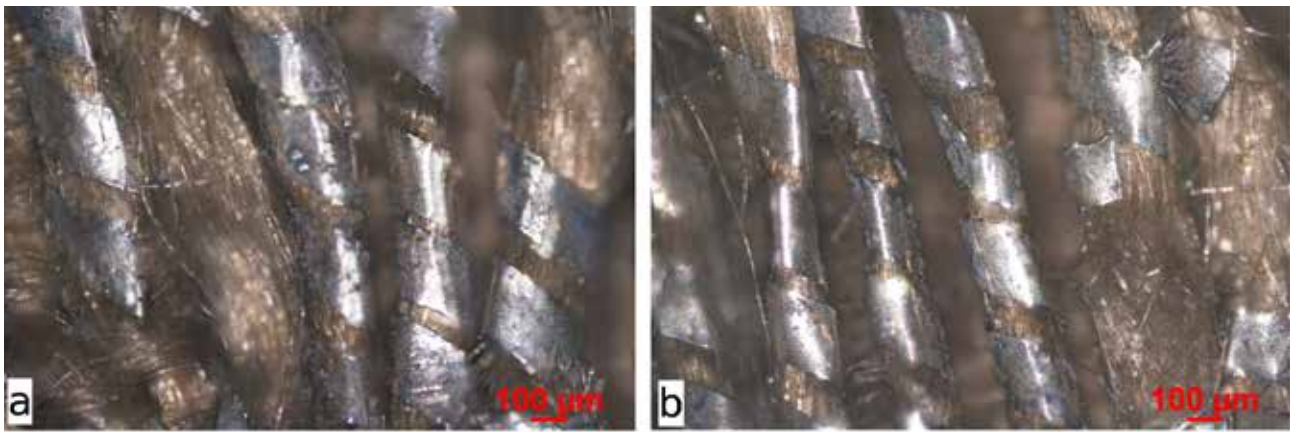


Fig. 8. Microscopic picture of metal threads (section no. 2), showing the best condition of braiding: its loss (a) and the tape damages and folds (b) (photo by B. Miazga).

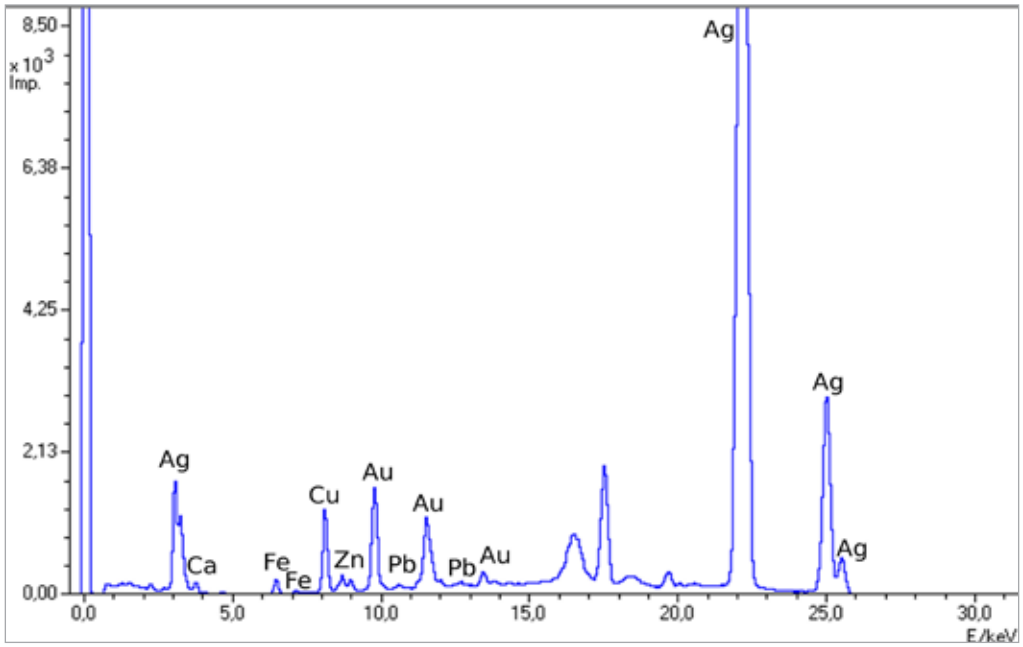


Fig. 9. ED-XRF spectrum of tassels from the sash (section no. 3) (photo by B. Miazga).

The examined tassels were fastened to short sash ends (section no 3 in Fig. 1; Tab. 3) indicating that they were made of material containing silver (95.7%) and 1.6% of gold, nearly 1% of copper, 0.4% of iron and 0.1% of zinc (Fig. 9). Spectrum analysis also shows the minor participation of lead, reported as weak peaks. Neither mercury (characteristic for fire-gilding), nor bromine (silver corrosion product) were identified in the spectrum. The microscopic picture of tassel threads confirms their relatively good condition, braid preservation, and their metal glow with a silver-golden color. The golden glow is particularly clear in places that were not exposed to mechanical damage (rubbing out of the gold layer during the object's use), as presented in Figure 10. Metrical analysis for this sash section shows an average braiding tin width of 209.1 µm in the tassel fastening place and 201.3 µm in their loose threads. Average braiding shift is respectively: 66.8 µm and 100.4 µm. The estimation of the diameter of the textile thread core gave results as follows: 150 µm (tassel fastening) and 240 µm (loose thread). It indicates that probably two different threads were used to make the tassels.

Table 3. Metal contents in tested sample no 3 from the *kontush* sash

Elements	Ag	Au	Cu	Zn	Fe	Other	Total
%	95.7	1.6	1.0	0.1	0.4	1.2	100

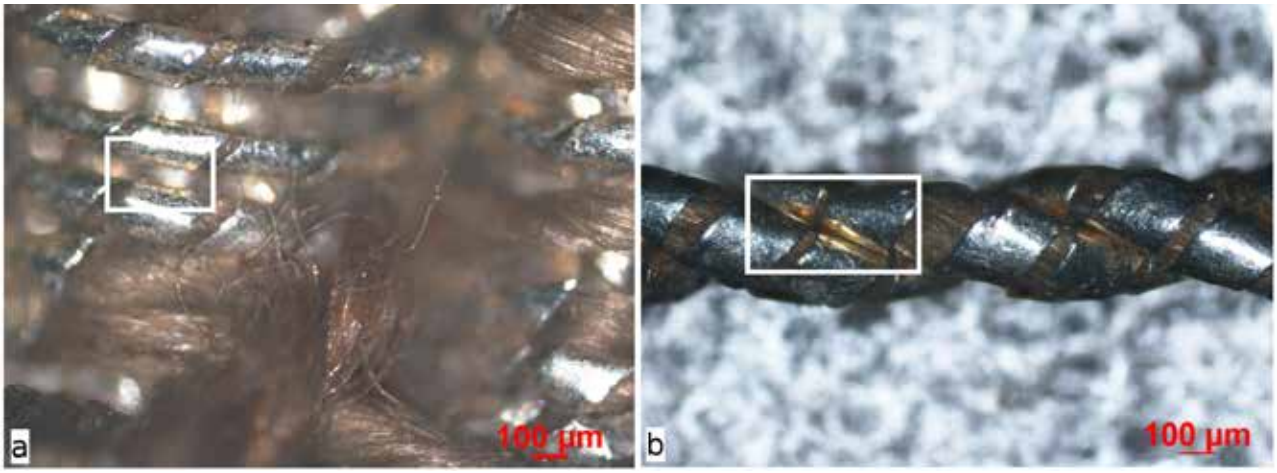


Fig. 10. Microscopic picture of tassels metal threads. The white frame matches the golden glow visible on the metal braiding of the tassels where they were fastened to the sash (a) and loose threads (b) (photo by B. Miazga).

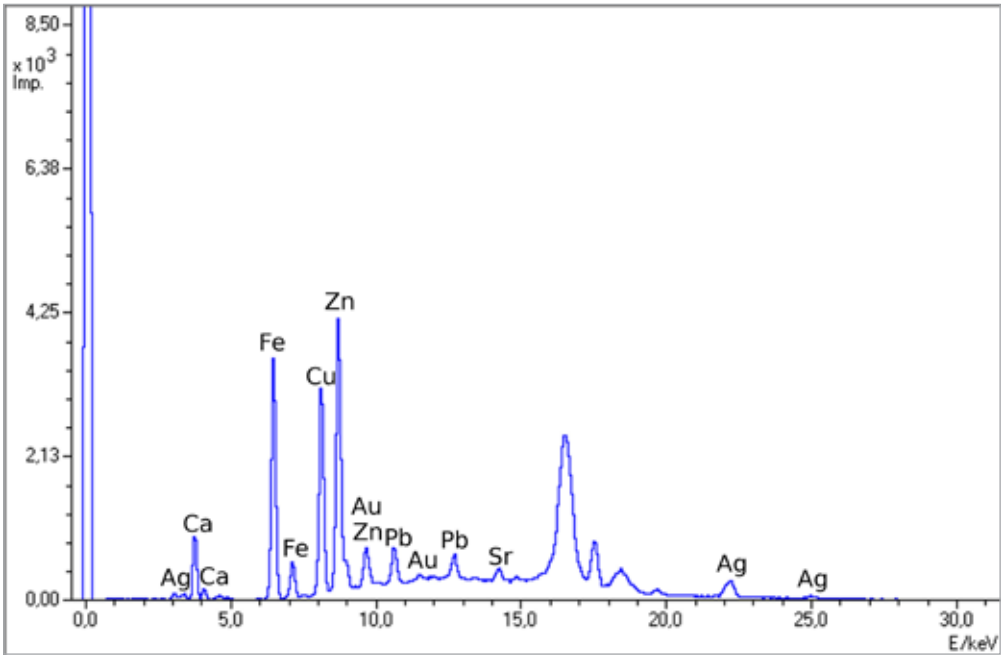


Fig. 11. Spectrum ED-XRF of textile not decorated with metal thread (section no. 4) (photo by B. Miazga).

The textile fragment deprived of any decorations was the last examined section (Fig. 1 – place no 4), analyzed to define the background (base elements level in textile) for metal threads and their contamination. The highest spectrum intensity signals were registered for iron and calcium, followed by copper, zinc, lead, and silver (Fig. 11). It confirms the hypothesis of textile contamination with these metals from objects deposited in the crypt. Metals from braiding oxidizing selectively gained in volume, thus contaminating the textile. Elements present in the textile deposition environment, such as iron and calcium, were also deposited on fibers.

Conclusions

Archaeometric studies of textiles are still rare and are usually conducted on single objects, hence it is difficult to make general conclusions about both Polish and European production (Grupa *et al.* 2014, 60). However, even single analyses provide important data on the production of objects. Archaeometric (spectral and microscopic) studies have shown that the thread braid is entirely of metal, being made of gilded silver. They also demonstrated the use of various materials in different parts of the sash.

The thread condition was relatively good (with the exception of the decoration on the bright part of

the textile – area marked no 2), and a metallic glow was readable in all of the tested places. Natural silver ore was probably used, as confirmed by the lack of lead. Because the artefact comes from the end of 18th century, the manufacturers were able to employ advanced technologies of obtaining pure silver, without the admixture of lead from intermediate processes (Nord and Tronner 2000; Tronner *et al.* 2002; Miazga 2018, 162–165; Miazga *et al.* 2018, 68–76). The analyzed material did not reveal any mercury signals, thus rather excluding the fire-gilding method (we use "rather" than "certainly", because gold signals are not the strongest, and minor traces of mercury accompanying gold can be placed beyond spectrometer detection). Gold coated the metal strip surfaces and it was rubbed out systematically during the use of the sash, as can be observed in the unevenness of the surface color of the metal. Metal strips used to wind threads, both in the basic sash part and in the tassels, was made of complete metal element – tin band – which can be obtained by wire flattening (Járó2009).

The iron might have come from other artefacts present in the crypt layers, something which was also mentioned in other publications (Balta *et al.* 2015; Miazga 2018, 161–165). In this case, other materials (metal, organic), which can often be identified in threads of similar construction, were eliminated. Non-invasive textile tests did not enable the estimation of whether the gilding was one-sided or coated on both sides of a silver core. Analyses of silk threads from the Piaseczno sash confirms that threads gilded on both sides are much more frequent finds than only one-sided ones in 17th and 18th centuries examples (Tronner *et al.* 2002). The gold coating technique might be related to the use of gold foil covering a silver base with/without the use of integrating agents and the mechanical fastening both foils by flattening them.

Using x-ray fluorescence spectrometer with excitation energy of over 40kV helped not only to examine the gilded surface, but also the silver base. The rather poor condition of the gilding, being a result of the long use of the sash, was sufficient enough to identify the base of metal coating.

As remarked earlier, the sash was produced in the Besch workshop in Gdańsk. Silk yarn was imported, but its combination with metal braid could have been of local Gdańsk production, as the city was inhabited by craftsmen manufacturing silver and gold wire, making decorative strings, galloons, laces, artificial flowers (silk and paper) with metal constructions (Grupa 2014, 18; 2015, 48–51; Grupa and Grupa 2013, 50; Dudziński *et al.* 2015, 91–92, 94). The masters of drawing and flattening gold and silver wire belonged to the wealthiest citizens of Gdańsk. City authorities passed sumptuary laws (1714, 1736), regulating the excessive demonstration of their wealth (Grupa 2005, 91). The exploration of the other site in Szczuczyn also revealed another two sashes coming from Gdańsk tapestry workshops (Grupa 2012, 119; Majorek 2013, 206, 208), which future studies will confirm or negate their material similarities.

Based on the information resulting from archaeometric studies of the Piaseczno belt, it would be appropriate to verify the information of art historians about the fabrication methods employed in the Besch workshop in Gdańsk. Until now, these belts were thought to be of inferior quality, since the surface of the metal threads (compared to, for example, Słuck, Persian or Turkish belts) was dull. In fact, this is the case for most of the known relics in museum collections (Grupa 2022, 161), but the dullness of the metal webbing arose as a result of the gold rubbing off the surface during the belt's use. Analyses of the belt showed the presence of gold at the border of two metal threads (weft and warp) in contact with each other. So, the surface of the metal belt, which was exposed to abrasion, was originally covered with gold. These findings are confirmed by the observations of the Besch belt from Szczuczyn, on the surface of which the gold layer of interest was not fully wiped off. In view of these findings, it would be necessary to verify the data obtained in the previous century, which would fundamentally change the approach to the history of belts made in the Gdańsk *persiarium*.

