

**GLOBULAR AMPHORA CULTURE,
CENTRAL AND EASTERN GROUPS:
INSIGHT INTO NEW CHRONOMETRIC
AND TAXONOMIC DATA**

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EDITORS' FOREWORD

The twenty-fifth volume of *Baltic-Pontic Studies* brings together further studies – after volumes nos. 4 and 8 – devoted to the Globular Amphora culture. Sites associated with this unit are found in the vast expanses of Central and Eastern Europe from the Rhine basin in the west to the Dnieper in the east. In turn, its impact is identified even more widely – from the Baltic Sea to the Black Sea and the Sea of Azov. However, throughout the lifetime of human groups related to the discussed unit, its heartland was located in the Central European Lowlands. It was here that communities were formed that pursued their own way of life, one different from other contemporary groups. This can be seen in a unique combination of economic activities, social organization, ceremonial practices and religious beliefs, the traces of which have been preserved in the form of material relics. It was from the Lowlands epicentre that not only human groups migrated in various directions, but also the ideas and material traits of their culture were spread even further afield.

The ten articles that make up this volume therefore explore the issues related to the spreading of Globular Amphora communities and ideas towards the southeast. We thus gathered in one place the latest research findings, representing current data on the chronological and taxonomic characteristics of important settlement agglomerations between the Vistula and Dnieper. These concern two areas, where the so-called central and eastern groups were located. Seven articles refer to the former, more precisely to the Sandomierz-Opatów and East-Lublin subgroups and to the unique grave from Koszyce, Lesser Poland. Three papers discuss selected research questions related to the eastern group. Not only are the time frames of some Globular Amphora agglomerations being redefined, but also their characteristic trait sets and their relationships to other contemporary communities are being reconsidered. The outlined perspective is complemented by a study that documents the distant impact of the Globular Amphora culture into the East European steppe zone.

The preparation and publication of the twenty-fifth volume of *Baltic-Pontic Studies* were made possible thanks to funds granted by the Faculty of Archaeology, Adam Mickiewicz University in Poznań and the National Science Centre under project no. 2017/27/B/HS3/01444 “Podolia as a Contact Area in the Third Millennium BC: Kurgans on the Rivers Murafa and Riv”.

Marzena Szmyt

Editorial comment

1. All dates in the BPS are calibrated (BC). Deviations from this rule will be pointed out in notes [bc].
2. The names of the archaeological cultures and sites are standardized to the English literature on the subject (e.g. M. Gimbutas, J.P. Mallory). In the case of a new term, the author's original name has been retained.
3. The spelling of names of localities having the rank of administrative centres follows official, state, English language cartographic publications, e.g. Ukraine, scale 1 : 2 000 000, Kyiv: Mapa LTD, edition 1996; Respublika BELARUS', Review-Topographic Map, scale 1:1 000 000, Minsk: Byelorussian Cartographic and Geodetic Enterprise, edition 1993.

Barbara Witkowska

RADIOCARBON DATING OF THE ARCHIVAL FUNERAL COMPLEXES OF THE GLOBULAR AMPHORA CULTURE ON THE SANDOMIERZ UPLAND: GAJOWIZNA, MALICE, MIERZANOWICE AND SANDOMIERZ SITES

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ABSTRACT

The article presents results of a special project aimed at re-examining the grave associated with the Globular Amphora culture in the Sandomierz Upland. The main purpose was to obtain data to establish the absolute chronology of the graves. In total, the reported project produced 25 absolute age determinations of samples from 17 sepulchral features. Some determinations are second attempts to date the same sample in an effort to make calibrated BC ranges more accurate. The samples selected for analyses were taken from osteological material coming from human graves and associated animal deposits (twelve and five features, respectively). The graves discussed in the paper come from Gajowizna (known as *Złota-Gajowizna*), Sandomierz-Kruków, Mierzanowice, site 1, and Malice, site 1. The determinations fit into the range from 4225 ± 25 BP to 4040 ± 35 BP, with the highest concentration occurring in the period of 4200 ± 40 – 4100 ± 35 BP (18 determinations), or in calibrated years 2901–2577 BC (1 sigma) or 2901–2498 BC (2 sigma). The highest calibration probability, amounting in the case of all the dates to almost 90%, is cumulated in the range of 2870–2600 BC (2 sigma). Summing up, the new age determinations of samples from cemeteries on the Sandomierz Upland

are consistent with the knowledge on the chronology of the Globular Amphora culture - Małopolska group gathered by using the traditional typological method and referring to dates for neighbouring regions. The time bracket defined by the new series of radiocarbon dates from the Sandomierz Upland begs important questions about relationships of the Globular Amphora culture communities with other Late and Final Neolithic groups that lived there in the first half of the 3rd millennium BC related to the Złota and Corded Ware cultures.

Keywords: Globular Amphora culture, Late Neolithic, absolute chronology, radiocarbon dating, cemeteries

INTRODUCTION

Materials identified as belonging to the Globular Amphora culture (GAC) are known from over 189 sites on the Sandomierz Upland now (Fig. 1). Most of them are small sites of undefined nature, recorded during surface surveys, therefore their informational value is relatively low. A higher informational potential for chronological studies is shown by 13 excavated settlements, 26 cemeteries and 3 sites having the function of a workshop. Altogether, they yielded about 200 GAC features.¹ The set of eight radiocarbon age determinations that were obtained for them, however, was too small to draw any conclusions on the time brackets of the local GAC group. Furthermore, devising credible chronological schemes was made more difficult by the fact that only a single date, obtained for Grave VIII from Sandomierz-*Kruków*, came from a closed assemblage [Ścibior, Ścibior 1990]. The other dates related to the background area of the flint mine in Krzemionki Opatowskie and it was not clear if they concerned the GAC at all [Borkowski, Zalewski 1992].

Due to these shortcomings of the source base, development schemes devised for the Sandomierz Upland sometimes leave the GAC out and its role in the cultural transformations of the Late Neolithic in Małopolska is outright marginalised. The determination of the chronological position of the GAC Sandomierz-Opatów subgroup and its relationships to other groups living in the same region was one of the aims of National Science Centre, Poland, research project no. 2014/12/S/HS3/00355. It produced altogether 47 new radiocarbon determinations of which

¹ The exact counting of the number of GAC features at the site complex in Złota would call for their comprehensive processing; this, however, went far beyond the project reported in this article.

42 bore out the connection of features being dated to the GAC.² Some were located in the four largest GAC cemeteries on the following sites: *Złota-Gajowizna*, *Mierzanowice*, *Sandomierz-Kruków* and *Malice*. Others were explored at the settlements in *Mierzanowice*, *Złota-Nad Wawrem* and *Gańkowice*. This date series was supplemented by two dates for graves related to the Corded Ware culture, coming into stratigraphic relations with the GAC features [Witkowska, Włodarczak 2021]. By reason of the complexity of issues surrounding the features, dates for cemeteries and settlements shall be discussed in separate articles. In this paper, my main goal is to discuss the ¹⁴C determinations taken from the funeral complexes of the Sandomierz-Opatów subgroup of the GAC.

On the Sandomierz Upland, 54 GAC graves have been discovered so far in 26 cemeteries (Table 1). This number of features, containing the remains of over 80 persons in total, is relatively high and seems to be conducive to chronometric studies. However, in the case of most features, collecting samples for radiocarbon tests has proven impossible. The reason being that in the course of the oldest investigations, which can be characterised as amateurish, carried out on such sites as *Boleszyn*, *Chwałki*, *Jastków*, *Stodoły* or *Wąworków* [Nosek 1967: 167, 188, 191], osteological material was either left unexposed or not collected from the ground. Nor were any charcoals preserved. Similar situations took place, too, at later accidental finds as for instance the discovery of a damaged grave in *Ossolin* in 2009 [Florek 2010]. What is more, most osteological material originating with old planned excavations has been lost or is unavailable for study. For example, this is the case with the human and animal remains from the largest GAC cemetery, from the *Gajowizna* site (known generally as the *Złota-Gajowizna* site), currently stored in the Department of Anthropology, Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Wrocław, Poland. As this collection was unavailable, the cemetery in *Gajowizna* was dated using single bones left among artefacts. This, however, made it impossible to repeat determinations when laboratory results were inconsistent with archaeological knowledge based on typochronology or when a sufficient amount of collagen could not be extracted. Furthermore, very interesting materials from the cemetery in *Sadowie* have not been made available for study either. They are particularly valuable, having been procured by scrupulously applying modern research methods and are presented in separate publications [Pasterkiewicz 2017; 2020; 2021].

All in all, the reported project covered the examination of samples from 17 GAC sepulchral features located on the Sandomierz Upland (Table 2). This, in turn, allowed researchers to determine the absolute age of the four largest (not counting the site in *Sadowie* mentioned above) cemeteries of the GAC Sandomierz-Opatów subgroup.

² Dates pointing to a different chronology shall be discussed below and in another articles in this volume [Florek, Witkowska 2021; Witkowska, Włodarczak 2021].

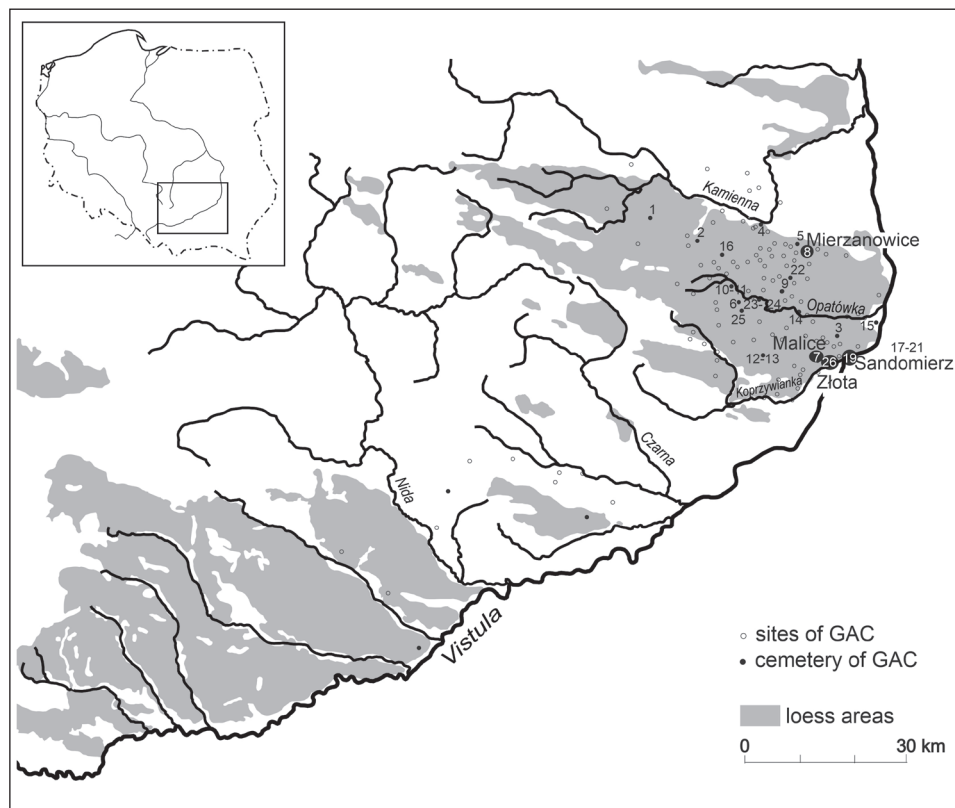


Fig. 1. Cemetery of Sandomierz - Opatów group on the background of other sites of the Globular Amphora culture in Małopolska. The numbering of cemeteries according with Table 1

T a b l e 1

List of cemetery of the Globular Amphora culture in the Sandomierz Upland. The numbering in the table according with Figure 1.

The explain of shortcuts: PMA – State Archaeological Museum in Warsaw; MAK – Archaeological Museum in Krakow; IaiE PAN – Institute of Archeology and Ethnology, Polish Academy of Science, Warsaw; MNK – National Museum in Kielce; MOS – District Museum in Sandomierz; PAI – Archaeological Laboratory of the Institute of Archeology and Ethnology of the Polish Academy of Sciences in Igołomia; IA UR – Institute of Archeology, University of Rzeszów; UMCS – Institute of Archeology, Maria Curie-Skłodowska University.

No.	Site	Number of site	Other name of site used in the literature	Number of AZP	Type of site	Discovery	Author and year of discovery	Graves	Number of buried persons	Animal graves	References	Museum collection
1	Boleszyn, district Opatów	2	Nowak's field	217/84-68	single grave	accidental	unknown 1924	1	≥1	0	Jakimowicz 1935; Nosek 1967	PMA
2	Broniszowice, district Opatów		site XII		single grave	accidental	unknown 1973	1	≥1	0	Bąbel 1975	PMA
3	Chwałki, district Sandomierz	1	Dragan's field	59/89-73	single grave	accidental	unknown 1931	1	1	0	Nosek 1967	MAK
4	Grójec, district Ćmielów	24		428/85-71	cemetery	excavation	Krzak 1970	2	≥2	0	Krzak 1974	IaiE PAN
5	Jastków, district Opatów	3		127/85-71	single grave	accidental	unknown before 1930	1	≥1	0	Antoniewicz 1936; Nosek 1967	MNK, MOS
6	Kochów, district Opatów	1		87-70	single grave	accidental	Bargiel 1989	1	≥1	0	Bargiel <i>et al.</i> 1989	UMCS
7	Malice, district Sandomierz	1		70/89-73	cemetery	excavation	Kamińska 1973; Witkowska 2017	2	6	2	Kamińska 1964; Nosek 1967; Witkowska <i>et al.</i> 2021	PAI

No.	Site	Number of site	Other name of site used in the literature	Number of AZP	Type of site	Discovery	Author and year of discovery	Graves	Number of buried persons	Animal graves	References	Museum collection
8	Mierzanowice, district Opatów	1	site I	66/86-72	settlement and cemetery	excavation	Salewicz 1936-1938	5	5	1	Balcer 1963; Babel 1979; 1985	PMA
9	Nikisiałka Duża, district Opatów	?		?/87-71	cemetery	survey	Krzak 1969	1	≥1	0	Krzak 1991	?
10	Opatów, district Opatów	2		2/87-70	single grave	accidental		1	≥1	0	Bargiel <i>et al.</i> 1989	–
11	Opatów, district Opatów	6		6/67-70	cemetery	accidental		1	≥1	0	Antoniewicz 1928; Nosek 1967	MNK
12	Ossolin, district Sandomierz	2	manor buildings	4/89-71	single grave	accidental	Pyzik 1957	1	2	0	Pyzik 1960; Nosek 1967	MNK
13	Ossolin, district Sandomierz	40		?/89-71	single grave	excavation	Florek 2009	1	≥1	0	Florek 2010	
14	Pęczyny, district Sandomierz	1		7/88-72	single grave	accidental	Mierzyński 1960	1	≥1	0	unpublished	MNK
15	Rzeczyca Mokra, district Sandomierz	1		50/89-74	single grave	accidental	Zięba 1982	1	6	0	Ścibior 1993a	MOS

No.	Site	Number of site	Other name of site used in the literature	Number of AZP	Type of site	Discovery	Author and year of discovery	Graves	Number of buried persons	Animal graves	References	Museum collection
16	Sadowie, district Opatów	23		136/86-70	cemetery	excavation	Pasterkiewicz 2015-2018	4	≥11	5	Pasterkiewicz 2017	IA UR
17	Sandomierz, district Sandomierz	31	Chwałki – military cemetery	5/89-73	single grave	accidental		1	1	0	Gurba 1956 (published as related to the Ziota culture)	UMCS
18	Sandomierz, district Sandomierz	73	Góry Pieprzowe	23/89-73	single grave	accidental	unknown before 1930	1	1	0	Jakimowicz 1920; Antoniewicz 1936; Nosek 1967	MDS
19	Sandomierz, district Sandomierz	78	Kruków	27/89-73	cemetery	excavation	Ścibior 1984	3	5	2	Ścibior, Ścibior 1990	MOS
20	Sandomierz, district Sandomierz	44	11 Lis-topada street	25/89-73	single grave	accidental	unknown 1937	1	≥1	0	unpublished	MOS
21	Sandomierz, district Sandomierz	43	St. Joseph church	24/89-73	single grave	accidental	collection PTK Sandomierz	1	≥1	0	unpublished	MOS
22	Stodół, district Opatów	1		22/86-72	single grave	accidental	unknown 1859	1	≥1	0	Przyborowski 1873; Nosek 1967	MAK
23	Wąworków, district Opatów	1	Opatów	1/87-71	single grave	excavation	Antoniewicz 1925	1	≥1	0	Antoniewicz 1936; Nosek 1967	MNK

No.	Site	Number of site	Other name of site used in the literature	Number of AZP	Type of site	Discovery	Author and year of discovery	Graves	Number of buried persons	Animal graves	References	Museum collection
24	Wąworków, district Opatów	4		24/87-71	single grave	accidental		1	1	0	Kowalski 1975	PMA
25	Włostów, district Opatów		sugar factory	88-71	single grave	excavation	Gąsowska 1959	1	≥1	0	Gąsowska 1962 (published as related to the Złota culture); Nosek 1967	MOS
26	Złota, district Sandomierz	1	Gajo- wizna	14/90-73	cemetery	excavation	Jakimowicz, Szmit 1926	18	30	12	Krzak 1977	PMA

T a b l e 2

List of radiocarbon dating of sepulchral features related to the Globular Amphora culture in the Sandomierz Upland. Calibration in OxCal v4.4.2 [Bronk Ramsey 2020]

Site	Feature	Sample	Lab. no.	BP	cal BC (68.2%)	cal BC (95.4%)	Combine BP	Combine/ Modelled BC (68.2%)	Combine/ Modelled BC (95.4%)
Gajowizna	Feature 1	human bone	Poz-90799	1880±40	[122-216 AD]	[33-244 AD]			
	Feature 3	animal bone	Poz-90800	4100±40	2848-2577	2870-2498			
	Feature 6	animal bone	Poz-90802	4090±40	2846-2505	2868-2493			
	Feature 9	human bone	Poz-90803	3510±40	1892-1767	1943-1699			
	Feature 24	animal bone	Poz-90804	4140±50	2866-2631	2879-2579			
	Feature 27	animal bone	Poz-90806	4200±40	2888-2701	2901-2633			
	Feature 28	charcoal (inner ring)	Poz-94739	4435±35	3320-3012	3331-2926	D_ sequence	3293-3034	3306-3020
		charcoal (outer ring)	Poz-94740	4485±35	3331-3100	3348-3031			
Mierzanowice 1	Feature 31	animal bone	Poz-90807	4180±40	2881-2679	2889-2631			
	Feature 1	human bone	Poz-90808	4140±40	2866-2631	2876-2582			
	Feature 3	human bone	Poz-90809	4180±40	2881-2679	2889-2631			
	Feature 127	human bone	Poz-90810	4120±40	2857-2584	2874-2574			
	Feature II	human bone	Poz-90821	4160±40	2874-2671	2884-2588			
Sandomierz 78		charcoal	Gd-2462	4370±70	3092-2905	3332-2885			
	Feature VIII	human bone	AAR-?	4222±23	2895-2776	2901-2701	4202±20	2885-2707	2891-2697
		human bone	Poz-90784	4155±35	2871-2671	2881-2623			
		human bone	GrN-20927	3950±30	2563-2352	2570-2342			
	Feature X	human bone	Poz-90785	4190±35	2883-2700	2893-2635			

Site	Feature	Sample	Lab. no.	BP	cal BC (68.2%)	cal BC (95.4%)	Combine BP	Combine/ Modelled BC (68.2%)	Combine/ Modelled BC (95.4%)
Malice 1	Feature 31	animal bone	Poz-94493	4135±35	2862-2630	2874-2581			
	Feature 32	human bone – individual A	Poz-94494	4165±35	2874-2675	2881-2630	4113±25	2848-2585	2865-2575
			Poz-94495	4060±35	2663-2494	2847-2473			
		human bone – individual B	Poz-94496	4215±35	2893-2705	2905-2672	4220±25	2894-2775	2901-2700
			Poz-94497	4225±35	2898-2707	2910-2675			
	Feature 33	human bone – individual C	Poz-94499	4130±35	2860-2627	2872-2580	4123±25	2851-2627	2866-2580
			Poz-94500	4115±35	2852-2584	2871-2574			
		human bone – individual D	Poz-94501	4090±35	2845-2573	2865-2494	4107±23	2845-2581	2859-2575
			Poz-94502	4120±30	2854-2623	2868-2577			
		human bone	Poz-94503	4040±35	2622-2488	2836-2468			

Gajowizna

The best explored, traditionally assigned to the village of *Złota-Gajowizna* cemetery, actually belongs to Polanów Złocki according to the Archaeological Record of Poland (in Polish: AZP; Polanów Złocki, site 1, AZP 90-73/14). The 1926 investigations unearthed 30 GAC sepulchral features there clustered in schematically laid out ritual complexes, consisting of human graves and accompanying animal burials and sacrificial pits [Krzak 1977, Fig. 8; for re-interpretation see Witkowska *et al.* 2020, Fig. 8]. In total, the site yielded 18 Late Neolithic human burials and 12 animal deposits [Witkowska *et al.* 2020, Table 1; for other estimates see Krzak 1977: 78–79; Włodarczak, Przybyła 2013, Table 8]. After studying the plan of the cemetery, it seems plausible, as suggested by the authors of the investigations, that in spite of the large number of unearthed features, only a part of it has been exposed [Jakimowiczowa 1927: 33]. Its special characteristic is human graves bearing traces of intentionally lighting a fire in grave chambers and the presence of structural beams in them. Due to the problems mentioned earlier, samples could be collected from only eight features. The age determinations of six of them are related to the GAC: features no. 3, 6, 24, 27, 28, 31.

Feature 3. An animal deposit belonging to a ritual complex (Fig. 2) extending W-E and consisting of two human graves (Features 1 and 6) and two the so-called sacrificial pits (Features 3 and 4). It held the carcasses of eight pigs and single bones of a bear.

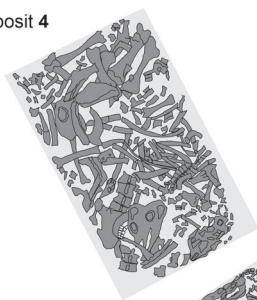
Feature 6. It belonged to the complex mentioned above, a damaged human grave in which an indeterminate number of persons had been buried. Grave goods included three vessels that have subsequently been lost (including at least one with cord ornament), three flint flakes (not preserved) and a double-edged bone point (Fig. 2).

Feature 24. Part of a larger complex oriented NW-SE and consisting additionally of human Grave 14 and sacrificial Pit 25. The function of the feature, due to the presence of both human remains together with grave goods and ten cattle skeletons, is hard to determine [Witkowska *et al.* 2020: 265–267]. The grave goods comprised four vessels, including a small and a large amphora (missing) and a cup and a small amphora (preserved) with a cord ornament (Fig. 3). The artefacts were supplemented by the bones of two pigs and three sheep or goats.

Feature 27. A regular animal deposit connected to human Grave 26. In it, four complete cows, two pigs and sheep or goat bones were deposited together with a partially preserved double-edged bone point (Fig. 4).

Feature 28. A human grave forming part of a ritual complex, comprising also Features 29, 30 and 31, which were arranged along a NW-SE axis. The grave chamber held the remains of a wooden structure that together with loess walls

Animal deposit 4



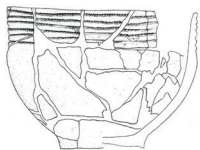
Animal deposit 3

**4100 ± 40 BP**

Grave 1



0 5 cm



Grave 6

4090 ± 40 BP

0 5 cm

Gajowizna site

ritual complex 4-3-1-6

- outline of feature
- stones
- human bones
- animal bones
- pottery
- small equipment

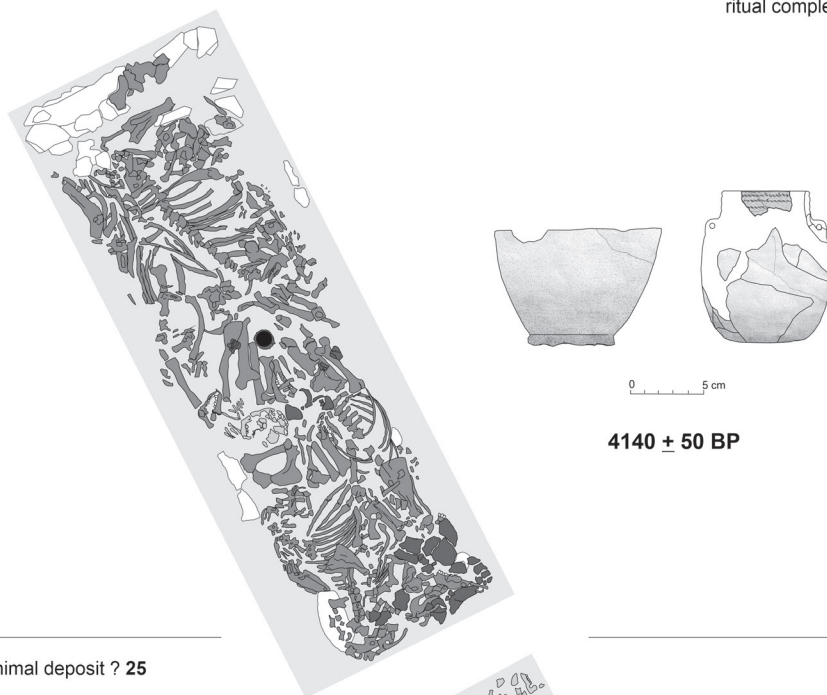
0 50 cm



Fig. 2. Gajowizna site, Sandomierz district. Ritual complex of features 4-3-1-6 with preserved equipment and radiocarbon dates. After Krzak 1977 with changes. Artefacts from grave 1 drawn by B. Witkowska. The legend also applies to other illustrations in the text

Animal deposit with human grave 24

Gajowizna site
ritual complex 14-24-25



Animal deposit ? 25



Grave 14

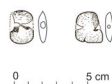


Fig. 3. Gajowizna site, Sandomierz district. Ritual complex of features 14-24-25 with preserved equipment and radiocarbon date. After Krzak 1977 with changes. Artefacts from grave 24 drawn by B. Witkowska

Gajowizna site

ritual complex 26-27

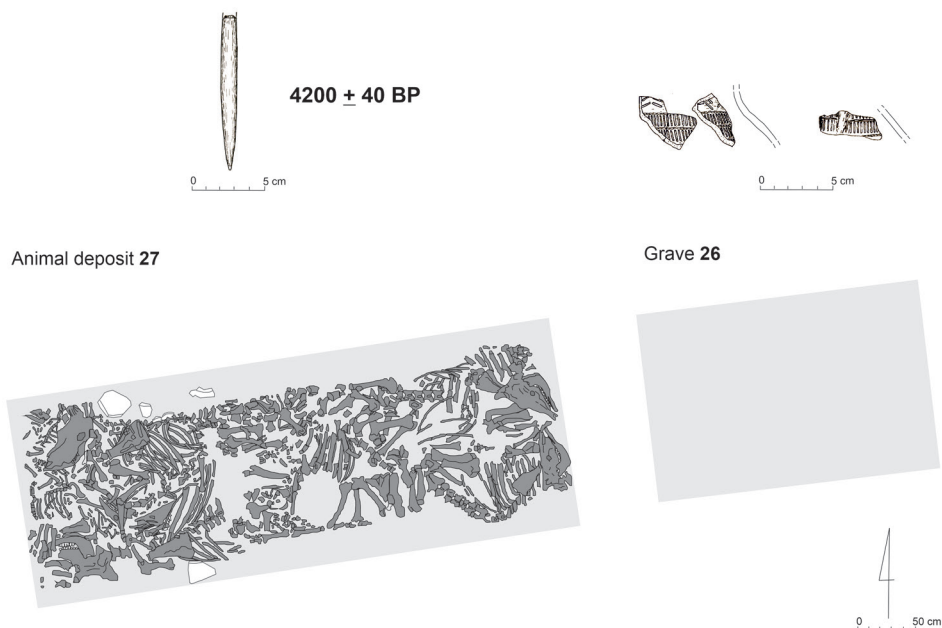


Fig. 4. Gajowizna site, Sandomierz district. Ritual complex of features 26-27 with preserved equipment and radiocarbon date. After Krzak 1977 with changes

bore traces of an intentionally set fire. Two persons lay buried in the grave with goods consisting of a burnt striped-flint axe, Świeciechów flint blade and bones of a cow, a pig and a horse (Fig. 5).

Feature 31. A part of the feature group mentioned above, it was an animal deposit accompanying Feature 30. In it, five cows and one sheep or goat were deposited. No artefacts were found in the feature (Fig. 5).

Sandomierz-Kruków

Another GAC cemetery selected for chronometric studies was the Sandomierz-Kruków site (Sandomierz, site 78, AZP 89-73/27), on which altogether five sepulchral features had been exposed during rescue excavations in 1984 [Ścibior, Ścibior

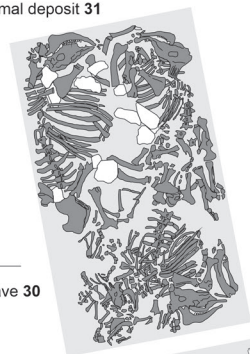
Animal deposit 31

Gajowizna site

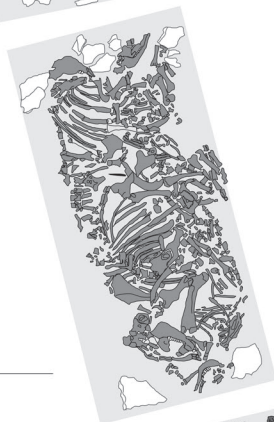
ritual complex 28-29-30-31

 4180 ± 40 BP

Grave 30



Animal deposit 29



Grave 28

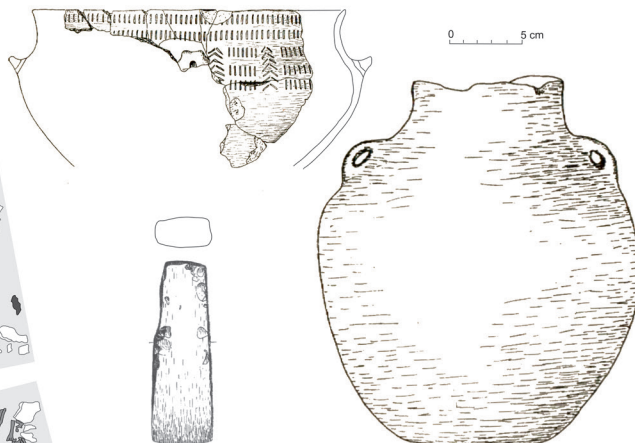
 4435 ± 35 BP 4485 ± 35 BP

Fig. 5. Gajowizna site, Sandomierz district. Ritual complex of features 28-29-30-31 with preserved equipment and radiocarbon dates. After Krzak 1977 with changes

Grave II

Sandomierz, site 78

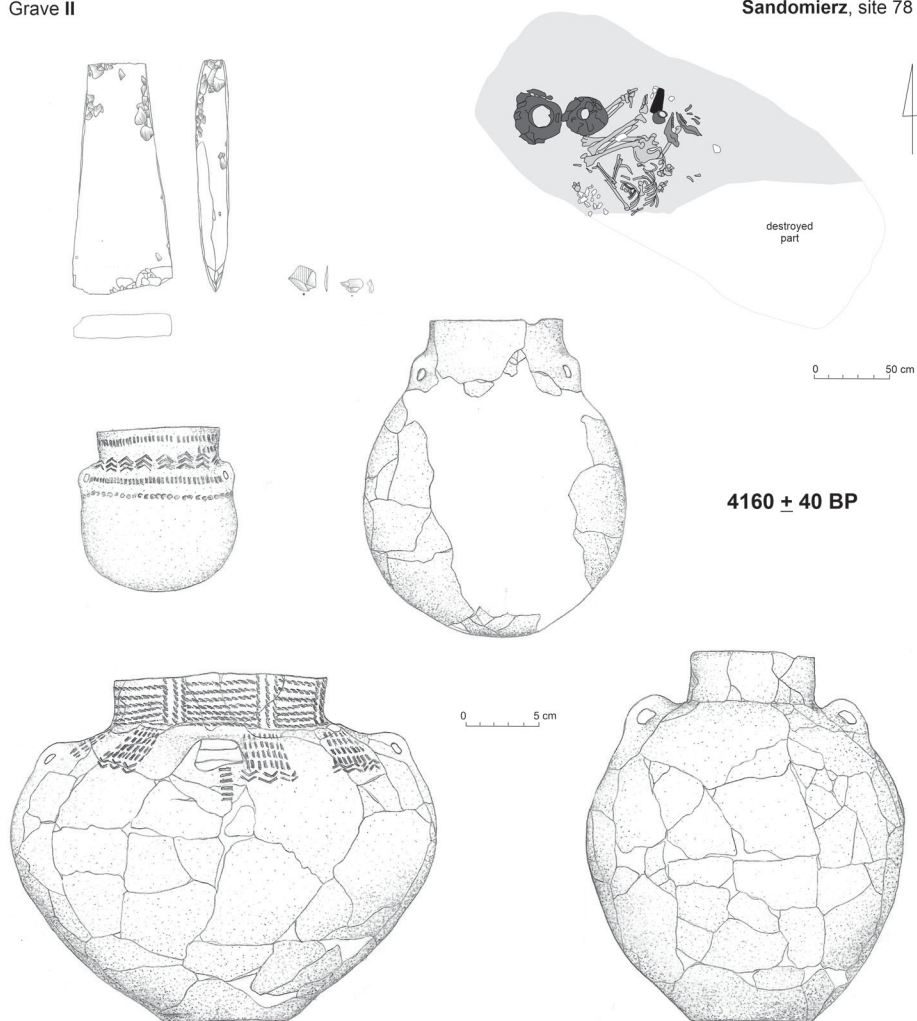


Fig. 6. Sandomierz-Kruków, site 78, Sandomierz district. Grave II with equipment and radiocarbon date. After Ścibior, Ścibior 1990 with changes

Grave VIII

Sandomierz, site 78

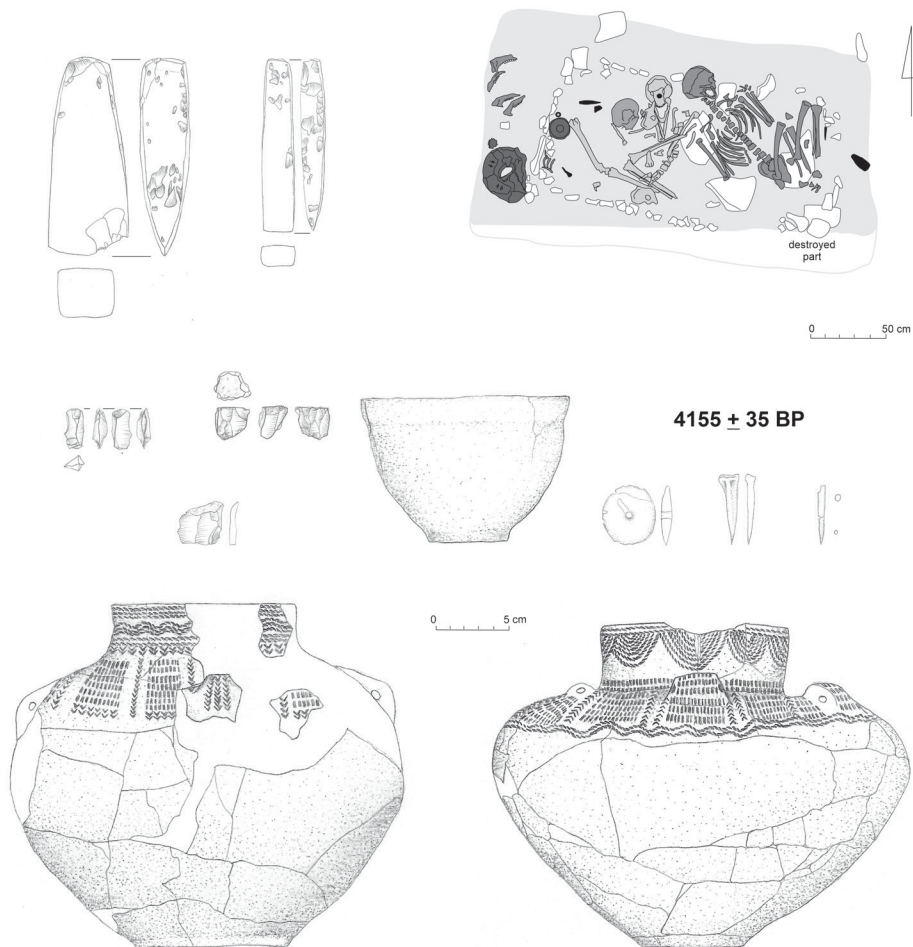


Fig. 7. Sandomierz-Kruków, site 78, Sandomierz district. Grave VIII with equipment and radio-carbon date. After Ścibior, Ścibior 1990 with changes

1990]. The nature of the discoveries and the fact that it has been only preliminarily explored prevents putting any estimate on the size of the site. Human bones found in three GAC graves on the site served to determine its absolute chronology. The bones were also subjected to specialised anthropological analyses [Schroeder *et al.* 2019] that also produced an additional absolute age determination for Grave VIII, carried out in the laboratory of Aarhus University, Denmark.

Grave II. A partially damaged human grave extending NW-SE. In the exposed part, one person was buried with the following grave goods: four vessels (including two with a cord ornament), a striped-flint axe and two flakes: one chipped off a striped-flint axe and the other made of Świeciechów flint (Fig. 6).

Grave VIII. A human grave with three burials, extending W-E with a vestigial stone lining. Besides human remains, it held two richly ornamented four-handled amphorae, an unornamented goblet, one Świeciechów flint axe, one striped-flint chisel, one small Turonian flint core, one splintered piece, one chocolate flint flake, a partially preserved bone point, a bone awl, an amber disk and two wild boar mandibles (Fig. 7).

Grave X. A human grave with a strongly disturbed stone lining and bone remains. The surviving inventory includes a ceramic stamp-ornamented lid, two Świeciechów flint blades and two wild boar tusks (Fig. 8).

Grave X

Sandomierz, site 78

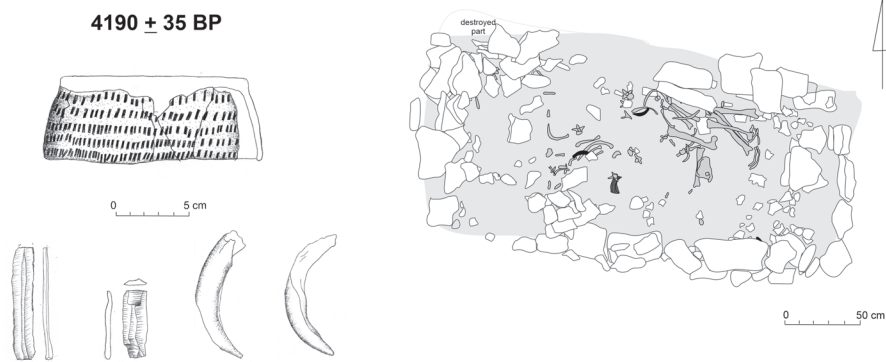


Fig. 8. Sandomierz-Kruków, site 78, Sandomierz district. Grave X with equipment and radiocarbon date. After Ścibior, Ścibior 1990 with changes

Mierzanowice, site 1

Site 1 in Mierzanowice (site 1, AZP 86-72/66) was excavated in 1936–1938. It yielded 36 GAC-related features in total, including seven human graves [Balcer 1963; Bąbel 1979]. The materials from this site have been scattered in storage. For radiocarbon dating, samples from three GAC sepulchral features could be obtained, nonetheless. It must be noted that one of these (Grave 1) has been presented until now in the professional literature as a feature of the Złota culture (ZC) [Salewicz 1937: 41, Bąbel 1979: 76–79], despite the absence of any direct analogies in the ZC artefact inventory.

Grave 1. A double human burial with a stone lining and pavement of large blocks of limestone. The pit outline was not recorded but the arrangement of the better preserved skeleton suggests that the grave was oriented along the SE-NW axis. Its goods consisted of a single vessel, bearing a cord ornament and appliqué bosses next to the vessel base, three flakes, including two of chocolate flint and one of striped flint, a wild boar tusk and animal bones (Fig. 9).

Grave 3. A single human burial with a stone lining; it extended along the SW-NE axis (Fig. 9). Next to the skeleton sat a single vessel with a cord ornament. Found in the pit fill, rough-outs of bifacial axes must be considered as belonging to the Mierzanowice culture, whose feature disturbed the older GAC grave.

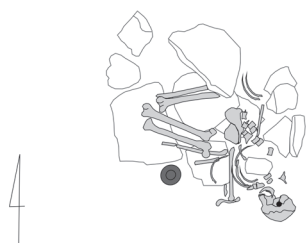
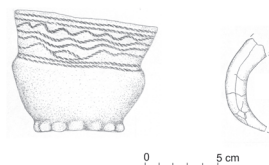
Grave 127. A single human disarticulated burial with a stone lining and pavement accompanied by pottery shards left likely by a vessel that has not been preserved. Other artefacts included one striped-flint axe, one flake and one hammerstone made of the same raw material, fragments of an elephant or mammoth tooth, pig bones and two bone ornaments in the type of a bone buckle (Fig. 9).

Malice, site 1

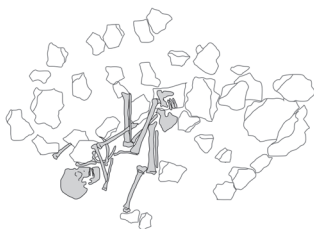
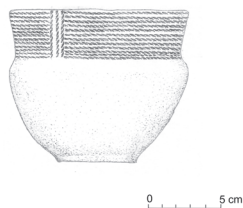
The last GAC cemetery for which absolute chronology was determined is one in Malice where three certain and one hypothetical GAC features were recorded [for details see Witkowska *et al.* 2021]. The first GAC features were discovered there in 1962 [Kamieńska 1964]. The cemetery was revisited in 2017 as part of research project no. 2014/12/S/HS3/00355. One of the purposes of the revisit was to examine a closed GAC assemblage from the Sandomierz Upland and procure new materials for analysis. It was to be more credible as it was to follow the latest research methodology. This demand was necessary because the potential of the source base of the Sandomierz GAC oecumene was critically

Grave 1

Mierzanowice, site I

**4140 \pm 40 BP**

Grave 3

**4180 \pm 40 BP**

Grave 127

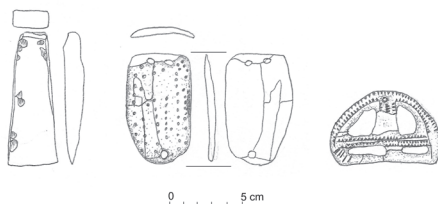
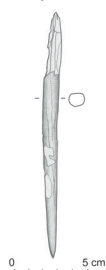
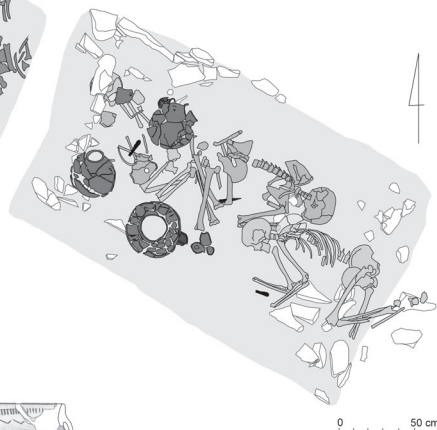
**4120 \pm 40 BP**

Fig. 9. Mierzanowice, site I, district Opatów. Graves of the Globular Amphora culture with equipment and radiocarbon dates. After Bąbel 1979 with changes. Features drawn by B. Witkowska based on field photos without scale

Animal deposit 31

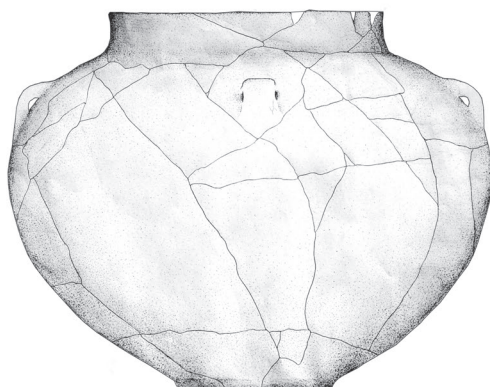
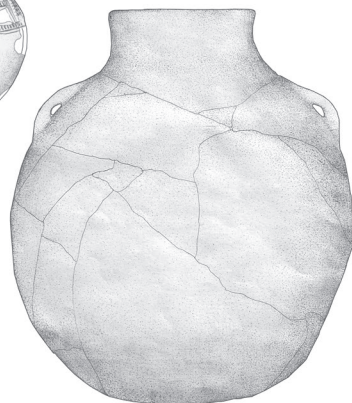
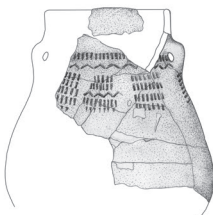
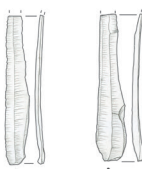
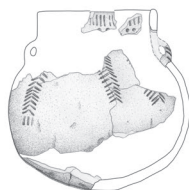
4135 \pm 35 BP

Malice, site 1



Grave 32

4113 \pm 25 BP
 4220 \pm 25 BP
 4123 \pm 25 BP
 4107 \pm 23 BP



0 5 cm

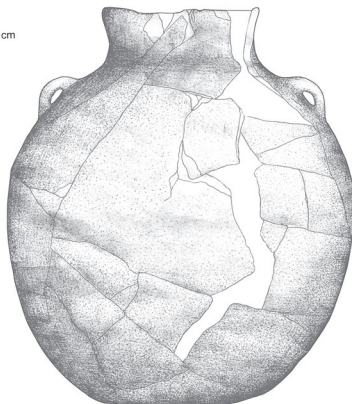


Fig. 10. Malice, site 1, Sandomierz district. Ritual complex of features 31-32 with equipment and radiocarbon dates. Research by B. Witkowska

viewed. The 2017 excavations allowed researchers to observe stratigraphy within a collective grave and record relationships holding among the burials deposited in it. This, in turn, helped model the calibration of radiocarbon dates [Witkowska *et al.* 2021].

Feature 31. An animal deposit accompanying human grave (Feature 32) that contained the bones of an indeterminate number of small ruminants and a pig (Fig. 10). Most of the osteological material is now lost. Among the animal bones, one double-edged bone point was found.

Feature 32. A collective human grave with a vestigial stone lining, oriented along the NW-SE axis. Altogether five persons were buried in it, accompanied by the following grave goods: seven vessels, including three large unornamented amphorae and four small richly ornamented vessels, two Świeciechów flint blades, five flakes of the same raw material and a partially preserved bone awl (Fig. 10).

Feature 33. A single human grave with a pavement of large limestone slabs accompanied by a hypothetical animal deposit designated by number 54. The inventory of the grave consisted of three vessels (including one beaker with a cord ornament and two partially preserved bottom parts of vessels of an indeterminate form), a striped-flint axe and blade, animal bones of indeterminate species (now lost) and a bifacial bone point (Fig. 11).

RESULTS OF RADIOCARBON DATING

In total, the reported project produced 25 absolute age determinations of samples from 17 GAC sepulchral features located on the Sandomierz Upland (Fig. 12; Table 2). Some determinations are second attempts to date the same sample in an effort to make calibrated BC ranges more accurate [Witkowska *et al.* 2021]. The samples selected for analyses were taken from osteological material coming from human graves and associated animal deposits (twelve and five features, respectively).

The only feature dated, using a sample of another material, is human Grave 28 from Gajowizna. In this case the amount of collagen extracted from the burial bones was too small to determine its absolute age. A charred pine beam found in the grave was used instead. Radiocarbon age determinations were obtained for its two extreme tree rings that were dendrochronologically assessed to differ in age by 31 years [Witkowska *et al.* 2020].³ The obtained dates are 4435 ± 35 BP and 4485 ± 35 BP, respectively, with a slightly older determination of the BP age being

³ Dendrochronological studies financed with funds from NSC project no. 2014/12/S/HS3/00355 were carried out by Professor Tomasz Ważny, Nicolaus Copernicus University, Toruń, Poland.

Feature 54 (hypothetical animal deposit)

Malice, site 1

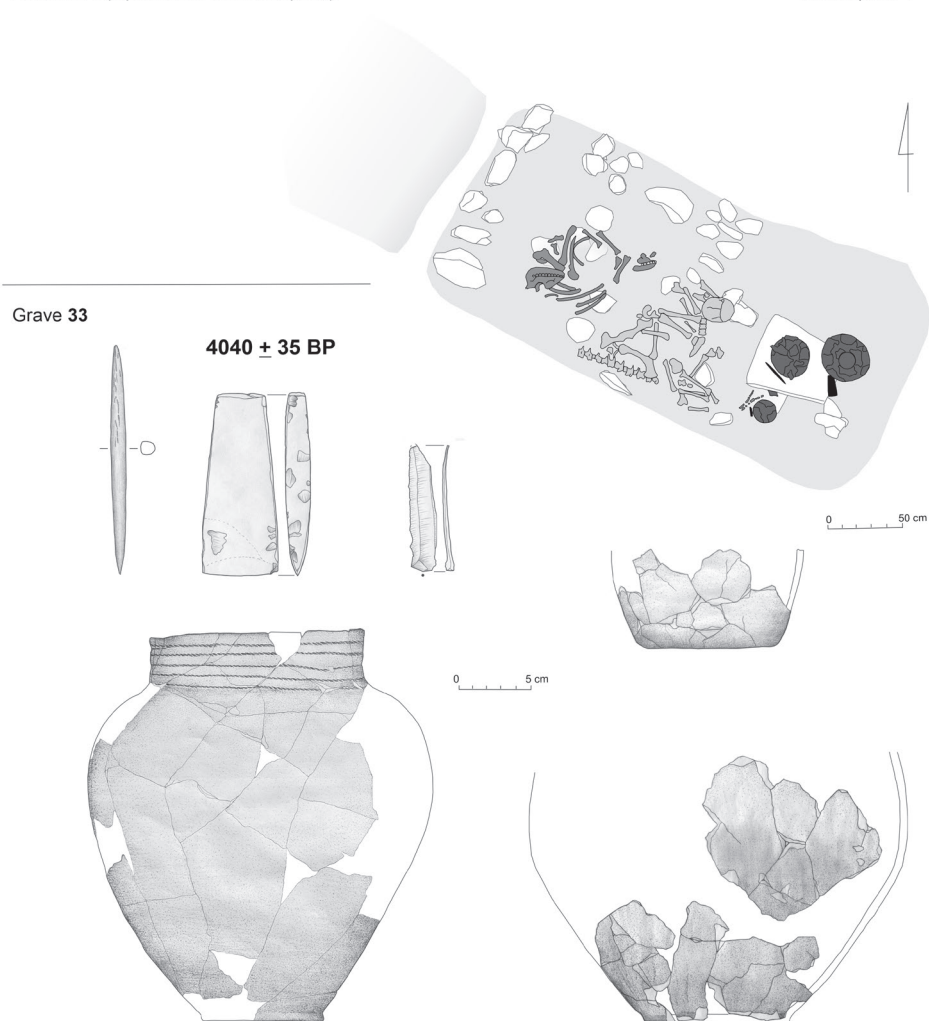


Fig. 11. Malice, site 1, Sandomierz district. Ritual complex of features 33-54 with equipment and radiocarbon date. After Kamińska 1964 with changes; artefacts drawn by B. Witkowska

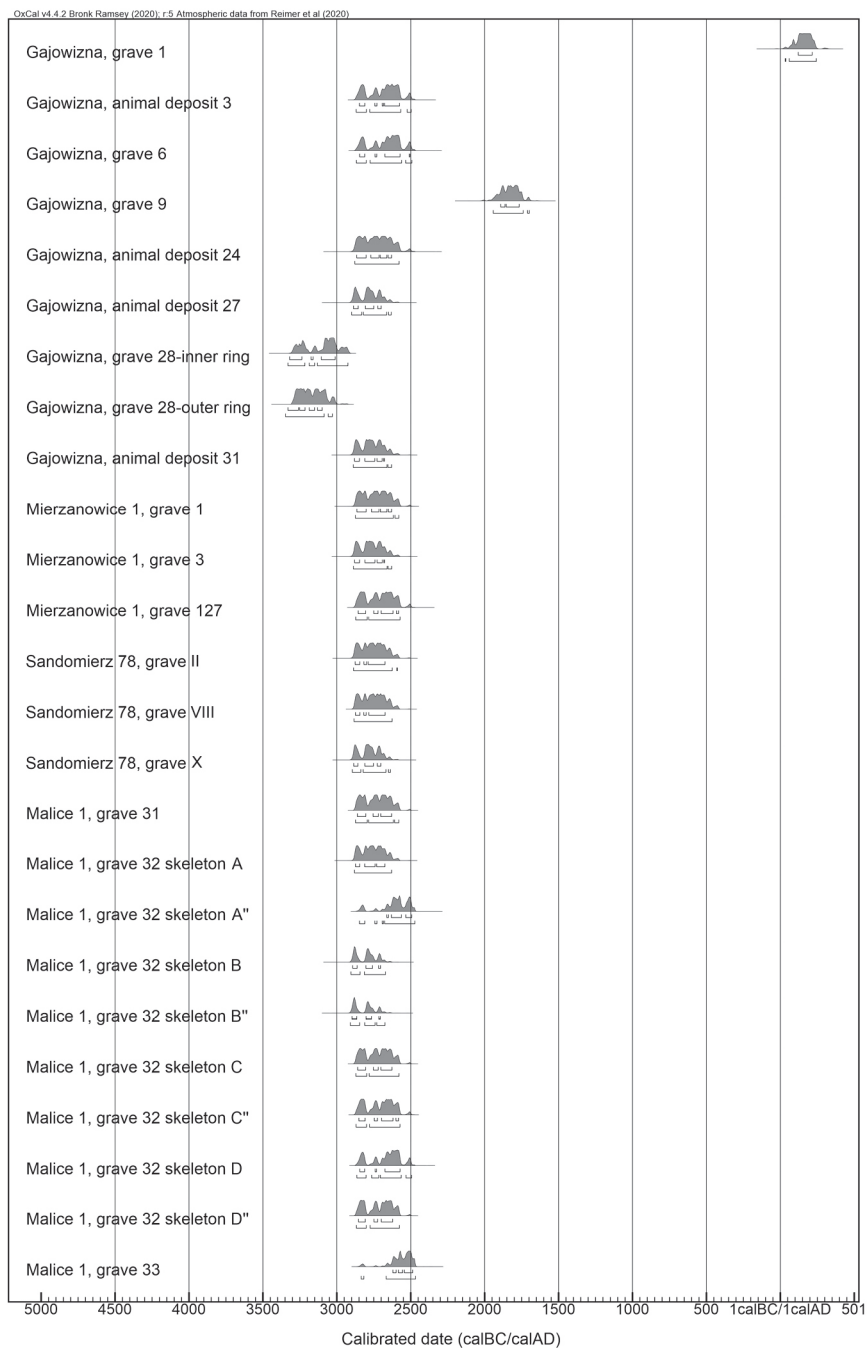


Fig. 12. The calibration of all radiocarbon dates obtained from Globular Amphora graves within the project NSC 2014/12/S/HS3/00355

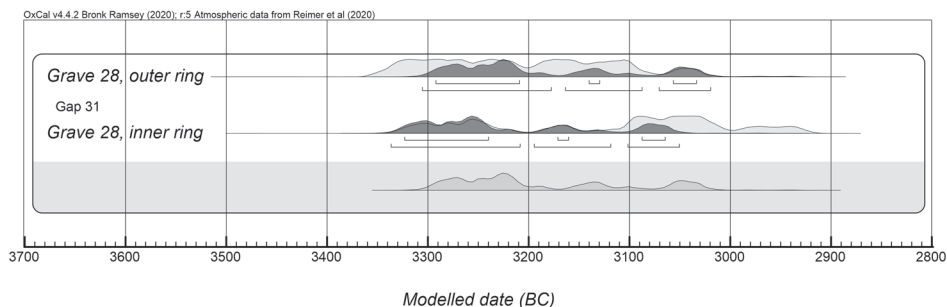


Fig. 13. Gajowizna site, Sandomierz district. The calibration with wiggle matching method of two radiocarbon dates from a fragment of beam found in Feature 28

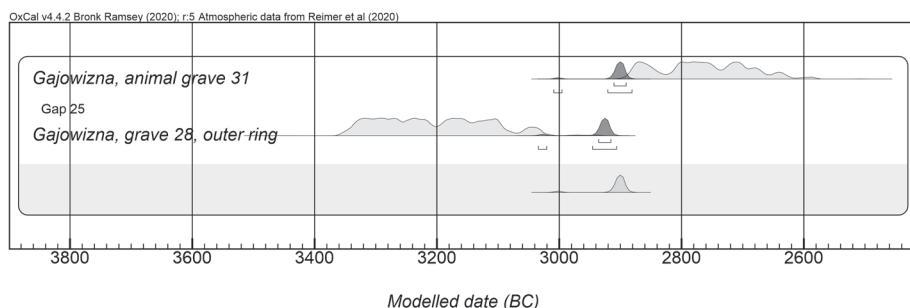


Fig. 14. Gajowizna site, Sandomierz district. The calibration with wiggle matching method of two dates from features 28 and 31 assuming a short distance time separating their formation

obtained for the outer tree ring. This paradoxical situation results from the very nature of the radiocarbon method and should be a warning against constructing chronological models, relying on uncalibrated dates. The calibration ranges of these two determinations largely overlap, producing the following results: 3331–2926 and 3348–3031 BC (2 sigma), respectively.

Relying on *a priori* knowledge on the sequence of samples and the time interval between them, these ranges may be slightly narrowed down to 3333–3025 BC (2 sigma) using modelling (Fig. 13). They are significantly older than the entire series of dates for the Sandomierz-Opatów subgroup and are among the oldest in the whole Polish GAC oecumene [Szmyt 1996, Table 1]. Interestingly enough, they have been confirmed by testing other samples of the same structural element, in this case, three prepared tree rings [Witkowska *et al.* 2020]. The other ^{14}C determinations from Gajowizna and the typological analysis of movable finds from this site argue against adopting so early a chronology of the cemetery. The false seniority

of the sample from Grave 28 results in all likelihood from the special nature of the organic material used for dating. This argument is borne out by the date for Feature 31, forming part of the same ritual complex. A bone of one of the animals deposited in it yielded the result of 4180 ± 40 BP, which is similar to the other absolute age determinations of GAC features on the Sandomierz Upland. Assuming that a short time interval separated features located exactly along the same axis, it is possible to make another attempt to model the actual age of the samples (Fig. 14). In this attempt, the 95.4% probability range is modified to 3010–2882 BC. This observation and the wide calibration brackets of the dates for Grave 28 (405 and 317 years, respectively, in the 2 sigma range) justify the claim that the actual age of Grave 28 is closer to the lower limit of the obtained ranges, or the period to which early graves from the Lublin Upland are dated, such as ones from Klementowice and Raciborowice-Kolonia. For their analogous assemblages the following dates were obtained: 3007–2883 BC and 3011–2902 BC [Włodarczak 2016: Fig. 2; cf. also Bronicki 2021].

Problems following from combining radiocarbon determinations obtained for different raw materials and performed in different laboratories are illustrated by dates for Grave VIII on the Sandomierz-*Kruków* site. For this grave, we have radiocarbon dates determined by four different research centres (Fig. 15; Table 2). They are as follows:

- Gd-4252 4370 ± 70 BP [Ścibior, Ścibior 1990: 195]
- AAR-? 4222 ± 23 BP [Schroeder *et al.* 2019]
- Poz-90784 4155 ± 35 BP
- GrN-20927 3950 ± 30 BP⁴ (letter of A. Lanting to K. Tunia of 1996).

The oldest date, obtained from charcoal, is close to the determination for Grave 28 from Gajowizna and indicates the range of 3332–2885 BC, thus, preceding the so-called Neolithic plateau. Meanwhile, the inventory of Grave VIII, comprising an amphora ornamented with cord impressions and showing affinities with the other dated assemblages from this site, unambiguously points to a later chronology of the feature. It is reflected in two determinations for burial bones that fit into the range of 2891–2697 BC (2 sigma, Table 2). It appears, therefore, that in the case of the determination Gd-4252, we are dealing with an ‘old wood effect’.

The youngest absolute age determination for Grave VIII is the date from the Groningen laboratory; it is significantly younger than the whole pool of GAC dates from the Sandomierz Upland obtained as a result of the current project because its calibration range falls on the second half of the 3rd millennium BC.

⁴ An unpublished date determined in the 1990s and made available by courtesy of Dr. Krzysztof Tunia and Prof. Piotr Włodarczak.

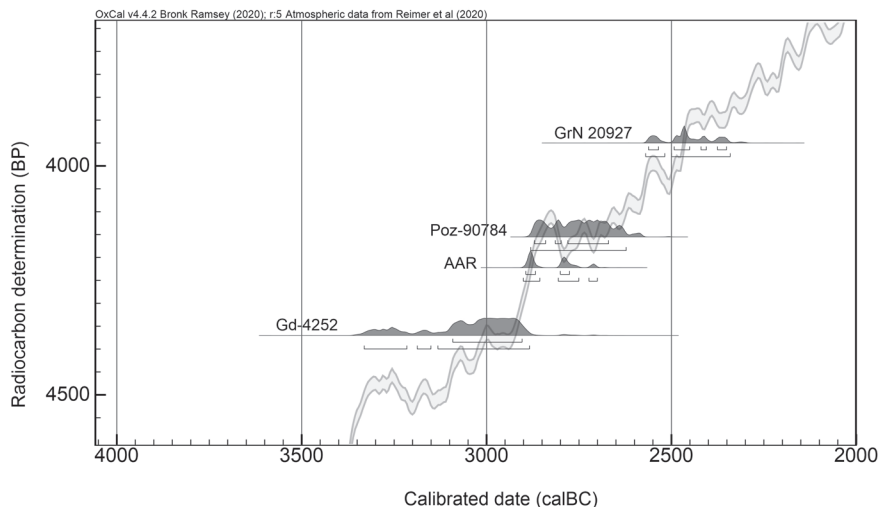


Fig. 15. Sandomierz-*Kruków*, site 78, Sandomierz district. The calibration of all radiocarbon dates obtained from grave VIII

So young radiocarbon dates were obtained for only a few GAC assemblages from the entire range of their occurrence such as the ritual features from Opatowice, site 1 in Kujawy [Koško, Makowiecki, Szmyt 2007: 272], a pit from site 25/5 in Linowo, features from the Katelbogen and Poggendorfer-Forst, Germany [Szmyt 1996, Table 18], and a settlement pit of the GAC eastern group from the site in Peresopnitsa [Kadrow, Szmyt 1996, Table 1]. The only features from south-eastern Poland dated to so late a chronology have so far been a GAC grave from Site 6 in Czulczyce-Kolonia [Bronicki 2019, Table 1; 2021], Grave 523 from Koszyce [Włodarczak, Przybyła 2013, Table 5], Grave 4 from Sadowie [Pasterkiewicz 2020: 68].

In two cases, however, we are faced with a difference between dates analogous to that described above. For the Czulczyce grave, altogether four age determinations have been obtained of which two lean towards the first half of the 3rd millennium BC: 4035 ± 90 BP (Kiev-7831) and 4020 ± 90 BP (Kiev-7830), while the other two reach its second half: 3995 ± 35 BP (Poz-61739) and 3940 ± 85 BP (Kiev-7829). It must be observed, however, that the wide calibration ranges of all the dates largely overlap in the interval of 2623–2411 BC. Grave 523 in Koszyce yielded an impressive number of 22 absolute age determinations [Schroeder *et al.* 2019, Appendix, Dataset S1], for the most part staying in the calibrated range of 2900–2550 BC. Yet, two of the determinations significantly precede this range: 4330 ± 34 BP (AAR-26317) and 4379 ± 32 BP (AAR-28710), while another two provided by another laboratory are significantly younger than this range: 3960 ± 44 (Ua-45618) and 3985 ± 38 (Ua-45619). These examples illustrate well the limitations of the radiocarbon method itself and make us realise the need to accumulate a pool of radiocarbon dates as large as possible for the purpose of cross-checking.

Two human bones from the Gajowizna site have yielded results inconsistent with the classification of features, made using traditional taxonomic analyses. In the case of sample Poz-90799 from Grave 1 (Table 2) what attracts attention is a high (14%) amount of collagen with which a late radiocarbon date correlates ($1180 \pm \text{BP}$ or 53–236 AD). Although in the case of the other feature (Grave 9), the absolute age determination does not differ so much from the expected one ($3510 \pm 40 \text{ BP}$, i.e. 1941–1700 BC), this result can hardly be deemed correct, keeping in mind that the cultural attribution of the feature to the culture in question raises no doubt. Adopting so long a lifespan of the GAC on the Sandomierz Upland would contradict our knowledge on this cultural unit as a whole, for the youngest dates attributed to it derive from the features of the eastern group and do not cross the dividing line of 2300 BC [Kadrow, Szmyt 1996]. Therefore, it appears that – contrary to initial assumptions – the bones used for dating could not come from GAC features. They must have been mixed with other osteological material in the long, reaching almost 100 years, period of storage.

GAC ABSOLUTE CHRONOLOGY ON THE SANDOMIERZ UPLAND

The other 23 age determinations of samples from GAC cemeteries on the Sandomierz Upland (Fig. 16; Table 2) are consistent with the knowledge on the chronology of the GAC Małopolska group gathered by using the traditional typological method and referring to dates for neighbouring regions [Szmyt 1996, Table 18; Włodarczak, Przybyła 2013, Table 5; Włodarczak 2016, Table 1-2; Bronicki 2016; 2019, Table 1]. As mentioned earlier, one of the advantages of the series of dates under discussion is the fact that almost all the determinations were made for the same material and by one laboratory, using uniform procedures and equipment. This has greatly improved the credibility of any comparative studies and is reflected in the cohesion of the determinations. Except for the determinations for charcoal from Grave 28 in Gajowizna, all the credible determinations fit into the range from $4225 \pm 25 \text{ BP}$ to $4040 \pm 35 \text{ BP}$, with the highest concentration occurring in the neighbourhood of 4200 ± 40 – $4100 \pm 35 \text{ BP}$ (18 determinations), or in calibrated years 2901–2577 BC (1sigma) or 2901–2498 BC (2 sigma). It must be noted that the highest calibration probability, amounting in the case of all the dates to almost 90%, is cumulated in the range of 2870–2600 BC (2 sigma; Fig. 17).

These dates, therefore, set the time bracket of GAC settlement on the Sandomierz Upland. Its span, made more credible by a series of 19 radiocarbon determinations for GAC settlement features – that also for the most part fit into the range of 2900–2600 BC [Florek, Witkowska 2021] – is surprisingly short. This

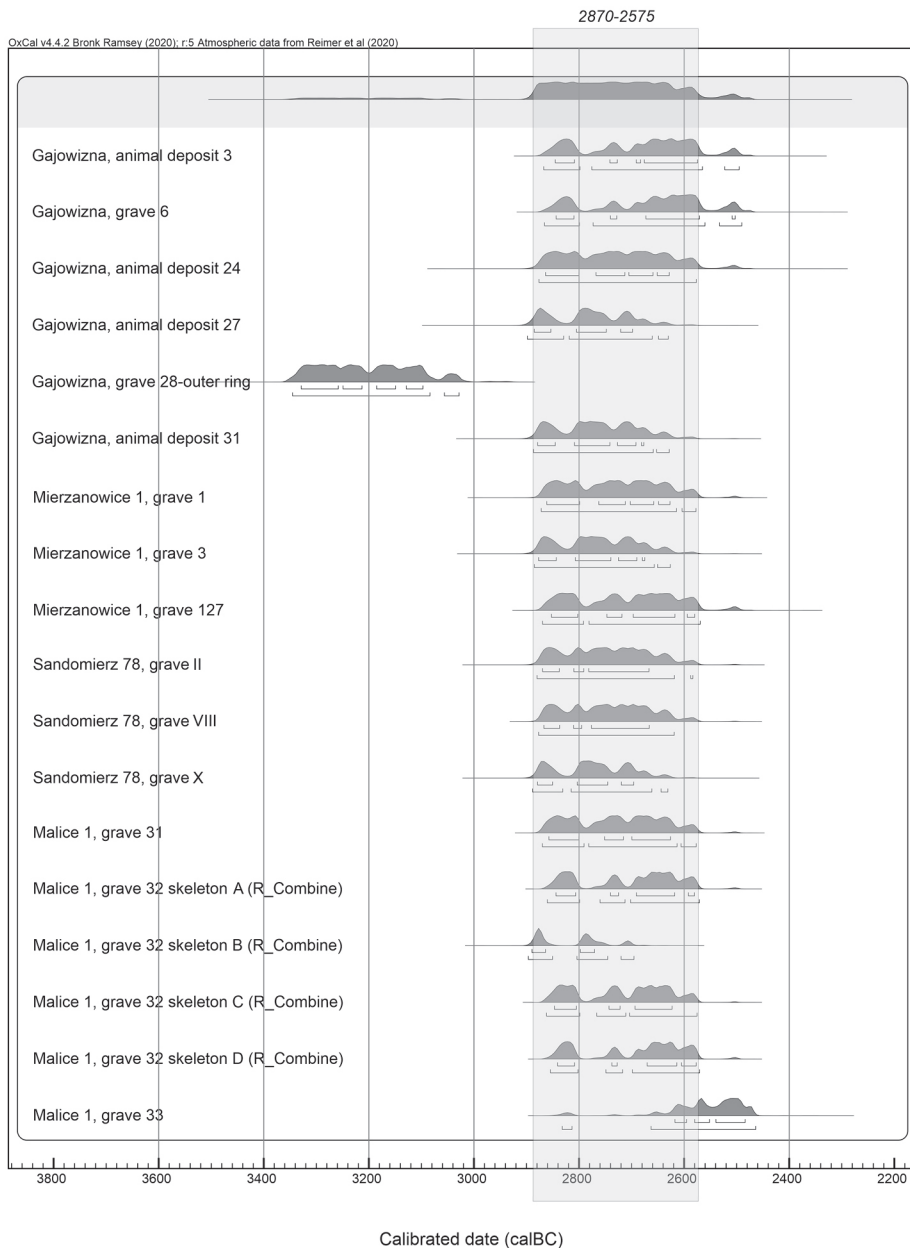


Fig. 16. The calibration of radiocarbon dates of Globular Amphora culture graves from Sandomierz Upland

fact, in turn, makes it necessary to revise the assumptions on the settlement by the Sandomierz-Opatów subgroup that have been made until now.

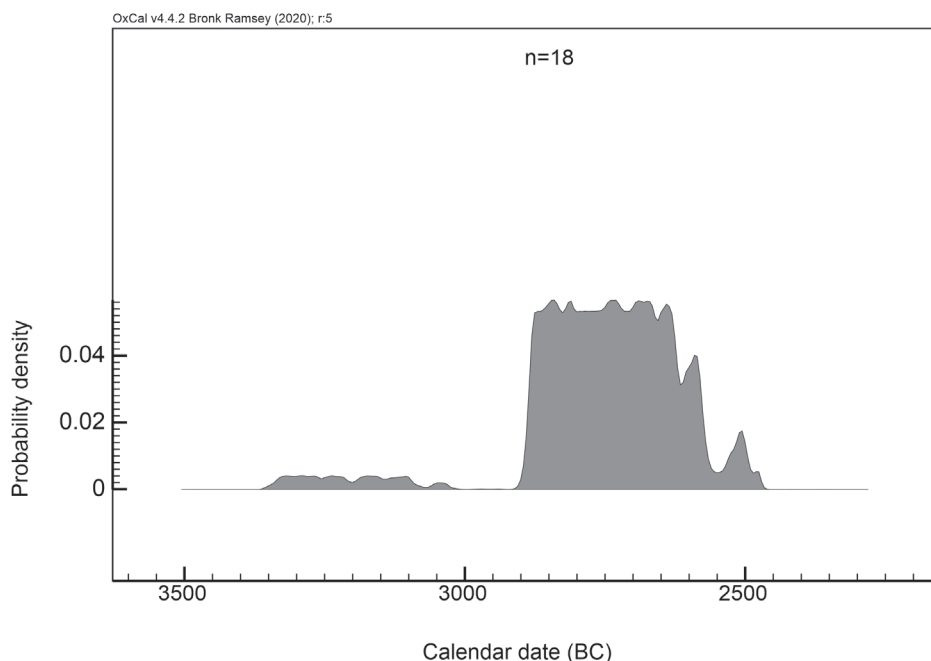


Fig. 17. The graph showing the expressive concentration of the probability 90% in the range 2870-2575 BC for calibration most dates of Globular Amphora culture graves form Sandomierz Upland

DEVELOPMENT SCHEME OF THE GAC SANDOMIERZ-OPATÓW SUBGROUP

The start of GAC expansion onto the Sandomierz Upland has been believed until now to have taken place at the turn of Phases IIb/IIIa, according to the overall chronological scheme of the Kujawy centre of the Polish group [Szmyt 1999, Fig. 25] or roughly in 3000/2900 BC [Włodarczak 2006: 29]. This opinion must have resulted from the interpretation of the first absolute age determination of a Sandomierz-Opatów subgroup funerary assemblage that has been published so far, namely, the date of 4370 ± 70 BP obtained for charcoal from Sandomierz-*Kruków* (3092–2905 BC, 1 sigma). As was shown above, the date has been disproved by two independent laboratories. In the entire pool of newly obtained ^{14}C determinations, only the date from Feature 28 on the Gajowizna site,

made also from charcoal, is equally early. Meanwhile, all the other determinations point to a later date of the beginning of GAC settlement in the area in question. This must have started in the well-advanced Phase IIIa according to the Kujawy periodization.

Nor does the stylistic analysis of GAC pottery found on the Sandomierz Upland supply any credible sources of an early date. The only artefacts suggesting an early origin are stray finds from Chwałki [Gurba 1956, Fig. 1], Grzegorzewice (unpublished collections of the National Museum in Kielce), the Góry Pieprzowe [Antoniewicz 1936: 379], the vicinity of St. Joseph's Church in Sandomierz (unpublished collections of the Regional Museum in Sandomierz) and Wąworków [Antoniewicz 1936: 235, Fig. 33]. These artefacts have no cord ornament and are decorated only with circular stamps or appliqué bosses. Although the style set of the named grave assemblages is quite expressive, there is no certainty, due to the circumstances of their procurement, that they are complete. Since no organic material has been preserved by accidental finders, the assemblages cannot be radiocarbon dated. Nor has it been possible to determine the absolute age of the cordless grave assemblages from Gajowizna because – as mentioned above – the osteological material included in them has been lost. Admittedly, no cord ornament has been recorded in the ceramic inventories of some settlement pits from Site 1 in Mierzanowice, but radiocarbon dates obtained for them do not bear out their early provenance [Florek, Witkowska forthcoming]. Thus, the possibility that the GAC appeared in the area under discussion at the very turn of the 3rd and 4th millennia BC, as suggested in reliance on traditional typology, is poorly evidenced now in terms of chronometry.

GAC grave inventories from the Sandomierz Upland are rather homogeneous and characterised by the co-occurrence of cord-ornamented vessels next to unornamented ones as for instance in Feature 24 from Gajowizna (Fig. 3) or Grave VIII from Sandomierz (Fig. 7) or ornamented ones using different techniques as for instance in Feature 32 from Malice (Fig. 10) and a grave from Rzeczyca Mokra [Ścibior 1993a]. A relatively high incidence of cord ornament in inventories from the area under discussion is considered the marker of a GAC younger development phase in the relevant literature [Wiślański 1966: 76; Szmyt 1996: 35]. By reason of the stylistic homogeneity, it must be assumed that most burials of the GAC Sandomierz-Opatów subgroup are chronologically close to radiocarbon-dated assemblages, i.e. they date back to 2900–2500 BC.

But only few grave features argue for the survival well into the 3rd millennium BC of the GAC settlement on the Sandomierz Upland. A late chronological position of some materials may be suggested by so-called suspended hatched triangles [nos. 12, 14–15 according to the ornament typology developed by Balcer 1963: 139] on an amphora from Broniszewice [Bąbel 1975, Fig. 2] and in the grave inventory from Site 1 in Chwałki [Nosek 1967, Fig. 128]. Possibly, of a similarly late date are also other sharp-angled motifs made with cord impressions [no. 11

acc. to Balcer 1963: 139] such as zigzags on bowls discovered in settlement Pits 170 and 173, Site 1, Mierzanowice [Florek, Witkowska 2021], Pits 2 and 5, Site 4, Mierzanowice [Gardawski, Miśkiewicz 1958, Fig. 8, Table 50] or Feature 26, ‘Nad Wawrem’ site, Złota (unpublished materials of the State Archaeological Museum in Warsaw). Sharp-angled vessel ornamentation motifs are one of the markers of the youngest development phase of the GAC East-Lublin subgroup according to the regional periodization [Bronicki 2019: 226, Table 2]. It must be noted that on the Lublin Upland analogous ornamentation is made above all with incisions and stamp impressions. However, their late chronology is not borne out beyond doubt by radiocarbon dates (*see* above comments on the grave in Czulczyce-Kolonia) [for a different opinion *see* Bronicki 2019: 219; 2021]. Sharp-angled motifs made with a cord are found in the Sandomierz-Kraków group of the Corded Ware culture, where they are considered an influence from the post-Baden environment [Włodarczak 2008: 258].

THE SANDOMIERZ UPLAND, FIRST HALF OF THE 3RD MILLENNIUM BC: CULTURAL CONTEXT

The time bracket defined by the described series of radiocarbon dates for GAC features from the Sandomierz Upland begs important questions about GAC relationships with other Late and Final Neolithic groups that lived there in the first half of the 3rd millennium BC.

One of the vital aspects of the study of the Samborzec-Opatów subgroup is its relation to the ZC. We now know of 15 radiocarbon dates, determining the absolute chronology of the ZC [Włodarczak 2019, Table 4]. The only absolute age determination of the ZC going beyond the range of 2900–2500 BC is the date 4390 ± 100 BP obtained from charcoal for a grave exposed on *Salve Regina Mount* in Sandomierz [Ścibior 1993b; Kruk, Milisauskas 1999: 212–213]. The other dates, obtained from human bones collected from graves, completely fit into the range determined by GAC chronometry (Fig. 18), which proves that these units – the ZC and GAC – were contemporaneous. Meanwhile, at the outset of the project, it was assumed that the lifespan of the GAC Sandomierz-Opatów subgroup at least in part preceded the ZC. However, none of the 42 absolute age determinations for the GAC on the Sandomierz Upland bore out this assumption. Consequently, there is no hard evidence for its acceptance now.

This sheds new light on the possibility of constructing sequential models of cultural transformations in the Late and Final Neolithic in the area under study. Two possible hypotheses therefore should be considered. The first argues for the succession of the two groups, which has been already suggested in the relevant

literature [e.g. Ścibior 1991]. The process of replacing the GAC with the ZC would not involve, however, the fade-out of all GAC traits, which are after all clearly visible in Złota assemblages, especially at its early development stage [Witkowska 2014]. Instead, the process would involve only the change of the funerary rite and the assimilation of certain exogenous elements into material culture. The above process would be reflected in the change from the chamber (cist) grave to the niche structure (*see* hypotheses about the structure of Grave 32 in Malice) [Witkowska *et al.* 2021] and the appearance of patterns originating from different cultural milieus in grave inventories. This scenario appears rather implausible now because it would call for assuming a very high, even unprecedented, dynamic of cultural transformation on the Sandomierz Upland in the Late Neolithic.

The second hypothesis, consistent with the suggested dating of the GAC Samborzec-Opatów subgroup, assumes that only a portion of the GAC population separated from the mother unit under the influence of external stimuli and subsequently formed the genetic substratum from which the ZC arose. What differentiated the GAC Samborzec-Opatów subgroup and the newly forming ZC would be thus the response to stimuli from the GAC eastern group, Baden milieu and early Corded Ware culture. This scenario, however, does not answer the question why new cultural patterns were assimilated only by a portion of the population and what rules governed the coexistence of two human groups following different cultural scenarios in so small an area.

With respect to the Corded Ware culture, there are only eight radiocarbon age determinations available obtained from bones collected from graves located on four sites on the Sandomierz Upland [Włodarczak 2019, Table 3, Fig. 3]. They all refer to the second half of the 3rd millennium BC and are linked to the Kraków-Sandomierz group. Therefore, in the light of the chronometric data, it seems reasonable to assume that the two groups (the GAC and Corded Ware culture) succeeded one another in time (Fig. 19). However, the presence of elements derived from GAC traditions in the Kraków-Sandomierz group [Włodarczak 2006: 129] somewhat complicates this picture. A separate question is the chronological and taxonomic position of the elements of the so-called old-Corded horizon found on the Sandomierz Upland in the contexts of ZC graves and GAC settlement pits. This question shall be discussed in greater detail in a separate work [Witkowska, Włodarczak 2021].