References

Balta Z. I., Csedreki L., Furu E., Cretu I., Huszank R., Lupu M., Torok Z., Kertesz Z. and Szikszai Z. 2015. Ion beam analysis of golden threads from Romanian medieval textiles. *Nuclear Instruments and Methods in Physics Research B* 348, 285–290.

Bielniak T., Krupiński T. Magnuszewicz M., Rauhut J. and Szczotkowa Z. 1961. *Cmentarzysko w Gródku nad Bugiem. XIII–XVII w.* (= *Materiały i Prace Antropologiczne* 50). Wrocław: Zakład Antropologii Polskiej Akademii Nauk.

Bogucki M. 2018. Najstarsze ślady kontaktów Słowian zachodnich z kulturą arabską. In A. S. Nalborczyk, M. Switat and J. Tyszkiewicz (eds.), *Pierwsze kontakty polsko-arabskie* (= *Transfer Kultury Arabskiej w Dziejach Polski* 1). Warszawa: Dialog, 159–197.

Brandt L. O. and Allentoft M. 2019. Archaeological wool textiles: a window into ancient sheep genesis. In S. Sabatini and S. Bergerbrandt (eds.), *The textile revolution in*

Bronze Age Europe. Cambridge: Cambridge University Press, 274–303.

Crowfoot E. and Chadwick Hawkes S. 1967. Early anglo-saxon gold braids. *Medieval Archaeology* 11, 42–86.

Cybulska M., Marciniak M. and Sielski J. 2018. Textile finds from Grodek upon the Bug river. An analysis of materials, manufacturing techniques and origin [Tekstylne znaleziska z Gródka nad Bugiem. Analiza materiałów, techniki wykonania i pochodzeniu]. In M. Wołoszyn (ed.), *The early medieval settlement complex at Gródek upon the Bug River in the light of results from past research (1952–1955). Material evidence* [*Wczesnośredniowieczny zespó*ł osadniczy *w Gródku nad Bugiem w świetle wyników bada*ń dawnych (1952–1955). Podstawy *źródłowe*] (= *U Źródeł Europy Środkowo-Wschodniej / Fruhzeit Ostmitteleuropas* 4). Kraków, Leipzig, Rzeszów, Warszawa: Leipziger Universitätsverlag, 751–815.

Dudziński T., Grupa M., Grupa D., Krajewska M., Majorek M., Nowak M., Nowak S., Przymorska-Sztuczka M. and Wojciechowska A. 2015. *Tajemnice szczuczyńskich krypt*, 3. Grajewo, Toruń: Towarzystwo Przyjaciół 9 Pułku Strzelców Konnych w Grajewie, Wydawnictwo Uniwersytetu Mikołaja Kopernika.

Enguita O., Climent-Font A., Garcia G., Montero I., Fedi M., E., Chiari M. and Lucarelli F. 2002. Characterization of metal threads using differential PIXE analysis. *Nuclear Instruments and Methods in Physics Research B* 189, 328–333.

Fitzgerald S. 2008. Non-destructive micro-analysis of art and archaeological objects using micro-XRF. *Archeometriai Muhely* 3, 73–78.

Frankopan P. 2015. *Jedwabne szlaki. Nowa historia świata*. Warszawa: Grupa Wydawnicza Foksal.

Good I. 2001. Archaeological textiles. A review of current research. *Annual Review of Anthropology* 30, 209–226.

Grupa D. 2013. Pozostałości tekstylne w skarbie z Olbrachtówka. In E. Jelińska (ed.), *Średniowieczne skarby srebrne z Pojezierza Iławskiego w zbiorach Muzeum Warmii i Mazur*. Olsztyn: Muzeum Warmii i Mazur, 301–307.

Grupa M. 2005. *Ubiór mieszczan i szlachty z XVI–XVIII wieku z kościoła p.w. Wniebowzięcia Najświętszej Marii Panny w Toruniu*. Toruń: Wydawnictwo Uniwersytetu Mikołaja Kopernika.

Grupa M. 2007a. Silk bands from an early medieval cemetery in Kałdus (Poland). In A. Rast-Eicher and R. Windler (eds.), *IX NESAT, Archaologische Textilfunde-Archaeological Textiles, Braunwald, 18–21 Mai 2005*. Ennenda: ArcheoTex, 108–111.

Grupa M. 2007b. Wczesnośredniowieczne tkaniny z Kałdusa. In G. Nawrolska (ed.), *XV Sesja Pomorzoznawcza. Materiały z konferencji, 30 listopada – 2 grudnia 2005*. Elbląg: Muzeum Archeologiczno-Historyczne w Elblągu, 275–279.

Grupa M. 2009. Jedwabne wstążki z Gruczna. *Pomorania Antiqua* 22, 215–221.

Grupa M. 2012. *Wełniane tekstylia pospólstwa i plebsu gdańskiego (XIV–XVII w.) i ich konserwacja*. Toruń: Wydawnictwo Uniwersytetu Mikołaja Kopernika.

Grupa M. 2014. Zabytki tekstylne ze Śliwic. *Zeszyty Chojnickie* 30, 15–24.

Grupa M. 2015. Preliminary analyses of silk flowers from modern graves in Poland. *Archaeological Textiles Review* 57, 47–53.

Grupa M. 2016. Wstążki – moda czy prestiż? In E. Wółkiewicz, M. Saczyńska and M. Pauk (eds.), *Habitus facit hominem. Społeczne funkcje ubioru w średniowieczu i w epoce nowożytnej*. Warszawa: Wydawnictwo Instytutu Archeologii i Etnologii Polskiej Akademii Nauk, 179–190.

Grupa M. 2018a. Elementy orientalne w kulturze materialnej we wczesnym średniowieczu na ziemiach polskich. In A. S. Nalborczyk, M. Switat and J. Tyszkiewicz (eds.), *Pierwsze kontakty polsko-arabskie* (= *Transfer Kultury Arabskiej w Dziejach Polski* 1). Warszawa: Dialog, 245–266.

Grupa M. 2018b. Kultura materialna w świetle badań archeologicznych w sanktuarium w Piasecznie. In W. Pikor (ed.), *Kultura materialna i duchowa sanktuarium w Piasecznie*. Pelplin: Bernardinum, 33–43.

Grupa M. 2020. Tkaniny z cmentarzyska w Pniu, gm. Dąbrowa Chełmińska. Textiles from burial site in Pień, Dąbrowa Chełmińska commune. In D. Poliński (ed.), *Wczesnośredniowieczne i nowożytne cmentarzysko w Pniu. Early medieval and early modern burial site in Pień*. Toruń: Wydawnictwo Edukacyjne Akapit, Jagielloński Instytut Wydawniczy, Europejska Fundacja Pamięć i Dziedzictwo, 367–382.

Grupa M. 2022. *Czas żupanów, czas czechmanów. Strój polski w źródłach archeologicznych, ikonograficznych i pisanych*. Toruń: Wydawnictwo Uniwersytetu Mikołaja Kopernika.

Grupa M. 2023. Jedwab w Polsce – od Wikingów po rozbiory. In S. Galij-Skarbińska and M. Damazyn (eds.), *Historia zawsze bliska. Księga Pamiątkowa ofiarowana Profesorowi Wojciechowi Polakowi*. Toruń: Wydawnictwo Adam Marszałek, 219–258.

Grupa M. and Grupa D. 2013. Wstążki, wstążeczki z krypt kościoła p.w. Imienia NMP w Szczuczynie. In M. Grupa and T. Dudziński (eds.), *Tajemnice szczuczyńskich krypt. Materiały z konferencji naukowej Szczuczyn – 21 IX 2013 r.* Grajewo: Towarzystwo Przyjaciół 9 Pułku Strzelców Konnych w Grajewie, 41–52.

Grupa M., Grupa D., Kozłowski T., Krajewska M., Majorek M., Nowak M., Nowak S., Przymorska-Sztuczka M., Wojciechowska A. and Dudziński T. 2014. *Tajemnice szczuczyńskich krypt*, 2. Grajewo, Toruń: Towarzystwo Przyjaciół 9 Pułku Strzelców Konnych w Grajewie, Wydawnictwo Uniwersytetu Mikołaja Kopernika.

Grupa M. and Kozłowski T. 2022. Selected determinants of social position and elitism in archaeological studies of the Early Middle Ages. *Światowit* 60, 87–96.

Grupa M. and Łukaszewicz J. 2019. Silk band and metal appliqués of a child bonnet from the northern crypt of the parish church in Gniew. *Analecta Archaeologica Ressoviensia* 14, 137–153.

Janssens K., Vittiglio G., Deraedt I., Aerts A., Vekemans B., Vincze L., Wei F., Deryck I., Schalm O., Adams F., Rindby A., Knoechel A., Simonovici A. and Snigirev A. 2000. Use of Microscopic XRF for Non-destructive Analysis in Art and Archaeometry. X-Ray Spectrometry 29, 73–91.

Járó M. 2009. Metal thread variation and materials: simple method of pre-treatment identification for historical textiles. In J. B. Perjés, K. E. Nagy, M. Kissné Bendefy, P. M. Kovács and E. Sipos (eds.), *Conserving Textiles. Studies in Honour of Ágnes Timár-Balázsy* (= *ICCROM Conservation Studies* 7). 68–76.

Kałamajska-Saeed M. 1987. *Polskie pasy kontuszowe*. Warszawa: Krajowa Agencja Wydawnicza.

Karatzani, A. 2012. Metal Threads: The Historical Development. In I. Tzachili, and E. Zimi (eds.), *Textiles and Dress in Greece and the Roman East: A Technological and Social Approach*. Athens: Pragmata Publications, 55–65.

Kylafi M., Katakos A., Boyatzis S., Palamara E. and Zacharias N. 2017. Characterisation and analysis of mnetallic artefacts from the Pylos Archaeological Museum. *STAR: Science & Technology of Archaeological Research* 3(2), 161–168. DOI: 10.1080/20548923.2018.1456742.

Maik J. 1988. Frümittelalterlichen Textilwaren in Wolin. In L. Bender Jørgensen, B. Magnus and K. E. Munksgaard (eds.), *Archaeological textiles. Report from the 2nd NESAT Symposium 1.–4. V. 1984*. Bergen: Arkaeologiske Skrifter fra Historisk Museum, Universitet Bergen, 162–186.

Maik J. 1991. *Tekstylia wczesnośredniowieczne z wykopalisk w Opolu*. Warszawa, Łódź: Instytut Historii Kultury Materialnej Polskiej Akademii Nauk.

Majorek M. 2013. Pasy kontuszowe z wstępnych badań archeologiczno-inwentaryzacyjnych krypt w kościele pw. Imienia NMP w Szczuczynie. *Studia Łomżyńskie* 24, 199–210.

Miazga B. 2017. *Zabytek archeologiczny jako źródło informacji o przeszłości. Badania specjalistyczne śladów produkcji, użytkowania i depozycji artefaktów*. Wrocław: Instytut Archeologii Uniwersytetu Wrocławskiego.

Miazga B. 2018. Metal-decorated textiles in non-destructive archaeometric studies. Examples from Poland. *Fasciculi Archaeologiae Historicae* 31, 161–167.

Miazga B. and Grupa M. 2023. Non-invasive archaeometric studies of metal threads with silk core coming from two kontush sashes from the Szczuczyn excavations in Poland. *Acta Archaeologica* 92(2), 164–175.

Miazga B., Grupa M. and Grupa D. 2018. Wyniki nieniszczących badań mikroskopowych i spektralnych galonów grobowych z Torunia i Gdańska. *Wiadomości Archeologiczne* 69, 67–78.

Nord A. G. and Tronner K. A. 2000. Note on the analysis of gilded metal embroidery threads. *Studies Conservation* 45, 274–279.

Rezic I., Curkovic L. and Ujevic, M. 2010. Simple methods for characterization of metals in historical textile threads. *Talanta* 82, 237–244.

Suomela J. A., Suhonen H., Räisänen R. and Wright K. 2022. Identifying Late Iron Age textile plant fibre materials with microscopy and X-ray methods – a study on finds from Ravattula Ristimäki (Kaarina, Finland). *Archaeological and Anthropological Sciences* 14(40), 1–15. DOI: 10.1007/s12520-022-01507-4.

Tronner K., Nord A. G., Sjostedt J. and Hydman H. 2002. Extremely thin gold layers on gilded silver threads. *Studies in Conservation* 47(2), 109–116.

Vanden Berghe I., Van Bos M., Vandorpe M. and Coudray A. 2023. Non-invasive analysis of heritage textiles with MA-XRF mapping – exploring the possibilities. The study of Bishop Jacques de Vitry's mitres and fragile medieval reliquary purses from Namur (Belgium). *Heritage Science* 11(183), 1–15. DOI: 10.1186/s40494-023-00977-6.

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

Stanislav Martyčák

DOI: 10.15584/anarres.2023.18.14

Section of History, Department of Archaeology and Speleoanthropology, Regional Museum and Gallery in Česká Lípa, Náměstí Osvobození 297/1, 470 01 Česká Lípa, Czech Republic;
e-mail: archeolog@muzeumcl.cz; ORCID: 0009-0006-6676-7644

Research on the Bridge in Jestřebí, Česká Lípa District, Czech Republic

Abstract

Martyčák S. 2023. Research on the Bridge in Jestřebí, Česká Lípa District, Czech Republic. *Analecta Archaeologica Ressoviensia* 18, 217–233

The aim of this article is to present to the reader with the results of the watching brief of the defunct historical bridge in Jestřebí, Česká Lípa district. The research brought new knowledge about the construction technology and dating of the bridge. The new findings are then placed in context with the information gathered to date about other bridges in the Česká Lípa region in North Bohemia.