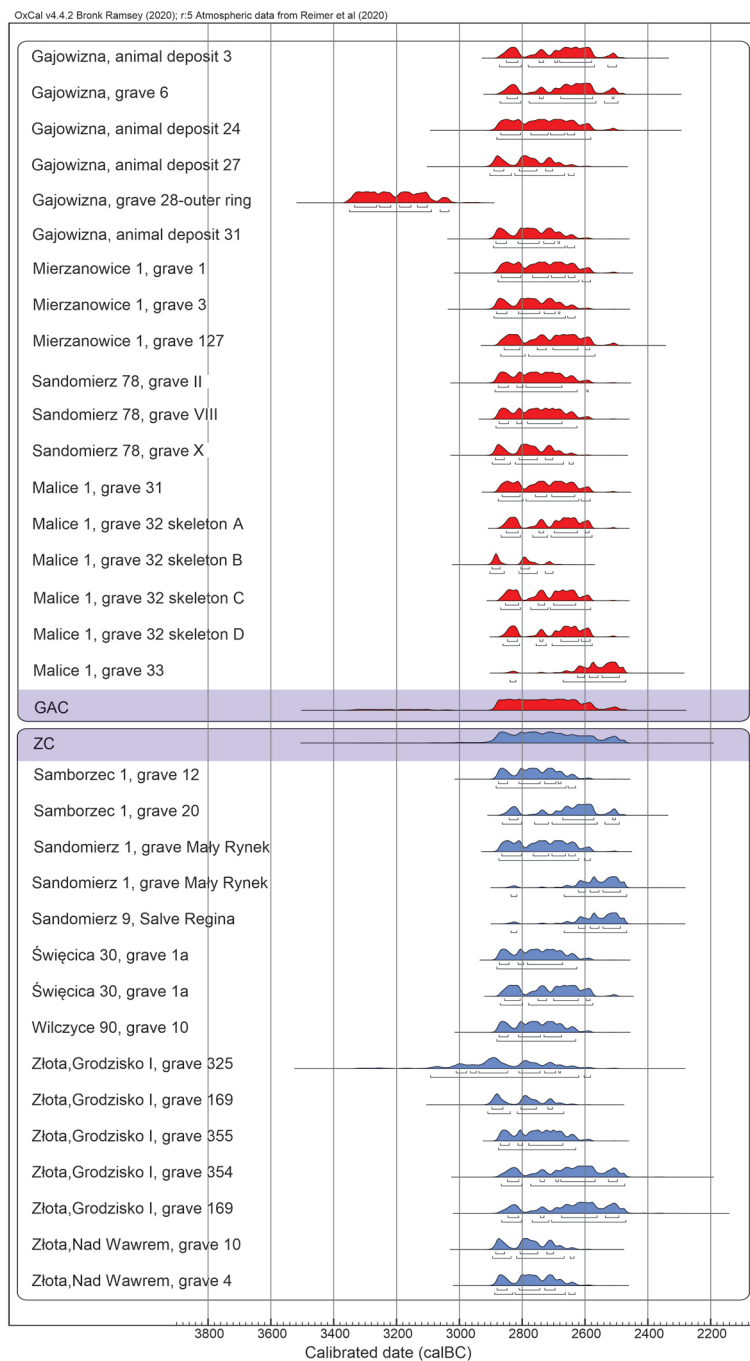


Fig. 18. Comparison of radiocarbon dates from the graves of the Globular Amphora culture (red) from Sandomierz Upland obtained in the project and absolute age determinations of Złota culture graves (blue). Złota culture dates after Włodarczak 2019

OxCal v4.4.2 Bronk Ramsey (2020); r 5 Atmospheric data from Reimer et al (2020)

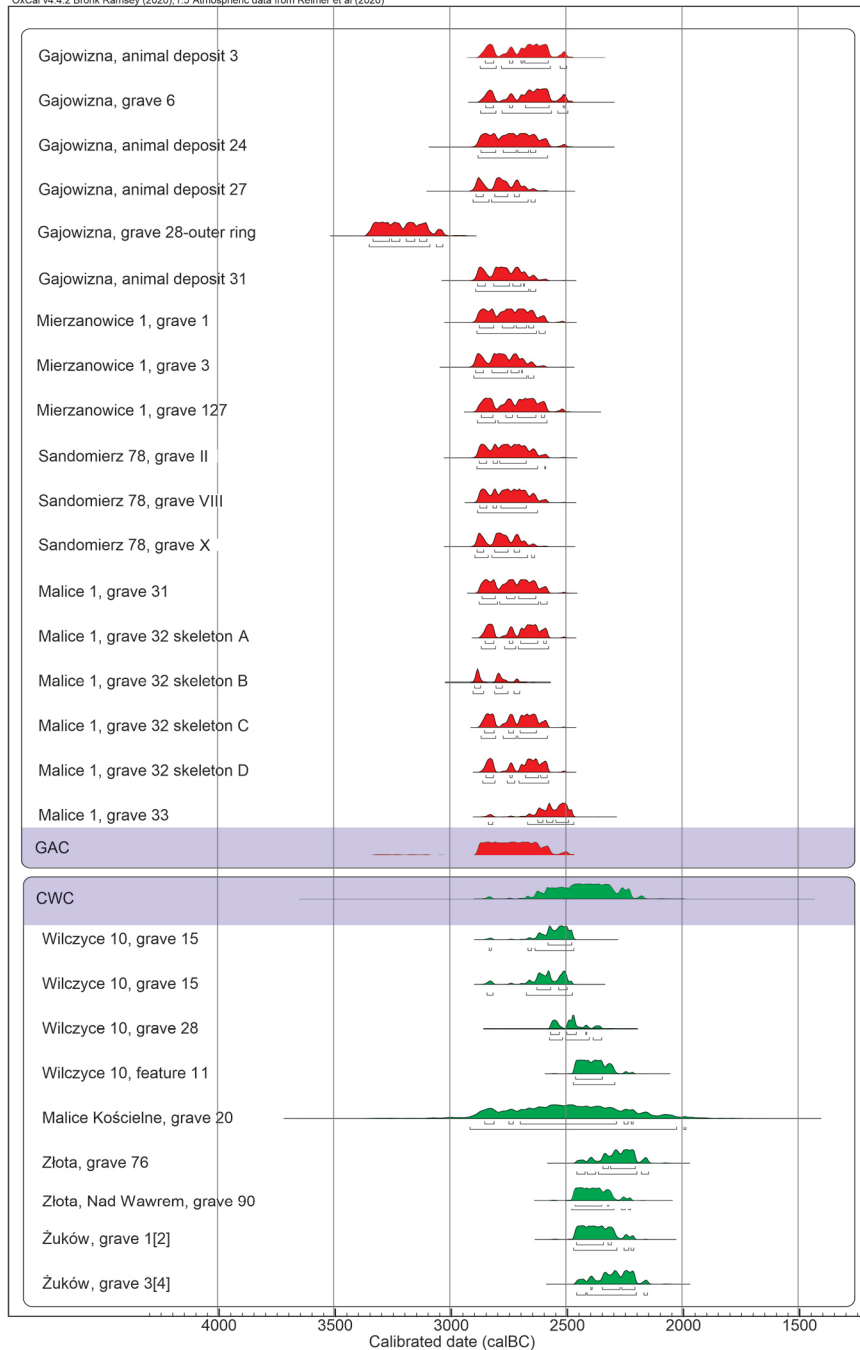


Fig. 19. Comparison of radiocarbon dates from the graves of the Globular Amphora culture (red) and absolute age determinations of Corded Ware graves (green), both list from Sandomierz Upland obtained in the project. Datings of the Corded Ware culture after Włodarczak 2019

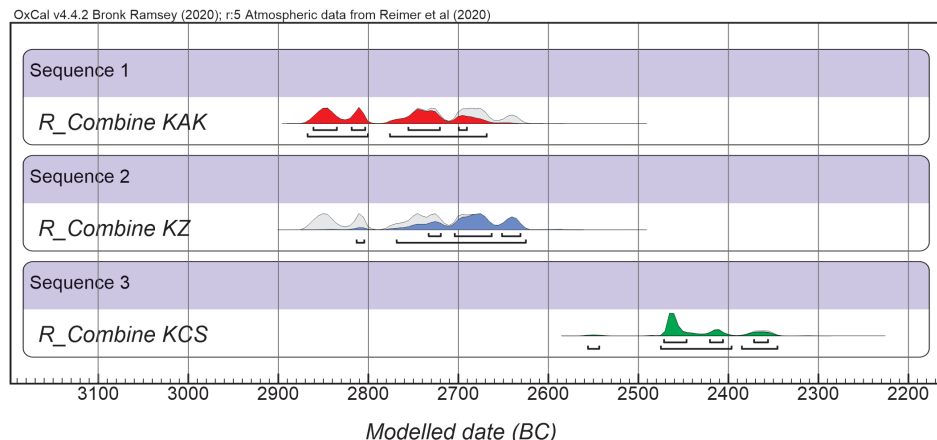


Fig. 20. The development diagram created on the basis of the summary calibration of the all radiocarbon dates of three cultural units existing in the Sandomierz Upland in the 3rd millennium BC

CONCLUSIONS

Obtained as a result of NSC project no. 2014/12/S/HS3/00 355, the series of GAC radiocarbon age determinations from the Sandomierz Upland is now the most numerous among ones referring to the south-eastern group and one of the most numerous in the entire area where this unit is found [Szmyt 1999; Włodarczak 2016; Bronicki 2019]. The new dates helped make the chronological brackets of the GAC in Małopolska more accurate. However, a full reconstruction of transformations unfolding in the first half of the 3rd millennium BC on the Sandomierz Upland is not possible now due to a limited number of absolute age determinations, concerning the other Late and Final Neolithic groups. All what can be done now is to suggest a preliminary development scheme (Fig. 20) that would call for verification with richer chronometric data.

REFERENCES

Antoniewicz W.

1928 *Archeologia Polski. Zarys czasów przedhistorycznych i wczesnodziejowych ziem polskich*. Warszawa.

1936 Z dziedziny archeologii ziem Polski. *Światowit* 17: 341–422.

Balcer B.

1963 Osada kultury amfor kulistych na stanowisku 1 w Mierzanowicach, pow. Opatów. *Materiały Archeologiczne* 9: 99–142.

Bargieł B., Florek M., Libera J., Zakościelna A.

1989 Badania powierzchniowe nad środkową Opatówką. *Sprawozdania z badań terenowych Katedry Archeologii UMCS w 1989 r.*, 38–46. Lublin.

Bąbel J.

1975 Naczynie kultury amfor kulistych ze stanowiska XII w Broniszowicach, pow. Opatów. *Wiadomości Archeologiczne* 39(3): 398–399.

1979 Groby neolityczne ze stanowiska I w Mierzanowicach, woj. tarnobrzemie. *Wiadomości Archeologiczne* 44: 67–82.

1985 Weryfikacyjne badania powierzchniowe przeprowadzone w rejonie wsi Mierzanowice i Wojciechowice, woj. Tarnobrzeg. *Sprawozdania Archeologiczne* 37: 55–71.

Borkowski W., Zalewski M.

1992 Problem datowania radiowęglowego kopalń krzemienia w Krzemionkach. In: W. Brzeziński (Ed.) *Materiały krzemionkowskie*. Studia nad gospodarką surowcami krzemiennymi w pradziejach 1, 151–167. Warszawa.

Bronicki A.

2016 Obrządek pogrzebowy społeczności amfor kulistych na Wyżynie Lubelskiej. In: P. Jarosz, J. Libera, P. Włodarczak (Eds) *Schylek neolitu na Wyżynie Lubelskiej*, 45–256. Kraków.

2019 Chronologia podgrupy wschodniolubelskiej kultury amfor kulistych w świetle oznaczeń radiowęglowych. In: M. Szymt, P. Chachlikowski, J. Czebreszuk, M. Ignaczak, P. Makarowicz (Eds) *Vir Bimaris. From Kujawy Cradle to Black Sea Steppes. Studies on the Prehistory of the Baltic-Pontic Between-the-Seas In Recognition of Professor Aleksander Koško*. *Archeologia Bimaris – Dyskusje* 5, 201–228. Poznań.

2021 Chronology and periodization of the Globular Amphora culture East Lublin subgroup. *Baltic-Pontic Studies* 25: 221–264.

Bronk Ramsey C.

2020 OxCal v4.4.2. Oxford (www.rlaha.ox.ac.uk).

Florek M.

2010 Odkrycie kolejnego grobu kultury amfor kulistych w Ossolinie koło Klimontowa. *Zeszyty Sandomierskie* 30: 99–100.

Florek M., Witkowska B.

2021 Absolute chronology of settlement remains of the Globular Amphora culture in Sandomierz Upland (Gałkowice-Ocin, Mierzanowice, Złota-Nad Wawrem). *Baltic-Pontic Studies* 25: 159–188.

Gardawski A. and Miśkiewicz J.

1958 Sprawozdanie z badań podjętych w 1957 roku w miejsc. Mierzanowice, pow. Opatów. *Wiadomości Archeologiczne* 25 (4): 322–337.

Gąssowska E.

1962 Nowe odkrycia grobów kultury ceramiki sznurowej w pow. Sandomierz. *Wiadomości Archeologiczne* 28: 88–90.

Gurba J.

1956 Stanowisko złockiej grupy kultury ceramiki sznurowej w Sandomierzu na Chwałkach. *Wiadomości Archeologiczne* 12 (1): 96–97.

Jakimowicz R.

1920 Zbiór wykopalisk przedhistorycznych w Muzeum djecezejalnem w Sandomierzu. *Wiadomości Archeologiczne* 5: 214–222.

1935 Sprawozdanie z działalności Państwowego Muzeum Archeologicznego za 1928 rok. *Wiadomości Archeologiczne* 13: 232–278.

Jakimowiczowa Z.

1927 Groby zwierzęce pod Sandomierzem. *Z otchłani wieków* 2 (3): 33.

Kadrow S., Szmyt M.

1996 Absolute chronology of the Eastern Group of Globular Amphora Culture. *Baltic-Pontic Studies* 4: 103–111.

Kamieńska J.

1964 Sprawozdanie z badań archeologicznych na stanowisku neolitycznym w Malicach, pow. Sandomierz w 1962 r. *Sprawozdania Archeologiczne* 16: 30–34.

Kośko A., Makowiecki D., Szmyt M.

2007 Miejsce obrzędowe ludności kultury amfor kulistych. In: A. Kośko, M. Szmyt, *Opatowice – Wzgórze Prokopiaka* II. Studia i materiały do badań nad późnym neolitem Wysoczyzny Kujawskiej II, 265–273. Poznań.

Kowalski K.

- 1975 Materiały do badań neolitu w Polsce. *Materiały Starożytne i Wczesno-średniowieczne* 3: 45–70.

Kruk J., Milisauskas S.

- 1999 *Rozkwit i upadek społeczeństw rolniczych neolitu*. Kraków.

Krzak Z.

- 1974 Dwa groby kultury amfor kulistych w Grójcu Opatowskim. *Sprawozdania Archeologiczne* 24: 341–347.
- 1977 Cmentarzysko na Gajowiźnie pod względem archeologicznym. In: J. Kowalczyk (Ed.) *Cmentarzysko kultury amfor kulistych w Złotej Sandomierskiej*, 9–79. Warszawa – Kraków – Gdańsk.
- 1991 Nowe stanowiska neolityczne w dorzeczu górnej Opatówki na Wyżynie Sandomierskiej. *Wiadomości Archeologiczne* 52 (2): 133–140.

Nosek S.

- 1967 *Kultura amfor kulistych w Polsce*. Wrocław – Warszawa – Kraków.

Pasterkiewicz W.

- 2017 Wyniki badań archeologicznych na cmentarzysku z późnego neolitu w Sadowiu koło Opatowa. *Materiały i Sprawozdania Rzeszowskiego Ośrodka Archeologicznego* 38: 281–289.
- 2020 The first radiocarbon dates for the Globular Amphora culture cemetery in Sadowie in the Sandomierz Upland. *Analecta Archeologica Ressoiviensia* 15: 53–76.
- 2021 Sepulchral complexes of human burials and animal deposits, site 23, Sadowie, Opatów district. Study of selected examples. *Baltic-Pontic Studies* 25: 79–116.

Przyborowski J.

- 1873 Z epoki kamienia w Sandomierskiem. *Wiadomości Archeologiczne* 1: 12–14.

Pyzik J.

- 1960 Grób kultury amfor kulistych we wsi Ossolin pow. Sandomierz. *Wiadomości Archeologiczne* 26: 349–350.

Salewicz K.

- 1937 Tymczasowe wyniki badań prehistorycznych w Mierzanowicach (pow. Opatowski, woj. Kieleckie). *Z otchłani wieków* 12: 39–59.

Schroeder H., Margaryan A., Szmyt M., Theulot B., Włodarczak P., Rasmussen S., Gopalakrishnan S., Szczepanek A., Konopka T., Jensen T.Z.K., Witkowska B., Wilk S.,

Przybyła M.M, Pospieszny Ł., Sjögren K-G., Belka Z., Olsen J., Kristiansen K., Willerslev E., Frei K., Sikora M., Johannsen N.N., Allentoft M.E.

2019 Unraveling ancestry, kinship, and violence in a Late Neolithic mass grave. *Proceedings of the National Academy of Sciences* 116(22): 10705–10710. DOI: <https://doi.org/10.1073/pnas.1820210116>

Szmyt M.

1996 *Spółeczności kultury amfor kulistych na Kujawach*. Poznań.

1999 Between West and East. People of the Globular Amphora Culture in eastern Europe: 2950-2350 BC. *Baltic-Pontic Studies* 8: 1–349.

Ścibior J.

1991 Odpowiedź dyskutantom. In: J. Gurba (Ed.) *Schylek neolitu i wczesna epoka brązu w Polsce środkowowschodniej*. Lubelskie Materiały Archeologiczne 6, 47–65. Lublin.

1993a Grób kultury amfor kulistych z Rzeczycy Mokrej k. Sandomierza. *Sprawozdania Archeologiczne* 45: 73–82.

1993b Badania na wzgórzu Salve Regina w 1988 roku. In: S. Tabaczyński (Ed.) *Sandomierz: Badania 1969-1973*. Vol. I, 318–322. Warszawa.

Ścibior J. M., Ścibior J.

1990 Sandomierz 78 – wielokulturowe stanowisko z przełomu neolitu i epoki brązu. Badania ratownicze w 1984 roku. *Sprawozdania Archeologiczne* 42: 157–199.

Wiślański T.

1966 *Kultura amfor kulistych w Polsce północno-zachodniej*. Wrocław – Warszawa – Kraków.

Witkowska B.

2014 *Kultura złocka. Taksonomia, osadnictwo i chronologia*, Kraków (unpublished doctoral dissertation at the Institute of Archeology of the Jagiellonian University). Kraków.

Witkowska B., Czebreszuk J., Gmińska-Nowak B., Goslar T., Szmyt M., Ważny T.

2020 The cemetery of the Globular Amphora culture community at the Złota-Gajowizna site in the light of radiocarbon analysis and dendrochronology. *Sprawozdania Archeologiczne* 72(2): 259–284. DOI: <https://doi.org/10.23858/SA/72.2020.2.0XX>

Witkowska B., Przybyła M. M., Podsiadło M., Szczepanek A., Włodarczak P.

2021 Absolute chronology of the Globular Amphora funeral complex at Malice, Sandomierz Upland. *Baltic-Pontic Studies* 25: 49-78.

Witkowska B., Włodarczak P.

- 2021 Relationships between Globular Amphora and Corded Ware occupation phases in *Złota-Nad Wawrem* site, Sandomierz Upland. Chronometric and stratigraphic evidence. *Baltic-Pontic Studies* 25: 117–158.

Włodarczak P.

- 2006 *Kultura ceramiki sznurowej na Wyżynie Małopolskiej*. Kraków.

- 2008 Corded Ware and Baden Cultures. Outline of chronological and genetic relations based on the finds from western Little Poland. In: M. Furholt, M. Szmyt, A. Zastawny (Eds) *The Baden Complex and the Outside World. Proceedings of the 12th Annual Meeting of the EAA 2006, Cracow*. Studien zur Archäologie in Ostmitteleuropa / Studia nad Pradziejami Europy Środkowej 4: 247–261. Kiel – Poznań – Kraków.

- 2016 Chronologia absolutna cmentarzysk późno- i schyłkowoneolitycznych na Wyżynie Lubelskiej. In: P. Jarosz, J. Libera, P. Włodarczak (Eds) *Schyłek neolitu na Wyżynie Lubelskiej*: 537–548. Kraków.

- 2019 Grób 15 z Wilczyc na tle środkowoeuropejskim: odmienność i reguła w rytuale pogrzebowym kultury ceramiki sznurowej. In: P. Włodarczak (Ed.) *Wilczyce stanowisko 10. Norma i precedens w rytuale pogrzebowym małopolskiej kultury ceramiki sznurowej*. Ocalone Dziedzictwo Archeologiczne 9, 169–209. Kraków – Niepołomice – Pękwice.

Włodarczak P., Przybyła M.M.

- 2013 Groby z Koszyc na tle innych późno- i schyłkowoneolitycznych znalezisk środkowoeuropejskich. In: M. M. Przybyła, A. Szczepanek, P. Włodarczak (Eds) *Koszycy, stanowisko 3. Przemoc i rytuał u schyłku neolitu*. Ocalone Dziedzictwo Archeologiczne 4, 209–255. Kraków – Pękwice.

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ABSOLUTE CHRONOLOGY OF THE GLOBULAR AMPHORA FUNERAL COMPLEX AT MALICE, SANDOMIERZ UPLAND

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ABSTRACT

The article presents new radiocarbon datings made for a funeral complex from Malice, site 1, located on the Sandomierz Upland and related to the Globular Amphora culture. The complex included at least two human graves (features no. 32 and 33) and two animal deposits or sacrificial pits (no. 31 and probably 54). Feature 32 was a collective grave including five burials (of a male, a female and three children), while in Feature 33 the only one disarticulated human skeleton has been excavated. Pit 31 contained at least three animal individuals. It is possible the unexamined Pit 54 also contained animal depositions. The described features probably formed two clusters, each of which

included a human grave and an accompanying pit with animal deposits. Altogether ten radiocarbon dates were obtained with the dated bone samples coming from five human skeletons found in Graves 32 and 33, and animal remains from Pit 31. The calibration results point to the first half of the 3rd millennium BC and stay between 2909 and 2472 BC (with the probability of 95.4%) or more precisely between 2898 and 2490 BC (probability of 68.2%). However, thanks to the stratigraphic documentation it was possible to determine that five deceased from Feature 32 were buried in three phases most likely to ca. 2850–2750 BC. It is highly probable that individual burials were separated by short time intervals. A similar age should be adopted for Feature 31 – a sacrificial pit linked to Grave 32. However, it is not possible to determine with any certainty the age of Grave 33: it could have been contemporaneous with, or slightly younger (ca 2620–2500 BC) than Feature 32.

Keywords: Globular Amphora culture, radiocarbon dating, modelled calibration, funerary rite, collective grave

INTRODUCTION

On the Sandomierz Upland, a number of Globular Amphora culture (GAC) sites have been discovered (Fig. 1) either by chance in most cases or in the course of investigations carried out already in the period between the two world wars [Nosek 1967; Wiślański 1979; Ścibior 1991]. The interwar discoveries yielded above all rich grave goods from the ‘Gajowizna’ cemetery in Złota [Krzak 1977; Witkowska *et al.* 2020] and settlement finds from Mierzanowice, site 1 [Balcer 1963]. Unfortunately, these finds are now incomplete and their documentary do not meet modern methodological standards. For these reasons, to obtain good quality data for the study of the chronometry and biological characteristics of GAC populations on the Sandomierz Upland, a decision was made to hold new excavations as per NSC project no. 2014/12/S/HS3/00355. For this purpose, Malice, site 1 (AZP 89-73/70¹), Obrazów commune (Fig. 2) was selected as it had been known in the professional literature for the discovery of a single GAC human grave – Feature 33 [Kamieńska 1964]. The study of field notes from the investigations conducted in 1960–1962 suggested, however, the existence of a ceremonial-funerary complex, comprising a larger number of features. Actually, the earlier investigations unearthed over 30 archaeological features altogether (Fig. 3) [Kamieńska 1962; 1963; 1967; 1964; 1972] of which four were plausibly linked to the GAC. Of the four, only two were explored then, with only Grave 33 mentioned earlier being published. Orientations, pit shapes and spatial relationships between features

¹ Identification number in Archaeological Record of Poland (in Polish: Archeologiczne Zdjęcie Polski = AZP).

discovered but left unexplored in 1963 suggested their connection to a GAC cemetery. To verify this hypothesis, field works commenced in the summer of 2017.

Their first stage was to locate the locus of previous excavations and rediscover the features left unexplored. This was successfully done, owing to information obtained from villagers, allowing us to locate roughly where the previous excavations took place, and a magnetometer survey that pinpointed the features searched for.

Relying on the reconstructed 1960s are grid, a rectangular trench was delineated, measuring 2.2×3.7 m in which – as expected – Feature 32 was found – a presumed GAC burial. The exploration covered a fragment of its surroundings as well by exposing space to the north, east and south of it. However, no other Late Neolithic features were discovered. In total, the exploration covered an area of over 1.0 are on which 12 settlement-type features were recorded (Fig. 3). Some were examined and materials associated with the late phase of the Mierzanowice culture were recovered. It is to the Early Bronze Age too that most features from the investigations in 1960–1962 are linked. As far as we can tell now, the GAC cemetery was most likely small, consisting of two grave pits and accompanying sacrificial pits or Feature 32 with Pit 31 and Feature 33 whose hypothetical animal deposit (Pit 54) has not been examined.

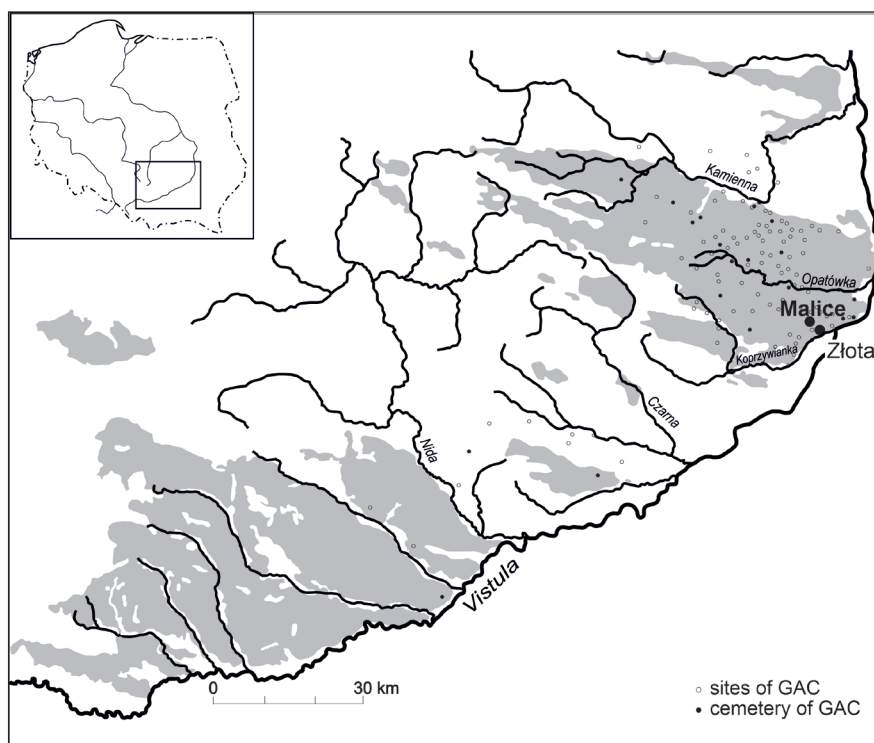


Fig. 1. Malice cemetery (site 1) against the background of other sites of the Globular Amphora culture in Małopolska

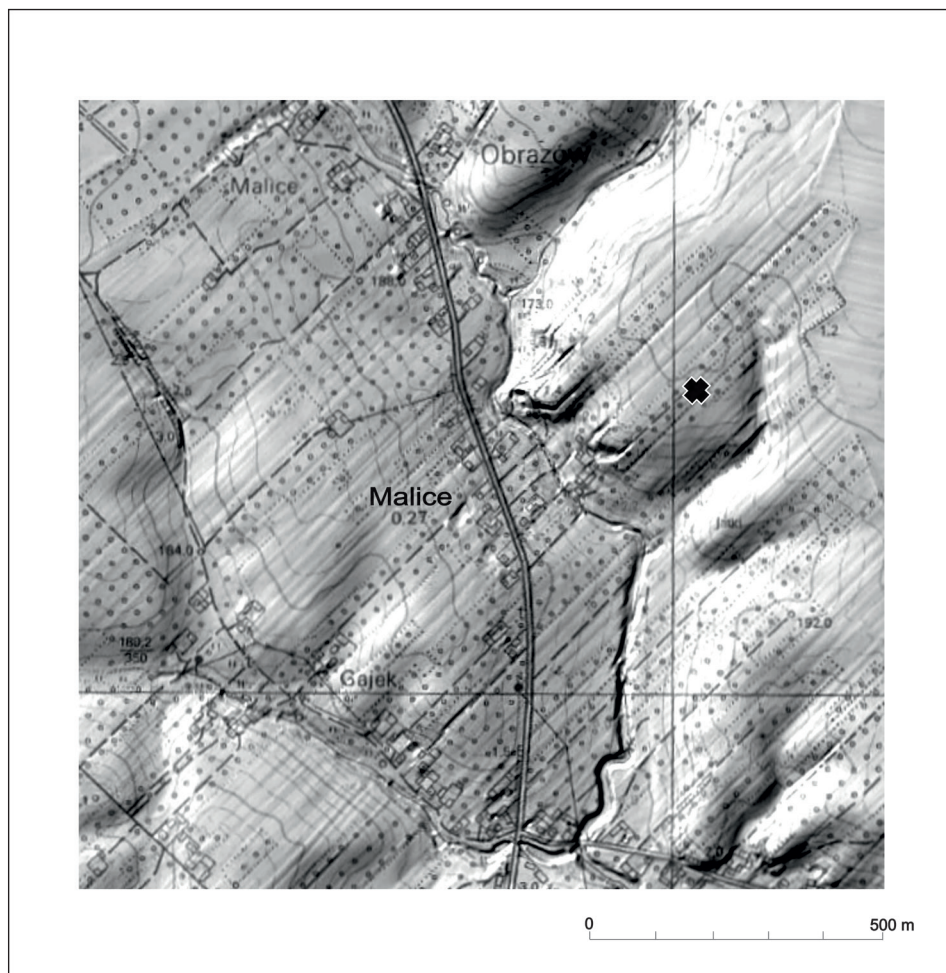


Fig. 2. Location of site 1, Malice, Sandomierz district

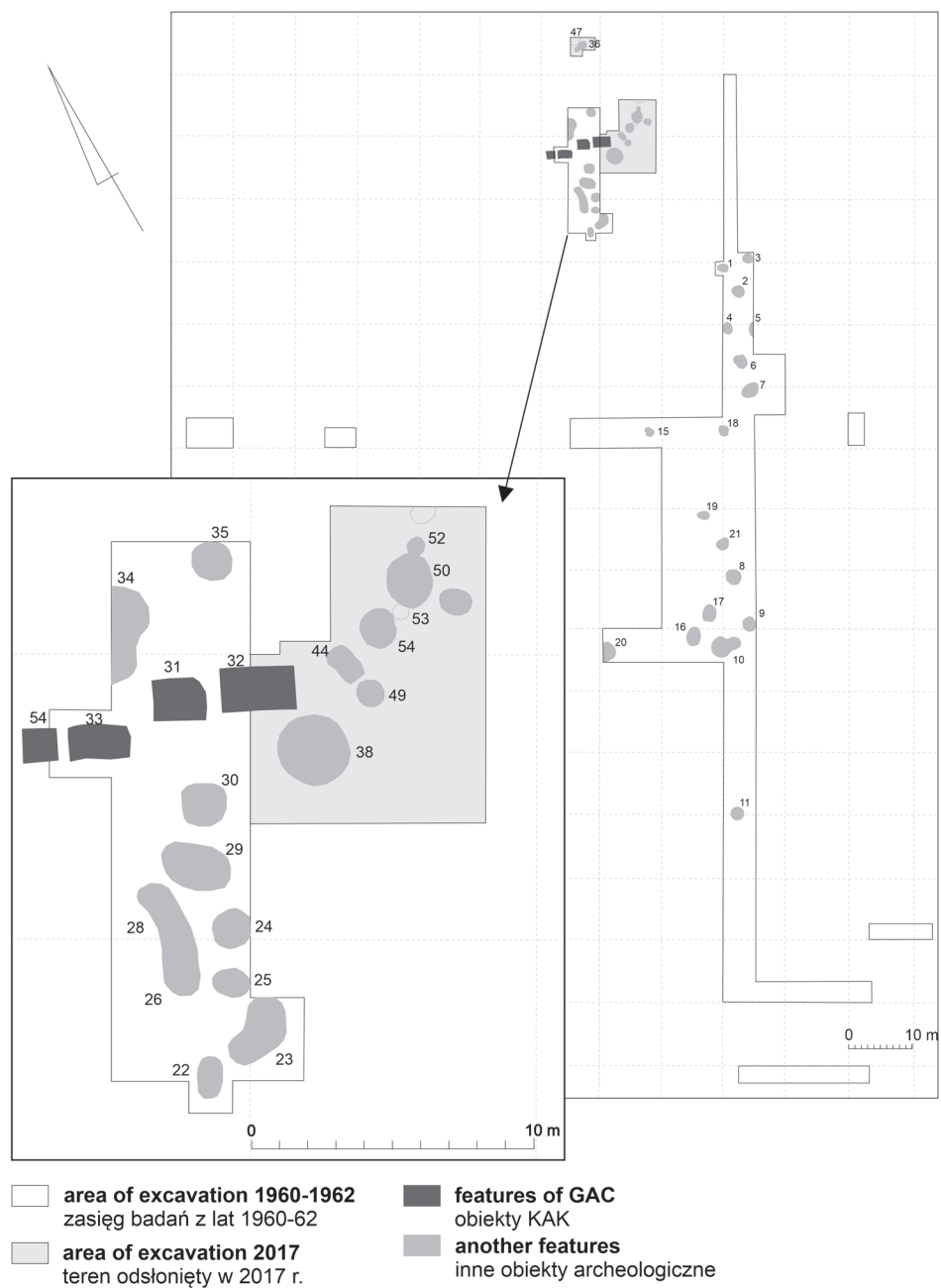


Fig. 3. Malice, site 1, Sandomierz district. Site plan

FEATURE 31 (PIT WITH ANIMAL SACRIFICE)

Although discovered in 1962, the feature has not been published yet. Its pit resembled a square of 130×160 cm and 50 cm deep from the ground surface. It was filled with light-brown soil, recorded among numerous animal bones tightly filling its interior. Most of the osteological material has gone missing, preventing any species identification. Relying on a field drawing, the articulated remains of at least three individuals were identified together with a few dozen more animal bones (Fig. 4). Among the bones, a discovery was made of a double-edged bone point 16.8 cm long (Fig. 5: 1). A ^{14}C age determination was performed on a fragment of a long bone of a small ruminant.



Fig. 4. Malice, site 1, Sandomierz district. Grave 32 explored in 2017 together with sacrificial Pit 31, discovered in 1962

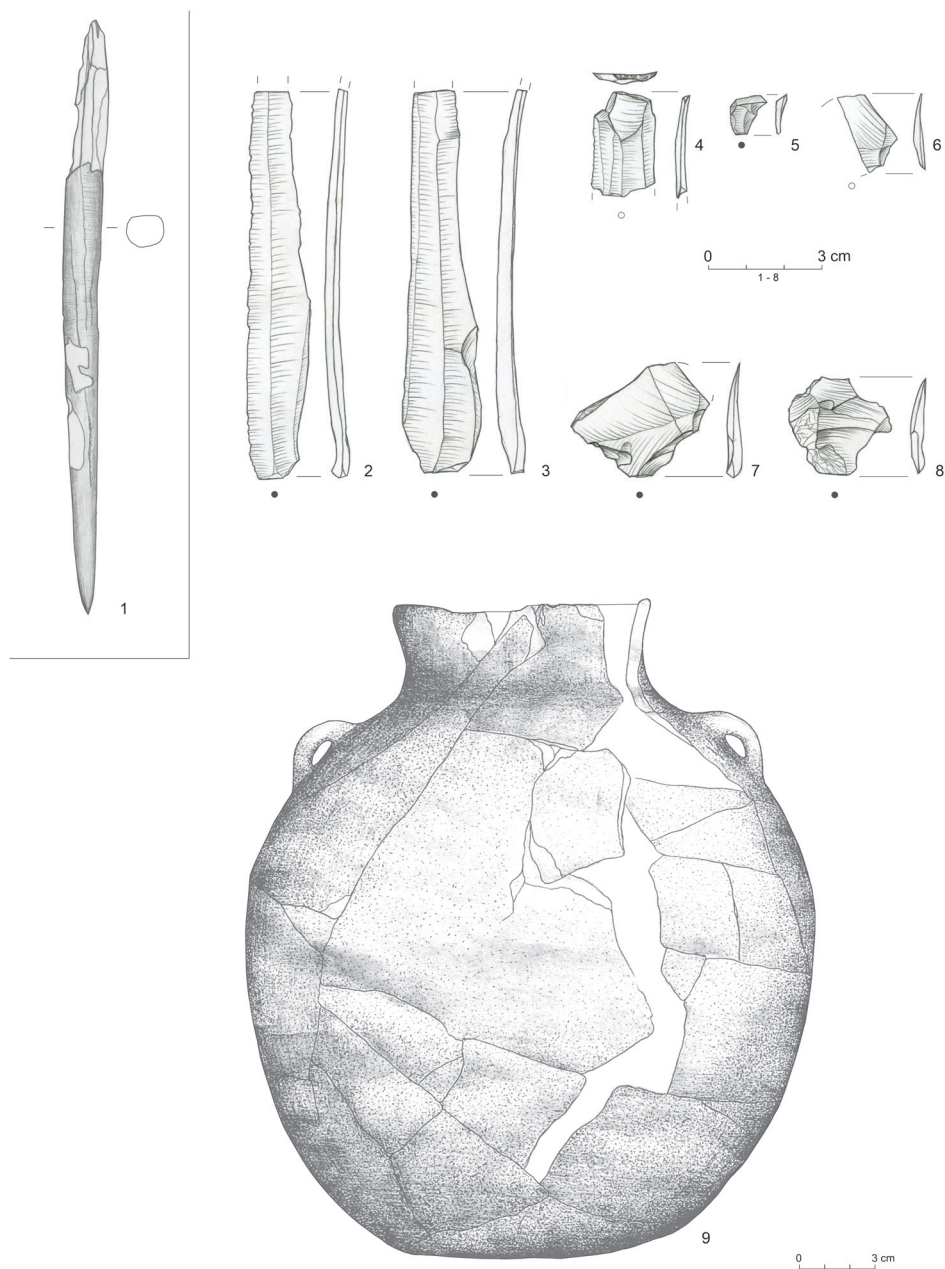


Fig. 5. Malice, site 1, Sandomierz district. Bone point in Pit 31 (1) and grave goods from Grave 32 (2–9). Drawn by B. Witkowska

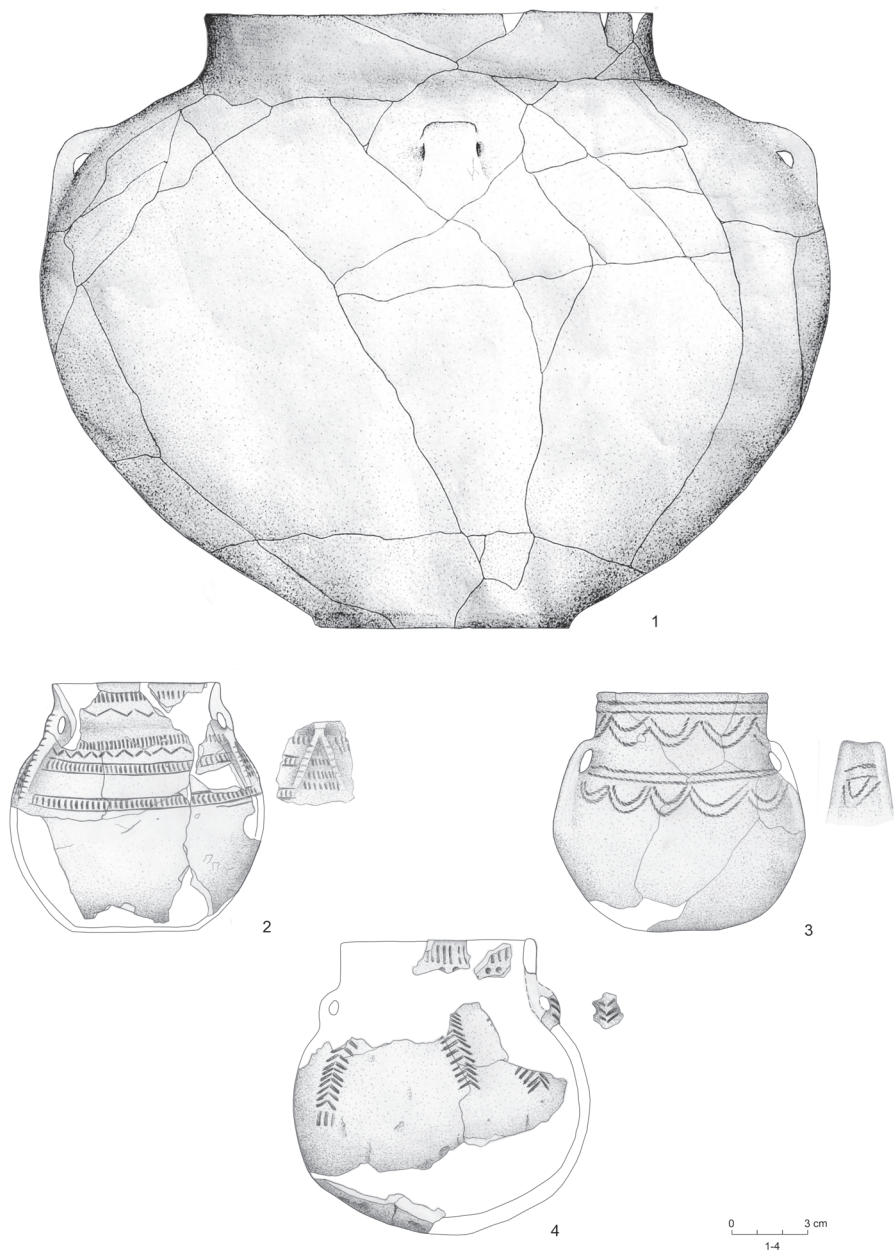


Fig. 6. Malice, site 1, Sandomierz district. Grave 32: grave goods. Drawn by B. Witkowska

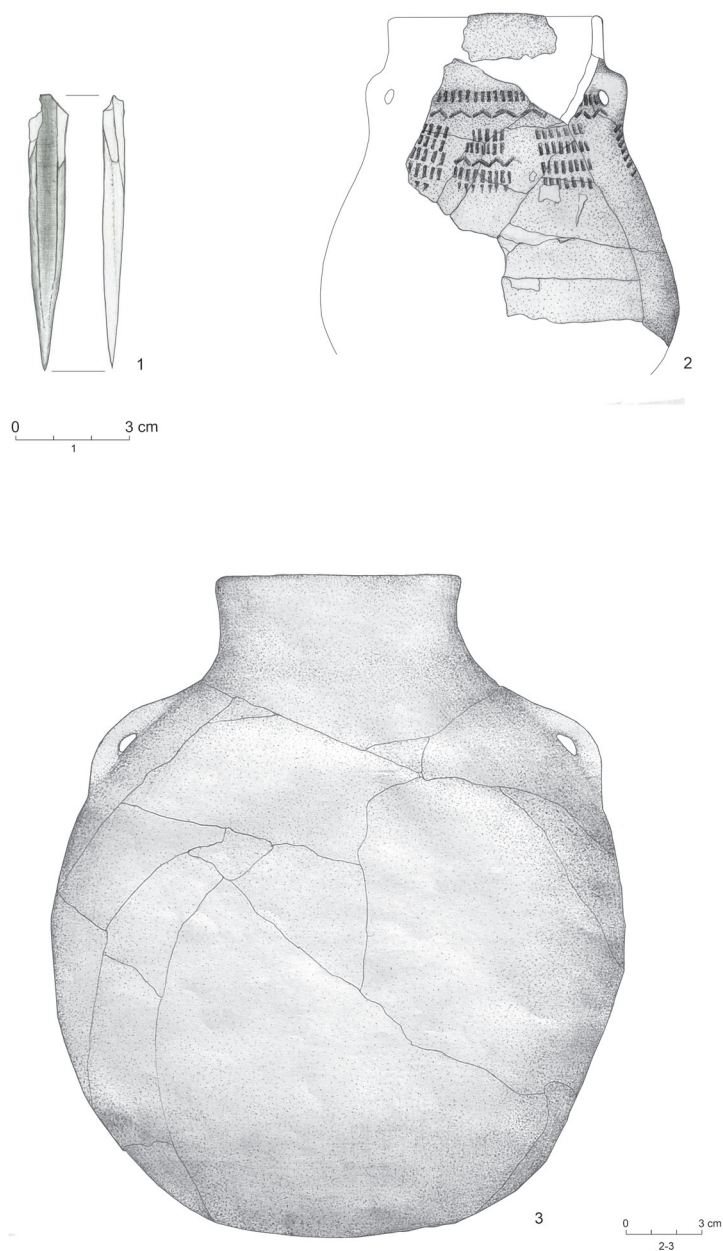


Fig. 7. Malice, site 1, Sandomierz district. Grave 32: grave goods. Drawn by B. Witkowska

FEATURE 32 (GRAVE WITH A HUMAN MULTIPLE BURIAL)

The grave was exposed in 1962 and investigated in 2017. Its pit resembled a rectangle, measuring 160 × 270 cm and oriented NW-SE. Its borders were clearly marked in part by a stone lining surviving as a low kerb of small flat lime stones. In the middle of the shorter south-eastern side, there was a small annex which was found to hold the lower limb bones of one of the buried individuals (Fig. 4).

On a flat unpaved bottom, at a depth of 60 cm, the remains of four individuals were exposed that lay in antipodal position in pairs (Skeletons B–E). Above them, Skeleton A was discovered whose lower limbs were located outside the chamber – in the annex mentioned earlier. A part of this skeleton directly lay on the bones of complete Individual B and the skull of Individual C. Found in the north-eastern part of the feature, the skeletons of Individuals D and E were preserved in a worse state than the other burials.

Skeleton A belonged to a male aged 35–45 years (*Maturus*)² whose intravital body height was about 162 cm.³ The deceased lay crouched on the right side with the upper limbs bent at elbows and pointing towards the face. In spite of the fact that it lay in part outside the grave pit proper, the skeleton was oriented consistently with its longer axis. The head pointed to the NW, with the face directed to the SW. Interestingly, its right tibia was missing, which could not result from natural taphonomic processes as it seems. In the place of the anatomic position of its distal end, the distal epiphysis of a long cattle bone was found.

Almost complete, *Skeleton B* belonged to a female aged about 50–55 years (*Maturus/Senilis*) whose intravital body height was about 153 cm. It lay on its left side, oriented along the longer axis of the grave, contracted. Its head pointed to the SE while the face was directed towards the SW.

The designation *Individual C* was applied to an infant skull placed on its base and resting on the hand of Skeleton B. Its back faced the female's face. The degree of morphological development of the skull bones [Scheuer, Black 2000] suggests that the individual was 3–4 years old (*Infans I*).

The northern part of the feature held two incomplete, relocated no doubt, child skeletons.

Individual D was laid to rest in a crouched position on its right side, with the head pointing NW and the face directed most likely towards the SW. Relying on the degree of dentition [fol. Al Qahtani *et al.* 2010] and the length of femur shaft [Bernert *et al.* 2007], its age was set at 10–11 years (*Infans II*).

² The age of the individuals was determined following White, Folkens 2005.

³ The individuals' intravital body height was determined following Formicola, Franceschi 1996.

Individual E was a child aged 11–12 years (*Infans II*). Its position is difficult to reconstruct because some skeleton parts have been relocated and the bones have been poorly preserved. The arrangement of the vestiges of upper limbs suggests the position on the right side. Single skeleton bones found underneath those of Individual D suggest that Individual E was deposited first in the grave. Incidentally, part of Individual E's calva was found at a distance from the original position, on the bones of the skeleton of Individual D.

In the northern part of the grave pit, the following grave goods were found: seven vessels (Table 1; Figs. 5–7), two Świeciechów flint blades (both 10 cm long, Fig. 5: 2–3) and an awl made of a small ruminant bone; its reconstructed length is approx. 8 cm (Fig. 7: 1). The vessels were deposited in two clusters, in part on the bones of Individuals D and E. The eastern cluster comprised three vessels (I, V and VII) and the western one – four (II, III, IV and VI). Large vessels were crushed while small ones fragmented, with some shards being clearly relocated. The observed pottery destruction in all likelihood was not intentional or secondary to the interment but rather followed from natural taphonomy and the poor firing of the vessels.

In addition, the grave pit fill was found to contain five Świeciechów flint flakes (Fig. 5: 4–8). Their connection to the grave goods is not certain, but – on account of raw-material identity – it seems probable though. Among them, there is a fragment of a truncated piece (Fig. 5: 4).

Radiocarbon dates were obtained for bones from the burials. For the most part, these were fragments of human ribs. Only in the case of Individual C, was a fragment of a skull bone used. The state of preservation of Individual E's skeleton prevented sample collection for dating.

Grave 33

A partially stone-paved human grave with the vestiges of a stone lining was explored in 1963 [Kamieńska 1964: 31–33, Fig. 2]. The grave pit, measuring 160 × 330 cm, extended NW–SE (Fig. 8). Inside, at a depth of 60 cm, a disarticulated human skeleton was found and a cluster of animal bones of various species (the author of the field investigations believed these to be the remains of cattle and sheep/goat). The bones have gone missing.

On a stone pavement in the eastern part of the feature, there were found a large beaker ornamented with cord impressions (Table 1; Fig. 9: 2) and two other vessels omitted from the 1964 publication (Table 1; Figs. 9: 3; 10: 3), a striped-flint axe (Fig. 10: 2), single Świeciechów-flint blade (Fig. 10: 1) and a double-edged bone point analogous to the artefact discovered in Feature 31 (Fig. 9: 1).

The human remains and most animal bones from the feature have gone missing, preventing any specialist analyses. To determine their absolute age, a surviving bone of a small ruminant was used after it had been stored together with other artefacts from the feature.

Table 1

Malice, Sandomierz district, site 1. Vessels from Features 32 and 33.

No. of feature and vessel	Vessel	Handles	Height (cm)	Diameter (cm)			Wall thickness (mm)	Bottom thickness (mm)	Clay admixture	Decoration	Figure
				rim	belly	bottom					
32/I	amphora	2	26	10, 5	22,5		4-5	7	white stone > 1 mm	—	5:9
32/II	amphora	4	24,5	18	31,5	10	5-7	8	pinkish stone > 3 mm	—	6:1
32/III	amphora	2	26,5	10	22,5		4-5	8	white and pinkish stone > 3 mm and sand	—	7:3
32/IV	amphora	2	~12	8	12		5	8	pinkish stone > 3 mm	engraved and stamp	7:2
32/V	amphora	2	10	7	10	5	3-4	3	white and pinkish stone > 3 mm and sand	engraved, stamp, plastic strip	6:2
32/VI	amphora	2	9,5	7	10,5	4	4	4	sand	corded	6:3
32/VII	amphora	2	> 20	8,5	14,5	—	5-7	—	pinkish stone > 2 mm	stamp	6:4
33/I	beaker	—	27, 5	15	24	8,5	5-6	8	white stone	corded	9:2
33/II	indefinite	—	< 20	—	27	10	5	6		—	10:3
33/III	indefinite	—	—	—	13,5	10	5	7		—	9:3



Fig. 8. Malice, site 1, Sandomierz district. Grave 33 explored in 1962 together with hypothetical Sacrificial Pit 54. Foll. Kamińska 1964, modified

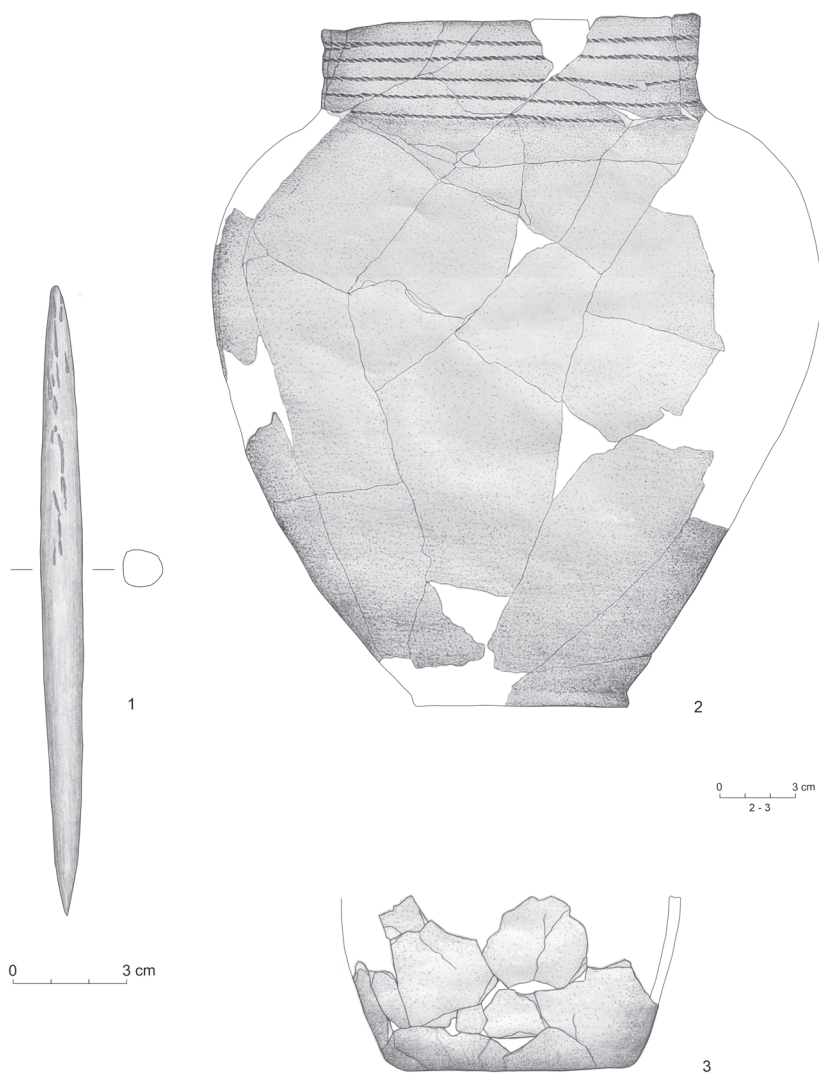


Fig. 9. Malice, site 1, Sandomierz district. Grave 33: grave goods. Drawn by B. Witkowska

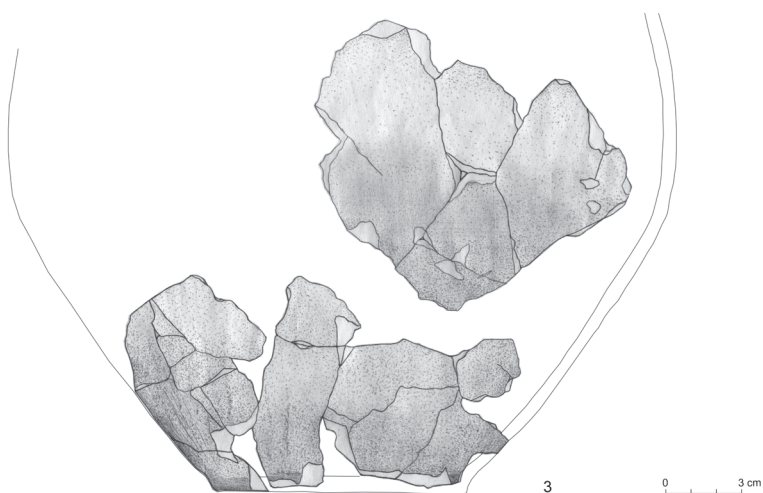
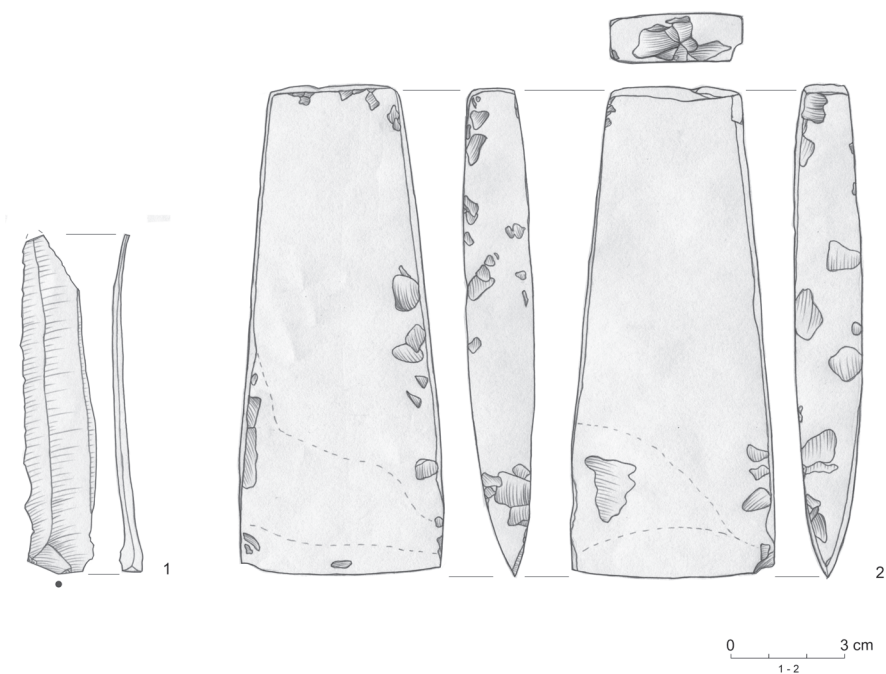


Fig. 10. Malice, site 1, Sandomierz district. Grave 33: grave goods. Drawn by B. Witkowska

FEATURE 54 (PIT WITH A HYPOTHETICAL ANIMAL SACRIFICE)

Moreover, during the 2017 excavations, a feature was successfully located that had been partially exposed in the 1960s (at that time, it was not numbered). It could have been a sacrificial pit linked to Grave 33 (Fig. 8), but it was not possible to confirm that this had actually been its function due to site inaccessibility, ruling out excavations (the feature is located in an orchard now). Due to the fact that artefacts are buried shallowly and the damage done by tree roots, the feature has certainly been badly damaged by now if not almost destroyed.

DESCRIPTION OF THE CEMETERY

The structure of Malice cemetery graves was typical of the Małopolska GAC. These were limestone-lined pits but not forming compact cists. Stones lined only parts of pit walls and paved pit bottoms (in Feature 33) or merely formed vestigial wall linings (in Feature 32). An analogous structure was shared by Nałęczów-type GAC graves [Ścibior 1991], exemplified by features in the nearby ‘Gajowizna’ cemetery in Złota. Despite the absence of a stone lining forming a cist, there are reasons to believe that in the case of the Malice grave, we are dealing with an originally empty chamber in which successive burials could be placed and, possibly, where corpses placed earlier could be manipulated. The existence of such a chamber is suggested by the arrangement of human bones. It testifies to the presence of an empty space when dead bodies were decomposing. Furthermore, the grave was presumably covered with a timber roofing, but all traces of it are gone as a result of, possibly, site erosion and natural conditions. In such a case, the stones at the pit bottom had more of a ritual role than a structural one. The structure of the grave is unusual in that it has an ‘annex’ on its SE side, occupied by a part of the skeleton of Individual A. The annex must be all that is left of an entrance shaft, leading to the burial chamber from its shorter south-eastern side. What is noteworthy is the similarity of this design to one found in the niche graves of the Złota culture. Actually, it cannot be ruled out that the Malice grave had an analogous structure: a narrow and short shaft and a long shallowly dug niche. However, the destruction of the ceiling portion of the feature prevents its reliable reconstruction.

The arrangement of human burials in Feature 32 tells us that it was used in several phases (Fig. 11). Field investigations and anthropological analyses helped reconstruct the sequence of interment of individuals and deposition of grave goods. With the highest probability, the chamber was used in three stages:



Fig. 11. Malice, site 1, Sandomierz district. Grave 32. Reconstruction of body arrangement

1. First, the two child burials were interred (Skeletons D and E). There are reasons to believe that Individual E is the older of the two; his skull could have been damaged when Individual D was buried.
2. Next, Individual B (a female aged 50-55 years) was placed in the feature and the skull of Individual C (a child aged 3-4 years) was deposited on her hand. The absence of his long bones and the mandible or mandibular teeth shows that the deposition of the calva alone in the grave was intentional. The preservation of some articular connections in Individuals D and E, in turn, suggests that the redeposition of their remains took place in the early stage of decomposition.
3. Finally, in the grave, the dead body of an adult male (Skeleton A) was interred. It was placed at a higher level of the feature, partially outside the original pit, which points to a certain lapse of time between the older collective burial (the remains of a female with children and grave goods) and the interment of the male. Furthermore, the arrangement of his lower limbs and pelvis, which were found slightly higher than his skull, suggests that the individual was deposited in an empty chamber and not one filled with earth. His remains were put to rest on the bones of Individuals B and C. Since he lay partially on the fallen-off stones of the lateral lining, it can be assumed that he was deposited in the grave after it had been originally sealed, but before it was intentionally filled with earth or as a result of natural sedimentation. Single stones found underneath Skeleton B prove that the lateral lining was reconstructed each time a dead body was buried. The arrangement of the skeletons and the manner of their deposition suggest that an entrance was located at the south-eastern side of the chamber. The small annex, in which a part of Individual A lay, must be interpreted as a kind of entrance pit – a vertical shaft. It gave easy access to the burial crypt without the need to disturb its ceiling. The burial of the male was the last event in the history of feature use for funeral purposes.

RELATIVE CHRONOLOGY

An attempt to establish a relative chronology of the GAC features at Malice relies primarily on the study of pottery from Graves 32 and 33. A beaker from Grave 33 (Fig. 9: 2) deserves special attention as it is rare in funerary features. On the Sandomierz Upland, we know of only four such vessels originating from such a context. They were discovered on sites in Jastków, Opatów district [Nosek 1967: 167, Fig. 112], in the ‘Gajowizna’ cemetery [Krzak 1977: 28, Fig. 30] and in a grave from Wąworków, Opatów district (unpublished materials from the collections of the State Archaeological Museum in Warsaw) and Grave 107 from

Mierzanowice [Bąbel 1979, Fig. 30]. Only the latter two, however, can be considered good analogies to the Malice specimen. Slightly more – seven beakers – were discovered in graves from the Lublin Upland, but only three constitute tolerable analogies to the specimen from Grave 33. These are vessels from Grave 1 on Site 4 in Klementowice, Grave IV on Site 16 in Las Stocki and a grave on Site 6 in Mętów [Bronicki 2016: 95, 135, 156; Fig. 47: 1, 86: 1, 107: 1]. Besides the grave context, this vessel type is found in settlement pits, e.g. Site 1 in Mierzanowice [Balcer 1963: Table IV:4, IX:8] or *Nad Wawrem* in Złota – located not far from the Malice cemetery (unpublished materials from the collections of the State Archaeological Museum in Warsaw) [Florek, Witkowska 2021]. Generally, GAC beakers are good chronological markers. In this case, the form of the vessel and the ornament of a horizontal cord impression clearly assign Grave 33 to the later stages of the GAC, most likely to its Phase III [Nosek 1967: 393].

The set of amphorae found in Grave 32 is typical of GAC grave complexes. Most amphorae, however, are not highly chronologically sensitive. Six – despite certain differences – represent the same variety, IA according to Wiślański [1966], or globular or ovate amphorae with a clearly marked neck, coming in two classes: IA1 (smaller ornamented specimens, Fig. 6: 2–4) and IA2 (two unornamented ovate amphorae, Figs. 5: 9 and 7: 3). Neither class is of any taxonomic or chronological value, though, because they comprise the most distinctive ceramic artefacts, common to the entire GAC oecumene [Nosek 1967: 133, 220, 239, Figs. 81:9; 157:17-18; 171:14; Krzak 1977: 28, 53, Figs. 31, 69]. A slightly rarer specimen, Vessel VII (Fig. 7: 2) is assigned to amphora class IA4 on account of its low position of the broadest part of belly. Analogies to it come mostly from Kujawy and Wielkopolska [Wiślański 1966: 27; Nosek 1967: 99, Fig. 46: 2]. Single specimens, however, are found on the Lublin Upland as well [Bronicki 2016: 105, 192, Figs. 58:1, 143:1]. Class IA4 enjoys relatively early chronology within the GAC as it emerges already in its Phase II. However, it does appear too in graves dated to later periods. An unornamented amphora, bearing field number II, belongs to type IIA, variety ‘c’ or is a flat-bottomed amphora with a very broad low neck – a so-called ‘Kujawy amphora’. It finds also many analogies in the Małopolska GAC, including the nearby settlement in Mierzanowice [Nosek 1967: 176, 234, Figs. 118:7; 167:11]. As was the case with Grave 33, the dating of this inventory too relies mainly on vessel ornamentation, specifically the presence of cord impressions that are considered a marker of GAC late phases [Wiślański 1966: 76; 1979: 279; Szmyt 1996: 34-35]. They are found, arranged in festoons, on the small amphora no. VI (Fig. 6: 3).

When it is assumed that all the features exposed in the cemetery at Malice are chronologically proximal, seen in its regular layout, and relying on a typological analysis, its chronological position must be considered relatively late with respect to the general GAC development scheme. The age of the finds coincides most likely with Sub-phase IIIa or the period to which most funerary sites of the GAC Sandomierz-Opatów subgroup are assigned.

For the GAC features from the Malice cemetery, altogether ten radiocarbon dates were obtained with the dated bone samples coming from five human skeletons found in Graves 32 and 33, and animal remains from Pit 31 (Table 2; Fig. 12). Although most osteological material collected during old investigations had been lost, it was possible nonetheless to date all the explored GAC features. The only exception being Skeleton E, in collective Grave 32, whose state of preservation prevented the collection of a suitable sample. The radiocarbon age determinations of the remaining four skeletons from this feature were duplicated. For this reason, the chronological models presented below show results that have been averaged, using the R_Combine function in the OxCal software. The purpose has been to narrow down absolute age ranges for particular samples. In a single case only, the radiocarbon ages of two samples from the same burial clearly differed from each other (Skeleton A). In three instances, the result pairs were very close indeed.

The calibration results of the obtained dates are quite consistent with one another: all point to the first half of the 3rd millennium BC and stay between 2909 and 2472 BC (with the probability of 95.4%) or more precisely between 2898 and 2490 BC (probability of 68.2%). In all probability, the time when the Malice cemetery was used was much shorter, covering an indeterminate period within the above given range. The considerable breadth of probability ranges, determined for each sample, is a result of a marked plateau in the calibration curve, covering about two centuries – 2870–2670 BC [Furholt 2003; Włodarczak 2007: 37]. Its

Table 2

Malice, Sandomierz district, site 1. Radiocarbon dates for GAC features. Calibration in OxCal v4.3.2 [Bronk Ramsey 2017], IntCal13 calibration curve [Reimer *et al.* 2013]

Feature	Skeleton	No lab.	¹⁴ C Date BP	BC (68,2%)	BC (95,4%)	Combine Date BP
31		Poz-94493	4135±35	2862–2631	2873–2588	
32	A	Poz-94494	4165±35	2874–2670	2882–2631	4113±25
	A	Poz-94495	4060±35	2831–2494	2850–2478	
	B	Poz-94496	4215±35	2893–2712	2904–2678	4220±25
	B	Poz-94497	4225±35	2898–2761	2909–2680	
	C	Poz-94499	4130±35	2861–2627	2872–2582	4123±25
	C	Poz-94500	4115±35	2856–2601	2871–2575	
	D	Poz-94501	4090±35	2847–2574	2864–2495	4107±23
	D	Poz-94502	4120±30	2856–2624	2866–2579	
33		Poz-94503	4040±35	2619–2490	2835–2472	

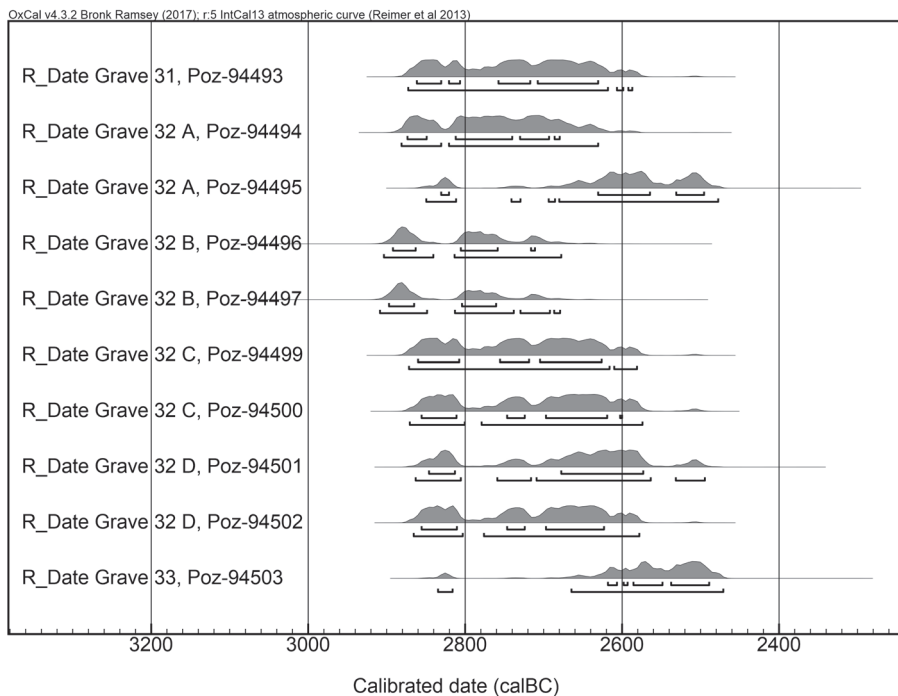


Fig. 12. Malice, site 1, Sandomierz district. Calibration of radiocarbon dates for human bones from Graves 32 and 33, and animal bone from Pit 31. Calibration in OxCal v4.3.2 [Bronk Ramsey 2017], IntCal13 calibration curve [Reimer *et al.* 2013]

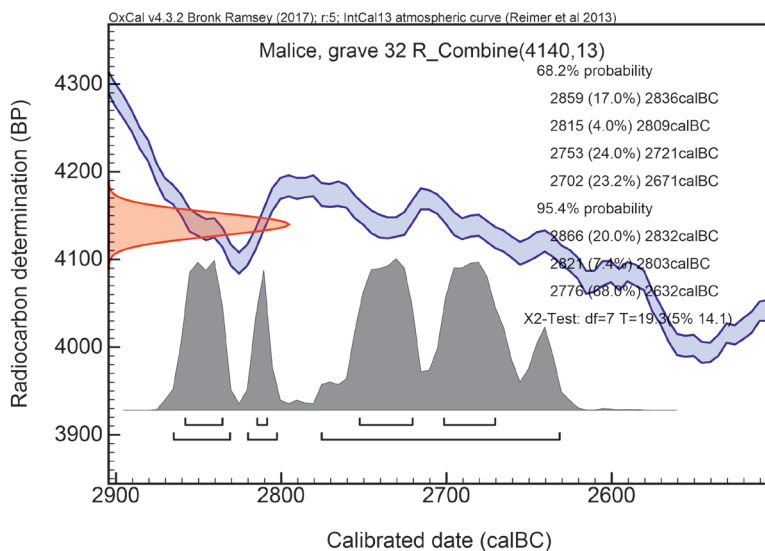


Fig. 13. Malice, site 1, Sandomierz district. Calibration of an averaged dating result (R_Combine) for eight radiocarbon determinations related to Grave 32. Calibration in OxCal v4.3.2 [Bronk Ramsey 2017], IntCal13 calibration curve [Reimer *et al.* 2013]

time span makes it possible to set the absolute age of samples at similar values in spite of the fact that the radiocarbon age values (BP) obtained for them differ widely. It is also for this reason that an alternative proposal is possible, namely one assuming that all the three features under discussion are contemporaneous. The chronological models presented below were designed with the use of the calibration software v4.3.2 [Bronk Ramsey 2017] and calibration curve IntCal13 [Reimer *et al.* 2013].

It is crucial to narrow down the absolute dating range of Grave 32 for which eight ^{14}C determinations were obtained (two for each of the four individuals; no determination for Individual E). Assuming that all the determinations are correct and simultaneous (or rather that the individuals were interred at short time intervals that are insignificant for the present study), we arrive at an averaged result of 4140 ± 13 BP (Fig. 13), indicating the range of 2859–2671 BC (at the probability of 68.2%). What is more, the younger portion of this range (2753–2671 BC) attracts a clearly broader probability range.

Next, a similar absolute age approximation can be performed in respect of Features 31 and 32 or a human grave and a sacrificial pit linked to it. An averaged result (R_Combine) for two age determinations is 4139 ± 13 BP (2859–2670 BC); it is almost identical to the result for Feature 32 itself. In turn, in respect of Grave 33, holding a single male burial, a slightly younger determination was obtained: 4040 ± 35 BP, or 2619–2490 BC (at the probability of 68.2%). When a broader probability range is adopted (95.4%), the respective ranges change as follows: 2835–2817 BC (3.5%) and 2665–2472 BC (91.9%). The former permits a synchronisation of Feature 33 with Features 31 and 32, while the latter – indicates its younger chronological position (Fig. 14). Assuming the contemporaneity or chronological proximity of the complex of Features 31 and 32 as well as Feature 33, the obtained result is hardly acceptable.

Thus, the determination obtained in respect of Grave 33 clearly differs from the other results. With a higher probability, it indicates that this burial is younger than the funeral complex formed by Features 31 and 32. It is possible, however, that it is a quirk that would not be borne out if determinations for Grave 33 were duplicated (*see* the question of the difference between the results for Burial B in Feature 32 discussed below). Judging by the regular layout of the funeral complex, one can assume that Features 32 and 33 do not differ much in terms of age. At a low goodness of fit (16.1%), the possibility of such a contemporaneity can be calculated to have occurred somewhere between 2850–2632 BC. However, accepting this model prevents any precise dating of the cemetery in question.

Moreover, when building models, the sequence of human burials in Grave 32 can be accounted for: first Individual D, followed by Individuals C and B and finally Individual A. Although there are no reliable data available to determine

the time intervals between the deposition of particular burials, the very sequence is a stratigraphic fact that can help in model building. In the future, the estimation of these intervals will be helped by the results of genetic studies, determining the degree of kinship between the buried individuals.

The oldest dates for the Malice cemetery were obtained for the skeleton of Individual B from the collective burial – a woman deposited in the upper portion of the grave pit – while the youngest date from this feature refers to child remains designated as Individual D. In the light of stratigraphy and anthropological observations, the latter individual was deposited in the grave in the first phase of its use (*see above*). These are respectively the following combined dates: 4220 ± 25 BP and 4107 ± 23 BP. They apparently differ widely, but in reality they produce clearly overlapping calendar age ranges, owing to the plateau in the calibration curve mentioned earlier. It is possible, therefore, to build a model accounting for the sequence of the three stratigraphically marked phases (Fig. 15).

To explain the clear difference between the older determinations for Individual B and the other dates for Grave 32, one may quote the age of buried individuals. Skeleton B belonged to a female aged 50–55 years, thus, much older than Individual C, a child aged 3–4 years, placed at the same stratigraphic level. The difference may justify making a correction following from the slowing rate of ^{14}C replenishment in the human body with age [Goslar *et al.* 2015: 265]. For an individual aged 50–55 years such a correction should be 30 ± 10 years (Fig. 16) [Geyh 2001]. Hence, after making the correction, the absolute age range for Individual B is 2876–2756 BC (68.2%), only slightly younger than the one previously determined (2894–2765 BC). Allowing for the above correction and the contemporaneity of Burials B and C, we arrive at a range of 2863–2751 BC. In respect of older Burial D, the range is 2860–2819 BC, while for younger Burial A the range is 2850–2628 BC.

When this is kept in mind, a model of three phases of burial deposition occurring in close succession seems plausible. To present it, the function ‘sequential phases’ in the OxCal software was chosen (Fig. 17). The model selects the older portion of probability ranges for most of results. This reflects the stratigraphic position of skeleton B (second phase) for which the oldest determinations were obtained. If this seems plausible, the dating is narrowed down to about one century.

In sum, it can be generally claimed that Grave 32 at Malice is dated most likely to ca 2850–2750 BC. Moreover, it is highly probable that individual burials were separated by short time intervals. A similar age should be adopted for Feature 31 – a sacrificial pit linked to Grave 32. However, it is not possible to determine with any certainty the age of Grave 33: it could have been contemporaneous with, or slightly younger (ca 2620–2500 BC) than Feature 32.

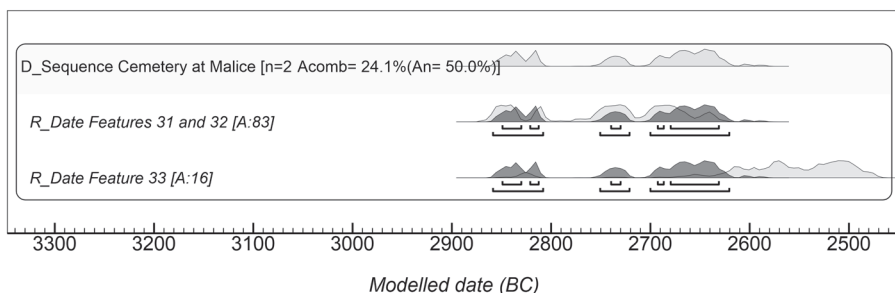


Fig. 14. Malice, site 1, Sandomierz district. Attempt to synchronise the age of Features 31, 32 and 33. Calibration in OxCal v4.3.2 [Bronk Ramsey 2017], IntCal13 calibration curve [Reimer *et al.* 2013]

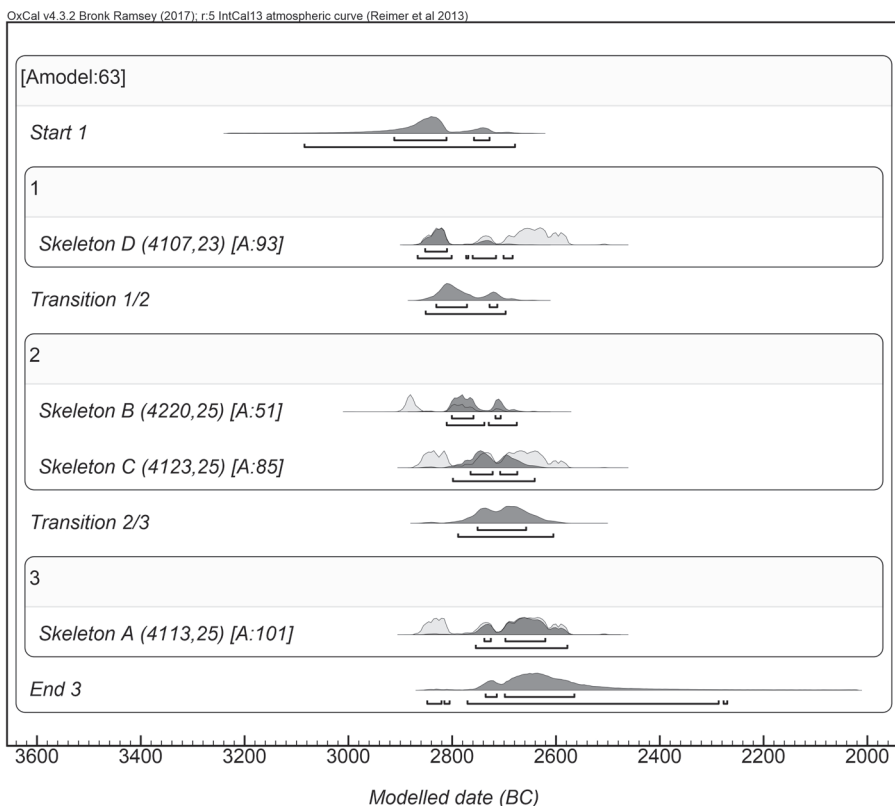


Fig. 15. Malice, site 1, Sandomierz district. Grave 32. Attempt to construct a sequential model of use of the grave in three phases (*see* comments in text). Calibration in OxCal v4.3.2 [Bronk Ramsey 2017], IntCal13 calibration curve [Reimer *et al.* 2013]

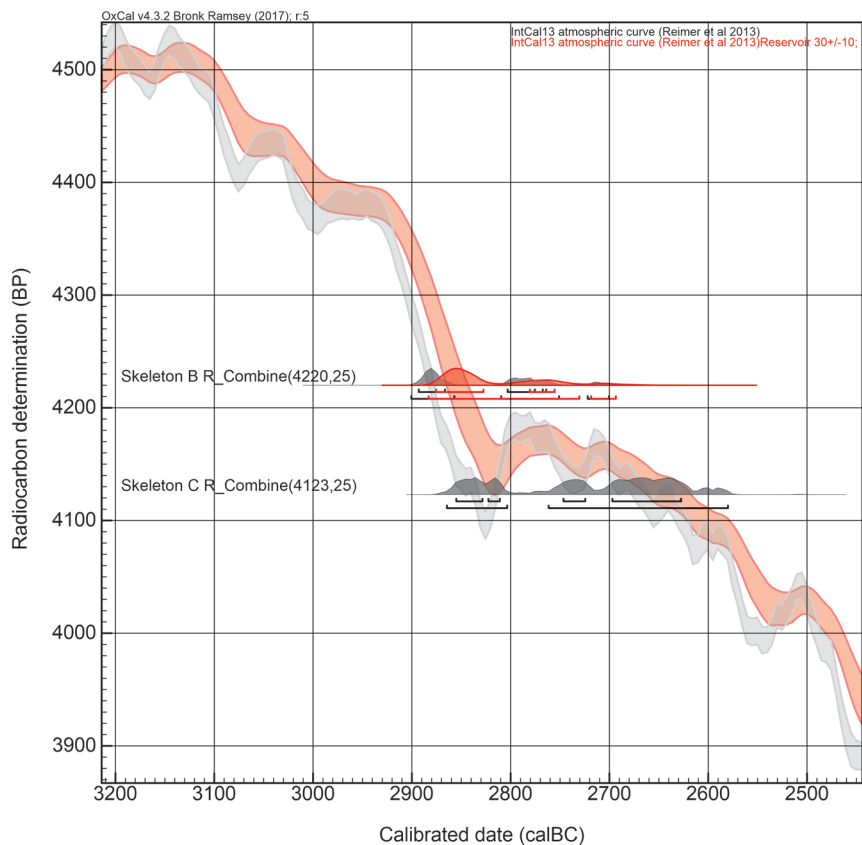


Fig. 16. Malice, site 1, Sandomierz district. Grave 32. Allowing for the age of Burial B (of a woman aged 50-55 years) in relation to the age of contemporaneous Burial C (of a child aged 3-4 years). Calibration in OxCal v4.3.2 [Bronk Ramsey 2017], IntCal13 calibration curve [Reimer *et al.* 2013]

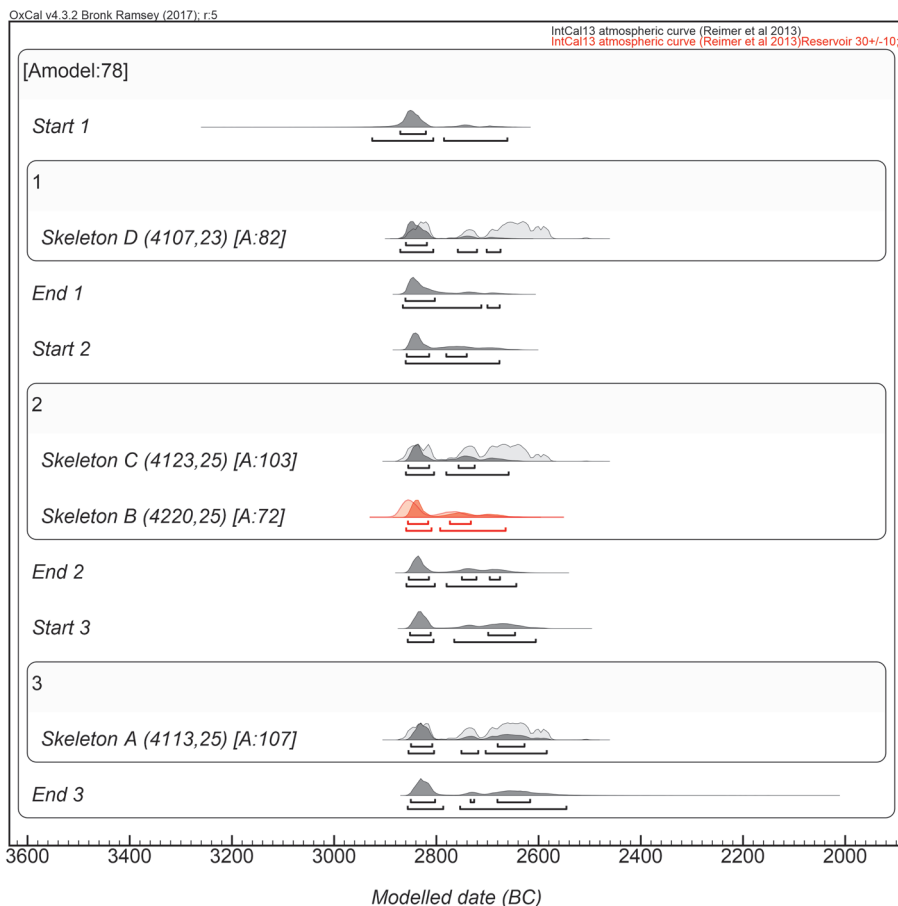


Fig. 17. Malice, site 1, Sandomierz district. Grave 32. Allowing for the age of Burial B (of a woman aged 50-55 years) in relation to the age of contemporaneous Burial C (of a child aged 3-4 years). Calibration in OxCal v4.3.2 [Bronk Ramsey 2017], IntCal13 calibration curve [Reimer *et al.* 2013]

CONCLUSIONS

The radiocarbon dating results of the Malice materials are part of an entire series of determinations for other GAC graves on the Sandomierz Upland discovered in cemeteries in Mierzanowice and Sandomierz-Kruków, and the Gajowizna site [Witkowska *et al.* 2020; Witkowska 2021]. Similar absolute age determinations were obtained for GAC settlement features in Mierzanowice, Gałkowice-Ocin and Złota – *Nad Wawrem* [Florek, Witkowska 2021]. A series

of radiocarbon dates obtained for GAC burial bones fits into the intervals of 2889–2578 BC (68.2%) or 2900–2497 BC (95.4%). These dates mark no doubt the timeframe of GAC settlement on the Sandomierz Upland. At present, the unfavourable course of the calibration curve mentioned earlier prevents any determination of chronological positions of individual sites in the development scheme of the Sandomierz-Opatów subgroup. Furthermore, for the same reason, the relationship of the Malice necropolis to the nearby GAC cemetery at the *Gajowizna* site or the *Nad Wawrem* settlement in Złota is made indeterminable.

It would be interesting, because of the design of Feature 32 resembling that of niche graves, to compare the Malice age determinations to the chronology of the Złota culture. However, the available pool of 14 radiocarbon dates relating to the latter culture [Włodarczak 2019: 192, Table 4] falls on a curve plateau too (excluding the controversial much older date from the *Salve Regina Mount*, Sandomierz), which greatly hampers the construction of the sequences of cultural changes. The tracking of possible directions of mutual borrowings would call for a significant narrowing-down of the ranges of calibrated absolute age determinations of Złota-type complexes.

Grave 32 at Malice, explored in 2017, is the only feature that owing to its stratigraphic documentation and subsequent analyses could be dated with greater accuracy. This illustrates the need to find more GAC complexes, using modern-day research methods that allow researchers to collect comprehensive data. They, in turn, could lead to plausible reconstructions of prehistoric reality, including chronometric findings.

ACKNOWLEDGEMENTS

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REFERENCES

- Al Qahtani S. J., Hector M. P., Liversidge H. M.
 2010 Brief Communication: The London Atlas of Human Tooth Development and Eruption. *American Journal of Physical Anthropology* 142: 481–490.
- Balcer B.
 1963 Osada kultury amfor kulistych na stanowisku I w Mierzanowicach. *Materiały Starożytne* 9: 99–142.
- Bąbel J.
 1979 Groby neolityczne ze stanowiska I w Mierzanowicach, woj. tarnobrzskie. *Wiadomości Archeologiczne* 44: 67–82.
- Bernert Zs., Évinger S., Hajdu T.
 2007 New data on the biological age estimation of children using bone measurements based on historical populations from the Carpathian Basin. *Annales Historico-Naturales Musei Nationalis Hungarici* 99: 199–206.
- Bronicki A.
 2016 Obrządek pogrzebowy kultury amfor kulistych na Wyzynie Lubelskiej. In: P. Jarosz, J. Libera, P. Włodarczak (Eds) *Schylek neolitu na Wyzynie Lubelskiej*: 45–256. Kraków.
- Bronk Ramsey C.
 2017 OxCal v4.3.2. Oxford (www.rlaha.ox.ac.uk).
- Florek M., Witkowska B.
 2021 Absolute chronology of settlement remains of the Globular Amphora culture in Sandomierz Upland (Gałkowice-Ocin, Mierzanowice, Złota-Nad Wawrem). *Baltic-Pontic Studies* 25: 159–188.
- Formicolla V., Franceschi M.
 1996 Regression equations for estimating stature from long bones Early Holocene European samples. *American Journal of Physical Anthropology* 100: 83–88.
- Furholt M.
 2003 *Die absolutchronologische Datierung der Schnurkeramik in Mitteleuropa und Südsandinavien*. Universitätsforschungen zur Prähistorischen Archäologie 101. Bonn.
- Geyh M.A.
 2001 Bomb radiocarbon dating of animal tissues and hair. *Radiocarbon* 43: 723–730.

Goslar T., Klochko V.I., Koško A., Włodarczak P., Żurkiewicz D.

- 2015 Chronometry of late Eneolithic and 'Early Bronze' cultures in the middle Dniester area: investigations of the Yampil barrow complex. *Baltic-Pontic Studies* 20: 256–291.

Kamińska J.

- 1959 Osada kultury nadcisańskiej w Malicach, pow. Sandomierz. *Materiały Archeologiczne* 1: 45–62.
- 1962 Sprawozdanie z badań osady neolitycznej w Malicach, pow. Sandomierz. *Sprawozdania Archeologiczne* 14: 52–55.
- 1963 Sprawozdanie z badań ekspedycji neolitycznej w 1961 r. *Sprawozdania Archeologiczne* 15: 47–50.
- 1964 Sprawozdanie z badań archeologicznych na stanowisku neolitycznym w Malicach, pow. Sandomierz w 1962 r. *Sprawozdania Archeologiczne* 16: 30–34.
- 1967 Z badań nad kulturą lendzielską w Małopolsce. *Archeologia Polski* 12(2): 257–279.
- 1972 Osada neolityczna w Malicach, pow. Sandomierz. *Sprawozdania Archeologiczne* 24: 327–339.

Krzak Z.

- 1977 Cmentarzysko na Gajowiźnie pod względem archeologicznym. In: J. Kowalczyk (Ed.) *Cmentarzysko kultury amfor kulistych w Złotej Sandomierskiej*, 9–79. Warszawa – Kraków – Gdańsk.

Nosek S.

- 1967 *Kultura amfor kulistych w Polsce*. Wrocław-Warszawa-Kraków.

Reimer P.J., Bard E., Bayliss A., Beck J.W., Blackwell P.G., Bronk Ramsey C., Buck C.E., Cheng H., Edwards R.L., Friedrich M., Grootes P.M., Guilderson T.P., Haflidason H., Hajdas I., Hatté C., Heaton T.J., Hoffmann D.L., Hogg A.G., Hughen K.A., Kaiser K.F., Kromer B., Manning S.W., Niu M., Reimer R.W., Richards D.A., Scott E.M., Southon J.R., Staff R.A., Turney C.S. M., van der Plicht J.

- 2013 IntCal13 and Marine13 Radiocarbon Age Calibration Curves 0–50,000 Years cal BP. *Radiocarbon* 55(4).

Szmyt M.

- 1996 *Spółeczności kultury amfor kulistych na Kujawach*. Poznań.

Ścibior J.

- 1991 Kultura amfor kulistych w środkowowschodniej Polsce. In: J. Gurba (Ed.) *Schylek neolitu i wczesna epoka brązu w Polsce Środkowowschodniej*, 47–65. Lublin.

White T., Folkens P.

2005 *The Human Bone Manual*. Burlington, San Diego. London.

Wiślański T.

1966 *Kultura amfor kulistych w Polsce północno-zachodniej*. Wrocław – Warszawa – Kraków.

1979 Dalszy rozwój ludów neolitycznych. Plemiona amfor kulistych. In: W. Hensel, T. Wiślański (Eds) *Prahistoria ziem polskich. II. Neolit*, 261–299. Wrocław.

Witkowska B.

2021 Radiocarbon dating of the archival funeral complexes of the Globular Amphora culture in Sandomierz Upland: sites at Mierzanowice, Sandomierz and Złota-Gajowizna. *Baltic-Pontic Studies* 25: 7–47.

Witkowska B, Czebreszuk J., Gmińska-Nowak B., Goslar T., Szmyt M., Ważny T.

2020 The cemetery of the Globular Amphora culture community in the Złota-Gajowizna site in the light of radiocarbon analysis and dendrochronology. *Sprawozdania Archeologiczne* 72(2): 259–284. DOI: <https://doi.org/10.23858/SA/72.2020.2.0XX>

Włodarczak P.

2007 Problem chronologii radiowęglowej kultury ceramiki sznurowej w świetle dendrochronologicznych datowań późnoneolitycznych osad palafitowych ze Szwajcarii. *Archeologia Polski* 52: 35–80.

2019 Grób 15 z Wilczyce na tle środkowoeuropejskim: odmienność i reguła w rytuale pogrzebowym małopolskiej kultury ceramiki sznurowej. In: P. Włodarczak (Ed.) *Wilczyce, stanowisko 10. Norma i precedens w rytuale pogrzebowym małopolskiej kultury ceramiki sznurowej*. Ocalone Dziedzictwo Archeologiczne 9, 169–201. Kraków – Niepołomice – Pętkowice.

Wojciech Pasterkiewicz

SEPULCHRAL COMPLEXES OF HUMAN BURIALS
AND ANIMAL DEPOSITS, SITE 23, SADOWIE,
OPATÓW DISTRCT.
STUDY OF SELECTED EXAMPLES

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ABSTRACT

This article attempts to reconstruct the functional relationships between human graves and animal deposits in the context of a Globular Amphora culture cemetery in Sadowie, Opatów District, Sandomierz Upland, Poland. A special characteristic of this cemetery is the grouping of graves into complexes, forming functional-chronological wholes. For the purpose of the study, three such complexes were selected: III (Graves 1 and 2), IV (Graves 5-4-3) and IX (Graves 8-7). Each consisted of a human burial and an accompanying animal deposit of mostly cattle remains. In the case of Complexes III and IX, the lack of stratigraphic relationships and similarity in cultural inventories suggest that they were built at short intervals. Complex IV in contrast, is characterised by a time spread between animal deposits and human burials, which is indicated by radiocarbon dates. The complexes of human graves and animal deposits find analogies in other sepulchral features in the Vistula drainage basin and areas settled by the other regional groups of the Globular Amphora culture at that time.

Keywords: Globular Amphora culture, Sandomierz Upland, human burials, animal deposits, radiocarbon datings

The funerary rite of the Globular Amphora culture (GAC) in Poland and across Europe has been comprehensively discussed by several authors [Wiślański 1966; Sveshnikov 1983; Beier 1988; Szmyt 1999]. They stressed the forms of grave structures, types of behaviour, cultural traditions and ideological changes from chronological and territorial perspectives. Relying on available sources, they also studied the occurrence of animal graves [Behrens 1964; Pollex 1999; Szmyt 2006; Kołodziej 2011; Szczodrowski 2012]. At present, considerable new information on behaviour patterns, relating to features containing animal remains and placed next to human burials, may be supplied by the investigation of the GAC cemetery on Site 23 in Sadowie, Opatów District, Świętokrzyskie Province.

In this brief study the term ‘animal deposit’ is used to refer to features containing complete or fragmentary animal skeletons numbering from several to over a dozen [Pollex 1999: 542; Szmyt 2006: 2–3; Kołodziej 2011: 58–59; Szczodrowski 2012: 51]. At the same time, other terms are used in the relevant literature such as ‘animal grave’ (or possibly ‘animal burial’) [Gabałówna 1958; Wiślański 1966: 73–75; Nosek 1967: 281–283; Szmyt 1996: 58–63], ‘sacrificial pit’ [Krzak 1977: 60] or ‘sacrificial animal burials’ [Wiślański 1979: 294].

CEMETERY IN SADOWIE, SITE 23

The Sadowie cemetery is a newly discovered sepulchral-ritual site, dating to the Late Neolithic and linked to the GAC and the Złota culture (ZC) [Mackiewicz *et al.* 2016; Pasterkiewicz 2017; 2020]. It is located on the northern edge of the loess patch of the Sandomierz Upland, on one of the broad elevations in the drainage basin of the Kamienna River (Fig. 1). There, a concentration of settlement points is found, comprising permanent settlements and single finds, belonging to the GAC Sandomierz-Opatów group [Kowalewska-Marszałek 2019: 124, Fig. 1:b]. The location of the site is typical of funerary facilities on the Sandomierz Upland at that time. It is on a similar terrain that *Gajowizna* [Krzak 1977: 10, Fig. 1] and *Nad Wawrem* [Krzak 1961: 7, Fig. 3] cemeteries are located in Złota as well as one on Site 10, Wilczyce, Sandomierz District [Boroń, Włodarczak 2019: 11, Fig. 3; Włodarczak 2019].

The rescue investigations in Sadowie, continuing since 2015, have explored over 1,700 sq. m. in which twenty six GAC and three ZC graves have been recorded and excavated (Fig. 2) [Pasterkiewicz 2017; 2020]. In addition, Early Bronze Age settlement relics have been discovered as well as the remains of communication

trenches dating to the end of the Second World War and Lviv-Sandomierz military operation.

GAC graves differed in terms of the funerary rite and structure. Among features with human remains, pits sunk into the ground were the most common. They

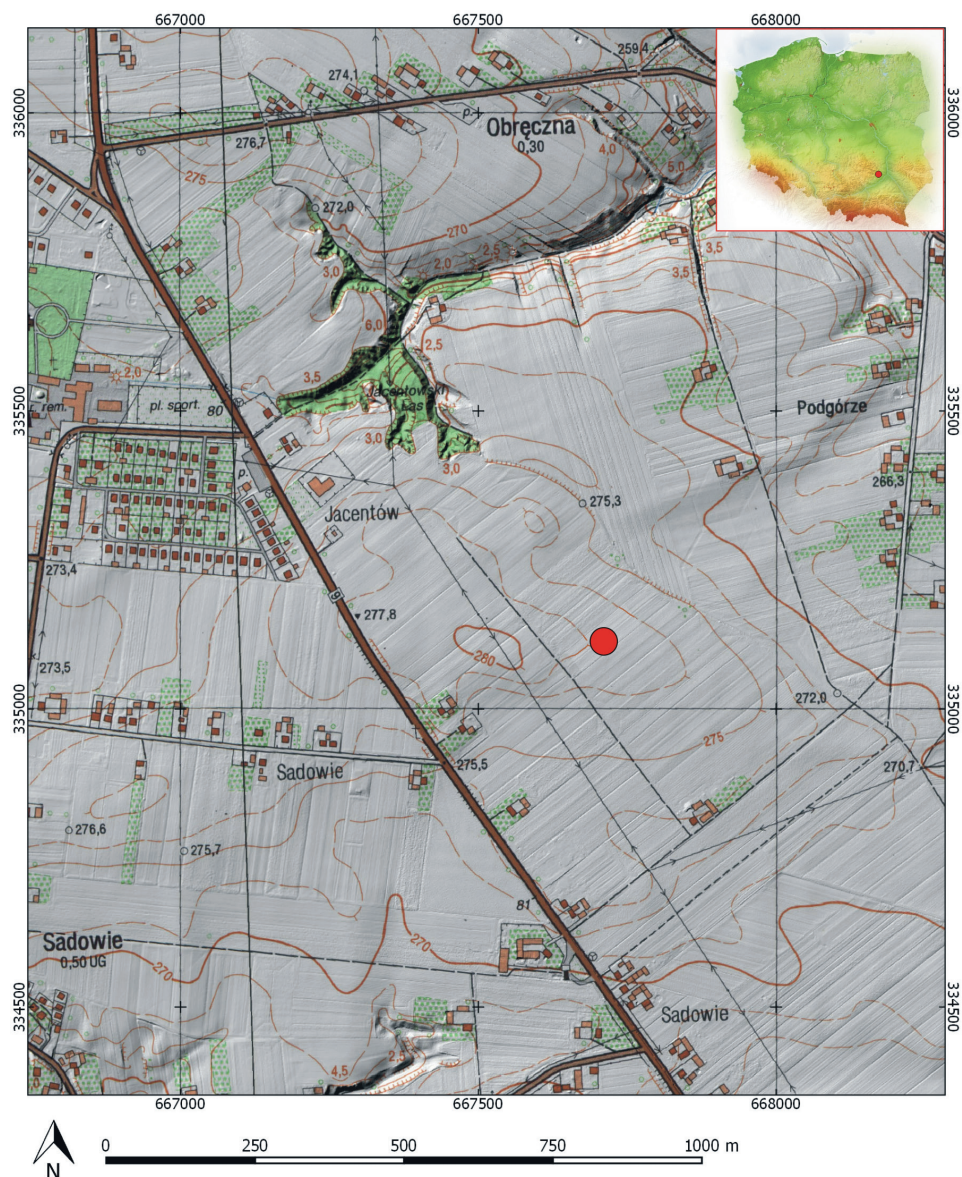


Fig. 1. Sadowie, site 23, Opatów district. Location of the site (marked as a red dot) superimposed on a shaded terrain model and a 1:100,000 map. Designed by M. Mackiewicz and B. Myślecki



Fig. 2. Sadowie, site 23, Opatów district. Layout of Late Neolithic cemetery. State of research as at 2020

showed remains of a stone-lining or pavements over bodies. Another category consisted of cists built of stone slabs or blocks and having paved bottoms. The third kind of features discovered on the site comprised niche graves typical of the communities belonging to the ZC and the Corded Ware culture (CWC) circle [Machnik 1966; Krzak 1976; Włodarczak 2006]. In addition, single cremation-pit graves were recorded as well as timber structures in the type of mortuary houses, which could have functioned as funeral pyres.

Features containing animal deposits were dominated by flat pits with stone structures in the form of pavements laid in their ceiling parts. The pits held whole animals or their very large quartered parts of various species and ages.

Characteristically, Sadowie grave features are grouped into complexes of which ten are known now, forming three or four larger clusters.

Complex I was formed by two features irregularly spaced along the NW-SE axis of which one (no. 23) showed the characteristics of a cenotaph or one that had been robbed in antiquity while the other (no. 16B) was an animal bi-ritual grave. Into its ceiling, the ZC Grave 16A was sunk.

Complex II comprised two features oriented NW-SE, one being a human grave (no. 24), disturbed in the past and the other – a pit with two cattle skeletons, known as a double grave (no. 17).

Complex III consisted of two features oriented E-W. In this case too, one feature was a collective human grave in a stone cist (no. 1), while the other was an animal deposit of the remains of two cattle (no. 2).

Complex IV comprised one collective human cist grave (no. 5) and two pits holding animal skeletons (no. 4 and 3).

Complex V was made up of four features regularly arranged along the NW-SE axis. They included one human grave containing two burials (no. 22) and three pits holding animal deposits (no. 11, 12 and 13).

Complex VI had a similar arrangement. A human grave (no. 19) was followed in line by three animal graves (no. 18A, 18B and 18C) and one cremation-pit grave (no. 18D). To this complex could have belonged Grave 15 too, holding the bones of a single pig. Furthermore, north of the cluster of Graves 19–18(A, B, C, D)-15, there was a single human stone-lined grave (14), placed away from others and unaccompanied by any animal deposit.

Complex VIII was made up of two features oriented NW-SE; one was a collective human niche-grave (no. 21) and the other an animal deposit of complete and quartered cattle skeletons (no. 20).

Complex IX encompassed two features oriented NW-SE; one was a pit holding cattle skeletons (no. 7) while the other (no. 8) could not be determined. It could have been a human grave destroyed by a WWII trench.

Complex X had a similar arrangement of features lined up along the NW-SE axis. These were Grave 9 (cremation grave with a structure resembling a mortuary house) and Grave 10 (collective grave holding quartered cattle).

DISCUSSION OF SELECTED COMPLEXES

For detailed chronological studies, Complexes III, IV and IX were selected because there were radiocarbon dates (Table 1) and rich artefact assemblages available. The latter therefore could be compared with other GAC assemblages and moreover, they allowed researchers to trace the complexity of grave structures in the context of funerary customs.

Table 1.

Sadowie, site 23, Opatów district. Radiocarbon datings for graves of the Globular Amphora culture. Calibration in OxCal v4.4.2 [Bronk Ramsey 2020]

Grave no.	Individual no.	Lab. no.	BP	BC (68.2%)	BC (95.4%)	References
1	5	Poz-102997	4075±35	2837-2500	2857-2476	Juras <i>et al.</i> 2021
5	4	Poz-102996	4125±35	2858-2625	2871-2578	Juras <i>et al.</i> 2021
4	1	Poz-111913	3995±35	2568-2470	2623-2411	Pasterkiewicz 2020, Tab. 1
3	skull no. 2	Poz-130232	4080±35	2840-2501	2861-2489	-
7	2	Poz-111914	4185±35	2882-2698	2891-2632	Pasterkiewicz 2020, Tab. 1

COMPLEX III

Grave 1. It was rectangular, measured 2.25×1.5 m and was oriented E-W, slightly deviating to NW-SE (Fig. 3: A). Its ceiling portion was destroyed by its discoverer in the course of land tillage, while its side walls were made of Triassic sandstone slabs placed upright in the ground. They differed in terms of size and shape (from 50×60 to 60×100 cm). Some (in particular those in the SE corner) bore traces of careful hewing and surface polishing. Where the walls met, they were supported with small stones and sealed with a thin layer of clay subjected to firing. The bottom of the grave chamber was paved with slabs overlapping like roofing tiles. Joins were filled with smaller stones numbering below twenty. The depth of the grave chamber reached approx. 90 cm (30–35 cm from the level of identification). Additionally, earth had been removed around its edges in order to set the walls better (Fig. 3: B). Inside, accumulations of disarticulated human bones were found, belonging to at least five to six individuals. Next to the northwestern wall, a fragment of a broken vessel lay (Fig. 4: 1). In addition, the grave fill was found to contain two flint artefacts (Fig. 4: 2–3).

Artefact inventory:

1. *Clay vessel* (no. 12–14/2015) having vase proportions, partially preserved, with a short slightly bent neck and a bulbous rather high shoulder (Fig. 4: 1). It points to connections with Type VIIIB1 according to Wiślański [1966: 34, List V], ‘miscellany’ cups in Nosek’s classification [Nosek 1967: 312, Pl. XII: 21] or IIIB1–22?–ca pots in the typology designed by Szmyt [1996: 30]. The vessel was made of clay with a large amount of temper of medium-grained white crushed stone, small amount of light-grey coarse-grained angular crushed stone and a medium amount of sand. The walls are variegated, flecked, brown in the upper part of the vessel and light brown in the middle and bottom parts. Their surfaces are carefully finished and smoothed, and shining in places; on the outside and inside, they bear traces of rubbing with grass or straw. Their fracture is uniform. Dimensions: height: 22 cm, rim diameter: 21 cm, neck diameter: 20 cm, the greatest protrusion of the belly: 25 cm, base diameter: 9 cm, wall thickness at rim: 0.4 cm, wall thickness at the middle portion of belly: 0.5 cm, wall thickness at base: 0.6 cm, base thickness: 1.3 cm.
2. *Chocolate flint blade* (no. 1/2015), regular, with a prepared butt, clear traces of removed microflakes and microchips, tip portion broken off in modern times; dimensions: 45 × 18 × 4 mm (Fig. 4: 2).
3. *Chocolate flint (crested?) blade* (no. 2/2015) produced by preliminary core exploitation; on its upper side, there are traces of scars left by the formation of a flaking surface perpendicular to its axis, a formed butt, its upper side is covered by cortex; dimensions: 54 × 20 × 6 mm (Fig. 4: 3).

The vase-like vessel from Grave 1 does not have many analogies in GAC pottery inventories in the Vistula drainage basin. The only close counterpart is an unornamented vessel from collective Grave 523 in Koszyce, Proszowice District, Site 3 [Przybyła *et al.* 2013: 35, Pl. 4:7] for which a series of 24 radiocarbon dates is available, staying within the range of 2880–2776 BC [Włodarczak, Przybyła 2013, Tab. 5; Schroeder *et al.* 2019, Dataset 1]. Similar vessels are found in the artefact assemblage from Grave II, Site 1, Klementowice, Puławy District [Uzarowiczowa 1968: 220, Fig. 5: a]. Moreover, it resembles in terms of morphology some vessels from the settlement in Mierzanowice, Opatów District, Site 1, classified as belonging to the earlier stage of GAC presence on the Sandomierz Upland. Examples include specimens from Pit 174 [Balcer 1963: 129, Pl. II: 7–8,11] and Pit 221 [Balcer 1963: 137, Pl. X: 5].

In addition, Grave 1 yielded chocolate flint blades, including a very regular one with a straight profile (Fig. 4: 2–3). Such objects are found in considerable numbers in GAC human grave inventories in the upper Vistula drainage basin. Examples are offered by objects found in Grave 523 in Koszyce [Przybyła *et al.* 2013: 28–30], Grave 1 in Klementowice, Site 2 [Nosek 1967: 220, Fig. 157: 3] or Grave X, Site 78, in Sandomierz [Ścibior, Ścibior 1990: 189, Fig. 28: c-d]. They

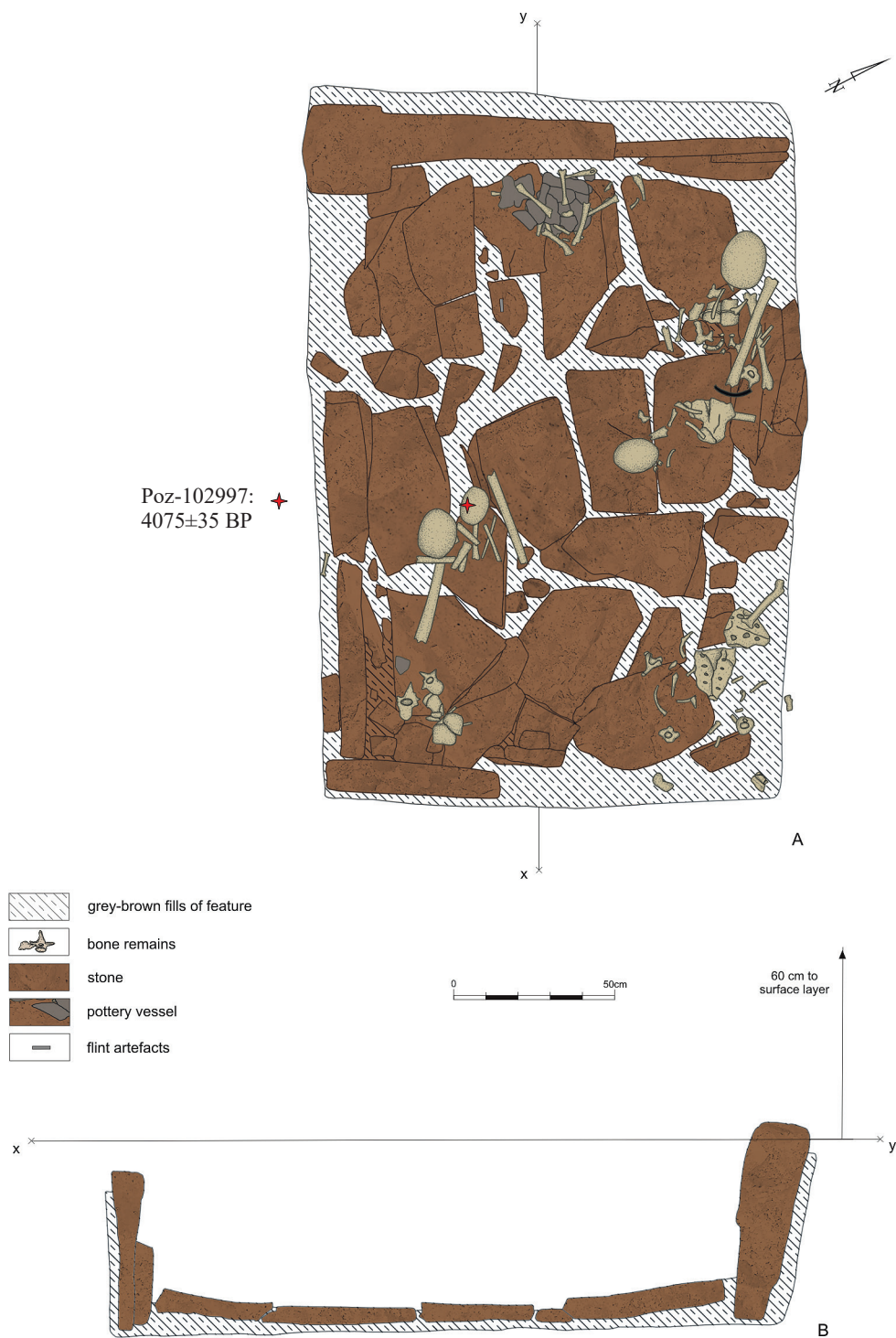


Fig. 3. Sadowie, site 23, Opatów district. Documentation of Grave 1. Drawn by A. Bardetsky

were also found in cist graves such as Depułtęcze Nowe-Kolonia, Site 12, Chełm District [Bronicki 2007: 192, Fig. 6: 2], Huta, Site 2, Chełm District [Bronicki 2016: 70] and Stefankowice Kolonia, Site 33, Hrubieszów District [Ścibior *et al.* 1991: 88, Fig. 8: e-i].

A ^{14}C determination for Grave 1, dating the skull bones of Individual 5, dates this to 4075 ± 35 BP (Poz-102997) [Juras *et al.* 2021]. After calibration, the dates are 2837–2500 BC at a probability of 68.2% and 2857–2476 BC at a probability of 95.4% (Table 1).

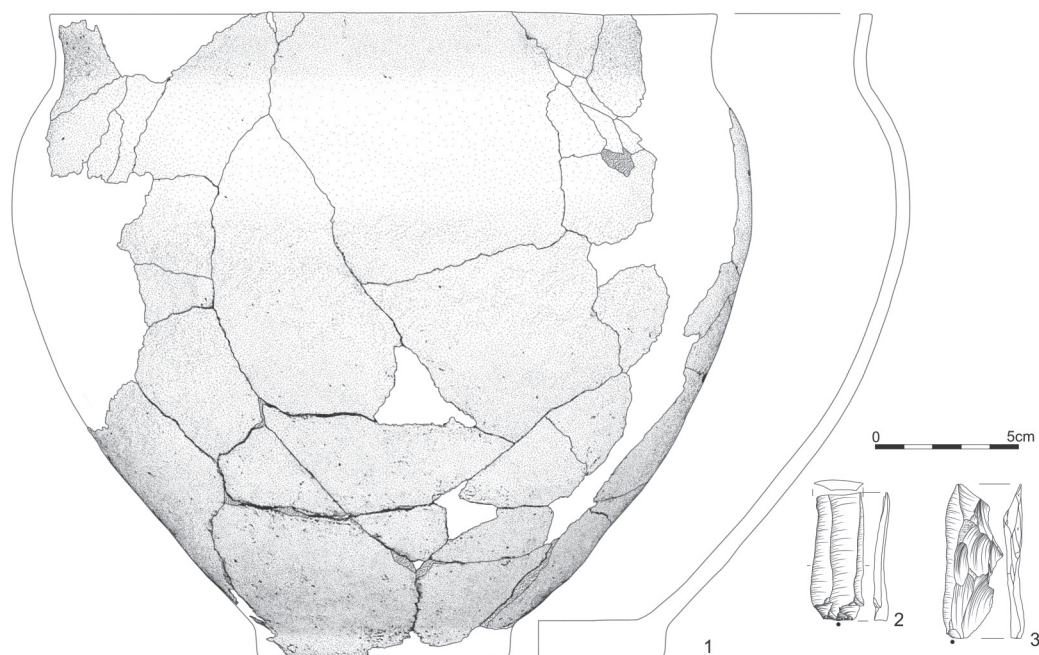


Fig. 4. Sadowie, site 23, Opatów district. Artefacts from Grave 1. Drawn by A. Bardetsky and A. Nowak

Grave 2. Its outline, exposed at a depth of 30 cm, measured $2.05 \text{ m} \times 1.3 \text{ m}$ and was oriented W-E (Fig. 5: A). In the western portion of the grave chamber, at a level of 10 cm, a small stone pavement was unearthed that was made up of slabs measuring $20 \times 10 \text{ cm}$ and $25 \times 25 \text{ cm}$. On the pit bottom, at a level of 20–30 cm, a so-called paired animal deposit was discovered, consisting of two cattle (Fig. 5: B-C) [Zabilska-Kunek, Pasterkiewicz in press]. The arrangement of their bones suggested that the animals had been placed on their sides with their heads opposite each other. Furthermore, the grave fill was found to contain pig bones – a mandible and a fragment of a long bone, deposited as grave goods. Apart from that, no other artefacts were found.

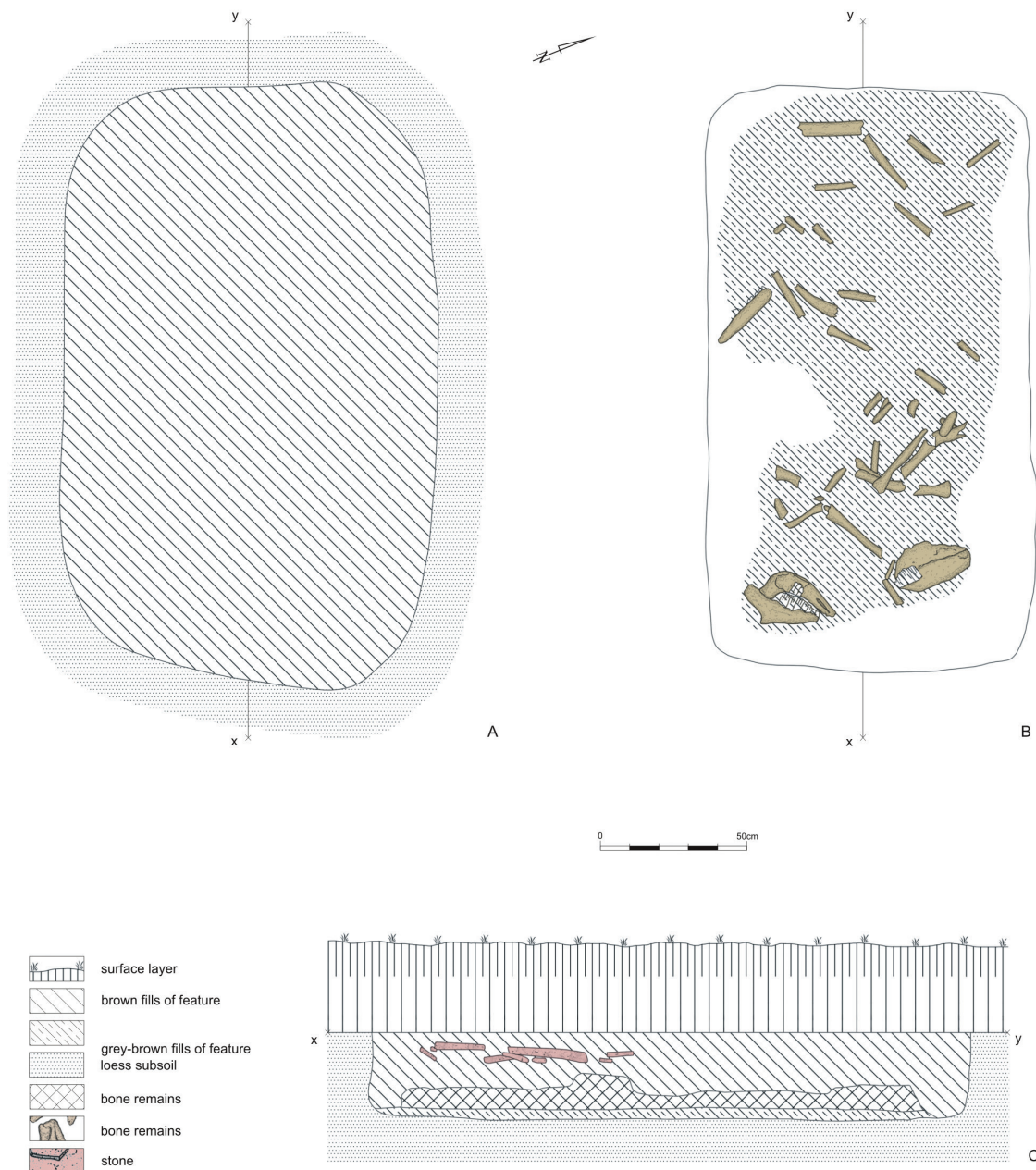


Fig. 5. Sadowie, site 23, Opatów district. Documentation of Grave 2. Drawn by A. Bardetsky

Grave 5. Its outline stood out at a depth of 30 cm from today's ground level as an irregular square with rounded corners (dimensions: 2.20×2.15 m) and its longer axis oriented WNW-ESE (Fig. 6: A). At a depth of 20 cm, an outline of a stone cist was exposed, measuring $1.85 \times 1.27/1.15$ m and shaped like an irregular rectangle and was built of sandstone slabs of varied sizes (Fig. 6: B). The longer (southwestern) wall was an irregular block slightly moved towards the grave interior (dimensions: $130 \times 90 \times 17$ cm). It could have got in the way of land cultivation and must have been moved by the owner of the field. The southeastern part was made of a slab, bearing traces of dressing, measuring $78 \times 52 \times 14$ cm, and a few lumps forming the southern corner. In turn, the northeastern wall was incomplete: a stone slab was missing and only in the northern part, was a corner of closely fitted slabs left. An even and flat bottom stretched at a depth of 40–45 cm (Fig. 6: C). It was completely paved with fitted stone slabs, forming a rather tight pavement. The grave chamber held strongly dispersed bone remains of at least five individuals. The bones bore traces of secondary damage and most were preserved only in pieces. This was a result of opening and disturbing the grave possibly to add more corpses. At the southeastern side, under an upright slab, four skulls had been deposited with their occipital parts pointing towards the grave bottom. Next to them, lay a flint chisel and four boar tusks (Fig. 7: 2–4, 6, 8). The rest of the chamber held a flint chisel blank, another three boar tusks and shards of three clay vessels, a hammerstone, a flint blade and flake (Fig. 7: 1, 5, 7, 9–12).

Artefact inventory:

1. *Small tetrahedral-cross-section striped flint chisel* (no. 9/2015), carefully smoothed on its entire surface, in particular from half of its length to the crescentic cutting edge. It is symmetrical and slightly damaged (Fig. 7: 8). On its upper portion, there are several scars. At the butt, there are polished marks left by a mounting. Dimensions: 92×15 mm at the butt, 19 mm in the middle, 17 mm at the cutting edge; thickness: 15 mm at a half of its length.
2. *Blank of a small striped flint chisel* (no. 13/2015). This is an unfinished specimen left as a blank due to damage to its cutting edge in the course of knapping (Fig. 7: 9). On its side walls, no traces of polishing were found; dimensions: 91×17 mm at the butt and in its middle, 13 mm at the cutting edge; thickness: 14 mm at the butt.
3. *Regular Świeciechów flint blade* (no. 12/2015); dimensions: $65 \times 16 \times 3$ mm (Fig. 7: 10).
4. *Striped flint flake* (no. 6/2015); at its distal-end right side, minor retouch can be seen; dimensions: $29 \times 27 \times 5$ mm (Fig. 7: 11).

5. *Hammerstone* (no. 5/2015) preserved only in half of its original size. One of its tips bears multiple chippings and crushing marks, spreading to its sides; similar marks can be seen on its dorsal, broken off face. They indicate that the tool was used after it had been damaged. Hard crystalline rock of a light grey colour; dimensions: $92 \times 80 \times 37$ mm.
6. *Boar mandible tusk* (no. 7/2015). Height: 68 mm, maximum width and thickness: 11 mm and 9 mm, respectively (Fig. 7: 4).
7. *Boar upper-jaw tusk* (no. 11/2015). Height: 97 mm, maximum width and thickness: 16 mm and 5 mm, respectively (Fig. 7: 6).
8. *Boar upper-jaw tusk* (fragment, no. 8/2015). Height: 46 mm, maximum width and thickness: 8 mm and 4 mm, respectively (Fig. 7: 1).
9. *Boar upper-jaw tusk* (fragment, no. 10/2015). Height: 59 mm, maximum width and thickness: 10 mm and 4.5 mm, respectively (Fig. 7: 2).
10. *Boar mandible tusk* (no. 14/2015). Height: 108 mm, maximum width and thickness: 19 mm and 17 mm, respectively (Fig. 7: 7).
11. *Boar upper-jaw tusk* (fragment, no. 15/2015). Height: 62 mm, maximum width and thickness: 12 mm and 5 mm, respectively (Fig. 7: 3).
12. *Boar upper-jaw tusk* (fragment, no. 16/2015). Height: 82 mm, maximum width and thickness: 15 mm and 5.5 mm, respectively (Fig. 7: 5).
13. *Four clay-vessel shards* (no. 234–237/2015) including a fragment of the base (Fig. 7: 12). The clay includes fine- and coarse-grained crushed stone of a whitish colour. The surfaces of outer walls are polished and uniformly light brown, while inner surfaces are black. The firing is quite good, the fracture is compact and the shards are hard. Weight: 36 g. Dimensions: base thickness: 10 mm, wall thickness: 6–9 mm.
14. *Three fine fragments of a thin-walled clay vessel* (no. 238–240/2015) made of clay tempered with medium- and coarse-grained crushed stone of a whitish colour. Wall surfaces are smooth and polished. On the outside, they are variegated light beige, while on the inside they are black or dark brown. These are quite hard ceramics of a compact fracture. Weight: 11 g. Dimensions: wall thickness: 3–4 mm.

Owing to their shape, the flint chisels (Fig. 7: 8, 9) are typical of the so-called GAC Gierczanka industry [Balcer 1983: 209–211]. They are not often found among grave goods on the Sandomierz Upland, but they were discovered, nonetheless, for instance, in Chwałki near Sandomierz [Nosek 1967: 190–192, Fig. 128: 5]. These artefacts are more numerous in the area occupied by the Nałęczów group as for instance in graves from Łopiennik Dolny-Kolonia, Site 1, Krasnystaw District [Gołub 1996: 48, Fig. 4: 2], Klementowice, Puławy District, Site 1, Grave II

[Bronicki 2016: 77, Fig. 29: 5], Las Stocki, Puławy District, Site 7 [Zakościelna 1989: 49, Fig. 2: B] and Grave V from Site 16 [Bronicki 2016: 137, Fig. 88], and Opole Lubelskie [Bronicki 2016: 162, Fig. 113]. Similar tools are known from other GAC grave assemblages from the upper Vistula drainage basin. A grave in Koszyce yielded two tools in the type of a chisel together with five axes [Przybyła *et al.* 2013: 27–28, Fig. 21]. Interestingly, this assemblage included one specimen of an unfinished chisel. In the opinion of Włodarczak and Przybyła, its presence is related to the symbolism of depositing unfinished specimens or ones requiring an alteration in graves holding larger assemblages of core tools [Włodarczak, Przybyła 2013: 219–220].

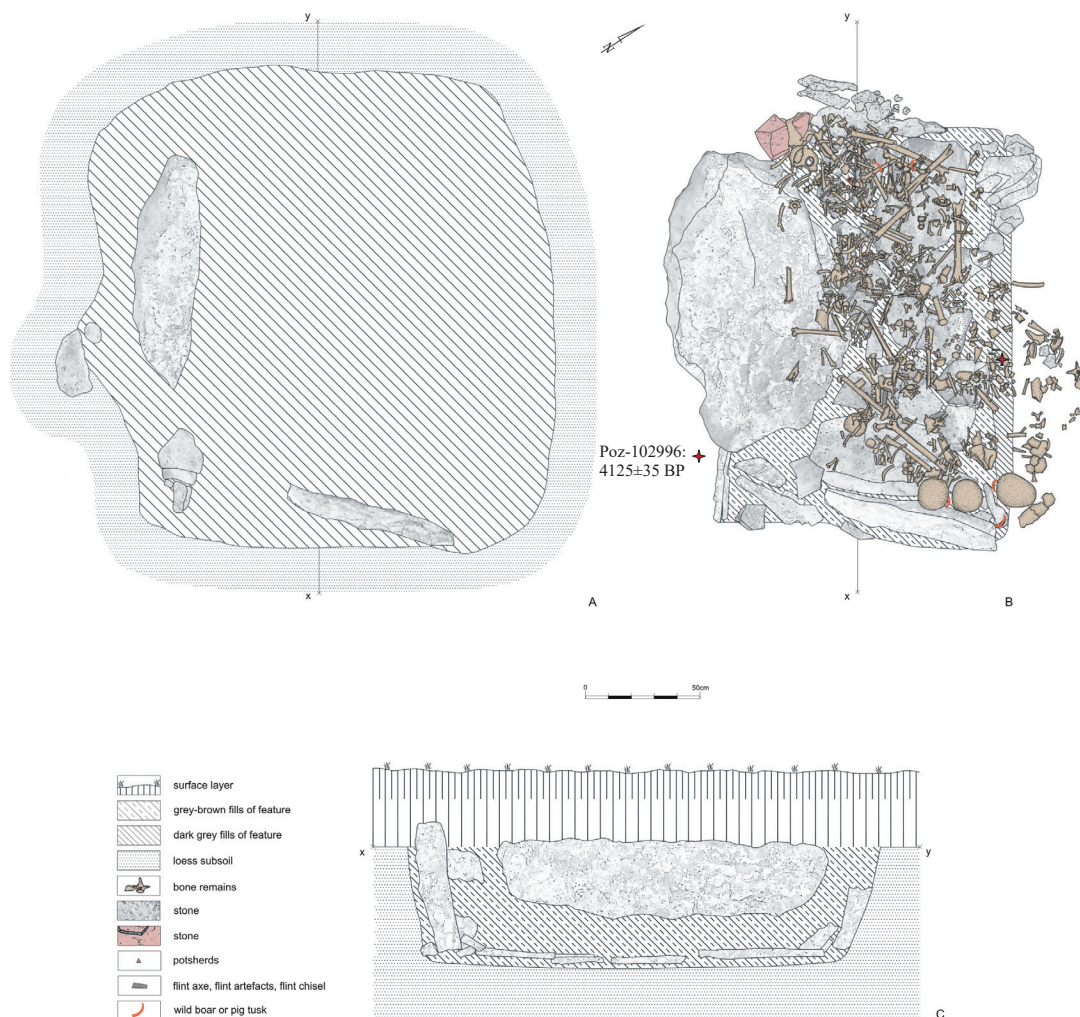


Fig. 6. Sadowie, site 23, Opatów district. Documentation of Grave 5. Drawn by A. Bardetsky

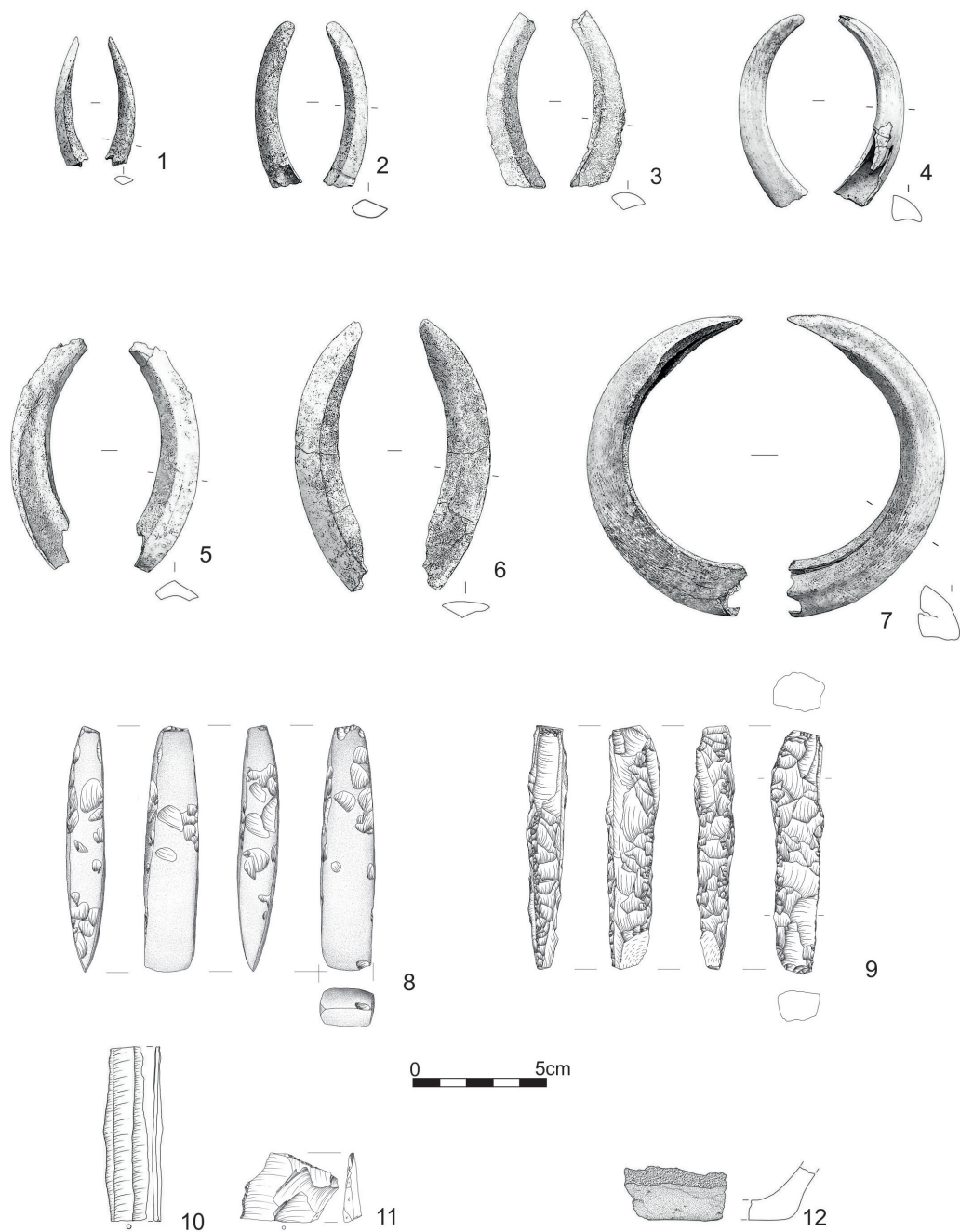


Fig. 7. Sadowie, site 23, Opatów district. Artefacts from Grave 5. Drawn by A. Bardetsky and A. Nowak

The inventory comprised also a large series of bone artefacts such as boar or pig tusks (Fig. 7: 1–7) that are often found among grave goods in male graves in the upper Vistula drainage basin [Bronicki 2016: 240, 242, 246, 247, Tab. 10–12, 250]. They are especially numerous on the Lublin Upland, for instance, in Grave I, Site 2, Klementowice [Nosek 1951: 71, Fig. 5], in burials from Nałęczów [Nosek 1967: 236] and Włostowice, Puławy District, Site 1 [Gurba *et al.* 1978: 139]. So far, the only example of boar tusk deposition in an animal grave is Grave 11, Sadowie, which held the remains of two cattle [Pasterkiewicz 2020: 67, Fig. 11].

A ^{14}C determination for Grave 5, obtained from the skull of Individual 4, is 4125 ± 35 BP (Poz-102996) [Juras *et al.* 2021]. After calibration, it is 2858–2625 BC at a probability of 68.2% and 2871–2578 BC at a probability of 95.4% (Table 1).

Grave 4. Its outline was rectangular-oval and elongated along the WNW-ESE axis (Fig. 8: A), with its preserved dimensions being 2.45×1.1 m. On the grave chamber bottom, at a level of 30 cm, the fragments of three animal skeletons were found piled one upon another (Fig. 8: B, C). They were identified as two cattle and a pig [Zabilska-Kunek, Pasterkiewicz in press]. On the animal remains, lay stone lumps, forming a small pavement. Next to the skull of Cattle 2, there lay a broken vessel – a cord-impression ornamented amphora (Fig. 9) [Pasterkiewicz 2020: 58–59].

The amphora has analogies in assemblages from the Gajowizna site in Złota, from an unknown part of the site [Krzak 1977: 58, Fig. 75], Peresopnica on the Stubła [Shelomentsev-Terskiy 1996, Fig 3:6], radiocarbon-dated to 3910 ± 50 BP [Kadrow, Szmyt 1996, Tab. 1], and Site 1, Mierzanowice, Opatów District [Balcer 1963, Pl. III: 11, VII: 17].

A ^{14}C determination for Grave 4 was obtained from teeth belonging to Skeleton 1 (Poz-111913: 3995 ± 35 BP) [Pasterkiewicz 2020: 68]. After calibration, it is dated to 2568–2470 BC at a probability of 68.2% and 2623–2411 BC at a probability of 95.4% respectively (Table 1).

Grave 3. The grave chamber outline of stones was perceptible at a level of 30 cm, forming a kind of discontinuous lining. It had the shape of an irregular rectangle with rounded corners and the longer side oriented along the axis ($2.1/2.15 \times 1.3$ and 1.52 m; Fig. 10: A). In its ceiling part, along the northern edge, there were fine rock rubble and sandstone slabs, forming a ‘loose lining’. In the northern corner, there were two large lumps, measuring $60 \times 30 \times 40$ cm and $35 \times 15 \times 15$ cm and over a dozen smaller ones lying between them, measuring below 10×10 cm. In the pit centre, a stone slab, measuring $96 \times 18 \times 26$ cm, stood upright, oriented roughly in agreement with the grave axis orientation. At a level of 50 cm, an incomplete cattle skeleton was discovered, lying on its right side with limb bones contracted and the head pointing east (Fig. 10: B-C) [Zabilska-Kunek, Pasterkiewicz in press]. Its hind limb bones and cervical vertebrae were missing. At a small distance from the head, there lay a slightly crushed amphora ornamented

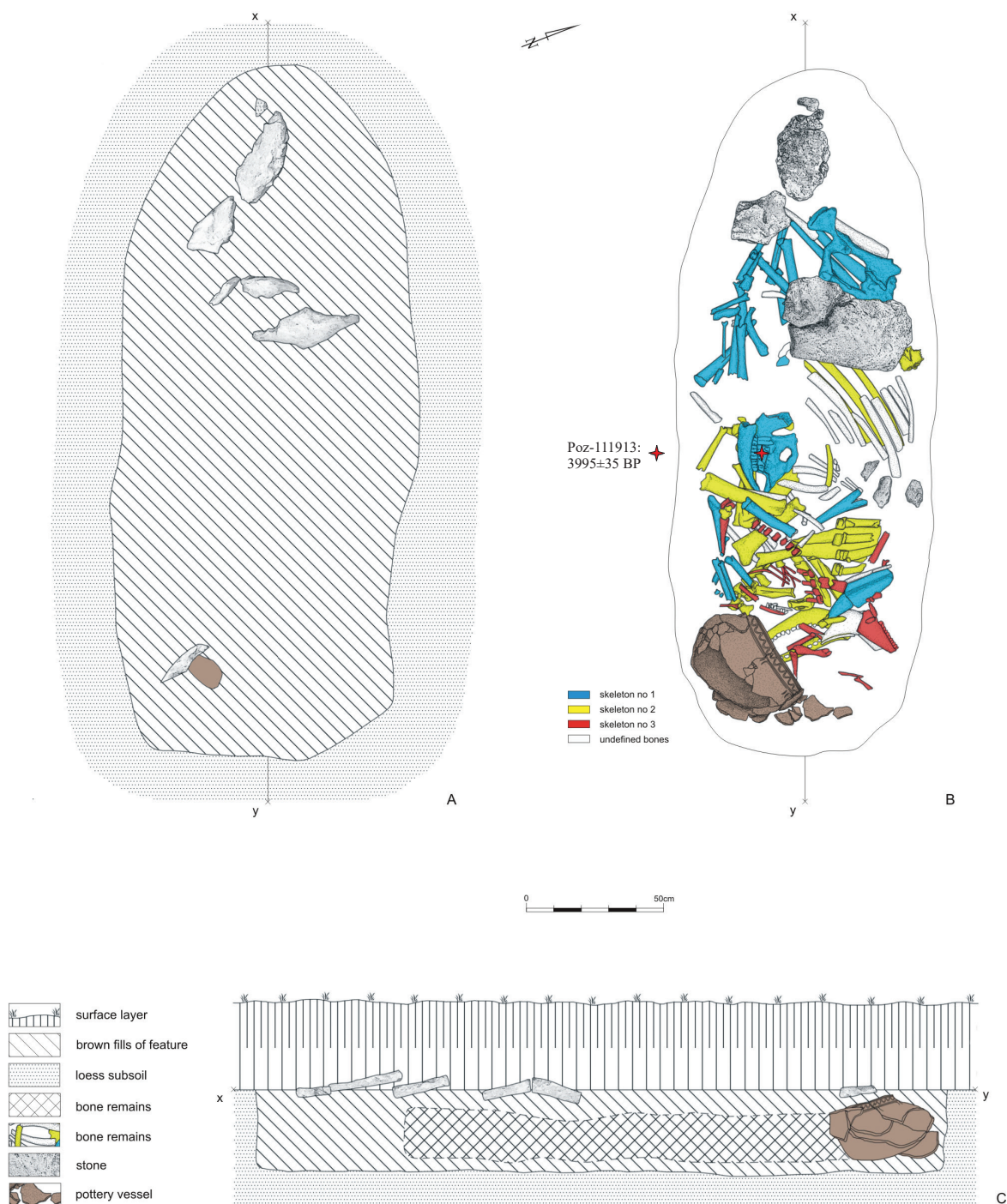


Fig. 8. Sadowie, site 23, Opatów district. Documentation of Grave 4. Acc. to Pasterkiewicz 2020: 57, Fig. 3



Fig. 9. Sadowie, site 23, Opatów district. Artefacts from Grave 4. Acc. to Pasterkiewicz 2020: 58, Fig. 4

with cord and stamp impressions. At its belly, a flint axe was found, while south of it – a flint retouched blade and another clay vessel (small amphora), bearing an ornament of round impressions (Fig. 11). At the same level, in the southeastern part, another two cattle skulls were found of which only teeth had been preserved, which were intentionally deposited (grave goods?).

Artefact inventory:

1. *Clay vessel* (no. 148/2015) – four-handled amphora (Fig. 11: 1), representing Type IIA1 according to Wiślański [1966: 28, 29, List II] or so-called ‘Kujawy-type amphorae’ according to Nosek [1967: 292–295, Pl. III-IV]. In Szmyt’s classification, in turn, it can be assigned to Type VBII1–21–2b-ca or -cb [Szmyt 1996: 31]. Its cylindrical neck prominently stands out from the belly and is fitted with four symmetrically-placed, elbow-shaped handles. A globular belly, being slightly asymmetrical, makes the vessel seem to lean to one side. Its base is clearly marked, forming a low foot, while the neck and upper belly are

ornamented with horizontal and curved lines of left-twisted cord impressions and arrangements of vertical and horizontal motifs of rectangular and crescentic stamp impressions. Going from the rim edge, these are two horizontal cord impressions super-adjacent on a band of nine drooping festoons (made up of four parallel cord impressions each) followed underneath by vertical bands of three or four crescents that are underlined by a single row of similar impressions, but arranged horizontally. The belly displays vertical stamp-impressions arranged in groups of ten and separated by vertical columns of crescents (preserved asymmetrically, therefore not visible in Fig. 11: 1). The entire ornament is underscored by a double horizontal line of crescents. The clay is tempered with a large amount of sand and medium-grained crushed stone, in particular in the bottom part of the vessel, which shows that it was made of two kinds of mass of clay. The vessel surface is smooth and of a variegated colour with blotches in its lower portion. Its upper portion around handles, in turn, bears traces of rubbing or brushing. Fractions are uniform in the upper and middle portions and three-layered in the bottom portion. Dimensions: height: 23.5 cm, neck height: 3.5 cm, rim diameter: 11.5 cm; greatest protrusion of the belly: 23.5 cm; base diameter: 8.5 cm; wall thickness: at the rim: 5–6 mm, at the shoulder: 2.5–3.0 mm, at the middle portion of the belly: 5 mm, at the base: 6.0–6.5 mm; base thickness: 7.0–7.5 mm. Handle height: 3.6–4.0 mm; handle width: 2.0–2.3 mm; handle thickness: at the middle portion: 5 mm, at the root: 6.5 mm; handle perforation diameter: 5–6 mm. Weight: 1,332 g.

2. *Clay vessel shard* (no. 149/2015) – of a small amphora (?) slightly above 10 cm high (Fig. 11: 2). It is ornamented with a single horizontal line of round-stamp impressions under the lip rim and loops placed underneath. The clay has a small amount of temper of crushed medium- and coarse grained stone of a light cream colour. Dimensions: rim diameter: approx. 7 cm, wall thickness: 5 mm, wall thickness at rim: 2 mm. Weight: 8 g.
3. *Świeciechów-flint tetrahedral axe* (no. 3/2015) of an irregular shape, resembling a trapezium and polished throughout (Fig. 11: 3). Its arched cutting edge is slightly asymmetrical and damaged in one corner while its side walls are convex. On its upper portion, there are visible scars left by low-angle retouch at the forming stage and ridges bearing wear and sheen signs resulting from its use in a haft. Dimensions: length: 138 mm, width: at the butt: 38 mm, in the middle: 47 mm, at the cutting edge: 52 mm; thickness: at the butt: 25 mm, in the middle: 30 mm, at the cutting edge: 26 mm.
4. *Chocolate-flint retouched blade* (no. 4/2015), truncated, with the tip and butt portions broken off (Fig. 11: 4). Both of its sides bear inverse retouch in part effected in the course of its use. Its right edge has a sheen. Dimensions: 83 × 26 × 5 mm.

Artefacts from this grave have analogies in a nearby GAC grave and settlement assemblages. The closest analogy to the four-handled ‘Kujawy amphora’

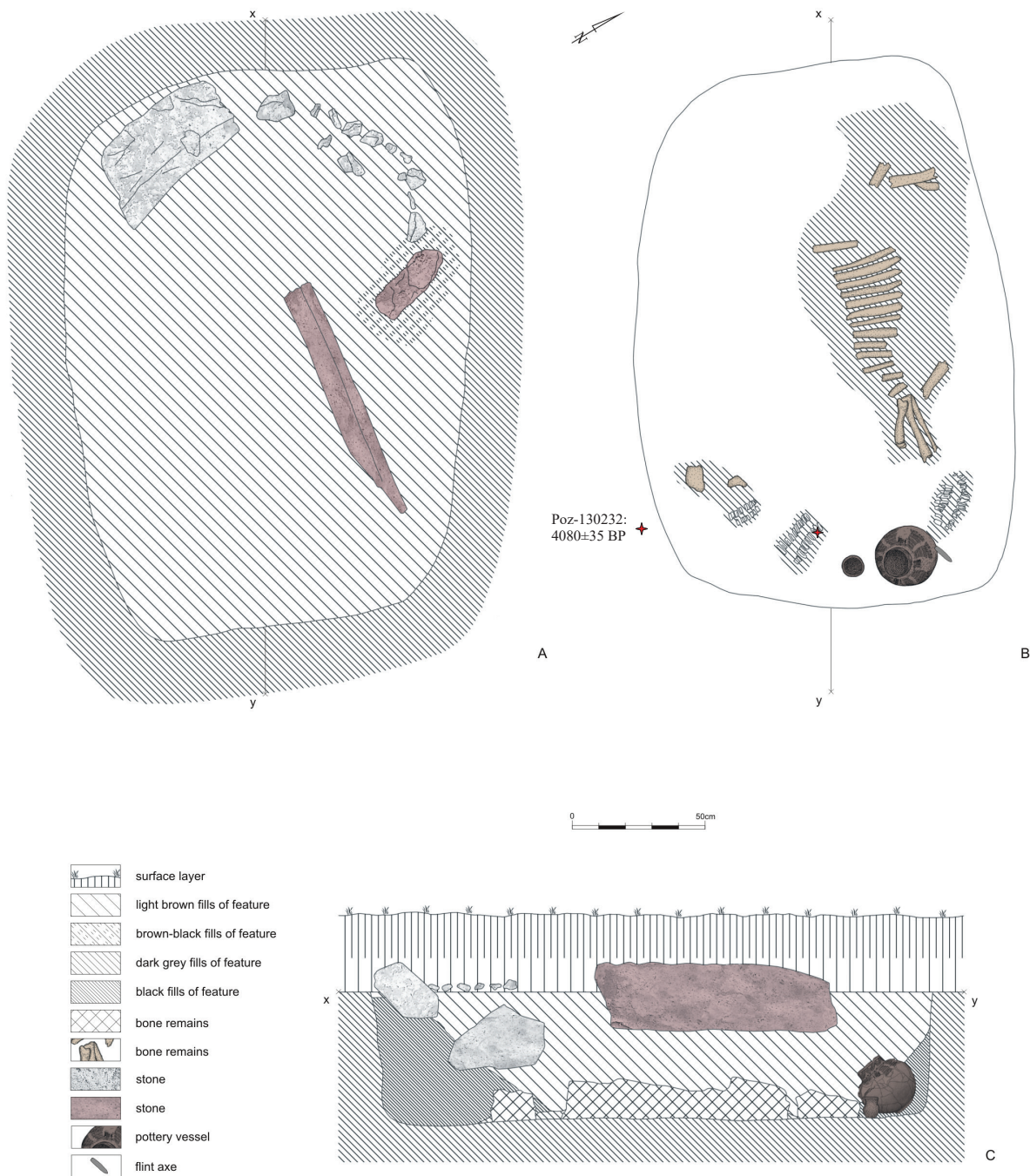


Fig. 10. Sadowie, site 23, Opatów district. Documentation of Grave 3. Drawn by A. Bardetsky

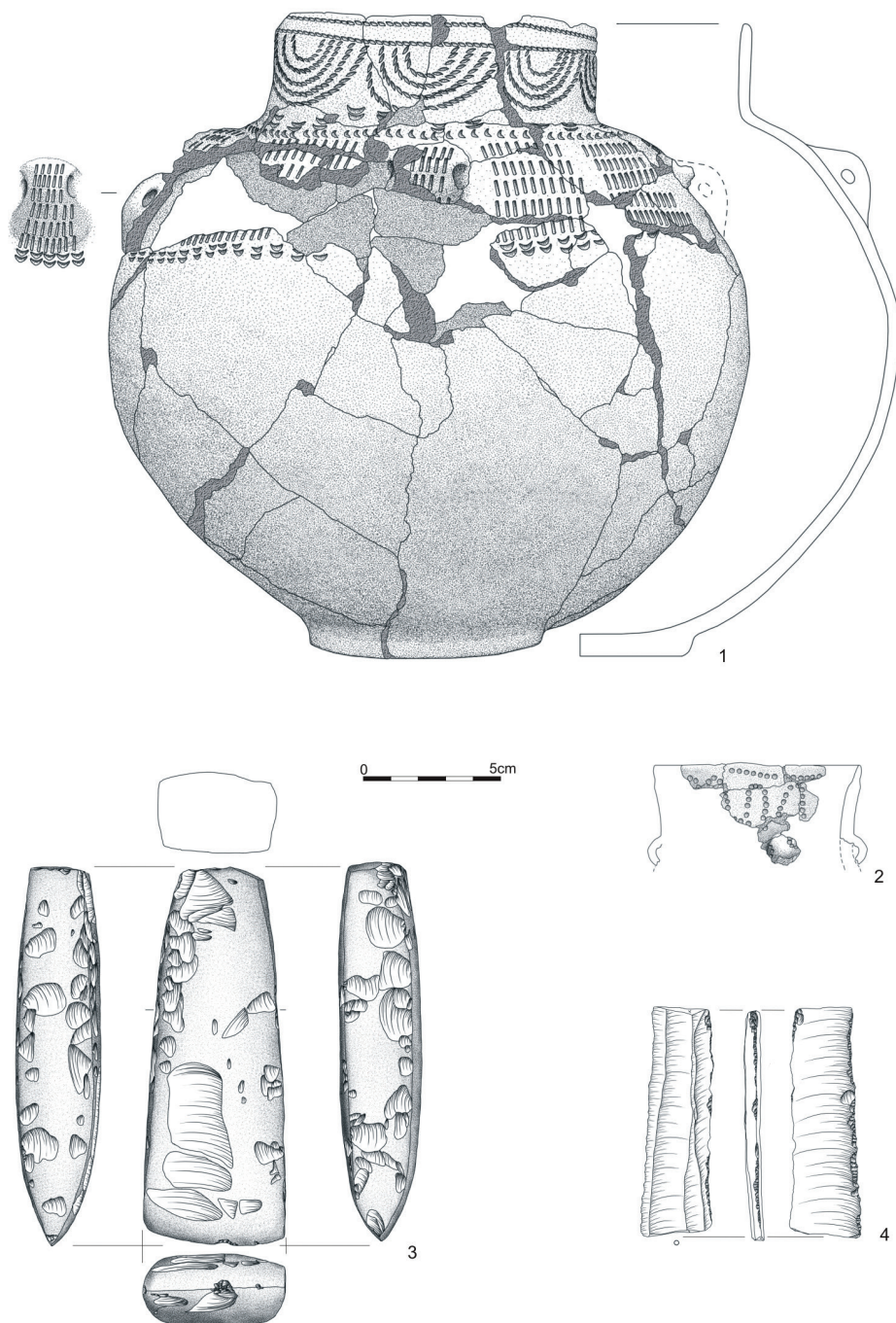


Fig. 11. Sadowie, site 23, Opatów district. Artefacts from Grave 4. Drawn by A. Bardetsky and A. Nowak

(Fig. 11: 1) is afforded by a specimen retrieved from Grave VIII, Site 78, Sandomierz [Ścibior, Ścibior 1990: 186, Fig. 25:a]. The two vessels differ solely in proportions and the shape of lower belly. Their ornaments resemble closely one another, too. For Grave VIII in Sandomierz, there is an age determination made from a charcoal sample found next to the skeleton; it gives its age as 4370 ± 70 BP [Ścibior, Ścibior 1990: 192]. Another, recent determination made for one of the bones suggests a slightly younger age, synchronous with most dates for GAC assemblages in southeastern Poland [Witkowska *et al.* 2020: 278].

The artefact inventory comprises also a small amphora ornamented with tiny round impressions (Fig. 11: 2). This type of ornament is not very common in GAC materials from other sites. A similar ornament is found on a bowl retrieved from Pit 5 on the Mierzanowice settlement [Gardawski, Miśkiewicz 1958: 236, Pl. 49: 6]. Meanwhile, motifs made with a round stamp/point are quite common in the ZC. Examples come from Grodzisko I site in Złota, Grave 33 (325) [Krzak 1976: 54, Fig. 13: c], Grave 14 [Krzak 1976: 57, Fig. 15: f], Grodzisko II site – Pit 139 [Krzak 1976: 77, Fig. 29: g] and the Nad Wawrem site (unknown portion of the site) [Krzak 1976: 107, Fig. 38: c].

In the case of Grave 3, the Świeciechów flint axe deserves special attention (Fig. 11: 3). Such objects are not often found among grave assemblages with animal remains. So far, a similar artefact, made also of Świeciechów flint, has been found in the fill of Grave I, Site 78 in Sandomierz [Ścibior, Ścibior 1990: 159, Fig 2: c]. Another, more distant example comes from Site 6, Husynne-Kolonia, Hrubieszów District, Lublin Province [Ścibior *et al.* 1991: 90, Fig. 10: c-d].

Furthermore, the grave inventory was found to contain a retouched blade, bearing traces of use, made from a large massive chocolate-flint blade (Fig. 11: 4). Such artefacts are rarely found in inventories of GAC features with animal burials. The only example has been supplied so far by Grave 1, Site 7, Klementowice [Bronicki 2016: 106; cf. Uzarowiczowa 1968].

A ^{14}C determination for Grave 3, obtained from the teeth of cattle skull 2, is 4080 ± 35 BP (Poz-130232). After calibration, it gives its age as 2840–2501 BC, at a probability of 68.2%, or 2861–2489 BC, at a probability of 95.4% (Table 1).

COMPLEX IX

Grave 8. It was rectangular-oval in shape and measured $2.95/3.0 \times 1.75/1.65$ m, being elongated in the NW-SE direction (Fig. 12: A). Its central portion was damaged by a World War II communication trench, which branched southward in this very place. In the southwestern corner, a fragment of a stone structure was exposed, built of medium-sized rubble ($50/40 \times 30/20$ cm) arranged in layers (Fig. 12: B, C). In fill layers, no skeletal remains were found but its position in respect of other

GAC graves and Grave 7 with an animal deposit shows that the feature belonged to the GAC and presumably held human remains. The fill of the feature and WWII trench yielded a lot of strongly comminuted pottery. The shards belonged to at least five vessels, including two amphorae and a vessel with a stamp-impressed ornament (Fig. 13).

Artefact inventory:

1. *Thirteen clay vessel shards* (no. 484, 487, 488, 490, 492, 496, 498, 499, 502/2016) belonging to an unornamented amphora with two vertical handles placed symmetrically on its sides (Fig. 13: 1). Its form indicates connections to some amphorae of Types IA1 and IA4 according to Wiślański [1966: 26–28, List 1], while in Nosek's typological division, it may represent so-called 'globular' or 'ovoid' amphorae [Nosek 1967: 289–292, Pl. I and II]. Its neck is short, slightly S-shaped and turning outward at the rim. The clay contains a medium amount of sand and whitish fine-grained crushed stone. Wall surfaces are carefully smoothed and black on the outside and inside while their fractions are brick-red in colour. Some shards had their inner surfaces rubbed with a bunch of grass or straw. The vessel has been well-fired and the shards are medium-hard. Weight: 52 g. Dimensions: rim diameter: 6.5–7.0 cm; neck height: 2.5 cm; wall thickness: at the rim: 3 mm, at other places: 4–5 mm.
2. *Twenty clay vessel shards* (no. 380, 473–478, 486, 489, 491, 494, 501, 504–506, 512, 513/2016) left most likely of an amphora with horizontally perforated handles (Fig. 13: 4). The clay contains whitish fine- and medium-grained crushed stone. Wall surfaces are uneven, brown-orange on the outside and black on the inside with light brown blotches. The vessel has been well-fired, making its fracture compact and shards hard. Weight: 99 g. Dimensions: wall thickness: 5–7 mm.
3. *Three clay vessel shards* (no. 479, 493, 495/2016) ornamented with a band of horizontal and angular impressions of a rectangular stamp (Fig. 13: 2–3). In addition, a fragment of the vessel base and adjacent walls has been preserved. The clay contains temper of a whitish colour and varied grain sizes. Wall surfaces are smooth, slightly burnished, uniformly black with brighter, dark grey blotches in places. On the inside, there are signs of rubbing with a bunch of grass or straw. The vessel has been quite well-fired, making its fracture compact and shards quite hard. Weight: 35 g. Dimensions: base diameter: approx. 7 cm; base thickness: 7 mm, wall thickness: 3.0–4.5 cm, at the base: 4 mm.
4. *Sixteen clay vessel shards* (no. 481–483, 485, 500, 503, 508–511/2016). They were made of clay with the temper of whitish medium- and coarse-grained crushed stone. The walls are smooth, their colour varies from light brown to orange on the outside and inside, while their fractures are grey. They have been well-fired, making shards hard. Weight: 99 g. Dimensions: wall thickness: 8–10 mm.

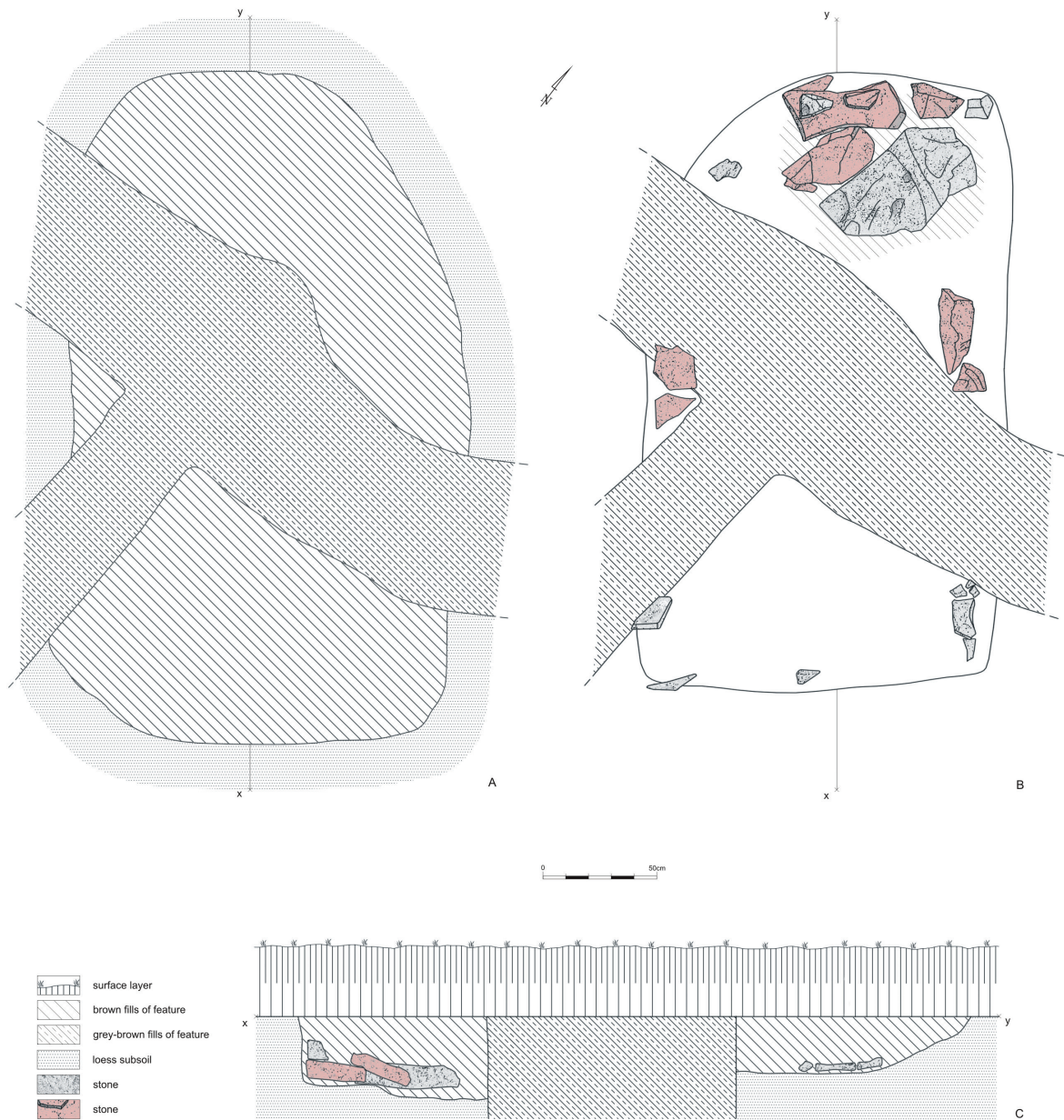


Fig. 12. Sadowie, site 23, Opatów district. Documentation of Grave 8. Drawn by A. Bardetsky

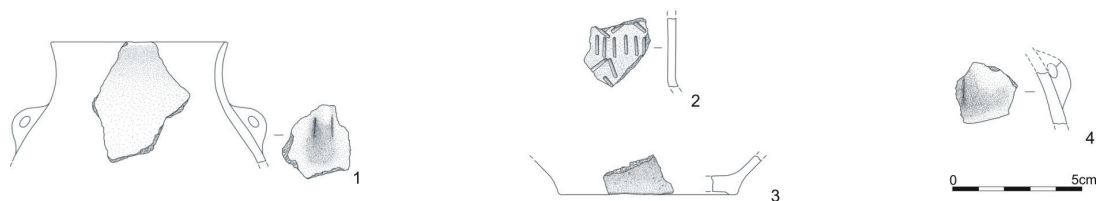


Fig. 13. Sadowie, site 23, Opatów district. Artefacts from Grave 8. Drawn by A. Bardetsky

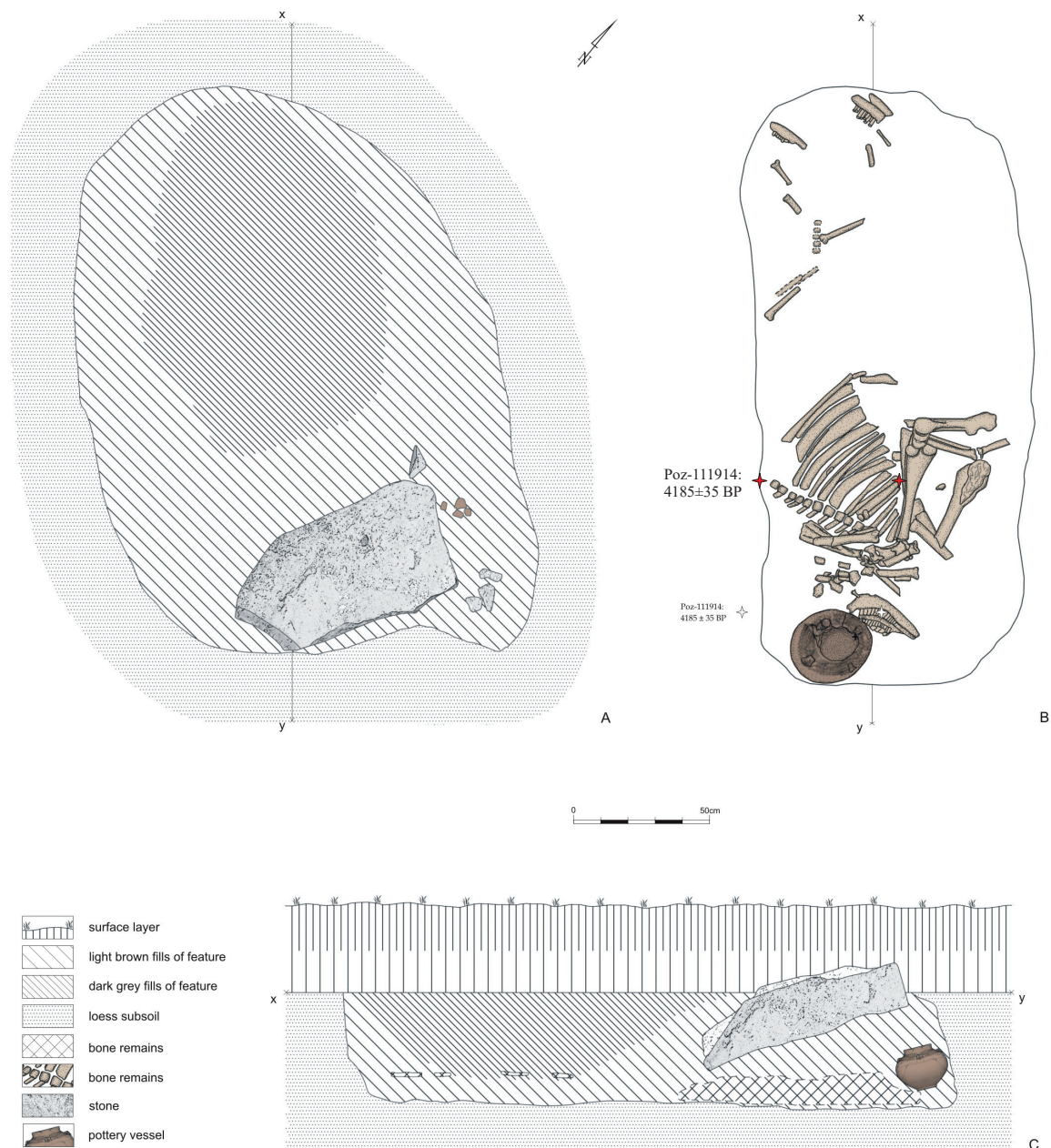


Fig. 14. Sadowie, site 23, Opatów district. Documentation of Grave 7. Acc. to Pasterkiewicz 2020: 60, Fig. 5

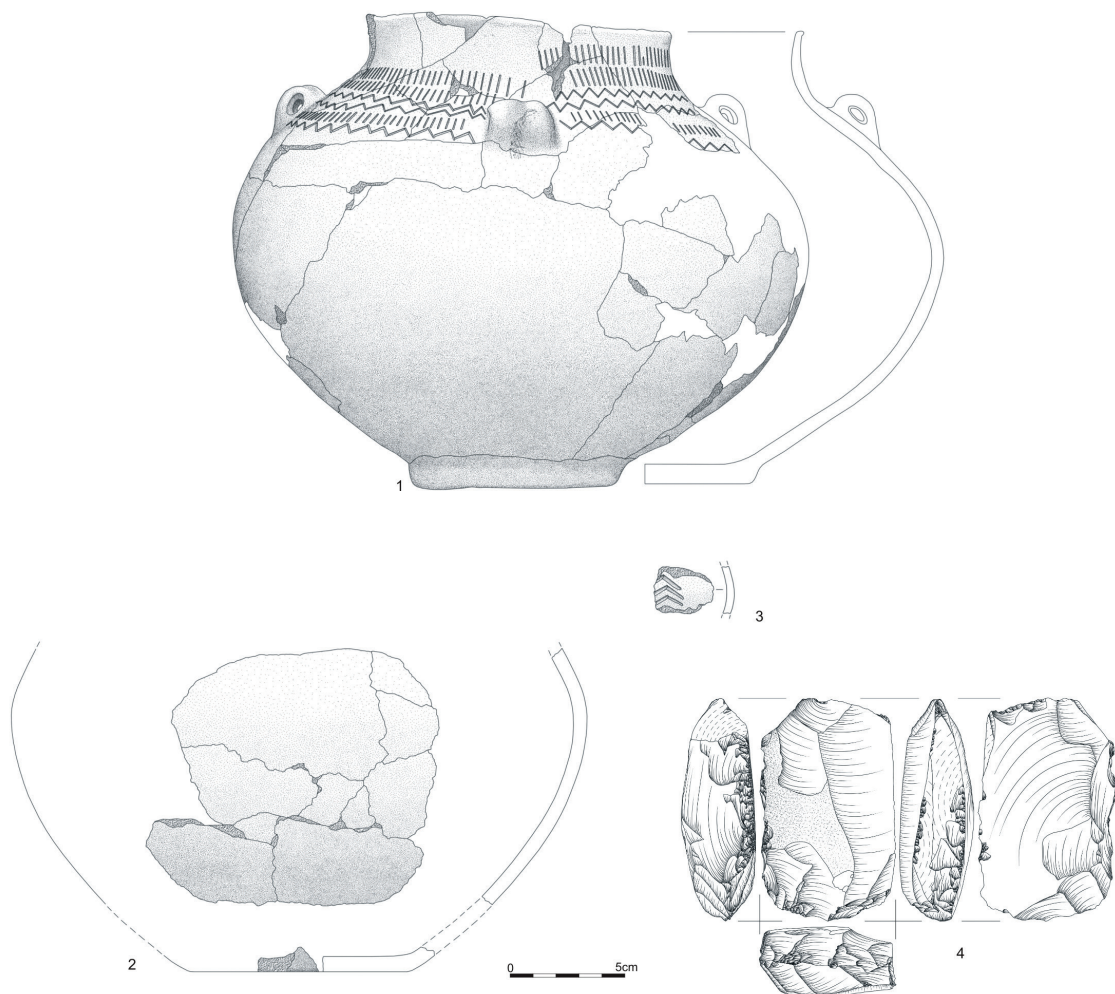


Fig. 15. Sadowie, site 23, Opatów district. Artefacts from Grave 7. Acc. to Pasterkiewicz 2020: 61, Fig. 6

5. *Two clay vessel shards* (no. 480, 507/2016). The clay contains temper of whitish fine-grained crushed stone. Wall surfaces are smooth and uniformly dark grey. The vessel has been quite well-fired, making its fracture compact and shards quite hard. Weight: 25 g. Dimensions: wall thickness: 5 mm.
6. *A flint flake* (no. 33/2016).

Due to its incompleteness, the preserved inventory does not allow any conclusions on its chronological position. It is worth noting, nonetheless, that ornament motifs on one of the preserved vessel shards to a degree resemble those on the

amphora from Grave 7 (Fig. 15: 1). Additionally, the vessels from both graves show considerable technological similarity.

Grave 7. The grave pit outline was irregular, resembling a rectangle with rounded corners, and measured 2.1×1.5 m (Fig. 14: A). Its longer axis was oriented NW-SE. Inside, in its northeastern portion, an incomplete cattle skeleton was discovered (no. 1), with its bones being badly damaged (Fig. 14: B-C) [Zabilska-Kunek, Pasterkiewicz in press]. The damage must have been caused by a purposeful grave disturbance, already in antiquity. In its southeastern portion, a stone slab lay (an element of a pit pavement), underneath which there lay the bones of the upper trunk, head and limbs of another cattle individual (no. 2).