Keywords: bridges, transportation, industrial structures, Jestřebí, Provodín, Česká Lípa region

Received: 14.09.2023; **Revised:** 29.09.2023; **Accepted:** 19.10.2023

Introduction

In 2021 the demolition of the historical bridge ev. no. 26832-6 in Jestřebí took place due to its state of disrepair. The bridge was located in the district of Česká Lípa between the villages of Jestřebí and Provodín on the road III/26832 over the Robeč Stream (Fig. 1). The bridge was replaced by a new reinforced concrete structure with a higher load capacity. The watching brief during the demolition was carried out by the Regional Museum and Gallery in Česká Lípa (Czech: Vlastivědné muzeum a galerie v České Lípě – further as VMG) and the demolition process was conducted accordingly to allow the gradual documentation of individual parts of the bridge.

Brief overview of previous research

The current extent of archaeological knowledge of bridges in the Česká Lípa region is determined by the amount of reconstruction work carried out. Bridges had never previously been of specific interest for archaeologists in the region. Until the year 2009, only bridges in medieval mansions were researched, with the exception of two bridges from the early modern period at Lipý Castle in Česká Lípa. In 2009 a watching brief was carried out during the reconstruction of the Zámecký (Lázeňský) bridge. However, in August 2010 there were floods in northern Bohemia which damaged or even almost destroyed several bridges. For this reason, in the following years there have been many reconstructions on a smaller or larger scale. Furthermore, the problem of poor, inappropriate, or insufficient maintenance of some bridges or their expansion became apparent. This had the effect of increasing interest in the state of bridges, which led to greater control and the suspension of traffic for some. An entire range of bridge types and their construction methods were then identified, with bridges from the 19th century being a widely represented group. The current development and scope of investigation of bridge constructions in the Česká Lípa region corresponds to the development of post-medieval and industrial archeology in the country as a whole (Blažková and Matoušek 2013).

Environmental context

The bridge is located in a swampy lowland floodplain of the Robeč Stream. The Robeč Stream (Neuschlosser Bach in German), locally at its source

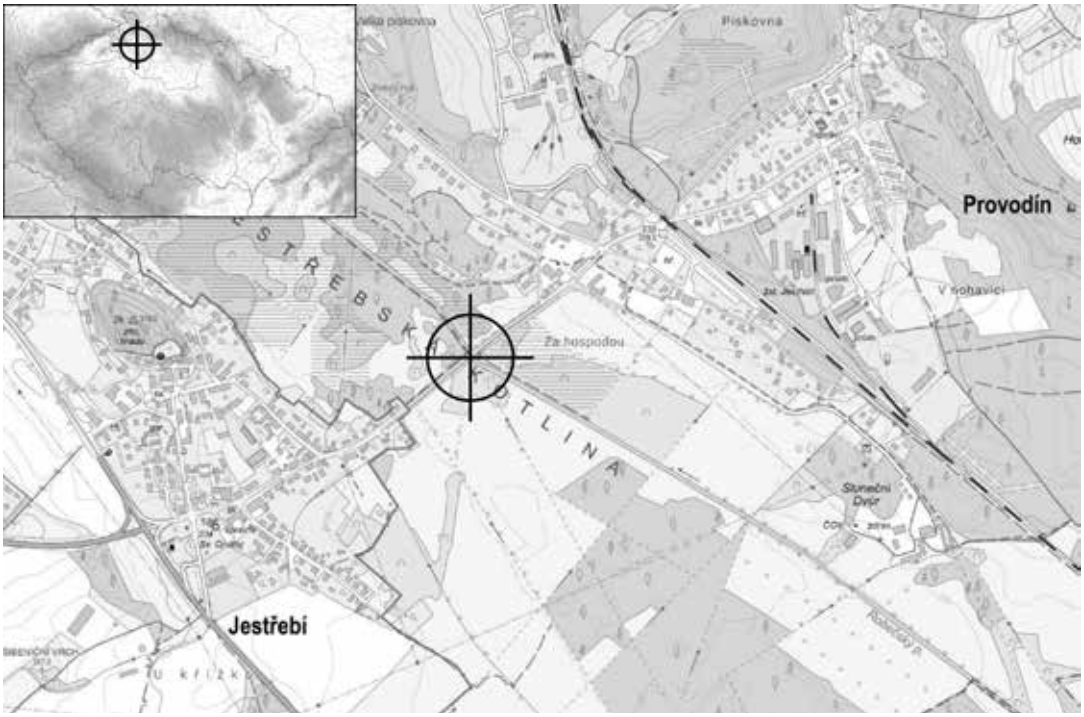


Fig. 1. Surroundings of Jestřebí and Provodín with the location of the bridge on the 1:10 000 scale basic topographic map of the Czech Republic (source: Český úřad zeměměřický a katastrální, modified).

also called Okna Stream (Kolka 2003, 54), is a left-hand branch of the Ploučnice River and belongs to its most important ones. It springs south of the village of Okna, Česká Lípa district, and in the course of its total 25.2 km it gradually feeds a number of ponds, while the bridge itself is located between Mácha Lake (which, despite its name, is also a pond) and Novozámecký Pond.

Historical context

The first known settlements in the Jestřebí area reach back to prehistoric times. The latest archaeological excavations under the castle overhang proved that there were two settlement horizons, the older one being dated from the 2nd half of the 13th century to the 1st half of the 14th century (Peša *et al.* 2015, 363–365). The first written source confirming the existence of a church is an entry of a levy of the papal tithe from 1352 (Kracíková and Smetana 2000, 77), the church was located below the castle plateau. Provodín belonged to the Jestřebí parish at least since 1786 (Kracíková and Smetana 2000, 77–79), the situation in the medieval period is unfortunately unclear. An expansion of the settlement occurred in the 18th century and in 1780 St. Andrew´s Church was built. Further development occurred in the 19th century, mostly in connection with the construction of the railway.

Provodín is first mentioned in 1376 (Peša and Meduna 2013, 235). However, it was a less significant and apparently much smaller village, originally located in a different place, and Provodín in its current location is only documented between 1536 and 1545 (Peša and Meduna 2013, 227–238). In the early modern period the village suffered greatly as result of various war events. In particular the Prussian-Austrian wars led to the construction of field fortifications, for example on Dlouhý vrch, built no later than 1778.

The Imperial road (*Reichsstraße*) from Prague to Rumburk led from Stvolínky through Zahrádky to Česká Lípa and was constructed between 1796 and 1806. It was followed by the road from Zahrádky via Jestřebí to Mladá Boleslav (Smejkal 2018, 176) completed between 1837 and 1842 (Ringes 1958, 40).

In 1867 the railway from Bakov nad Jizerou to Česká Lípa started operating and a railway station was built in Provodín, however, it was called Jestřebí throughout its whole existence (Šindlauer 2018, 418). The railway also contributed to the further development of the village.

The only known historical documents directly related to the bridge are maps. Müller's oldest map of Bohemia from 1720 is rather inaccurate and simplistic and all the roads captured on it completely avoided Jestřebí. The road and the bridge are depicted for the first time on the map of the first military (Josephinian) land survey from 1764 to 1768 and its rectification from 1780 to 1783 (Fig. 2). At that time, the road

from Jestřebí to Provodín already seems to be located on its current route, probably on the embankment still preserved today. The map also shows the extent of the Novozámecký Pond at that time, as well as the course of the flow of the Robeč Stream, which was partly diverted further north through Provodín to the mill race and then back to the current flow, just beyond the bridge downstream. A more accurate depiction of the flow is later captured on the maps of the stable land survey. According to the imperial imprint of the stable land survey from 1843 (Fig. 3), which is much more detailed, it is clearly visible that at the time the road from Jestřebí to Provodín went along the current route. The Robeč Stream and other smaller unnamed watercourses are depicted as parallel and perpendicular, indicating the use of the area on both sides of the embankment agriculturally as meadows or for the extraction of raw materials such as peat, which is

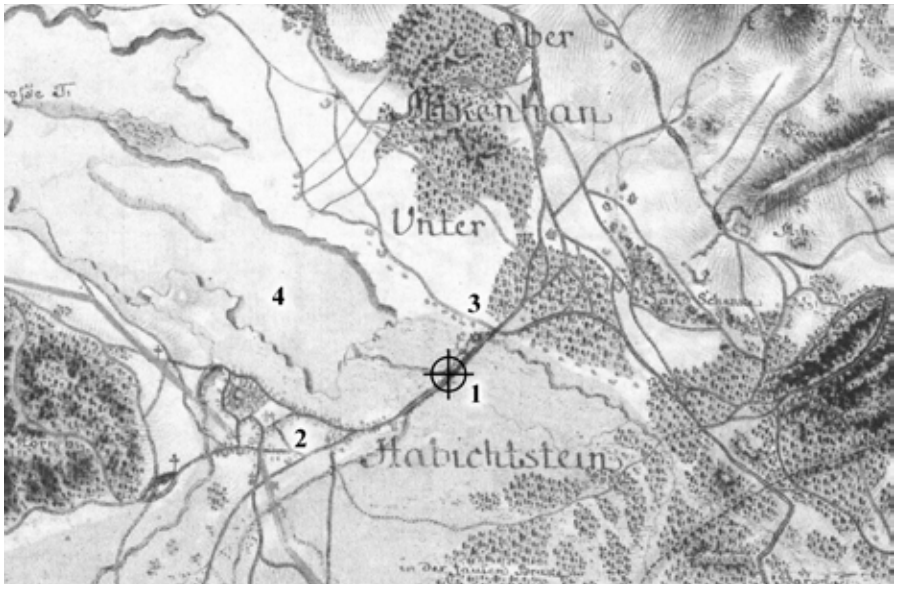


Fig. 2. Section of the map from the first military land survey, map sheet no. 28.
1 – bridge, 2 – Jestřebí, 3 – Provodín, 4 – Novozámecký pond (source: Český úřad zeměměřický a katastrální, modified).

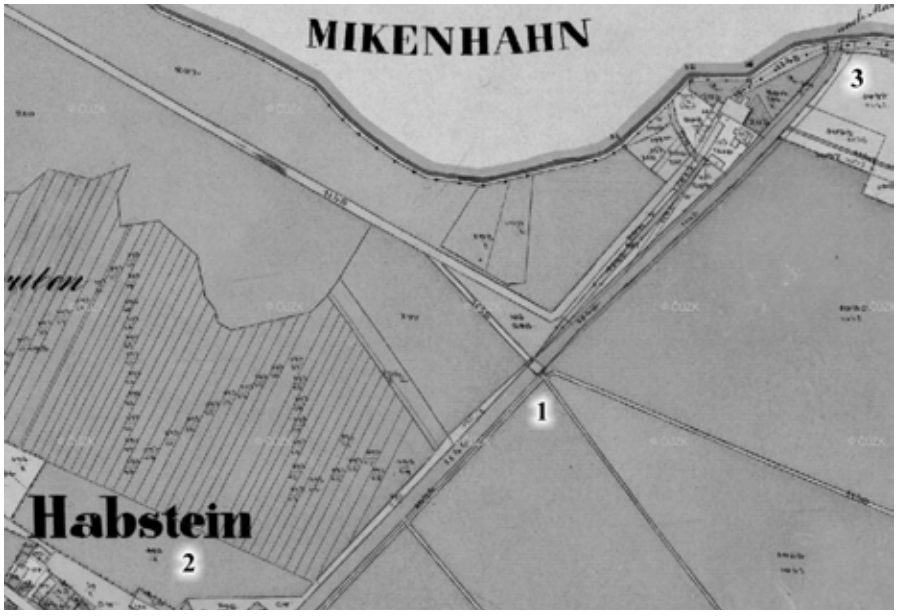


Fig. 3. Section of the original map of the stable land survey.
1 – bridge, 2 – Jestřebí, 3 – Provodín (source: Český úřad zeměměřický a katastrální, modified).

suggested by the German names "in pits" and some traces of peat extraction are still preserved southeast of Jestřebí. On the maps of the stable land survey, the bridge is more precisely depicted as a permanent structure, but we cannot say for sure whether it was wooden or brick. In comparison, a second bridge across the mill race in Provodín at the end of the road embankment is depicted as a lighter, probably rather wooden structure. The mill is already captured on the maps of the first military land survey. This bridge is still preserved, however, the surrounding terrain was covered up to the level of the road, so only some elements of its structure are present.

The second and third military land surveys do not provide better information. Another, younger source is aerial photography, especially from the years 1938, 1946 and 1953. From these images we can deduce that the mill race ceased to be used after 1938 and had disappeared by 1946. In later aerial images the existence of parapets on the bridge is apparent, together with an extension added no later than the 1970s when a footbridge was built on the downstream side.