Above the head bones, a *clay vessel* was placed – an amphora ornamented with vertical stamp impressions and a zigzag. In addition, the pit fill yielded *shards of two other vessels*, including the bottom portion of an amphora with a globular belly and a vessel bearing a herringbone ornament and a single flint lump with the traces of knapping (most likely an unfinished axe; Fig. 15).

A detailed stylistic and typological description of the inventory from this grave was given in an earlier publication [Pasterkiewicz 2020: 59–62]. It is worth stressing that particular vessels in this inventory indicate many connections to GAC grave and settlement pottery. Similar specimens come from, for instance, Świerszczów, Hrubieszów District, Site 5 [Ścibior *et al.* 1991: 82, Fig. 3: f-g], for which a ^{14}C determination is available: 4170 ± 35 BP [Kadrow, Szmyt 1996, Tab. 1], and Trzeszkowice, Świdnik District, Site 14, from a grave whose age is determined by the ^{14}C date: 4170 ± 35 BP obtained by sampling bones [Polańska 2016: 42].

A ^{14}C determination for Grave 7 was obtained from Skeleton 2: Poz-111914 4185 ± 35 BP [Pasterkiewicz 2020: 68]. After calibration, the dates are 2882–2698 BC at a probability of 68.2% and 2891–2632 BC at a probability of 95.4% (Table 1).

COMPARATIVE ANALYSIS

Cist graves are the most common sepulchral features throughout the GAC oecumene, in all territorial groups. The basic type is made up of structures carefully built of stone slabs or blocks, often taking the shape of rectangles or trapezia, with their bottoms being paved with smaller stones. The dimensions of classic cist range from 1.0/1.5 m to 1.5/2.5 m [Priebe 1938: 6–8; Wiślański 1966: 54–66; Nosek 1967: 261–265; Sveshnikov 1983: 12–16; Szmyt 2014: 214, Fig. 8; Bronicki 2016: 228–229]. In the case of Sadowie, the grave structure is different: an incomplete rectangular single-chamber cist built of sandstone slabs with a paved bottom. In Graves 1 and 5, the walls are not complete: no closing of the chamber on the longer

side was found. In neither case, was a cover identified, either; it is very likely that it was no longer there when the grave was being used. The shortage of appropriate construction material could have forced GAC communities to replace stone covers with, let's say, wood. What else distinguishes the cist burials is the lack of bones. Most such burials lack from several to over a dozen bones and what's more, those that are left are disarticulated. This was a result of multiple opening of graves to add skeletons of the dead, and of the ritual grave disturbance that took place in the course of the burial cycle. A frequent consequent occurrence was the disturbance of grave goods with some going missing.

Moreover, another characteristic of the Sadowie sepulchral complexes is the deposition of skulls at the shorter side of graves (this is also true for stone-lined Grave 14 on this site). Interestingly, these features do not show any affinities with other GAC sepulchral features on the upper Vistula. Admittedly, from the Sandomierz Upland, information comes on graves constructed as stone-slab cists, for instance, from Ossolin [Pyzik 1959: 349–350], Stodoły [Nosek 1967: 188] and Sandomierz, Pepper Mountains (*Góry Pieprzowe*) [Nosek 1967: 195–196], but their structure was a typical stone cist. It cannot be ruled out, therefore, that the Sadowie graves form a local type of a cist grave with a limited incidence range. Its construction differences may follow from diverse reasons such religious-ideological, cultural or chronological [Włodarczak 2016b: 553]. Alternatively, the differences may result from the shortage of suitable rock material. In the immediate vicinity of the Sadowie cemetery, we know of the deposits of Jurassic quartzitic sandstone in Podole, approx. 5 km to the southeast [Dowgiałło 1972]. Another locally available rock is reddish Triassic sandstone from Czerwona Góra [Romanek 1991], located approx. 4.5 km to the west. The properties of these kinds of sandstone, however, do not lend them to making slabs of a suitable size and necessary thickness. According to the recent findings [Włodarczak 2016a; 2016b: 551, Fig. 1; Bronicki 2019, Table 3], cist graves emerged between 2900 BC and 2800 BC and continued in existence until the second half of the 3rd millennium BC on the Lublin Upland. The available radiocarbon dates from Grave 1 and Grave 5 fall on a similar chronological bracket, which points to synchronism with materials from the Nałęczów and East Lublin groups.

Grave 8, in turn, represents a type of flat pit feature with an inner stone lining along the bottom. In terms of its structure, it is typical of the area occupied by the GAC Nałęczów group [Bronicki 2016: 229–232], while being rather rare west of the Vistula. The only similar instance was recorded in Sandomierz, Site 78, Grave X [Ścibior, Ścibior 1990: 189, Fig. 28:a]. However, any closer study of this grave is prevented by damage caused to it by a World War II trench.

'Animal deposits' were placed in flat pits sunk into the ground and supported by simple stone structures. This was the most common GAC type of a sepulchral feature with animal bones [Behrens 1964: 96–105; Wiślański 1966: 73–75; Nosek 1967: 281–283; Krzak 1977: 59–70; Bronicki 2016: 232]. Grave 2, described

above, held a paired cattle burial placed in a pit, with cattle heads pointing in the direction of human Grave 1. Remains were similarly arranged in a human-animal grave in Zdrojówka, Koło District, Site 1 [Wiślański 1966: 155, Fig. 14:11]. Good examples of a paired arrangement of skeletons come from an animal cemetery in Brześć Kujawski [Gabałówna 1958: 63]. Grave 5 discovered there held a double burial of cattle, lying in parallel, their heads pointing northeast [Gabałówna 1958: 75]. Additionally, on the remains of one of the cattle, there lay a dog skull and bones. Analogous animal pairs were found in Grave 2 and Grave 3 in Brześć Kujawski [Gabałówna 1958: 78–79].

To Sadowie Grave 3, the closest analogy is the burial discovered on Site 6 in Dobrze, Radziejów District, and found to contain a cattle skeleton, lying on its left side [Wiślański 1966: 183, Fig. 30:9]. In addition, close analogies are offered by graves in Kuczkowo, Aleksandrów Kujawski District, Site 1, Features A136 and C2 [Szmyt 2000: 175, 183, Fig. 11]. In them, single complete and articulated cattle skeletons were discovered that had been placed on their sides with contracted legs. In this set, one should also include Grave 1, Site 1, in Mierzanowice not far away from Sadowie [Gardawski, Miśkiewicz 1958: 327, Fig. 6]. In Grave 3 there, certain ritual traits merit attention, namely, the deposition of skulls belonging to other cattle. In the upper Vistula drainage basin, a similar example comes from Złota, Feature 24, in which, next to animal skeletons, a cattle skull and human bones were discovered [Krzak 1977: 40–42]. A similar situation was recorded in Feature 22, too [Krzak 1977: 38–39, Fig. 48].

In Sadowie Grave 4, incomplete bones originating with two cattle were recorded (one adult individual with massive bones had been placed on the pit bottom) topped by the bones of one pig. Presumably, the grave was disturbed, bringing about the loss of some bone remains or addition of others. Leaving aside the secondary opening of the grave, analogous ways of depositing animals are observable, for instance, in *Złota-Gajowizna*, Feature 24, where at least ten cattle were deposited: six adult individuals, three young ones and one calf. The cattle were laid in layers consistently with the pit direction and with their heads pointing in one direction [Krzak 1977: 40–42]. Among the bones, there were others of two sheep and two pigs. Some of these skeletons were not complete. A similar arrangement of animals was revealed in *Ostróg-Zeman* Site, Volhynia Upland [Pozikhovskiy, Samolyuk 2007: 313]. In this case, three cattle lay on their backs side by side in the pit together with one pig; the animals' heads pointed in the direction of human Grave 1. A similar arrangement was also observed in Features 2, 3 and 5 from Brześć Kujawski, referred to earlier [Wiślański 1966: 205, Fig. 42: 7–8, 10]. Grave 4 is special owing to the presence of stones over the remains of dead animals. The stones were either elements of a lining (pavement) or were to 'weigh down the animal material' [Krzak 1977: 61]. A similar practice was observed on the *Złota-Gajowizna* cemetery, in Features 7, 8, 16, 22, 24, 25, 29, 31 [Krzak 1977: 23, 24, 35, 38, 40–43, 49, 53–55].

The principal characteristic of Grave 7 was the deposition of two different parts of skeletons in the two opposite parts of the pit. Such an antipodal orientation of a pair of animals is very rare: apart from Sadowie, such orientations were documented only on the cemetery in *Złota-Gajowizna*, referred to earlier, as illustrated by collective multi-species Features 27, 29 and 31 [Krzak 1977: 44–55, Figs. 59, 63, 71]. Fragmentary animal burials, in contrast, are much more frequent. They are known from Kujawy GAC cemeteries, as for instance, Kolonia-Dębice, Site 1, Włocławek District, where the remains were weighed down with stone boulders [Jażdżewski 1936]. Similar paired burials were recorded in Brześć Kujawski, Site 4, where in Grave 4, one half of a cattle skeleton had been weighed down with a stone to the pit bottom [Wiślański 1966: 205, Fig. 42:6].

CEMETERY ORGANISATION IN SADOWIE, SITE 23. A COMPARISON

A special characteristic of the Sadowie cemetery is the grouping of graves into functional-chronological complexes. Most of the time, these are pairs of features of which one is a human grave and the other an animal deposit, containing on most occasions cattle remains. Such complexes are not frequent GAC finds in Europe. Of all the three GAC territorial groups, they are most often found within the Polish group in the Vistula drainage basin, whence we know of 75 features [Kołodziej 2011: 89]. A particularly large number is located on the Sandomierz Upland. Analogies to the Sadowie features can be encountered on other sites of the GAC Sandomierz-Opatów group. With respect to Graves 5–4–3, this is a cluster of Features 24–25–14 in *Złota*, comprised of a collective human burial (14) and two animal deposits located close to one another. One contained pig skeletons (25) while the other (24) was a collective multi-species deposit [Krzak 1977: 10, Fig. 2]. A certain similarity is also seen in a human stone-lined grave from Ostrog-Zeman Site, and a pit located nearby, holding the remains of three cattle and pig individuals [Pozikhovskiy, Samolyuk 2007: 310–313]. This type of features is also observed within the GAC western group. Good examples come from Zauschwitz, Ldkr. Leipzig, Saxony [Coblentz, Fritzsche 1962], Börnecke, Ldkr. Harz [Döhle, Pape 2006] and Stobra, Ldkr. Weimarer Land [Schirmer 1939], where next to human graves, double pits were exposed, holding animal deposits.

A slightly different complex is represented by Graves 7 and 8 with similar grave pairs being encountered in *Złota*: 32–33, 23–22, 9–8 and 17–16 [Krzak 1977: 10, Fig. 2]. Separate grave features located close to each other of which one holds human remains and the other animal ones are also known from Raciborowice-Kolonia, Site 2, near Chełmno [Polańska 2016: 20, Fig. 3]. A similar feature pair was recorded in Zdrojówka, Site 1 [Wiślański 1966: 155–156, Fig. 14:11]. In this

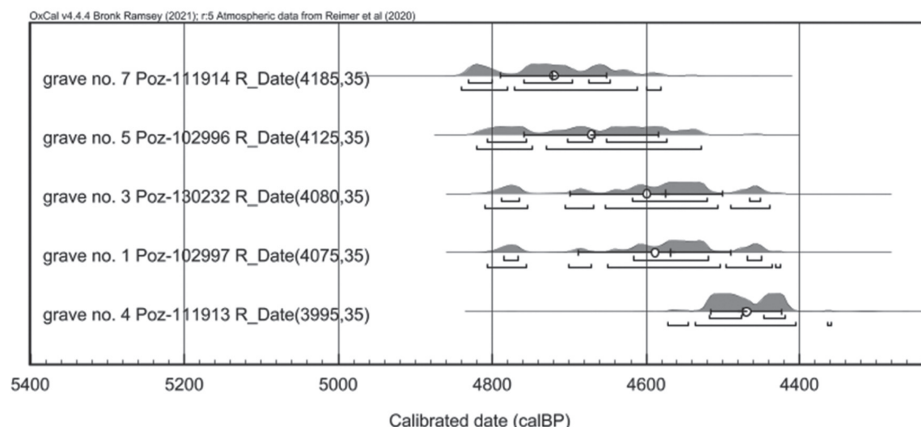


Fig. 16. Sadowie, site 23, Opatów district. Radiocarbon determinations for Graves 1, 5, 4, 3 and 7. Calibration in OxCal v4.4.2 [Bronk Ramsey 2020]

case, it was a joint human-animal burial in a stone cist accompanied nearby by two cattle skeletons placed symmetrically in a regular pit grave.

A dominating view in the relevant literature is that separate grave features located close to each other of which one contained human remains and the other animal ones were contemporaneous [Witkowska *et al.* 2020: 277]. Both were related to a single ceremonial-funerary act whereby animals were slaughtered and deposited as an offering next to a human grave. This interpretation was borne out, for instance, in the case of two features from Koszyce: Feature 543 (human collective grave with 24 radiocarbon determinations) [Włodarczak, Przybyła 2013: Table 5; Schroeder *et al.* 2019, Dataset 1] and Feature 506 (animal grave with one radiocarbon determination dating it) [Włodarczak, Przybyła 2013, Table 5]. The series of determinations indicates unambiguously a similar age of 2880–2776 BC (i.e. the time of skeleton deposition), coinciding well with the development of the GAC there. Furthermore, these age determinations agree well with the results of stylistic-typological analyses of grave inventories. Another complex for which absolute dates are available comprises graves from Zauschwitz, Ldkr. Leipzig, Saxony. The results of dating bones from a human grave (4185 ± 30 BP and 4120 ± 25 BP) and a cattle grave (4110 ± 25 BP and 4190 ± 25 BP) are consistent with similar age brackets and put the age of the complex at 2890–2570 BC [Bergemann 2018: 316–317, Abb. 182]. The synchronism of human graves and animal deposits was confirmed also in the case of the Gajowizna cemetery in Złota. Recently, ^{14}C determinations have been published for six features from this cemetery. Interestingly, the datings for Features 6 and 3 are consistent, being 4090 ± 40 BP and 4100 ± 40 BP, respectively [Witkowska *et al.* 2020, Table 2], and pointing with a high probability to the first half of the 3rd millennium BC. For Features 28 and 31, the determinations are as follows: 4500 ± 35 BP, 4500 ± 35 BP,

4480±35 BP and 4180±40 BP. They are not synchronous because the first three dates, obtained from charred wood, after calibration, indicate the end of the 4th millennium BC. It has been determined that this age bracket does not correspond to the age of the grave and is caused by the so-called 'old wood' effect [Witkowska *et al.* 2020: 278].

For Sadowie Graves 5, 4 and 3, one radiocarbon determination each was obtained by dating bone samples taken from human and animal skeletons (Table 1; Fig. 16). The dates for Graves 3 and 5 are consistent and indicate with a high probability the same calendar age of 2853–2507 BC. Published earlier, a ^{14}C date for Grave 4 is slightly younger and after calibration indicates the period of 2568–2470 BC [Pasterkiewicz 2020, Table 1]. This determination discrepancy may be caused by the complex GAC funerary ritual. The cist structure of graves allowed for multiple funerary rituals over a long period of time [Wiślański 1969: 304–305]. In this context, valuable data on the use of such graves was supplied by the study of a sepulchral feature from Kierzkowo, Żnin District, Pałuki. Twenty-eight dates for particular individuals indicated a considerable time spread, suggesting that the grave had been used for a very long time, for a period of 100–400 years, between 3180 and *c.* 2760 BC [Pospieszny 2017: 283]. A long period of use characterised also a ritual-funerary site from Kowal, Site 14, Włocławek District [Osipowicz *et al.* 2014].

This evidence supports the view that cist graves were used for a long time over several generations and that they served as family tombs. In the case of the Sadowie complex of Graves 5–4–3, spatial relationships and the absence of any stratigraphic relationships between the features suggest that they were built at short time intervals. If the dating results are considered credible, Graves 3 and 5 must be held to come from a single initial phase of the complex use. In Grave 4, in turn, the arrangement of bones indicates that secondary rituals were performed in it and bones of another animal were added subsequently. Possibly, the ^{14}C date indicates one of the younger stages of the funerary cycle. To determine time relationships with any greater precision, it will be necessary to obtain more dates for each individual deposited in Graves 4 and 5.

For Sadowie Features 2 and 8, there are no radiocarbon determinations available due to a lack of suitable organic material. Judging by stratigraphic relationships, orientation and grave goods, it can be claimed, nonetheless, that they are contemporaneous with Graves 1 and 7.

REFERENCES

Balcer B.

1963 Osada kultury amfor kulistych na stanowisku 1 w Mierzanowicach, pow. Opatów. *Materiały Starożytne* 9: 99–142.

1983 *Wytwórczość narzędzi krzemiennych w neolicie ziem Polski*. Wrocław – Warszawa – Kraków – Gdańsk – Łódź.

Behrens H.

1964 *Die neolithisch-frühmetallzeitlichen Tierskelettfunde der Alten Welt*. Berlin.

Beier H.J.

1988 *Die Kugelamphoren-Kultur im Mittel-Elbe-Saale-Gebiet und in der Altmark*. Veröffentlichungen des Landesmuseums für Vorgeschichte in Halle 41. Berlin.

Bergemann S.

2018 *Zauschwitz (Lendkreis Leipzig): Siedlungen und Gräber eines neolithischen Fundplatzes*. Universitätsforschungen zur prähistorischen Archäologie 314. Human Development in Landscapes 13. Bonn.

Boroń T., Włodarczak P.

2019 Stanowisko 10 w Wilczycach: miejsce schyłkowoeneolitycznych praktyk funeralnych. In: P. Włodarczak (Ed.) *Wilczyce, stanowisko 10. Norma i precedens w rytuale pogrzebowym małopolskiej kultury ceramiki sznurowej*. Ocalone Dziedzictwo Archeologiczne 9, 9–16. Kraków – Niepołomice – Pętkowice.

Bronicki A.

2007 Box grave of the Globular Amphora Culture in Kolonia Depułtęcze Nowe, site 12, Chełm Commune, Chełm district, Lublin voivodship/ Grób skrzynkowy kultury amfor kulistych w Kolonii Depułtęcze Nowe, stanowisko 12, gm. Chełm, pow. Chełm, woj. Lublin. *Sprawozdania Archeologiczne* 59: 181–212.

2016 Obrządek pogrzebowy społeczności kultury amfor kulistych na Wyżynie Lubelskiej. In: P. Jarosz, J. Libera, P. Włodarczak (Eds) *Schylek neolitu na Wyżynie Lubelskiej*, 45–256. Kraków.

2019 Chronologia podgrupy wschodniolubelskiej kultury amfor kulistych w świetle oznaczeń radiowęglowych. In: M. Szmyt, P. Chachlikowski, J. Czebreszuk, M. Ignaczak, P. Makarowicz (Eds) *Vir Bimaris. Od kujawskiego matecznika do stepów nadczarnomorskich. Studia z dziejów pogranicza bałtycko-pontyjskiego ofiarowane Profesorowi Aleksandrowi Kośko*. Archaeologia Bimaris – Dyskusje 5, 201–228. Poznań.

- Bronk Ramsey C.
2020 OxCal v4.4.2. Oxford (www.rlaha.ox.ac.uk).
- Coblenz W., Fritzsche K.
1962 Doppelbestattung der Kugelamphorenkultur neben der rituellen Rinderbeisetzung von Zauschwitz. *Ausgrabungen und Funde* 7 (2): 77–82.
- Dowgiałło W. D.
1972 *Szczegółowa Mapa Geologiczna Polski 1: 50 000 (SMGP)*. Arkusz: Opatów (<http://metadane.pgi.gov.pl>).
- Döhle H.-J., Pape J.
2006 Ein Grabmal der Kugelamphorenkultur auf dem Jätchenberg. *Archäologie in Sachsen-Anhalt. Sonderband 4: Archäologie XXL. Archäologie an der B 6n im Landkreis Quedlinburg*, 83–89. Halle.
- Gabałówna L.
1958 Pochówki bydłęce kultury amfor kulistych ze stanowiska 4 w Brześciu Kujawskim w świetle podobnych znalezisk kultur środkowoeuropejskich. *Prace i Materiały Muzeum Archeologicznego i Etnograficznego w Łodzi* 3: 63–108.
- Gardawski A., Miśkiewicz J.
1958 Sprawozdanie z badań podjętych w 1957 roku w miejsc. Mierzanowice, pow. Opatów. *Wiadomości Archeologiczne* 25 (4): 322–337.
- Gołub S.
1996 Grave of the Globular Amphora Culture from site no. 1 in Łopiennik Dolny Kolonia (Prov. of Chełm, Poland). *Baltic-Pontic Studies* 4: 44–50.
- Gurba J., Matyaszewski M., Miliszkiewicz G.
1978 Puławy-Włostowice, woj. lubelskie, stanowisko 2. In: M. Konopka (Ed.) *Informator Archeologiczny. Badania rok 1977*: 139. Warszawa.
- Jażdżewski K.
1936 Neolityczne groby zwierzęce z Kujaw. *Z Otchłani wieków* 11 (3): 41–50.
- Juras A., Ehler E., Chyleński M., Pospieszny Ł., Spinek A., Malmström H., Krzewińska M., Szostek K., Pasterkiewicz W., Florek W., Wilk S., Mnich B., Kruk J., Szmyt M., Kozieł S., Götherström A., Jakobsson M., Dabert M.
2021 Maternal genetic origin of the Late and Final Neolithic human populations from present-day Poland. *American Journal of Physical Anthropology* 176: 223–236. DOI: <https://doi.org/10.1002/ajpa.24372>
- Kadrow S., Szmyt M.
1996 Absolute chronology of the eastern group of Globular Amphora Culture. *Baltic-Pontic Studies* 4: 103–111.

Kołodziej B.

- 2011 Pochówki zwierzęce w neolicie na terenie ziem Polski. *Materiały i Sprawozdania Rzeszowskiego Ośrodka Archeologicznego* 32: 55–106.

Kowalewska-Marszałek H.

- 2019 The Funnel Beaker and Globular Amphora Cultures in the Sandomierz Upland in the Light of Settlement Research. *Archaeologia Polona* 57: 119–134.

Krzak Z.

- 1961 *Materiały do znajomości kultury złockiej*. Wrocław – Warszawa – Kraków – Gdańsk.
- 1976 *The Złota Culture*. Wrocław – Warszawa – Kraków – Gdańsk.
- 1977 Cmentarzysko na „Gajowiźnie” pod względem archeologicznym. In: J. Kowalczyk (Ed.) *Cmentarzysko kultury amfor kulistych w Złotej Sandomierskiej*, 9–82. Wrocław – Warszawa – Kraków – Gdańsk.

Machnik J.

- 1966 *Studia nad kulturą ceramiki sznurowej w Małopolsce*. Wrocław.

Mackiewicz M., Pasterkiewicz W., Myślecki B.

- 2016 Badania geomagnetyczne w obrębie późnoneolitycznego kompleksu sepulkralno-obrzędowego w Sadowiu. In: M. Furmanek, T. Herbich, M. Mackiewicz (Eds) *Metody geofizyczne w archeologii polskiej 2016*, 73–76. Wrocław.

Nosek S.

- 1951 Kultura amfor kulistych na Lubelszczyźnie. *Annales Universitatis Mariae Curie-Skłodowska. Sectio F* 5 (1954/1955): 55–158.
- 1967 *Kultura amfor kulistych w Polsce*. Wrocław – Warszawa – Kraków.

Osipowicz G., Bokiniec A., Kurzyk K., Makowiecki D., Bienias D., Górzyński T., Jankowski M., Jędrychowska-Dańska K., Kępa M., Kozłowska A., Kozłowski T., Noryśkiewicz A. M., Płoszaj T., Pomianowska H., Reitsema L. J., Rumiński J. K., Stepańczak B., Szostek K., Weckwerth P., Witas H. W.

- 2014 Miejsce sepulkralno-obrzędowe KAK ze stanowiska 14 w Kowalu w świetle wyników analizy pozyskanych źródeł – podsumowanie. In: G. Osipowicz (Ed.) *Kowal 14. Miejsce sepulkralno-obrzędowe ludności kultury amfor kulistych*, 251–266. Toruń.

Pasterkiewicz W.

- 2017 Wyniki badań archeologicznych na cmentarzysku z późnego neolitu w Sadowiu koło Opatowa. *Materiały i Sprawozdania Rzeszowskiego Ośrodka Archeologicznego* 38: 281–289.

- 2020 The first radiocarbon dates for the Globular Amphora culture cemetery in Sadowie in the Sandomierz Upland. *Analecta Archaeologica Ressorviensia* 15: 53–75.
- Polańska M.
- 2016 Obiekt kultury amfor kulistych na stanowisku 2 w Raciborowicach-Kolonii, pow. chełmski. In: P. Jarosz, J. Libera, P. Włodarczak (Eds) *Schylek neolitu na Wyżynie Lubelskiej*, 17–32. Kraków.
- Pollex A.
- 1999 Comments on the interpretation of the so-called cattle burials of Neolithic Central Europe. *Antiquity* 73(281): 542–550.
- Pospieszny Ł.
- 2017 Datowanie absolutne ludzkich i zwierzęcych szczątków kostnych z grobowca megalitycznego w Kierzkowie. In: S. Nowaczyk, Ł. Pospieszny, I. Sobkowiak-Tabaka (Eds) *Megalityczny grobowiec kultury amfor kulistych z Kierkowa na Pałukach. Milczący świadek kultu przodków z epoki kamienia*. Biskupińskie Prace Archeologiczne 12, 267–286. Biskupin.
- Pozikhovskyi O.L., Samolyuk V.O.
- 2007 Doslidzhennya gruntovogo mogilnika dobi eneolitu-rannoy bronzы v m. Ostrog. *Arkheologicheskiye doslidzhennya v Ukraine 2005–2007*, 310–313. Kyiv – Zaporizhzhya.
- Priebe H.
- 1938 *Die Westgruppe der Kugelamphoren*. Jahresschrift für die Vorgeschichte der sächsisch-thüringischen Länder 28. Halle.
- Przybyła M. M., Włodarczak P., Podsiadło M., Tunia K.
- 2013 Obiekty kultury amfor kulistych, In: M.M. Przybyła, A. Szczepanek, P. Włodarczak (Eds) *Koszyce, stanowisko 3. Przemoc i rytuał u schyłku neolitu*. Ocalone Dziedzictwo Archeologiczne 4, 11–64. Kraków-Pętkowice.
- Pyzik Z.
- 1959 Grób kultury amfor kulistych we wsi Ossolin, pow. Sandomierz. *Wiadomości Archeologiczne* 26(3–4) [1960]: 349–350.
- Romanek A.
- 1991 *Szczegółowa Mapa Geologiczna Polski 1: 50 000 (SMGP)*. Arkusz: Ostrowiec Świętokrzyski (<http://metadane.pgi.gov.pl>).
- Schirmer E.
- 1939 Der Große Hügel von Stobra. *Spatenforscher* 4: 17–35.

Shelomentsev-Terskiy S.V.

- 1996 Settlement of Globular Amphora Culture in Peresopnitsa, the Volhynia Region (Ukraine). *Baltic-Pontic Studies* 4: 70–78.

Schroeder H., Margaryan A., Szmyt M., Theulot B., Włodarczak P., Rasmussen S., Gopalakrishnan S., Szczepanek A., Konopka T., Jensen T.Z.T., Witkowska B., Wilk S., Przybyła M.M., Pospieszny Ł., Sjögren K.-G., Belka Z., Olsen J., Kristiansen K., Willerslev E., Frei K.M., Sikora M., Johannsen N.N., Allentoft M.E.

- 2019 Unraveling ancestry, kinship, and violence in a Late Neolithic mass grave. *Proceedings of the National Academy of Sciences of the United States of America* 116 (22): 10705–10710. DOI: <https://doi.org/10.1073/pnas.1820210116>

Sveshnikov I.

- 1983 *Kultura sharovidnykh amfor*. Arkheologiya SSSR. Svod arkheologicheskikh istochnikov I-27. Moskva.

Szczodrowski R.

- 2012 Spatial Aspects of Globular Amphora Culture Funeral Rites with Animal Deposits in Poland. In: A. Pluskowski (Ed.) *The Ritual Killing and Burial of Animals. European Perspectives*, 51–60. Oxford.

Szmyt M.

- 1996 *Spoločności kultury amfor kulistych na Kujawach*. Poznań.
- 1999 Between West and East. People of the Globular Amphora Culture in Eastern Europe: 2950–2350 BC. *Baltic-Pontic Studies* 8: 1–349.
- 2000 Osadnictwo społeczności kultury amfor kulistych. In: A. Kośko (Ed.) *Archeologiczne badania ratownicze wzdłuż trasy gazociągu tranzytowego. III. Kujawy. 4. Osadnictwo kultur późnoneolitycznych oraz interstadium epok neolitu i brązu: 3900 – 1400/1300 przed Chr.*, 135–329. Poznań.
- 2006 Dead Animals and Living Society, *Journal of Neolithic Archaeology* 8: 1–10 (www.jungsteinsite.de).
- 2014 Fourth-third millennium BC stone cist graves between the Carpathians and Crimea. An outline of issues. *Baltic-Pontic Studies* 19: 107–147.

Ścibior J., Kokowski A., Koman W.

- 1991 Zespoły grobowe kultury amfor kulistych z zachodniej części Wyżyny Wołyńskiej. *Sprawozdania Archeologiczne* 43: 79–108.

Ścibior J., Ścibior J. M.

- 1990 Sandomierz 78 – wielokulturowe stanowisko z przełomu neolitu i epoki brązu. Badania ratownicze w 1984 r. *Sprawozdania Archeologiczne* 42: 157–201.

Uzarowiczowa A.

- 1968 Grób kultury amfor kulistych na stanowisku I w Klementowicach, pow. Puławy. *Wiadomości Archeologiczne* 33 (2): 217–223.

Wiślański T.

- 1966 *Kultura amfor kulistych w Polsce północno-zachodniej*. Wrocław – Warszawa – Kraków.
- 1969 *Podstawy gospodarcze plemion neolitycznych w Polsce północno-zachodniej*. Wrocław.
- 1979 Kształtowanie się miejscowych kultur rolniczo-hodowlanych. Plemiona kultury pucharów lejkowatych. In: W. Hensel, T. Wiślański (Eds) *Prahistoria ziem polskich. II. Neolit*, 165–260. Wrocław – Warszawa – Kraków.

Witkowska B., Czebreszuk J., Gmińska-Nowak B., Goslar T., Szmyt M., Ważny T.

- 2020 The cemetery of the Globular Amphora culture community at the Złota-Gajowizna site in the light of radiocarbon analysis and dendrochronology. *Sprawozdania Archeologiczne* 72 (2): 61–86. DOI: <https://doi.org/10.23858/SA/72.2020.2.0XX>

Włodarczak P.

- 2006 *Kultura ceramiki sznurowej na Wyżynie Małopolskiej*. Kraków.
- 2016a Chronologia absolutna cmentarzysk późno- i schyłkowoneolitycznych na Wyżynie Lubelskiej. In: P. Jarosz, J. Libera, P. Włodarczak (Eds) *Schyłek neolitu na Wyżynie Lubelskiej*, 537–548. Kraków.
- 2016b Dwa rytuały, dwie społeczności, dwie epoki, dwa światy? Obrządek pogrzebowy w późnym- i schyłkowym neolicie na Wyżynie Lubelskiej. In: P. Jarosz, J. Libera, P. Włodarczak (Eds) *Schyłek neolitu na Wyżynie Lubelskiej*, 549–561. Kraków.
- 2019 Grób z Wilczyc na tle środkowoeuropejskich odmienności i reguła w obrzędzie pogrzebowym małopolskiej kultury ceramiki sznurowej. In: P. Włodarczak (Ed.) *Wilczyce, stanowisko 10. Norma i precedens w rytuale pogrzebowym małopolskiej kultury ceramiki sznurowej*. Ocalone Dziedzictwo Archeologiczne 9, 169–209. Kraków – Niepołomice – Pękowice.

Włodarczak P., Przybyła M. M.

- 2013 Groby z Koszyc na tle innych późno- i schyłkowoneolitycznych znalezisk środkowoeuropejskich. In: M.M. Przybyła, A. Szczepanek, P. Włodarczak (Eds), *Koszycy, stanowisko 3. Przemoc i rytuał u schyłku neolitu*. Ocalone Dziedzictwo Archeologiczne 4, 209–255. Kraków – Pękowice.

Zabilska-Kunek M., Pasterkiewicz W.

in press Animal burials from Globular Amphora Culture cemetery in Sadowie (Site 23), South-Eastern Poland (in print).

Zakościelna A.

1989 Grób kultury amfor kulistych na stan. 7 w Lesie Stockim, gm. Końskowola, woj. lubelskie. *Lubelskie Materiały Archeologiczne* 3: 47–54.

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RELATIONSHIPS BETWEEN GLOBULAR
AMPHORA AND CORDED WARE
OCCUPATION PHASES IN ZŁOTA-NAD WAWREM
SITE, SANDOMIERZ UPLAND. CHRONOMETRIC AND
STRATIGRAPHIC EVIDENCE

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ABSTRACT

On the *Nad Wawrem* site in Złota, unique instances of stratigraphic sequences were recorded, involving materials linked to the Globular Amphora culture and Corded Ware culture. This article discusses these sequences and presents hitherto unpublished materials that may contribute to the study of the decline of the Eneolithic in Małopolska. The stratigraphic sequences involve the presence of pottery belonging to the older phase of the Corded Ware culture in pits related to the Globular Amphora culture and the intercutting of Globular Amphora settlement features by Corded Ware graves. In settlement pits, besides dominating materials of the Globular Amphora culture, pottery typical of the older phase of the Corded Ware culture was discovered. Corded Ware niche graves, in turn, were clearly younger than the Globular Amphora settlement pits they cut into. The study of the sequences reveals the complexity of cultural relations on the Sandomierz Upland

in the first half of the 3rd millennium BC. An interesting aspect is the cross-border nature of the pottery often treated as a clear cultural marker. Substantiated by absolute dating, the synchronous development model of the Globular Amphora culture, the older phase of the Corded Ware culture and the Złota culture is reflected in the peculiarity of recorded pottery assemblages.

Keywords: Globular Amphora culture, Corded Ware culture, A-horizon, radiocarbon dating, stratigraphy

INTRODUCTION

From the Sandomierz Upland, at present we know of 42 excavated Globular Amphora culture (GAC) sites and 35 Corded Ware culture (CWC) cemeteries (Fig. 1). The populations of both cultures exhibited similar settlement preferences, leading to the frequent occurrence of their material traces within the same landforms, e.g. in Mierzanowice, Sandomierz-*Kruków*, Wilczyce or Kichary Nowe [Bąbel 1979; Ścibior, Ścibior 1990; Włodarczak 2019: 197 as well as unpublished research by Hanna Kowalewska-Marszałek]. However, stratigraphic sequences involving features linked to the two cultures or the co-occurrence of their materials within the same stratigraphic units are very rare. One of the very few locations where such situations are identified is the *Nad Wawrem* site in Złota village, Sandomierz District. The purpose of this article is to present artefact inventories and radiocarbon dates relating to six features from this site. What attracted our attention was the complexity of materials from two settlement pits in which, next to artefacts displaying classic GAC traits, elements of the so-called A-horizon of the CWC were present. The other four features' high research value, in turn, follows from their stratigraphic interconnections, establishing the sequence of cultural phenomena on the Sandomierz Upland in the 3rd millennium BC. The article therefore makes an important contribution to the study of GAC chronometry.¹

¹ These investigations were carried out as part of the NSC project *Sandomierz-Opatów Group of the Globular Amphora Culture* (no. 2014/12/S/HS3/00 355). The article is part of the implementation of the project.

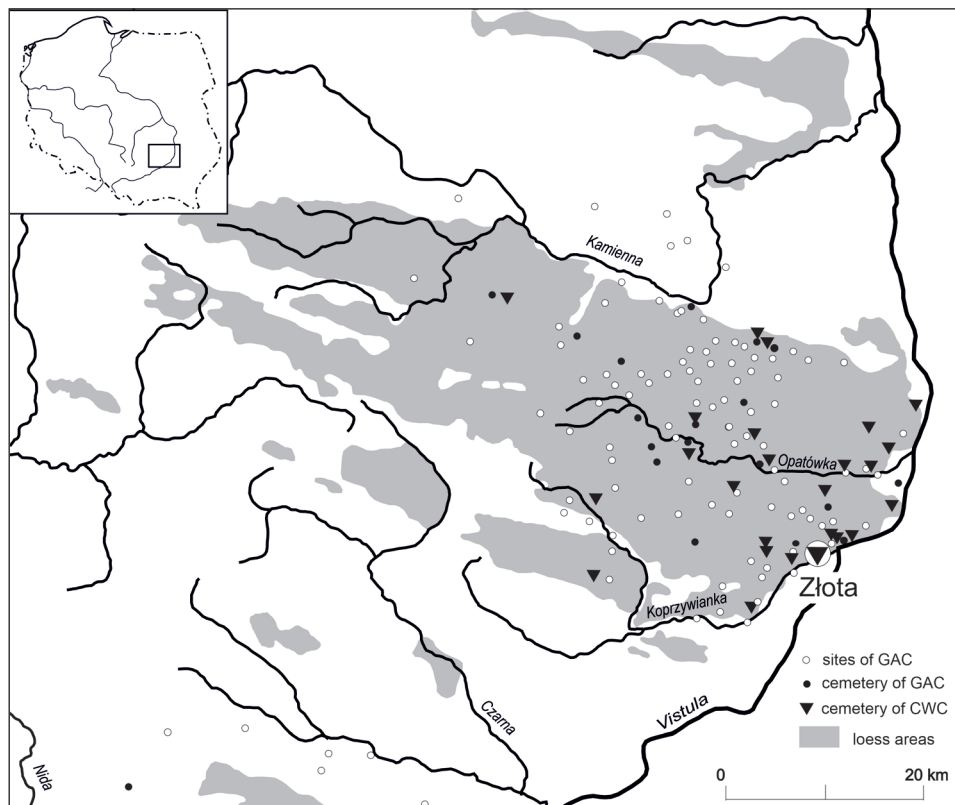


Fig. 1. Complex of sites in Złota on the background of others sites of Globular Amphora and Corded Ware cultures from Sandomierz Upland. Prep. by B. Witkowska

DESCRIPTION OF THE ZŁOTA-NAD WAWREM SITE

The *Nad Wawrem* site, being one of the well-known complex of sites in Złota, now labeled as Złota, site 3, is located on a loess bluff at the edge of a high plain about 7 km east of Sandomierz. It was discovered in 1911, when in the course of amateur prospecting, Zdzisław Lenartowicz dug up two Złota culture (ZC) graves there [Antoniewicz 1925]. Successive single features were exposed in 1922 [Antoniewicz 1925] and 1925 [Pietraszewski 1924; Żurowski 1930]. The site was systematically explored by the expedition of the State Archaeological Museum headed by Józef Żurowski in 1926–29. It recorded almost 600 features, dated mostly to the Neolithic and Early Bronze Age (Fig. 2) [Krzak 1970: 11–15; Matraszek 2001]. The abundance of sources that the exploration yielded and the diversity of issues related to them prevented the materials from being ever

published in full. So far, only sepulchral features have been published almost in full: a ZC cemetery of 47 burials [Krzak 1970], five Malice culture graves [Kadrow *et al.* 2009: 231–233, Fig. 61–65], another five graves belonging to the Bell Beaker culture [Budziszewski, Włodarczak 2010: 32–35, 204–210] and 11 Early Bronze graves [Bąbel 2013: 275–299]. Moreover, ten settlement pits have been published as well [Matraszek 2001]. Single artefacts from this site were also mentioned in some articles [e.g. Bąbel 1992; Matraszek *et al.* 2002]. The other materials still await to be processed and published.

This is also true for GAC and CWC sources, which have not been presented in full yet. Some selected artefacts from 18 GAC settlement pits have been published as belonging to the ZC, despite the fact that among them there were items that did not have any analogy in the grave assemblages of the latter [Krzak 1976: 62–78]. A survey of the collections of the State Archaeological Museum held as part of the project (*see* footnote 1) helped verify relevant source attribution and organize the data on several dozen features associated with the GAC. To put an estimate on their number, it would be necessary to process the *Nad Wawrem* site in full. A similar situation prevails with respect to the other culture under discussion. From CWC graves exposed on the site, only single artefacts from Features 42, 90, 246, 298 and 326 have been published [Machnik 1966: 236, Figs. XV: 3, XVI: 2, XXVII: 6, XXVIII: 4, 7] together with incomplete information on the burials themselves [Krzak 1980: 136, 137]. This by no means exhausts the list of CWC assemblages from the site.

DESCRIPTION OF DATED FEATURES

Chronometric data, most of which have not been published before, helpful in studying the GAC–CWC relationship, were obtained for six features. They include pits in which Final Eneolithic materials were found such as, primarily, pottery characteristic of the older phase of the CWC (Features 49 and 184). The other kind of diagnostic features includes GAC settlement pits cut into by Final Eneolithic graves, attesting to the chronological sequence (Features 71 and 90). As mentioned above, some of these features were wrongly presented in the literature as ZC settlement pits, despite the fact that the ceramic materials retrieved from them exhibited a style typical of either the GAC (a majority) or the CWC. The situations mentioned here involve two types of a stratigraphic relationship:

- co-occurrence of materials of both cultures within settlement pits
- intercutting of older GAC features by CWC graves.

Two pits, 75 m apart, holding CWC materials in the context of materials attributable to the GAC were exposed in the southern part of the site (Fig. 2).

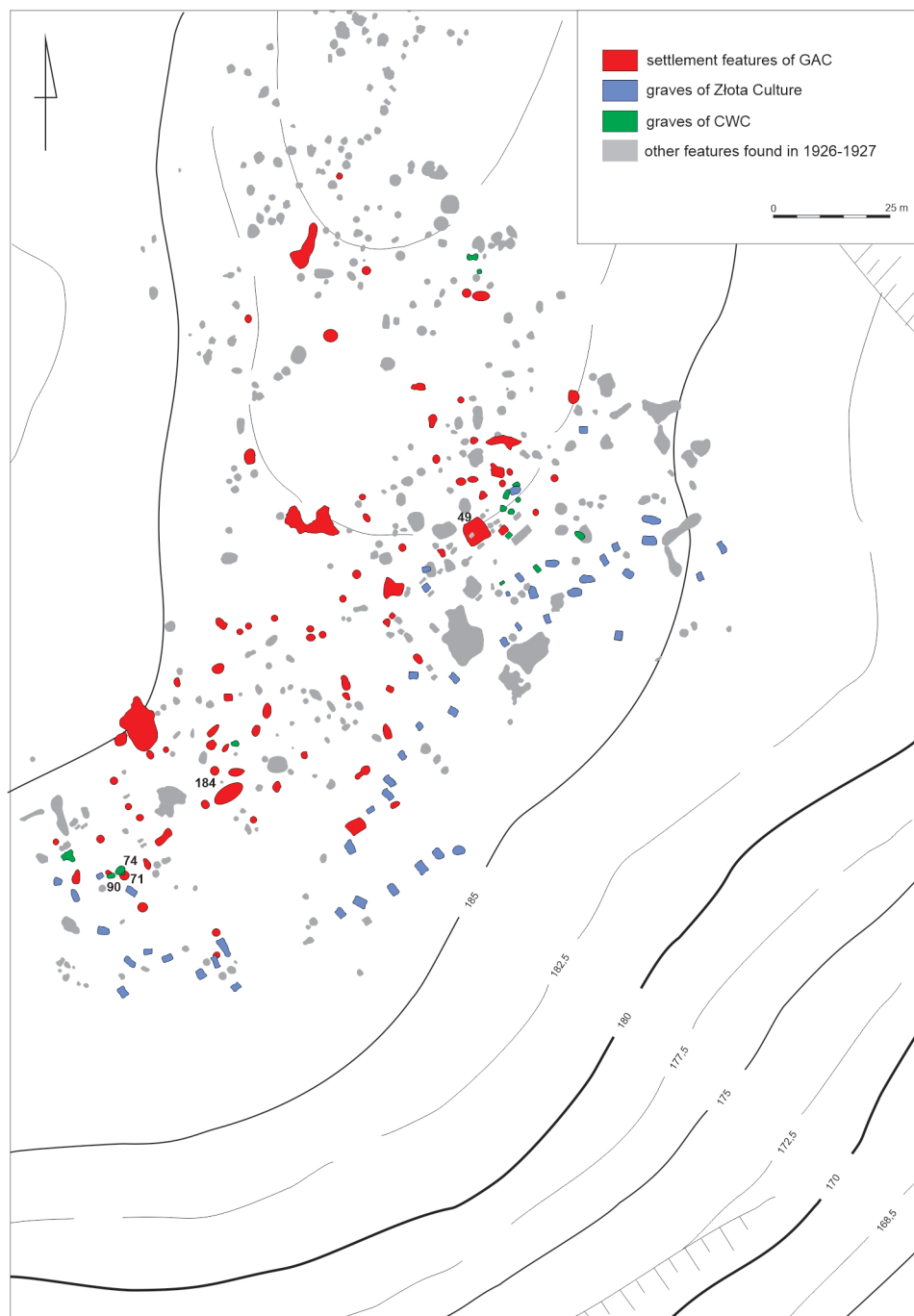


Fig. 2. Złota-Nad Wawrem site, Sandomierz district. Plan of the site based on archives of State Archeological Museum in Warsaw. Prep. by B. Witkowska

Feature 49

It was a large oval-rectangular pit, most likely of a dwelling nature (Fig. 3: a). At the level of discovery, it was 520 cm wide and 600 cm long. Down to a depth of 100 cm, it was regularly slightly basin-like shaped; below, it separated into several depressions, captured by a few profile cuttings. The drawings of vertical sections show an irregular bottom with numerous over-deepened spots (Fig. 3: b). It cannot be ruled out that this picture resulted from a very schematic documentation system and a wrong interpretation of strata, leading to an incorrect delimitation of the feature boundaries. In addition, little is known about the nature of the fill. In the deepest place, it reached 210 cm. The function of the pit is hard to determine, but by reason of its considerable size (over 30 sq. m), shape resembling a rectangle and hypothetical simultaneity of foundation, seen in the homogeneity of artefacts, it can be assumed that it was a kind of pit house with accompanying storage pits.

Artefacts were discovered at various depths, with the their greatest number concentrating in the ceiling portion down to a depth of 80 cm and in a depression in the bottom in the southeastern part of the feature (Fig. 3: b).

Pottery

In total, the feature yielded 2,342 pottery shards of which 1,682 represented unornamented mass material. Among the rest, the remains of about 170 vessels were identified. These are mostly fine fragments of rims, ornamented bellies, handles and bases. Only four forms could be fully reconstructed (Fig. 4: 1–4). Of the remainder of vessels, mostly upper portions have survived. They are usually ornamented with horizontal cord impressions wrapped closely around them (Fig. 4: 5–7; 5: 1–4) and occurring sometimes in patterns with knobs (Fig. 5: 5, 8) as well as vertical and horizontal plastic strips (Fig. 5: 6, 9) or a row of finger imprints (Fig. 5: 7, 8). In a single instance, such mat-like cord impressions are cut across by a triple vertical impression (Fig. 5: 10). The motif of grouped horizontal cord impressions was identified only in six instances (Fig. 4: 2, 4; 5: 11–13). Most vessel shards of a specific morphology and bearing a simple corded ornament were assigned to the base group of beakers (Fig. 4: 5–7; 5: 1–13). Most of the non-decorated vessels belong to the same group (Fig. 6: 1–4, 6). Among them, a vessels stands out which is ornamented with alternating cord impression motifs and rows of oblique stamp impressions, forming a zigzag line (Fig. 6: 7, 8).

Amphora shards, in turn, bear complex ornamental motifs made above all with various stamps (Fig. 4: 1; 6: 9–19, 21, 22). In the hollows of some impressions, the traces of white incrustation are visible. There are also amphorae decorated little (Fig. 6: 23, 24) or no ornament at all (Fig. 6: 20; 7: 19). Recorded in almost 30 instances, the motif of a multiple wavy cord lined with horizontal impressions is characteristic of both bowls (Fig. 4: 3; 7: 1–7) and amphorae (Fig. 7: 8–13). What merits special attention is a shard ornamented with the impressions of a fine round

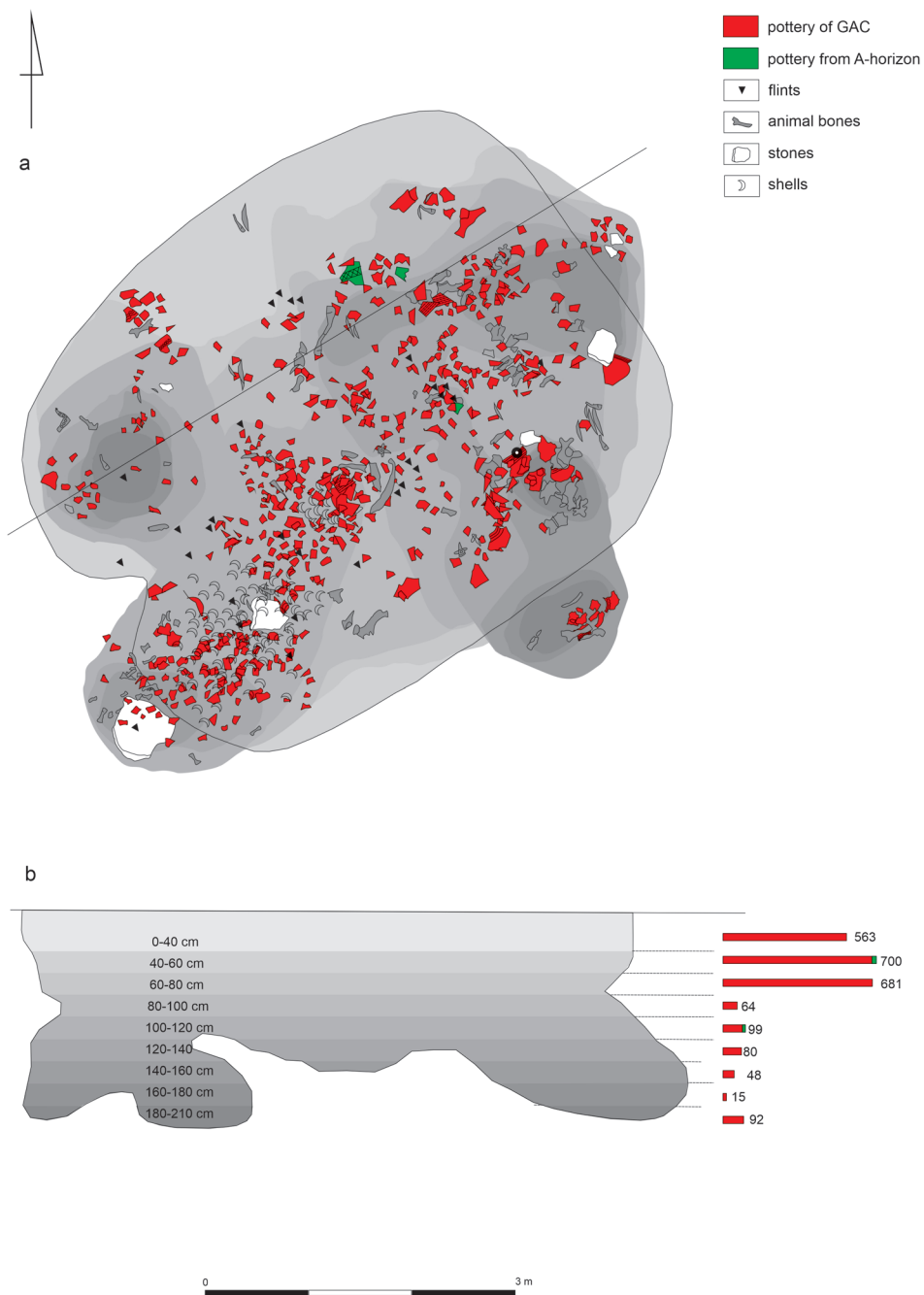


Fig. 3. Złota-Nad Wawrem site, Sandomierz district, Feature 49. Plan and cross-section based on field documentary from archives of State Archeological Museum in Warsaw. Prep. by B. Witkowska

stamp, imitating a wavy cord impression (Fig. 7: 14). Among the reconstructed vessels, there is a vase ornamented with grouped triple knobs (Fig. 7: 15).

The GAC materials are technologically highly homogeneous which is attested to by the number of distinguished technological groups being considerably lower than the number of reconstructed vessels. The dominating group is made up of shards containing a mixture of fine- and medium-grained crushed stone and sand. A much smaller group consists of shards in which sand or mineral temper occurs independently. The firing of most vessels must be considered very good or good, which is reflected in the relatively low comminution of the material. The maximum chord of over 6 cm was recorded in the case of almost 200 shards. In addition, the vessels are thin-walled; wall thickness rarely exceeds 7 mm. Vessel surfaces are carefully finished, sometimes burnished, giving them a shine. In most cases, they were fired to a colour oscillating between orange and beige or less often dark grey or black. However, it must be stressed that the surfaces of large reconstructed forms greatly vary in colour even on a single vessel. This observation should make one cautious when using this characteristic as one of the criteria for distinguishing technological groups.

From the above-described materials, fragments of a thick-walled amphora clearly differ. Found at a depth of 60 cm, a body shard, rim shard and a handle bear an incised and fluted ornament (Fig. 7: 16, 20). They were made from clay tempered with sand and a small amount of fine-grained grog, and fired to an orange colour. A similar technology was used to make a thin-walled vessel, found at a level of 120 cm, of which a body shard has survived, ornamented with vertical incised lines (Fig. 7: 17). These finds do not have any analogies among GAC artefacts, being, no doubt, fragments of Type A amphorae, linked to the earliest CWC horizon.

Flint inventory

The inventory of flints originating with feature 49 comprises 55 artefacts of which 37 are blanks in the form of four scaled pieces, 24 flakes and 9 unretouched blades. Two blades must be counted among functional tools, owing to a clear gloss on their edges (Fig. 8: 1, 2). Among the retouched tools, the following were identified: double endscraper on regular blade (Fig. 8: 3), fragment of alternately retouched blade (Fig. 8: 4), irregular borer on thermal flake (Fig. 8: 5), and side-scraper made from a thick flake originating with a tetrahedral axe (Fig. 8: 6). A polished core tool was used as a shapeless pounder. Of a similar type of a tool, too, three unintentional flakes were left with crushed surfaces. Apart from the four blade tools, the flints are highly irregular and carelessly made. The settlement character of the inventory is additionally underscored by four splintered pieces made from thick flakes (Fig. 8: 7), retouched thermal flakes and the secondary use of forms attesting to the economic management of raw materials. The raw material dominating in the inventory was Świeciechów flint of which 27 artefacts were made – including almost all the tools – except for the fragments of a Jurassic

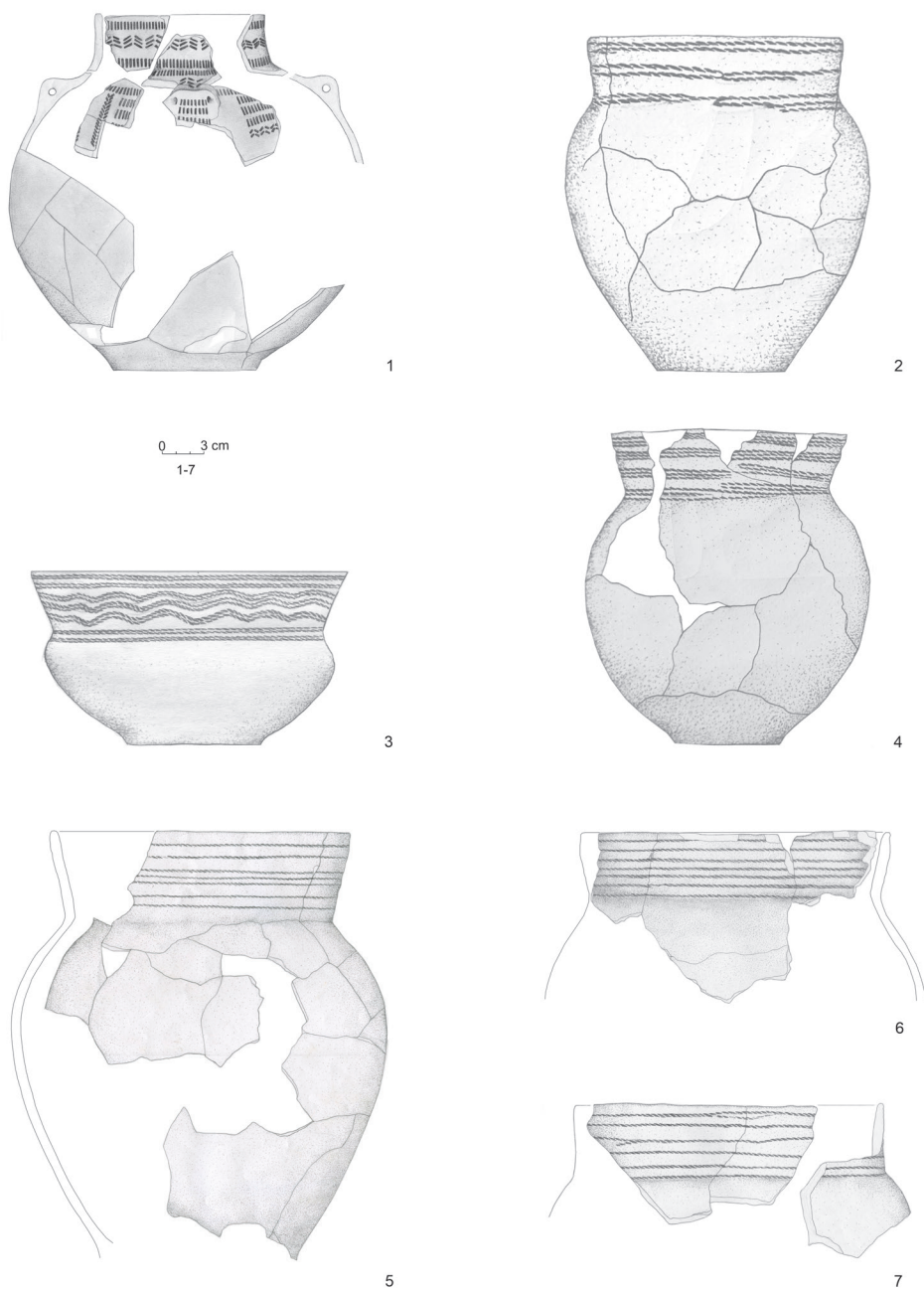


Fig. 4. Złota-Nad Wawrem site, Sandomierz district, Feature 49. Pottery: 1, 5-7 – drawn by B. Witkowska; 2-4 – after Krzak 1976 with changes

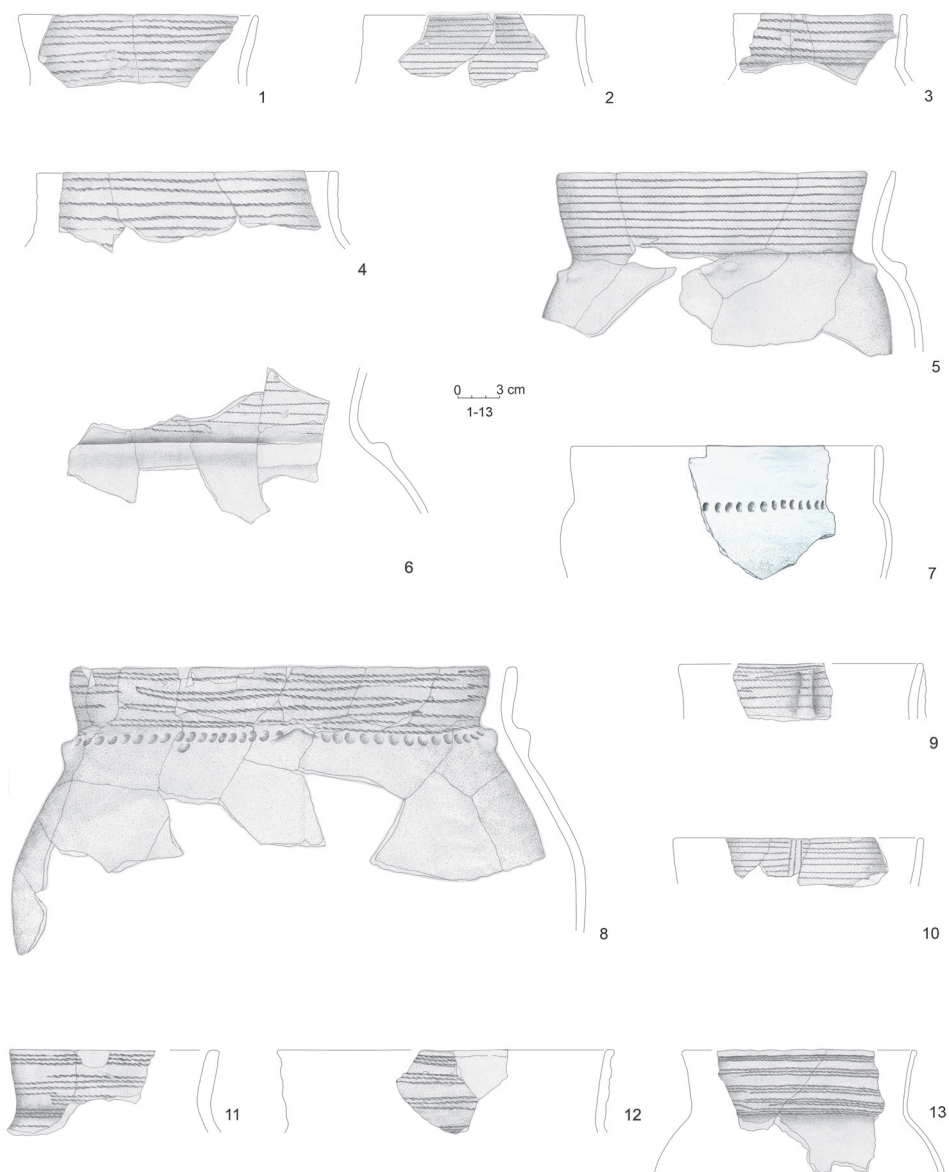


Fig. 5. Złota-Nad Wawrem site, Sandomierz district, Feature 49. Pottery: 1-6, 8-13 – drawn by B. Witkowska; 7 – after Krzak 1976 with changes

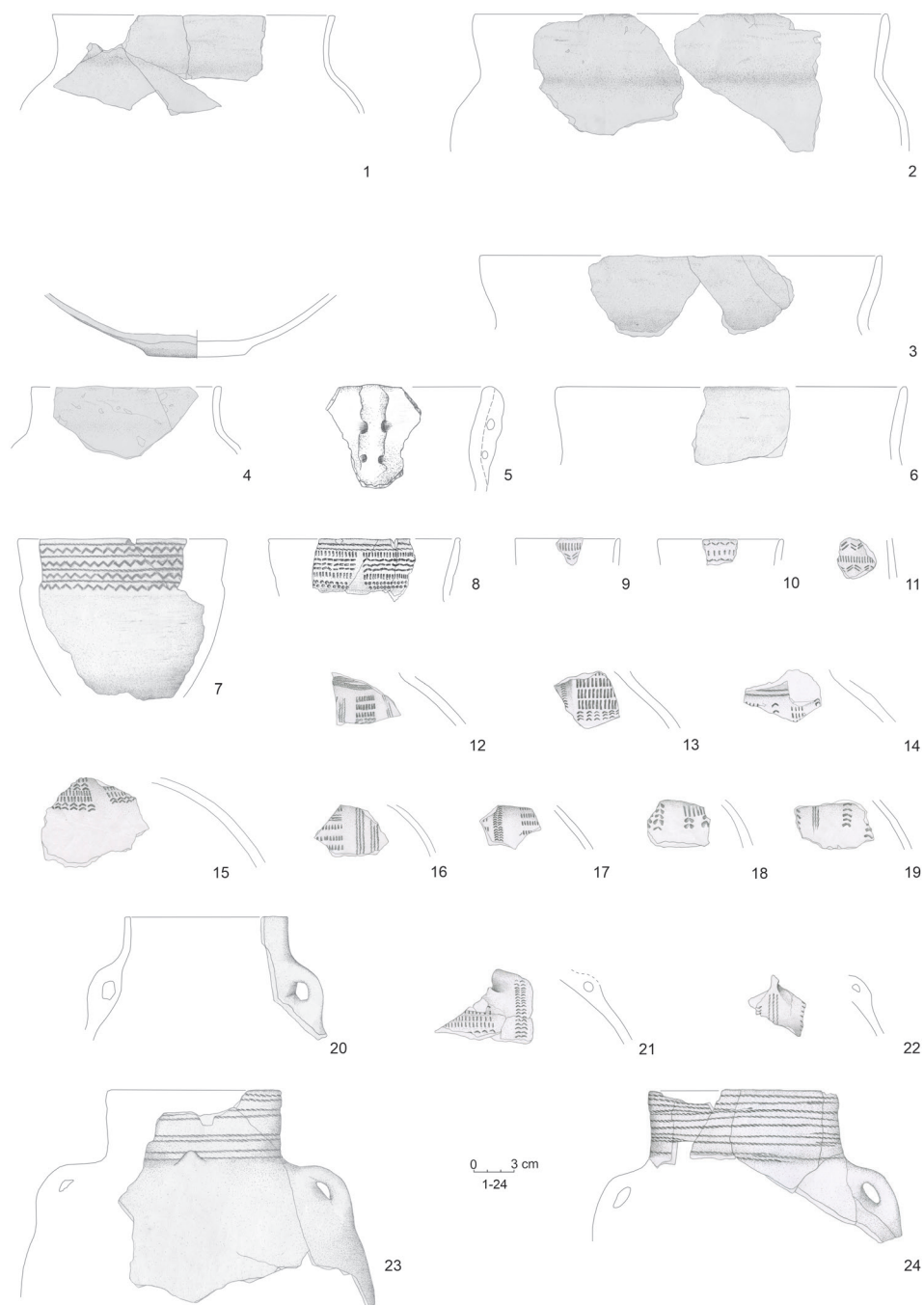


Fig. 6. Złota-Nad Wawrem site, Sandomierz district, Feature 49. Pottery: 1-4, 6, 8-24 – drawn by B. Witkowska; 5,7 – after Krzak 1976 with changes

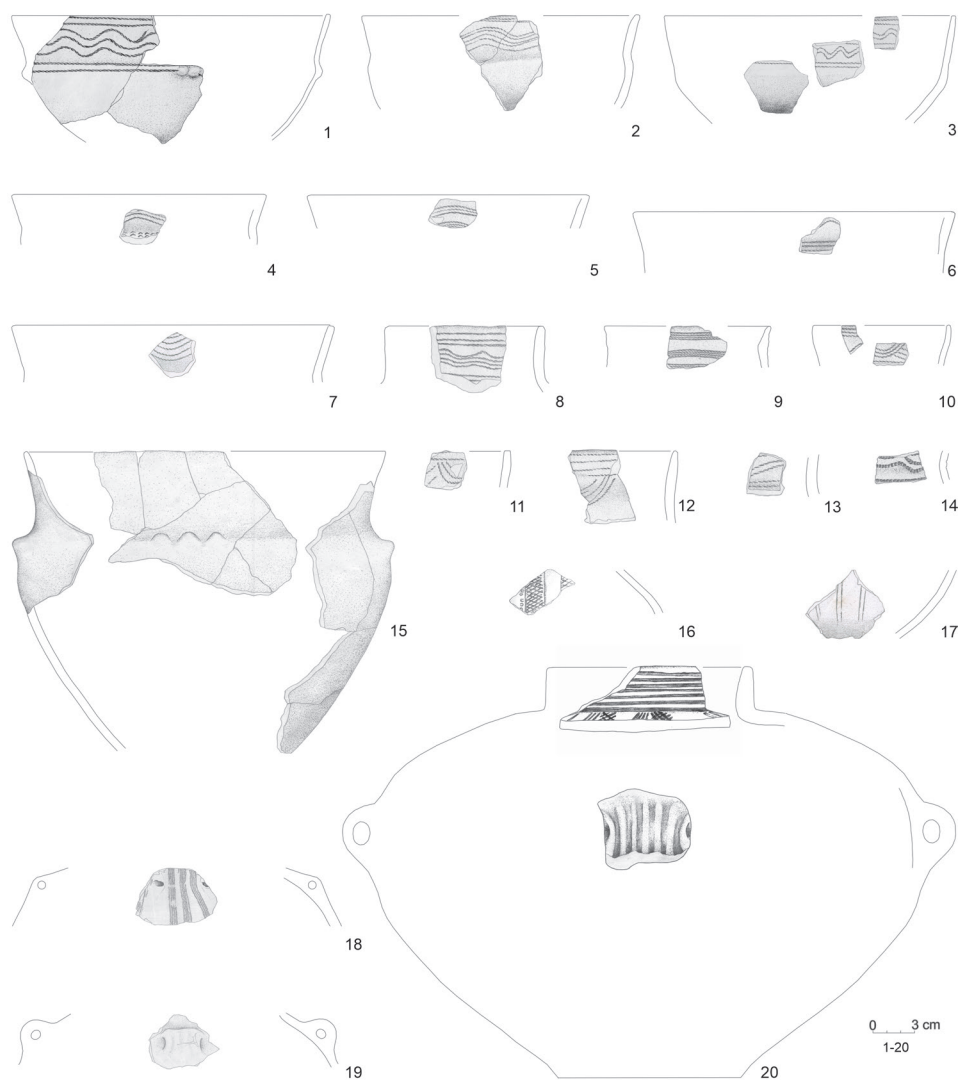


Fig. 7. Złota-Nad Wawrem site, Sandomierz district, Feature 49. Pottery: 1, 16 – after archives of State Archeological Museum in Warsaw; 2-15, 17-20 – drawn by B. Witkowska

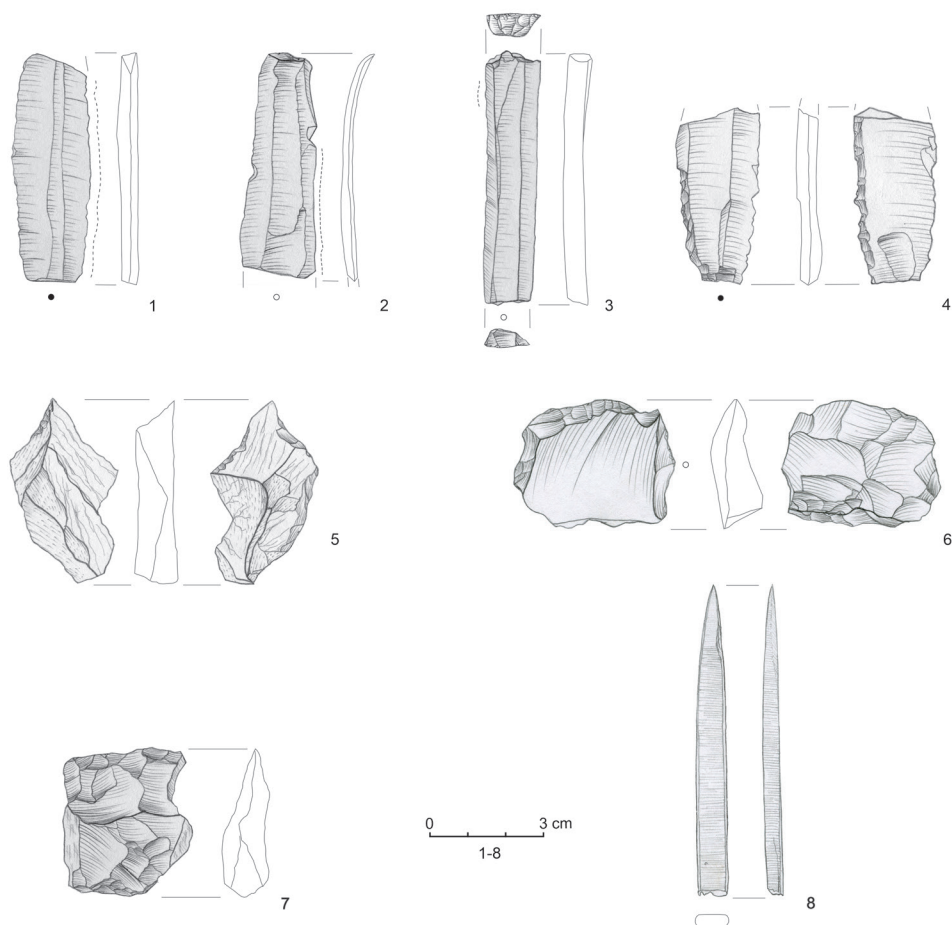


Fig. 8. Złota-Nad Wawrem site, Sandomierz district, Feature 49. Flint and bone artefacts: 1-4, 6 – Świeciechów flint; 5 – chocolate flint; 7 – striped flint; 8 – animal bone. Drawn by B. Witkowska

flint pounder and a chocolate flint borer on thermal flake. Chocolate flint was represented by 15 artefacts, another six were made of striped flint and four of Jurassic flint. In addition, two small lumps of erratic flint and one of striped flint were extracted from the feature.

Other materials

The collection of tools found in the feature is enlarged by a carefully smoothed bone blade in the type of a perforator with a flat cross-section and preserved length of 81 mm (Fig. 8: 8).

Moreover, the feature fill yielded a damaged amber ornament, 40 swan mussel (*Anadonta cygnea*) shells, fine charcoals and large structural daub lumps with impressions. Apart from these, many animal bones were found in the pit, sheep/goat

remains among them. Although they do not bear any clear signs of damage or burning, their comminution and incompleteness suggest their post-consumption character.

A ^{14}C AMS determination (Poz-90789 4155 ± 35 BP) was made on a sample from a long-bone fragment of a small ruminant.

Feature 184

A GAC settlement pit, circular in horizontal projection (Fig. 9: a) and trapezium-shaped in vertical projection, had a diameter of 160 cm (Fig. 9: b) at the level of discovery, while close to its bottom the diameter was much larger, measuring 250 cm. Its depth reached 120 cm. The documentation lacks a profile drawing, but it specifies that in the lower part of the fill, in the centre, there was a conical block of loess, which was described as a 'seat'. Krzak's publication, which wrongly – in our opinion – attributes the feature to the ZC, says that its shape resembled a 'round niche' [Krzak 1976: 63]. This interpretation, however, is not substantiated by the field records. One can hardly agree with the suggestion either that it was a dwelling pit [Krzak 1976: 65] although its settlement character is unquestionable.

Pottery

The feature fill was saturated with artefacts, although they occurred only from a depth of 70 cm. It yielded 921 pottery shards, originating with at least 55 vessels of which most were ornamented with horizontal cord impressions (Fig. 9: 1–3). They co-occurred with other ornamental elements such as: finger imprints (Fig. 9: 4, 5, 7), single appliqué knobs (Fig. 9: 6, 7), or round stamp impressions typical of the GAC (Fig. 9: 8, 9). It is worth noting that cord impressions rarely formed mat-like surfaces; instead, they were more often arranged in bands of double or triple lines on the rims of vessels in the type of beakers (Fig. 9: 10–14). The same ornamental motif is seen on the necks of beaker (Fig. 9: 15) where it co-occurs with wavy bands. An analogous ornament is found on the fragments of two cups (Fig. 10: 1–2) and preserved fragments of amphorae (Fig. 10: 3–6) and bowls (Fig. 10: 8–12). The most complicated ornamentation is obviously visible on the Kujawy type amphoras (Fig. 10: 6–7).

Vessel surfaces are carefully finished, sometimes burnished, giving them a shine. The mass of clay is dominated by medium- and fine-grained crushed stone, sometimes co-occurring with sand. The pottery is relatively well-fired, but it is highly comminuted. The shards are usually no more than 4 cm long while vessel forms are partially reconstructed only thanks to few larger fragments.

Against this background, a Thuringian amphora stands out. Preserved almost whole, it has a cylindrical neck ornamented with furrows from which groups of vertical grooved lines radiate to decorate its belly (Fig. 10: 13). It differs from the other ceramic artefacts in having very thick walls (over 1 cm), being very well fired and tempered with grog. It lay at a depth of 85 cm, among GAC-attributable materials.

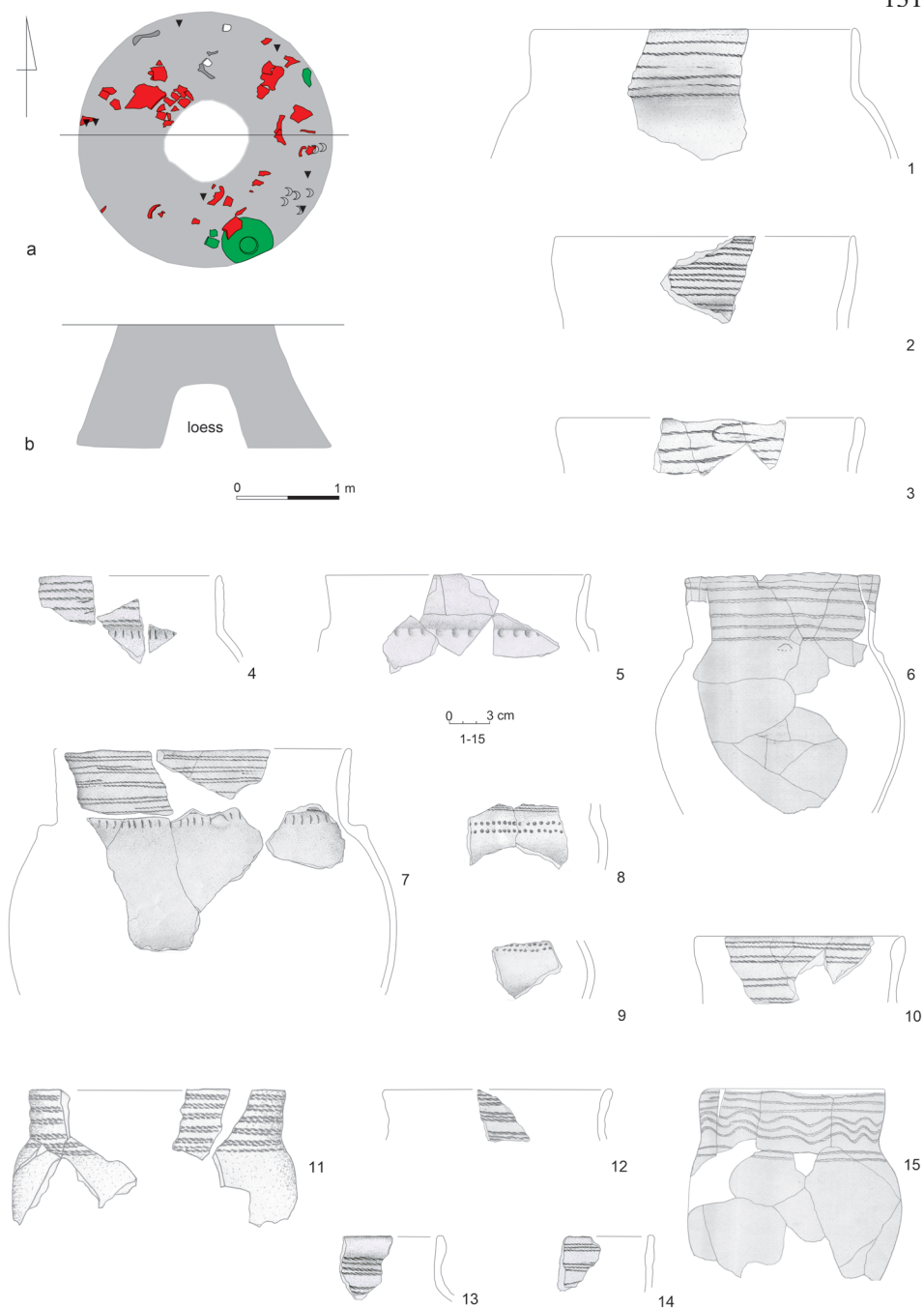


Fig. 9. *Złota-Nad Wawrem* site, Sandomierz district, Feature 184: a – plan drawn by B. Witkowska based on field drawing; b – reconstructed cross-section based on field notes; 1-5, 7-10, 12-14 – pottery drawn by B. Witkowska; 6 – after Krzak 1976 with changes; 11, 15 – after archives of State Archeological Museum in Warsaw

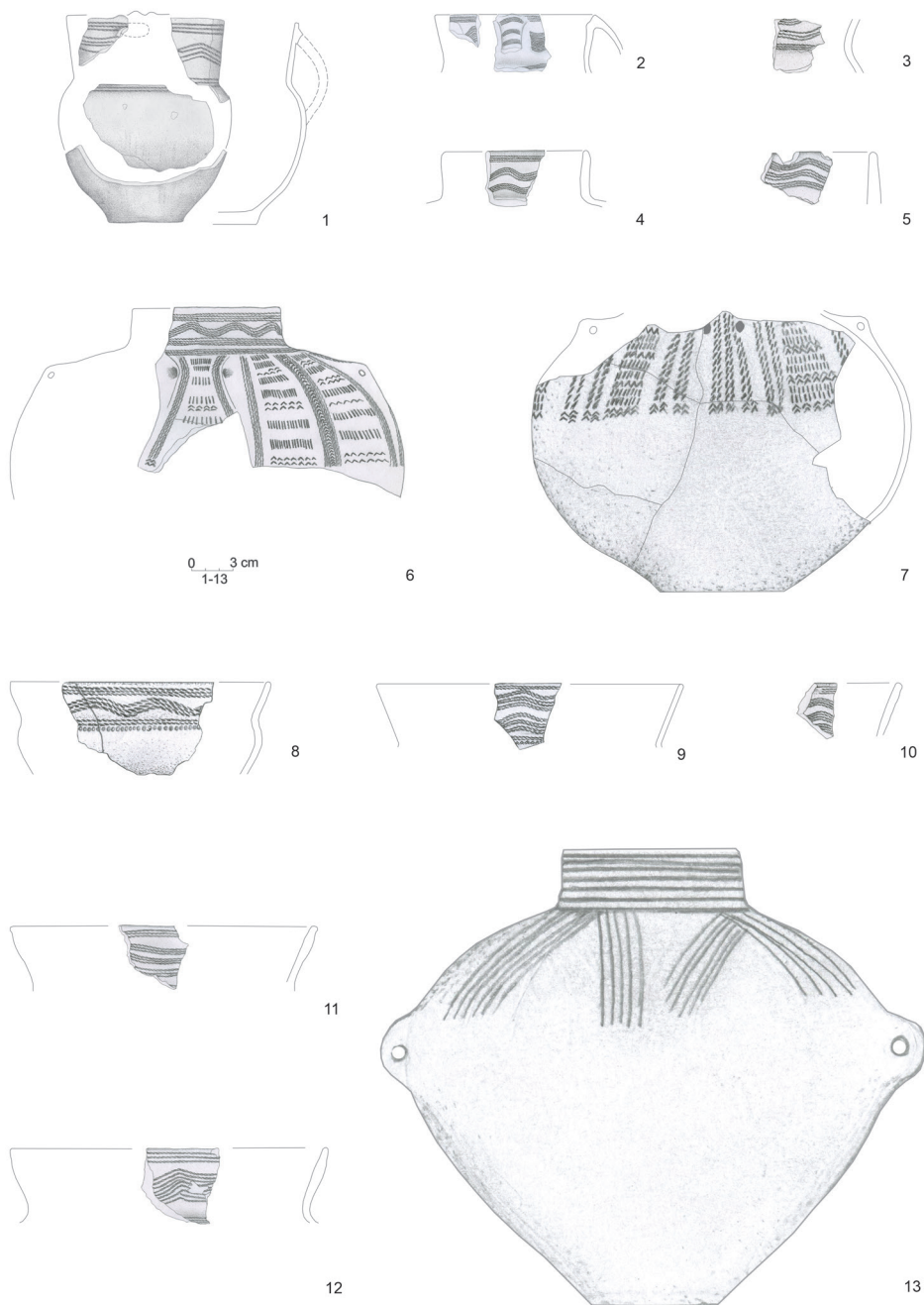


Fig. 10. Złota-Nad Wawrem site, Sandomierz district, Feature 184. Pottery: 1-6, 13 – drawn by B. Witkowska; 7 – after Krzak 1976 with changes; 8-12 – after archives of State Archeological Museum in Warsaw

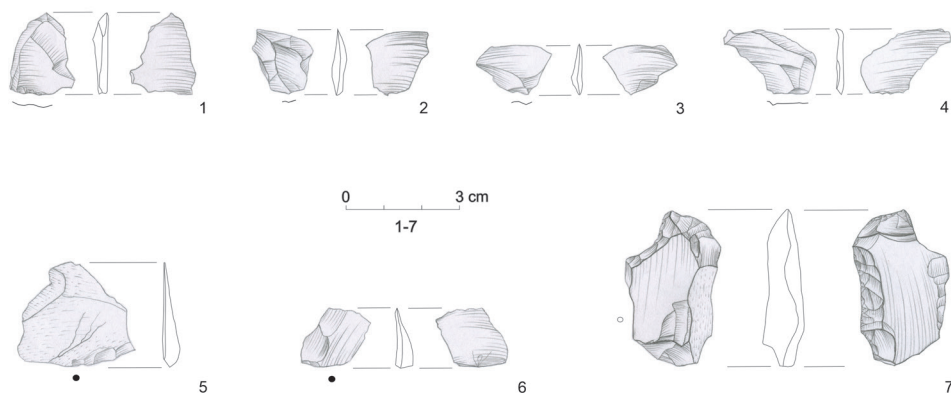


Fig. 11. Złota-Nad Wawrem site, Sandomierz district, Feature 184. Flint artefacts: 1, 2, 5-7 – Świeciechów flint; 3, 4 – striped flint. Drawn by B. Witkowska

Flint inventory

In Feature 184, 11 flint artefacts were found, mostly unretouched scaled pieces and small flakes (Fig. 11: 1–6) and a single amorphous Świeciechów flint sidescraper (Fig. 11: 7). It was this kind of flint that dominated in the assemblage as only two artefacts were made of striped flint. The kind of flint of which another two artefacts were made could not be identified because of their overheating (calcination).

In addition, the fill of Feature 184 yielded four rough stones, many shells, daub lumps with structural impressions and animal bones.

A ^{14}C AMS determination (Poz-90892 3545 ± 35 BP) was made on a sample from a fragment of a cattle rib.

STRATIGRAPHIC SEQUENCE I: FEATURES 71 AND 74

It was found in the southeastern part of the site, in the close vicinity of Stratigraphic Sequence II described below (Fig. 2).

Feature 71

GAC settlement pit cut into by Feature 74 (CWC grave). It was round with a maximum diameter of about 140 cm (Fig. 12: a) and had straight vertical walls (Fig. 12: b). Its convex bottom extended at a depth of about 100 cm, slightly below the bottom of the niche grave cutting into it. The preserved documentation shows two levels of the pit and a compact semicircular concentration of prehistoric material surrounding a space without any artefacts at a depth of 70 cm. The artefact-free space is perhaps all that is left of the niche entrance that cut into artefact-suffused

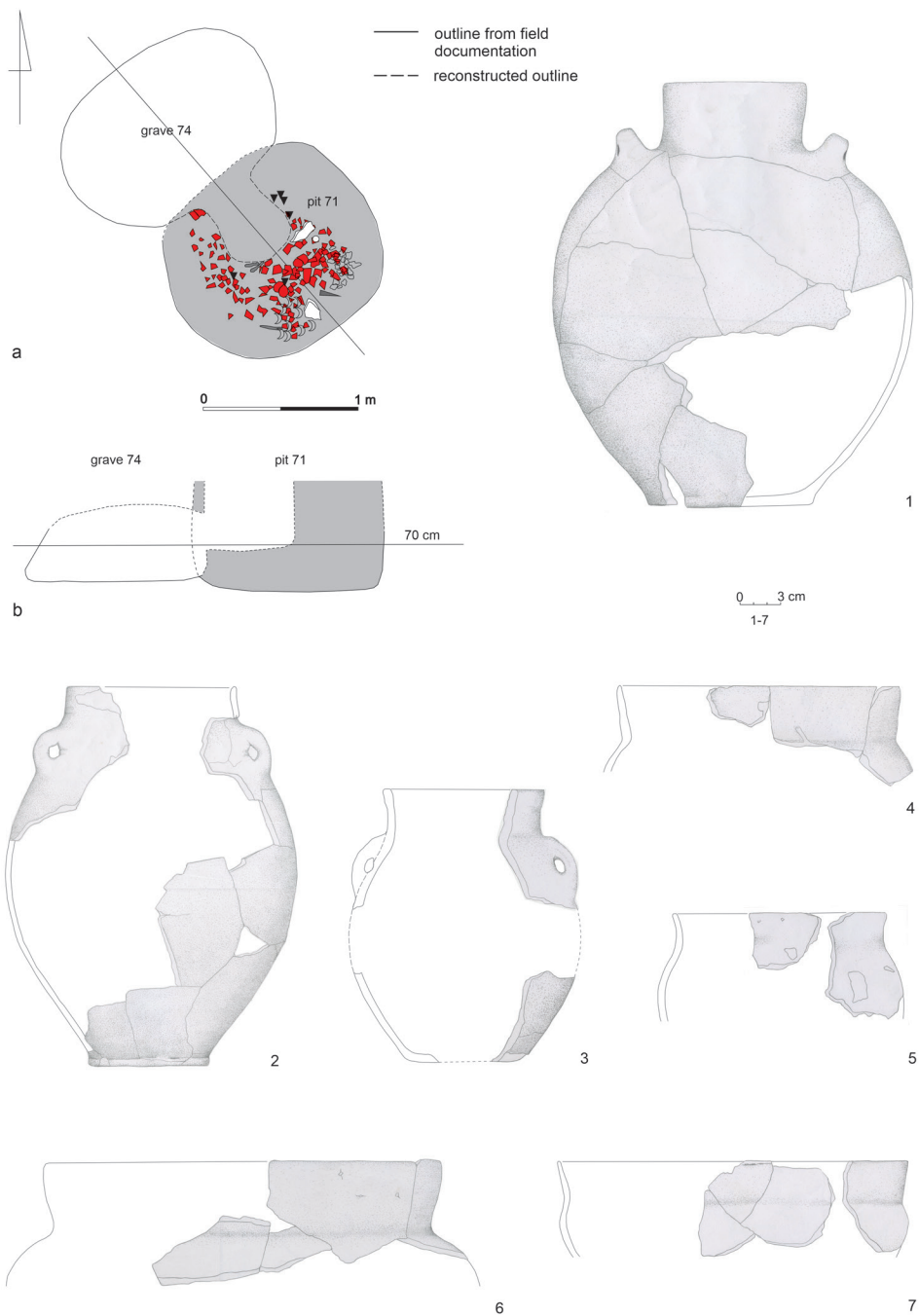


Fig. 12. Złota-Nad Wawrem site, Sandomierz district, Feature 71: a – plan based on field documentary; b – cross-section partially reconstructed from the notes; 1-7 – pottery. Drawn by B. Witkowska

strata (Fig. 12: a). At a depth of 90 cm, there was no sign of the intercutting and artefacts occupied the entire pit bottom, giving almost the impression of going beyond the boundary of the CWC feature (Fig. 16: a). This is probably a result of leaving the skeleton on a raised island during the exploration and over-deepening the surrounding strata. This method of exploration was sometimes employed during investigations by Żurowski, which is seen in the existing photographic records of other sepulchral features on the *Nad Wawrem* site [Krzak 1970, Fig. 96, 103].

Pottery

The pit yielded 1,334 highly comminuted pottery shards among which the remains of at least 33 vessels could be identified. A large portion was unornamented. Unornamented vessels included two-handled amphorae of which one had vertically perforated handles (Fig. 12: 1–3), beaker-type vessels (Fig. 12: 4–6) and bowls (Fig. 12: 7). Single knobs decorated beaker (Fig. 13: 1) and small goblets (Fig. 13: 2, 3). Mat-like cord impressions were recorded only four times (Fig. 13: 4); on two occasions, they were part of more complex patterns made up of plastic motifs as well (Fig. 13: 5, 6). Group cord impressions, in turn, were found on small rim fragments together with wavy bands (Fig. 13: 7, 8), festoon motifs (Fig. 13: 9, 10) or a combination of stamp impressions (Fig. 13: 11, 12). The last-mentioned ornamentation technique was also used on its own to form more complex compositions (Fig. 13: 14–15). The list of ornamental motifs recorded in the feature is closed by a row of finger imprints found on a large, wide-orifice vessel (Fig. 13: 16).

Flint inventory

The flint inventory of the feature comprises 36 artefacts, including 16 flakes and unretouched scaled pieces (Fig. 14: 1–15) of which two originated with polished axes (Fig. 14: 4–5). Most of the 10 blades are regular blanks with parallel edges, originating with single-platform cores (Fig. 14: 16–18; 15: 1–6). One specimen was retouched in its proximal part (Fig. 14: 16) while the other tools were functional specimens, which is seen in their sickle gloss (Fig. 15: 1–3). Retouched tools are represented by one endscraper (Fig. 15: 7) and two scrapers on a flake (Fig. 15: 8, 9). In addition, discoveries were made of three splintered pieces (Fig. 15: 10–12), a flint hammer (Fig. 15: 13) and a round, flat stone which could have served as a pestle (Fig. 15: 14). All the blades and tools are made of Świeciechów flint, which is represented by 14 specimens in total. One flake is made of striped flint and another – of indeterminate flint (due to overheating/calcination). What makes one wonder is the domination of chocolate flint artefacts (20 items) in the inventory. Perhaps some of the indistinctive materials, such as flakes and scaled pieces, were discovered in a secondary context and in reality, are connected to the CWC feature.

According to the field records, Pit 71 yielded two bone awls. Archival collections, however, hold only a partially preserved blade (Fig. 15: 15). Moreover, in the pit fill, there were large structural daub lumps, animal bones and many mollusc shells.

A ^{14}C AMS determination (Poz-90790 4120 ± 30 BP) was made on a sample from an animal long-bone fragment.

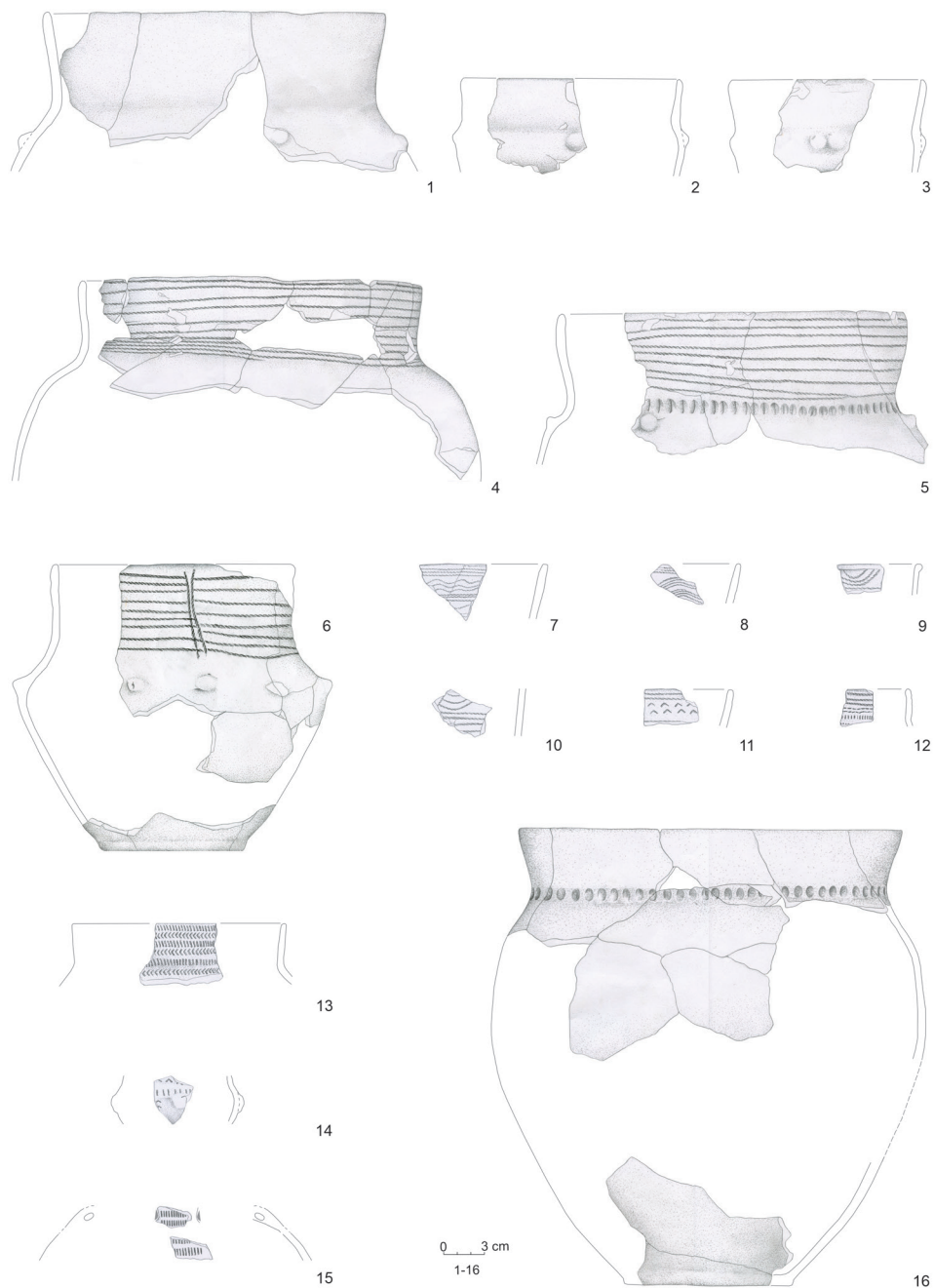


Fig. 13. Złota-Nad Wawrem site, Sandomierz district, Feature 71. Pottery. Drawn by B. Witkowska

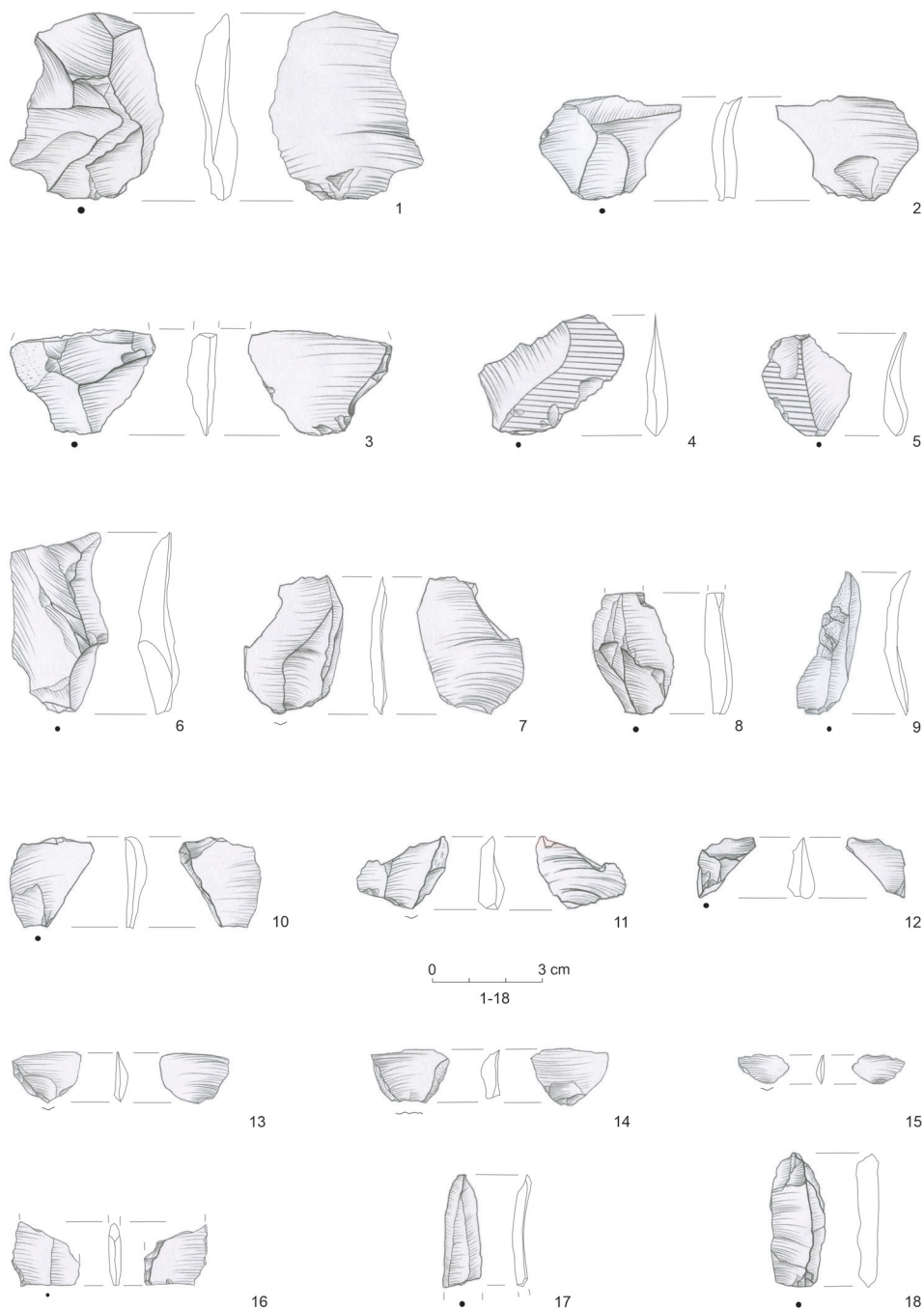


Fig. 14. Złota-Nad Wawrem site, Sandomierz district, Feature 71. Flint artefacts: 1-2, 4-6, 15 – Świeciechów flint; 3 – striped flint; 7-14, 16-18 – chocolate flint. Drawn by B. Witkowska

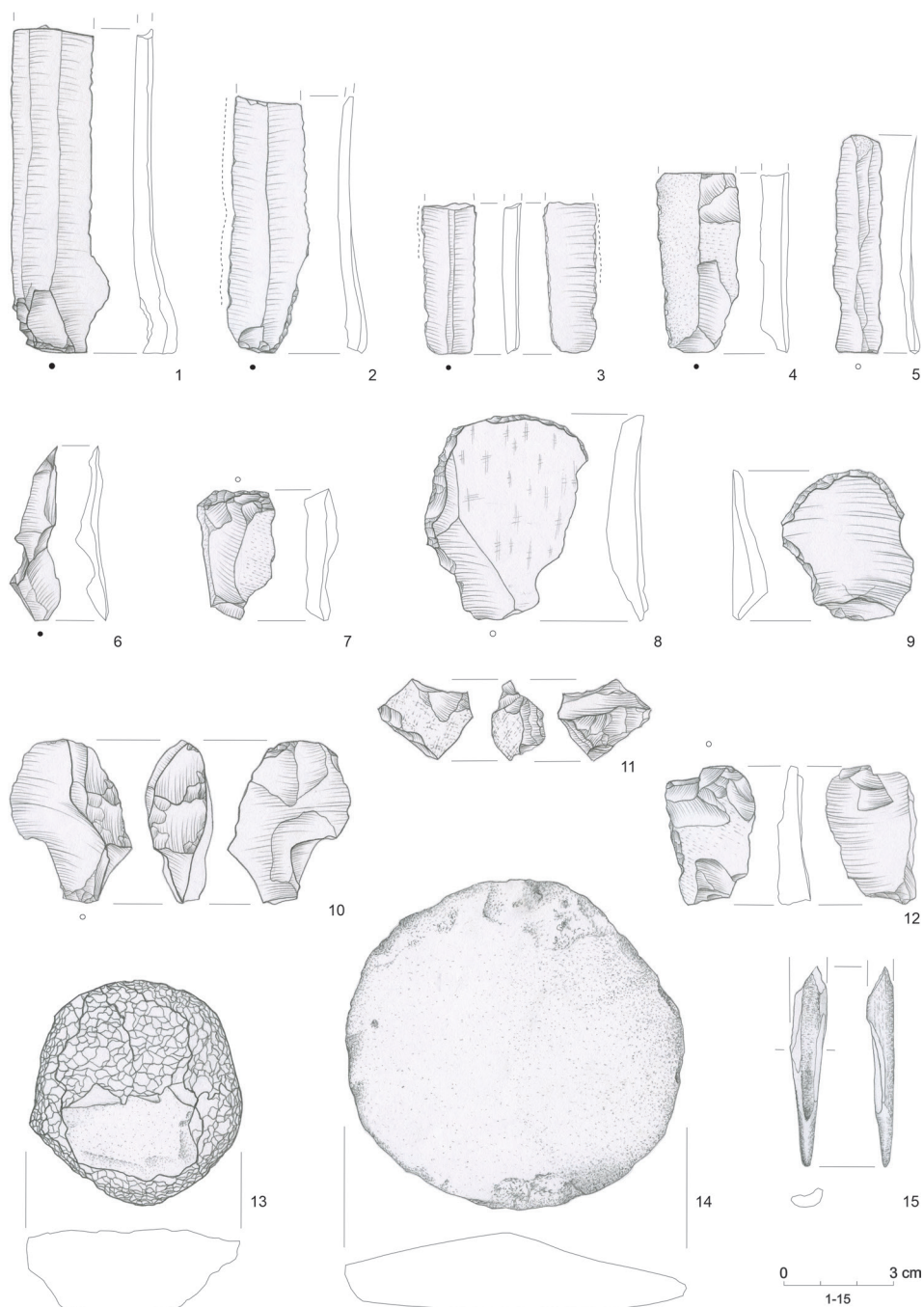


Fig. 15. Złota-Nad Wawrem site, Sandomierz district, Feature 71. Flint, stone and bone artefacts: 1-6, 8-10 – Świeciechów flint; 7, 11, 13 – chocolate flint; 14 – stone; 15 – animal bone. Drawn by B. Witkowska

Feature 74

CWC burial. Relying on its recorded trapezium-shaped profile and the knowledge of CWC funerary rites, it can be presumed that it was a niche grave with an entrance pit on the southeastern side, cutting into Feature 71 (Fig. 16). For this reason, it was not identified during the excavations. Probably, the niche ceiling was exposed at a depth of approx. 70 cm from the ground surface and only then was a decision made to set up a profile, revealing the relationship between Features 71 and 74. In a schematic vertical cross-section, only 40 cm of the thickness of features was captured, without giving any details of their strata. The niche was oval and measured approx. 160×110 cm. On its bottom (depth: 90 cm), a flexed skeleton was discovered, lying supine with its head and lower limbs turned to the right side (Fig. 16: a). Its right upper limb was bent at the elbow and extended towards the knees. The left arm was bent at the elbow, with the palm reaching towards the face. The burial was oriented SW-NE, with the head pointing SW and the face turned

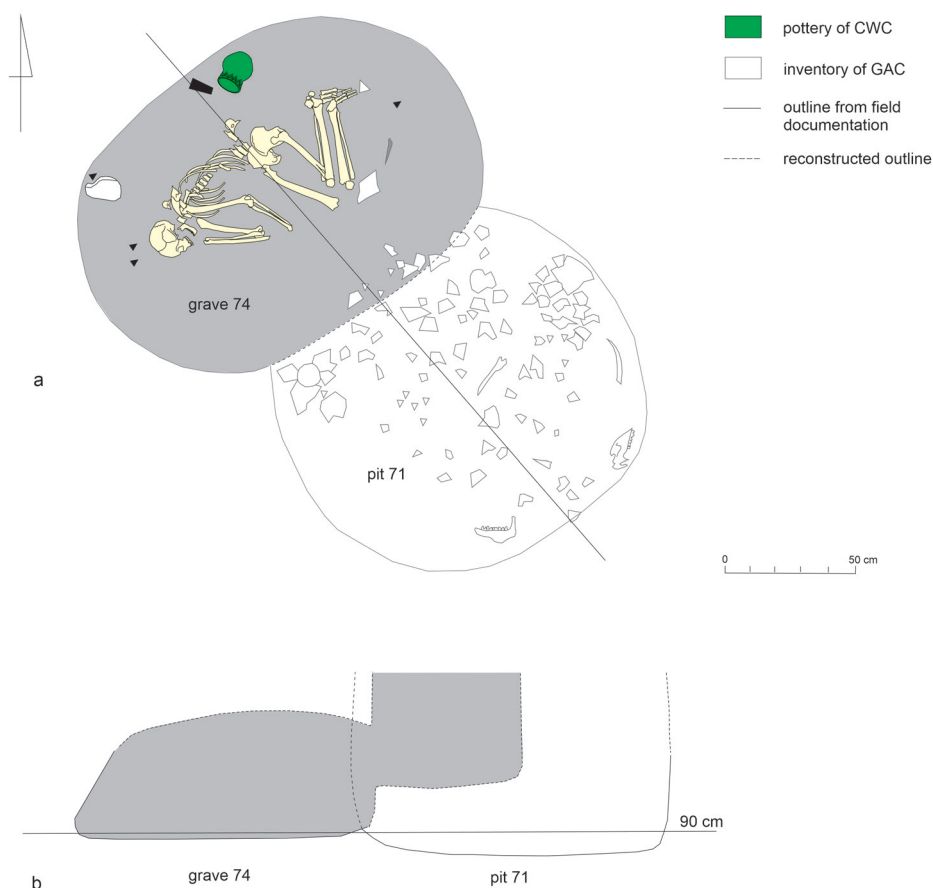


Fig. 16. Złota-Nad Wawrem site, Sandomierz district, Grave 74. Plan and cross-section based on field documentary from archives of State Archeological Museum in Warsaw. Prep. by B. Witkowska)

SE. Its furnishings included a beaker with a corded ornament (Fig. 17: 1), rim of other vessel (Fig. 17: 2), Świeciechów flint axe (Fig. 17: 6), chocolate flint blade tool (Fig. 17: 5), chocolate flint arrowhead (Fig. 17: 3) and a bone awl (Fig. 17: 4). Furthermore, the feature yielded an unornamented pottery shard and a shard bearing a wavy corded ornament, coming from a vessel found in Feature 71 (Fig. 13: 7).

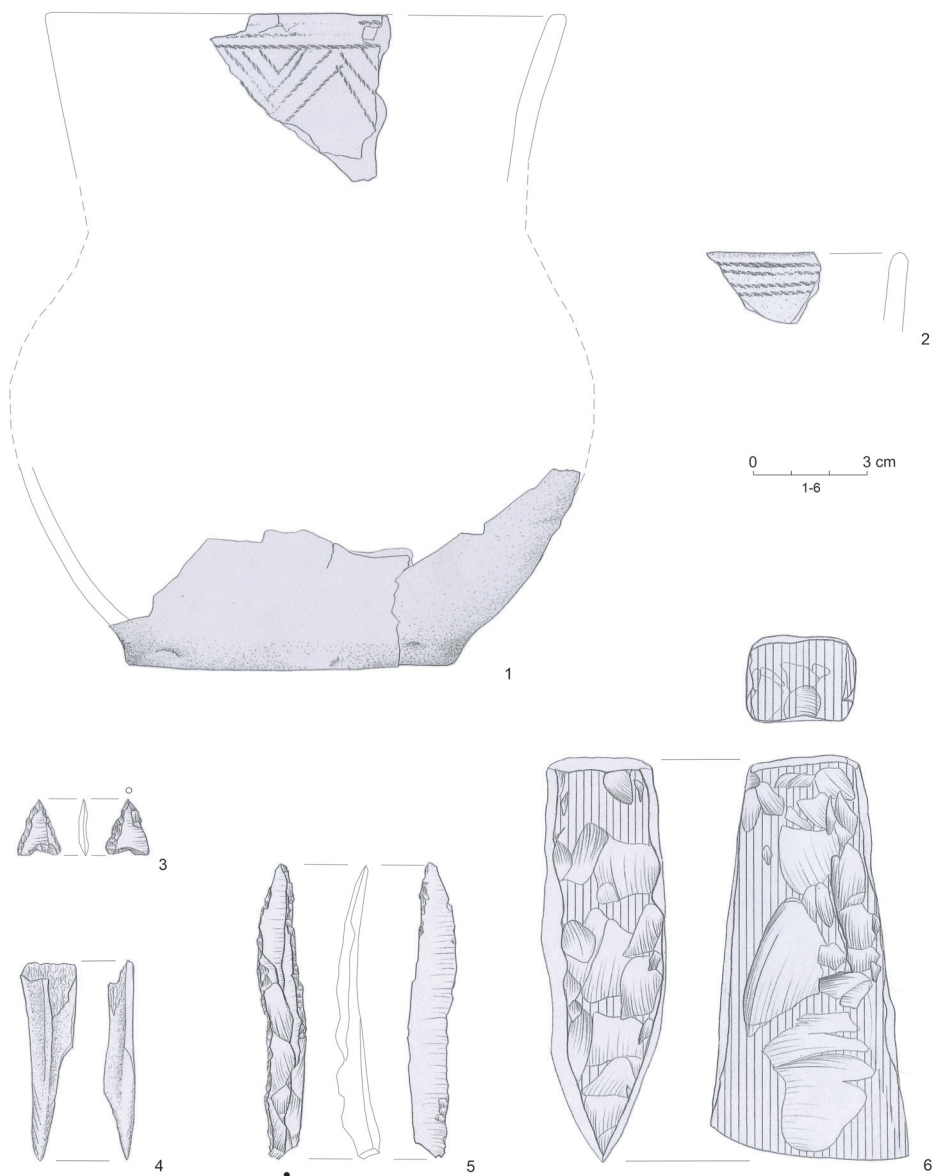


Fig. 17. Złota-Nad Wawrem site, Sandomierz district, Grave 74. Grave goods: 1, 2 pottery; 3, 5 – chocolate flint; 4 – animal bone; 6 – Świeciechów flint. Drawn by B. Witkowska

A ^{14}C AMS dating (Poz-90791 3155 ± 30 BP) was made on a sample from the human forearm bone of the burial. Apparently, for unknown reasons, the obtained result obviously does not correspond to the actual age of the CWC burial. The simplest explanation of the situation is that the museum holding was mislabelled.

STRATIGRAPHIC SEQUENCE II: TWO FEATURES JOINTLY DESIGNATED AS FEATURE 90

Feature 90 was unearthed immediately west of Pit 71 and Grave 74 (Fig. 2).

Feature 90

GAC settlement pit cut into by a CWC grave designated by the same number. It is hard to definitely determine its shape and dimensions since all that is available on the feature is a drawing showing the pit level at a depth of 75 cm (Fig. 18: a). At this level, a compact concentration of GAC artefacts stretched NW-SE, immediately adjacent to the CWC grave. Boundaries between the fills of the older pit and the younger grave were not captured in the drawing. GAC artefacts, identified by their field numbers, in spite of the fact that they occupied a space about 160 cm long and less than 100 cm wide, were encircled with a line marking a greater range. Perhaps, the line marked the boundary of the exploration dig.

Pottery

The concentration was found to contain 612 pottery shards, originating with about 16 GAC vessels, including a two-handled amphora decorated with cord impressions (Fig. 18: 1), unornamented vase with vertically perforated handles (Fig. 18: 2), beaker (Fig. 18: 3), and at least three richly ornamented bowls (Fig. 18: 8–10). The pottery was highly comminuted: almost 400 shards were below 2 cm in size. They did not permit vessel form identification because they were mostly unornamented body shards. Among its, three rim fragments with a corded ornament (Fig. 18: 5–7) and a single vessel base was recorded with appliqué knobs on its circumference (Fig. 18: 11).

Flint inventory

Among the artefacts making up the GAC material concentration, only one flint tool was found. It was a massive endscraper with a high front made on a striped-flint flake (Fig. 17: 12). Additionally, a record was made of a single pebble with traces of use, shells and fine animal bones.

A ^{14}C AMS determination (Poz-90793 4135 ± 35 BP) was made on a sample from a long-bone fragment of a small ruminant.

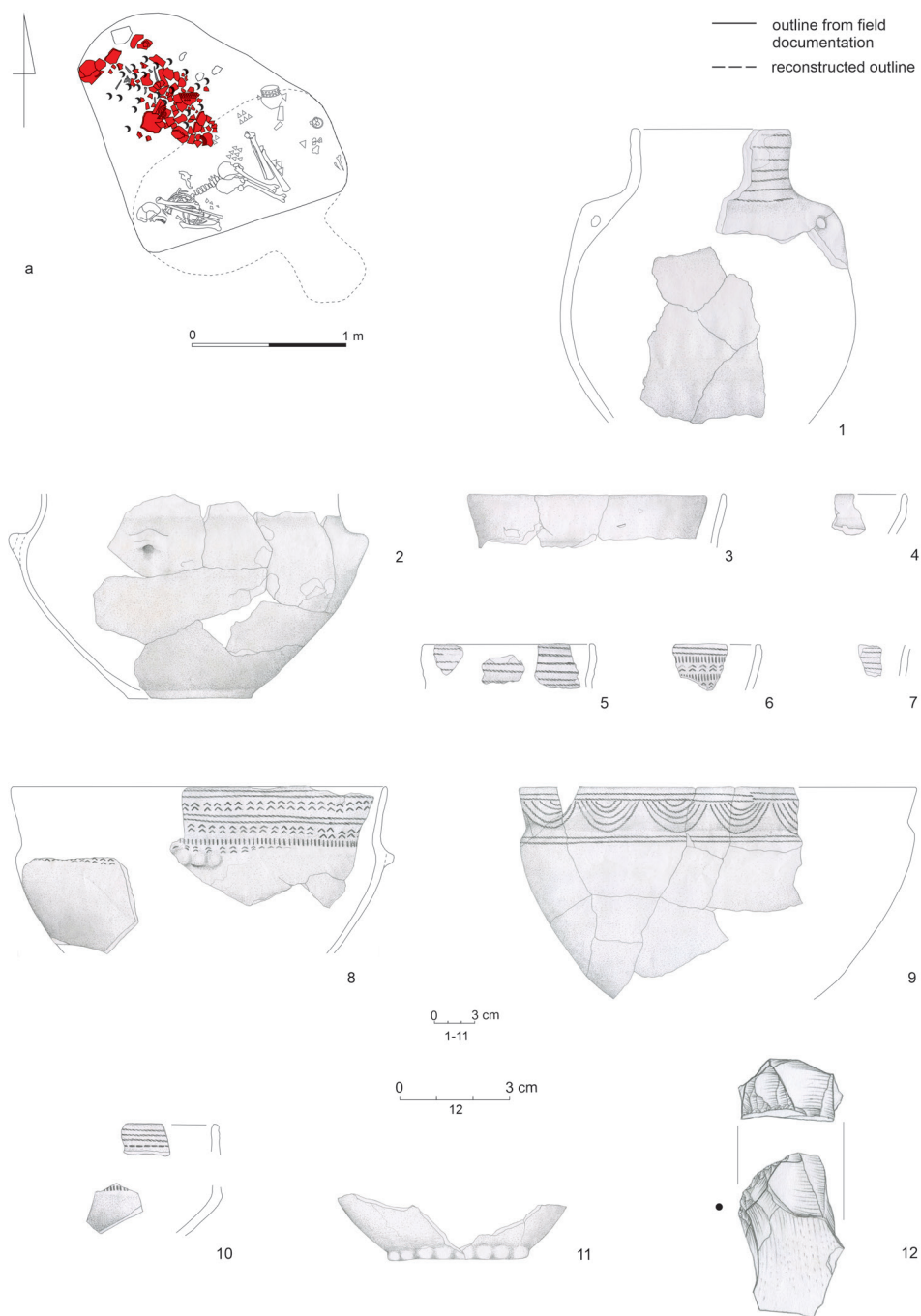


Fig. 18. Złota-Nad Wawrem site, Sandomierz district, Pit 90: a – plan based on field documentary, partially reconstructed; 1-11 – pottery; 12 – striped flint. Drawn by B. Witkowska

Grave 90

The niche of this human grave cut into the southern portion of the GAC pit (Fig. 19). Its outline was not properly recorded. Nor was an entrance pit marked. Judging by the arrangement of the skeleton, it was located on the S or SE side of the niche. On the grave bottom (75 cm), a burial of an adult lay crouched on its right side, oriented W-E, with the head pointing W and facing S. The right upper limb was bent at the elbow, with the hand reaching towards the face. The arrangement of the left upper limb could not be determined due to a slight shifting of the humerus and a lack of forearm bones. It may have been bent at the elbow – as in the case of the corpse in Grave 74. Most grave goods were placed at the lower limb bones: two vessels (only one beaker has been preserved, Fig. 20: 1), 16 arrowheads (only five chocolate flint points and two Świeciechów flint ones have been preserved, Fig. 20: 2–8), eight flint flakes (Fig. 20: 10–14) including two made of Świeciechów flint, three – of chocolate flint, one – of Cretaceous flint, and one – of Turonian flint, a chocolate flint flake fragment (Fig. 20: 15), cortical blade (Fig. 20: 16), flake tool (Fig. 20: 17), two rectangular axes made of Świeciechów flint (Fig. 20: 19) and another variety of Lower Turonian flint (Fig. 20: 18), two bone beads (Fig. 20: 20, 21) and one made of an animal tooth (Fig. 20: 22), and an animal tooth (Fig. 20: 23) and a chisel made from a cattle radius (Fig. 20: 24). The abundance and kind of grave goods suggest that it was a burial of an adult man.

A ^{14}C AMS dating (Poz-90758 3890 ± 35 BP) was made on a sample from a human skull fragment. The skull was the only part of the burial that could be recovered from archival collections.

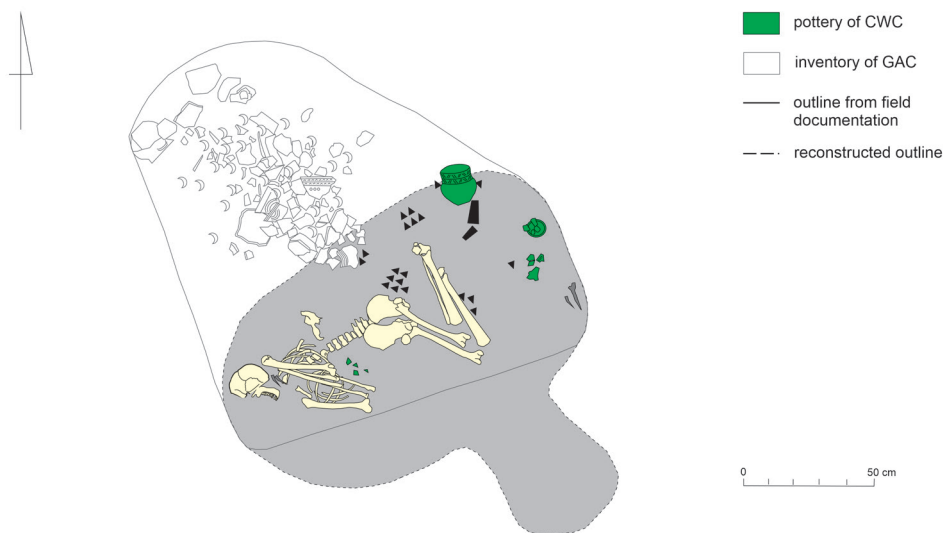


Fig. 19. Złota-Nad Wawrem site, Sandomierz district, Grave 90. Plan based on field documentary from archives of State Archeological Museum in Warsaw - partially reconstructed. Drawn by B. Witkowska

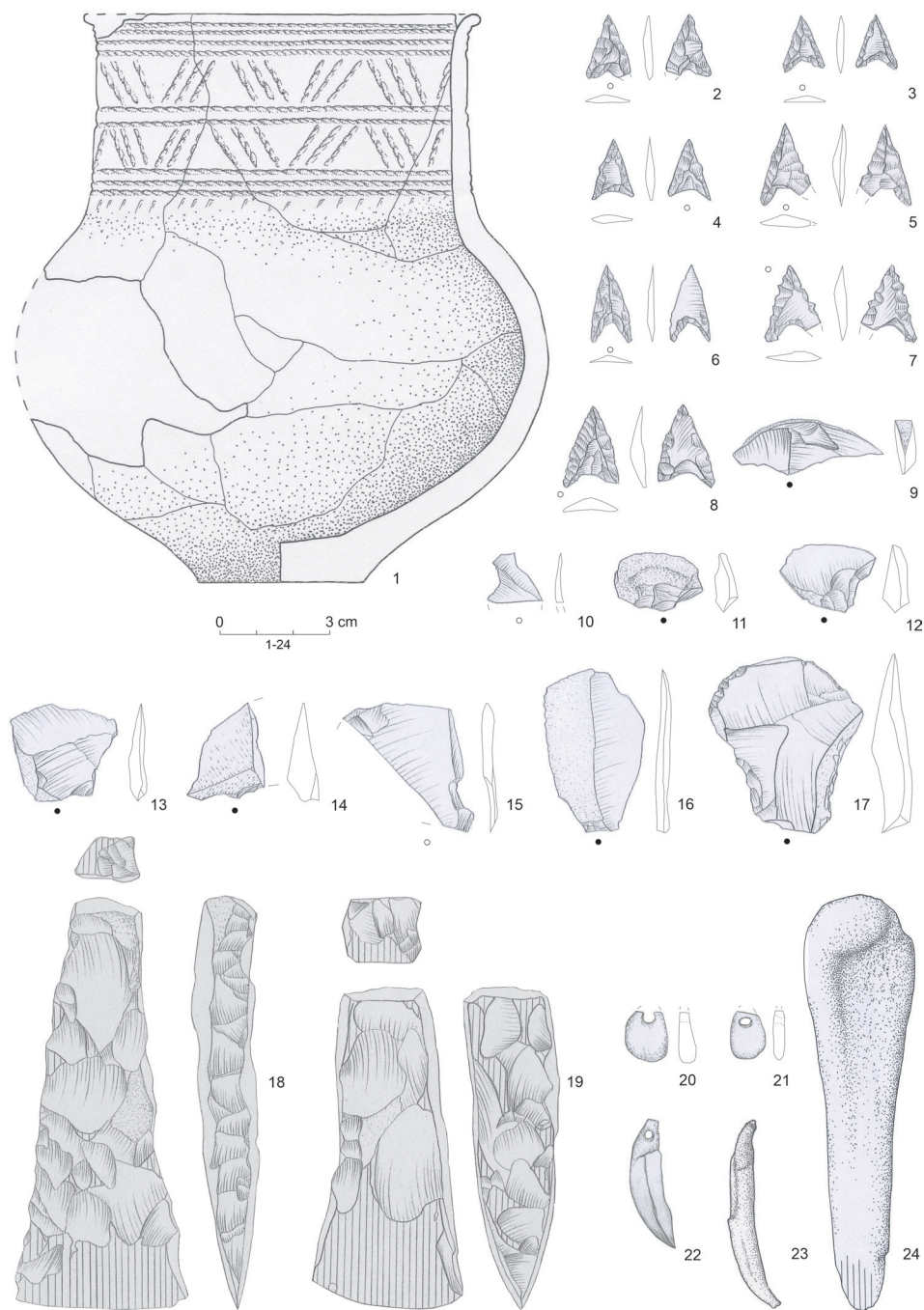


Fig. 20. Złota-Nad Wawrem site, Sandomierz district, Grave 90. Grave goods: 1 – vessel; 2–19 – flint artefacts (2, 4, 6–11, 15 – chocolate flint; 3, 5, 13, 16, 17, 19 – Świeciechów flint; 12 – Cretaceous flint; 14, 18 – Turonian flint); 20, 21, 24 – animal bone; 22–23 – animal teeth. 1, 23, 24 – after archives of State Archeological Museum in Warsaw; 2–21 – drawn by B. Witkowska

DISCUSSION OF RADIOCARBON DATING RESULTS

Altogether, for the features discussed above, six radiocarbon dates have been obtained (Table 1). However, in two cases, for unknown reasons, the results do not correspond to the typological classification of the dated materials. For the bones of the burial from CWC Grave 74, a ^{14}C date has been obtained that relates to the Bronze Age, Period II (corresponding to determinations for Trzciniec culture finds). In turn, for GAC Pit 184, the result of absolute dating points to the late phase of the Early Bronze Age (or the early stage of the Mierzanowice culture). Both results have been considered false and excluded from further analysis. The other determinations concern three GAC settlement features and niche Grave 90 linked to the CWC Kraków-Sandomierz group (Fig. 21).

T a b l e 1.

Radiocarbon datings of features presenting Globular Amphora – Corded Ware relationship from site 3 – “Nad Wawrem” at Złota, Sandomierz district. Calibration in OxCal v4.4.4 [Bronk Ramsey 2021]

Feature no.	Culture	Dated material	Laboratory no.	Age 14C BP	Calendar age BC (68,2%)*
49	GAC	animal bone	Poz-90789	4155±35	2871-2671
71	GAC	animal bone	Poz-90790	4120±30	2854-2623
74	CWC	human bone	Poz-90791	3155±30	1494-1406
90	GAC	animal bone	Poz-90793	4135±35	2862-2630
90	CWC	human bone	Poz-90758	3890±35	2458-2310
184	GAC	animal bone	Poz-90892	3545±35	1941-1779

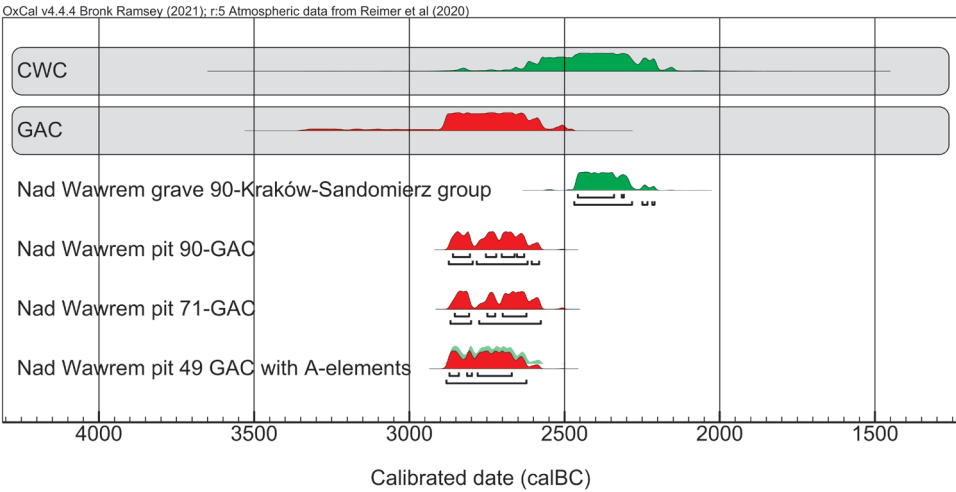


Fig. 21. Złota-Nad Wawrem site, Sandomierz district. Calibration of radiocarbon dates of features presenting relationships of the Globular Amphora and Corded Ware cultures. Summary dates calculated including all Corded Ware dates from Sandomierz Upland [after Włodarczak 2019] and all Globular Amphora dates obtained in project the reported project. Calibration in OxCal v4.4.4 [Bronk Ramsey 2021]

For all three credibly dated GAC features,² very similar results were obtained, indicating the chronological bracket of *c.* 2870–2620 BC. These results are compatible with other radiocarbon determinations for GAC sites on the Sandomierz Upland, including the cemeteries in *Złota-Gajowizna* site [Witkowska *et al.* 2020], *Malice* [Witkowska *et al.* 2021, Table 2], *Sadowie* [Pasterkiewicz 2020] and settlements in *Mierzanowice* and *Gańkowice-Ocinek* [Florek, Witkowska 2021]. Moreover, a similar age is suggested by determinations obtained for the other GAC settlement pits on the *Nad Wawrem* site in *Złota* [Florek, Witkowska 2021].

In turn, the dating of niche Grave 90 to 2458–2310 BC (probability of 68.2%) corresponds to the age of the Kraków-Sandomierz group. This determination is well in line with an already long list of ¹⁴C AMS dates for features from the CWC younger phase in southeastern Poland [recently: Włodarczak 2018].

THE QUESTION OF THE RELATIONSHIP BETWEEN THE GAC AND CWC A-HORIZON

The complex of Late and Final Eneolithic sites in *Złota* supplies rich and crucial data for the study of genetic and chronological relationships between the GAC, CWC and ZC. The occurrence of GAC and A-Horizon artefacts in the same inventories entails a number of research questions concerning relationships between the two cultural phenomena and the place of the GAC in the development scheme of the Małopolska Late and Final Eneolithic. Until recently, the relevant literature has highlighted above all the relationship between the oldest phase of the CWC and the ZC. This preoccupation is quite obvious, considering the facts that Type A artefacts are common in ZC graves and both cultural phenomena are similarly dated, which is borne out by radiocarbon determinations [for the latest list *see* Włodarczak 2019, Fig. 7]. The GAC was referred to in the literature chiefly in the context of ZC origins.

In the course of many years of study of the ZC, Zygmunt Krzak drew attention above all to its syncretism, emphasising the synchronism of the traits of the Funnel Beaker culture, Baden culture, GAC, CWC and even the Bell Beaker culture [summary: Krzak 1976: 195–223], without making chronological divisions for corded elements, occurring in ZC assemblages. What he did stress, however, was the simultaneous appearance of CWC and GAC influence in such assemblages [Krzak 1976, Fig. 6].

Józef Ścibior in his brief reconstruction underscored the importance of the badenization of the GAC, proposing to distinguish a pre-Corded stage in the rise

² The Table gives only the results for GAC features particularly significant for studying the chronological relationship to the CWC. A complete list of radiocarbon dates for GAC features from the *Nad Wawrem* site is to be found in another article in this volume [Florek, Witkowska 2021].

of the ZC from the substratum of ‘amphora’ populations [Ścibior 1991]. Janusz Kruk and Sarunas Milisauskas slightly modified these proposals by pointing to the crucial role of contact between Małopolska GAC communities and Beaker-Baden groups [Kruk, Milisauskas 1999: 208–213]. Both conceptions assumed that the GAC appeared on the Sandomierz Upland slightly earlier, before the rise of the ZC. A similar view was held by Piotr Włodarczak when studying the CWC [Włodarczak 2006, Fig. 55]. As a decisive factor in the origins of the ZC, however, he considered the Northern Pontic contacts between Małopolska GAC communities and those of the older phase of the CWC [Włodarczak 2008].

The conceptions cited above could be verified thanks to the procurement of a series of high-precision (AMS) radiocarbon age determinations for GAC, CWC and ZC material from Małopolska. The most valuable among them were those made on samples of bones from burials. Furthermore, in recent years, a possibility has appeared to verify genetic conceptions, owing to the study of fossil DNA. Its potential is shown by the first results obtained for materials from Małopolska, including above all ones from a collective grave in Koszyce [Schroeder *et al.* 2019] and the burials of the CWC Kraków-Sandomierz group. Unfortunately, the research potential offered by the DNA studies of ZC cemeteries still has not been used. It would settle controversial issues, regarding the nature of cultural changes in Małopolska in the 3rd millennium BC. This is why, yet another attempt made below to fine-tune chronometric data concerns a question that should be further studied, employing specialist methods in the nearest future.

Interestingly enough, in ZC graves, identifications were made of a whole gamut of traits marking the oldest CWC horizon, including all index forms: Type A (or Thuringian) amphorae [Buchvaldek 1986], Type A beakers, early types of battle-axes (including Type A) and pots with a short-wavy moulding strip (Ger. *Wellenleistentöpfe*). Therefore, a simple and obvious conclusion is that ZC graves (or at least some of them) should be dated similarly to CWC Phase I. This conclusion is borne out by radiocarbon dating results. However, the dating of the Małopolska GAC complicates the matter: most absolute age determinations obtained so far give the same age as in the case of the ZC and CWC older phase [for a list see Witkowska 2021, Table 2; Florek, Witkowska 2021, Table 2]. In this context, it was important to identify a group of GAC pottery inventories, comprising artefacts with CWC traits, too.

The absolute age determinations of the CWC oldest phase in Małopolska are few [latest updating: Włodarczak 2018]. To make matters worse, none are available for the Sandomierz Upland. This deficiency follows from a failure to explore a Final Eneolithic barrow there. From the vicinity of Sandomierz, not a single grave is known either that would be linked with certainty to CWC Phase I. All we have is two old-CWC beakers, coming from a destroyed grave, discovered close to Site 1 in Samborzec [Machnik 1966: 234]. It could have been a CWC feature, but it cannot be ruled out that it was a ZC feature that was destroyed. In the ZC, similar artefacts are recorded as well. Furthermore, CWC older phase pottery as well as

stone battle-axes were recorded in cemeteries on Sites 1–3 (*Grodzisko I*, *Grodzisko II* and *Nad Wawrem*, respectively) in Złota [Machnik 1966; Krzak 1976]. On these grounds, the horizon of CWC barrows (Phase I, possibly Phase II as well) was synchronised with the age of ZC cemeteries [Włodarczak 2006; 2008].

The oldest radiocarbon determinations for a CWC grave were procured for two barrows located in the Carpathian region: in Średnia [Machnik, Sosnowska 1996] and Bierówka [Gancarski, Machnikowie 1986; 1990]. Two datings from the barrow in Średnia (Gd-10402 4390 ± 100 BP and Gd-10397 4290 ± 90 BP) point to *c.* 2900–2800 BC. A relatively early datings are also shared by Barrows A and B from Bierówka (Gd-1877 4240 ± 40 BP; Gd-2759 4120 ± 80 BP) [for interpretation *see* Włodarczak 2018: 191, Fig. 7]. However, all these oldest determinations come from uncertain contexts and are characterised by large standard errors. Most other determinations for Final Eneolithic barrow graves set their absolute age at *c.* 2850–2600 BC. From the entire Małopolska, only few determinations have been obtained so far for burials exhibiting traits of the oldest CWC horizon, with only one – for Grave 1, Gabułów (Poz-9451 4115 ± 30 BP) [Jarosz, Włodarczak 2007: 72, 73] – having good quality and an appropriate sample collection context.

Difficulties in fine-tuning data and marking more precise sequences follow from the nature of the calibration curve – it forms a plateau for a considerable portion of the 3000–2500 BC section [Włodarczak 2007; 2009; 2018]. Hence, a good quality result for the Gabułów grave (4115 ± 30 BP) indicates a relatively long age bracket of 2850–2585 BC (68.2%). Importantly, this bracket covers also most dates obtained for ZC graves [recently: Włodarczak 2019, Table 4] and GAC graves on the Sandomierz Upland [Witkowska 2021, Table 2]. An analogous ^{14}C date has been obtained for GAC Feature 49, *Nad Wawrem* in Złota, in which artefacts exhibiting traits of the CWC older phase have been discovered (2871–2671 BC).

Bearing in mind that the beginning of CWC Phase I in the overall – central European perspective – may be set at *c.* 2800 BC at the latest, we must presuppose the contemporaneity of Final Eneolithic barrows and most GAC features for which absolute age determinations are available. Harder to interpret, however, the chronological sequence on the *Nad Wawrem* site in Złota is marked by CWC elements, supporting a late dating of GAC pits there (after *c.* 2850/2800 BC). In turn, beyond the bounds of possibility however, the fine-tuning of the relationship between GAC settlement pits and nearby ZC graves also containing CWC older phase elements, may be expected to render an age that would be the same or only slightly younger. For ZC burials from the *Nad Wawrem* site, two determinations were obtained earlier – for Graves 4 and 10 (GrN-9144 4180 ± 35 BP; GrN-9145 4195 ± 35 BP) [Krzak 1989]. Not allowing for any stylistic retardations, it would have to be assumed therefore that Złota graves holding Type A artefacts are dated not later than from *c.* 2850–2700 BC.

A similar dating is correct in the case of the relics of the GAC settlement on the Złota-*Nad Wawrem* site as well as probably the other GAC sites on the Sandomierz

Upland. GAC materials found in the pits under discussion are quite stylistically cohesive albeit certain differences between them are noticeable, e.g. a high share of unornamented vessels in Feature 71 or a low frequency of mat-like cord impressions in Feature 184. It does not seem, however, that these differences are chronologically significant. The study of pottery as the most sensitive marker of typological changes in the GAC makes one conclude that the pits are of a similar age. The fact that they hold the same vessel forms or pottery with identical ornamental motifs such as vertical plastic strips or cord impressions cutting across a mat-like corded ornament, corded festoons, inlays, fine round stamp impressions and cord impression imitations, convincingly argues for their synchronism. At the same time, all these traits classify them as GAC sources, owing to a lack of any analogies in ZC graves.³ These materials may be viewed in a broader context and – similarly to other GAC sites on the Sandomierz Upland – dated with the greatest certainty to Subphase IIIa [Witkowska *et al.* 2020; Florek, Witkowska 2021; Witkowska 2021].

It must be stressed in this context that making a sharp distinction between ZC artefacts and GAC materials is not always possible or even justified. This is so largely because of ZC peculiarity. However, equally important are newly obtained chronometric data. In their light, it seems impossible to build the sequential models of cultural changes taking place on the Sandomierz Upland in the first half of the 3rd millennium BC and distinguish a pre-CWC phase in the GAC settlement episode in Małopolska. A series of radiocarbon dates argues therefore clearly in favour of the synchronism of the GAC, ZC and the oldest CWC elements (Fig. 22).

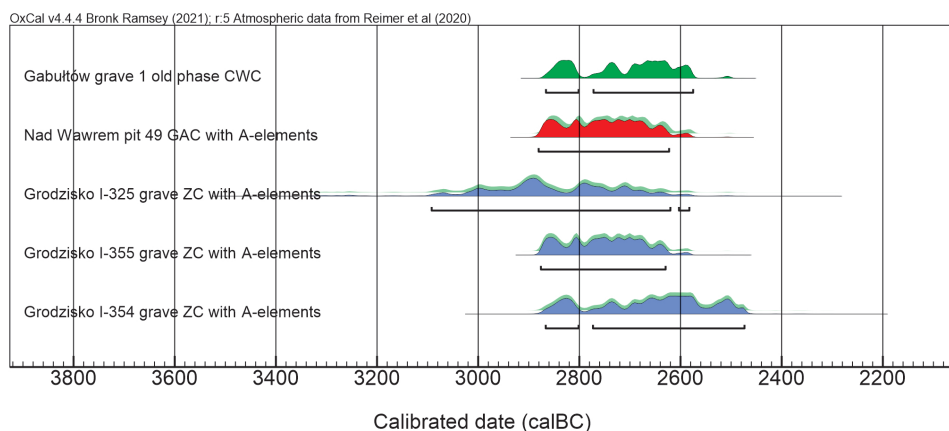


Fig. 22. Calibration of radiocarbon dates of related to the Globular Amphora culture (Pit 49 from *Złota-Nad Wawrem* site), *Złota* culture with Corded Ware A-elements (three graves from *Złota-Grodzisko I* site) and the old Corded Ware phase (grave 1 from *Gabułów*). Calibration in OxCal v4.4.4 [Bronk Ramsey 2021]

³ The same conclusions were favoured in his later publications by Krzak, too, who in 1980 corrected the cultural classification of the features under discussion [Krzak 1980: 136].

THE QUESTION OF THE RELATIONSHIP BETWEEN THE GAC AND THE KRAKÓW-SANDOMIERZ GROUP

Matters look different in the case of the relationship between the GAC and the younger development stage of the CWC or the Kraków-Sandomierz group. At present there are no GAC assemblages that could be referred to the second half of the 3rd millennium BC on the Sandomierz Upland. This is true of both radiocarbon dating results and the overall picture produced by the typological study of materials. The stylistic variety of GAC artefacts on the Sandomierz Upland is relatively small, being probably a reflection of the short lifetime of the culture there. What is more, there are no markers of relatively early (4th millennium BC) and late age of such materials (about the middle of the 3rd millennium BC).

The two examples of stratigraphic sequences discussed above show a sequence characteristic of the *Nad Wawrem* site in Złota: older GAC settlement pits with respect to a CWC cemetery made up above all of burials in niche graves characteristic of the Kraków-Sandomierz group for which a number of absolute age determinations are available [Włodarczak 2006; 2013; Jarosz, Włodarczak 2007]. Few of these ¹⁴C determinations, however, relate to cemeteries on the Sandomierz Upland [Włodarczak 2019: 191, Table 3]. The most significant in this context, age determinations for cemeteries located on the so-called ‘Vistula scarp’ – in Żuków and on the neighbouring *Grodzisko II* site in Złota (*see below*) – suggest a late chronology for niche graves on these sites, falling on the very end of the Final Eneolithic.

The recorded shape of features, corpse arrangement and the scatter pattern of grave goods show that Grave 90 had a niche structure. It was found to hold a burial of an adult (probably a male) arranged characteristically of the CWC Kraków-Sandomierz group. The body orientation was less typical though because the arrangement along the W-E axis with the head pointing W, while encountered in many CWC regions, is rare on Małopolska sites [Włodarczak 2006: 63, Fig. 35]. The grave goods included several elements, chronometrically significant and distinctive for the local CWC group: a large beaker (the second vessel had not been preserved; in all likelihood it was a smaller beaker) and a rich set of points (16 items) and two flint axes. In addition, the male sex of the burial was confirmed by the presence of a bone chisel and a cache of flint flakes. To sum up, the grave goods of Grave 90 consisted of two vessels, a large set of flint points, two axes, tool equipment items (retouched flake, chisel and possibly an animal-tooth fabricator) and a set of flakes (to make points?). What strikes the eye is the absence of a stone battle-axe – frequently encountered in Małopolska CWC male graves. In terms of quality, the inventory has good counterparts in other CWC inventories on the Sandomierz Upland, above all from Graves 76 and 93 on *Grodzisko II* in Złota [Krzak 1958], Grave 1(2) in Żuków [Marciniak 1961],

Grave 29 in Kichary Nowe [Kowalewska-Marszałek 2000]. Outside the Sandomierz vicinity, only one similar inventory is known: from Grave 128, Żerniki Górne, which yielded, however, only three flint points [Kempisty, Włodarczak 2000: 76–81]. Meanwhile, a clear exception is the absence of a regular knife-blade from Grave 90, Złota, which is a standard furnishing of male graves on the Małopolska Upland. The inventory of this last-mentioned grave can hardly be considered complete.

The beaker from Grave 90 is a large two-segment form (Variety PVBb-7) ornamented on the entire neck height. Its ornamentation pattern of successively repeated elaborate motifs was given as an example of the reminiscence of GAC patterns on CWC pottery [Włodarczak 2006: 99], while its component elements (motifs of horizontal and chevron cord impressions, a row of incisions) are characteristic of Kraków-Sandomierz group vessels. The chevron impressions can be found also on other beakers from CWC cemeteries in Złota: from Features 246, 326 and 396 on the *Nad Wawrem* site and Feature 93 on the *Grodzisko II* site [Machnik 1966, Pl. XV: 3a, XVI: 1b, 2b].⁴ While relatively rare in other Sandomierz Upland microregions, this ornamental motif was often recorded on beakers and slender amphorae from western Małopolska.

The set of two axes is made up of GS (thick-medium) and PS (flat-medium) types [Budziszewski, Włodarczak 2011]. Hence, this is a classic core tool pair from the Małopolska Upland [Włodarczak 2006: 27], associated above all with burials dated to Subphase IIIB of the CWC. Analogous sets come, for instance, from Grave 1(2), Żuków [Marciniak 1961, Pl. IV: 5, 6] and Grave 93, *Grodzisko II* site, Złota [Krzak 1958: 379, Fig. 32: b, e].

Of the set of 16 points, only seven have been preserved. They differ in terms of typology and dimensions but have a trait in common: a deep notch. Points made of chocolate flint dominate – which is a rule in inventories linked to CWC Subphase IIIB. Only in the inventory from Grave 15, Wilczyce, is raw material noticeably more varied [Boroń 2019: 67–78]. The inventory from Grave 90, Złota, includes a point of slim proportions – as in the assemblage from Grave 76, *Grodzisko II*, Złota [Krzak 1958: 370, Fig. 28: c]. Such forms are characteristic of Early Bronze inventories. In terms of number, the point set from Grave 90 is a rich one, although more numerous inventories are occasionally seen on the Sandomierz Upland, for instance from Grave 1(2), Żuków (21 items) [Marciniak 1961] or Grave 2, Mydlów (27 items) [Bargiel 2009]. The special character of Grave 90 furnishings in Złota is

⁴ CWC materials from cemeteries in Złota have not been fully processed yet. Two features (76 and 93) from Site 2 (= *Grodzisko II*) have been published [Krzak 1958] while from Site 3 (= *Nad Wawrem*) only those CWC features have been presented that remained in stratigraphic relationships with ZC graves [Krzak 1970]. Some additional information on other unpublished features and drawings of selected ceramic artefacts have been presented by Jan Machnik [1966]. Materials from unprocessed Features 90 and 246 from Site 3 (*Nad Wawrem*) have been used in a study by Piotr Włodarczak [2006].

consistent with the tendency, observed throughout the region, of stressing archer's tackle in the funerary rite of the CWC younger phase.

It is quite clear, therefore, that Grave 90 goods, *Nad Wawrem* site, fit in well with the local peculiarities of Subphase IIIB of the CWC on the Sandomierz Upland and have many good analogies in the immediate vicinity, that is, on the so-called 'Vistula scarp' close to Sandomierz. The obtained dating corresponds closely to determinations for graves from this microregion, that is, for features 1(2) and 3(4), Żuków (Poz-9583 3885 ± 35 BP; Poz-9579 3835 ± 35 BP) [Jarosz, Włodarczak 2007: 77, 78] and Grave 76, Site 2 (*Grodzisko II*), Złota (GrN-9146 3825 ± 35 BP) [Machnik, Ścibior 1991: 50]. All these determinations, however, are slightly younger than a ^{14}C date for Grave 15, Site 10, Wilczyce (Poz-59139: 4030 ± 35 BP; Poz-4055 ± 30 BP) [Włodarczak 2019]. Importantly, the date refers to a rich inventory linked to CWC Phase II/IIIA, i.e. in terms of typology also older than Kraków-Sandomierz grave assemblages from the *Nad Wawrem* and *Grodzisko II* sites in Złota. The ^{14}C dating of Grave 90, Złota, points to – as do the determinations for the Żuków burials – the middle or late stage of Subphase IIIB, i.e. the late stage of the Kraków-Sandomierz group, chronologically close to the horizon of the Małopolska Bell Beaker culture and the oldest assemblages of the Mierzanowice culture. In general terms, this is the period of 2450–2300 BC.

Grave 74, for which a false result of absolute dating was obtained, was located close to Grave 90. Usually, niche graves, forming small compact concentrations, are of a similar age. Presumably, this was the case here. If so, Grave 74 was connected to the late phase of the Kraków-Sandomierz group, which is also supported by the traits of grave goods found in it.

Judging by the artefact style and funerary rite, it can be claimed that also the other CWC grave features on the *Złota-Nad Wawrem* site date to Subphase IIIB of the CWC, most likely to its younger stage [above all: Krzak 1970; Machnik 1966; Włodarczak 2006].

So late a chronology of the CWC assemblages obviously rules out their synchronism with the GAC settlement on the *Nad Wawrem* site, which is borne out by stratigraphic observations. This conclusion, however, does not apply to the entire lifetime of the Kraków-Sandomierz group that could partially overlap with the decline phase of the GAC on the Sandomierz Upland. This is particularly true for early-dated Kraków-Sandomierz assemblages as per Grave 15 type, Wilczyce [Włodarczak 2019]. Furthermore, the role of the GAC and ZC must be stressed in the origins of the local CWC group (Phase II) on the Małopolska Upland. The role was already noticed in the relevant literature [Włodarczak 2006: 91–99]. Jan Machnik, too, stressed the chronological sequence of the ZC → CWC Kraków-Sandomierz group [Machnik 1966: 119–121], assuming that the two groups were partially synchronous [Machnik 1966: 178; 1979: 392].

CONCLUSIONS

The cultural landscape on the Małopolska Upland in the Late and Final Eneolithic, in the light of the latest radiocarbon age determinations, appears rather complex owing to the co-occurrence of material phenomena that are usually assigned to separate cultural units. On the *Nad Wawrem* site in Złota taxon boundaries have become obliterated, complicating the construction of traditional taxonomic-chronological models. The appearance of old-CWC artefacts in GAC and ZC assemblages means that A-horizon traits cannot be assigned to a specific taxonomic unit on the Sandomierz Upland. They represent a set of exogenous traits that, being a harbinger of changes leading to the rise of corded groups, may also occur in various contexts.

It cannot be ruled out that in the initial phase of the Final Eneolithic on the Sandomierz Upland, A-Horizon traits were found primarily not in the context of the CWC, but the GAC and ZC. This claim seems to be borne out by radiocarbon dating results for GAC and ZC assemblages from the sites in Złota and throughout the region. Their vast majority point to a chronology of *c.* 2800–2600 BC.

Most Kraków-Sandomierz group assemblages, including those from the Złota-*Nad Wawrem* cemetery, are clearly younger, dating to 2500–2300 BC, than GAC and ZC finds. Hence, it continues to be difficult to document the impact of the Złota-GAC factor when studying the origins of the groups of the Final Eneolithic younger phase, including Subphase IIIB of the CWC Kraków-Sandomierz group.

REFERENCES

Antoniewicz W.

- 1925 Eneolityczne groby szkieletowe we wsi Złota w pow. Sandomierskim. *Wiadomości Archeologiczne* 9: 191–245.

Bargieł B.

- 2009 Z problematyki występowania grocików krzemiennych na przykładzie znaleziska z Mydłowa, pow. opatowski, woj. świętokrzyskie. In: H. Taras, A. Zakościelna (Eds) *Hereditas praeteriti. Additamenta archaeologica et historica dedicata Ioanni Gruba octogesimo anno nascendi*, 195–208. Lublin.

Bąbel J.

- 1979 Groby neolityczne ze st. I w Mierzanowicach, woj. tarnobrzskie. *Wiadomości Archeologiczne* 44: 67–86.
- 1992 Wyobrażenie wioski prahistorycznej na zabytku ze Złotej, woj. tarnobrzskie. *Sprawozdania Archeologiczne* 44: 117–128.
- 2013 *Cmentarzyska społeczności kultury mierzanowickiej na Wyżynie Sandomierskiej: Źródła*. Rzeszów.

Boroń T.

- 2019 Wyroby krzemienne. In: P. Włodarczak (Ed.) *Wilczyce, stanowisko 10. Norma i precedens w rytuale pogrzebowym kultury ceramiki sznurowej*. Ocalone Dziedzictwo Archeologiczne 9, 61–88. Kraków – Niepołomice – Pękowice.

Bronk Ramsey C.

- 2021 Oxcal v4.4.4. Oxford (www.rlaha.ox.ac.uk).

Buchvaldek M.

- 1986 Kultura se šňůrovou keramikou ve střední Evropě I. Skupiny mezi Harcem a Bílými Karpaty. *Praehistorica* 12: 127–139.

Budziszewski J., Włodarczak P.

- 2010 *Kultura pucharów dzwonowatych na Wyżynie Małopolskiej*. Kraków.
- 2011 Die schnurkeramischen Beile aus den kleinpolnischen Gräbern. In: H.-J. Beier, R. Einicke, E. Biermann (Eds) *Dechsel, Axt, Beil & Co – Werkzeug, Waffe, Kultgegenstand? Aktuelles aus der Neolithforschung*. *Varia Archaeologica* 7. Beiträge zur Ur- und Frühgeschichte Mitteleuropas 63, 55–64. Langenweissbach.

Florek M., Witkowska B.

- 2021 Absolute chronology of settlement remains of the Globular Amphora culture in Sandomierz Upland (Gałkowice-Ocin, Mierzanowice, Złota-Nad Wawrem). *Baltic-Pontic Studies* 25: 159–188.

Gancarski J., Machnikowie A. i J.

1986 Wyniki badań kurhanu A kultury ceramiki sznurowej we wsi Bierówka, gmina Jasło, w województwie krośnieńskim. *Acta Archaeologica Carpatica* 25: 57–87.

1990 Kurhan B kultury ceramiki sznurowej w Bierówce, gmina Jasło, w świetle badań wykopaliskowych. *Acta Archaeologica Carpatica* 29: 99–124.

Jarosz P., Włodarczak P.

2007 Chronologia bezwzględna kultury ceramiki sznurowej w Polsce południowo-wschodniej oraz na Ukrainie. *Przegląd Archeologiczny* 55: 71–108.

Kadrow S., Czerniak L., Dobrzańska H., Golański A., Grabowska B., Kurgan-Przybylska M., Rola J., Rzepecki S., Sałacińska B., Suchorska-Rola M., Tunia K., Zakościelna A., Zastawny A.

2009 Kultura malicka. In: A. Czekaj-Zastawny (Ed.) *Obrządek pogrzebowy kultur pochodzenia naddunajskiego w neolicie Polski południowo-wschodniej (5600/5500-2900 BC)*, 217–258. Kraków.

Kempisty A., Włodarczak P.

2000 *Cemetery of the Corded Ware culture in Żerniki Górne*. Światowit Supplement Series P: Prehistory and Middle Ages 5. Warszawa.

Kowalewska-Marszałek H.

2000 Spiral rings from Kichary Nowe – the most ancient gold objects of Poland. In: S. Kadrow (Ed.) *A Turning of Ages. In Wandel der Zeiten. Jubilee book dedicated to Professor Jan Machnik on His 70th anniversary*, 347–361. Kraków.

Kruk J., Milisauskas S.

1999 *Rozkwit i upadek społeczeństw rolniczych neolitu*. Kraków.

Krzak Z.

1958 Cmentarzysko kultury złockiej na stanowisku “Grodzisko II” we wsi Złota, pow. Sandomierz. *Archeologia Polski* 2: 329–388.

1970 *Cmentarzysko kultury złockiej „Nad Wawrem” w Złotej*. Warszawa.

1976 *The Złota culture*. Wrocław – Warszawa – Kraków.

1980 *Geneza i chronologia kultury ceramiki sznurowej w Europie*. Wrocław – Warszawa – Kraków – Gdańsk.

1989 Złota Culture. Zespoły datowane metodą C14. *Przegląd Archeologiczny* 36: 255–269.

Machnik J.

1966 *Studia nad kulturą ceramiki sznurowej w Małopolsce*. Wrocław – Warszawa – Kraków.

- 1979 Krąg kultury ceramiki sznurowej. In: W. Hensel, T. Wiślański (Eds) *Prahistoria ziem polskich. Vol. II. Neolit*, 337–411. Wrocław – Warszawa – Kraków – Gdańsk.
- Machnik J., Ścibior J.
- 1991 Die Chronologie der Schnurkeramikkultur (SchK) in Südostpolen. In: C. Strahm (Ed.) *Internationales Symposium „Die kontinentaleuropäischen Gruppen der Kultur mit Schnurkeramik“, Praha-Štířín 1–6 X 1990. Die Chronologie der regionalen Gruppen. Zusammenfassungen*, 45–54. Freiburg i. Br.
- Machnik J., Sosnowska E.
- 1996 Starożytna mogiła z początki III tysiąclecia przed Chrystusem ludności kultury ceramiki sznurowej w Średniej, gm. Krzywca. *Rocznik Przemyski* 32(3): 3–28.
- Marciniak J.
- 1961 Materiały neolityczne z Żukowa, pow. Sandomierz. *Materiały Archeologiczne* 2: 43–55.
- Matraszek B.
- 2001 Osada kultury pucharów lejkowatych ze stan. Nad Wawrem w Złotej, gm. Samborzec, woj. świętokrzyskie. *Wiadomości Archeologiczne* 40: 123–173.
- Matraszek B., Migal W., Sałaciński S.
- 2002 Składanki form rdzeniowych z jamy 424 z osady kultury pucharów lejkowatych ze stanowiska “Nad Wawrem” w Złotej, woj. świętokrzyskie. In: B. Matraszek, S. Sałaciński (Eds) *Krzemień świeciechowski w pradziejach. Materiały z konferencji w Ryńi 22-24.05.2000*. Studia nad gospodarką surowcami krzemiennymi w pradziejach 4, 237–254. Warszawa.
- Pasterkiewicz W.
- 2020 The first radiocarbon dates for the Globular Amphora culture cemetery in Sadowie in the Sandomierz Upland. *Analecta Archaeologica Ressorviensia* 15: 53–75.
- Pietraszewski J.
- 1924 Notatki archeologiczne z ziemi sandomierskiej. *Wiadomości Archeologiczne* 9: 120–124.
- Schroeder H., Margaryan A., Szymt M., Theulot B., Włodarczak P., Rasmussen S., Gopalakrishnan S., Szczepanek A., Konopka T., Jensen T. Z. K., Witkowska B., Wilk St., Przybyła M. M., Pospieszny Ł., Sjögren K-G., Belka Z., Olsen J., Kristiansen K., Willerslev E., Frei K., Sikora M., Johannsen N. N., Allentoft M. E.
- 2019 Unraveling ancestry, kinship, and violence in a Late Neolithic mass grave. *Proceedings of the National Academy of Sciences* 116(22): 10705–10710. DOI: <https://doi.org/10.1073/pnas.1820210116>

Ścibior J.

- 1991 Odpowiedź dyskutantom. In: J. Gurba (Ed.) *Schylek neolitu i wczesna epoka brązu w Polsce środkowowschodniej*. Lubelskie Materiały Archeologiczne 6, 47–65. Lublin.

Ścibior J. M., Ścibior J.

- 1990 Sandomierz 78 – wielokulturowe stanowisko z przełomu neolitu i epoki brązu. Badania ratownicze w 1984 roku. *Sprawozdania Archeologiczne* 42: 157–199.

Witkowska B.

- 2021 Radiocarbon dating of the archival funeral complexes of the Globular Amphora culture on the Sandomierz Upland: Gajowizna, Malice, Mierzanowice and Sandomierz Sites. *Baltic-Pontic Studies* 25: 7–47.

Witkowska B., Podsiadło M., Przybyła M. M., Włodarczak P.

- 2021 Absolute chronology of the Globular Amphora funeral complex at Malice in Sandomierz Upland. *Baltic-Pontic Studies* 25: 49–78.

Witkowska B., Czebreszuk J., Gmińska-Nowak B., Goslar T., Szmyt M., Ważny T.

- 2020 The cemetery of the Globular Amphora culture community in the Złota-Gajowizna site in the light of radiocarbon analysis and dendrochronology. *Sprawozdania Archeologiczne* 72(2): 259–284. DOI: <https://doi.org/10.23858/SA/72.2020.2.0XX>

Włodarczak P.

- 2006 *Kultura ceramiki sznurowej na Wyżynie Małopolskiej*. Kraków.
- 2007 Problem chronologii radiowęglowej kultury ceramiki sznurowej w świetle dendrochronologicznych datowań późnoneolitycznych osad palafitowych ze Szwajcarii. *Archeologia Polski* 52: 35–80.
- 2008 Kultura złocka i problem genezy kultury ceramiki sznurowej w Małopolsce. In: J. Bednarczyk, J. Czebreszuk, P. Makarowicz, M. Szmyt (Eds) *Na pograniczu światów. Studia z pradziejów międzymorza bałtycko-pontyjskiego ofiarowane Profesorowi Aleksandrowi Kośko w 60. rocznicę urodzin*, 555–576. Poznań.
- 2009 Radiocarbon and dendrochronological dates of the Corded Ware culture. *Radiocarbon* 51(2): 737–749.
- 2013 Projekt badań chronologii absolutnej eneolitu i początków epoki brązu w Małopolsce. In: I. Cheben, M. Soják (Eds) *Otázky neolitu a eneolitu našich krajín – 2010*, 373–387. Nitra.
- 2018 Chronometry of the Final Eneolithic cemeteries at Święte from the perspective of cultural relations among Lesser Poland, Podolia and the north-western Black Sea region. *Baltic-Pontic Studies* 23: 190–224.

- 2019 Grób 15 z Wilczyc na tle środkowoeuropejskim: odmienność i reguła w rytuale pogrzebowym kultury ceramiki sznurowej. In: P. Włodarczak (Ed.) *Wilczyce stanowisko 10. Norma i precedens w rytuale pogrzebowym małopolskiej kultury ceramiki sznurowej*, 169-209. Kraków – Niepołomice – Pętkowice.

Żurowski J.

- 1930 Dwa groby kultury złockiej. In: J. Kostrzewski (Ed.) *Księga pamiątkowa ku czci Prof. dr Włodzimierza Demetrykiewicza*, 151–176. Poznań.

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ABSOLUTE CHRONOLOGY OF SETTLEMENT REMAINS OF THE GLOBULAR AMPHORA CULTURE IN THE SANDOMIERZ UPLAND (SITE GAŁKOWICE-OCIN, MIERZANOWICE, ŻŁOTA – NAD WAWREM)

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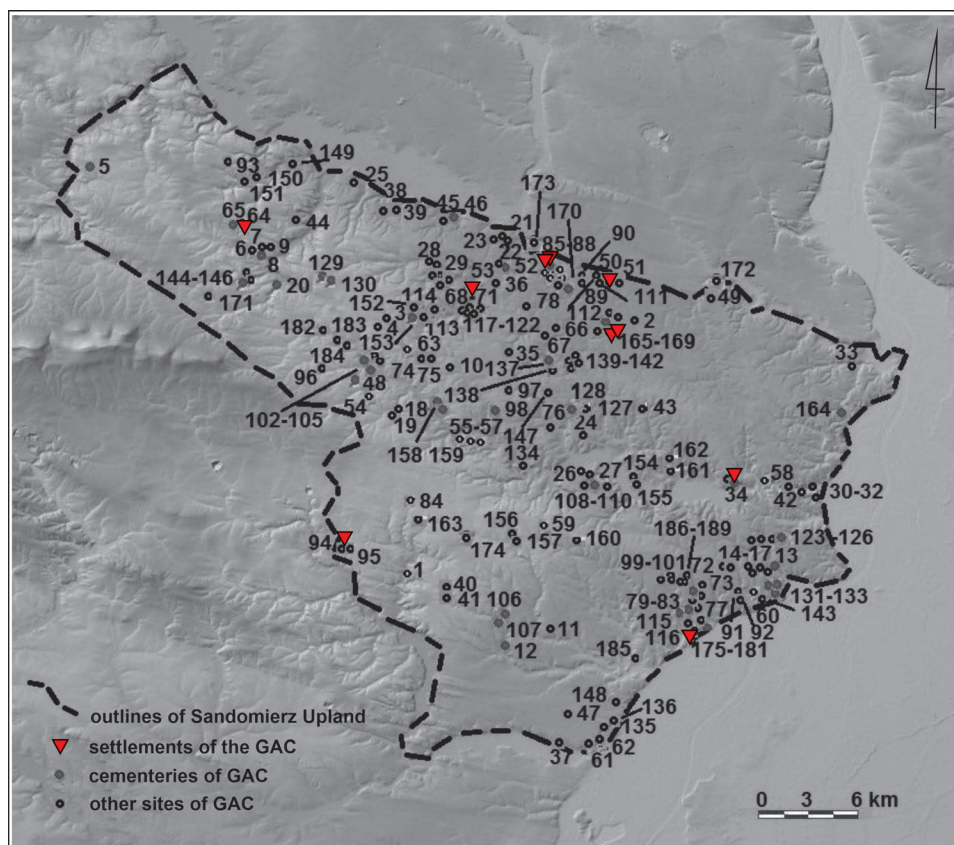
ABSTRACT

Under the project financed by the National Science Centre no 2014/12/S/HS3/00355 the first series of chronometric data has been obtained which forms the basis for establishing the chronology of the Globular Amphora culture in the Sandomierz Upland. It has produced altogether 42 absolute age determinations setting a chronological bracket of the Sandomierz-Opatów subgroup, of which 19 new radiocarbon determinations came from five settlements of this culture. Some are sites known in the literature, while others have been discovered in recent years. In general, the data from the settlements are compatible with the series obtained from graves, but a few dates and materials indicate the possibility of GAC surviving until the second half of the 3rd millennium BC.

Keywords: Globular Amphora culture, radiocarbon dating, large upland settlements

One of the elements distinguishing the Sandomierz-Opatów subgroup of the Globular Amphora culture (GAC) from the sources of this culture from other regions is the presence of large upland settlements in its territory. These sites have greater cognitive value than typical lowland settlements, if only because loess soils allow for obtaining well-preserved osteological materials for dating. However, this potential has not been appropriately used hitherto. Before the start of the project dedicated to the GAC from the Sandomierz Upland, we had only eight determinations of the absolute age from this area referring to the above-discussed culture, made from charcoal samples [Witkowska 2021].

In the Sandomierz Upland the 13 settlements of the GAC were excavated (Fig. 1). Most of them were explored during the old investigation and part have been lost during the long period of storage. For this reason, the selection of objects for dating was often guided by the criterion of the availability of materials, which is obviously not optimal, but has allowed to obtain a series of radiocarbon samples from the largest settlements of the Sandomierz-Opatów subgroup from Mierzanowice and *Żłota-Nad Wawrem*. This was one of the aims of National Science Centre, Poland,



research project no. 2014/12/S/HS3/00355, under which the dating was funded. Multiplied dates are proven to be more reliable than single absolute age determination as evidenced by analysis of absolute chronology of GAC cemeteries from the described area [Witkowska 2021]. Among the available materials, features whose fill contained only artefacts of the GAC were selected. Taking into account the long history of storing such, this allowed to limit the possibility of taking a sample from mixed materials. In addition, pits with exogenous elements found between GAC artefacts were included in the dated series. The context of those discoveries clearly indicated their simultaneous nature, which raised interesting research questions about the chronological position of these materials. The pool of samples was completed with a single date from the site in Gałkowiec-Ocin and the unpublished settlement in Kichary Nowe (research by Hanna Kowalewska-Marszałek).