The condition of the bridge before its removal

The single-arch stone bridge (Fig. 4, 5) had its foundations placed in the flat, wide floodplain of the Robeč Stream, which creates an approximately 60 to 80 cm deep notch in the sediments here. The bridge was part of an embankment, up to 12 m wide at the base and up to 8 m at the crown, and with a maximal height of 2.3 m and it was formed by one unit of barrel vault made of sandstone blocks supported on both banks of the stream by terraced walls, also from sandstone blocks. The carriageway was widened on both sides by approximately 0.5 m in the 2nd half of the 20th century by adding concrete lintels in front of the voussoir. On the upstream side, in front of the voussoir there were masonry buttresses with grooves (Fig. 6) that were used to insert planks to regulate the waterflow or to retain water and spill it onto the meadows as a form of flood prevention. These grooves were later repaired using cement mortar or concrete. On the downstream side, the buttresses in the form of ter-

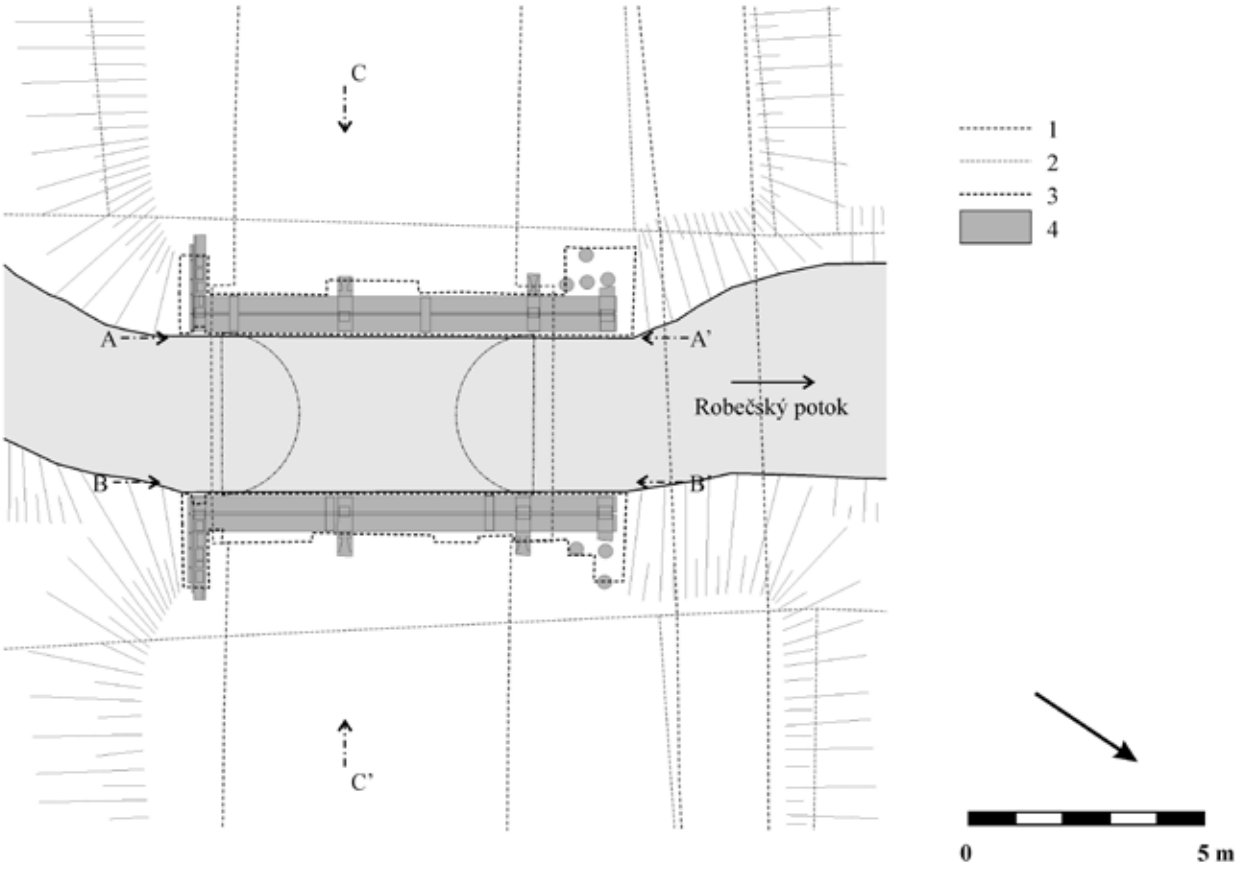


Fig. 4. Floor plan of the wooden grid forming the foundations of the bridge.
1 – road outline, 2 – cadastral outline, 3 – masonry from sandstone blocks, 4 – wooden structure of the bridge foundations (source: VMG archive).

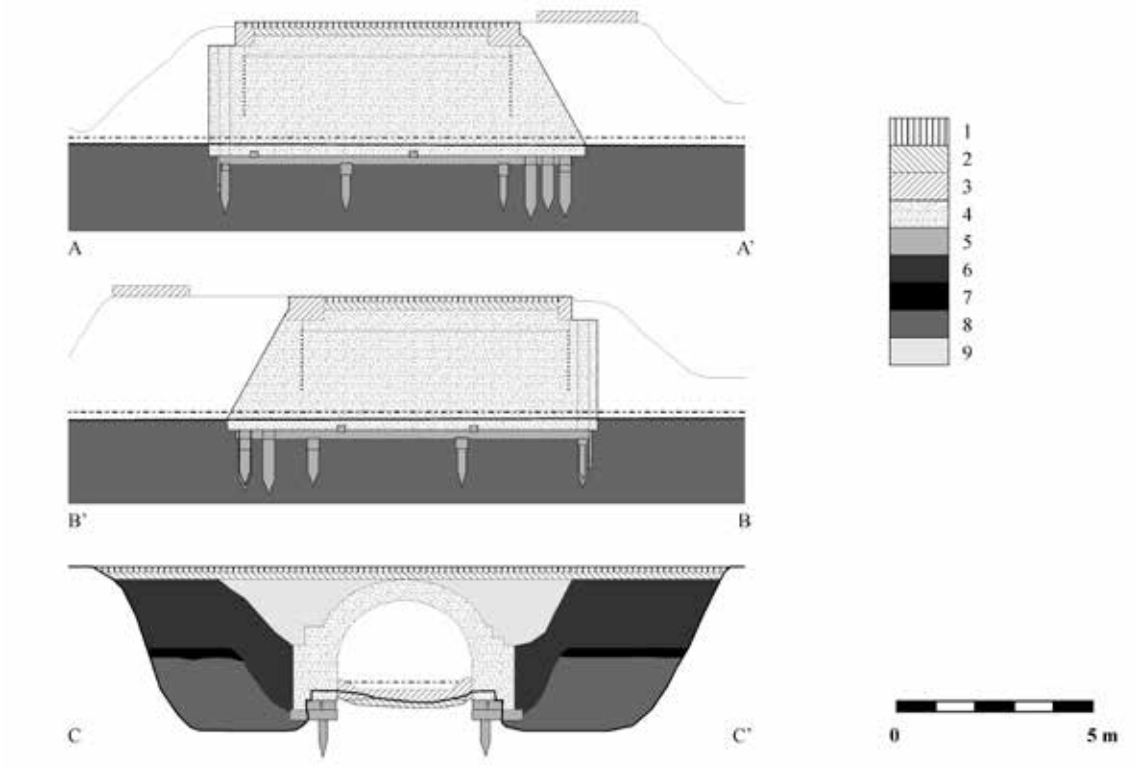


Fig. 5. Front view of the right (A–A') and left (B–B') abutments and on the transverse cross-section (C–C') of the bridge. 1 – asphalt road surface, 2 – gravel road base, 3 – concrete, 4 – masonry from sandstone blocks, 5 – wooden structure of the bridge foundations, 6 – brown–ochre sandy soil, 7 – brown to black humus soil, 8 – subsoil, sandy soil to sand, 9 – sandy soil with sandstone stones (source: VMG archive).

Fig. 6. Front view of the bridge vault on the upstream side with a groove used for waterflow regulation (source: VMG archive).

raced walls were extended and tilted and their top was damaged by adding a concrete lintel. On the upstream side, the wing of the terraced wall on the left bank was significantly extended in the form of a terrace reinforcing the embankment with the road.

Bridge construction and technology

After the removal of road layers consisting of the asphalt surface and gravel base, the reverse side of the bridge vault and its fill consisting of sandy soil with sandstone stones were exposed. This layer slightly expands to the sides from the level of the lower part of the arches, but interferes only minimally with the structure of the embankment. The fill material could be related to the extraction and subsequent processing of sandstone used in the construction of the bridge. It is interesting that between this layer and the construction layers of the road there were no older road levels exposed, such as paving or its base, which indicates that there must have been a significant intervention in the road layers and modification of the bridge sometime during the 20th century, consisting at least of the removal of the original pavement and its base. Most likely the bottom of the stream bed in the area under the bridge and its immediate surroundings was also strengthened at this time.

Subsequently, the fill from the bridge body and the embankment was gradually removed. For the construction of the road embankment, brown ocher sandy soil captured in profiles on both sides of the bridge was used. This layer, which is up to 2 m thick, lies on a layer of brown to black humus soil, which can be assumed to be the original ground level, as indicated by the same height level of the surroundings. Below this layer there is gray sandy soil to sand forming the geological subsoil.

The masonry structure of the bridge itself, made of worked sandstone blocks, consisted of left (northwest) (Fig. 7) and right (southeast) bridge abutment, which supported a semicircular bridge vault. The foundations of the abutments were laid on wooden fir edged beams parallel to the bridge abutments, two

Fig. 7. View of the uncovered individual piles and grid beams under the abutment on the left bank of the stream. In the front right, a short transverse beam with mortises that were not used in the bridge construction (source: VMG archive).

Fig. 8. The pilot originally placed under the foundation grid (source: VMG archive).

Fig. 9. A wooden plank with a groove, that was part of the formwork on the upstream side of the bridge (source: VMG archive).

next to each other on both sides of the bridge. To solidify the structure, these beams were connected to each other by inserting shorter beams into the grooves over them, again two on each side of the bridge. Under these beams, shorter beams with unused mortises were then placed again in the grooves, four pieces on each side (two in the middle and one at the edges). These shorter beams were supported by wooden piles (Fig. 8), one under each beam except for the extreme ones on the upstream side, where there were six stakes on the right bank and five stakes on the left bank. There was also probably additional foundation fortification at this place in the form of tongue and groove wooden planks fitted into the wooden formwork (Fig. 9), where any gap was filled by adding slats. An atypical situation was also on the downstream side, where the load-bearing beams with piles were supplemented with loosely rammed stakes with a diameter of up to 35 cm, on which was built directly the masonry abutments. This method of laying the foundation on an incomplete grid is less common than a regular grid below the entire bridge structure, such as in Stará Lípa, Česká Lípa district.

The well-preserved state of the wooden structure made it possible to take samples for dendrochronological analyses. Of the 12 samples taken, 6 were successfully determined, namely 4 beams and 2 piles. Interestingly, while the beams were dated between 1662+ and 1684 to 1685, the piles placed under the beams were dated between 1873+ and 1878+ (Unger and Kyncl 2021). It is therefore obvious that the grid structure itself is made of older wood than the piles supporting the structure.

Evaluation of the findings

With regard to the construction of the bridge structure and the determined age of its wooden structure, we can assume that the stone bridge documented by the watching brief was built in 1878 or not long after that date. However, we cannot rule out that its predecessor could also have been a stone bridge of a similar structure, which would be indicated by the way the bridge was captured on the stable land survey maps as a non-flammable, permanent structure. The

beams could have been used from the previous bridge, whether stone or wooden, but they could also have come from other buildings from the villages of Jestřebí or Provodín, where there was rapid construction activity related to the establishment of the railway, mainly consisting of the replacement of older wooden houses. The use of an irregular grid, which was formed only of beams under the masonry without overlaps, is also recorded in other single-arched bridges, mainly from the 19th century in the Česká Lípa region, for example in Žandov, Česká Lípa district or Kněžice, Liberec district. Also, the recycling of wooden elements in a rural environment is not exceptional and we encounter it quite often, for example in the fencing of the Dlaska homestead in Dolánky, Semily district (Jakouběová and Marek 2016, 6). This practice needs to be taken into account when dating structures based on the dendrochronology of its individual elements. The imbalance of the wooden foundations of the bridge, with a significant accumulation of elements on the upstream side and individual stakes under the buttresses on the opposite side, may indicate possible changes or problems during the construction due to static factors or a lack of material. In other archaeologically uncovered bridges from the same period in the Česká Lípa region, for example in Stará Lípa and Ploužnice, Česká Lípa district, we have evidence of more massive and regular grid constructions (Jenč 2017).

The placing of the wooden grid directly on the bottom of the stream bed is another example of the already observed common practice of founding bridges dating roughly to the 19th century almost without any excavations, with the piles essentially driven into the stream bed and the beams laid on the previously adjusted surface. The most extreme example of this practice was documented in the case of the bridge in Žandov, where the masonry was built directly on a beam laid on the bottom of the stream without piles (unpublished research conducted by VMG in 2023). When compared with the oldest archaeologically uncovered bridge in the Česká Lípa region, the castle bridge in Mimoň, Česká Lípa district from the 1st half of the 17th century, where the foundations were laid on a wooden grid, the main difference is mainly in the massiveness of the beams used, the complexity and the connection of the beams into the form of a real grid (Jenč *et al.* 2011, 55–61; Panáček 2011, 22–23).

The watching brief of the demolition of the historical bridge in Jestřebí captured the method of construction and the technologies used and raised new questions about the actual age and location of roads in the monitored area, the recycling of building materials and the possibilities of dendrochronological dating. The example of the bridge in Jestřebí shows that even a situation so clear at first glance can be significantly more complicated after revealing all the elements and proceeding with the careful use of the available dating methods.

The Jestřebí bridge in the broader context of archaeologically excavated bridges in the Česká Lípa region

Most single arched bridges have a similar masonry surface construction and an almost archaic appearance. It can be discussed if the constructors in the case of village bridges were locals using current knowledge with the help of local craftsman. This would certainly not be the case of larger bridge construction. The Jestřebí bridge is completely different on the upstream side, where the grooves for stream regulation were placed. On the other hand, slopes on the flood side of the bridge also occur at the bridge over the outlet of Holany Pond, which was founded on bedrock (unpublished research conducted by VMG in 2023). The bridge ev. no. 26219-1 over the Vrbový Stream in Žandov was specific with its distinctly segmental arch, another point of interest was its visible secondary connection to the sandstone masonry of the stream's fortifications, while the bridge itself is made of neovulcanite, from which it can be concluded that the bridge was inserted additionally (Fig. 10). Another noticeable recent modification was a concrete slab laid across this bridge, widening it on both sides (unpublished research conducted by VMG in 2012). Another bridge, ev. no. 26219-3, located further down the stream was arched and neovulcanite was mainly used in its construction (Chochulová 2019b). The last examined bridge, ev. no. 26219-2 in Žandov across the Vrbový Stream, was built of neovulcanic slabs, and in the 20th century it was expanded on the sides with a concrete lintel (unpublished research conducted by VMG in 2023). In Dubnice, Česká Lípa district during the reconstruction of the original bridge, ev. no. 27241-6 across the Dubnický Stream, a pine beam was uncovered under the remains of the masonry of hewn sandstone, which was dated to the years 1867 to 1868, placing the bridge at this time or not long after. In the 20th century, the bridge was widened with concrete panels on its western side (Chochulová 2020).