F i g . 1. The sites of the Globular Amphora culture in the Sandomierz Upland. Prep. by M. Florek

Key : 1 – Beradz; 2 – Bidziny, site 7; 3 – Bogusławice, site 12; 4 – Bogusławice, site 14; 5 – Boleszyn, site 2; 6 – Broniszowice, site 6; 7 – Broniszowice, site 10; 8 – Broniszowice, site 12; 9 – Broniszowice, site 19; 10 – Brzezie, site 17; 11 – Bystrojowice, site 9; 12 – Byszów, site 22; 13 – Chwałki, site 1; 14 – Chwałki, site 6; 15 – Chwałki, site 17; 16 – Chwałki, site 21; 17 – Chwałki, site 26; 18 – Czerników Karski, site 3; 19 – Czerników Karski, site 5; 20 – Czerwona Góra, site 3; 21 – Ćmielów, site 1; 22 – Ćmielów, site 33; 23 – Ćmielów-Przepaść, site 9; 24 – Daromin, site 45; 25 – Denkówek, site 5; 26 – Dobrocice, site 16; 27 – Dobrocice, site 17; 28 – Drzenkowice, site 27; 29 – Drzenkowice, site 31; 30 – Dwikozy, site 3; 31 – Dwikozy, site 14; 32 – Dwikozy, site 19; 33 – Dziurów, site 19; 34 – Gałkowiec-Ocin, site 15; 35 – Gierczyce, site 10; 36 – Glinka, site 3; 37 – Gnieszowice, site 55; 38 – Goździelin, site 4; 39 – Goździelin, site 8; 40 – Goźlice, site 56; 41 – Goźlice, site 60; 42 – Góry Wysockie, site 14; 43 – Grochocice, site 6; 44 – Gromadzice, site 25; 45 – Grójec, site 5; 46 – Grójec, site 24; 47 – Jachimowice, site 3; 48 – Jałoweszy, site 28; 49 – Jankowice, site 4; 50 – Jasice, site 23; 51 – Jasice, site 26; 52 – Jastków, site 3; 53 – Jastków, site 24; 54 – Jurkowice, site 5; 55 – Karwów, site 22; 56 – Karwów, site 24; 57 – Karwów, site 28; 58 – Kichary Nowe, site 2; 59 – Kleczanów, site 1–2; 60 – Kobierniki, site 5; 61 – Koprzywnica, site 22; 62 – Koprzywnica, site 26; 63 – Kornacie, site 39; 64 – Kosowice, site 3; 65 – Kosowice, site, site 12; 66 – Koszyce, site 2; 67 – Koszyce, site 4; 68 – Krzczonowice, site 52; 69 – Krzczonowice, site 54; 70 – Krzczonowice, site 63; 71 – Krzczonowice, site 69; 72 – Lenarczyce, site 11; 73 – Lenarczyce, site 26; 74 – Lipowa, site 1; 75 – Lipowa, site 2; 76 – Lisów, site 31; 77 – Łojowice, site 3; 78 – Łukawka, site 6; 79 – Malice, site 1; , site – Malice, site 6; 81 – Malice, site 8; 82 – Malice, site 19; 83 – Malice, site 20; 84 – Małżyn, site 10; 85 – Mierzanowice, site 1; 86 – Mierzanowice, site 3; 87 – Mierzanowice, site 4; 88 – Mierzanowice, site 5; 89 – Mikułowice, site 6; 90 – Mikułowice, site 35; 91 – Milczany, site 13; 92 – Milczany, site 29; 93 – Mychów Kolonia, site 38; 94 – Mydłów, site 38; 95 – Mydłów, site 51; 96 – Niemienice, site 16; 97 – Nikisiałka Duża, site 4; 98 – Nikisiałka Mała, site 44; 99 – Obrazów, site 1; 100 – Obrazów, site 2; 101 – Obrazów, site 3; 102 – Opatów, site 6; 103 – Opatów, site 17; 104 – Opatów, site 61; 105 – Opatów, site 62; 106 – Ossolin, site 2; 107 – Ossolin, site 42; 108 – Pęczyny, site 1; 109 – Pęczyny, site 9; 110 – Pęczyny, site 10; 111 – Podgajcze, site 1; 112 – Podgajcze, site 5; 113 – Podole, site 4; 114 – Podole, site 29; 115 – Polanów, site 1 (Złota-Gajowizna); 116 – Polanów, site 6; 117 – Przeuszyn, site 1; 118 – Przeuszyn, site 2; 119 – Przeuszyn, site 5; 120 – Przeuszyn, site 9; 121 – Przeuszyn, site 13; 122 – Przeuszyn, site 37; 123 – Rzeczyca Mokra, site 1; 124 – Rzeczyca Mokra, site 2; 125 – Rzeczyca Mokra, site 5; 126 – Rzeczyca Mokra, site 13; 127 – Sadłowie, site 17; 128 – Sadłowie, site 34; 129 – Sadowie, site 3; 130 – Sadowie, site 23; 131 – Sandomierz, site 43; 132 – Sandomierz, site 44; 133 – Sandomierz, site 78; 134 – Słabuszewice, site 46; 135 – Sośniczany, site 6; 136 – Sośniczany, site 33; 137 – Stodoły, site 1; 138 – Stodoły, site 11; 139 – Stodoły Kolonia, site 3; 140 – Stodoły Kolonia, site 6; 141 – Stodoły Kolonia, site 7; 142 – Stodoły Kolonia, site 52; 143 – Strohice, site 3; 144 – Stryczowice, site 4; 145 – Stryczowice, site 7; 146 – Stryczowice, site 63; 147 – Studzianki, site 10; 148 – Szewce, site 2; 149 – Szewna, site 14; 150 – Szwarzowice, site 15; 151 – Szwarzowice, site 29; 152 – Trębanów, site 1; 153 – Trębanów, site 2; 154 – Tułkowice, site 14; 155 – Tułkowice, site 35; 156 – Usarzów, site 51; 157 – Usarzów, site 55; 158 – Wąworków, site 1; 159 – Wąworków, site 3; 160 – Węgrce Panińskie, site 18; 161 – Wilczyce, site 10; 162 – Wilczyce, site 64; 163 – Wilkowice, site 6; 164 – Winiary, site 3; 165 – Wojciechowice, site 1; 166 – Wojciechowice, site 4; 167 – Wojciechowice, site 6; 168 – Wojciechowice, site 8; 169 – Wojciechowice, site 20; 170 – Wojnowice, site 4; 171 – Worowice, site 6; 172 – Wólka Chrapanowska, site 7; 173 – Wólka Wojnowska, site 32; 174 – Zdanów, site 19; 175 – Złota, site 2; 176 – Złota, site 3 (Złota-Nad Wawrem); 177 – Złota, site 38; 178 – Złota, site 45; 179 – Złota, site 62; 180 – Złota, site 68; 181 – Złota, site 72; 182 – Zochcin, site 35; 183 – Zochcinek, site 13; 184 – Zochcinek, site 17; 185 – Żuków, site 2; 186 – Żurawica, site 4; 187 – Żurawica, site 5; 188 – Żurawica, site 7; 189 – Żurawica, site 8.

Galkowice-Ocin, site 15

The site was examined in October 2016 during intervention works by the Institute of Archaeology, Maria Curie-Skłodowska University. The five survey excavations, measuring 25 sq. m, were established, covering an area of over one are in total. Despite the presence of numerous artefacts and bones on the surface of the site, only one feature was found in the excavations, which was a GAC settlement pit. This probably indicates some degree of degradation of the site.

Feature 1

The pit was only partially recognized. It was oval and had lengths of at least 300 cm, width undefined and depth 80 cm. At the level of the bottom of the pit four circular recesses were found, basin-like in the cross-section, with a diameter of 60 cm each and a depth of 10 to 40 cm.

In the fill, 97 pottery shards were discovered: a large fragment of a beaker with a simple, horizontal corded ornament (Fig. 2: 1), two rims with a composition of rectangular stamps with cord impressions (Fig. 2: 2–3) and one undecorated rim (Fig. 2: 4). There was also a damaged clay whorl fragment (Fig. 2: 5). On the surface of the site other fragments with more complex ornamental motifs were found: one shard with festoon corded elements (Fig. 3: 1) and one with wavy and horizontal quadruple corded lines (Fig. 3: 2), and the next four with mat-like cord impressions (Fig. 3: 3–6). On another shard the above co-occurred with one knob on the belly (Fig. 3: 7).

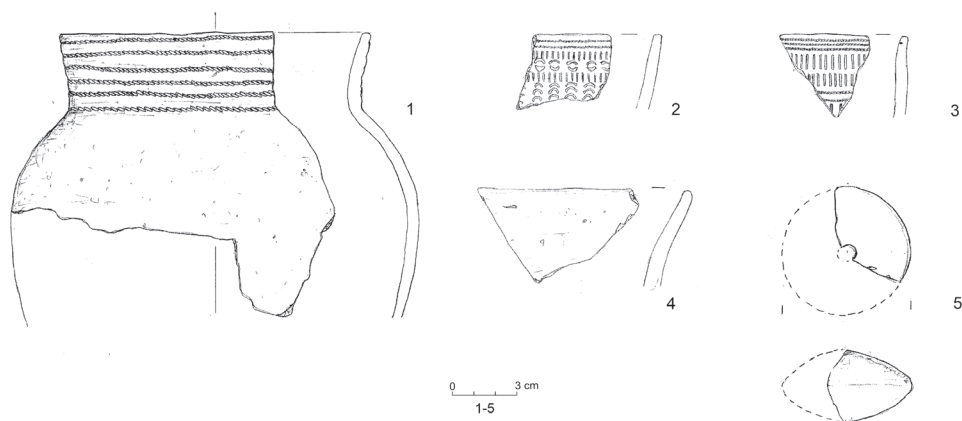


Fig. 2. Galkowice-Ocin, site 15, Wilczyce district. Pottery from Feature 1. Drawn by M. Florek

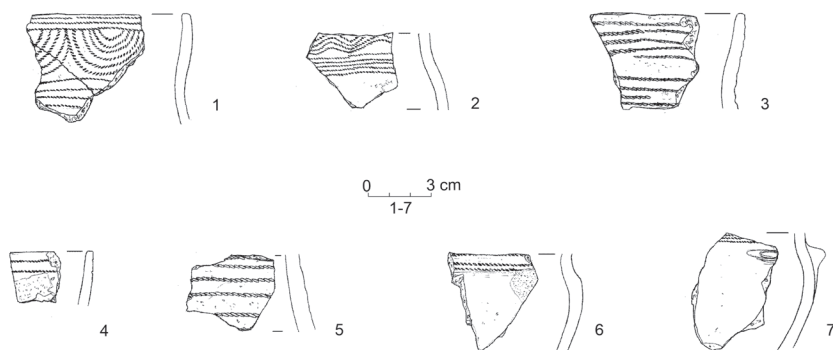


Fig. 3. Galkowice–Ocin, site 15, Wilczyce district. Pottery of the Globular Amphora culture found in topsoil. Drawn by M. Florek

The flint inventory of the feature comprises a damaged small fragment of an axe made of Świeciechów flint and four flakes of the same raw material, one flake of striped flint and one flake of Jurassic flint. In addition, the fill of Feature 1 yielded a fragment of a groundstone, 13 fragments of animal bones, four mussel shells and a lump of daub. At the bottom of the pit and in its ceiling there were a dozen stones of various size – lumps and crumbs of local rock.

Mierzanowice, site 1

The settlement marked with this number was located on the top of a hill in the Gierczanka river basin. It was discovered in 1935 and explored by K. Salewicz in 1938. In total 30 features were found there, most of which belong to the GAC [Nosek 1967: 167–181]. The field documentation alas, has been lost. The artefacts from settlement pits founded on this site were published by B. Balcer [1963].

Feature 173

Judging by the amount of material and information from the tags, it was a large pit divided into parts. It is possible that several features merged into stratigraphic relations with each other were registered here. However, the pottery found there is quite homogeneous and referenced only to the GAC. There were remains of numerous unornamented vessels in the type of bowls [Balcer 1963, Pl. IV: 1; V: 11–12], two-handled amphorae [Balcer 1963, Pl. IV: 4; V: 6,9–10] and beakers [Balcer 1963, Pl. V: 4; VI: 2]. Others were ornamented only with fingerprints [Balcer 1963, Pl. V: 7] or a row of knobs [Balcer 1963, Pl. V: 3]. The share of pottery decorated only with a combination of stamps was quite large in the set. There were remains of vessels only with simple rows of stamp [Balcer 1963, Pl. IV: 5; VI: 4], with rows combined with zigzags [Balcer 1963, Pl. VI: 1,6] and metopes made in

the same technique presented on four-handle amphorae [Balcer 1963, Pl. V: 13]. Some are connected with horizontal corded lines [Balcer 1963, Pl. V: 1; VI: 12]. The most complex multi-elements motifs were made of cord impressions consisting of suspended [Balcer 1963, Pl. VI: 7] or hatched triangles [Balcer 1963, Pl. VI: 3,13] bound by horizontal lines and summed up by a row of vertical impressions. One of the rims had short vertical cord impressions between horizontal lines and, below the neck, metopes filled with diagonal sections of the cord [Balcer 1963, Pl. VI: 8]. The rest of the shards were decorated with simple horizontal cord impressions on the neck [Balcer 1963, Pl. IV: 1,4,8]. Altogether, several hundred fragments of pottery from at least 35 vessels were discovered in the pit.

There were also a few blades made of Świeciechów flint [Balcer 1963, Pl. IV: 11–12,14,16], several dozen flint flakes (unpublished), one bone awl [Balcer 1963, Pl. IV: 13] and animal bones.

Feature 187

It was a circular pit with a diameter of about 100 cm [Balcer 1963, Fig. 2]. The depth and shape of the cross-section is unknown. There were almost one hundred pottery shards in the fill and one, almost entire, wide-necked tureen with six handles [Balcer 1963, Pl. VI: 3]. Among the remaining fragments were some with a horizontal cord (unpublished) and two rims decorated with a combination of cord impressions and a row of stamps [Balcer 1963, Pl. VII: 2,4].

In the fill were also animal bones and a damaged axe made of striped flint [Balcer 1963, Pl. VII: 7]. Another axe [Balcer 1963, Pl. VII: 5], a retouched blade made of Świeciechów flint [Balcer 1963, Pl. VII: 1] and over a dozen flakes were found near the pit.

Feature 194

The shape of the pit and its dimensions are unknown. Dark fill has been noticed at the depth of 75 cm. The artefacts were discovered above, but it seems to be a homogeneous set. There were 130 pottery shard, among them, a rim and belly of the beaker ornamented with wavy and horizontal cord impressions [Balcer 1963, Pl. VII: 17] and fragments of bottoms from two other vessels [Balcer 1963, Pl. VII: 18–19].

The flint inventory consisted of 16 flakes (one retouched) of striped flint, six blades and five flakes of Świeciechów flint, one flake-core and six flakes made of chocolate flint (unpublished). There were also many lumps of daub in the set marked with this number.

Feature 211

The field notes show that the pit was partially damaged by contemporary fosse. We do not know anything about its shape and dimensions. Pottery, numbering over one hundred was found in the fill, featuring large fragments of Kujawian amphora decorated with horizontal and festoon corded lines [Balcer 1963, Pl. IX: 19],

a beaker with vertical, short corded sections between horizontal corded lines on the neck [Balcer 1963, Pl. IX: 8], another with corded checkered and a zigzag [Balcer 1963, Pl. IX: 4]. One fragment had wavy cord impressions (unpublished). Other rims were ornamented with a solely stamp technique with rows and zigzags [Balcer 1963, Pl. IX: 3,5]. One of them had incrustation [Balcer 1963, Pl. IX: 6]. There were also vessels with a row of fingerprints and another without an ornament [Balcer 1963, Pl. IX: 20].

The flint inventory consisted of two damaged striped flint axes [Balcer 1963, Pl. IX: 7,13], two sidescrapers [Balcer 1963, Pl. IX: 16] and 56 flakes made of the same raw material. There were also a perforator (unpublished), retouched and rough blades of chocolate flint [Balcer 1963, Pl. IX: 10], three blades [Balcer 1963, Pl. IX: 9, 14–15], 11 flakes and a concretion of Świeciechów flint, and a sanding plate. The next tool was a bone awl [Balcer 1963, Pl. IX: 17]. The function of boar tusks found in inventory is unclear [Balcer 1963, Pl. IX: 12]. The fill of the pit contained animal bones, including cattle, pigs and deer, shells and lumps of daub.

Feature 226

According to the field notices it was oval pit with dimensions of 220 by 240 cm and depth of 75 cm. It was basin-shape in cross-section. Almost two hundred pottery shards were found in the fill: a whole undecorated amphora [Balcer 1963, Pl. XI: 15], another vessel of this type with ornament made only of rectangular stamps arranged in rows, zigzags and metopes [Balcer 1963, Pl. XI: 11], a bowl with the same technique of decoration [Balcer 1963, Pl. XI: 19], beakers ornamented with suspended triangles made of corded lines between rows of stamps [Balcer 1963, Pl. XI: 13] and another shard with festoon cord impressions [Balcer 1963, Pl. XI: 9].

Found were one flake-core and one unfinished axe made of striped flint, 14 flakes of this raw material, a flake-core and scraper of chocolate flint, eight flakes of Świeciechów flint, a groundstone and pestles. Among animal bones found in the fill were a jaw of a pig, remains of a sheep or goat and cattle.

Feature 229

We have not had any information about the shape and dimensions of the pit. It is also unknown how many artefacts have been discovered here. Among them, a large fragment of a beaker ornamented with horizontal corded lines and rows of stamps [Balcer 1963, Pl. XI: 22], an undecorated rim of another vessel [Balcer 1963, Pl. XI: 23] and some shard with a handle (unpublished) have been preserved in the collection as well as a lump of daub.

Mierzanowice, site 4

The settlement adjacent directly to Site 1 described above, is perhaps an extension of this. It was excavated in 1957 and 1959 as a continuation of the field work

of Salewicz. In total, more than 30 features have been discovered there, of which 16 can be associated with the GAC [Gardawski, Miśkiewicz 1958; Wrotek 1961; Nosek 1967: 182–186; cf. history of research in Bąbel 2013]. For radiocarbon dating features excavated in 1957 were selected.

Feature 2

An oval shape measuring 200 by 150 cm at the discovery level, pear-shaped and flat-bottomed in cross-section [Gardawski, Miśkiewicz 1958, Fig. 3], reaching a depth of 215 cm. Dozens of pottery fragments were discovered in the fill, among them, shards ornamented horizontal cord impressions (unpublished) and a bowl decorated with rows of stamps, triangles and zigzags made in this technique [Gardawski, Miśkiewicz 1958, Pl. L: 1].

There were also several blades and flakes made of striped and chocolate flint (unpublished) and animal bones, including cattle.

Feature 5

A circular pit with a diameter of 120 cm and depth of 110 cm. It had straight walls and a flat bottom in the cross-section. Over one hundred pottery shards were found inside. Among them, were fragments of vessels decorated in horizontal corded lines, sometimes cut by a vertical element [Gardawski, Miśkiewicz 1958, Pl. XLIX: 4] or complementary stamps or knobs [Gardawski, Miśkiewicz 1958, Pl. L: 6]. A bowl with horizontal and festoon cord impressions was also found [Gardawski, Miśkiewicz 1958, Pl. XLIX: 7]. There were moreover, bowls and beakers with a complex decorative motif made of horizontal corded lines and suspended triangles combined with plastic elements like handles or knobs [Gardawski, Miśkiewicz 1958, Pl. XLIX: 5, Fig. 8] and an incrustation was recorded on some ornaments. Other vessels had simple decorations in the form of a row of fingerprints [Gardawski, Miśkiewicz 1958, Pl. L: 3]. One fragment of a bowl, decorated with a round stamp imitating a cord, is also interesting in terms of provenance [Gardawski, Miśkiewicz 1958, Pl. XLIX: 6].

In addition, a bone awl [Gardawski, Miśkiewicz 1958, Pl. LI: 5], dozens of flakes made of striped and chocolate flint (unpublished) and many animal bones were to be found in the fill.

Feature 19

A circular pit measuring 180 cm in diameter. It was basin-shaped and reached 160 cm in the cross-section. Inside, dozen of pottery shards ornamented with horizontal cord impressions, some combined with a row of stamps were found. There were also fragments of bowls and beakers. One of them was additionally decorated with wavy, horizontal and vertical multiple corded bands connected with knobs on the neck [Gardawski, Miśkiewicz 1958, Pl. XLIX: 2].

The inventory of flint boasted two axes of Świeciechów and striped flint [Gardawski, Miśkiewicz 1958, Pl. LI: 6–7] and dozens of blades and flakes (unpublished). The fill contained also animal bones and charcoal.

Złota-Nad Wawrem

Site 3 in Złota, commonly called *Nad Wawrem*, is a part of the well-known multicultural complex of sites near Sandomierz. This place is the largest settlement of the Sandomierz-Opatów subgroup. According to the preliminary reconnaissance carried out as part of the NSC project, at least 75 settlement features of the GAC have been registered there [Witkowska, Włodarczak 2021, Fig. 2]. However, due to the lack of a complete processing of the site, an estimate of definite number of GAC pits is impossible. The radiocarbon samples were obtained for 10 of them. Some of the dated features were previously presented in the literature as belonging to the Złota culture (features 49, 71, 90, 140, 184) [Krzak 1976]. Moreover, four of them were discussed in detail in a separate article in this volume due to their relationship with the CWC [Witkowska, Włodarczak 2021]. There is also a complete history of research and publication of the site explored in the years 1926–29.

Feature 16

A settlement pit of indeterminate shape and illegible borders. In the field drawing, the approximately circular cluster of artefacts is outlined with a rectangular line, probably reflecting the space of exploration [Krzak 1976, Fig. 7]. The materials occupy a space with a diameter of about 190 cm and the depth of the feature was 90 cm. About 300 fragments of pottery were discovered in the fill, of which 250 belong to the GAC. Among them, are shards ornamented with horizontal imprints of cord, probably mostly from beakers (Fig. 4: 1–6), some with a row of stamps (Fig. 4: 9) or fingerprints (Fig. 5: 6–7), remains of two-handle undecorated amphorae (Fig. 4: 10) and rims of other unornamented vessels (Fig. 4: 7–8, 12–14). There were also a few fragments with a round stamp imitating cord impressions (Fig. 5: 1–3), one rim with a horizontal cord band cut across by a vertical impression (Fig. 5: 4) and one with a wavy and horizontal cord (Fig. 5: 5). The remaining 50 fragments make up almost the entire big amphora of a clearly exogenous nature (Fig. 5: 8) [Krzak 1976, Fig. 8: a]. This vessel finds analogies in the Baden cultural circle [cf. Zastawny 2015a, Fig. 9].

The tool inventory consisted of 13 artefacts made of striped and Świeciechów flint, including a blade retouched in the proximal part (Fig. 6: 1) and two end-scrapers made of irregular, massive flakes (Fig. 6: 2–3) and 10 unretouched flakes (Fig. 6: 4–13), one from an axe (Fig. 6: 13). Moreover, the pit's fill yielded some stones, shells, lumps of daub and several animal bones.

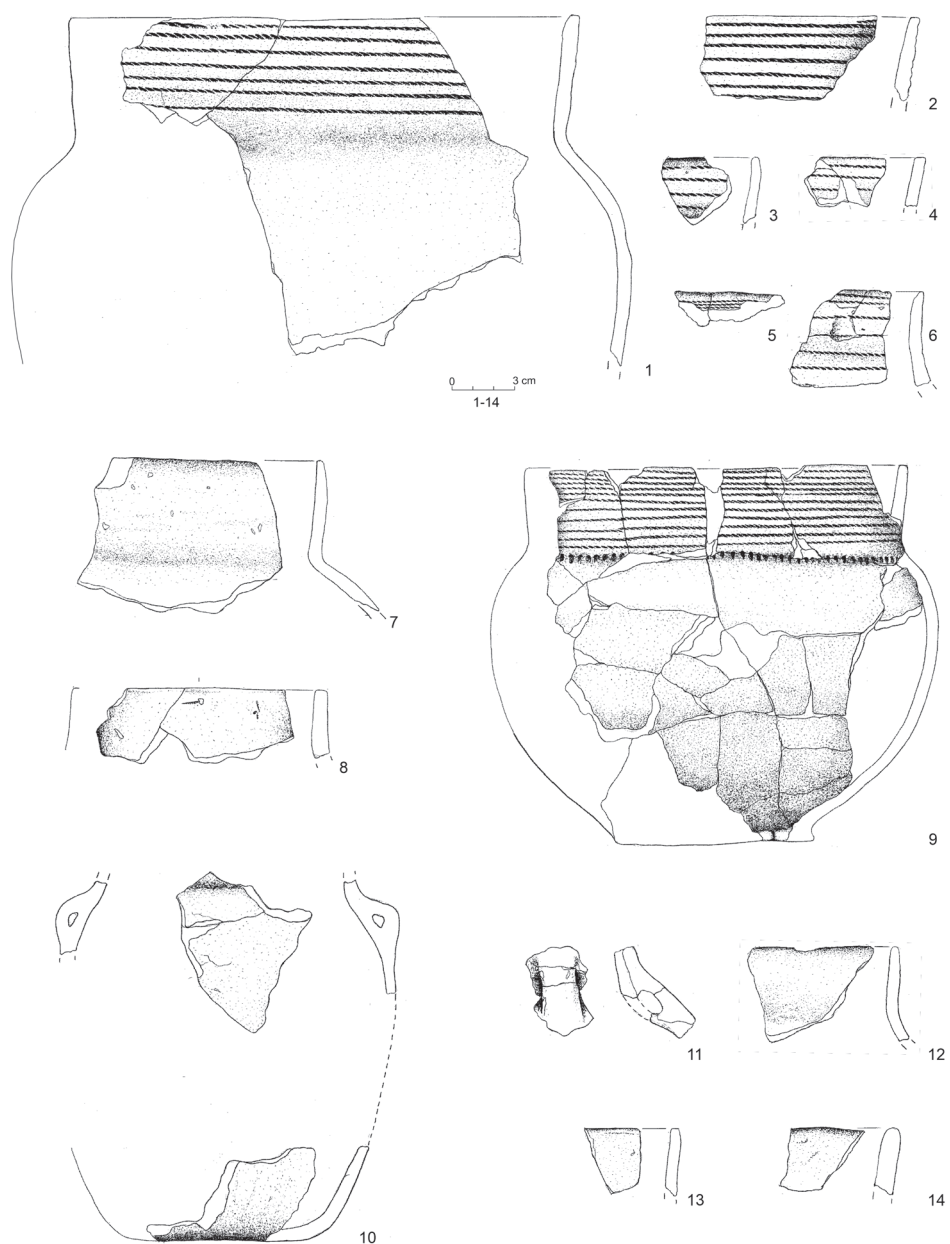


Fig. 4. Złota-Nad Wawrem site, Sandomierz district. Pottery from Feature 16. Drawn by B. Witkowska

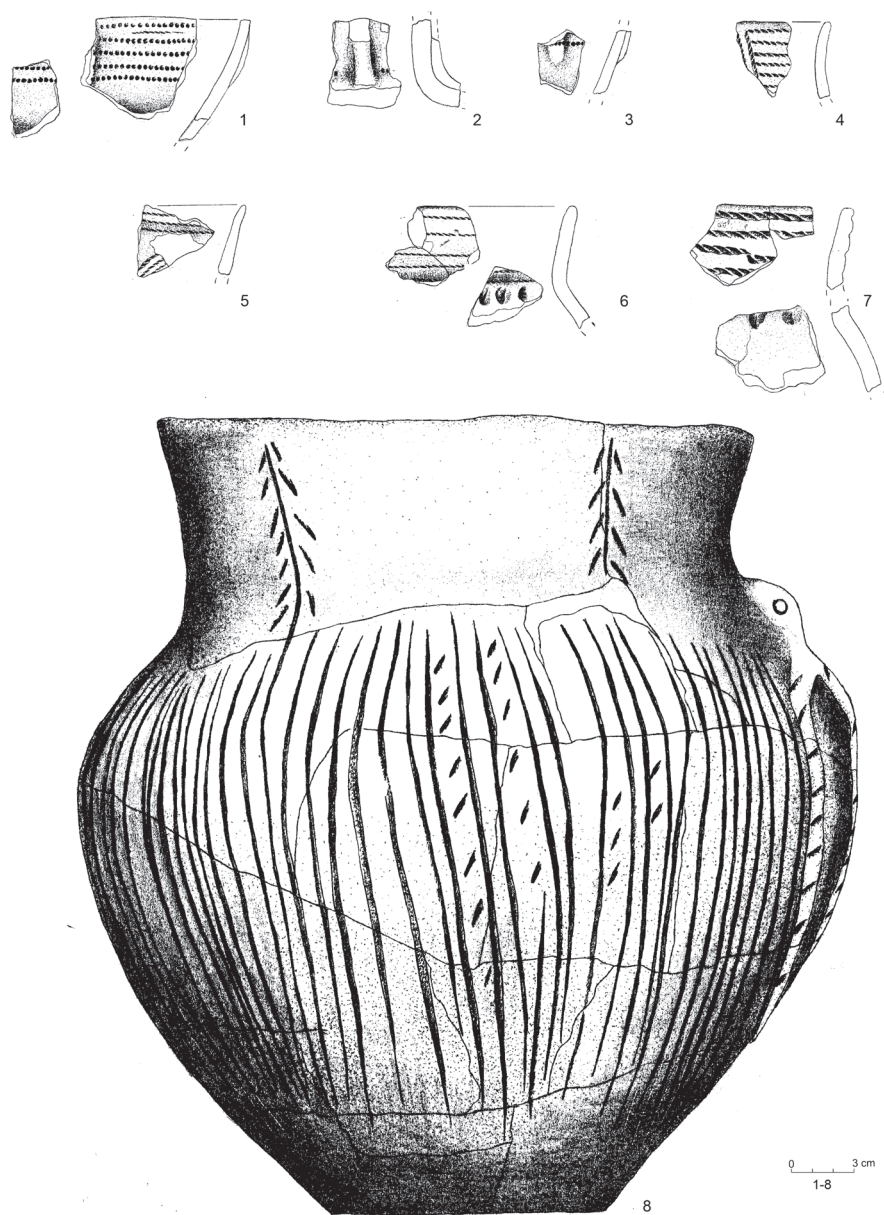


Fig. 5. Złota-Nad Wawrem site, Sandomierz district. Pottery from Feature 16. Drawn by B. Witkowska

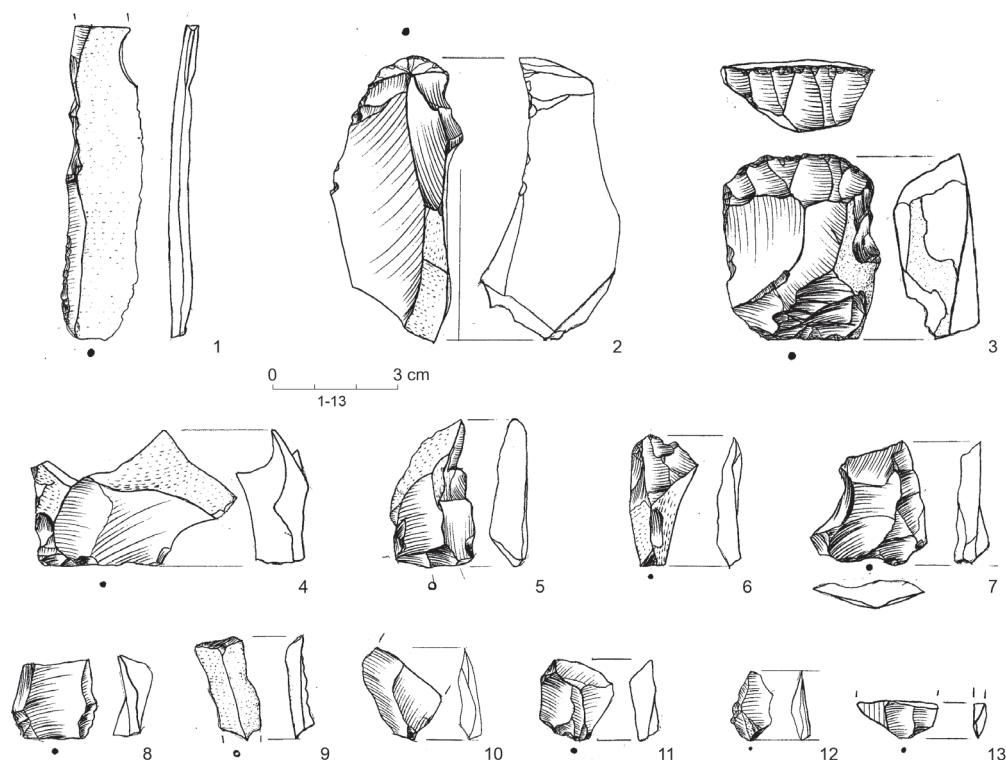


Fig. 6. Złota–Nad Wawrem site, Sandomierz district. Flint artefacts from Feature 16: 1–3, 7–10 – Świeciechów flint; 4–6, 11–13 – striped flint. Drawn by B. Witkowska

Feature 32

A rectangular large pit with a trapezium-shaped vertical cross-section. At the level of discovery, it was 190 cm wide and 250 cm long. On the bottom, the longer axis of the pit measured 350 cm. The depth of the feature reached 150 cm. From the level of 80 cm, the fill was saturated with materials. Over a thousand pottery shards were found there. Among them, there were numerous rims of the beakers decorated by horizontal cord impressions (Fig. 7: 1–7), remains of two- and four-handled amphorae with an analogous ornament (Fig. 7: 8, 10–11), a bowl with a festoon corded ornament analogous to the one found in Pit 90 [Witkowska, Włodarczak 2021, Fig. 18: 9], shards from beaker and bowls with combined horizontal and wavy cord impressions (Fig. 7: 9; 8: 1–2), one belly with short cord impressions grouped in diagonal metopes between horizontal lines (Fig. 8: 4), a bowl decorated with a single, horizontal cord and V-shaped stamps (Fig. 8: 5). There were also vessels with only knobs (Fig. 8: 6) and unornamented specimens (Fig. 8: 7–10).

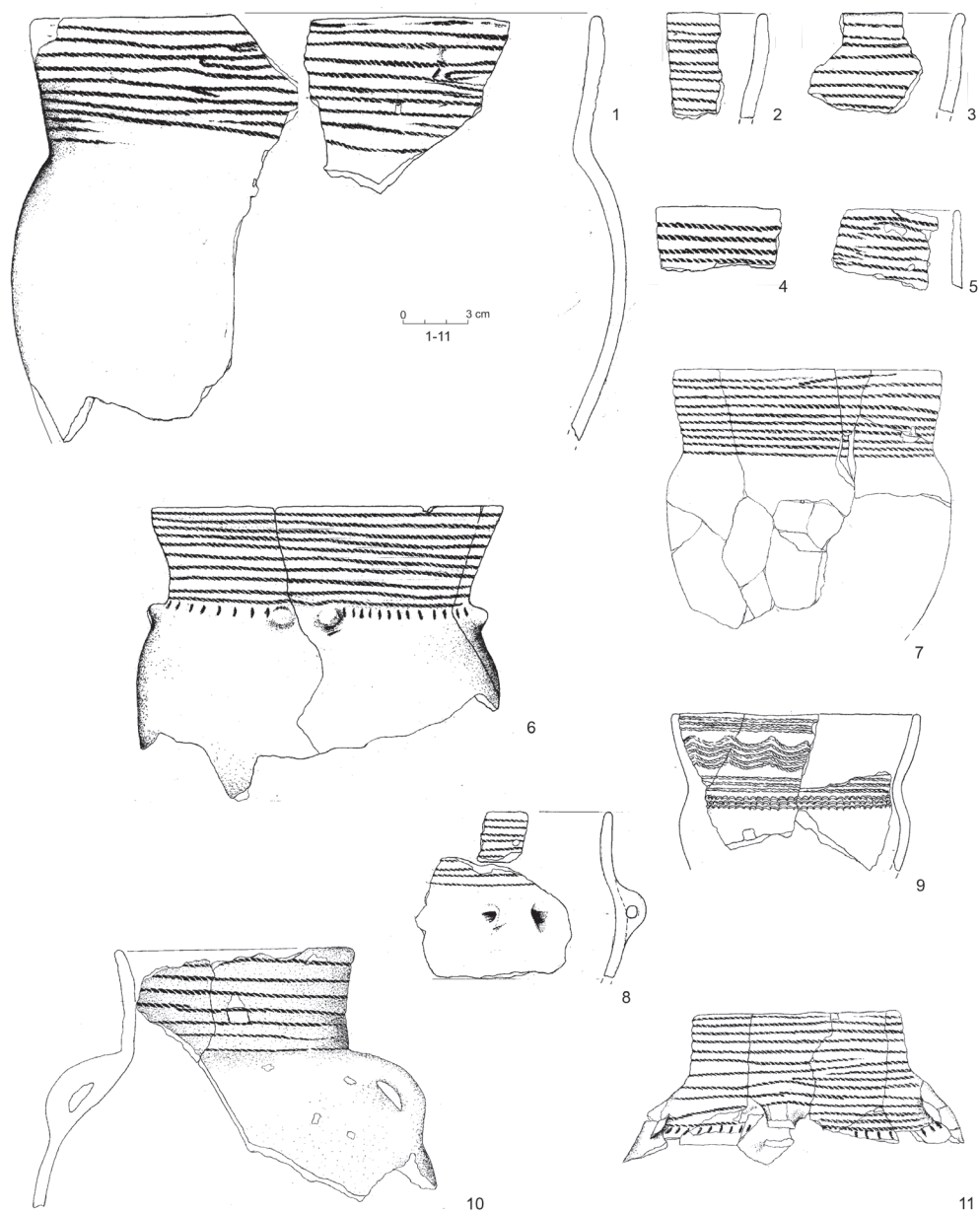


Fig. 7. Złota-Nad Wawrem site, Sandomierz district. Pottery from Feature 32: 1-5, 7-11 – drawn by B. Witkowska; 6 – after archives of State Archaeological Museum in Warsaw

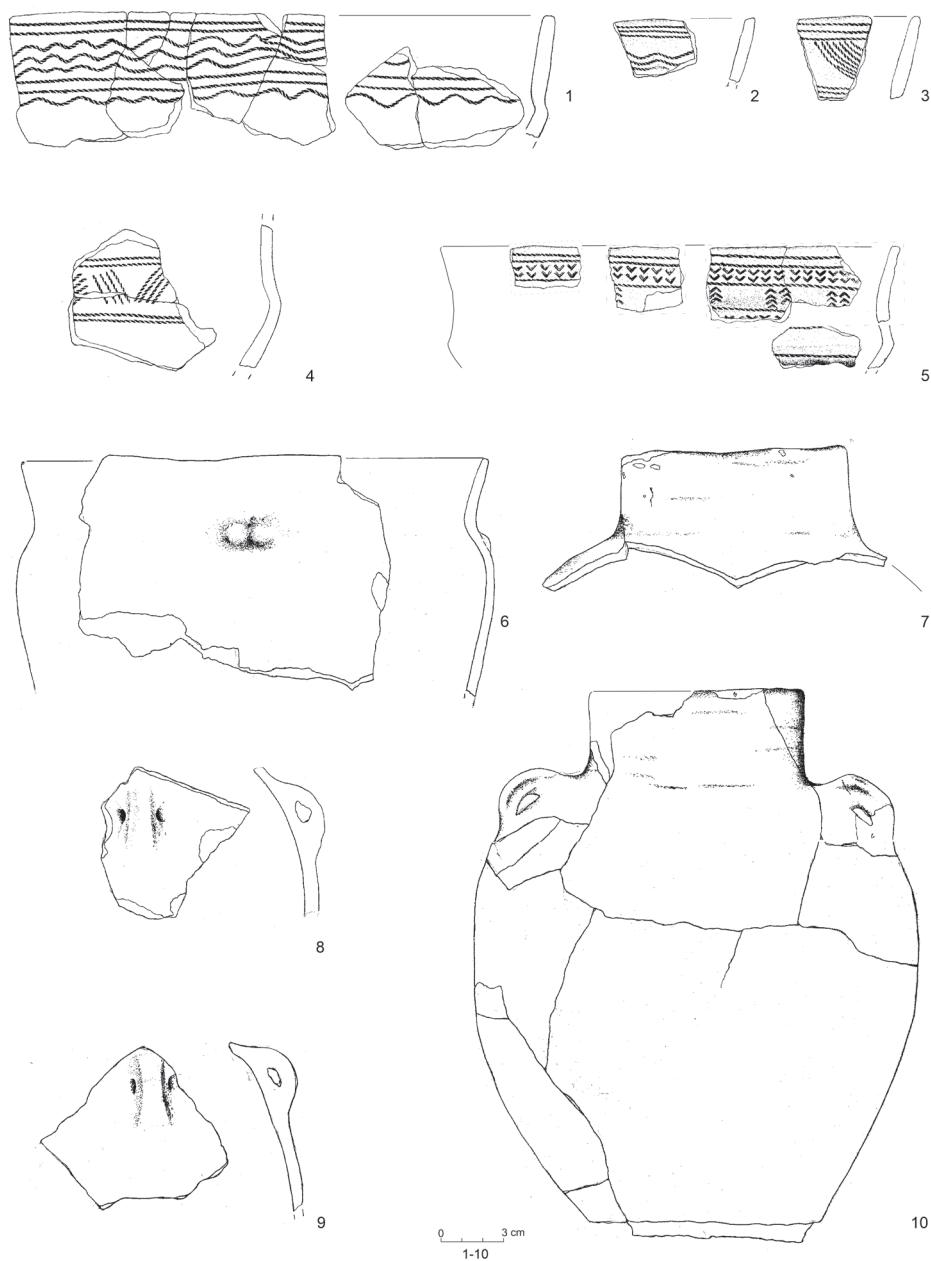


Fig. 8. Złota-Nad Wawrem site, Sandomierz district. Pottery from Feature 32. Drawn by B. Witkowska

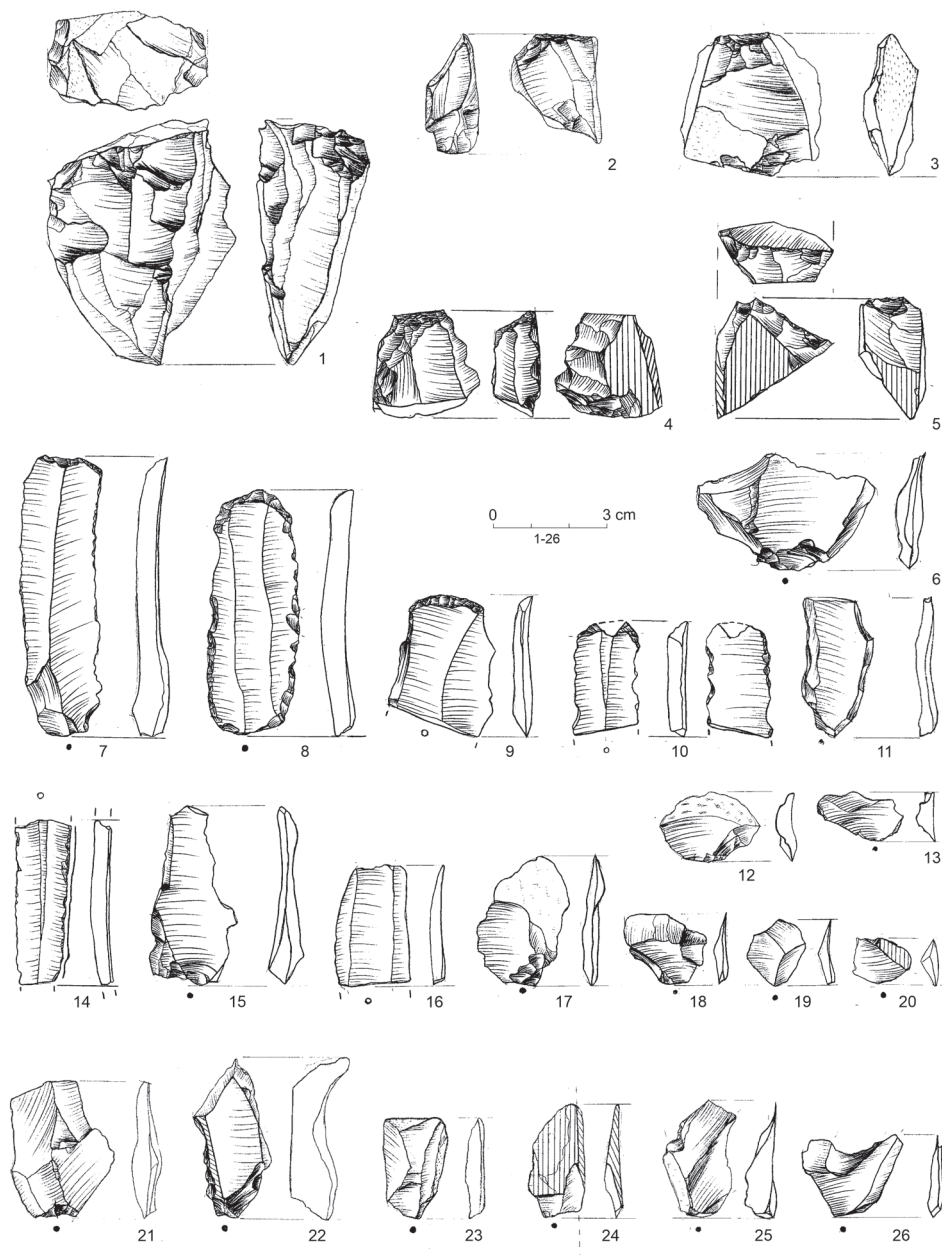


Fig. 9. Złota-Nad Wawrem site, Sandomierz district. Flint artefacts from Feature 32: 1, 4-5, 7-9, 14-18, 20-24 – Świeciechów flint; 2-3, 10-13 – chocolate flint; 19, 25-26 – striped flint. Drawn by B. Witkowska

The flint inventory comprises 25 artefacts, including one single-platform bladed core (Fig. 9: 1), four splintered pieces (Fig. 9: 2–5), two of them coming from axes (Fig. 9: 4–5), one half-tilted (Fig. 9: 7), three endscrapers (Fig. 9: 8–10), one sidescraper (Fig. 9: 11), one retouched blade (Fig. 9: 14), two unretouched (Fig. 9: 15–16) and 14 flakes (Fig. 9: 6, 17–26), as well as two from polished axes (Fig. 9: 20, 24). The Świeciechów flint is the dominant raw material of the set with 15 artefacts made of it, four of striped flint, the next four of chocolate flint and two of undefined flint. The toolkit includes also two bone blades (Fig. 10: 1–2), one made from a boar's tusk (Fig. 10: 2). Animal tooth pendants also were found above the object in the topsoil layer (Fig. 10: 3). In addition, the fill of the feature contained stones, many daub lumps with structural impressions, charcoals, animal bones and a cluster of shells.

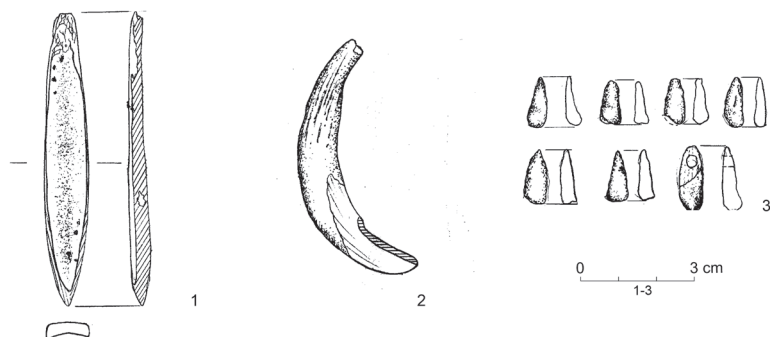


Fig. 10. Złota–Nad Wawrem site, Sandomierz district. Bone artefacts from Feature 32 and topsoil above. Drawn by B. Witkowska

Feature 49

A large oval-rectangular pit. At the level of discovery, it was 520 cm wide and 600 cm long. Down to a depth of 100 cm, it was regularly slightly basin-like shaped; below, it separated into several depressions. In the deepest place it reached 210 cm. Probably it was a kind of domicile with accompanying storage pits [Witkowska, Włodarczak 2021, Fig. 3]. In the feature 2,342 fragments of pottery from about 170 vessels ornamented by horizontal and wavy cord impressions combined with stamp or finger impressions were found. There were some vessels with plastic elements or without an ornament also [Witkowska, Włodarczak 2021, Fig. 4–7]. Among them, fragments of the so-called A-amphora were discovered [Witkowska, Włodarczak 2021, Fig. 7: 16, 20].

The tool inventory includes 55 flints and one bone blade in the type of a perforator [Witkowska, Włodarczak 2021, Fig. 8]. Moreover, the feature fill yielded

a damaged amber ornament, 40 shells, fine charcoals and large structural daub lumps with impressions. Apart from these, many animal bones were discovered.

Feature 71

The GAC settlement pit was cut into by a CWC grave. It was round with a maximum diameter of about 140 cm and had straight vertical walls [Witkowska, Włodarczak 2021, Fig. 12: a-b]. Its depth reached 100 cm. The pit yielded 1,334 highly comminuted pottery shards among which the remains of at least 33 vessels could be identified. A large portion was unornamented [Witkowska, Włodarczak 2021, Fig. 12: 1–7]. Other materials were decorated by a horizontal cord in a few combinations with stamps, knobs and finger or festoon cord impressions. In three cases, the stamp impressions occurred alone. One of the beakers was ornamented with only a row of finger impressions [Witkowska, Włodarczak 2021, Fig. 13].

The flint inventory comprises 36 artefacts, including 16 flakes, 10 blades, one endscraper and two scrapers on a flake, three splintered pieces, a flint hammer and a round, flat stone which could have served as a pestle [Witkowska, Włodarczak 2021, Fig. 14–15]. Moreover, there were found one bone awl, large structural daub lumps, animal bones and many shells.

Feature 80

A small, circular pit with a diameter of 150 cm and depth of 100 cm. It had a very regular shape and straight walls reaching to a slightly basen-shape bottom. The fill was full of artefacts. Over 400 fragments of pottery were found there. Among them, almost a whole beaker with grouped corded lines (Fig. 11: 1) and cup with horizontal and wavy corded bands (Fig. 11: 2), many remains of bowls with a similar ornament (Fig. 11: 3–5), some completed with a V-shaped stamp (Fig. 11: 7–8) or festoons made of cord (Fig. 11: 6) and fragments of Kujawian amphorae (Fig. 11: 9–10). There were also many rims and fragments of necks with horizontal cord impressions (Fig. 12: 1–2), including some with a row of stamps (Fig. 12: 3), knob (Fig. 12: 4) or nail impressions (Fig. 12: 5). Some ornaments on amphorae and bowls bear traces of incrustation.

The flint inventory comprises four unretouched blades, one flake and one damaged axe, all made of Świeciechów flint, one bladed core of striped flint, one natural fragment of this raw material and one blade of chocolate flint. Further, in the fill of the pit were discovered several animal bones and lumps of daub.

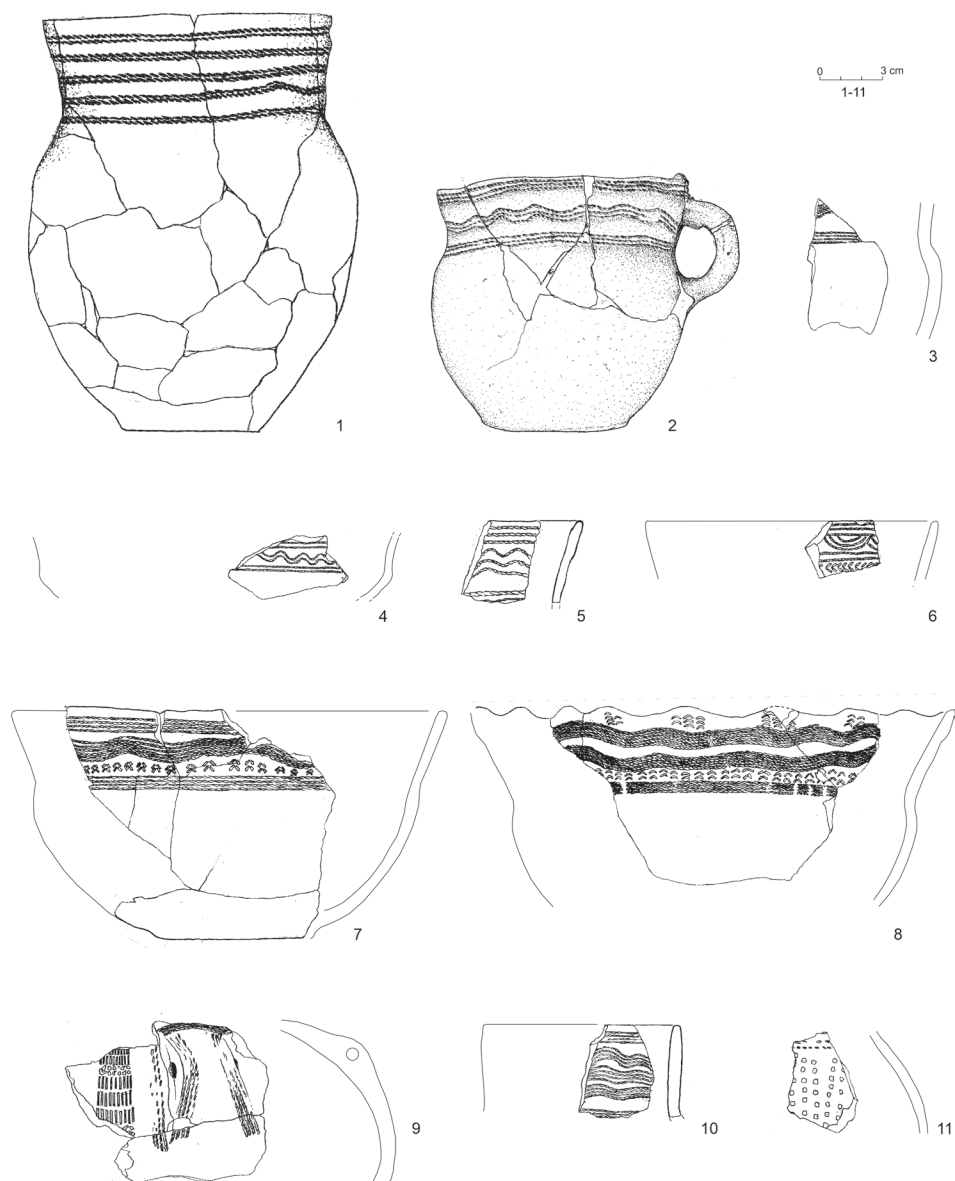


Fig. 11. Złota-Nad Wawrem site, Sandomierz district. Pottery from Feature 80: 1–2 – drawn by A. Czubińska; 3–11 – after archives of State Archaeological Museum in Warsaw

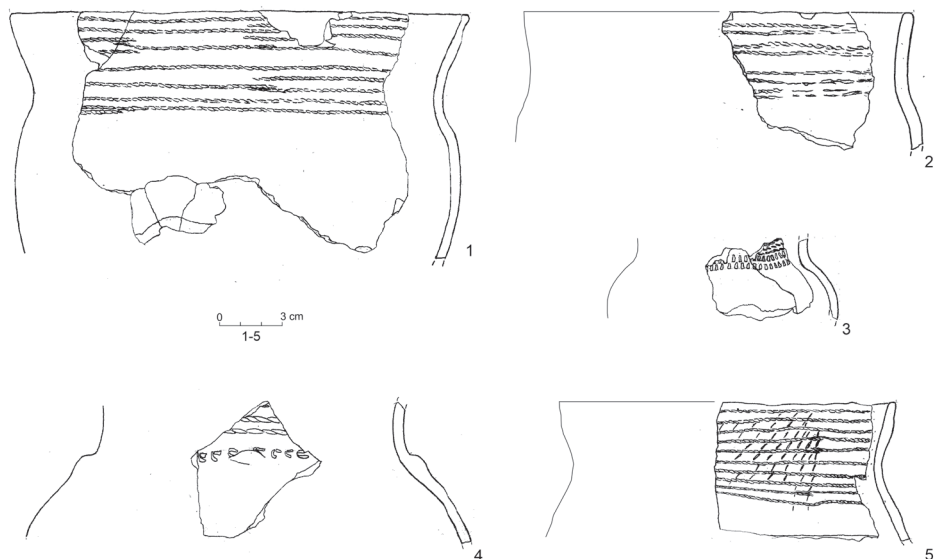


Fig. 12. Złota–Nad Wawrem site, Sandomierz district. Pottery from Feature 80. After archives of State Archaeological Museum in Warsaw

Feature 90

A settlement pit of the GAC cut into by a CWC grave designated by the same number. It is hard to definitely determine the shape and size of it. The GAC materials that occupied a space about 160 cm long and less than 100 cm wide, were encircled with a line marking a greater range. Perhaps the line marked the boundary of the exploration dig, while the feature itself was probably oval in shape [Witkowska, Włodarczak 2021, Fig. 18: a]. Inside, 612 pottery shards were found, coming from about 16 vessels decorated with horizontal or festoons cord impressions, combinations of stamps, cord and knobs or without an ornament [Witkowska, Włodarczak 2021, Fig. 18: 1–11].

There was only one tool found: a massive endscraper made out of a striped-flint flake [Witkowska, Włodarczak 2021, Fig. 18: 12]. Additionally, there was a single pebble with traces of use, shells and fine animal bones.

Feature 140

According to the field documentation, it was a very large, irregular pit with an uneven bottom, 13 meters long and 8.5 meters wide [Krzak 1976, Fig. 20]. The deepest part of the pit reached two meters, but most of the bottom surface was at a depth of 80 cm. One of the cross-sections shows a recess in the type of

cellar (unpublished field documentation from the State Archaeological Museum in Warsaw). Probably Feature 140 was a dwelling pit similar to Pit 49.

Over 4,500 fragments of pottery were discovered there. Among them, were remains of undecorated vessels in the type of beakers [Krzak 1976, Fig. 21: c] or two-handled (unpublished) and four-handled amphorae [Krzak 1976, Fig. 21: e]. The other amphorae were ornamented with very complex multi-elements motifs combined with horizontal and wavy cord impressions and stamps grouped in the metopes. There was almost a whole tureen [Krzak 1976, Fig. 21: d], a large fragment of a typical Kujawian amphora (unpublished) and numerous smaller fragments from four-handled amphorae decorated in this style. The fusion of cord impressions and stamps on the beakers were observed, one case with a single horizontal line and a zigzag made of stamps [Krzak 1976, Fig. 21: b] and another with corded festoons and impressions of round stamps [Krzak 1976, Fig. 21: f]. The other beakers were adorned with less complex motifs of a horizontal corded band [Krzak 1976, Fig. 21: a], sometimes combined with rows of fingerprints, stamps or knobs (unpublished), sometimes grouped in two or three lines (unpublished). There were also bowls with a wavy and horizontal corded band and vessels with simple rows of fingerprint or grouped knobs (unpublished).

Over a hundred flint artefacts were discovered (all unpublished). The dominant raw material of the inventory was Świeciechów flint represented by one blade-core, 38 flakes and four blades. The next 37 were of striped flint, one of them was a sidescraper on the cortical flake. Some flakes were retouched. The damaged axe was made of the same raw material. There were also a few chocolate flakes. The collection of tools was enlarged by two bones awls (unpublished). Many animal bones, shells, rough stones, large structural daub lumps with impressions of construction and charcoals were found also in the fill.

Feature 170

The shape and dimensions of the pit at the discovery level is unknown, as it was part of a larger stratigraphic complex. According to the field documentation, it was clearly distinguished at lower levels, but it was not drawn. Only a drawing of the cross-section has survived. It shows a trapezoidal pit with a bottom diameter of about 170 cm and depth of 70 cm. There were few artefacts in the fill, where only 130 fragments of pottery were found: a rim of a bowl decorated with wavy and horizontal corded bands (Fig. 13: 1), a fragment of another bowl with a preserved row of stamps (Fig. 13: 2), shards with simple horizontal cord impressions (Fig. 13: 3–5), some with a row of fingerprints, one fragment with a single knob (Fig. 13: 7), an unornamented handle of an amphora (Fig. 13: 10) and rims of other undecorated vessels (Fig. 13: 6, 8–9).

Among flint artefacts there was a retouched blade and burin made of chocolate flint, a retouched flake of Turonian flint and one flake of striped flint. Only a few animal bones, shells and many rough stones were found in the fill.

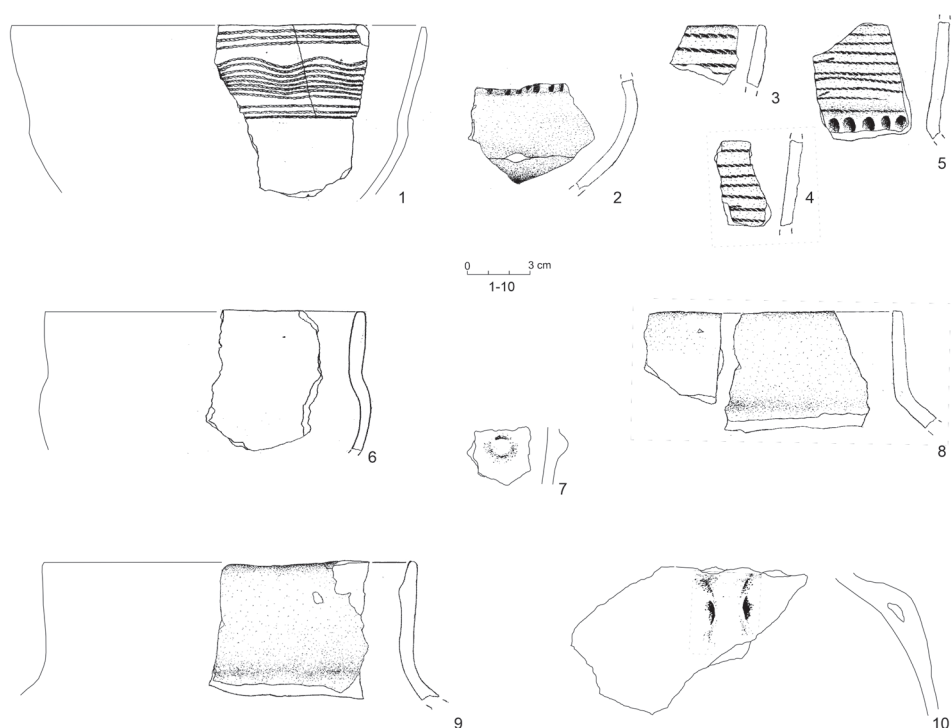


Fig. 13. Złota-Nad Wawrem site, Sandomierz district. Pottery from Feature 170: 1, 6 – after archives of State Archaeological Museum in Warsaw; 2–5, 7–10 – drawn by B. Witkowska

Feature 184

A circular pit with a trapezium-shaped vertical projection, had a diameter of 160 cm at the level of discovery and 250 cm on the bottom. Its depth reached 120 cm [Witkowska, Włodarczak 2021, Fig. 9: a-b]. In the feature were discovered 921 fragments of pottery, originating with at least 55 vessels of which most were decorated with horizontal cord impressions. Those ornaments co-occurred with wavy cord, finger imprints, knobs or a few kinds of stamp [Witkowska, Włodarczak 2021, Fig. 9: 1–15, 10: 1–12]. Among the GAC pottery was an almost complete large Type A amphora identified with the milieu of the early CWC [Witkowska, Włodarczak 2021, Fig. 10: 13].

In Feature 184, 11 flint artefacts were found, mostly unretouched scaled pieces and small flakes. Only one tool was there: a single amorphous Świeciechów flint sidescraper [Witkowska, Włodarczak 2021, Fig. 11]. The fill of the pit yielded four rough stones, many shells, daub lumps with structural impressions and animal bones.

Feature 202

A small, circular pit with a diameter of 100 cm and a depth of 85 cm. In the cross-section an annex forming a step was visible. A patch of burnt clay was also

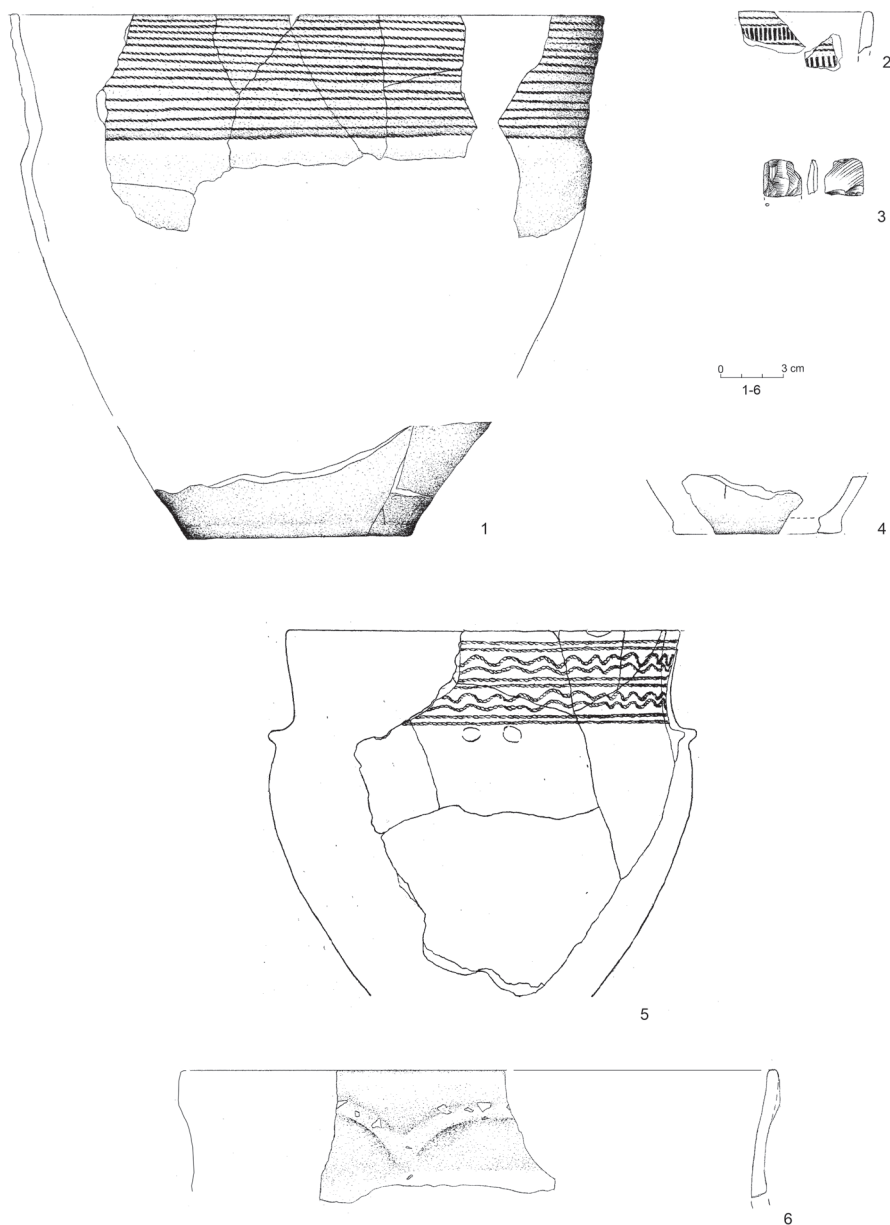


Fig. 14. Złota-Nad Wawrem site, Sandomierz district. Artefacts from Feature 202: 1–4, 6 – drawn by B. Witkowska; 5 – after archives of State Archaeological Museum in Warsaw

found at this level. The function of the pit is undefined. Relatively few materials were found in it. There were about 90 fragments of pottery from four vessels: a large beaker decorated in horizontal cord impressions (Fig. 14: 1), a vessel ornamented by alternating single horizontal and wavy cord lines with double knobs (Fig. 14: 5), a rim with a wavy plastic strip (Fig. 14: 6) and a small rim with a combination of rectangular stamps and single cord impressions (Fig. 14: 2). The rest of the ceramic material is undecorated.

Moreover, in the fill one splintered piece made of Turonian flint (Fig. 14: 3) and 64 shells were discovered.

RESULTS OF RADIOCARBON DATING

Altogether 22 absolute age determinations have been obtained from the features described above (Table 1 and Fig. 15). The AMS radiocarbon tests were carried out in the Poznań Radiocarbon Laboratory, only on osteological material – animal bones. As mentioned above, only homogeneous features of the GAC were selected to date. However, in two cases, they yielded results that differed from our knowledge about chronological ranges of the GAC based on the traditional methods of taxonomic classification of materials. There were radiocarbon determinations of Feature 229 from Site 1 in Mierzanowice (3500 ± 35 BP) and Pit 184 from *Złota-Nad Wawrem* (3545 ± 35 BP). Both dates, after calibration, clearly indicate the first half of the II millennium BC, i.e. the Bronze Age. In the light of the current knowledge about the GAC, adopting such a long chronological framework for the development of this culture is impossible [Witkowska 2021; Witkowska, Włodarczak 2021]. In this context, erroneous results are probably the consequence of mixing materials in the storage.

Most of the remaining dates obtained for GAC settlements from the Sandomierz Upland show a high degree of agreement and almost all of them fall within the range of 2895–2550 BC. This bracket is compatible with the chronological framework defined by the series of radiocarbon dates from the grave assemblages of the Sandomierz-Opatów subgroup [Witkowska 2021]. However, among them, we can distinguish absolute age determinations markedly younger that cross borders of the so-called Neolithic plateau entering the second half of the III millennium BC. These are radiocarbon dates of Features 173 (4030 ± 40 BP) from Site 1 in Mierzanowice or Pit 16 (4065 ± 35 BP) and Pit 202 (3980 ± 35 BP) from *Złota-Nad Wawrem*. The dating of the latter feature is entirely outside the plateau, only assuming 95% probability, somewhat near its limit. Thus young radiocarbon dates were obtained for only a few GAC assemblages from the entire range of their occurrence [Witkowska 2021]. However, their presence obliges us

to consider the possible survival of the Sandomierz-Opatów subgroup deep into the III millennium and examine GAC materials in terms of the possibility of their eventual chronological stratification.

T a b l e 1.

List of radiocarbon dating of settlements features related to the Globular Amphora culture in the Sandomierz Upland.

Site	Feature	Sample material	Lab. No.	Age C14 BP	Date BC	
					68,2%	95,4%
Gąlkowice-Ocin, site 15	pit 1	animal bone	Poz-94504	4100±35	2846–2577	2867–2499
Kichary Nowe, site 2	pit 225	animal bone	Poz-94505	4125±35	2848–2632	2856–2624
Mierzanowice, site 1	pit 173	animal bone	Poz-90811	4030±40	2579–2475	2837–2464
	pit 187	animal bone	Poz-90812	4120±40	2857–2584	2874–2574
	pit 194	animal bone	Poz-90813	4170±40	2877–2676	2886–2627
	pit 211	animal bone	Poz-90814	4130±40	2862–2626	2874–2578
	pit 226	animal bone	Poz-90816	4150±40	2871–2637	2880–2584
	pit 229	animal bone	Poz-90817	3500±35	1884–1768	1924–1699
Mierzanowice, site 4	pit 2	animal bone	Poz-90818	4130±40	2862–2626	2874–2578
	pit 5	animal bone	Poz-90819	4100±40	2848–2577	2870–2498
	pit 19	animal bone	Poz-90820	4190±40	2885–2697	2895–2632
Złota-Nad Wawrem	pit 16	animal bone	Poz-90787	4065±35	2832–2496	2848–2475
	pit 32	animal bone	Poz-90788	4120±35	2856–2585	2871–2576
	pit 49	animal bone	Poz-90789	4155±35	2871–2671	2881–2623
	pit 71	animal bone	Poz-90790	4120±30	2854–2623	2868–2577
	pit 80	animal bone	Poz-90792	4160±35	2873–2672	2881–2627
	pit 90	animal bone	Poz-90793	4135±35	2862–2630	2874–2581
	pit 140	animal bone	Poz-90890	4090±35	2845–2573	2865–2494
	pit 170	animal bone	Poz-90891	4090±35	2845–2573	2865–2494
	pit 184	animal bone	Poz-90892	3545±35	1941–1779	2015–1751
	pit 202	animal bone	Poz-90894	3980±35	2567–2466	2580–2349

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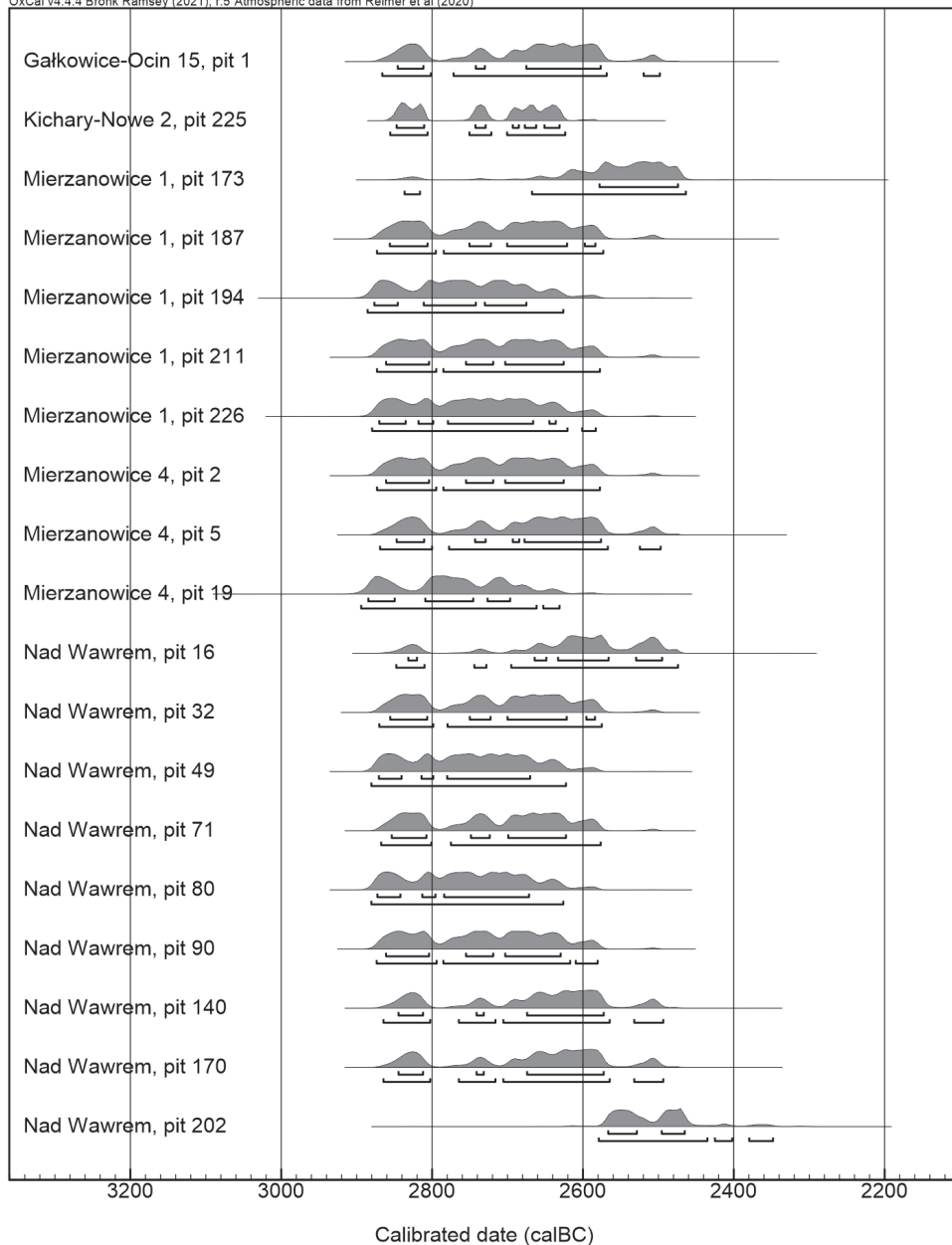


Fig. 15. The calibration of radiocarbon datings obtained within the project NSC 2014/12/S/HS3/00355 from the settlement features of the Globular Amphora culture

Some differences in the style of the ceramic artefacts discovered on upland settlements of the GAC can be noticed when analyzing the ornamentation of vessels from these places. At most sites, apart from unornamented materials, the dominant decorative element is the so-called wavy cord grouped in multiple bands. This is a distinctive ornament of the Sandomierz-Opatów subgroup. It is present in most grave assemblages of the GAC from the Sandomierz Upland [Witkowska 2021], settlement features from Gałkowice-Ocin, Kosowice [Bąbel, Kowalski 1975], Kichary Nowe (unpublished research by Hanna Kowalewska-Marszałek), Wojciechowice [Nosek 1967: 190], Złota [Krzak 1976, Fig. 17: e-f, 19: h, 21: d] and Mierzanowice Site 4 [Gardawski, Miśkiewicz 1958, Pl. XLIX: 2]. At the same time, in the latter settlement, there are also materials with a different, angular style discovered in Pits 2 and 5 [Gardawski, Miśkiewicz 1958, Pl. XLIX: 5, L: 1, Fig. 8]. Whereas, at a nearby Mierzanowice Site 1 corded angular ornamentation dominates and is numerous represented by zigzags [Balcer 1963, pL. II: 1,9; III: 6; VI: 12; VIII: 6], hatched [Balcer 1963, Pl. II: 1; III: 7; VI: 3,13; VIII: 18] or so-called suspended triangles [Balcer 1963, Pl. III: 13; VI: 7; XI: 13] found in features 166, 170c, 173, 174, 195 and 226. This type of ornament is almost absent in the *Złota-Nad Wawrem* settlement, where it occurred on single fragments from Pit 26 (unpublished materials of the State Archaeological Museum in Warsaw). On the pottery from Site 1 in Mierzanowice there is also a wavy cord present, but it is a single line used in combinations different from ornamentation known from *Złota-Nad Wawrem*. The best proof of the disagreement of materials from the two largest settlements of the Sandomierz-Opatów subgroup is the impossibility of applying a typology of decorative motifs developed on the basis of artefacts from Mierzanowice [Balcer 1963, Pl. XII] for a description of vessels found on the GAC settlement in *Złota-Nad Wawrem*. The research question is whether this reflects two chronological horizons or two development lines of the Sandomierz-Opatów subgroup. Due to the nature of the calibration curve, which forms the plateau between 2870–2550 BC, it would be difficult to disprove any thesis by radiocarbon dating.

The presence of the Baden amphora (Fig. 5: 8) among GAC artefact found in Pit16 from the *Nad Wawrem* site in Złota requires a separate discussion. Due to the fact that it was published in a monograph of the Złota culture, this feature is sometimes mistakenly attributed to this taxon [see e.g. Kowalewska-Marszałek 2008: 239; Włodarczak 2008, Fig. 8]. However, the author of this publication properly related it to the GAC [Krzak 1976: 37], considering its presence among the materials of the GAC as proof testifying to contacts between this culture and the Baden groups that preceded the establishment of the Złota culture. From the point of view of mutual contacts between the Baden circle and the GAC, the Sandomierz Upland occupies a special place, due to the geographical proximity of

the two units. Despite this, the materials of the Sandomierz-Opatów subgroup are not distinguished by a large number of badenization markers. This situation may lead to the thesis that the apogee of Baden influence on this area took place after the disappearance of the features identified by us as unequivocal determinants of Sandomierz-Opatów subgroup. According to some researchers, under the influence of Baden impact, groups of the GAC would transform into the Złota culture, in which radial elements are represented very intensively [see e.g. Ścibior 1991; Kruk, Milisauskas 1999: 208–213]. However, the entire series of radiocarbon dating obtained as part of the NSC 2014/12/S/HS3/00355 project does not authorize the construction of sequential development models. At the same time, such a late determination of the absolute age of Feature 16, which contains an element referring to the Baden milieu, is difficult to accept in the light of the absolute chronology of this culture [see Zastawny 2015b; Kruk *et al.* 2018, Tab. 10]. It seems therefore necessary to date another sample from this pit.

CONCLUSIONS

Compared to other groups of the GAC, the Sandomierz-Opatów subgroup has a relatively short chronology (Fig. 16). Probably the GAC appeared in this area in the already developed phase IIIa. Nevertheless, the possibility of its survival deep into the second half of the 3rd millennium BC should be considered, although few dates support it.

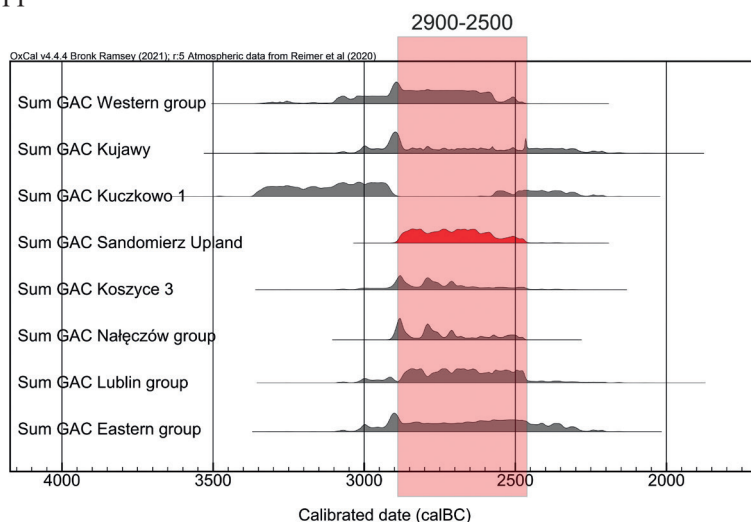


Fig. 16. The summary calibration of absolute chronology of the Globular Amphora culture from different regions

The settlement's features are not closed assemblages, which makes them of little use for classical taxonomic studies leading to the establishment of a relative chronology. However, the series of absolute age determinations obtained from pits of the Sandomierz-Opatów subgroup testify to their research value for chronometric studies. Not only have they confirmed the observations made on the basis of radiocarbon dated cemeteries [Witkowska 2021], but also prompted us to consider the possibility of chronological stratification of GAC materials from the Sandomierz Upland and raised an interesting research question about mutual relations between the GAC and other cultures developing in this region during the 3rd millennium BC.

REFERENCES

- Balcer B.
1963 Osada kultury amfor kulistych na stanowisku I w Mierzanowicach. *Materiały Starożytne* 9: 99–142.
- Bąbel J.
2013 *Cmentarzyska społeczności kultury mierzanowickiej na Wyżynie Sandomierskiej. Obrządek pogrzebowy*. Rzeszów.
- Bąbel J., Kowalski K.
1975 Osada kultury amfor kulistych w Kosowicach, pow. Opatów. *Wiadomości Archeologiczne* 40: 307–316.
- Bronk Ramsey C.
2021 Oxcal v4.4.4. Oxford (www.rlaha.ox.ac.uk).
- Gardawski A., Miśkiewicz J.
1958 Sprawozdanie z badań podjętych w 1957 roku w miejsc. Mierzanowice, pow. Opatów. *Wiadomości Archeologiczne* 25: 322–337.
- Kowalewska-Marszałek H.
2008 The Most Distant Outskirts. The Baden Elements in the Złota Culture (Little Poland). In: M. Furholt, M. Szmyt, A. Zastawny (Eds) *The Baden Complex and the Outside World*. Proceedings of the 12th Annual Meeting of the EAA in Cracow, 19th–24th September 2006. *Studien zur Archäologie in Ostmitteleuropa / Studia nad Pradziejami Europy Środkowej* 4, 233–246. Bonn.
- Kruk J., Milisauskas S.
1999 *Rozkwit i upadek społeczeństw rolniczych neolitu*. Kraków.
- Kruk J., Milisauskas S., Włodarczak P.
2018 *Real time. Radiocarbon Dates and Bayesian Analysis of the Neolithic Settlement at Bronocice, Fourth Millennium BC*. Kraków.
- Krzak Z.
1976 *The Złota Culture*. Wrocław – Warszawa – Kraków.
- Nosek S.
1967 *Kultura amfor kulistych w Polsce*. Wrocław – Warszawa – Kraków.
- Ścibior J.
1991 Odpowiedź dyskutantom. In J. Gurba (Ed.) *Schyłek neolitu i wczesna epoka brązu w Polsce środkowowschodniej. Lubelskie Materiały Archeologiczne* 6: 47–65. Lublin.

Witkowska B.

- 2021 Radiocarbon dating of the archival funeral complexes of the Globular Amphora culture on the Sandomierz Upland: Gajowizna, Malice, Mierzanowice and Sandomierz Sites. *Baltic-Pontic Studies* 25: 7–47.

Witkowska B., Włodarczak P.

- 2021 Relationships between Globular Amphora and Corded Ware occupation phases in Złota-Nad Wawrem site, Sandomierz Upland. Chronometric and stratigraphic evidence. *Baltic-Pontic Studies* 25: 117–158.

Włodarczak P.

- 2008 Corded Ware and Baden Cultures. Outline of chronological and genetic relation based on the finds from western Little Poland. In: M. Furholt, M. Szmyt, A. Zastawny (Eds) *The Baden Complex and the Outside World. Proceedings of the 12th Annual Meeting of the EAA in Cracow, 19th-24th September 2006*. Studien zur Archäologie in Ostmitteleuropa / Studia nad Pradziejami Europy Środkowej 4, 247–287. Bonn.

Wrotek L.

- 1961 Sprawozdanie z prac wykopaliskowych przeprowadzonych w 1959 r. na st. 4 w Mierzanowicach, pow. Opatów. *Sprawozdania Archeologiczne* 13: 23–28.

Zastawny A.