In contrast, in the case of the bridge ev. no. 26844-2 in Dolní Světlá, Česká Lípa district, a load-bearing wall of sandstone blocks was preserved on its western

Fig. 10. Bridge in the city of Žandov (source: VMG archive).

side up to the height of the arch, the connection of the three rows was made with low-quality lime mortar with a high content of clay. These were placed on a dry sandstone row, which rested dry on flat neovolcanic stones deposited on coarse neovolcanic gravel. Dry stone structures were sunk into the clay subsoil. The prepared bottom of the stream under the bridge was made of smooth neovolcanic stones, and on the southern flood side of the bridge there was a transversely placed wooden beam with a length of 250 cm, which was edged on one side (Chochulová 2019a). The sandstone bridge ev. no. 9-044 had a complicated development (Fig. 11). The bridge which is part of the 1st class road in Zahrádky, Česká Lípa district, and it is led across the Novozámecký gap (Fig. 12), which drains water from the Novozámecký Pond through the Robeč Stream. The bridge, built on sandstone, is supposed to have a baroque barrel vault preserved in its core and it gradually underwent at least two expansions. The first was most likely related to the construction of the imperial road in the 19th century and the second expansion with a concrete part in 1967. Another bridge structure also having at least three stages of development, with the oldest being baroque and the youngest concrete, is situated in the masonry of the dam of the Novozámecký Pond itself (unpublished research conducted by VMG in 2018). A similar situation was found during the research of the bridge ev. no. 9-043 over the Munich gap (Fig. 13) of the extinct Munich Pond. There are probably three phases here again, the original, another walled extension noticeable only in the form of a joint, and the last in the form of an extension with a concrete part, which most likely took place around 1967. The nearby bridge over the emergency spillway of the same pond was practically identical (unpublished research conducted by VMG in 2020).

The double-arched bridge ev. no. M-014 in Velenice, Česká Lípa district over the River Svitávka is one of the oldest preserved bridges, dating back to 1677 (Fig. 14). Archaeological research only confirmed the already visible construction of the bridge and did not bring any further findings (Jenč 2016).

The bridge in Stvolínky, Česká Lípa district (Fig. 15) over the Bobří Stream is already shown on the maps of the first military mapping and its older age can be assumed, it should also be older than the wall delimiting the castle area. It is a double-arched structure made of sandstone, in the lower part there were blocks of different sizes and therefore flat neovulcanic stones were used to level the unevenness. The grouting was of poor quality or absent, but it cannot be said with certainty that it might not have been there before. The foundation of the bridge was most likely in three excavated pits located significantly below the water level, which were filled with coarse and subsequently finer neovolcanic gravel. Clay was laid on both sides for insulating functions. Abutments from

Fig. 11. Revealed construction of the oldest part of the bridge over Novozámecký gap in the village of Zahrádky (source: VMG archive).

Fig. 12. Bridge over the Novozámecký gap in the village of Zahrádky (source: VMG archive).

Fig. 13. Bridge over the Munich gap in the village of Zahrádky
(source: VMG archive).

Fig. 14. Dating "1677" on the bridge in village of Velenice
(source: VMG archive).

Fig. 15. Bridge in the village of Stvolínky (source: VMG archive).

sandstone blocks were built on them reaching to the water level. The middle pillar has no clay insulation and the sandstone blocks are laid on gravel. At water level, all sides that were in direct contact with water are made of dry-stacked neovulcanic blocks. The bridge itself was then constructed on these foundations (Jenč *et al*. 2017, 97–102).

The sandstone block bridge in Lvová, Liberec district over the Panenský Stream is dated to 1803 on the basis of an oval cartouche with the date cut into the stone, located above the pillar on the upstream side of the bridge. It connects to the path leading over the dam of the Pivovarský pond and on its northern side it connects to the main outlet of the pond, which is anchored to the bridge on its upstream side. Both arches have the shape of a slightly compressed barrel vault. They lean against the side embankment walls on the sides and the bridge pillar in the middle. In front of the bridge, the bottom is reinforced with a wooden beam structure (Kolka and Peřina 2016, 71). The excavation uncovered that the terrain on the bridge was raised and a new road was laid, underneath the pavement made of rounded neovulcanic stones was revealed, under the pavement was the backfill of the bridge structure (unpublished research conducted by VMG in 2020).

The bridge ev. no. 26846-2 over the Dobranov Stream in Sloup v Čechách, Česká Lípa district dated to between 1851 and 1853, was part of the Pihel -Sloup-Cvikov road being built at the time, while this road connected the older state road. Other similar bridges were built on that occasion. It is a regionally typical bridge with carefully worked sandstone blocks and two segmental arches (Freiwillig and Kolka 2015, 89). Later in the 20th century, the parapet walls were demolished and the bridge was widened with concrete panels (Fig. 16), with some of the original paving preserved under it. On the southeast side of the bridge, a grid structure made of spruce logs with a diameter of 10 cm was discovered, but it was not possible to determine the time of their felling (Peša *et al*. 2020, 3–4).

Near the village of Žizníkov, Česká Lípa district, the inundation bridge ev. no. 2623-2 with about ten pillars across the Ploučnice River was reconstructed. Its foundations were made of well-worked sandstone blocks, which in places bore traces of younger repairs with concrete. This structure rested on a well-made wooden grid (Fig. 17–19) made of pine. Dendrochronological analysis failed to determine the age of the wood. A study of the map documents revealed that the bridge is only shown on the third military map, for which reason it can roughly be dated to the period between the end of the 1840s and the end of the 1870s (Jenč 2017).

In the case of the four-arched Zámecký (Castle) bridge in Mimoň (Fig. 20), structures related to its rebuilding in 1805 and after 1832 were captured (Fig. 21, 22), when a fir beam was found from the foundation part of the third pillar from the west, on its western

Fig. 16. Bridge in the village of Sloup v Čechách (source: VMG archive).

Fig. 17. Foundations of the bridge near the village of Žizníkov (source: VMG archive).

Fig. 18. Foundations of the bridge near the village of Žizníkov (source: VMG archive).

Fig. 19. Foundations of the bridge near the village of Žizníkov (source: VMG archive).

Fig. 20. View of the central part of the Zámecký (Castle) bridge in a prereconstruction state, city of Mimoň (source: VMG archive).

Fig. 21. The foundation of the 3rd bridge pillar of the Zámecký (Castle) bridge (source: VMG archive).

Fig. 22. The foundation of the 3rd bridge pillar of the Zámecký (Castle) bridge (source: VMG archive).

side, this beam was connected to another beam with a pin. Next to this beam, three more beams were laid. It was also possible to detect several levels of pavement through soundings, which proves the gradual increase in communication in the surface of the bridge. The findings date the top layer examined by detection technique to the turn of the 19th and 20th centuries. On the other hand, the modern pottery obtained from deeper layers can only generally be dated in the range of the 17th to 19th centuries. The research thus verified the assumption that the eastern and apparently also the central part of the bridge underwent major reconstruction during the 1st half of the 19th century, apparently in several stages caused by particularly serious damage after floods (Jenč *et al.* 2011, 60–61).

In general, it can be summarized that in the case of both single arch and multi-arch bridges, different foundations of these bridges are manifested, given in some cases by the properties of the subsoil, while in the case of larger bridges, their foundations can be more elaborate (Žíznikov, Stvolínky), but this is not necessarily the rule. Where a wooden grid is part of the foundation, the use of fir, pine and spruce has so far been found, while in the case of the Jestřebí bridge, the recycling of older wood is also documented. The construction of the grid differs both in its construction and in the quality of its execution, and the most abundantly recorded so far is the construction of masonry on a beam (Žandov, Dubnice). It was not possible in all cases to determine the dating using dendrochronology. There is also evidence of the use of wood in the construction at the riverbed, either under the bridge (Dolní Světlá) or even before it (Lvová). The main building material is processed sandstone blocks, although in some cases their processing is of better quality. We have also documented the use of neovolcanic stone, both unworked and worked, on the bridges in Žandov. To a lesser extent we can also see it in some foundations (Stvolínky, Dolní Svetlá). However, where the pavement is preserved, neovulcanite is common in various forms, while granite is used in younger constructions. In the course of the 20th century, generally in the 2nd half, concrete additions were made on some bridges, which expanded the existing capacity of the bridge, while most often taking the original bridge parapet walls as their own. The extension of the bridge slab, which widened the bridge slightly to both sides, is known apart from Jestřebí, for example also from Žandov or Sloup in Bohemia, while lateral expansion is known to a lesser extent, for example from Dubnice. In contrast, during the expansion of the bridges in Zákupy, these structures were larger. Concrete was

also often used in unprofessional and harmful bridge repairs (Stvolínky, Mimoň).

The dating of bridges can be done on the basis of documented written sources, which are, for example, very well prepared for Česká Lípa (Panáček 2018), or for the Castle bridge in Mimoň (Panáček 2011). Date inscription on bridges was also commonly used in the 19th and 20th century (Lvová, Zákupy), while the oldest one we have is from 1677. It is possible to date bridges, even only approximately, using maps (Žíznikov) or possibly historical images, however, especially here, various errors cannot be ruled out. A relatively accurate method which may not always work, however, is the use of dendrochronology. The dating according to some construction elements is significantly less accurate, and sometimes cannot be used at all, especially on single arch bridges. The various archaeological findings, especially the fill of the bridge structure, are rather recent and, additionally, they often have a lower chronological sensitivity.

References

Blažková T. and Matoušek V. 2013. Česká krajina 19. a 20. století ve světle industriální archeologie – stav bádání. In P. Vařeka (ed.), *Archeologie 19. a 20. století. Přístupy – Metody – Témata*. Pilsen: Západočeská univerzita v Plzni, 17–22.

Chochulová Z. 2019a. Rekonstrukce mostu ev. č. 26844-2. Archaeological excavation report, 1, unpublished manuscript in the archive of the Regional Museum and Gallery in Česká Lípa.

Chochulová Z. 2019b. Most ev.č. 26219-3. Archaeological excavation report, 1, unpublished manuscript in the archive of the Regional Museum and Gallery in Česká Lípa.

Chochulová Z. 2020. Rekonstrukce mostu. Archaeological excavation report, 1, unpublished manuscript in the archive of the Regional Museum and Gallery in Česká Lípa.

Freiwillig P. and Kolka, M. 2015. Výběr z nechtěného. Příklady industriálních staveb v Libereckém kraji, zdemolovaných mezi lety 2010 a 2015. *Fontes Nissae – Prameny Nisy* 16(2), 79–93.

Jakouběová V. and Marek D. 2016. *300 let Dlaskova statku v Dolánkách*. Turnov: Muzeum Českého ráje v Turnově.

Jenč P. 2016. Rekonstrukce kamenné dvouklenby. Archaeological excavation report, 1, unpublished manuscript in the archive of the Regional Museum and Gallery in Česká Lípa.

Jenč P. 2017. Most ev. č. 2623-2 Žizníkov. Archaeological excavation report, 1, unpublished manuscript in the archive of the Regional Museum and Gallery in Česká Lípa.

Jenč P., Havel Š. and Peša V. 2011. Zámecký most v Mimoni – záchranný archeologický výzkum 2009–2010. In *Proměna Zámeckého mostu v Mimoni*. Mimoň: city Mimoň, 54–74.

Jenč P., Novák V. and Peša V. 2017. Zánik historického mostu ve Stvolínkách, okres Česká Lípa. *Fontes Nissae – Prameny Nisy* 18(1), 96–102.

Kolka M. 2003. Vývoj rybniční soustavy na Bezdězském panství do roku 1554. *Bezděz* 12, 51–76.

Kolka M. and Peřina I. 2016. Stavební vývoj vodárenských objektů v areálu zámku Lemberk. *Fontes Nissae – Prameny Nisy* 17(2), 68–87.

Kracíková L. and Smetana J. 2000. *Románská a gotická sakrální architektura v okrese Česká Lípa* (= *Vlastivědná knihovnička Společnosti přátel starožitností* 9). Praha: Společnosti přátel starožitností.

Panáček M. 2011. Stavební vývoj Lázeňského (Zámeckého) mostu v Mimoni. In *Proměna Zámeckého mostu v Mimoni*. Mimoň: city Mimoň, 21–29.

Panáček J. 2018. Vývoj řečiště Ploučnice na území města. In J. Kratochvíl (ed.), *Česká Lípa město na Ploučnici.* Česká Lípa: city Česká Lípa, 382–393.

Peša V., Havel Š., Hávová V. and Frišová Z. 2020. 2012 NZ Sloup, most 26846-2. Archaeological excavation report, 7, unpublished manuscript in the archive of the Regional Museum and Gallery in Česká Lípa.

Peša V., Jenč P., Havel Š. and Novák V. 2015. K počátkům hradu Jestřebí u České Lípy. *Archeologie ve středních Čechách* 19(1), 357–365.

Peša V. and Meduna P. 2013. Zaniklá středověká ves u Provodína, okr. Česká Lípa. *Archeologie ve středních Čechách* 17(1), 227–247.

Ringes V. 1958. *Stezkou dějin naší dopravy*. Přerov: Dopravní nakladatelství Ministerstva dopravy.

Šindlauer Z. 2018. Železnice v České Lípě. In J. Kratochvíl (ed.), *Česká Lípa město na Ploučnici.* Česká Lípa: city Česká Lípa, 418–439.

Smejkal L. 2018. Počátky obecních samospráv a druhá polovina 19. století. In J. Kratochvíl, (ed.), *Česká Lípa město na Ploučnici*. Česká Lípa: city Česká Lípa, 168–183.

Unger J. and Kyncl T. 2021. Provodin Jestrebi – most-Z94. Dendrochronology analysis, 1, unpublished manuscript in the archive of the Regional Museum and Gallery in Česká Lípa.

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

REVIEWS

DOI: 10.15584/anarres.2023.18.15

Michał Jabłkowski

ORCID: 0000-0001-5124-2710

(review) Wojciech Poradyło. *Cmentarzysko z epoki brązu i wczesnej epoki żelaza w Machowie (Tarnobrzeg)* [*A cemetery from the Bronze Age and the Early Iron Age in Machów (Tarnobrzeg)*] (= *Biblioteka Muzeum Archeologicznego w Krakowie* 11). Kraków 2022: 330 pages, 18 figures, 174 plates, 5 tables.

A monograph presenting the results of research at the cemetery in Machów was published in 2022 as part of the series of the *Library of the Archaeological Museum in Kraków* [*Biblioteka Muzeum Archeologicznego w Krakowie*]. The presented publication by Wojciech Poradyło is a comprehensive study of grave materials from research conducted by the Museum in the 1960s in the area of the emerging sulphur mine in what is today Tarnobrzeg.