- 2015a The Baden Complex in Lesser Poland – Horizons of cultural influences. In: M. Nowak, A. Zastawny (Eds) *The Baden Culture around the Western Carpathians*. *Via Archeologica* 4, 119–150.
- 2015b Absolute chronology of the Baden culture in Lesser Poland – new radiocarbon dates. In: M. Nowak, A. Zastawny (Eds) *The Baden Culture around the Western Carpathians*. *Via Archeologica* 4, 191–220.

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GRAVE OF THE GLOBULAR AMPHORA CULTURE FROM KOSZYCE IN THE CHRONOLOGICAL PERSPECTIVE

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ABSTRACT

The grave of the Globular Amphora culture from site 2 in Koszyce, near Kraków, has already been the subject of a separate monograph and specialised analyses. This article addresses the chronology of the mass burial, resulting from a comparison of 23 radiocarbon dates obtained in three laboratories. The chronometric data were then juxtaposed with the results of isotopic analyses of strontium ($^{87}\text{Sr}/^{86}\text{Sr}$), carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$). The analysis of the results indicates that the burial from Koszyce should most likely be dated to around 2880–2870 BC, which is slightly earlier than assumed in previous studies. It comes from a time when the Final Eneolithic barrow communities of the Corded Ware culture had already been present in the loess uplands of western Lesser Poland, and the burial ritual of some of the GAC groups was evolving towards the ritual of the Złota

culture. The similar dating of these cultural phenomena makes it difficult to determine which community was responsible for the mass murder committed at Koszyce.

Keywords: Globular Amphora culture, Lesser Poland, radiocarbon chronology, stable isotopes, strontium isotopes, mass grave

INTRODUCTION

In 2011, two funerary features of the Globular Amphora culture (GAC) were discovered at site 2 in Koszyce, Proszowice district (Fig. 1). These were grave 523 and pit 506, the latter with the skeletons of five pigs (Fig. 2). These finds have been comprehensively studied [Przybyła *et al.* 2013] and have been the subject of additional specialist analyses [Konopka *et al.* 2016; Schroeder *et al.* 2019]. Tested by various analyses, including archaeogenetic ones, the grave with the remains of 15 murdered individuals (Figs 3 and 4) has become one of the most spectacular discoveries in the history of research on the Neolithic of Lesser Poland. Since its publication, it has been the subject of discussion in the scientific community. This has brought up the question of explaining the ‘Koszyce massacre’ [Przybyła *et al.* 2013; Schroeder *et al.* 2019]. The absolute dating of the grave, to the beginning of the Late Eneolithic (generally: c. 2900–2700 BC), seemed to indicate a link between the dramatic events and the increased population movements during this period, and above all with the arrival of the people of the Corded Ware culture (CWC). The simplest solution to the riddle would be to assume an execution of a Late Eneolithic population, the GAC, at the hands of a Final Eneolithic people, the CWC. The initial publications of the mass grave from Koszyce appeared at the same time as the ground-breaking works presenting archaeogenetic data [Allentoft *et al.* 2015; Haak *et al.* 2015]. Hence, one of the first interpretations of the event already suggested the involvement of a Final Eneolithic (CWC) population [Schroeder *et al.* 2019]. So far, however, no evidence has been obtained to support this supposition.

A fundamental issue, one with implications for further prehistoric interpretations, is the dating of the features from Koszyce and their positioning against the background of cultural changes in south-eastern Poland in the first half of the 3rd millennium BC. It is also important to compare chronometric data with the results of carbon ^{13}C , nitrogen ^{15}N and strontium $^{87}\text{Sr}/^{86}\text{Sr}$ isotope analyses. This is because these analyses contribute valuable data to the discussion on the mobility and economic characteristics of the Late Eneolithic community under study. These in turn contribute to considerations of the chronology of cultural processes in the Late and Final Eneolithic in Lesser Poland.

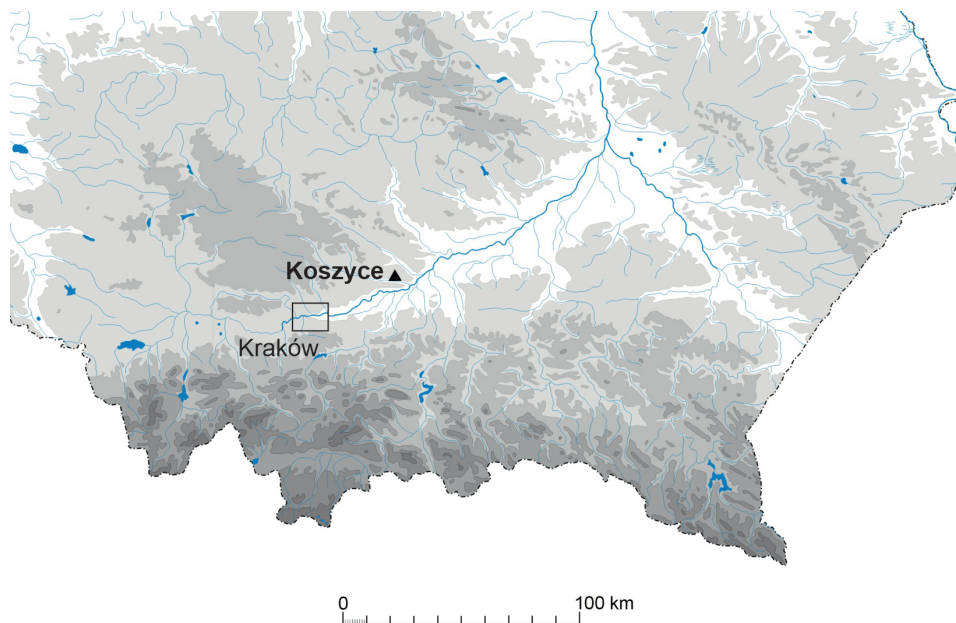


Fig. 1. Location of site 2 at Koszyce, Proszowice district, Lesser Poland

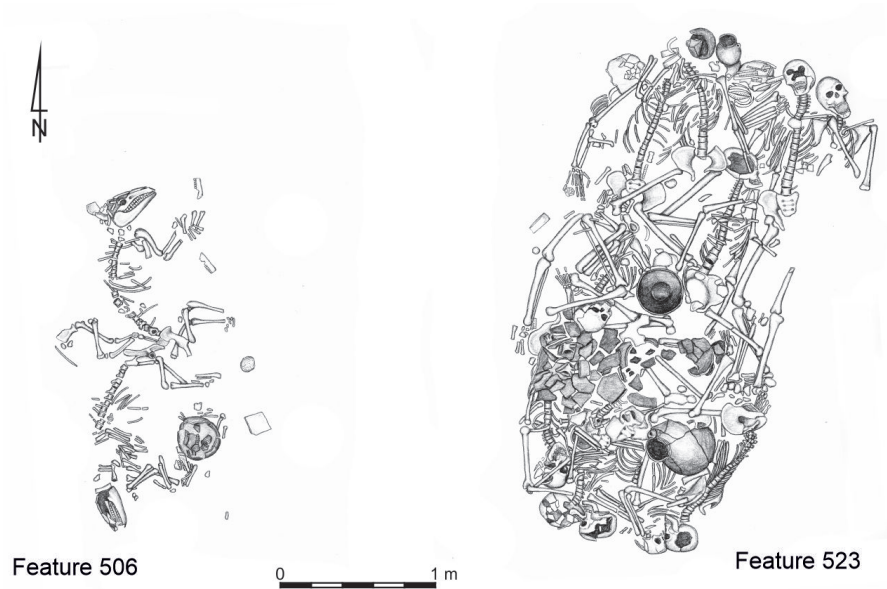


Fig. 2. Koszyce, site 2, Proszowice district. Features 506 (animal sacrifice) and 523 (mass grave). Prep. by M. Podsiadło

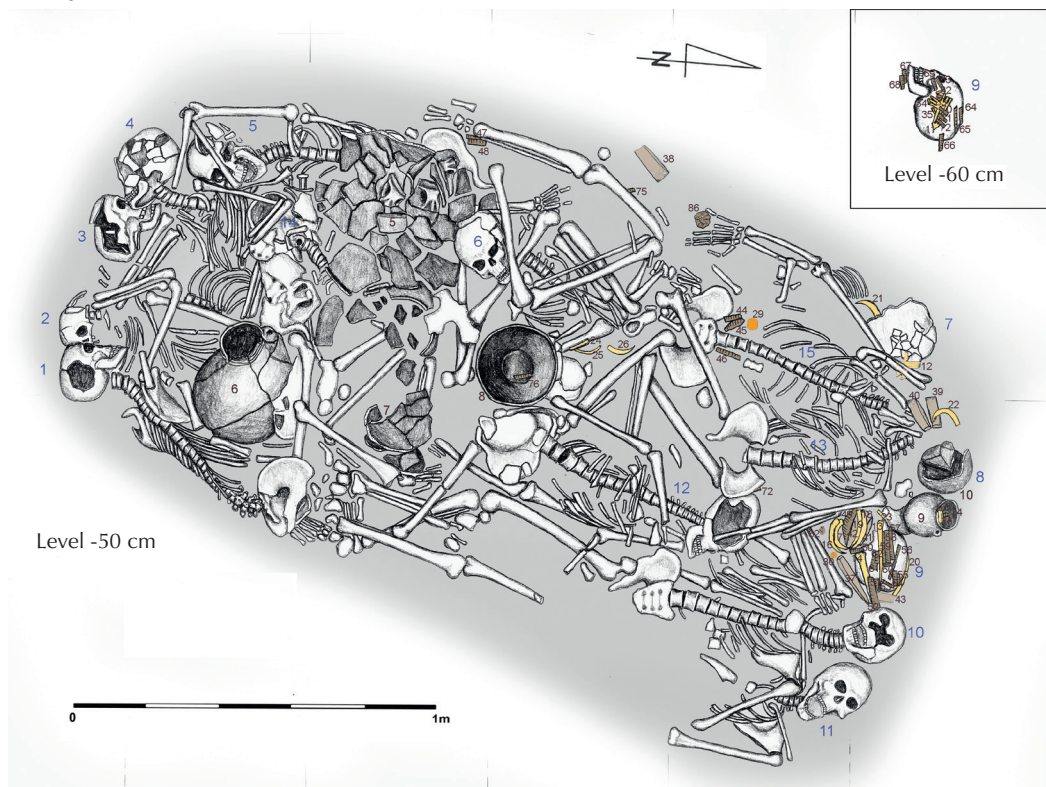


Fig. 3. Koszyce, site 2, Proszowice district. Feature 523. Prep. by M. Podsiadło

**Feature
523**



Fig. 4. Koszyce, site 2, Proszowice district. Feature 523. Photo by M. Podsiadło

The first radiocarbon age determinations for features 506 and 523 from Koszyce were obtained in laboratories in Poznań (5 results) and Uppsala (4 results) [Włodarczak, Przybyła 2013: 235, Tables 5 and 6]. Then, on the occasion of an archaeogenetic project carried out in Copenhagen, 15 further ^{14}C dates were obtained for human skeletons from feature 523 in the Århus laboratory [Schroeder *et al.* 2019]. In total, therefore, we have an impressive series of 23 results for human bones from grave 523 (Table 1) and one date for a pig bone from pit 506 (Table 2). It can be assumed with a high degree of probability that the grave (523) and the sacrificial pit (506) were created at the same time. Similarly, the date of death should be the same (or very close) for all the individuals buried in the mass grave. Chronometric studies of the features from Koszyce are therefore important not only because they pertain to spectacular finds. The large number of dates for a single burial also offers an interesting contribution to the study of the efficiency and precision of the radiocarbon method in determining the absolute age of prehistoric features. On the occasion of the analysis undertaken here, it is worthwhile to give some consideration to the dating of GAC mass burials by means of single and multiple ^{14}C dates.

The results of the absolute dating allow us to confidently place the features from Koszyce in the first half of the 3rd millennium BC (Tables 1 and 2; Fig. 5). More precise dating, however, is difficult to establish. For most of the ^{14}C results obtained, the absolute age falls into the interval corresponding to the extensive flattening of the calibration curve around 2880–2580 BC [Müller 1999; Rietzel-Fabian 2000; Furholt 2003; Włodarczak 2009]. This is a period when distinct changes can be seen in the funerary rituals of communities inhabiting Lesser Poland: the CWC barrow ritual becomes widespread, and the syncretic Złota culture (ZC) rite also appears. In general terms, one can expect a sequence in which the GAC ritual would undergo changes under the influence of the strong allochthonous CWC current (barrows, chamber graves, individualisation of burials), with the ZC rite representing the intermediate stage of this process. However, within the period of 2880–2580 BC detailed here, retardations are also possible, which means we cannot rule out the parallel occurrence of the GAC, CWC, and ZC rites. Moreover, these sequences may differ in character among the different micro-regions of Lesser Poland. The flattening of the curve makes it difficult to systematise these phenomena chronologically.

The second source of inaccuracy lies in the method itself. The differences in the ages obtained for the same material do not allow the age to be determined with the precision sufficient for establishing the dynamic sequence of cultural changes during the analysed period. The series of 23 age determinations obtained for one mass burial from Koszyce provides an excellent demonstration of the difficulties of

T a b l e 1

Koszyce, site 2, Proszowice district. Feature 523. Results of chronometric, isotope and archaeogenetic analysis. After Włodarczak, Przybyła 2013; Schroeder *et al.* 2019

Individual no.	Chromosomal sex	Age, years	14C BP			$\delta^{13}C_{\text{‰}}$ VPDB	$\delta^{15}N_{\text{‰}}$ AIR	87Sr/86Sr	DNA no.	mtDNA haplogroup	ChrY haplogroup
			Poznań	Uppsala	Århus						
1	XX	25-30	Poz-47439: 4085±35	Ua-45617: 4226±46	AAR-28702: 4208±35	-20.1	10.8	KF1240: 0.71053 ±0.000004	RISE1159	T2b	–
2	XY	1.5-2			AAR-28703: 4187±36	-19.9	12.9	KF1241: 0.71048 ±0.000006	RISE1160	T2b	I2a2a
3	XX	30-35			AAR-28704: 4230±36	-20.1	10.9	KF1242: 0.71145 ±0.000008	RISE1161	H27+16093	–
4	XY	16-17			AAR-26315: 4239±33	-20.4	10.4	KF1243: 0.71179 ±0.000009	RISE1162	K1a1b1e	I2a2a
5	XY	20-25	Poz-47441: 4190±35		AAR-28705: 4202±36	-20.1	11.7	KF1244: 0.71022 ±0.000009	RISE1163	HV0a	I2a2a
6	XX	13-14		Ua-45618: 3960±44	AAR-26316: 4014±45	-20.2	8.5	KF1245: 0.71151 ±0.000006	RISE1164	K1a1b1e	–
7	XY	2-2.5			AAR-28706: 4220±34	-19.6	12.5	KF1246: 0.70991 ±0.000006	RISE1165	HV16	I2a2a
8	XX	30-35			AAR-26317: 4330±34	-20.3	11.4	KF1247: 0.71201 ±0.000006	RISE1166	J1c3f	–

Individual no.	Chromosomal sex	Age, years	14C BP			$\delta^{13}\text{C}_{\text{‰}}$ VPDB	$\delta^{15}\text{N}_{\text{‰}}$ AIR	87Sr/86Sr	DNA no.	mtDNA haplogroup	ChrY haplogroup
			Poznań	Uppsala	Århus						
9	XX	15-16	Poz-47442: 4165±35	Ua-45619: 3985±38	AAR-26318: 4204±44	-20.5	10.0	KF1248: 0.71188 ±0.000005	RISE1167	J1c3f	–
10	XY	18-20			AAR-26319: 4126±36	-20.1	10.4	KF1249: 0.71151 ±0.000005	RISE1168	HV0a	I2a2a
11	XY	40-50			AAR-28707: 4215±35	-20.3	11.6	KF1250: 0.71152 ±0.000008	RISE1169	HV0a	I2a2a
12	XX	30-40	Poz-47440: 4215±35		AAR-28708: 4211±40	-20.3	11.1	KF1251: 0.71132 ±0.000007	RISE1170	K1a1b1e	–
13	XY	5-6			AAR-28709: 4264±34	-19.9	11.6	KF1252: 0.71045 ±0.000006	RISE1171	J1c3f	I2a2a
14	XX	50-60		Ua-45620: 4119±38	AAR-28710: 4379±32	-20.3	11.1	KF1253: 0.70963 ±0.000006	RISE1172	HV0a	–
15	XY	40-50			AAR-26320: 4099±53	-21.1	11.3	KF1254: 0.71099 ±0.000005	RISE1173	HV0a	I2a2a

Koszyce, site 2, Proszowice district. Radiocarbon dating of Feature 506

Feature No.	Dated material	Laboratory code	Age ^{14}C BP	Calendar age BC (68.2%)
506	pig bone	Poz-47437	4125 \pm 35	2858–2625

radiocarbon dating. A comparison of the results obtained in the three laboratories generally indicates the effectiveness of the method: most results oscillate within a similar section of the first half of the 3rd millennium BC. At the same time, differences between individual results are evident (Fig. 6). They concern the BP values obtained for the series from each laboratory, with the range of results being greatest for the analyses from the Uppsala laboratory (Fig. 7). In the longest series of 15 dates from the Århus laboratory, there were as many as five outliers: two older and three younger. If we had only the oldest result from this series, the age of the Koszyce grave would be determined as between 3022 and 2922 BC (68.2%), while based on the youngest result alone we would obtain a range of 2574–2472 BC (68.2%). These are therefore significantly different ranges, indicating at the same time different cultural-chronological connotations: in the first case, the Koszyce grave would be contemporary with the late Baden culture, and in the second case with the cemeteries of the Kraków-Sandomierz group of the CWC.

In the case of the Koszyce grave, the stratigraphic situation is suggestively clear: the burials are certainly contemporaneous and establishing their age is facilitated by the statistical coincidence of most of the numerous ^{14}C determinations made. Nevertheless, this example highlights the difficulties in the dating of GAC mass graves. Sometimes, the long-term use of a ceremonial-funeral site is assumed on the basis of a longer [e.g. Kierzkowo, *see* Pospieszny 2017] or shorter [e.g. Nakonowo, *see* Szmyt 2017] series of age determinations. The results obtained for the burial from Koszyce demand caution be taken in such interpretations: radiocarbon age determinations can relatively easily lead to erroneous conclusions of a long duration of a ceremonial-funeral site.

A comparison of the three series of radiocarbon age determinations from Koszyce also reveals statistical differences in the ages obtained in different laboratories (Fig. 7). Averaging the results from Århus indicates an age slightly older than that of the Poznań series, with the youngest results coming from the laboratory in Uppsala. It should be noted here that the averaged series of age determinations from Poznań is the only one for which the OxCal calibration software does not indicate a low concordance test result.

Determining – using the R_Combine function – the averaged BP age for all 15 results from the Århus laboratory, we arrive at the calendar age range of the analysed grave: 2890–2789 BC (68.3%), with the narrow range of 2890–2874 BC being the most likely (62.8%) (Fig. 8). Rejecting the five outliers from this

OxCal v4.4.4 Bronk Ramsey (2021); r5 Atmospheric data from Reimer et al (2020)

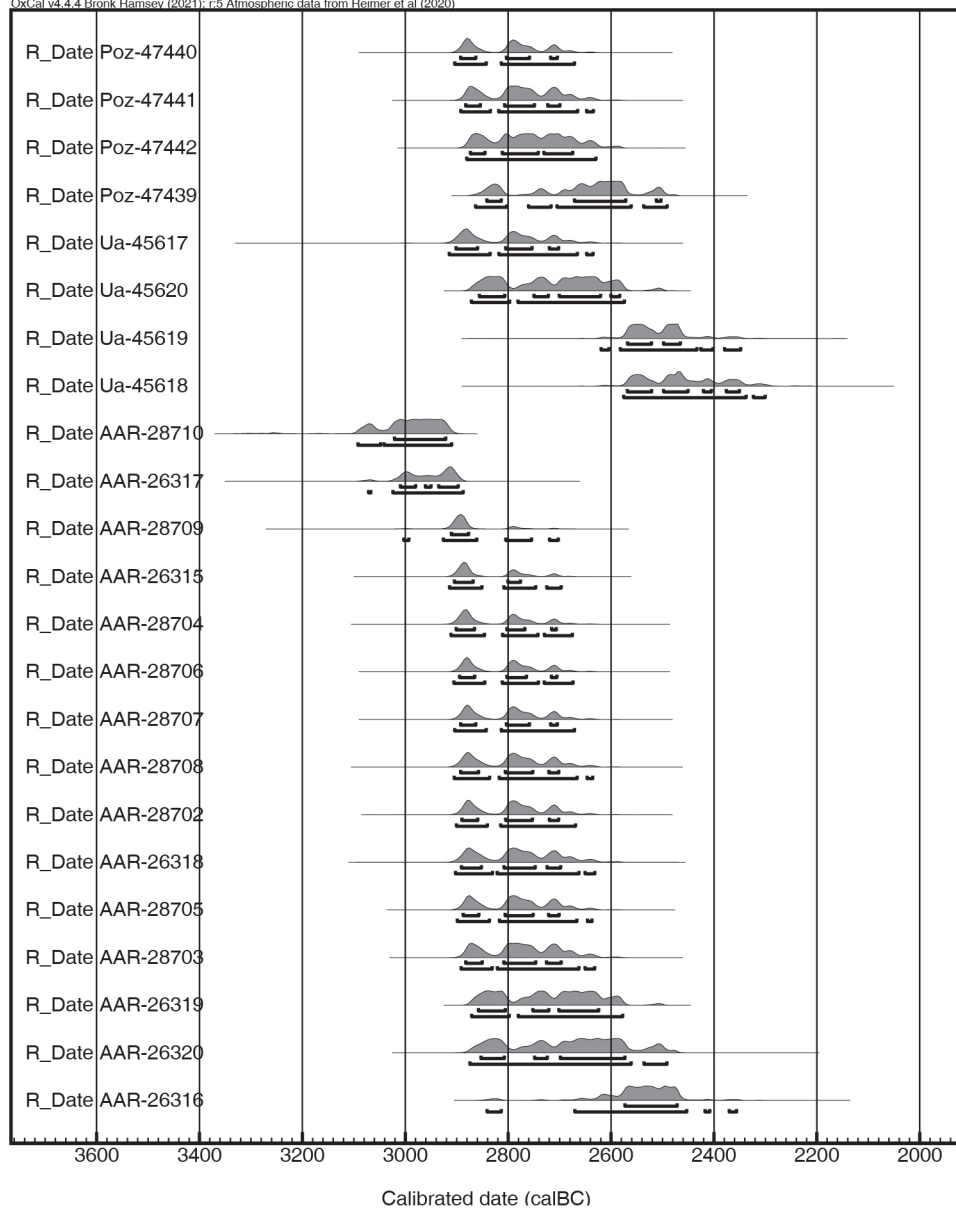


Fig. 5. Koszyce, site 2, Proszowice district. Radiocarbon dates of Feature 523. Calibration by OxCal program v4.4.4

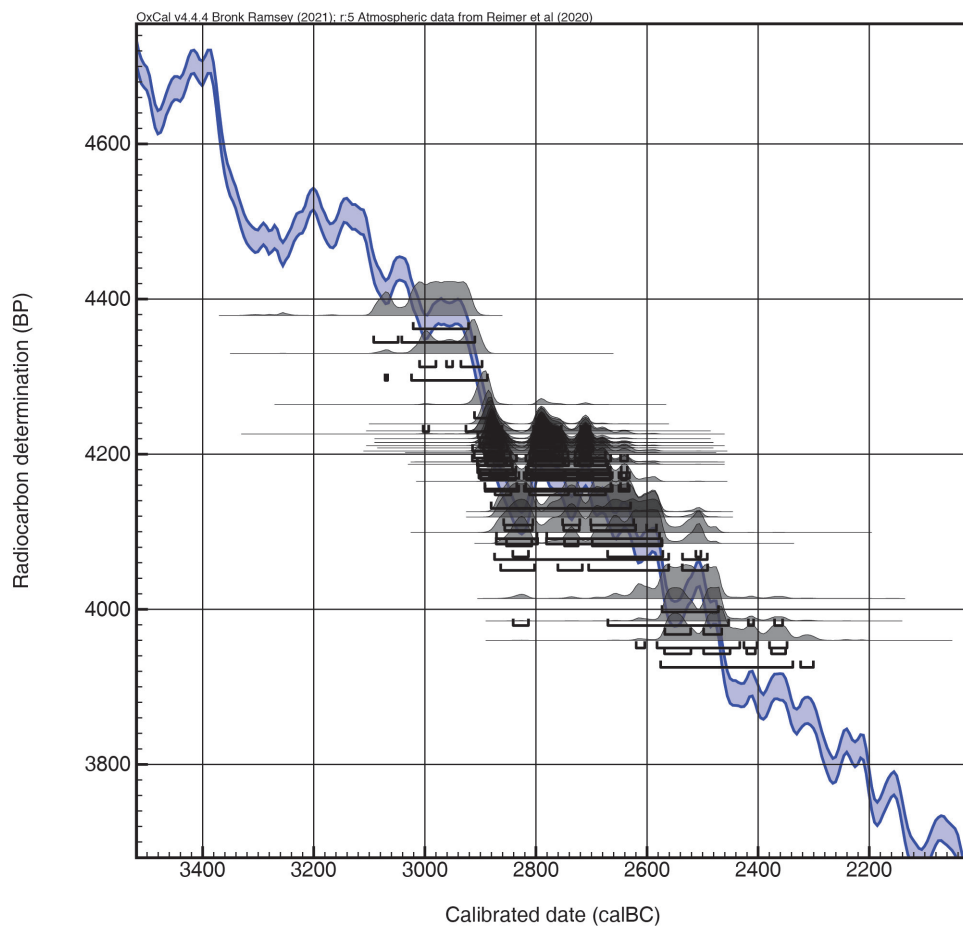


Fig. 6. Koszyce, site 2, Proszowice district. ^{14}C dating of Feature 523 on calibration curve. Calibration by OxCal program v4.4.4

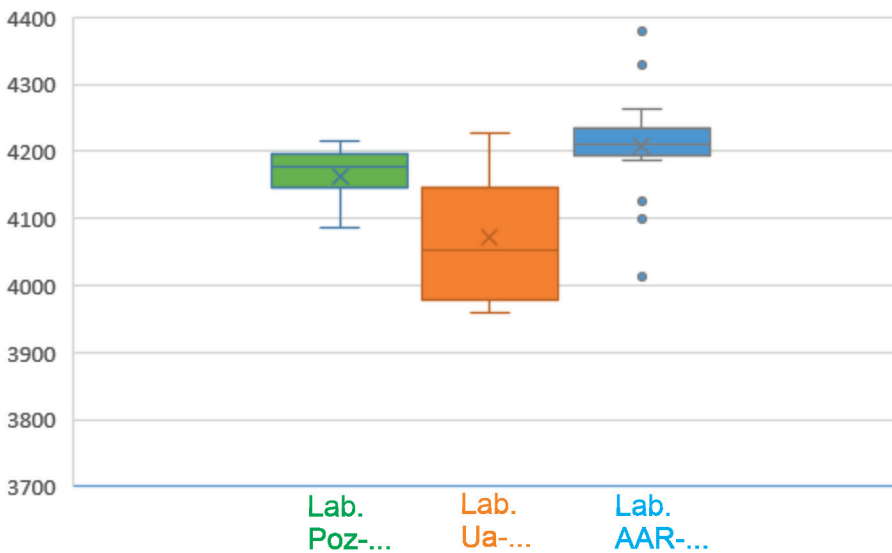


Fig. 7. Koszyce, site 2, Proszowice district. Feature 523. Comparing of BP values from three radiocarbon laboratories. Prep. by P. Włodarczak

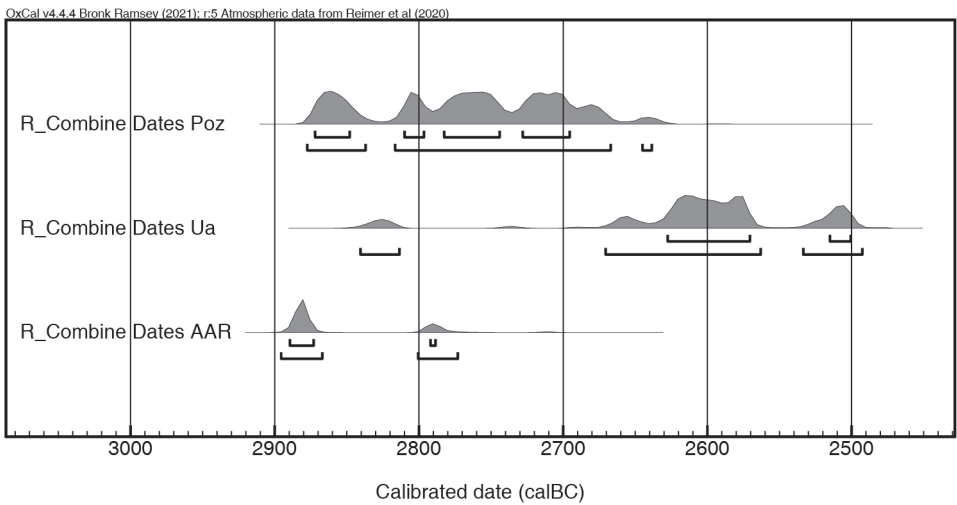


Fig. 8. Koszyce, site 2, Proszowice district. Feature 523. Calendar age BC obtained for averaged BP values from three radiocarbon laboratories (function R_Combine in OxCal program v4.4.4)

group yields a range of 2889–2786 BC (68.3%), with 2889–2873 BC as the most probable range. The series from the Poznań laboratory gives quite similar results: 2873–2696 BC. In this case, after the removal of one result for individual no. 1 (4085 ± 35 BP), a slight outlier, we obtain a range of 2880–2704 BC, which correlates quite well with the results from Århus. What is impossible to reconcile with all these findings, however, are the results obtained in Uppsala, among which only one of the four (for individual no. 1) is consistent with the results from the other two laboratories.

As can be seen from the comments above, even with the numerous ^{14}C determinations obtained using the AMS method in three different laboratories, establishing an exact calendar age for the grave from Koszyce is not an easy matter. Based on the relatively concordant series from Århus and Poznań, this age can be estimated to be in the first half of the 29th century BC, with a range of approx. 2880–2870 BC being the most likely. This result cannot be correlated well with the dating of a pig bone from sacrificial pit 506 (Table 2), which should indicate the same calendar age. However, this single determination can hardly be weighed against the statistically more significant age estimate for the human grave based on numerous radiocarbon age determinations. It should also be noted that two alternative options of dating the human burial from Koszyce – to the second half of the 29th century, or to approx. 2800–2700 BC – are statistically only slightly less likely.

COMPARISON WITH THE DATING OF OTHER LATE AND FINAL ENEOLITHIC GRAVES FROM THE LESSER POLAND UPLAND

In the last 20 years, a large number of radiocarbon dates have been obtained for GAC, ZC, and CWC graves, allowing the chronological scheme to be refined. First of all, the age of the features from Koszyce can be compared to the dating of other GAC burials. Most relevant here are the data available for the closest cemeteries in the Sandomierz Upland: Malice, Sandomierz district [Witkowska *et al.* 2021]; Sadowie, Opatów district [Pasterkiewicz 2021]; and Złota-Gajowizna, Sandomierz district [Witkowska *et al.* 2020]. For all these sites, results were obtained that were troublesome in a way similar to the case of Koszyce. This is because there are values among them that clearly diverge from the others. The dates obtained for the mass grave from Malice are internally the most consistent and, as in Koszyce, they point to the 29th century BC as the most likely time range. A similar chronology of the Sadowie and Złota sites is also possible, although in these cases the individual results are surprisingly divergent.

What all the cemeteries discussed above have in common is the co-occurrence of human graves (mainly mass graves) and sacrificial pits with animal skeletons.

The spatial arrangement of ceremonial-funeral sites there consisted mainly of pairs of such features; less frequently, human burials were accompanied by two pits with animal skeletons, with examples known from Sadowie and Złota-*Gajowizna*. So far, ordered arrangements formed by human graves and associated sacrificial pits have only been recorded in the Sandomierz Upland, at Malice, Sadowie and Złota. From the broader perspective of south-eastern Poland, single human burials accompanied by animal sacrifices are also known from the Nałęczów subgroup and the East Lublin subgroup [Włodarczak, Przybyła 2013: 220–222]. It is noteworthy that the radiocarbon dates obtained for such burials place them among the older features of the GAC in Lesser Poland (e.g. Raciborowice-Kolonia, Hrubieszów district or Parchatka, Puławy district) [Włodarczak 2016: 538, Tables 1 and 2]. This could indicate a continuation of a slightly older (Baden) tradition of matching human and animal burials [e.g. Szmyt 2008], which gradually disappeared and by around 2600–2500 BC (when the Kraków-Sandomierz CWC group began to develop) was already absent from the funerary rites of Lesser Poland communities.

A weak point in the general chronology of the CWC is the limited possibility for precise dating of the oldest phase in many areas of Central Europe, including Lesser Poland. In addition to the aforementioned problems with the flattening of the calibration curve, there is also a lack of suitable materials for making precise absolute age determinations. This situation is likely to change over time, as evidenced by a series of early dates, around 2900 BC, recently obtained for CWC graves from the Czech Republic [Dobeš *et al.* 2021]. These results disprove the suggestion of correlating the A horizon with the dendrochronologically dated oldest phase of the CWC in Switzerland [Włodarczak 2007; 2009]. They also indicate unequivocally that the grave from Koszyce and most of the other GAC graves from Lesser Poland come from a period when the tradition of CWC barrow cemeteries was already present in Central Europe. Proving the synchronicity of the two rituals in the area of western Lesser Poland remains another matter.

When evidence from different regions is brought together, the contemporaneity of the GAC cemeteries and the oldest CWC barrow graves in south-eastern Poland must be considered to be very likely [see Włodarczak 2018; Jarosz, Włodarczak 2022]. In western Lesser Poland, the only AMS date for a barrow of the older CWC phase comes from grave 1 from Gabułów: 2850–2580 BC (68.2%) [Jarosz, Włodarczak 2007]. This is only slightly younger than the calendar age indicated above for the Koszyce grave. In the Carpathian zone, barrow burials from Bierówka and Średnia point to the very beginning of the 3rd millennium BC. They are therefore even older than most of the GAC graves in Lesser Poland [Włodarczak 2018; Jarosz, Włodarczak 2022].

The age of the grave from Koszyce is also close to the oldest dates obtained for ZC burials (Table 3), although it should be noted that most of the results indicate a slightly younger age for the ZC graves. For example, the graves from Sandomierz (Mały Rynek site) and Samborzec (graves 12 and 20) were certainly younger. The

ZC cemeteries illustrate a process in which the influence of the Final Eneolithic CWC ideology, associated with the expansion of a barrow population of Eastern European origin, leads to the transformation of the essentially Late Eneolithic funerary ritual of the GAC. Thus, the dating of the ZC features also emphasises the presence of CWC cultural influences in south-eastern Poland between c. 2900 and 2600 BC. This is particularly important for the older part of this range, as we still do not have many radiocarbon dates from Final Eneolithic barrows for it.

Table 3

List of ^{14}C dates obtained for graves of the Złota culture

Site	Grave no., skeleton no.	Laboratory code	Dated material	Age ^{14}C BP	Calendar age BC (68.2%)	Literature
Kleczanów 8		Poz-121192	human bone	4225±35	2898-2707	Bajka, Florek 2020
Samborzec 1	12	Poz-34687	human bone	4170±35	2877-2695	Włodarczak 2013
Samborzec 1	20	Poz-34731	human bone	4085±35	2838-2506	Włodarczak 2013
Sandomierz 9 (<i>Salve Regina</i>)		Gd-6094	charcoal	4390±100	3320-2902	Ścibior 1993
Sandomierz 1 (<i>Mały Rynek</i>)		Poz-57504	human bone	4140±35	2864-2634	Bajka <i>et al.</i> 2018
Sandomierz 1 (<i>Mały Rynek</i>)		Poz-57502	pig bone	4040±35	2619-2490	Bajka <i>et al.</i> 2018
Święcica 30	1a	Poz-101614	human bone	4160±35	2872-2679	Bajka, Sieradzka 2019
Święcica 30	1a	Poz-101615	human bone	4120±35	2858-2621	Bajka, Sieradzka 2019
Wilczyce 90	10	Poz-34732	human bone	4165±35	2874-2680	Włodarczak 2013
Złota–Grodzisko I	33(325), skeleton D	GrN-9143	human bone	4260±80	3011-2696	Krzak 1989
Złota–Grodzisko I	10(169), skeleton B	GrN-9141	human bone	4220±40	2897-2708	Krzak 1989
Złota–Grodzisko I	43(355), skeleton B	GrN-12514	human bone	4155±30	2870-2695	Krzak 1989
Złota–Grodzisko I	42(354), skeleton A	GrN-9142	human bone	4080±55	2851-2498	Krzak 1989

Site	Grave no., skeleton no.	Laboratory code	Dated material	Age ¹⁴ C BP	Calendar age BC (68.2%)	Literature
<i>Złota–Grodzisko I</i>	10(169), skeleton C	GrN-9147	human bone	4070±55	2848-2492	Krzak 1989
<i>Złota–Nad Wawrem</i>	10, skeleton XIII	GrN-9145	human bone	4195±35	2886-2701	Krzak 1989
<i>Złota–Nad Wawrem</i>	4, northern skeleton	GrN-9144	human bone	4180±35	2880-2696	Krzak 1989

There are sites of the Baden complex known from the loess uplands of western Lesser Poland, in the vicinity of Koszyce, although they date from its early phase (Beaker-Baden). These are undoubtedly traces of settlement clearly pre-dating the GAC features analysed here. The same is indicated by the radiocarbon dating of a settlement pit from the nearby, well-known site 1 at Książnice Wielkie: c. 3300–3100 BC [Brzeska-Zastawna, Zastawny 2020: 309, 310], which is consistent with the results obtained for the BR IV phase at Bronocice [Kruk *et al.* 2018]. So far, chronometric evidence of the contemporaneity of the Baden and GAC settlement in western Lesser Poland is lacking.

STABLE CARBON AND NITROGEN ISOTOPE ANALYSIS OF HUMAN SKELETAL REMAINS BURIED IN THE MASS GRAVE IN KOSZYCE – SOME REMARKS

The detailed analysis of stable carbon and nitrogen isotopes to determine the diet of the individuals buried in Koszyce was presented by G. Eriksson and R. Howcroft [2013] and summarised by Schroeder *et al.* [2019]. In recent years, analyses of the aforementioned isotopes were carried out for representatives of the CWC from south-eastern Poland [Szczepanek, Jarosz 2022]. The results of these studies along with the analyses of strontium isotope composition and genetic studies [Schroeder *et al.* 2019] allowed us to enrich the previously published syntheses, which only concerned the diet of those buried in the mass grave from Koszyce (Fig. 9).

Comparing the content of stable carbon and nitrogen isotopes in the skeletal samples of the family group from Koszyce with the data available for the CWC, it

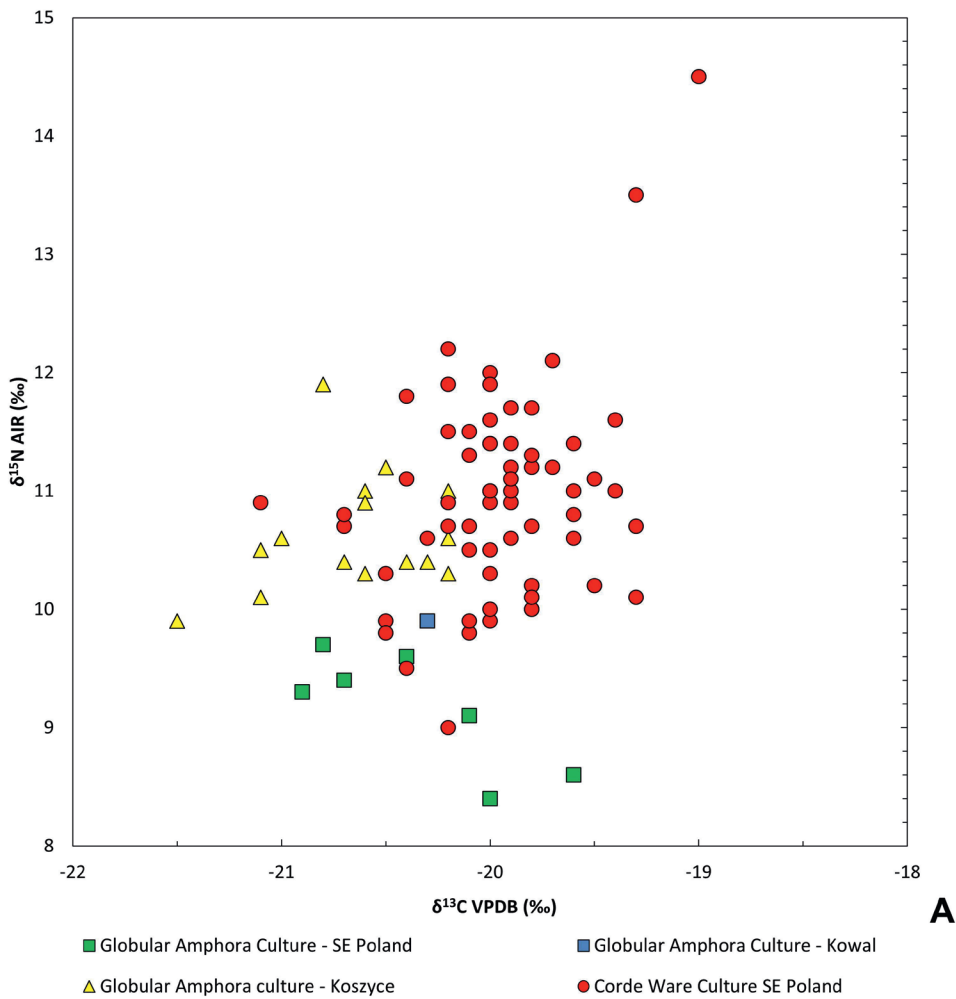


Fig. 9A. Koszyce, site 2, Proszowice district. Feature 523. $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ isotope values in collagen samples from human bones: A – family group from Koszyce on the background of late and final Eneolithic series. Prep. by A. Szczepanek

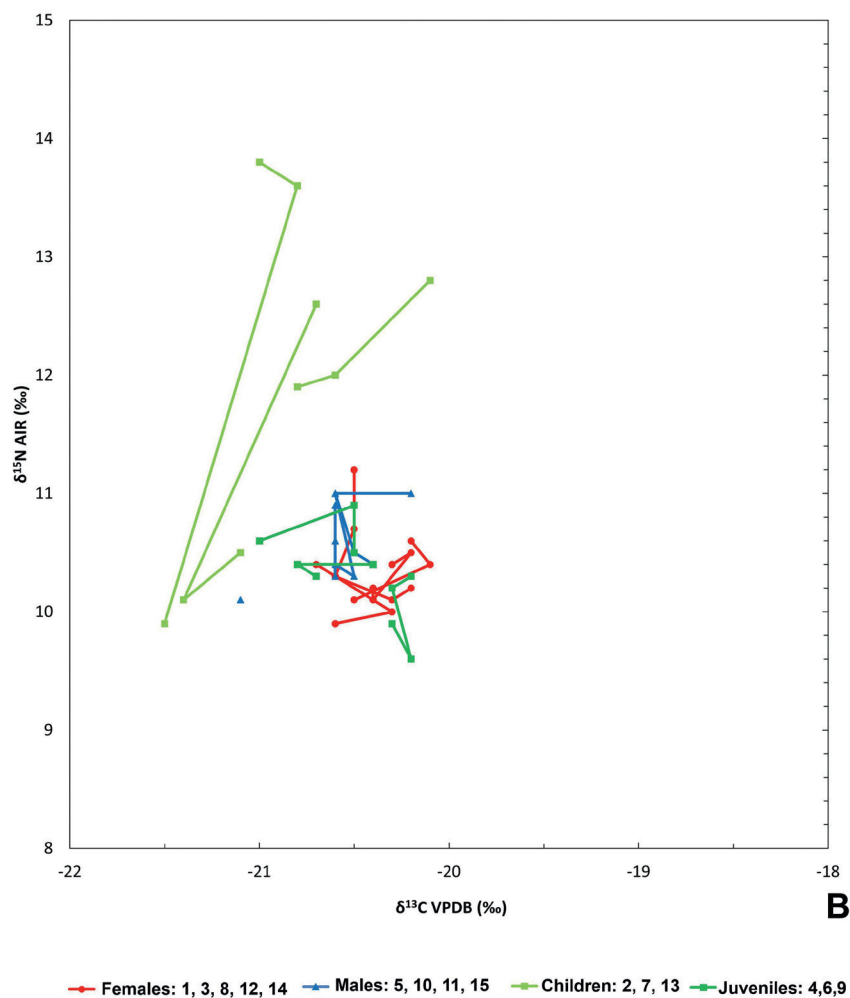


Fig. 9B. Koszyce, site 2, Proszowice district. Feature 523. $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ isotope values in collagen samples from human bones: B – isotope values for the group from Koszyce depending on the age and sex of the buried individuals [values acc. to Eriksson, Howcroft 2013, Table 2]. Prep. by A. Szczepanek

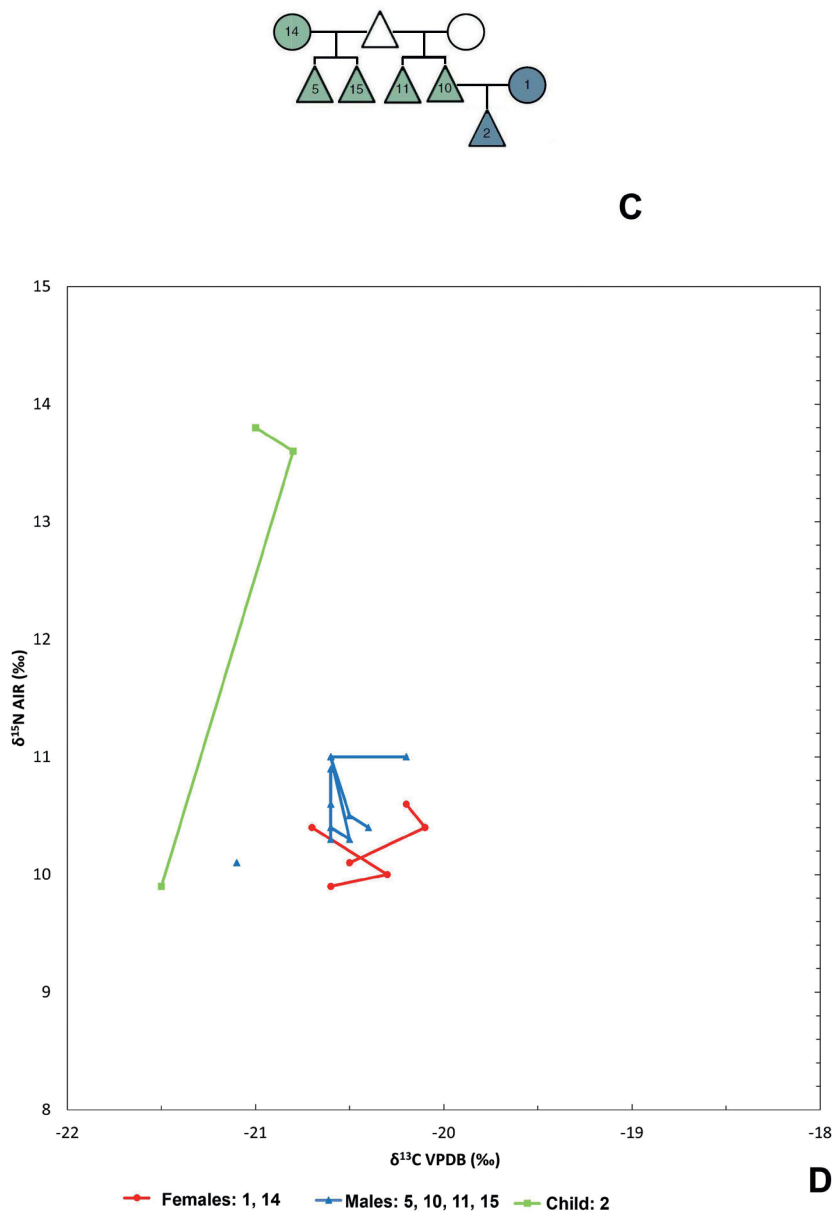


Fig. 9CD. Koszyce, site 2, Proszowice district. Feature 523. $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ isotope values in collagen samples from human bones: C – genetic structure of kinship of selected individuals from the mass grave in Koszyce [acc. to Schroeder *et al.* 2019, fig. 3]; D – isotope values obtained for a group of closely related individuals (C). Prep. by A. Szczepanek

should be noted that the group from the mass grave falls in the middle of the range of variation in isotopic values obtained for the CWC population (Fig. 9: A). The results for the group from Koszyce are clearly higher than the values recorded for other GAC graves [Kozłowski *et al.* 2014; Szczepanek, Jarosz 2022], pointing, among other things, to the higher proportion of animal protein in the diet of the group from Koszyce.

Analyses of the stable carbon and nitrogen isotope content in a series of samples obtained from both the bones and teeth of the Koszyce population [Eriksson, Howcroft 2013] show the typical variation resulting from the age at death of those buried (Fig. 9: B), with a distinctive group of the youngest children (individuals 2, 7, and 13). The differences between adult females and males are not clearly discernible, although for most of the males the obtained $\delta^{15}\text{N}$ values are slightly higher. Using the results of genetic studies (Fig. 9: C), the data acquired for the group of closely related individuals are presented (Fig. 9: D). In this case differences in the diet of the buried males and females are clearly visible, although it should be noted that the data are not numerous.

MOBILITY OF THE HUMAN GROUP BURIED IN THE MASS BURIAL FROM KOSZYCE

Analyses of the strontium ($^{87}\text{Sr}/^{86}\text{Sr}$) isotopic composition of human tooth enamel and the results of anthropological and genetic analysis [Schroeder *et al.* 2019], along with the determination of ranges of local strontium isotope values in south-eastern Poland [Bełka *et al.* 2022], have made it possible to refine previously published conclusions regarding the origin of the buried individuals. The article by Schroeder *et al.* [2019] concluded that on the basis of the local bioavailable $^{87}\text{Sr}/^{86}\text{Sr}$ values ranging between 0.7095 and 0.7105 it seems plausible that some of the Koszyce family members with Sr isotope within this range were born in the area around Koszyce, while the rest, who show a slightly more radiogenic Sr isotope composition ($^{87}\text{Sr}/^{86}\text{Sr} = 0.7113\text{--}0.7120$), might have been born elsewhere in the region of south-eastern Poland. Given the geological complexity of this region and the limitations of the $^{87}\text{Sr}/^{86}\text{Sr}$ isotope method, it is difficult to determine where exactly they might have originated. However, the latest studies [Błaszczuk *et al.* 2018; Bełka *et al.* 2022] point to the Świętokrzyskie Mountains and the vicinity of Sandomierz as the possible area of origin. The geological substrate there abounds with rocks and sediments characterised by high values of $^{87}\text{Sr}/^{86}\text{Sr}$ [Walczak, Bełka 2017]. Studies of early medieval burials from the Sandomierz area have established the local range of $^{87}\text{Sr}/^{86}\text{Sr}$ values as between 0.7106 and 0.7132 [Błaszczuk *et al.* 2018]. It is therefore possible that the non-local individuals

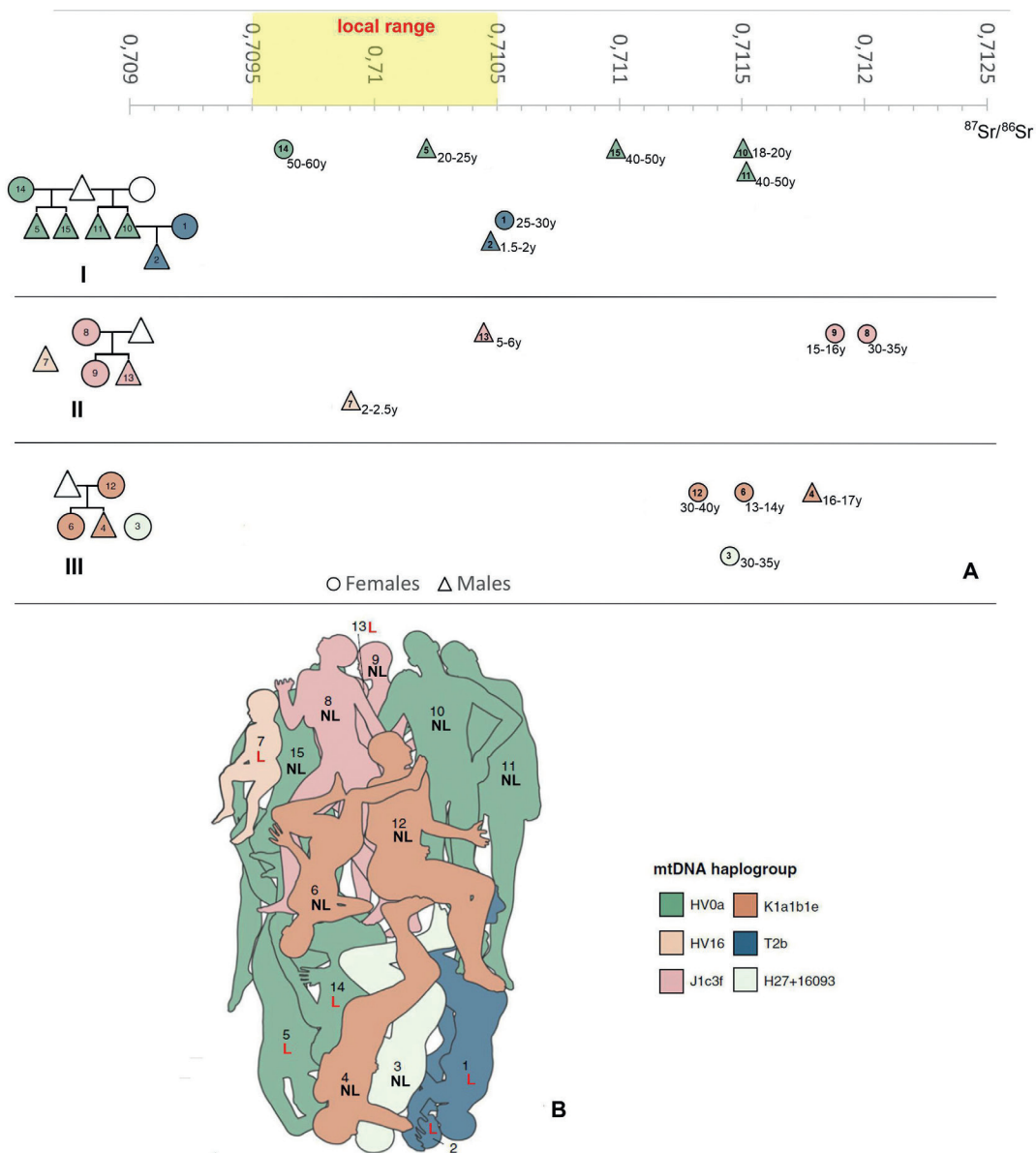


Fig. 10. Koszyce, site 2, Proszowice district. Feature 523: A – strontium isotope composition ($^{87}\text{Sr}/^{86}\text{Sr}$) of human tooth enamel; the range of $^{87}\text{Sr}/^{86}\text{Sr}$ values typical for the local population is marked in yellow; B – distribution of individuals of local (L) or non-local (NL) origin in the grave; I-III – genetically distinguished family groups [acc. to Schroeder *et al.* 2019, fig. 3, supplemented]. Prep. by A. Szczepanek

arrived from this area. A detailed analysis of the obtained isotopic signatures is presented below, also taking into account the kinship links established through aDNA studies (Table 1; Fig. 10).

- 1/ The group of individuals with local strontium isotope values of $^{87}\text{Sr}/^{86}\text{Sr}$:
 - contains the remains of the oldest woman (14), as well as her younger son (5), the youngest unrelated children (2, 7 and 13), and a woman (1) who is the mother of child no. 2;
 - the presence of the youngest children in this group, especially boy no. 13, the son of the non-local mother (8), who died at the age of 5–6, may mark the arrival of a ‘foreign’ group, as the older daughter (9) of this woman spent her childhood in another area.
- 2/ mtDNA family group HV0a – T2b:
 - the oldest woman (14) is of local origin; she may have changed her place of living in her youth, as evidenced by the slightly higher isotopic signature obtained for her elder son (15); her younger son (5), on the other hand, had already spent his childhood in the Koszyce area;
 - of local origin are woman (1) and her child (2), whose father is a non-local man (10) related to the sons of woman 14; the brother of man 10 is also a non-local (11).
- 3/ mtDNA family group J1c3f and individual HV16
 - a boy aged 5–6 years (13) is of local origin, while his mother (8) and sister (9), who died aged 15–16 years, spent their childhood in an environment with higher strontium isotope values; a boy (7) aged 2–2.5 years who is related to these individuals is also of local origin.
- 4/ mtDNA family group K1a1b1e and individual H27+16093
 - all individuals are of non-local origin and were buried next to each other in the upper part of the antipodal arrangement of the bodies.
- 5/ The arrangement of the remains of the deceased in the grave does not directly reflect their ancestry, but it can be seen that related individuals with similar isotopic values, e.g. individuals 1 and 2, individuals 8 and 9, and individuals 10 and 11, were buried close to each other.

Missing from each of the distinguished family groups are the fathers of boys and men who share the same haplogroup of the Y chromosome (I2a-L801). It is therefore difficult to determine their origins. The presence of only a single Y chromosome lineage, combined with the high diversity of mtDNA lineages, is certainly consistent with a patrilocality residence system. The results of the genetic

study allowed us to reconstruct a network of close genetic links among almost all of the buried individuals, with the exception of female no. 3 [Schroeder *et al.* 2019]. Such a genetic structure of the group is of importance when considering the organisation of local communities.

Taken as a whole, therefore, the strontium analyses indicate that the GAC group under study (or at least part of it) had been living in western Lesser Poland for several years. At the same time, isotopic indicators suggesting an allochthonous origin of some of its members are clear. They probably came from the area of the Świętokrzyskie Mountains – Sandomierz Upland, a suggestion which can also be supported by the results of archaeological analyses.

IN LIGHT OF GRAVE EQUIPMENT

Rich furnishings were discovered in grave 523 from Koszyce, consisting of 88 items: six vessels (four amphorae, a bowl, and a vase-like vessel; Fig. 11), eight amber ornaments (Fig. 12: 19–26), two bone ornaments (T-shaped pendants; Fig. 12: 3, 4), two bone tools (a chisel and an awl; Fig. 12: 1, 2), an unspecified bone object (Fig. 12: 5), 13 boar tusks (Fig. 12: 6–18), 50 flint artefacts (five axes, two chisels, 41 blades and flakes, a core and a scale; Fig. 13), and six unworked animal bones. In sacrificial pit 506, an amphora and three grinding plate fragments were found next to pig skeletons. The artefacts are typical of the Lesser Poland GAC, including materials from the left bank of the Vistula. The pottery is characteristic of the late (third) developmental phase of this culture, belonging most probably to subphase IIIa [Włodarczak, Przybyła 2013: 234]. Unfortunately, the flint assemblage from the investigated site is so far the only so large flint inventory from the loess uplands of western Lesser Poland. Hence, it is difficult to determine whether these materials are local in character or typical of other areas. Comparative analysis has indicated the presence of good, close analogies to the finds from Koszyce primarily in the GAC materials from the Sandomierz Upland and the Nałęczów Plateau [Włodarczak, Przybyła 2013].

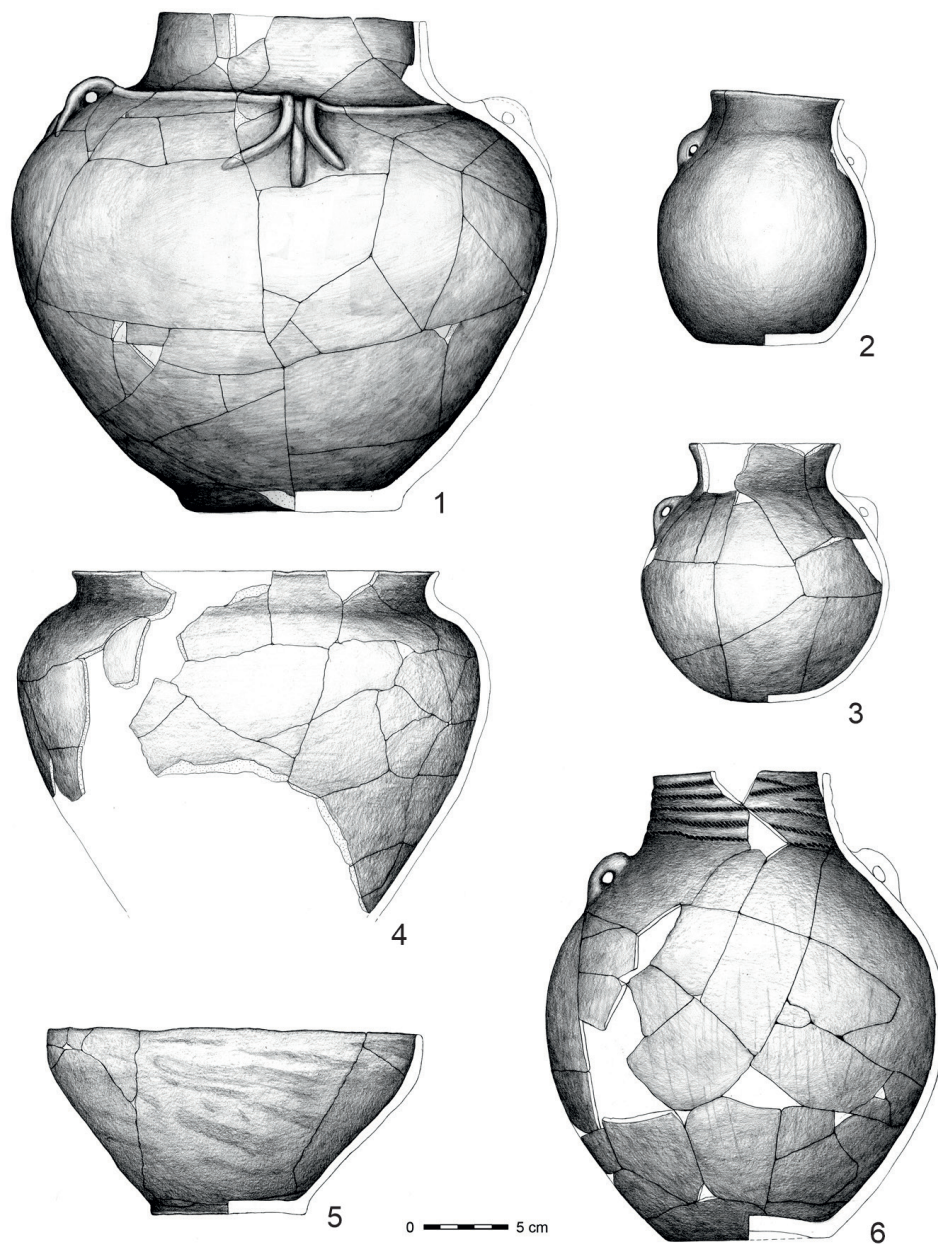


Fig. 11. Koszyce, site 2, Proszowice district. Inventory of Feature 523: 1-6 – ceramic vessels.
Prep. by M. Podsiadło

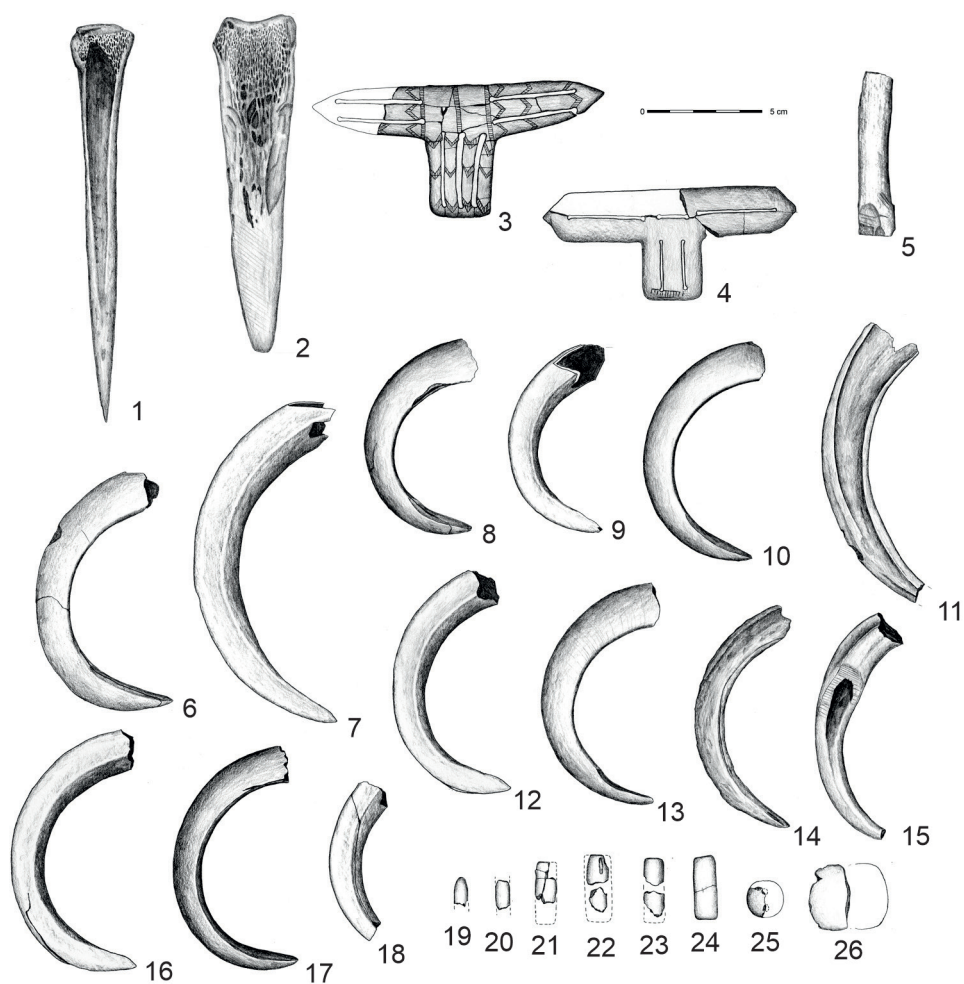


Fig. 12. Koszyce, site 2, Proszowice district. Inventory of Feature 523: 1–5 – bone artefacts; 6–18 – boar tusks; 19–26 – amber ornaments. Prep. by M. Podsiadło

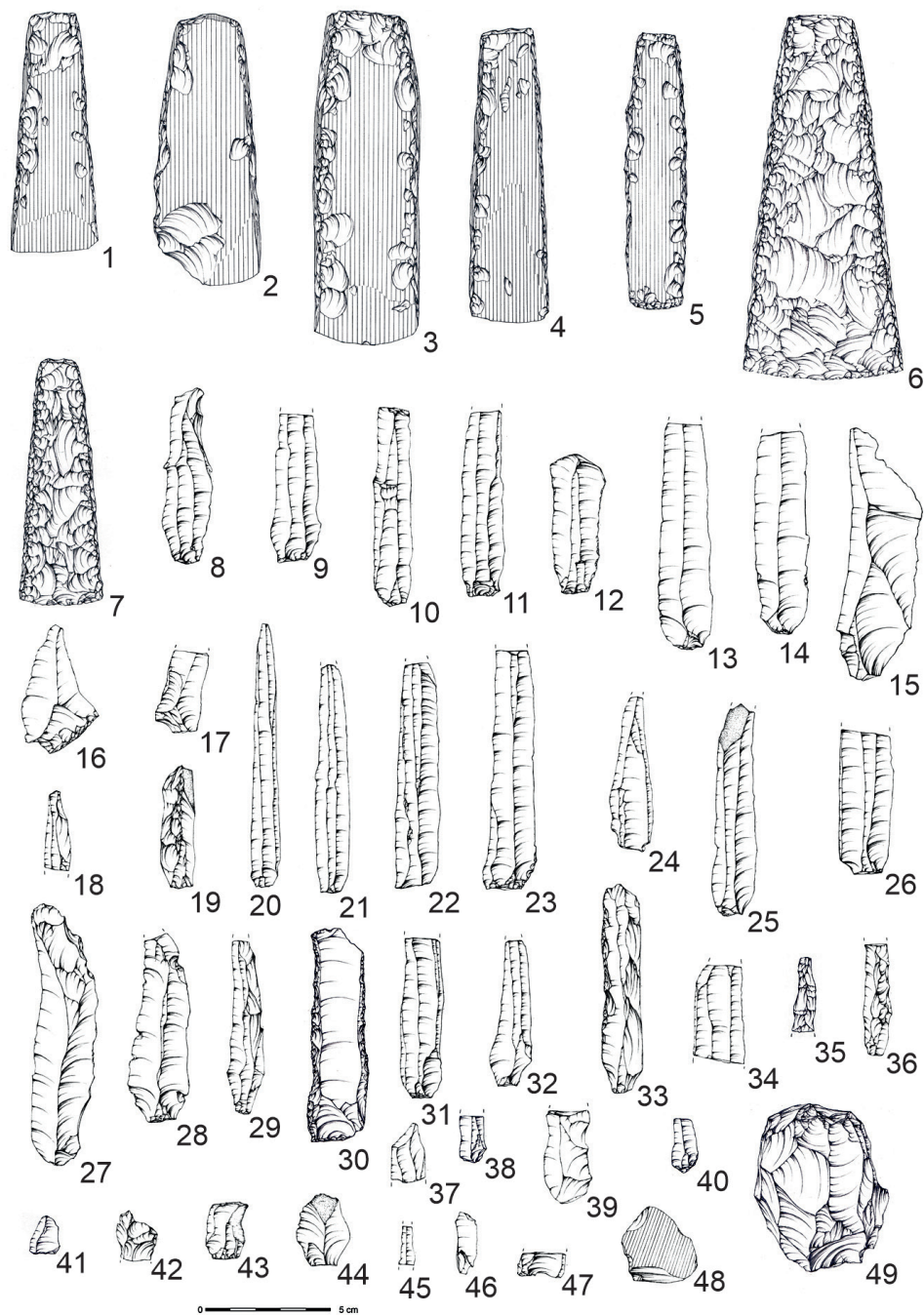


Fig. 13. Koszyce, site 2, Proszowice district. Inventory of Feature 523: 1–49 – flint artefacts. Prep. by A. Kosik-Roczalska

In the light of the chronometric analysis, the features from Koszyce date to the 29th century BC, and most probably to the older part of this period. By that time, groups of Final Eneolithic CWC had most likely started to appear in south-eastern Poland, which is supported by single radiocarbon dates from the Carpathian foothills [see Włodarczak 2018]. Moreover, a process of transformation in the funerary ritual of the Lesser Poland GAC had already been underway in that period, resulting in the emergence of a local Lesser Poland phenomenon: the ZC rite. This cultural differentiation was probably also a factor in the increased mobility of communities inhabiting south-eastern Poland in the first half of the 3rd millennium BC. Perhaps the increase in evidence of violence was also linked to the processes detailed here. Given these chronological circumstances, the question of who killed the 15 people buried in the grave from Koszyce – representatives of the CWC barrow population, or members of groups identified as inheritors of the Late Eneolithic GAC tradition – remains unanswered. What can be unequivocally confirmed, however, is that this event took place in the Final Eneolithic, during the period of the spread of the new CWC cultural pattern and the expansion of a population of Eastern European origin.

REFERENCES

Allentoft M. E., Sikora M., Sjögren K.-G., Rasmussen S., Rasmussen M., Stenderup J., Damgaard P. B., Schroeder H., Ahlström T., Vinner L., Malaspinas A.-S., Margaryan A., Higham T., Chivall D., Lynnerup N., Harvig L., Baron J., Della Casa P., Dąbrowski P., Duffy P.R., Ebel A.V., Epimakhov A., Frei K., Furmanek M., Gralak T., Gromov A., Gronkiewicz S., Grupe G., Hajdu T., Jarysz R., Khartanovich V., Khokhlov A., Kiss V., Kolář J., Kriiska A., Lasak I., Longhi C., McGlynn G., Merkevičius A., Merkyte I., Metspalu M., Mkrtchyan R., Moiseyev V., Paja L., Pálfi G., Pokutta D., Ł. Pospieszny, Price T. D., Saag L., Sablin M., Shishlina N., Smrčka V., Soenov V. I., Szeverényi V., Tóth G., Trifanova S. V., Varul L., Vicze M., Yepiskoposyan L., Zhitenev V., Orlando L., Sicheritz--Pontén T., Brunak S., Nielsen R., Kristiansen K., Willerslev E.

2015 Population genomics of Bronze Age Eurasia. *Nature* 522: 167–173. DOI: <https://doi.org/10.1038/nature14507>

Bajka M., Florek M.

2020 Złota culture grave from Kleczanów, Sandomierz district, Świętokrzyskie Voivodeship. *Sprawozdania Archeologiczne* 72(2): 285–306.

Bajka M., Florek M., Kozak-Zychman W., Makowiecki D., Szmyt M., Trzaska A.

2018 Grób ludności kultury złockiej z Sandomierza, stan. 1 (Mały Rynek), woj. świętokrzyskie. *Fontes Archaeologici Posnanienses* 54: 137–172.

Bajka M., Sieradzka E.

2019 The Złota culture grave from Święcica, site 30, Sandomierz district. *Sprawozdania Archeologiczne* 71: 243–272.

Bełka Z., Szczepanek A., Jarosz P., Dopieralska J., Walczak A.

2022 Mobilność ludności kultury ceramiki sznurowej w południowo-wschodniej Polsce w świetle badań izotopów strontu ($^{87}\text{Sr}/^{86}\text{Sr}$) biogenicznych fosforanów. In: A. Szczepanek, P. Jarosz, J. Libera, P. Włodarczyk (Eds) *Společnosti schyłkowego eneolitu w południowo-wschodniej Polsce w świetle badań interdyscyplinarnych i analiz archeologicznych*. Pęko-wice – Kraków (in print).

Błaszczak D., Bajka M., Bełka Z., Florek M.

2018 Pochodzenie osób pochowanych na wczesnośredniowiecznym cmentarzystwie w Sandomierzu, stan. 1 na podstawie badań izotopów strontu. In: T. Nowakiewicz, M. Trzeciecki, D. Błaszczak (Eds) *Animos labor nutrit. Studia ofiarowane Profesorowi Andrzejowi Buko w siedemdziesiątą rocznicę urodzin*, 271–278. Warszawa.

Brzeska-Zastawna A., Zastawny A.

- 2020 New radiocarbon dates for the Funnel Beaker and Funnel Beaker-Baden assemblages in Lesser Poland from Książnice Wielkie, site 1, Proszowice district. In: M. Dębiec, T. Saile (Eds) *A planitiebus usque ad montes. Studia archaeologica Andreae Pelisiak vitae anno sexagesimo quinto oblata*, 301–318. Rzeszów.

Dobeš M., Pecinová M., Ernée M.

- 2021 On the earliest Corded Ware in Bohemia. In: V. Heyd, G. Kulcsár, B. Preda-Bălănică (Eds), *Yamnaya Interactions. Proceedings of the International Workshop held in Helsinki, 25–26 April 2019. The Yamnaya Impact of Prehistoric Europe 2*, 487–511. Budapest.

Eriksson G., Howcroft R.

- 2013 Stable carbon and nitrogen isotope analysis of skeletal remains of humans and pigs In: M. M. Przybyła, A. Szczepanek, P. Włodarczak (Eds) *Koszyce, Stanowisko 3. Przemoc i rytuał u schyłku neolitu. Ocalone Dziedzictwo Archeologiczne 4*, 115–124. Kraków – Pękowice.

Furholt M.

- 2003 *Die absolutchronologische Datierung der Schnurkeramik in Mitteleuropa und Südsandinavien*. Universitätsforschungen zur Prähistorischen Archäologie 101. Bonn.

Haak W., Lazaridis I., Patterson N., Rohland N., Mallick S., Llamas B., Brandt G., Nordenfelt S., Harney E., Stewardson K., Fu Q., Mittnik A., Bánffy E., Economou C., Francken M., Friederich S., Garrido Pena R., Hallgren F., Khartanovich V., Khokhlov A., Kunst M., Kuznetsov P., Meller H., Mochalov O., Moiseyev V., Nicklisch N., Pichler S. L., Risch R., Rojo Guerra M. A., Roth C., Szécsényi-Nagy A., Wahl J., Meyer M., Krause J., Brown D., Anthony D., Cooper A., Alt K. W., Reich D.

- 2015 Massive migration from the steppe was a source for Indo-European languages in Europe. *Nature* 522: 207–211. DOI: <https://doi.org/10.1038/nature14317>

Jarosz P., Włodarczak P.

- 2007 Chronologia bezwzględna kultury ceramiki sznurowej w Polsce południowo-wschodniej oraz na Ukrainie. *Przegląd Archeologiczny* 55: 71–108.
- 2022 Chronometria cmentarzysk kultury ceramiki sznurowej w Małopolsce. In: A. Szczepanek, P. Jarosz, J. Libera, P. Włodarczak (Eds) *Společnosti schyłkowego eneolitu w południowo-wschodniej Polsce w świetle badań interdyscyplinarnych i analiz archeologicznych*. Pękowice – Kraków (in print).

Konopka T., Szczepanek A., Przybyła M. M., Włodarczak P.

- 2016 Evidence of interpersonal violence or a special funeral rite in the Neolithic multiple burial from Koszyce in southern Poland – a forensic analysis. *Anthropological Review* 79: 69–85.

Kozłowski T., Stepańczak B., Reitsema L. J., Osipowicz G., Szostek K., Płoszaj T., Jędrychowska-Dańska K., Pawłyta J., Paluszkiewicz Cz., Witas H. W.

2014 Osteological, chemical and genetic analyses of the human skeleton from a Neolithic site representing the Globular Amphora Culture (Kowal, Kuyavia region, Poland). *Anthropologie* 52(1): 91–111.

Kruk J., Milisauskas S., Włodarczak P.

2018 *The real time. Radiocarbon dates and Bayesian analysis of the Neolithic settlement at Bronocice, fourth millennium BC*. Kraków.

Krzak Z.

1989 Złota Culture. *Przegląd Archeologiczny* 36: 255–269.

Müller J.

1999 Zur Radiokarbondatierung des Jung- bis Endneolithikums und der Frühbronzezeit im Mittelteil — Saale Gebiet (4100–1500 v. Chr.). *Bericht der Römisch-Germanischen Kommission* 80: 31–90.

Pasterkiewicz W.

2021 Sepulchral complexes of human burials and animal deposits site 23, Sadowie, Opatów district. Study of selected examples. *Baltic-Pontic Studies* 25: 79–116.

Pospieszny Ł.

2017 Datowanie radiowęglowe ludzkich i zwierzęcych szczątków kostnych z grobowca megalitycznego KAK w Kierzkowie. In: S. Nowaczyk, Ł. Pospieszny, I. Sobkowiak-Tabaka (Eds) *Megalityczny grobowiec kultury amfor kulistych z Kierzkowa na Pahlukach. Milczący świadek kultu przodków z epoki kamienia*. Biskupińskie Prace Archeologiczne 12, 267–286. Biskupin.

Przybyła M. M., Szczepanek A., Włodarczak P. (Eds)

2013 *Koszyce, stanowisko 3. Przemoc i rytuał u schyłku neolitu*. Ocalone Dziedzictwo Archeologiczne 4. Kraków – Pękowice.

Raetzl-Fabian D.

2000 *Calden. Erdwerk und Bestattungsplätze des Jungneolithikums. Architektur-Ritual-Chronologie*. Universitätsforschungen zur Prähistorischen Archäologie 70. Bonn.

Schroeder H., Margaryan A., Szmyt M., Theulot B., Włodarczak P., Rasmussen S., Gopalakrishnan S., Szczepanek A., Konopka T., Jensen T. Z. K., Witkowska B., Wilk S., Przybyła M. M., Pospieszny Ł., Sjögren K.-G., Belka Z., Olsen J., Kristiansen K., Willerslev E., Frei K., Sikora M., Johannsen N. N., Allentoft M. E.

2019 Unraveling ancestry, kinship, and violence in a Late Neolithic mass grave. *Proceedings of the National Academy of Sciences* 116(22): 10705–10710. DOI: <https://doi.org/10.1073/pnas.1820210116>

Szczepanek A., Jarosz P.

- 2022 Rekonstrukcja diety ludności schyłkowego neolitu z południowo-wschodniej Polski w oparciu o analizy stabilnych izotopów węgla i azotu. In: A. Szczepanek, P. Jarosz, J. Libera, P. Włodarczak (Eds) *Společnosti schyłkowego eneolitu w południowo-wschodniej Polsce w świetle badań interdyscyplinarnych i analiz archeologicznych*. Pętkowice – Kraków (in print).

Szmyt M.

- 2001 The absolute (radiocarbon) chronology of the Central and Eastern Groups of the Globular Amphora culture. In: J. Czebreszuk, J. Müller (Eds) *Die absolute Chronologie in Mitteleuropa 3000–2000 v. Chr./The absolute chronology of Central Europe 3000–2000 BC*. Studien zur Archäologie in Mitteleuropa/Studia nad Pradziejami Europy Środkowej 1, 25–80. Poznań – Bamberg – Rahden/Westf.
- 2008 Baden patterns in the milieu of Globular Amphorae transformation, incorporation and long continuity. A case study from the Kujavia region, Polish Lowland. In: M. Furholt, M. Szmyt, A. Zastawny (Eds) *The Baden Complex and the Outside World. Proceedings of the 12th Annual Meeting of the EAA in Cracow 19–24th September 2006*. Studia nad pradziejami Europy Środkowej 4, 217–231. Kiel – Poznań – Kraków.

Ścibior J.

- 1993 Badania na Wzgórzu Salve Regina w 1988 roku. In: S. Tabaczyński (Ed.) *Sandomierz: badania 1969–1973*. Vol. 1, 318–322. Warszawa.

Walczak A., Belka Z.

- 2017 Fingerprinting Gondwana versus Baltica provenance: Nd and Sr isotopes in Lower Paleozoic clastic rocks of the Małopolska and Łysogóry terranes, southern Poland. *Gondwana Research* 45: 138–151.

Witkowska B., Czebreszuk J., Gmińska-Nowak B., Goslar T., Szmyt M., Ważny T.

- 2020 The cemetery of the Globular Amphora culture community at the Złota-Gajowizna site in the light of radiocarbon analysis. *Sprawozdania Archeologiczne* 72(2): 259–284.

Witkowska B., Przybyła M. M., Podsiadło M., Szczepanek A., Włodarczak P.

- 2021 Absolute chronology of the Globular Amphora funeral complex at Malice, Sandomierz Upland. *Baltic-Pontic Studies* 25: 49–78

Włodarczak P.

- 2007 Problem chronologii radiowęglowej kultury ceramiki sznurowej w świetle dendrochronologicznych datowań późnoneolitycznych osad palafitowych ze Szwajcarii. *Archeologia Polski* 52(1–2): 35–80.

- 2009 Radiocarbon and Dendrochronological Dates of the Corded Ware Culture. *Radiocarbon* 51(2): 737–749.
- 2013 Projekt badań chronologii absolutnej eneolitu i początków epoki brązu w Małopolsce. In: I. Cheben, M. Soják (Eds) *Otázky neolitu a eneolitu našich krajín – 2010*, 373–387. Nitra.
- 2016 Chronologia absolutna cmentarzysk późno- i schyłkowoneolitycznych na Wyżynie Lubelskiej. In: P. Jarosz, J. Libera, P. Włodarczak (Eds) *Schyłek neolitu na Wyżynie Lubelskiej*, 537–548. Kraków.
- 2018 Chronometry of the Final Eneolithic cemeteries at Święte in the perspective of cultural relation between Lesser Poland, Podolia and north-western Black Sea region. *Baltic-Pontic Studies* 23: 178–212.
- Włodarczak P., Przybyła M. M.
- 2013 Groby z Koszyc na tle innych późno- i środkowoneolitycznych znalezisk środkowoeuropejskich. In: M. M. Przybyła, A. Szczepanek, P. Włodarczak (Eds) *Koszycy, stanowisko 3. Przemoc i rytuał u schyłku neolitu*. Ocalone Dziedzictwo Archeologiczne 4, 209–255. Kraków – Pękowice.

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CHRONOLOGY AND PERIODIZATION OF THE GLOBULAR AMPHORA CULTURE EAST LUBLIN SUBGROUP

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ABSTRACT

The Globular Amphora culture East Lublin subgroup was distinguished in the 1950s by Stefan Nosek. The key argument in favour of the distinction involved stone cist graves, having south-eastern affinities. The newly-distinguished taxonomic unit boasted both western and eastern traits. Since 1996, 13 radiocarbon dates have been obtained for nine features: 1 settlement pit, 5 cist graves and 3 pit graves. The dates helped distinguish three chronological sequences and describe inventories of grave finds from particular development phases. By comparing inventories from graves for which radiocarbon dates were available with grave goods from features without such determinations, it was possible to supplement the sets of cultural elements characteristic of successive time intervals with traits to be found solely in the latter. Ultimately, the proposed periodization of Globular Amphora settlement in the eastern Lublin province is made up of three phases: I ('general Globular Amphora' horizon – preceding the formation of the East Lublin subgroup) – 3000/2950–2900/2850 BC; II ('classical' phase of the East Lublin subgroup) – 2900/2850–2650/2600 BC; III ('late' phase of the East Lublin subgroup) – 2650/2600–ca 2400 BC.