The reviewed monograph consists of two main parts. The first is a typical archaeological analysis of the material (by Wojciech Poradyło). It is divided into six chapters. The *Introduction* describes the history of research and the location of the site, the scope of research conducted and the state of preservation of materials and documentation. The second chapter is the *Materials Catalogue* in descriptive form. The next chapter covers material analyses. A division was made into metal artefacts, other objects and ceramics. The fourth chapter is devoted to dating the cemetery. The next chapter refers to the characteristics of the cemetery, including its size, layout and funeral rites. The last one is devoted to the settlement of the Tarnobrzeg Lusatian culture in the Machów area. The first part of the monograph ends with a short summary in English. The work then includes 174 tables showing material from the graves. The second part of the reviewed work is a presentation of the results of anthropological and bioarchaeological analyses of burnt human bones (by Anita Szczepanek, Bogumiła Wolska, and Paulina Żelazko). The analyses are divided into three parts: paleo-demographic analysis, strontium isotope analysis, and an anatomy-anthropological catalogue. The whole work ends with a short summary in English.

The first part of the publication opens with the *Introduction*, which contains information that the cemetery in Machów was discovered in 1928 while clearing trees. A year later, the first reconnaissance excavations were carried out, where 14 cremation graves were discovered (Czapkiewicz 1935, 148–149; Jakimowicz 1935, 270). Further excavations were carried out under the leadership of Adam Krauss in 1957 (Krauss 1963, 348–349). The excavations were of a rescue nature and were related to the construction of a sulphur mine. They were carried out in the area between the then villages of Machów and Nagnajów. The cemetery was located south of the current Tarnobrzeg Lake.

The next chapter contains information about the graves discovered at the site in Machów. The subject of the study was a cremation cemetery of the Lusatian culture from the Bronze Age and the Early Iron Age, where 614 graves were discovered. They create the source and analytical base of the reviewed work. The catalogue is descriptive in terms of the individual graves. It contains a description of burials and an inventory of discovered monuments. An undoubted deficiency in the catalogue is the failure to include anthropological analyses in the description of the graves. They constitute a separate subchapter and are located at the end of the publication, which must be considered a certain difficulty in using the catalogue for the reader.

The third chapter presents analyses of material. They begin with a presentation of metal monuments. The dominant form among them are pins made of

bronze. Other items made of bronze were also discovered, such as earring of the nail type, moulded bracelet, necklace with tops hammered and rolled into handles, rings, pendant with the shape of a triangular plate and *salta leone* beads. Noteworthy are the lack of objects made of iron. The author also mentions other monuments included in the grave equipment in the form of two clay beads. Then he moves on to the characteristics of ceramics, describing their technology and forms.

The issues of the chronology of the cemetery in Machów were presented in the fourth chapter. It was presented against the background of the regional periodization system of the Tarnobrzeg Lusatian culture (Czopek 2006, tab. 5). Analyses of material showed that the cemetery was probably founded around the 12th century BC. It operated for several hundred years, perhaps even until the turn of the 6th and 5th centuries BC. A certain shortcoming of the work is the lack of radiocarbon dating of the cemetery, which could be compared with the dating of monuments.

Chapter five is devoted to the characteristics of the cemetery. The author of the publication describes the arrangement of graves in the cemetery and the elements of the funeral rite in detail. It is worth noting that the work includes a plan of the cemetery, divided into graves from individual development phases (plan on a scale of 1:200).

The topic of the last chapter is a brief characterization of the settlement of the Tarnobrzeg Lusatian culture in the Machów area.

The second part of the reviewed work is a presentation of the results of anthropological and bioarchaeological analyses of burnt human bones. It is worth mentioning two conclusions of the conducted research. First of all, there was a higher mortality rate among adult women than men and a very small percentage of people aged 50–60. However, the analysis of strontium isotopes showed that the people buried in the cemetery in Machów were of local origin. The reviewed part of the work was enriched with tables and charts presenting a summary of the analysed anthropological parameters. An anatomical and anthropological catalogue is included at the end.

All things considered, the reviewed publication is a valuable read. Attention should be paid to the author's use of the term "Tarnobrzeg group", while the term "Tarnobrzeg Lusatian culture" proposed by Jan Dąbrowski (1980) has been used in the literature for a long time. Despite several imperfections in the work, the author's effort should be appreciated in analysing numerous grave materials from the cemetery in Machów (Tarnobrzeg). The aesthetic workmanship of the tables, plans, and graphic design of the book also deserve praise.

References

Czapkiewicz B. 1935. Sprawozdanie z poszukiwań archeologicznych w Małopolsce zachodniej w latach 1926–1929. *Wiadomości Archeologiczne* 13, 141–154.

Czopek S. 2006. Czas użytkowania cmentarzysk tarnobrzeskiej kultury łużyckiej – możliwości interpretacyjne i uwagi dyskusyjne. *Analecta Archaeologica Ressoviensia* 1, 101–132.

Dąbrowski J. 1980. Przydatność ceramiki łużyckiej dla podziałów kulturowych. In M. Gedl (ed.), *Zróżnicowanie wewnętrzne kultury łużyckiej. Materiały z konferencji zorganizowanej w ramach problemu resortowego R. III. 6 "Pradzieje Polski na tle porównawczym"*. Kraków: Instytut Archeologii Uniwersytetu Jagiellońskiego, 35–55.

Jakimowicz R. 1935. Sprawozdanie z działalności Państwowego Muzeum Archeologicznego za 1928 rok. *Wiadomości Archeologiczne* 13, 232–278.

Krauss A. 1963. Odkrycia archeologiczne w tarnobrzeskim zagłębiu siarki w latach 1957–1961. *Materiały Archeologiczne* 4, 347–353.

Michał Jabłkowski

Institute of Archaeology, University of Rzeszów,
Moniuszki 10, 35-015 Rzeszów, Poland;
e-mail: mjablkowski@ur.edu.pl

ANALECTA
ARCHAEOLOGICA RESSOVIENSIA
Volume 18 / Rzeszów 2023
ISSN 2084-4409
DOI: 10.15584/anarres

Tomasz Bochnak
ORCID: 0000-0002-0327-9575

DOI: 10.15584/anarres.2023.18.16

(review) Michał Grygiel. *Osadnictwo celtyckie w zachodniej Małopolsce. Ze studiów nad grupą tyniecką* [*Celtic settlements in western Lesser Poland. From studies on the Tyniec group*]. Kraków 2022: Polska Akademia Umiejętności, 571 pages, 112 figures, 100 plates, 8 tables.

A monograph on the Tyniec group by Michał Grygiel was published in 2022 by the Polish Academy of Arts and Sciences in Kraków [Polish: Polska Akademia Umiejętności]. The book is 571 pages long, with 112 figures in the text and two unnumbered illustrations. The separate illustrative part consists of 6 maps (other maps are included in the text and marked as figures; another map is labelled as table 1), 100 plates and 8 tables. The high editorial level should be emphasized. Most of the drawings are of good or very good quality. The unevenness of the quality of the figures is due to republishing pictures of varying resolution from older sources.

In a complex introduction, the author presented the main thesis of the book, briefly characterized the source base and discussed the history of research on the Tyniec group. The next part (chapter 1) is an attempt to synthesize the issue of "historical Celts" in Europe, with a particular emphasis on the Polish territory. The following chapters of the book constitute a classic triad of scientific studies. Here, we have an extensive presentation of the material, including portable and non-portable sources (chapters 2–5), its synthesis in chronological order (chapters 6–8) and a catalogue. The culmination of the book is an English summary and an illustrative section with English captions included.

The arrangement, where the presentation of sources precedes the synthesis including, among other things, the relative chronology of the Tyniec group, seems to be the most logical. However, the reference to the scheme of the division of the Tyniec group into three development groups (p. 13) used in the works of Zenon Woźniak and Paulina Poleska, even if the author claims that it has a completely local meaning, requires at least an outline of the relative chronology of these groups. Moreover, on p. 77 we again encounter the concepts of the first and second development phases of the Tyniec group, yet without defining the chronology. Later in the book there is a competent section on the chronology of Celtic materials in the sub-Kraków region, but only starting from p. 239. This, to some extent, disturbs the clarity of the argument, albeit not significantly.

Presenting the issues related to the Tyniec group against the European background, the author identifies the Celts (Gauls, Galatians) known from written sources with the people of the archaeological La Téne culture (and other cultures included in this circle, such as Púchov culture). Such an approach contradicts e.g. the comments of John R. Collis, who noted that in the second half of the 1st millennium BC, ranges of archaeological cultures do not coincide with the territory of tribes identified on the basis of written sources as Celtic people. Moreover, Celtic ethnonyms are to be found in places where neither the presence of historical Celts nor finds of the La Téne culture have been recorded (Collis 2003; 2006; 2017).

Caesar wrote unequivocally that the Veneti (i.e. the people inhabiting Armorica) were not Celts, and he consistently referred to the inhabitants of Britain as Britons, not even once using another ethnonym in relation to them. Other written sources in Antiquity were also silent on the subject. The theory that the ancient inhabitants of Britain were Celts was put forward in 1582 by the Scottish scholar George Buchanan (Collis 1999; 2006, 102–104; 2017, 58). In turn, Zenon Woźniak pointed out that the presence of Celtic toponyms (e.g. *Aliobrix*, *Arrubium*, *Noviodunum*, *vicus Verobrittianus* vel *Vergobrittianus*) in Dobrudja, is not

correlated with the presence of archaeological assemblages associated with Celts (Woźniak 1974, 171). However, the map published on p. 22 (fig. 2) seems to equally include the area settled by Celts/Gauls/Galatians known from written sources and the range of the La Téne culture, as well as places on the western shores of the Black Sea where Celtic ethnonyms occurred. Significantly, Kazimierz Godlowski already pointed out that the use of the term "Celtic culture" as a synonym of "La Téne culture" is inaccurate. That is because outside the frame of the archaeological La Téne culture, there were *znaczne odłamy ludów mówiących językami celtyckimi* [*significant fractions of peoples speaking Celtic languages*] (Godłowski 1977, 6). He clearly preferred the term "the La Téne culture", while the term "the Celtic culture" appeared in his works rarely, probably mainly for stylistic reasons. It is noteworthy that even in the chapter on the La Téne culture in Poland, the term "Celtic culture" was hardly used while he discussed Celtic coins, western Celtic territories or *celtycka grupa językowa* [*Celtic language group*] (Godłowski 1977, 69–76). A certain tendency to identify the Celts with the people of the La Téne culture was a common phenomenon until the early 21st century. I admit that I myself did not shy away from such an identification, but the last two decades have brought change in this regard (Rieckhoff (ed.) 2006; Rieckhoff 2012).

The book was written in logical and understandable language, the vocabulary is rich, and it is a pleasure to read. The author's erudition is remarkable. One gets the impression that the text was written with considerable confidence. The author only occasionally expresses hesitation in interpreting the data. Hence phrases such as "it cannot be excluded that", "it can be assumed", "one can think", "one can believe", which are frequent among other researchers and are an expression of caution, are rare in Michał Grygiel's work. The author is convinced of the validity of his claims and, as a rule, does not present alternative views or attempt to argue with dissenting opinions. This is particularly vivid in his perception of the definition of the Tyniec group and its chronology.

As is common knowledge, the term "Tyniec group" refers to a syncretic cultural group with characteristics of the La Téne culture and the Przeworsk culture, which developed in the vicinity of Kraków in the last centuries of the BC era. In addition, attention is drawn to the simultaneous presence of characteristic features of the Púchov culture and Dacian elements as well. The issue of the oldest horizon of the La Téne culture in the sub-Kraków region, sometimes referred to as the "classical" La Téne culture, and its relationship with the Tyniec group, remained (or perhaps still remains) a subject of discussion. Some researchers included the aforementioned horizon in the Tyniec group and by extension it became its first and oldest phase, while others wanted to see that phenomenon separately. However, with the growth of the source base, the opinions of some researchers, such as Zenon Wozniak, on the topic evolved (Bochnak and Dzięgielewski 2020, earlier literature there). Michał Grygiel also presented this issue; however, one can debate how accurate his thesis was. The author claims that: *Zgodnie z tendencją dominującą w ostatnich publikacjach określa ona* [grupa tyniecka – ed. TB] *zestaw źródeł odnoszących się do wszystkich form kultury lateńskiej na terenach zachodniej Małopolski* […] [*According to the trend prevailing in recent publications, it* [the Tyniec group – ed. TB] *defines a set of sources related to all forms of the La Téne culture in the areas of western Lesser Poland* […]] (p. 12). Although the author on the exact same page seems to contradict himself by writing: *W ostatnim czasie doszło do wieloznaczności w określeniu „grupa tyniecka", gdyż w literaturze obok dominującego, szerokiego ujęcia tej jednostki pojawiły się głosy postulujące konieczność powrotu do jej pierwotnego, wąskiego znaczenia* […] [*There has been ambiguity of the term "Tyniec group" as voices have emerged in the literature, alongside the dominant, broad coverage of this phenomenon, advocating the need to return to its original, narrow definition* […]]. As I already pointed out, the aforementioned "ambiguity" has accompanied the definition of the Tyniec group for decades (Bochnak and Dzięgielewski 2020, 101–103). Without further inquiry into this probably unintentional inconsistency, the author must be agreed with about the recent tendency to narrow down the term "Tyniec group". We will encounter such a narrow approach not only in the works of Przemysław Dulęba and Marcin Rudnicki he referred to, but also in the text on the commemorative plaque for the 70th anniversary of the Nowa Huta branch of the Archaeological Museum in Kraków, in which we can read: *Pierwsza grupa* [Celtów – ed. TB], *wywodząca się zapewne z Moraw, przybyła w rejon Nowej Huty ok. 300 r. p.n.e., osiedlając się m.in. w Wyciążu, Pleszowie i Cle. Kolejne grupy Celtów, przybyłe z południowo-wschodniej Słowacji, dotarły około 100 r. p.n.e. Powstały wówczas nowe osady, m.in. w Krzesławicach i Mogile. Rozpoczął się okres największej prosperity osadnictwa celtyckiego na tym terenie. W II w. p.n.e. zaczęły napływać na tereny podkrakowskie również grupy ludności identyfikowane z kulturą przeworską, integrując się z etnosem celtyckim. Ta specyficzna mozaika określana jest mianem „grupy*

tynieckiej" [*The first group* [of Celts – ed. TB], *probably originating from Moravia, arrived in the vicinity of Nowa Huta around 300 r. BC and settled, among other places, in Kraków Nowa Huta Wyciąże, Kraków Nowa Huta Pleszów or Kraków Nowa Huta Cło. Subsequent groups of Celts, arriving from southeastern Slovakia, arrived around 100 r. BC. New settlements were established at that time, including Kraków Nowa Huta Krzesławice and Kraków Nowa Huta Mogiła. The period of the greatest prosperity of Celtic settlement in the area began. In the 2nd century BC, people identified with the Przeworsk culture also began to arrive in the area near Kraków and assimilate with the Celts. This peculiar mosaic of people is known as "the Tyniec group"*].

Another problem may have awoken one's curiosity. The author includes into the source base of the Tyniec group not only sites where "pure" materials of the La Téne culture (mostly from the oldest phase of development) were recorded and sites with archaeological materials of a syncretic nature, associated both with the La Téne and the Przeworsk culture (sometimes with elements of the Púchov and the Dacian culture), but also sites attributed specifically to the Przeworsk culture (Bejsce, Kazimierza Wielka district; Kryspinów, Kraków district; Michałowice, Kraków district; Obrażejowice, Proszowice district; Siedlec, Bochnia district).

To date, everyone, including the authors of the publications themselves, agrees that the association with the Przeworsk culture is accurate. Admittedly, in the course of research on those sites some items typical of the La Téne culture were occasionally discovered, but those were referred to as imports, while earthen constructions were considered evidence of southern influence (the groove-type features). The inclusion of the sepulchral sites of the Przeworsk culture in the source base impinges on the picture of material culture and the characteristics of the funerary rites of the Tyniec group presented by Michał Grygiel. The described approach has another important consequence. As already mentioned, the author of the reviewed book considers the Tyniec group as a part of the La Téne cultural circle, treats the terms "La Téne" and "Celtic" as synonyms, and at the same time identifies the Celts known from written sources with the people of the La Téne culture. Consequently, from Michał Grygiel's perspective, the people who buried their dead in the necropolis of the Przeworsk culture at Siedlec or Obrażejowice were Celts.

Obviously, one interpretation of the source material is an indisputable right of every person of science, and, of course, everyone can and even should describe the phenomena in a manner consistent with his own beliefs. Therefore, some researchers consider the Tyniec group to be a group of Przeworsk culture (Kokowski 2004, 38–40). Michał Grygiel, on the other hand, has included the sites undisputedly linked to the Przeworsk culture in the Tyniec group. It is unfortunate that he did not justify such a decision in any way. We also do not find a reference to the remarks of Przemysław Dulęba, who discussed cultural transformations in western Lesser Poland (Dulęba 2009; 2014). He claimed there was a settlement hiatus dividing the classical La Téne culture horizon and the youngest stage, comprising syncretic materials of La Téne and Przeworsk cultures, with visible elements of the Púchov and Dacian cultures. In my opinion, the development of science requires not only the presentation of new hypotheses, but also references to the perspective of other researchers.

Concerning the subsequent parts of the book, the extended introduction is followed by an outline containing, as Michał Grygiel stated, *wprowadzenie do problematyki historycznych Celtów* [*an introduction to the problematics of historical Celts*]. He decided to include that chapter in the book, because *Dzieje Celtów i ich kultury bowiem od dawna nie doczekały się pogłębionego ujęcia w polskim piśmiennictwie* [*The history of the Celts and their culture for a long time has not been a subject of in-depth analysis in Polish writing*]. Here, the publication of Kazimierz Godłowski (Godłowski 1977) was pointed out as the last detailed study. Leaving aside idle deliberations on when a study can be considered either "concise characterization" or "in-depth analysis", I would like to note that the section dedicated to the La Téne culture in Kazimierz Godłowski's textbook is about 50 pages, while in Michał Grygiel's book only 9 pages (larger in format, but enriched with illustrations). However, it should be recalled that 20 years later, in 1998, a book written by Piotr Kaczanowski and Janusz K. Kozłowski was published and contained about 15 pages (with illustrations) of characterization of the La Téne culture. In turn, the 3rd volume of the *Wielka Historia Świata* edited by Aleksander Krawczuk became available in 2005. An analogous chapter on the subject, presented by Piotr Kaczanowski, took up 22 illustrated pages (Kaczanowski and Kozłowski 1998; Krawczuk (ed.) 2005). In my opinion, this chapter is not indispensable in the monograph of the Tyniec group (especially in the English summary), but the author cannot be blamed for his decision to include it. Undoubtedly, it will be a valuable aid to those wishing to learn about the most important issues of the La Téne culture, including students of archaeology.

Understandably, in order to present the problematics of La Téne culture in 9 pages, it is necessary to make far-reaching abbreviations and simplifications. Such a sketch, in essence, will always be an expression of the author's convictions about the hierarchy of importance of particular issues. In that section of the book, as a rule, bibliographic references are given in simplified form, i.e. without page numbers. References to ancient written sources are mostly missing as well. This is unfortunate, because some of the passages described by Michał Grygiel are intriguing, such as the indication that the ancients considered the language of the Celts to be "pagan" (p. 21). By necessity, the discussion of La Téne culture took on a popular science overtone, which contrasts with the highly detailed and erudite deductions presented in the subsequent sections of the reviewed book. In some cases, the statements made in the section dedicated to the Celts in Europe do not fully coincide with the remarks made later in the book. Thus, it is difficult to agree with the claim that the Celts did not know writing and used "imitations of letters" (p. 21). The term "imitations" suggests that the Celts imitated unfamiliar characters, as was the case with European imitations of dirhams, which bear meaningless characters meant to imitate Arabic letters (Rispling 2005). Whereas in the Celtic culture, writing was needed for trade and administration. Its practical use was limited to a relatively small group of people who could read; however, this was the standard in Antiquity. As an example, the "censuses" explicitly mentioned by Caesar as found in the Helvetian camp, can be named. Worth noting are also rather frequent examples of graffiti on pottery. The graffiti was not only present in the form of one or two letters of the Greek or Latin alphabet but also whole words of the Celtic language (Lambert and Luginbühl 2005). The knowledge of writing also seems to be confirmed by discoveries of fragments of writing tablets and styluses (Jacobi 1974). The ability to write down words in the chosen alphabet is also indicated by finds of coins, such as a brass issuance of Vercingetorix or other Central European coin issuances. Michał Grygiel wrote about them further in his work and rightly noted that the legends contain, among other things, the names of the issuers (p. 118). Therefore, in that case there is no "imitation" of letters, but information recorded by means of letters. The same remark applies to the inscription, Korisios [Κορισίος] – stamped on a sword found in Port, Switzerland (Wyss 1956).

Another example of inconsistency are remarks on rectilinear enclosures known as *Viereckschanzen*. Describing the constructions (p. 23), the author unequivocally advocated their ritual interpretation, which correlates with the views of, among others, Kazimierz Godłowski (Godłowski 1977). The cultic aspect of the interpretation of the *Viereckschanzen* was mostly influenced by the publications by Klaus Schwarz, especially on the structures at Holzhausen (Schwarz 1962). In turn Matthew L. Murray, based on the diversity of archaeological material, characterized the *Viereckschanzen* as places of meeting or cyclical ritual (?) feasts. However, almost from the beginning of studies on *Viereckschanzen*, researchers also provide others understanding of its functions or usage. This trend has intensified over the past few decades. Nowadays more and more attention is paid to the possibility of *Viereckschanzen* being headquarters of aristocracy. In addition, it could also serve a social function as a place to hold feasts. Occasionally, items interpreted as objects or structures of cult were discovered within those quadrangular enclosures. Note, however, that they may not have been crucial to the functioning of the establishment. Figurines of saints placed facades niches of modern tenements or small shrines standing in the yards of stand-alone house may serve as a certain analogy here. Their presence cannot prejudge the cultic function of the building. Such a nuanced approach to the interpretation of *Viereckschanzen* was already presented e.g. by Piotr Kaczanowski 25 years ago (Kaczanowski and Kozłowski 1998). The author of the reviewed book was obviously also familiar with it because on pp. 214 and 216 he cited concepts linking *Viereckschanzen* with the so-called *fermes indigenes* of the Gauls. Here one can only argue with the statement that interpretations focused on the sacred sphere were characteristic of German scholars, while those associated with *fermes indigenes* were typical of French researchers. In fact, a "secular" function for the *Viereckschanzen* was advocated by Germans as well, e.g. Jórg Biel, Sabine Rieckhoff and Caroline von Nicolai (Biel and Rieckhoff 2001; Rieckhoff 2002; von Nicolai 2006; 2009; 2011). Whereas, French scholars, e.g. Olivier Buchsenschutz in the post-conference volume on the subject edited by Olivier Buchsenschutz and Laurent Olivier, long have supported a cult interpretation of *Viereckschanzen* (Buchsenschutz 1978; 1989; 1991; Buchsenschutz and Olivier (eds.) 1989).

In a brief characterization of *oppida* Michał Grygiel described them as *centralne ośrodki o charakterze protomiejskim* [*central settlements of proto-urban character*] (p. 22). Such an approach was common until the 1980s, as indicated by the publications to which the author referred. At that time, the prevailing opinion was that the term "city" could refer either to the

Greek *poleis* and similar Etruscan or Roman settlements, but not to the fortified settlements of *Barbaricum*. However, the last 25 years of studies on urbanization processes in the La Téne culture provided a number of arguments allowing one to determine *oppida* as cities (Sievers and Schönfelder (eds.) 2012, earlier literature there; Zamboni *et al.* (eds.) 2020, earlier literature there). One can also have a minor objection about the map of *oppida* and the Middle La Téne open settlements in the Middle Danube Basin (fig. 6). It erroneously marks the Gališ-Lovačka site (Zakarpattia Oblast, Ukraine) as an *oppidum*. No fortifications were found at this site and most of the archaeological material was typical of the period prior to the oppida horizon. The site should be instead included in the group of large open settlements, such as Nowa Cerekwia (Głubczyce district, Poland), Roseldorf (Lower Austria, Austria) or Žehuň (Kolín district, Czechia).

As already mentioned, the following chapters of the book are indeed a very good study presenting the material culture of the Tyniec group. The author recalls analogies with great proficiency and pays attention to small but important details. This demonstrates his excellent understanding of the subject. The subsequent categories are described according to a clear scheme: first, the presentation of a source base, and then its analysis. This arrangement was somewhat interrupted when it came to coins, whose chapter had an elaborate introduction to the issues of Celtic minting. Michał Grygiel, like myself, after Piotr Kaczanowski (Kaczanowski 1996; 1997, 89; Bochnak 2006, 166) included the coin found in Kryspinów in the so-called Cracow type (p. 137). However, he did not refer to the studies of Marcin Rudnicki, who presented an extensive characterization of similar coins, narrowed the criteria of the Cracow type and excluded the find from Kryspinów (Rudnicki 2012). I believe the research of Marcin Rudnicki is essential and does not deserve to be overlooked (it is worth noting that the work of this researcher is known to Grygiel, as it can be found in the bibliography).

The situation was repeated while discussing the fibulae of the A.18 type (pp. 49–52). Michał Grygiel did not refer at all to the hypothesis of Przemysław Harasim, who suggested the possibility of producing that kind of fibulas in the Tyniec group (Harasim 2017, 55). In turn, on pages 61 and 63–65 there is a competent description of the technology of glass-making in the La Téne culture. The author emphasizes that the craftsmen of the La Téne culture based on glass raw material imported from the Middle East. Thus, it can be concluded that the mention about "glass production" (p. 27) by the Celts is simply an expression. On page 183 Michał Grygiel made remarks on bowls of the Roanne type. The author referred to the studies of Paulina Poleska, but the work of Zenon Woźniak should go first (Woźniak 1990, 25–27, 74; Poleska 2006).

The characterization of funerary rites prevailing in the sub-Kraków region in the last centuries BC may also be unsatisfactory (chapter 4 , pp. 217–224). On the one hand, as already mentioned, the picture presented by the author is affected by including sites so far commonly associated with the Przeworsk culture in the analysis. On the other hand, Michał Grygiel seems to underestimate the capital importance of the discoveries in Modlniczka (Kraków district), site 2, which he mentioned only in a few sentences. Whereas, thanks to the interpretation of Małgorzata Byrska-Fudali and Marcin M. Przybyła, the materials from the "swamp" in Modlniczka may provide a new perspective and shed some light on funerary rites, not only on the scale of the Tyniec group but also of the La Téne world (Byrska-Fudali and Przybyła 2010; 2012; Bochnak and Skowron 2016).

In the course of his analysis, the author invoked the concepts of "Nowa Huta cluster" and "Kryspinów cluster". Although he did not provide a definition of the mentioned clusters, it seems that it should be obvious to those who have even a vague understanding of the cultural situation of the sub-Kraków region in the last centuries BC. At this point, one may wonder whether distinguishing those clusters is necessary, and the distance that separates them today results from intensive urbanization processes in the centre of Kraków. Single finds, e.g. from the Old Town (including from the Wawel Hill itself), from Kraków Skałka, from Kraków Grzegórzki, from Kraków Górka Narodowa and Kraków Podgórze suggest the whole area located at that time in the floodplain of the Vistula and the Prądnik could have been settled by the population of the Tyniec group. In that case, one should expect an area with different population densities, reaching from Podłęże and Kraków Nowa Huta to Modlniczka and Kryspinów, rather than two separate settlement clusters.

Chapters 6–8 are a study of cultural changes in western Lesser Poland in the last centuries BC. It is basically a model example of a clear and structured scientific narrative. The author presented the oldest finds of the La Téne culture, before moving on to outline the subsequent phases of settlement with La Téne characteristics. The remarks contained herein significantly enrich and organize our state of knowledge on cultural changes in Lesser Poland at the end of the 1st millennium BC.

The work was written with great attention to the correctness of language. The sentences were thoughtful and the paragraphs coherent. Spelling errors are rare. Out of the reviewer's duty, one should mention "Violier" (p. 15) in place of its correct spelling: Viollier and successively: "Dacii" (p. 56; Dacji), "Berchin Pollanten" (p. 64; Berching Pollanten), "Buny" and "Austrii" (p. 97; Bujny, Austrii), "drahma" (p. 304, drachma), and "Knottenring" which recurs several times (pp. 79, 188, footnote no. 79 on p. 304, fig. 112). Regarding the map (p. 116, fig. 38) depicting the origin of Celtic minting, it is a misfortune that the author did not specify the sources on the basis of which he developed the map. According to the caption, fig. 39: 1 (p. 119) is supposed to depict blacksmithing tools, among them an adze. An adze is not a blacksmith's tool but is used for woodworking. In addition, the only tool visible in the picture with a sleeve does not resemble the aforementioned adze. The copper alloy "purse" in fig. 48 (p. 134) was not depicted at a 1:1 scale (actual measurements 4.3 × 3.3 cm). The list of scabbards with S-shaped motifs was incomplete. Several finds from Czechia, France, and even Poland were missing. Specimens from Korytnica (Jędrzejów district), Pikule (Janów Lubelski district), and Grudziądz-Rządz (Grudziądz district) (Bochnak 2005, earlier literature there) were omitted, as well as a scabbard from the Constanța area on display at the Museum of National History and Archeology [Muzeul de Istorie Națională și Arheologie] in Constanța, Romania. The caption to fig. 25 and fig. 28 (finds from Aleksandrowice, Kraków district) stated *Naglik niepubl.* [*Naglik unpublished*] – that figure, however, was published by T. Bochnak and the article was listed in the bibliography (Bochnak 2006, fig. 7: 1–7; 8: 5). Moreover, it cannot be overlooked that a brooch with a decorative foot from Kraków-Pleszów, site 17, grave 12/1954, appeared on three separate drawings of varying quality (fig. 96: 4; 105: 4 and 106: 32), while the specimen from Kraków-Pleszów, site 17, grave 1187 was used twice (fig. 105: 2, 2a, 2b and 106: 34).

The described errors do not have much of an effect on the very positive assessment of the reviewed book. It will undoubtedly change our understanding of the Tyniec group. The work of Michał Grygiel now makes the region of western Lesser Poland appear as the best recognized settlement zone of the La Téne culture in Poland.

Acknowledgments

The review was translated by Katarzyna Skowron.

References

Biel J. and Rieckhoff S. 2001. *Die Kelten in Deutschland*. Stuttgart: Theiss.

Bochnak T. 2005. *Uzbrojenie ludności kultury przeworskiej w młodszym okresie przedrzymskim*. Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego.

Bochnak T. 2006. Les Celtes et ses voisins septentrionaux. In M. Szabó (ed.), *Celtes et Gaulois. L'archéologie face à l'histoire, Les Civilisés et les Barbares. Actes de la table ronde tenu à Budapest, 17–18 juin 2005* (= *Collection Bibracte* 12/3). Glux-en-Glenne: Bibracte. Centre archéologique européen, 159–183.

Bochnak T. and Dzięgielewski K. 2020. Od Podłęża do Wyciąża, czyli stan badań nad osadnictwem celtyckim w rejonie podkrakowskim w siedemdziesięciolecie archeologii nowohuckiej. *Materiały Archeologiczne Nowej Huty* 26, 97–119.

Bochnak T. and Skowron K. 2016. "Riturile imperceptibile" în cultura Przeworsk–câteva piste de interpretare ale unui rit funerar deosebit și rădăcinile lui celtice ["Les rites imperceptibles" dans la culture de Przeworsk–quelques pistes d'interprétation d'un rite funéraire particulier et sesracines celtiques]. *Istros* 22, 13–64.

Buchsenschutz O. 1978. Faux camps romains… Vraies enceintes cultuelles? *Caesarodunum* 7, 287–298.

Buchsenschutz O. 1989. Introduction. In O. Buchsenschutz and L. Olivier (eds.), *Les Viereckschanzen et les enceintes quadrilatérales en Europe celtique. Actes du 9e Colloque de l'AFEAF, Chateaudun, 16–19 mai 1985*. Paris: Errance, 4–9.

Buchsenschutz O. 1991. Viereckschanzen et sanctuaires en Europe celtique. In J.-L. Brunaux (ed.), *Les sanctuaires celtiques et leurs rapports avec le monde méditerranéen. Dossiers de protohistoire*, 3. Paris: Errance, 106–112.

Buchsenschutz O. and Olivier L. (eds.) 1989. *Les Viereckschanzen et les enceintes quadrilatérales en Europe celtique. Actes du 9e Colloque de l'AFEAF, Chateaudun, 16–19 mai 1985*. Paris: Errance.

Byrska-Fudali M. and Przybyła M. M. 2010. Bog deposit of burnt human remains from site 2 in Modlniczka, dist. Cracow. *Sprawozdania Archeologiczne* 62, 439–489.

Byrska-Fudali M. and Przybyła M. M. 2012. Badania ratownicze na stanowisku 2 w Modlniczce, gm. Wielka Wieś. In S. Kadrow (ed.), *Raport 2007–2008*, 1. Warszawa: Narodowy Instytut Dziedzictwa, 509–553.

Collis J. R. 1999. George Buchanan and the Celts of Britain'. In R. Black, W. Gillies and R. Ó Maolalaigh (eds.), *Celtic connections. Proceedings of the Tenth International Congress of Celtic Studies*, 1: *Language, literature, history, culture.* East Linton: Tuckwell Press, 91–107.

Collis J. R. 2003. *The Celts: origins, myths and inventions*. Stroud: Tempus Publishing.

Collis J. R. 2006. Rethinking the Celts. The impact of historiography and archaeology. In S. Rieckhoff (ed.), *Celtes et Gaulois, l'Archéologie face à l'Histoire*, 1: *Celtes et Gaulois dans l'Histoire, l'historiographie et l'idéologie moderne. Actes de la table ronde de Leipzig, 16–17 juin 2005* (= *Collection Bibracte* 12/1). Glux-en-Glenne: Bibracte. Centre archéologique européen, 97–110.

Collis J. R. 2017. Celts ancient and modern. Recent controversies in Celtic studies. *Studia Celtica Fennica* 14, 58–71.

Dulęba P. 2009. Przemiany kulturowe w zachodniej Małopolsce w okresie od III do I wieku przed Chr. Przyczynek do kontaktów między Celtami a Germanami. In M. Karwowski and E. Droberjar (eds.), *Archeologia Barbarzyńcow 2008: powiązania i kontakty w świecie barbarzyńskim. Materiały z IV Protohistorycznej Konferencji Sanok, 13–17 października 2008* (= *Collectio Archaeologica Ressoviensis* 13). Rzeszów: Fundacja Rzeszowskiego Ośrodka Archeologicznego, Instytut Archeologii Uniwersytetu Rzeszowskiego, 11–35.

Dulęba P. 2014. Geneza zachodniomałopolskiej enklawy kultury lateńskiej i jej powiązania z innymi regionami osadnictwa celtyckiego. In J. Čižmářová, N. Venclová and G. Březinová (eds.), *Moravské křižovatky. Střední Podunají mezi pravěkem a historií*. Brno: Moravské zemské muzeum, 189–200.

Godłowski K. 1977. *Archeologia pierwotna i wczesnośredniowieczna*, 4: *Okres lateński w Europie*. Kraków: Uniwersytet Jagielloński.

Harasim P. 2017. Oddziaływania kultury lateńskiej na ozdoby i elementy stroju z cmentarzyska w Legionowie CSP. In W. Nowakowski, W. Orliński and M. Woińska (eds.), *Relacje kultury przeworskiej i lateńskiej na Mazowszu. Wnioski z badań cmentarzyska przeworskiego w Legionowie CSP*. Warszawa, Legionowo: Uniwersytet Warszawski, Muzeum Historyczne w Legionowie, 51–60.

Jacobi G. 1974. Zum Schriftgebrauch in keltischen Oppida nördlich der Alpen. *Hamburger Beiträge zur Archäologie* 4, 171–181.

Kaczanowski P. 1996. Złota moneta celtycka z osady kultury przeworskiej w Kryspinowie, woj. Kraków. *Sprawozdania Archeologiczne* 48, 119–133.

Kaczanowski P. 1997. Antike Münze aus Kryspinów. *Notae Numismaticae* [*Zapiski Numizmatyczne*] 2, 84–101.

Kaczanowski P. and Kozłowski J. K. 1998. *Najdawniejsze dzieje ziem polskich (do VII w.)* (= *Wielka Historia Polski* 1). Kraków: Fogra.

Kokowski A. 2004. Kultura przeworska – zarys dziejów. In Ch. Leiber and A. Kokowski (eds.), *Wandalowie. Strażnicy bursztynowego szlaku. Państwowe Muzeum Archeologiczne w Warszawie. 8 marca – 16 czerwca 2004. Katalog wystawy*. Lublin, Warszawa: Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej, 25–85.

Krawczuk A. (ed.) 2005. *Świat okresu cywilizacji antycznych* (= *Wielka Historia Świata* 3). Kraków, Warszawa: Fogra, Świat Książki.

Lambert P. Y. and Luginbühl T. 2005. Les graffites de Bibracte. Apports des inscriptions mineures à l'histoire des habitants de Bibracte. In J.-P. Guillaumet and M. Szabó (eds.), *Études sur Bibracte,* 1 (= *Collection Bibracte* 10). Glux-en-Glenne: Bibracte. Centre archéologique européen, 163–176.

von Nicolai C. 2006. Sakral oder profan? Späteisenzeitliche Einfriedungen in Nordfrankreich und Süddeutschland. *Leipziger online-Beiträge zur Ur- und Frühgeschichtlichen Archäologie 22*, 1–21 (https://ul.qucosa.de/api/qucosa%3A33998/attachment/ATT-0/, access: 22.05.2023).

von Nicolai C. 2009. La question des "Viereckschanzen" d'Allemagne du Sud revisitée. In I. Bertrand, A. Duval, J. Gomez de Soto and P. Maguer (eds.), *Habitats et paysages ruraux en Gaule et regards sur d'autres régions du monde celtique. Actes du XXXIème colloque international de l'AFEAF, Chauvigny (Vienne, F.), 17–20 mai 2007*, 2. Chauvigny: Association des Publications Chauvinoises, 245–280.

von Nicolai C. 2011. Viereckschanzen tra sacro e profane. In G. Cantino Wathagin (ed.), *Finem dare: il confine, tra sacro, profano e immaginario: a margine della stele bilingue del Museo Leone di Vercelli*. Vercelli: Mercurio, 217–241.

Poleska P. 2006. *Celtycki mikroregion osadniczy w rejonie podkrakowskim* (= *Biblioteka Muzeum Archeologicznego w Krakowie* 2). Kraków: Muzeum Archeologiczne w Krakowie.

Rieckhoff S. 2002. *Der Untergang der Städte. Der Zusammenbruch des keltischen Wirtschafts- und Gesellschaftssystems*. In C. Dobiat, S. Sievers and T. Stöllner (eds.), *Dürrnberg und Manching. Wirtschaftsarchäologie im ostkeltischen Raum. Akten des internationalen Kolloquiums in Hallein/Bad Dürrnberg vom 7. bis 11. Oktober 1998*. Bonn: Dr. Rudolf Habelt GmbH, 359–379.

Rieckhoff S. 2012. *Spurensuche. Kelten oder was man darunter versteht*. In *Die Welt der Kelten. Zentren der Macht. Kostbarkeiten der Kunst. Begleitband zur Großen Landesausstellung Baden-Württemberg 2012.* Ostfildern: Archäologisches Landesmuseum Baden-Württemberg, Landesmuseum Württemberg, Landesamt für Denkmalpflege im Regierungspräsidium Stuttgart, 26–36.

Rieckhoff S. (ed.) 2006. *Celtes et Gaulois, l'Archéologie face à l'Histoire*, 1: *Celtes et Gaulois dans l'Histoire, l'historiographie et l'idéologie moderne. Actes de la table ronde de*

Leipzig, 16–17 juin 2005 (= *Collection Bibracte* 12/1). Glux-en-Glenne: Bibracte. Centre archéologique européen.

Rispling G. 2005. Osteuropäische Nachahmungen islamischer Münzen. In T. Mayer, S. Heidemann and G. Rispling (eds.), *Sylloge der Münzen des Kaukasus und Osteuropas im Orientalischen Münzkabinett Jena* (= *Orientalisches Münzkabinett Jena* 1). Wiesbaden: Harrassowitz Verlag, 172–225.

Rudnicki M. 2012. Nummi Lugiorum – statery typu krakowskiego. *Wiadomości Numizmatyczne* 54, 1–96.

Sievers S. and Schönfelder M. (eds.) 2012. *Die Frage der Protourbanisation in der Eisenzeit* [*La question de la proto-urbanisation à l'âge du Fer*]. *Actes du 34e colloque de l'AFEAF (Aschaffenburg, 13–16 mai 2010)* (= *Kolloquien zur Vor- und Frühgeschichte* 16). Bonn: Rudolf Habelt.

Woźniak Z. 1974. *Wschodnie pogranicze kultury lateńskiej*. Wrocław, Warszawa, Kraków, Gdańsk: Zakład Narodowy im. Ossolińskich.

Woźniak Z. 1990. *Osada grupy tynieckiej w Podłężu, woj. krakowskie*. Wrocław, Warszawa, Kraków: Zakład Narodowy im. Ossolińskich.

Wyss R. 1956. The sword of Korisios. *Antiquity* 30(117), 27–28.

Zamboni L., Fernández-Götz M. and Metzner-Nebelsick C. (eds.) 2020. *Crossing the Alps. Early urbanism between Northern Italy and Central Europe (900–400 BC)*. Leiden: Sidestone Press.

Tomasz Bochnak

Institute of Archaeology, University of Rzeszów,
Moniuszki 10, 35-015 Rzeszów, Poland;
e-mail: tbochnak@ur.edu.pl

FUNDACJA
RZESZOWSKIEGO OŚRODKA
ARCHEOLOGICZNEGO

Uniwersytet Rzeszowski
Kolegium Nauk Humanistycznych
Instytut Archeologii

Wydawnictwo Uniwersytetu Rzeszowskiego