Keywords: Globular Amphora culture, East Lublin subgroup, radiocarbon dates, absolute chronology, periodization

The article discusses the remains of settlement by Globular Amphora culture (GAC) populations on the eastern Lublin Upland (Fig. 1), i.e. covering the Dorohusk Depression (*Obniżenie Dorohuckie*), Chełm Heights (*Pagóry Chełmskie*), Dubienka Depression (*Obniżenie Dubienki*), Horodło Bar (*Grzęda Horodelska*) and Hrubieszów Basin (*Kotlina Hrubieszowska*) [Jarosz *et al.* 2016: 9–10].

In the last four decades, the state of research into local GAC sites has greatly improved. Today, we know of 42 grave sites – 32 graves with stone cist and 10 graves without any stone structure (i.e. pit graves) – and a single, partially explored, settlement site. Since the mid-1960s, therefore, when there were known 22 GAC sites in total [Nosek 1967: 199–213, 241–247], the source pool has doubled. Most newly discovered features have been exhaustively published [Ścibior 1986; Ścibior *et al.* 1991; Gołub 1996; Panasiewicz 1996; Bagińska, Taras 1997; Zakościelna 2000; Bronicki 2000; 2007; 2010; Błędowska, Gałań 2006], with the publications being enhanced by specialist expert opinions in many instances. Some graves have been processed anew [Gołub 1996a; Polańska 2016]. All sepulchral features have found their way into the latest publication on the funerary rite of GAC communities on the Lublin Upland [Bronicki 2016a]¹. Since the mid-1990s radiocarbon age determinations have been made.

HISTORY OF RESEARCH

The East Lublin subgroup was distinguished in the 1950s by Stefan Nosek. The chief distinguishing trait was the presence of cist graves built of large monolithic stone slabs and resembling tombs built by GAC populations in Podolia and Volhynia. Nosek claimed that the compact range of such structures extended between the middle Bug and Wieprz rivers [Nosek 1954-1955: 124].

Tadeusz Wiślański, accepting the distinguishing of the East Lublin subgroup (it is to him that we owe the introduction of this designation to academic circulation) and listing its peculiar traits, drew attention to the flint raw-material used for making axes (other than striped flint) and the more frequent occurrence of arc impressions in pottery ornamentation in comparison to that practised in the Małopolska group (in which he included the ‘Puławy-Garwolin complex’, or the West Lublin group according to Nosek). He specified its territorial range as covering ‘eastern Lublin province: from the Radzyń district to Tomaszów district’ [Wiślański 1966: 89].

¹ A few years later, a monograph of the GAC East Lublin subgroup was published [Bronicki 2021].

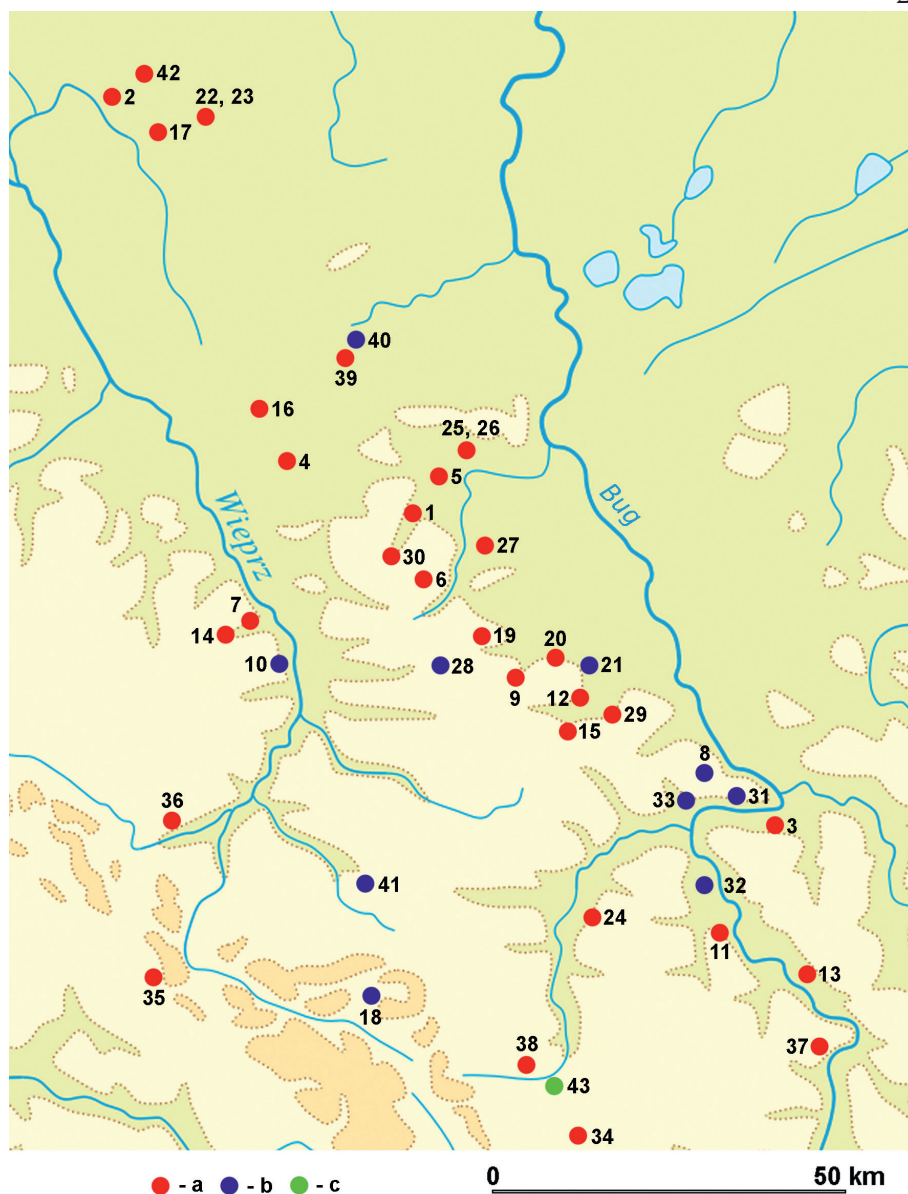


Fig. 1. Location of Globular Amphora graves in the East Lublin region. Based on a map of Gabrysiak 2004. Key: a – cist grave; b – pit grave; c – settlement. Prep. by A. Bronicki, G. Zabłocki

List of sites: 1. Bezek, site 5; 2. Branica Suchowolska, site 1; 3. Khotiachiv (Ukraine); 4. Cyców, site 14; 5. Czulczyce-Kolonia, site 6; 6. Deputycze Nowe-Kolonia, site 12; 7. Dobryniów-Kolonia, site 15; 8. Husynne-Kolonia, site 6; 9. Huta, site 2; 10. Krasnystaw, site 8; 11. Kryłów, site 2; 12. Kułakowice Trzecie, site 45; 13. Litovizh (Ukraine); 14. Łopiennik Dolny-Kolonia, site 1; 15. Miedniki, site 2; 16. Nadrybie – Dwór, site 3; 17. Okalew, site 1; 18. Partyzantów-Kolonia, site 9; 19. Poniatówka, site 1; 20. Putnowice-Kolonia, site 4; 21. Raciborowice-Kolonia, site 2; 22. Rudno, site 1; 23. Rudno, site 2; 24. Sahryń, site 1; 25. Sajczyce, site 18; 26. Sajczyce, site 66; 27. Srebrzyszcze, site 23; 28. Stadmarnia, site 2; 29. Stefankowice-Kolonia, site 33; 30. Stołpie, site 5; 31. Strzyżów, site 6; 32. Ślipse, site 14; 33. Świerzczów, site 5; 34. Tarnoszyn, site 42; 35. Tereszpol, site 11; 36. Tworczyów, site 43; 37. Ulvivok (Ukraine); 38. Wola Gródecka, site 2; 39. Wytoczno, site 2; 40. Wytoczno, site 4; 41. Zamość, site 4; 42. Zbulitów Mały, site 7; 43. Podlodów, site 2

Another researcher who studied the GAC in the Lublin province was Józef Ścibior. In the East Lublin subgroup, he noticed a clear quantitative domination of cist graves over pit ones and distinguished two subtypes of stone grave structures: the first – built of erratic monoliths (sometimes on an elliptical plan, e.g. Stefankowice-Kolonia) and oriented E-W, and the second – built of broken slabs of sandstone in most cases (on a rectangular, square or high trapezium plan) and oriented N-S. He defined the geographical range of the subgroup as the area ‘between the Wieprz and Bug rivers, and between Roztocze and the Łęczyca-Włodawa Lake District’ [Ścibior 1991: 55–56], with the ‘Radzyń-Parczew grave complex’ (Rudno but Branica Suchowolska, Okalew, Zbulitów Mały no doubt, too) being included in the adjacent Mazowsze-Podlasie group [Ścibior 1986: 119].

The set of eastern (Volhynia-Podolia) cultural components in the East Lublin subgroup, key to its distinction, was described by three archaeologists based in the Lublin province: Józef Ścibior, Andrzej Kokowski and Wiesław Koman in connection with the publication of the newly discovered graves in the Hrubieszów Basin and Zamość [Ścibior *et al.* 1991]. Besides the obvious idea of a stone cist, they drew attention to a ‘movable door’ in the tomb from Sahryń and above all to pottery traits. In this respect, the researchers noticed that the admixture of grog added to potting clay was practically missing in other local GAC groups in Poland. More Volhynia-Podolia traits, however, were found in pottery ornamentation. They included above all the custom of inlaying impressed ornaments with a white chalk paste, application of elaborate triangle motifs (‘chevrons’) as well as loops, broken lines, vertical stanchions and cord impressions. A frequent motif was one consisting of the impressions of small arc stamps, forming a ‘fish scale’ ornament. The traits of the eastern GAC group were observable in the morphology of many vessels, too. These were slightly different proportions of amphorae, vases or bowls when compared with the containers of the Polish group. Differences were also found in vessel micromorphology as exemplified by the shape of some amphora handles. Furthermore, it was found that among axes and other flint goods, Volhynia flint was more prevalent than, for instance, striped flint [Ścibior *et al.* 1991: 100–102].

Recently, the funerary rite of the East Lublin subgroup was described in a comprehensive publication on GAC funerary rites on the Lublin Upland [Bronicki 2016a: 45–256].

Practically all researchers concurred that the east of the Lublin province was a transitional area, displaying both occidental and oriental characteristics [e.g. Sveshnikov 1983: 10; Szmyt 1999: 50–51]. According to Marzena Szmyt, its western limit would be the line joining Sahryń and Łopiennik Dolny-Kolonia (the range of Podolia type graves), while its eastern limit cannot be determined due to the state of research along the Volhynia borderline [Szmyt 1999: 44, 49].

ABSOLUTE DATING: THE FIRST ATTEMPT AT PERIODIZATION

Initially, the question of the chronology of the East Lublin subgroup was raised while discussing new grave discoveries [Ścibior 1986: 119; Ścibior *et al.* 1991: 104–105; Bronicki 2000: 190–191; 2007: 200, 211; 2010: 150]. The discussions were rather general in nature especially as in most cases no radiocarbon dates were available (one exception being the determinations of samples from Czulczyce-Kolonia) [Borowska *et al.* 2000]. With time, however, the situation began to improve, favouring detailed studies.

Since 1996, 13 radiocarbon determinations have been made for nine features (Table 1)². One determination was obtained for a settlement pit (Podlodów), while of the others six were obtained for cist graves (Depułtycze Nowe-Kolonia, Sajczyce, Łopiennik Dolny-Kolonia, Serebryszcze and Czulczyce-Kolonia) and three for pit ones (Raciborowice-Kolonia, Świerszczów, Krasnystaw).

The first absolute dates were procured and published in connection with the programme of research into the GAC eastern group, coordinated by the Adam Mickiewicz University, Poznań, Poland [Kadrow, Szmyt 1996; Szmyt 1999: 271]. In the Kiev Laboratory, next to a series of ¹⁴C determinations for eastern group features, dates were obtained for three grave features excavated in the east of the Lublin province: in Świerszczów, Krasnystaw and Łopiennik Dolny-Kolonia and for a settlement pit from Podlodów. Another three determinations were made while processing newly discovered cist structures by archaeologists from the Chełm Museum [Bronicki 2000; 2007; 2010]. These were tombs located at Czulczyce-Kolonia,³ Depułtycze Nowe Kolonia and Sajczyce.⁴ It was possible now to compare a larger number of ‘East Lublin’ dates with ‘Volhynia-Podolia’ and ‘Nałęczów’ ones. Such an attempt was made in connection with the publication of flints from GAC graves in the Chełm Land [Bronicki 2011: 20–22; 2016: 348–351]. The author of the publication proposed to distinguish two time phases divided at 2700 BC by (1) relying on the age determinations of the oldest sojourn traces of GAC communities in the west of the Lublin province [Szmyt 1996: 224; 1999: 271], (2) as well as in Volhynia and Podolia [Szmyt 1999: 68, 203], (3) taking into account radiocarbon dates obtained for ‘East Lublin’ graves, and (4) considering some grave goods (showing ‘eastern’ and ‘western’ traits). The dividing line of 2700 BC represented a threshold in the intensity of contacts between the

² After the article was submitted to print, a grave in Tarnoszyn was radiocarbon dated [Bronicki 2021: 186]. This fact could not be taken into account in this study.

³ The dating was performed in the Kiev Laboratory and was financed with funds at the disposal of Prof. Janusz Czebreszuk, Ph. D. of the then Institute of Prehistory, Adam Mickiewicz University, Poznań, Poland.

⁴ Another two dates were produced in the Oxford Laboratory courtesy of Professor Elke Kaiser, Ph.D., of the Institute of Prehistoric Archaeology, Freie Universität Berlin.

T a b l e 1

Radiocarbon age determinations of graves related to the Globular Amphora culture, East Lublin subgroup. Calibration in OxCal v4.3.2 [Bronk Ramsey 2017], IntCal13 calibration curve [Reimer *et al.* 2013]

No.	Site	Feature	Lab. no.	¹⁴ C BP	cal BC	
					95,4 %	68,2 %
1	Raciborowice-Kolonia, site 2	pit grave	Poz-58109	4335±35	3081-2891 3081-3069 (2,2 %) 3026-2891 (93,2 %)	3010-2902 3010-2978 (24,7 %) 2960-2951 (5,9 %) 2942-2902 (37,6 %)
2	Świerszczów, site 27	pit grave	Kiev-5433	4170±35	2885-2631 2885-2831 (20,3 %) 2821-2631 (75,1 %)	2876-2694 2876-2851 (13,0 %) 2812-2742 (37,6 %) 2728-2694 (17,6 %)
3	Podłodów, site 2	settlement pit	Kiev-6545	4160±45	2885-2620 (95,4 %)	2872-2678 2872-2840 (12,8 %) 2813-2678 (55,4 %)
4	Deputytze Nowe-Kolonia, site 12	cist grave	OxA-23438	4136±28	2873-2620 (95,4 %)	2861-2634 2861-2832 (13,9 %) 2820-2808 (5,4 %) 2757-2718 (18,4 %) 2706-2658 (22,7 %) 2652-2634 (7,8 %)
5	Krasnystaw, site 8	pit grave	Kiev-5841	4120±30	2866-2579 2866-2804 (25,1 %) 2777-2579 (70,3 %)	2856-2624 2856-2811 (21,3 %) 2747-2724 (10,2 %) 2698-2624 (36,7%)
6	Sajczyce, site 66	cist grave	OxA-23437	4115±28	2865-2577 2865-2804 (25,1 %) 2762-2577 (70,3 %)	2853-2620 2853-2812 (20,7 %) 2744-2726 (7,9 %) 2696-2620 (39,6 %)

No.	Site	Feature	Lab. no.		¹⁴ C BP	cal BC	
						95,4 %	68,2 %
7	Łopiennik Dolny-Kolonia, site 1	cist grave	Poz-58148	4110±30	2865-2574 2865-2804 (24,1 %) 2762-2574 (74,3 %)	2850-2586 2850-2813 (18,5 %) 2742-2729 (5,0 %) 2694-2618 (37,6 %) 2600-2598 (3,7 %) 2594-2586 (3,3 %)	
8							
9	Serebryszcze, site 23	cist grave	Poz-61738	4045±35	2836-2473 2836-2816 (4,4 %) 2670-2473 (91,0 %)	2620-2491 2620-2558 (36,8 %) 2536-2491 (31,4 %)	
10	Czulczyce-Kolonia, site 6	cist grave	individual W	Kiev-7831	4035±90	2851-2466 2851-2812 (7,7 %) 2742-2728 (2,2 %) 2694-2466 (58,3 %)	
11			individual E	Kiev-7830	4020±90	2872-2300 2872-2333 (93,6 %) 2325-2300 (1,8 %)	2851-2458 2851-2812 (6,7 %) 2742-2728 (2,0 %) 2694-2458 (59,4 %)
12		chamber S	individual E	Poz-61739	3995±35	2619-2459 2619-2607 (1,2 %) 2599-2594 (0,4 %) 2586-2459 (93,6 %)	2566-2474 2566-2522 (45,3 %) 2497-2474 (22,9 %)
13			individual W	Kiev-7829	3940±85	2838-2147 2838-2815 (1,2 %) 2673-2196 (93,2 %) 2171-2147 (1,0 %)	2568-2299 2568-2519 (12,5 %) 2498-2299 (55,7 %)

Polish and eastern groups [Szmyt 1999: 305]. The older phase, therefore, would have relatively more western traces (presence of a clay drum, pit graves), while the younger phase would witness a domination of eastern elements (inlaying, ornamentation on vessels, cist graves).

The latest radiocarbon tests have been done as part of a project financed with the grant from the National Science Centre *Decline of the Neolithic in the North of the Lublin Upland*, headed by Prof. Piotr Włodarczak, Ph.D., of the Institute of Archaeology and Ethnology, Polish Academy of Sciences. In the Poznań Radiocarbon Laboratory samples from another two graves were examined (Raciborowice Kolonia and Srebrzyszcze) and a dating procedure was repeated for graves discovered in Łopiennik Dolny-Kolonia and Czulczyce-Kolonia. In the former case, there was a hundred-year discrepancy between Poznań and Kiev results, while in the latter we can speak of complete concurrence. The results of age determinations of graves (and of the utility pit) from the east of the Lublin province, in the context of other findings concerning the GAC, Corded Ware culture and Early Bronze Age units, have been discussed in detail in 2016 [Włodarczak 2016].

INTERPRETATION OF RADIOCARBON DATA: A PROPOSAL FOR A NEW PERIODIZATION

The shape of the calibration curve for the first half of the 3rd millennium BC is exceptionally troublesome due to plateaus and peaks, which makes it difficult or even impossible to reach necessary time precision during calibration. In the case at hand, at a probability of 68.2% only two dates fit into intervals of less than 100 years. One was obtained for a grave in Łopiennik Dolny-Kolonia (83 years) and the other for a grave in Czulczyce-Kolonia (92 years). The two least precise determinations (both from Czulczyce-Kolonia) fit into intervals of 393 and 385 years. In the other cases, these are 'medium' values – from 108 to 269 years (Raciborowice-Kolonia, Serebryszcze, Świerszczów, Podlodów, Krasnystaw, Sajczyce, Łopiennik Dolny-Kolonia and Czulczyce-Kolonia). At a probability of 94.5%, the intervals are still longer: from 149 years (Łopiennik Dolny-Kolonia) to 691 years (Czulczyce-Kolonia). The most precise dates include one determined in the Kiev Laboratory (Łopiennik Dolny-Kolonia) and one in the Poznań Laboratory (Czulczyce-Kolonia). The two least precise dates were determined in Kiev (Czulczyce-Kolonia). The age of samples that reached 'medium' values was determined in Kiev (Świerszczów, Podlodów, Krasnystaw, Czulczyce-Kolonia), Oxford (Sajczyce, Depułtysze Nowe-Kolonia) and Poznań (Raciborowice-Kolonia, Łopiennik Dolny-Kolonia).

Altogether, for the East Lublin subgroup, there are available 13 radiocarbon determinations (Table 1; Figs. 2 and 3). Of them, nine were obtained for cist

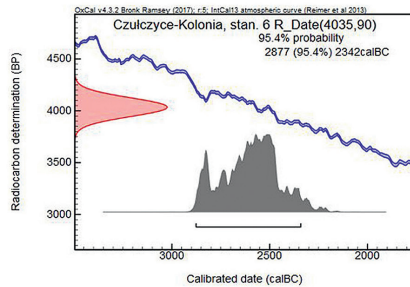
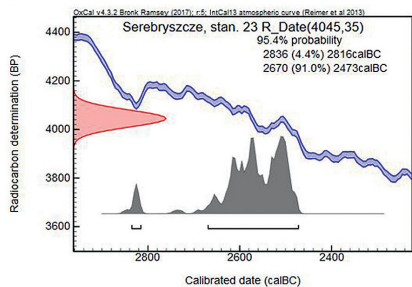
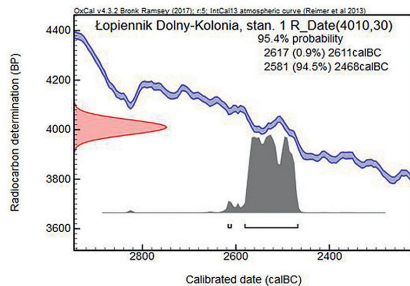
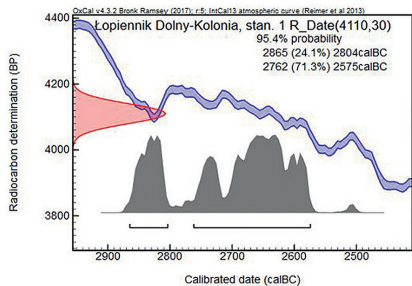
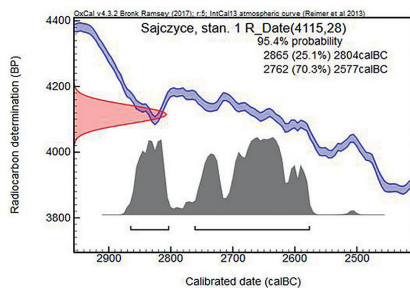
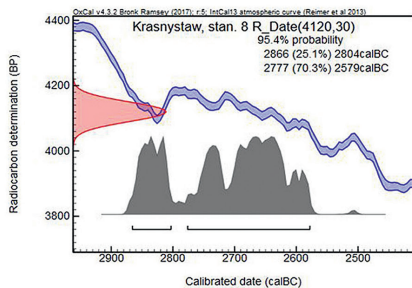
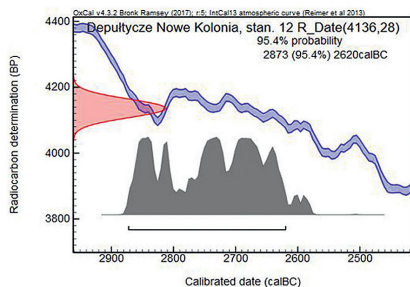
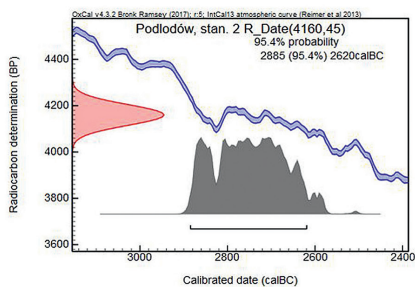
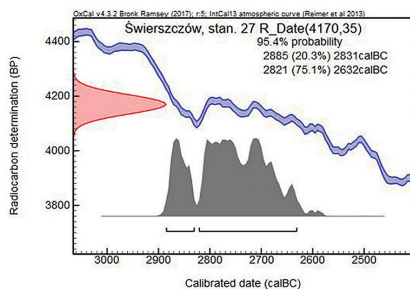
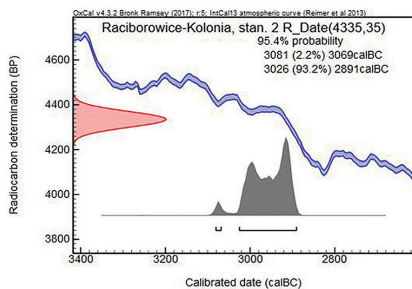
graves (Depułtęcze Nowe-Kolonia, site 12; Sajczyce, site 66; Łopiennik Dolny-Kolonia, site 1; Srebrzyszcze, site 23; Czulczyce-Kolonia, site 6), three – for pit graves (Raciborowice-Kolonia, site 2; Świerszczów, site 27; Krasnystaw, site 8) and only one – for a settlement feature (pit from Podłodów, site 2). The dates were calibrated using the OxCal v4.3.2 software [Bronk Ramsey 2017] and the IntCal13 calibration curve [Reimer *et al.* 2013].

The earliest date comes from the pit grave in Raciborowice-Kolonia. The feature cannot be older than 3081 BC (at a probability of 95.4%) or 3010 BC (at a probability of 68.2%). Whereas, the youngest grave is the double-chambered structure from Czulczyce-Kolonia, built prior to 2147 BC (95.4%) or 2299 BC (68.2%). Hence, the arithmetic difference between the age of the oldest and the youngest grave is 934 or 711 years (Table 1).

In a diagram (Fig. 4), all calibrated dates form three successive sequences [Bronicki 2019].

The first and oldest (I) is represented by a single pit grave from Raciborowice-Kolonia: Poz-58109 4335±35 BP, 3081–2891 BC (at a probability of 95.4%), 3010–2902 BC (at a probability of 68.2%). While the dating of this feature differs quite significantly from the sequence of the other ‘East Lublin’ dates, it is entirely coincidental with the determination for the oldest grave from the Nałęczów Plateau: Klementowice, Cemetery IV (D), Grave 7 – KN-1255 4300±40 BP and GrN-5046 4175±30 BP (after calibration both values mark the same time interval: 3023–2876 BC at a probability of 95.4% and 3006–2882 BC at a probability of 68.2%). The Raciborowice determination slightly precedes two successive almost identical dates from other features from the Nałęczów Plateau: Klementowice, Cemetery I (= A), Grave 1 – Poz-61735 4235±35 BP, 2914–2696 BC (95.4%) and 2904–2764 BC (68.2%) and Parchatka, Cemetery A – Poz-61733 4230±35 BP, 2912–2694 BC (95.4%) and 2901–2762 BC (68.2%).

The beginnings of GAC settlement in the Lublin province are no doubt older than the earlier date from Klementowice. In the opinion of Marzena Szmyt, the period to be considered is ca 3250/3100 BC, which corresponds to the beginning of Phase IIb in Kujawy [Szmyt 1996: 224]. Piotr Włodarczak, in turn, relying on a much larger sequence of dates, suggests that the oldest GAC graves appeared in the Lublin province slightly later: 3000–2900 BC or 3050/2950 BC [Włodarczak 2016: 541, 545]. The grave from Raciborowice-Kolonia (next to the Klementowice feature) would mark this very time horizon. The first (I) phase of settlement by GAC populations in the east of the Lublin province would fall, therefore, on 3000/2950–2900/2850 BC, while the rise of the eastern (Volhynia-Podolia) group is witnessed since ca 3000/2950 BC [Szmyt 1999: 68, 203; 2001: 172], which would make it coincident with Phase I of GAC settlement. Making a quite obvious assumption that the East Lublin subgroup was a syncretic taxonomic unit (Polish-eastern), it must be concluded that its beginning came later than the rise of the eastern group.



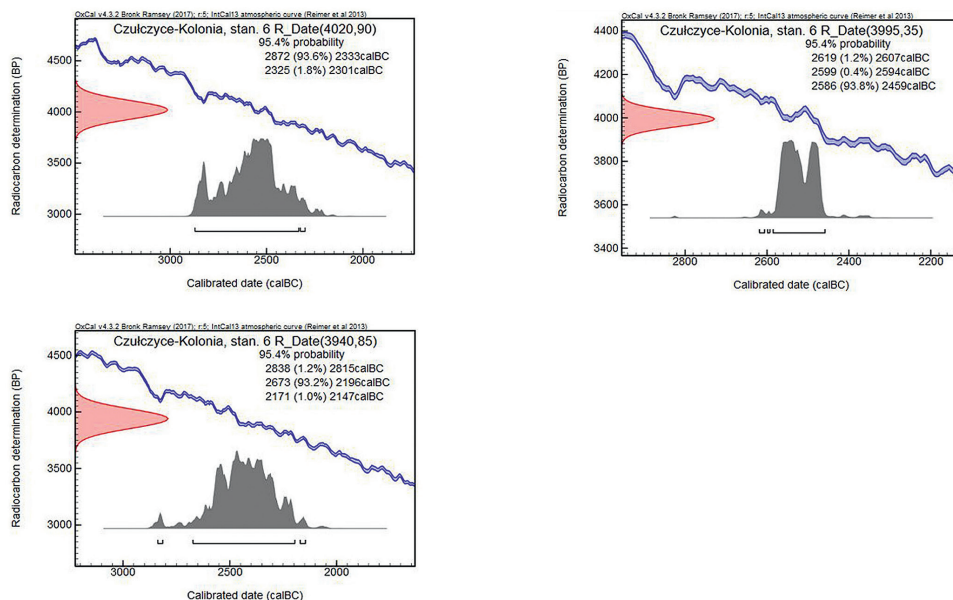


Fig. 2. Radiocarbon age determinations of graves related to the Globular Amphora culture, East Lublin subgroup. Calibration in OxCal v4.3.2 [Bronk Ramsey 2017], IntCal13 calibration curve [Reimer *et al.* 2013]

Therefore, the Raciborowice-Kolonia grave would represent a stage preceding the rise of a definite East Lublin subgroup when lands in Volhynia were being occupied by GAC communities arriving from the Polish lands. Another possibility is that the east of the Lublin province was the native land of the eastern group (next to the lands across the Bug river), while the East Lublin subgroup was a territorial variety of the Volhynia-Podolia (and not Polish) group.⁵ In such a case, ‘eastern’ elements would be equally local on the western and eastern sides of the Bug River. Finally, the third possible interpretation maintains that the dating of the beginning of GAC settlement in Volhynia adopted now should be made slightly younger. An argument in its favour is offered by the oldest known dates for the eastern group from the Tovpyzhyn site – Kiev-5011 4310 ± 45 BP and Kiev-5010 4270 ± 50 BP [Szmyt 1999: 268] – that after calibration fit into the interval of 3086–2876 BC (95.4%) or 3010–2887 BC (68.2%). This, in turn, justifies moving the beginnings of the eastern group to ca 2900 BC.

Between sequence I and sequence II, there is a small chronological gap of perhaps at least 26 years (at a probability of 68.2%). This, however, has little impact on the GAC periodization in the east of the Lublin province.

⁵ In the division into geographic regions, lands occupied by the GAC East Lublin subgroup are for the most part considered as belonging to eastern Europe (Polissya, Volhynia-Podolia Upland, East Roztocze).

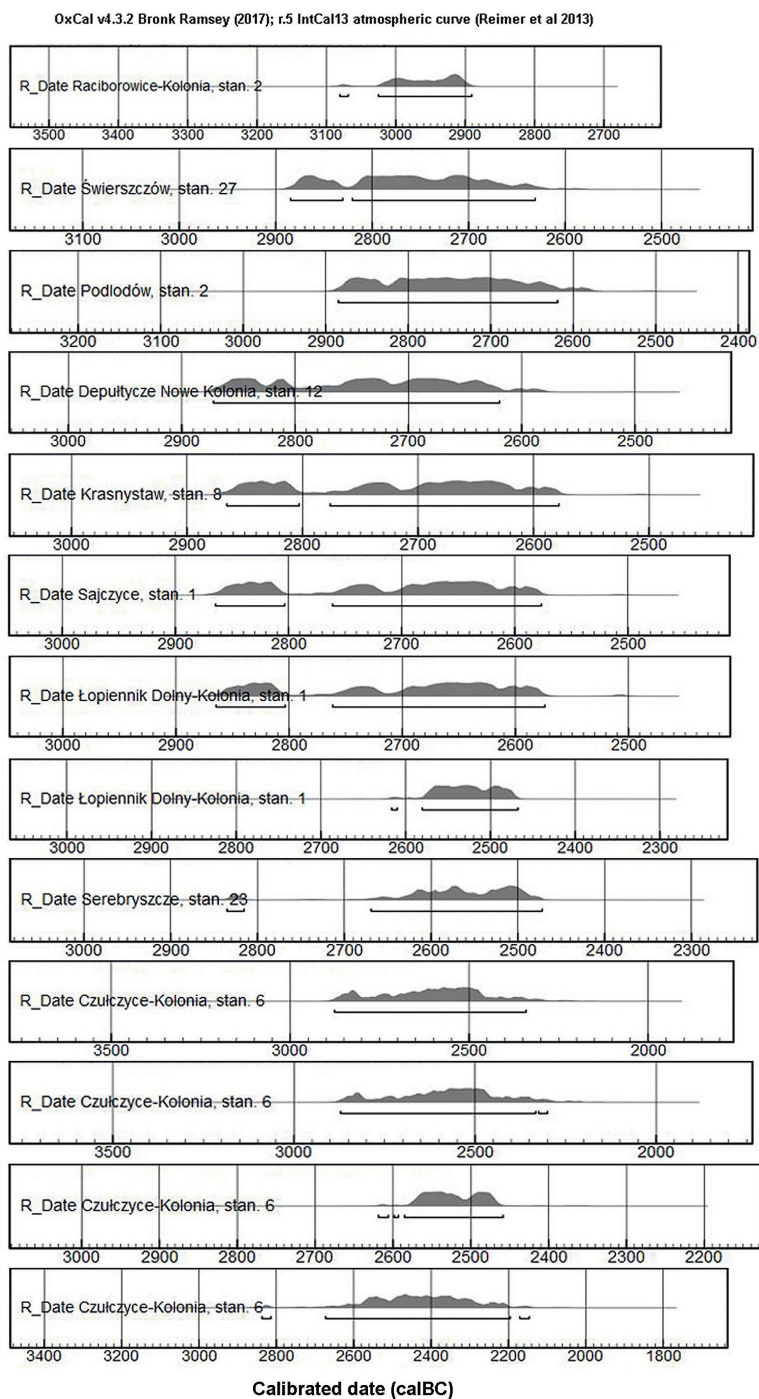


Fig. 3. Radiocarbon age determinations of graves related to the Globular Amphora culture, East Lublin subgroup. Calibration in OxCal v4.3.2 [Bronk Ramsey 2017], IntCal13 calibration curve [Reimer *et al.* 2013]

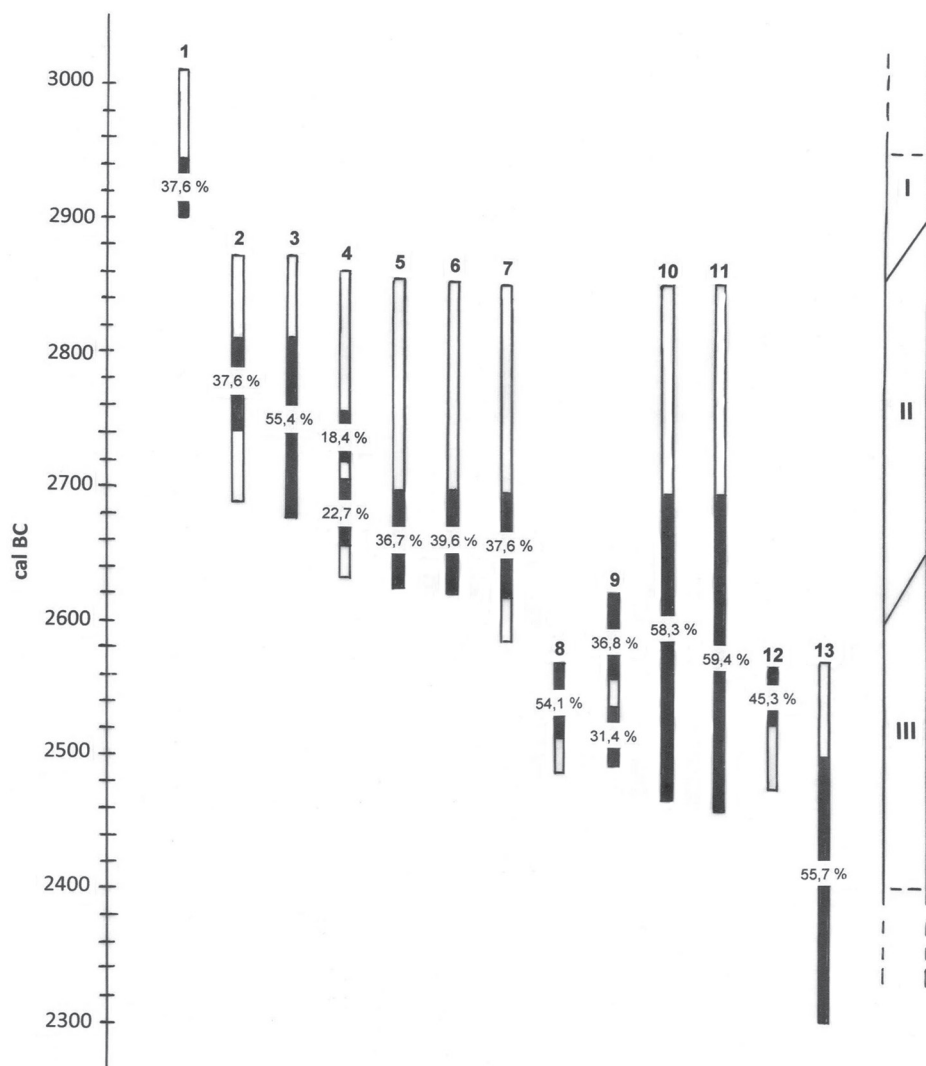


Fig. 4. Radiocarbon chronology of graves related to the Globular Amphora culture, East Lublin subgroup, with a periodization. Calibration in OxCal v4.3.2 [Bronk Ramsey 2017], IntCal13 calibration curve [Reimer *et al.* 2013]. Time intervals of the highest probability of 62.8% are marked in black; date numbering corresponds to item numbering in Table 1

The second sequence (II) of dates relates to the already developed East Lublin subgroup and determines the age of five or six graves (including two pit and three or four cist ones) and a single settlement pit. The age fits into the interval of 2885–2575 BC (at a probability of 95.4%) or 2876–2586 BC (at a probability of 68.2%), which corresponds to the older section of Phase IIIa in Kujawy [Szmyt 1996: 75]. One of the newly obtained dates comes from a cist grave in Łopiennik Dolny-Kolonia (Poz-58148 4110±30 BP). This is a second determination for this grave made from identical material (human bones), but giving an age 100 years older than the dating produced in Kiev in the 1990s (Kiev-5434 4010±30 BP). This is a fact of far-reaching consequences because depending on which date is accepted as more credible, the feature from Łopiennik Dolny-Kolonia will be assigned to sequence II or III. This, in turn, may mean that its grave goods may be characteristic of the production of the middle (classic) or late phase. If it were assumed that the younger (Kiev) date is more credible, the lower limit of sequence II would be marked by chronological findings for the Sajczyce tomb: 2577 BC (95.4%) or 2620 BC (68.2%). A quite strong argument that it is actually so is offered by a rich ornament on one of the amphorae – a trait of the late phase. A similar ‘baroque’ ornament was found on vessels from radiocarbon-dated graves in Czułczyce-Kolonia and Srebrzyszcze assigned to sequence III (late). To conclude, it is most likely now that the second phase of settlement of the east of the Lublin province by GAC populations fell on 2900/2850–2650/2600 BC.

The third (III) time sequence is the least cohesive chronologically. It is marked by six dates related to three cist graves, with the tomb from Łopiennik Dolny-Kolonia being included on a condition only – the acceptance of the Kiev date rather than the Poznań one. Certain interpretation doubts are raised by chronological findings for the Srebrzyszcze feature. At a probability of 95.4%, it is a broad time interval of as many as 363 years (2836–2473 BC) but at a probability of 68.2% the interval shrinks to ‘only’ 129 years (2620–2491 BC) and fits perfectly into sequence III. Three Kiev dates obtained for the Czułczyce-Kolonia tomb are very imprecise after being calibrated. They have been positively verified in the Poznań Laboratory that successfully dated a fourth sample. The new determination fits into the time intervals described earlier but is far more precise. The following limiting dates have been obtained: 2616–2459 BC (95.4%) and 2566–2474 BC (68.2%). They are coincident with the younger (Kiev) date for Łopiennik Dolny-Kolonia and similar to the date for Srebrzyszcze, calibrated with a probability of 68.2% to 2536–2491 BC.

Interestingly, the latest date for the GAC eastern group comes from a settlement in Peresopnitsa. The dated sample consisted of animal bones found in a settlement pit. Their age was given as Kiev-5075 3910±50 BP [Kadrow, Szmyt 1996: 104, Table 1], i.e. 2564–2209 BC (at a probability of 95.4%) or 2470–2310 BC (at a probability of 68.2%). GAC settlement in the east came to an end about 2400/2350 [Szmyt 1999: 82; 2002: 172]. There is no evidence whatsoever that it continued any longer in the east of the Lublin province. On the contrary, it must have ended prior to 2400 BC.

The end could have been brought about in part by the arrival of Corded Ware culture (CWC) communities as evidenced by two graves in Lublin-Sławinek dated to ca 2450–2300 BC [Włodarczak 2016: 543] and the fact that most ‘corded’ cemeteries between the Vistula and Bug rivers should be dated to 2500–2300 BC [Jarosz, Włodarczak 2007: 89, Fig. 11]. Thus, the third phase of GAC settlement in the east of the Lublin province coincided with the period from 2650/2600 to ca 2400 BC, corresponding to the younger section of Phase IIIa in Kujawy [Szmyt 1996: 75].

DESCRIPTION OF DEVELOPMENT PHASES

The description of the three phases of the GAC in the east of the Lublin province given below is supplemented with data in Tables 2 and 3.

Phase I (3000/2950–2900/2850 BC)

This is the oldest phase represented by merely one grave (Raciborowice-Kolonia): a pit one, most likely double-chambered with animal remains in the western chamber [Polańska 2016: 17, 20]. Inside, three vessels were found.

1. *Large, bulbous, wide-orifice Kujawy amphora of Type IIA1* [Wiślański 1966: 28–29], bearing a vertical-stanchion and broken-line ornament (Fig. 5A: 1). This vessel type is common in north-western Poland, Mazowsze, Podlasie, Lublin province, Volhynia, Podolia and Romania but rare in Mazury, Bohemia and Germany, while in Silesia it has peculiar traits [Wiślański 1966: 28–29].
2. *Small biconical amphora* with handles on the greatest protrusion of the belly and no ornament (Fig. 5A: 2). It is difficult to find close analogies to this vessel but the most similar one comes from Frygnowo, Mazury [Nosek 1967: 54, Fig. 9: 1].
3. *Deep bowl* with a short cylindrical neck of a type that is intermediate between IVA2 and beaker VIB [Wiślański 1966: 30] ornamented with a row of small conical appliqué knobs (Fig. 5A: 3). Similar vessels (Type IVA2) are known from Western Pomerania and Wielkopolska, while slightly different ones – from Mazury, Lublin province, Bohemia and Saxony [Wiślański 1966: 30]. Type VIB beakers, in turn, occurred in western and northern Wielkopolska and similar ones – in Brandenburg and Vorpommern [Wiślański 1966: 33].

Pit graves match graves with stone structures in terms of number in the area occupied by the western group – between the middle Elbe and Saale rivers, and in Brandenburg, while in Bohemia they clearly dominate [Szmyt 2004: 120]. In the eastern group, we know of only three such features of which one was presumably covered by a barrow. All the others (there are over 100 of them) had stone structures of various kinds inside them [Sveshnikov 1983: 12]. All this suggests that the idea of a pit grave is no doubt of western origin [Wiślański 1966: 87].

Traits	Raciborowice-Kolonia											Świerczów	Podlódów	Deputyce Nowe-Kolonia	Krasnystaw	Sajczyce				
																	Łopiennik Dolny-Kolonia	Srebrzyszcze	Czulezyce-Kolonia	
Clay drum of Type IX																				
Pot of Type VIIIB2																				
Cord ornamentation																				
Ornamentation of arc impressions (fish scale)																				
Ornamentation of broken line, herringbone																				
White paste inlays																				
Chevron ornamentation																				
Slender flint axe with wide butt																				
Slender flint axe with narrow butt																				
Chunky flint axe with flat butt																				
Flint axe with a rounded butt																				
Flint chisel																				
Mediolithic blade																				
Small blades																				
Flakes																				
Boar's tusk																				
Tubular amber beads																				
Knob-shaped amber beads, V-perforated																				
Bone chisel																				
Bone point-perforator																				
Bone double-edged point																				

Key:  Phase I  Phase II  Phase III

Globular Amphora culture, East Lublin subgroup. Selected cultural traits as markers of three phases. Based on radiocarbon dated graves

Traits	Phase I (3000/2950- 2900/2850 BC)	Phase II (2900/2850- 2650/2600 BC)	Phase III (2650/2600- ok. 2400 BC)
Biconical amphora			
Bowl of Type IVA2/Beaker of Type VIB			
Pit grave			
Kujawy amphora of Type IIA1 (with short neck)			
Appliqué conical knobs			
Globular amphora of Type IA1 (with short neck)			
Amphora of Type IA1/IA3			
Ovoid-belly amphora of Type IA2			
Barrel-shaped vessel of Type VIIIB3			
Bowl of Type IVA3			
Vase of Type VB1			
Vase of Type VB3			
Clay drum of Type IX			
Pot of Type VIIIB2			
Cord ornamentation			
Slender flint axe with wide butt			
Mediolithic blade			
Small blades			
Flakes			
Knob-shaped amber beads, V-perforated			
Stone cist grave			
White paste inlays			
Boar's tusk			
Tubular amber beads			
Ornamentation of arc impressions (fish scale)			
Ornamentation of broken line, herringbone			
Kujawy amphora of Type IIA1 (with high neck)			
Amphora with funnel-shaped neck and long handles			
Globular amphora of Type IA1 (with high neck)			
Small amphora of Type IB3			
Bowl of Type IVA2			
Vase-goblet (beaker) of Type VIA1			
Chevron ornamentation			
Slender flint axe with narrow butt			
Chunky flint axe with flat butt			
Flint axe with a rounded butt			
Flint chisel			
Bone chisel			
Bone point-perforator			
Bone double-edged point			

A vessel closely resembling the Type-IIA1 amphora from Raciborowice-Kolonia was found in Świerszczów, in a pit grave, too. It had an ornament of impressed vertical stanchions, broken lines and a cord (Fig. 5B: 1). Another specimen but with no ornament was discovered in a pit grave in Krasnystaw (Fig. 6C: 1). In addition, the same grave held another amphora that due to a missing upper portion could not be typologically classified with certainty. It bore an ornament of cord impressions (Fig. 6C: 6). Both graves have been radiocarbon dated and assigned to Phase II.

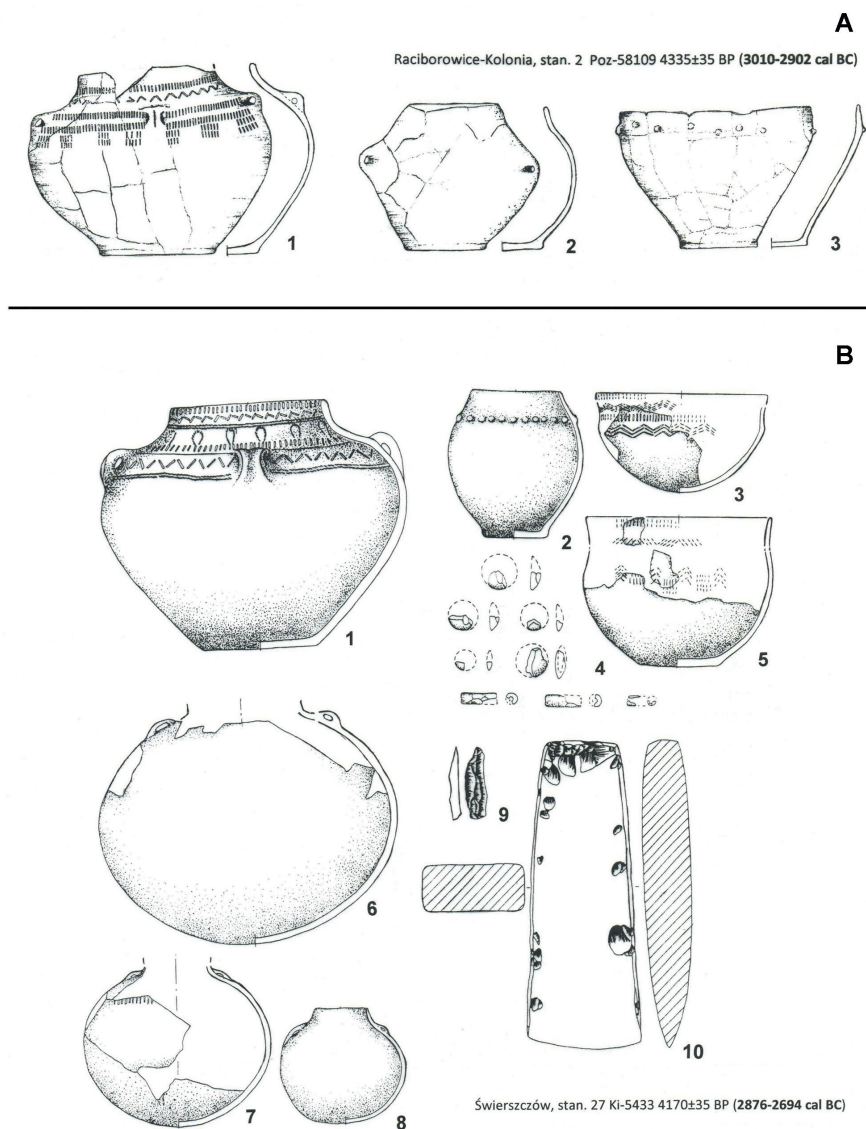
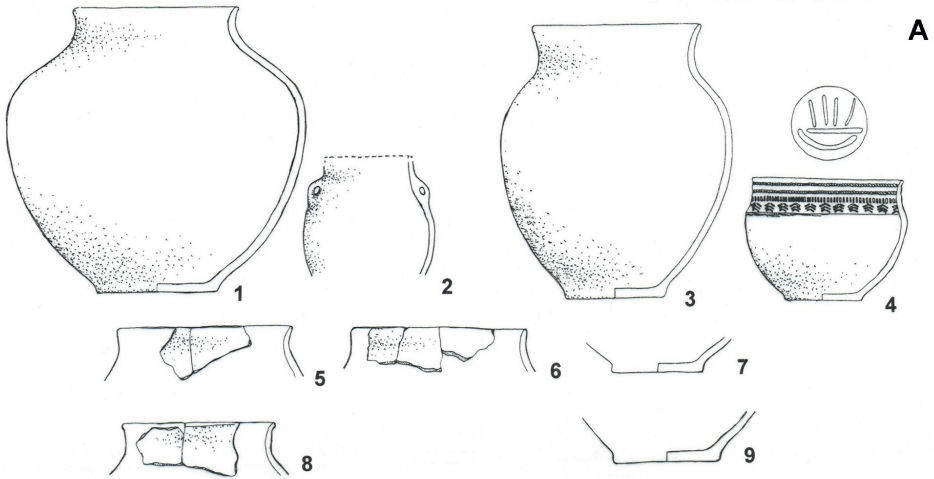
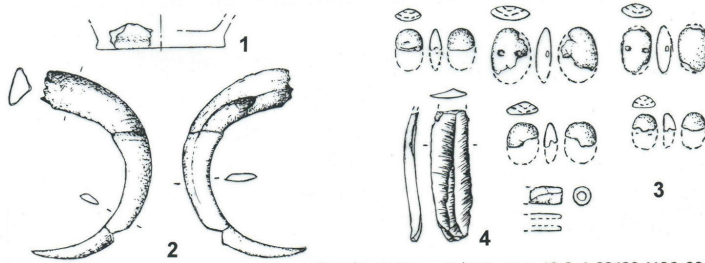


Fig. 5. Radiocarbon-dated complexes related to the Globular Amphora culture, East Lublin subgroup: A – Phase I, Raciborowice-Kolonia, site 2; B – Phase II, Świerszczów, site 5. After Bronicki 2019

Podlodów, stan. 2 KI-6545 4160±45 BP (2872-2678 cal BC)



Deputytze Nowe-Kolonia, stan. 12 OxA-23438 4136±28 BP (2861-2634 cal BC)



Krasnystaw, stan. 8 KI-5841 4120±30 BP (2856-2624 cal BC)

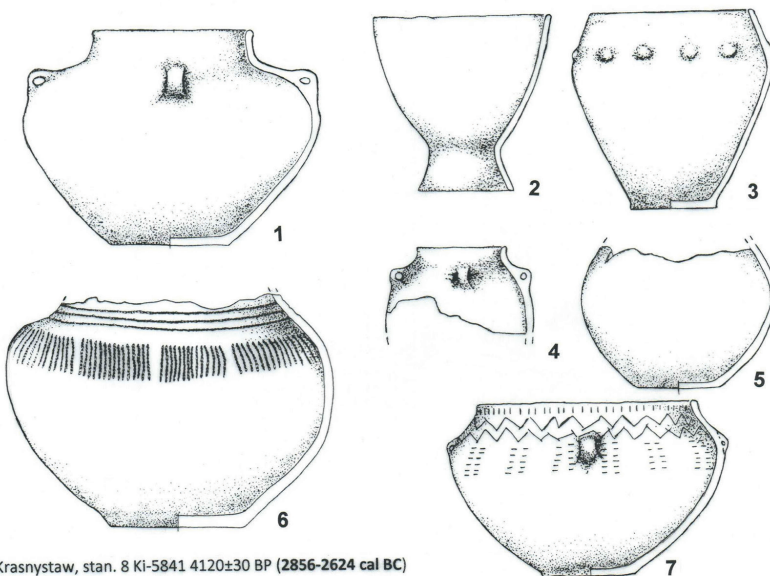


Fig. 6. Radiocarbon-dated complexes related to the Globular Amphora culture, East Lublin sub-group. Phase II: A – Podlodów, site 2; B – Deputytze Nowe-Kolonia, site 12; C – Krasnystaw, site 8. After Bronicki 2019

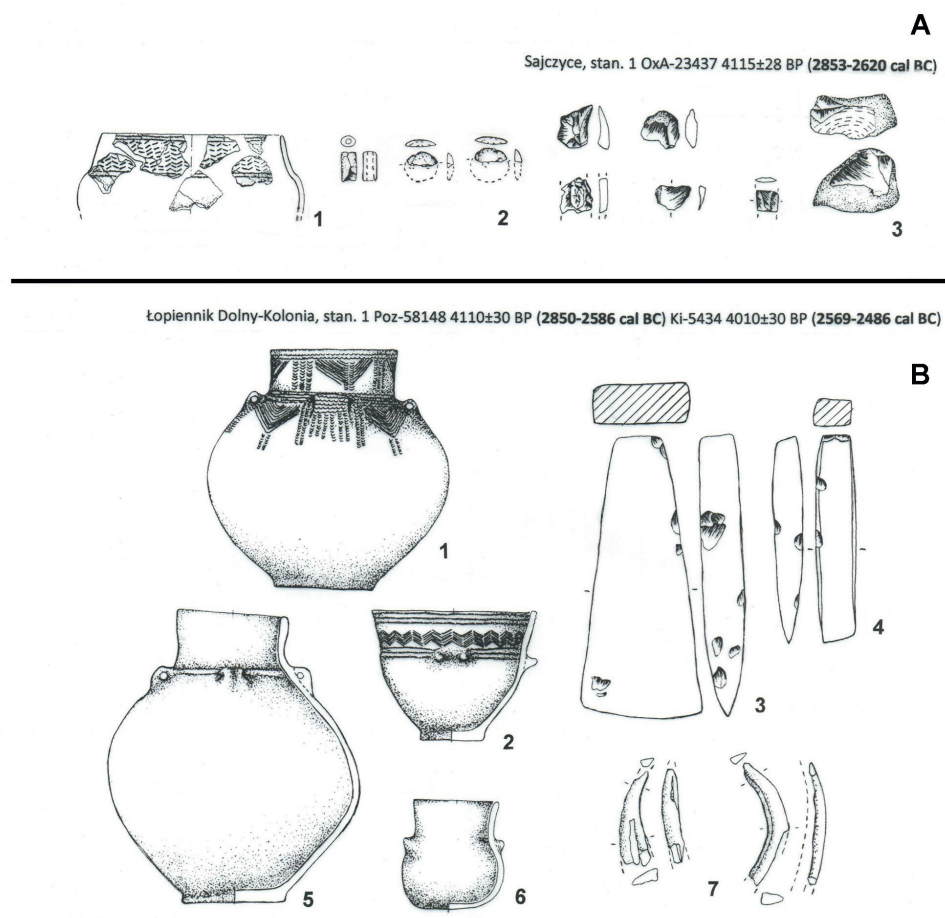
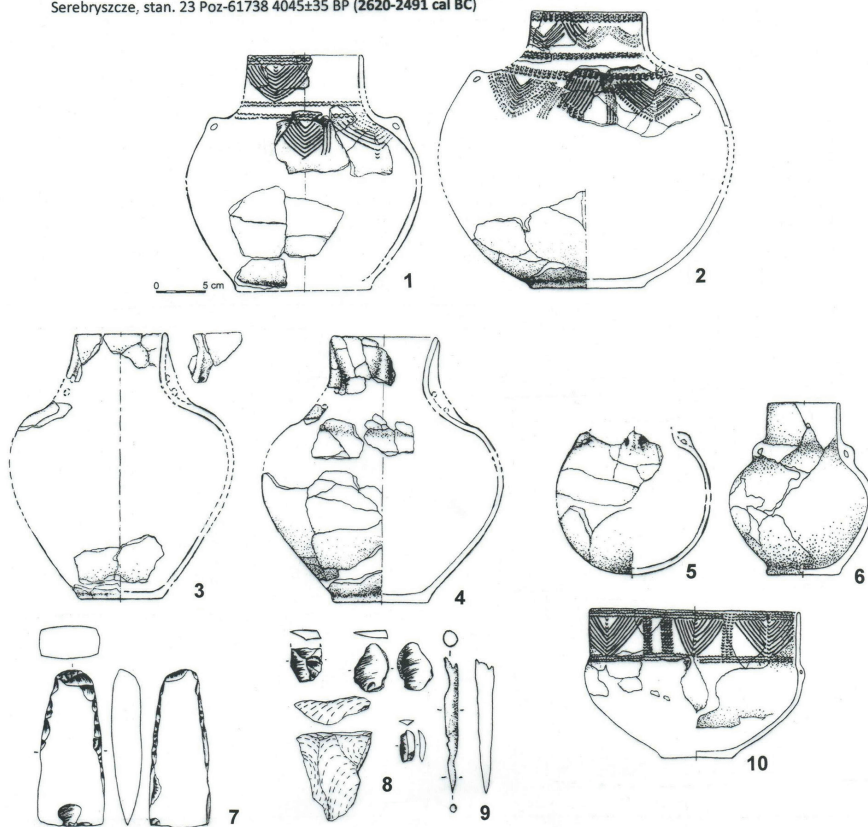


Fig. 7. Radiocarbon-dated complexes related to the Globular Amphora culture, East Lublin subgroup. A – Phase II, Sajczyce, site 66; B – Phase III, Łopiennik Dolny-Kolonia, site 1. After Bronicki 2019



Czulczyce-Kolonia, stan. 6, komora północna: KI-7831 4035±90 BP (2851-2466 cal BC) KI-7830 4020±90 BP (2851-2458 cal BC)
komora południowa: Poz-61739 3995±35 BP (2566-2474 cal BC) KI-7829 3940±85 BP (2568-2299 cal BC)

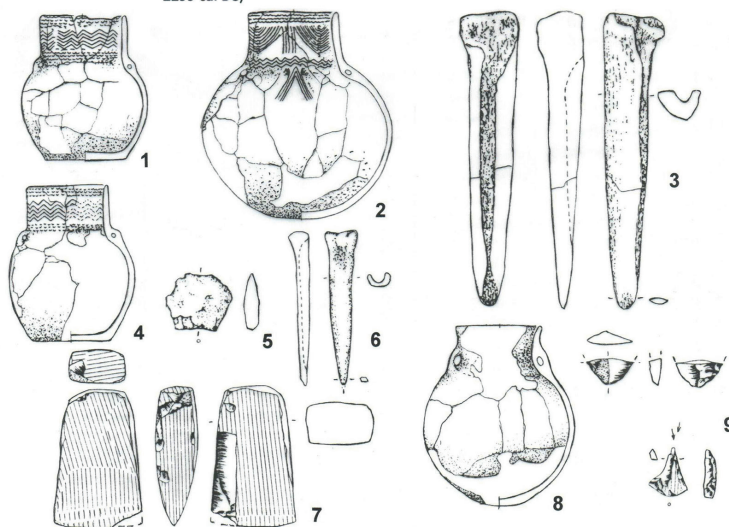


Fig. 8. Radiocarbon-dated complexes related to the Globular Amphora culture, East Lublin sub-group. Phase III: A – Serebryszcze, site 23; B – Czulczyce-Kolonia, site 6. After Bronicki 2019

The grave inventories of the East Lublin subgroup do not include any vessels analogous to the biconical amphora or the Type-IVA2 deep bowl from Raciborowice-Kolonia.

Phase II (2900/2850–2650/2600 BC)

If it is believed that the older date from Łopiennik Dolny-Kolonia (Poz-58148 4110±30 BP) should not decide the chronological classification of the respective feature, Phase II is characterised by finds from four graves: two pit ones (Świerszczów and Krasnystaw) and two cist ones (Depułtycze Nowe-Kolonia and Sajczyce), as well as from one settlement pit (Podlodów).

Cist graves may be evidence of ties joining the east of the Lublin province to the Pontic Area (Black Sea steppes) from where we know of earlier tombs built of stone slabs, dated to the Eneolithic [Szymt 2014: 120–126]. The east of the Lublin province would be a place (a relay) whence the idea of a cist grave spread to other lands occupied by GAC populations [Koško, Szymt 2011: 213–216]. Taking shape at that time, the community of the East Lublin subgroup would thus bury their dead in pit graves (of western origin) and cist ones (being the effect of an eastern or rather south-eastern impact).

Grave goods are varied and typologically diverse. Among vessels, the following forms were identified.

1. *Large bulbous Kujawy amphorae of Type IIA1* [Wiślański 1966: 28–29] with relatively short cylindrical necks. One bears an ornament combining the impressions of a vertical stanchion, broken lines and a cord. The cord impressions are arranged in double lines and oval loops (Świerszczów; Fig. 5B: 1). Another one bears no ornament at all (Krasnystaw; Fig. 6C: 1). Still another, with a lip portion missing (its typological affiliation being thus somewhat uncertain), was in all likelihood decorated solely with a cord ornament (Krasnystaw; Fig. 6C: 6). The shards of yet another (assigned to this typological group on the strength of probability) were decorated with a dense herringbone pattern built of broken lines impressed with a rectangular stamp and supplemented with horizontal lines made with a cord (Sajczyce; Fig. 7A: 1). Additionally, the ornament was inlaid with a white paste. This vessel type is common in north-western Poland, Mazowsze, Podlasie, Lublin province, Volhynia, Podolia and Romania but rare in Mazury, Bohemia and Germany, while in Silesia it has peculiar traits [Wiślański 1966: 28–29].
2. *Globular amphorae of Type IAI* [Wiślański 1966: 25–26]. One bears a trace of decoration with vertical stanchion impressions (Świerszczów; Fig. 5B: 7), but due to the fact that the vessel is preserved only in fragments, the ornamental motif cannot be identified. Another much larger amphora is even in a poorer state and so it cannot be said if it has been ornamented (Świerszczów; Fig. 5B: 6). This type of globular amphorae is common in Mazury and Mazowsze and in north-western Poland; in the Lublin province, Volhynia, Podolia, Silesia and Bohemia

they have been sporadically found as in Saxony, Brandenburg, on the lower Elbe and in Vorpommern [Wiślański 1966: 26].

3. *Amphora of an intermediate variety between Types IA1 and IA3* [Wiślański 1966: 25–27] without any ornament (Świerszczów; Fig. 5B: 8). This variety is typical of the Lublin province and resembles vessels from Volhynia and Podolia [Wiślański 1966: 26].
4. *Ovoid-belly amphora, probably of Type IA2* [Wiślański 1966: 26], unornamented (Krasnystaw and Podlodów; Fig. 6C: 4 and 6A: 2). Both specimens lack their bottom parts, preventing certain typological classification. Similar specimens are known from Kujawy, northern Wielkopolska, Mazowsze, Lublin and Kielce provinces, Volhynia, Podolia and eastern Germany [Wiślański 1966: 26].
5. *Small barrel-shaped vessel* with the greatest protrusion of the belly at a half of its height, ornamented with a row of appliqué knobs (Świerszczów; Fig. 5B: 2) and a similar one with the greatest protrusion of the belly above a half of its height (Krasnystaw; Fig. 6C: 3), representing Type VIIIB3 [Wiślański 1966: 34]. Such forms are encountered in north-western Poland, Podolia and Germany [Wiślański 1966: 34].
6. *Tall hemispherical bowl resembling Type IVA3* [Wiślański 1966: 31], ornamented with rectangular-stamp impressions and a broken line (Świerszczów; Fig. 5A: 3). Similar vessels were found in Kujawy, Mazury, Mazowsze, Podolia, Anhalt, Saxony, in the Elbe drainage basin, Brandenburg and Silesia [Wiślański 1966: 30–31].
7. *Wide-orifice, tall vase of Type VBI* [Wiślański 1966: 32], ornamented with vertical stanchion impressions, incised lines and herringbones (Świerszczów; Fig. 5A: 5) or cord, vertical stanchion and dense herringbone impressions (Podlodów; Fig. 6A: 4). Such forms are found in northern Wielkopolska, Kujawy, Mazury, Kielce and Lublin provinces, Silesia and Germany [Wiślański 1966: 32].
8. *Wide-orifice vase of Type VB3* with a narrowing, short and unmarked neck [Wiślański 1966: 32], ornamented with the impressions of a rectangular stanchion, vertical and horizontal, and broken incised lines (Krasnystaw; Fig. 6C: 7). Analogous forms are rare but single specimens are known from northern Wielkopolska, Kujawy, Kielce and Lublin provinces and Brandenburg [Wiślański 1966: 32].
9. *Goblet-shaped drum* with a pronounced foot, Type IX [Wiślański 1966: 35], unornamented (Krasnystaw; Fig. 6C: 2). Similar drums occur in Kujawy and Bohemia [Wiślański 1966: 35].
10. *S-shaped vessels (pots)* with various degrees of belly protrusion and indistinct short and slightly everted necks, Type VIIIB2 [Wiślański 1966: 34], unornamented (Podlodów, two specimens; Fig. 6A: 1, 3). Similar containers are known from Mazury, Kielce province, Silesia and Bohemia [Wiślański 1966: 34].

The non-ceramic grave goods found in graves dated to Phase II include flint artefacts made exclusively of Volhynia raw-material such as an axe with a relatively

wide butt (Świerszczów; Fig. 5B: 10), bladelets (Świerszczów and Sajczyce; Fig. 5B: 9 and 7A: 3), a medioblade (Depułtynce Nowe-Kolonia; Fig. 6B: 4) and flakes (Sajczyce; Fig. 7A: 3). Several features held amber beads: tubular of Type 1A1a [Mazurowski 1983: 24] (Świerszczów, Depułtynce Nowe-Kolonia, Sajczyce; Fig. 5B: 4, 6B: 3, 7A: 2) and V-perforated knob-shaped. The latter came in three varieties [Mazurowski 1983: 26]: Type 1BIb (round, plano-convex; Świerszczów and Sajczyce; Fig. 5B: 4 and 7A: 3), Type 1BIIa (oval, lenticular; Depułtynce Nowe-Kolonia; Fig. 6B: 3) and Type 1BIIb (oval, plano-convex; Depułtynce Nowe-Kolonia; Fig. 6B: 3). In addition, one grave yielded a boar's tusk (Depułtynce Nowe-Kolonia; Fig. 6B: 2).

Tubular amber beads are known from Pomerania, northern Wielkopolska, Mazury, Courland Spit, Mazowsze, Lublin province, Volhynia, Bohemia and – very few – Germany [Mazurowski 1983: 44]. Knob-shaped beads, in turn, were found in Kujawy, Podlasie, Mazury and Lublin province [Mazurowski 1983: 44], while boar-tusk or domesticated pig-teeth pendants occurred in many graves in north-western Poland, Kielce province, Volhynia, Podolia, Bohemia and Germany [Wiślański 1966: 46].

Kujawy amphora of Type IIA1, very similar to the specimens from the Krasnystaw and Świerszczów sites, was found in the grave in Raciborowice-Kolonia (from Phase I; Fig. 5A: 1). The wide-orifice amphora from Sajczyce, in turn, looks a lot like vessels from the East Lublin radiocarbon-undated graves: Ślipcze (pit grave?) [Bronicki 2016a: 207–209, Fig. 158], Strzyżów (pit grave) [Bronicki 2016a: 204, Fig. 155: 1] and Cyców (cist grave) [Bronicki 2016a: 51, Fig. 4: 2]. None of the three vessels was ornamented. The other Kujawy amphorae (extracted from other radiocarbon-undated features) are different because of much taller necks and different belly proportions (Cyców, Miedniki, Sahryń, Stefankowice, Tworczyów) [Bronicki 2016a: 51, 158, 169, 190, 195, 215, Fig. 3: 1, 109: 1, 121: 1, 142: 1, 165], hence, they cannot be considered close analogies.

Globular amphorae of Type IA1 from Świerszczów do not have identical counterparts among the furnishings of other East Lublin graves. What is more, their clear classification is greatly hampered by the fact that their lips have not been preserved. Out of the inventories that have been radiocarbon dated, the vessels from Srebrzyszcze (Fig. 8A: 5) and Czulczyce-Kolonia (Fig. 8B: 2, 8) bear the greatest resemblance to Świerszczów ones. The graves from the first two localities have been assigned to Phase III. There are, however, clear differences in the morphology and ornamentation between vessels from the three locations. Specifically, the Czulczyce amphorae have regularly globular bellies whereas the Świerszczów vessel bellies resemble a lying ellipsoid. The Srebrzyszcze specimen has its upper portion missing, hence it is not known if it had any ornament. In turn, one of the Czulczyce amphorae is richly ornamented with inlaid arc impressions, chevrons and a broken line, while the other is unornamented. Graves without ¹⁴C determinations yielded more globular amphorae, bearing various degrees of resemblance to Świerszczów

ones. They were found in a cist grave in Sahryń [Bronicki 2016a: 171–172 and Fig. 122: 1–2] and a pit grave in Ślipcze [Bronicki 2016a: 207–209, Fig. 169: 1]. The vessel from the latter feature has its handles placed a little bit higher similarly to the unornamented amphora from Czulczyce-Kolonia (Fig. 8B: 8). One of the Sahryń amphorae is richly ornamented with a motif of chevrons and impressions of a vertical stanchion (in three rows), while the others bear no ornament.

Amphora of an intermediate variety between Types IA1 and IA3 from Świerszczów has only two not very close analogies that occurred in radiocarbon-undated graves: Stadarnia (in pit grave) [Bronicki 2016a: 188, Fig. 139: 2] and Tworyczów (in cist grave) [Bronicki 2016a: 216, Fig. 166: 1]. The former has an incised ornament (chevrons and vertical lines), while the latter bears no ornament.

Preserved in fragments only, ovoid-belly amphorae probably of Type IA2 from Podlodów and Krasnystaw may be similar to the upper portion of the Cyców vessel ornamented with a triangular, arched stamp [Bronicki 2016a: 51 and Fig. 4: 1].

Barrel-shaped vessels of Type VIIIB3 from the Świerszczów and Krasnystaw sites do not find any analogies in other East Lublin subgroup graves while rather similar vessels are known from the Nałęczów subgroup: Parchatka [Bronicki 2016a: 162 and Fig. 114: 1] and Klementowice 2 (= Cemetery B), Grave IV [Bronicki 2016a: 91 and Fig. 44: 2].

Tall hemispherical bowl resembling Type IVA3 from Świerszczów has only a single analogy in the East Lublin subgroup: from the Wytyczno site (from a pit grave). This vessel is ornamented with chevrons and arc impressions [Gurba 1954: 161 and Fig. 37].

Vase of Type VB1, discovered in Świerszczów, finds no close analogies among East Lublin vessels but is rather popular in the Nałęczów subgroup.

Vase of Type VB3 from Krasnystaw very closely resembles a vessel from a pit grave in Strzyżów [Bronicki 2016a: 204 and Fig. 155: 2].

Goblet-shaped drum of Type IX, from Krasnystaw, is a single find.

S-shaped vessels (pots) of Type VIIIB2 occurred only once: at the Podlodów settlement. Perhaps this is a kind of pottery that was not used as grave goods in the East Lublin subgroup.

Flint axes of proportions closely resembling those of the tool found in Świerszczów come from radiocarbon-undated features on the following sites: Husynne-Kolonia (pit grave), Stefankowice-Kolonia (cist grave), Zamość (pit grave) [Bronicki 2016a: 66, 195, 222, Fig. 20: 4, 144: 1, 173: 2–3]. Only the specimen from Stefankowice-Kolonia is made of Volhynia flint while the other two – from striped flint.

Fine flint objects are known from two more radiocarbon-dated cist graves: Czulczyce-Kolonia (Fig. 8B: 9) and Srebrzyszcze (Fig. 8A: 8), assigned to Phase III, and from an undated feature in Stefankowice [Bronicki 2016a: 195 and Fig. 144: 2–6]. These specimens are made of local flint (Rejowiec and erratic flint), as well as Volhynia or Dniester flint.

Tubular amber beads (badly damaged) were found in cist graves in Czulczyce-Kolonia, Phase III [Bronicki 2016a: 57] and in a cist grave in Sahryń for which no ^{14}C determination is available [Bronicki 2016a: 173 and Fig. 124: 4–5]. No knob-shaped amber beads, known from the sites in Świerszczów, Depułtycze Nowe-Kolonia and Sajczyce, have been found in other East Lublin subgroup graves.

Boar's tusks were found only in a cist grave in Łopiennik Dolny-Kolonia (Fig. 7B: 7), which, however, must be placed rather in Phase III, and in a radio-carbon-undated pit grave in Strzyżów [Bronicki 2016a: 206].

Phase III (2650/2600–ca 2400 BC)

In Phase III, two graves may be included whose age determinations are clearly the youngest in the East Lublin subgroup, i.e. Srebrzyszcze and Czulczyce-Kolonia. The problem with the third grave – in Łopiennik Dolny-Kolonia – is two different dates obtained for human remains (*see* comments above). Its assignment to Phase III, besides the suggestion following from the date obtained in Kiev, relies on the similarity of proportions of Kujawy and globular amphorae, and 'baroque' vessel ornamentation (with a significant share of chevrons and arc impressions) to those of pottery extracted from the two youngest graves.

The double-chambered structure of the Czulczyce-Kolonia grave is considered a certain rarity albeit sporadically encountered in Volhynia (Wojciechówka/Kolodyazhnoye) [Sveshnikov 1983: 320] and in the Nałęczów subgroup where similar grave forms were exposed on the following sites: Klementowice, Cemetery D, Grave 3; Stok, Cemetery A; Las Stocki, Cemetery H [Bronicki 2016a: 97, 142, 196 and Fig. 48, 49, 95B, 147]. Double-chambered graves are also known from Mazury [Wiślański 1966: 60]. A similar structure was probably shared by a pit grave in Raciborowice-Kolonia, assigned to Phase I. While in Raciborowice, Klementowice, Las Stocki and Stok, the western chamber was allotted to animals, in Czulczyce-Kolonia both chambers held human remains arranged very carefully and symmetrically to each other [Bronicki 2016a: 54 and Fig. 7].

Grave goods, in particular pottery, are less diversified than in Phase II. Six vessel types were recorded.

1. *Bulbous Kujawy amphorae of Type IIA1* of various sizes [Wiślański 1966: 28–29] with relatively tall cylindrical necks. One specimen was unornamented (Srebrzyszcze; Fig. 8A: 6), while another had only a relief strip running around it (Łopiennik Dolny-Kolonia; Fig. 7B: 5), but the other amphorae of this type bore a rich ornament. It included 'hanging' chevrons supplemented by arc impressions forming horizontal and vertical lines (Łopiennik Dolny-Kolonia and Srebrzyszcze; Fig. 7B: 1; 8A: 1–2) or inlaid with a white paste, and multiple broken lines combined with horizontal lines of arcs (Czulczyce-Kolonia; Fig. 8B: 1–2). This vessel type is quite common in north-western Poland, Mazowsze, Podlasie, Lublin province, Volhynia, Podolia and Romania but rare in Mazury, Bohemia and Germany, while in Silesia it has peculiar traits [Wiślański 1966: 28–29].

2. *Amphorae* with tall, funnel-like-everted necks, strongly protruding bellies and well-pronounced bases. Their long, narrow handles, double-perforated horizontally, stretch from the shoulder to lip rim. They are unornamented (Fig. 8A: 3-4). Similar handles are found only on a small amphora from Klementowice, Cemetery B, Grave I, assigned to the Nałęczów group [Bronicki 2016a: 87–88 and Fig. 39: 2]. In shape, they resemble Type IIA1 [Wiślański 1966: 28–29], but the funnel-like necks everted to various degrees are not typical of any amphorae. In all likelihood, we are dealing with a peculiar form – a local East Lublin one (?).
3. *Globular amphorae of Type IAI* [Wiślański 1966: 25–26] are known from two graves: Srebrzyszcze (Fig. 8A: 5) and Czulczyce-Kolonia (Fig. 8B: 2, 8). The vessel from the former grave had its upper portion broken off, hence its height is not known, nor how it was ornamented. Another two specimens have relatively tall cylindrical necks. One of the amphorae has a rich ornament of chevrons, horizontal broken lines and arc impressions (Fig. 8B: 2). This type of globular amphorae is quite common in Mazury and Mazowsze and in north-western Poland; in the Lublin province, Volhynia, Podolia, Silesia and Bohemia they have been sporadically found as they have been in Saxony, Brandenburg, on the Elbe and in Vorpommern [Wiślański 1966: 26].
4. *Small amphora of Type IB3* [Wiślański 1966: 27], without ornament, occurred only once – in a grave in Łopiennik Dolny-Kolonia (Fig. 7B: 6). This form is known from the Nałęczów Plateau, Garwolin Plain, Lubusz Land [Nosek 1967: 440, Pl. VIII] and the eastern GAC group [Sveshnikov 1983: 82 and Pl. XXII: 1, 5, 10].
5. *Vase-goblet (beaker) of Type VIA1* [Wiślański 1966: 32], found in the grave in Łopiennik Dolny-Kolonia, bears a rich ornament of multiple zigzags placed between horizontal lines composed of fine dents (inlaid with a white paste), and flanked by two appliqué knobs placed next to each other. This type is known from northern Wielkopolska, Kujawy, Mazowsze, Kielce and Lublin provinces while similar but single specimens are also found in Saxony, Thuringia and Brandenburg [Wiślański 1966: 32]. They were recorded in Volhynia and eastern Roztocze in the Lviv area as well [Sveshnikov 1983: 62 and Pl. III: 1, 5].
6. *Hemispherical bowl of Type IVA2* [Wiślański 1966: 30] has a tall, cylindrical neck. The only specimen was found in a grave in Srebrzyszcze (Fig. 8A: 10). It bears a rich ornament of chevrons and arc impressions (horizontal and vertical). Similarly-shaped vessels come from West Pomerania, Wielkopolska, Mazury, Lublin province, Bohemia and Saxony [Wiślański 1966: 30].

The non-ceramic grave goods found in radiocarbon-dated graves include quadrifacial trapezium-shaped axes with flat smooth butts made of striped flint: a slender narrow-butt one (Łopiennik Dolny-Kolonia; Fig. 7B: 3) and another one – chunky, thick, repaired, with a broad butt (Czulczyce-Kolonia; Fig. 8B: 7).

Another specimen, trapezium-shaped, too, but with a rounded butt, was made of Volhynia flint (Srebrzyszcze; Fig. 8A: 7). A flint chisel occurred only once (Łopiennik Dolny-Kolonia; Fig. 7B: 4). Fine flint artefacts were found in two graves (Srebrzyszcze and Czulczyce-Kolonia; Fig. 8A: 8 and 8B: 9). They were made of Volhynia, Cretaceous (Rejowiec) or erratic flint. In addition, one feature yielded a quartzite flake (Czulczyce-Kolonia; Fig. 8B: 5), and also in one feature, boar's tusks were found (Łopiennik Dolny-Kolonia; Fig. 7B: 7); another two features yielded bone tools: a chisel and point-perforator (Czulczyce-Kolonia; Fig. 8B: 3, 6), and a fragment of a double-edged point (Srebrzyszcze; Fig. 8A: 9). A single amber bead was recorded: a poorly-preserved tubular one (Czulczyce-Kolonia) [Bronicki 2016a: 57].

Kujawy amphorae of Type IIA1 with relatively tall cylindrical necks, which were found in all three Phase III graves, find close analogies in other vessels, being furnishings of radiocarbon-undated features such as those in Cyców, Miedniki, Sahryń, Stefankowice-Kolonia or Tworyczów [Bronicki 2016a: 51, 158, 169–170, 190, 215, Fig. 3: 1, 109: 1, 121: 1, 142: 1, 165]. Vessels of this type are not found in Phase I or II. The Stefankowice and Cyców specimens share very similar and rich ornaments (chevrons, broken lines, stamp impressions). The Miedniki and Cyców specimens bear cord impressions.

Globular amphorae of Type IA1 with tall cylindrical necks did not occur in other radiocarbon-dated graves. They were discovered in Sahryń (cist grave) [Bronicki 2016a: 171–172 and Fig. 122: 1–2] and Ślipcze (pit grave?) [Bronicki 2016a: 207–209 and Fig. 169: 1]. The vessel from the latter site closely resembles the unornamented amphora from Czulczyce-Kolonia (both have identically placed handles). The ornamented Sahryń amphora bears an ornament of multiple *chevrons*.

Small amphora of Type IB3 has no good analogy in the East Lublin subgroup. It bears the closest resemblance to vessels from radiocarbon-undated features in Stadarnia (pit grave) and Tworyczów (cist grave) [Bronicki 2016a: 188, 215–216 and Fig. 139: 2, 165: 1] in spite of the fact that they have completely rounded unmarked bases. Both have their upper portions damaged, which makes their typological classification difficult. The Stadarnia amphora bears an ornament of chevrons while the Tworyczów specimen is unornamented.

Vase-goblet (beaker) of Type VIA1 finds very close analogies in vessels from radiocarbon-undated cist graves exposed in Poniatówka and Tworyczów [Bronicki 2016a: 166, 215–216 and Fig. 116: 1, 166: 2]. Both containers bear a rich, 'baroque' ornament of chevrons and horizontal lines composed of arcs. The ornament on the Tworyczów container is in part made with cord impressions.

Hemispherical bowl of Type IVA2 has imperfect analogies in vessels from a cist grave in Sahryń and a pit one in Stadarnia [Bronicki 2016a: 169, 187–188, Fig. 121: 2, 139: 1]. They are ornamented with rectangular stamp impressions, forming a multiple broken line (Sahryń), and rows of vertical stanchions combined with a single zigzag and bands of vertical lines (Stadarnia).

Flint axes with proportions similar to those of the tool found in Łopiennik Dolny-Kolonia come from radiocarbon-undated graves: pit ones from Strzyżów and Stadarnia and cist ones from Sahryń and Kułakowice Trzecie [Bronicki 2016a: 122, 172, 189, 206, Fig. 76, 123: 1, 140, 156]. The Strzyżów specimen is made of Volhynia or striped flint, while the others are made of Cretaceous-Rejowiec flint (Stadarnia, Sahryń), Volhynia flint (Kułakowice Trzecie) and striped flint (Sahryń). The chunky axe from Czulczyce-Kolonia resembles best only a Volhynia-flint specimen from a pit grave in Ślipcze [Bronicki 2016a: 209 and Fig. 159: 2]. The axe with a rounded butt from Srebrzyszcze finds a single analogy in a Cretaceous-Rejowiec-flint tool, found in Huta, Grave II [Bronicki 2016a: 70 and Fig. 23: 1].

The flint chisel is a single find without any analogies in archaeometrically dated features.

Fine flint objects are known from two other radiocarbon-dated cist graves – in Sajczyce (Fig. 7A: 3) and Depułtęcze Nowe-Kolonia (Fig. 6B: 4) – and one pit grave – in Świerszczów (Fig. 5B: 9), assigned to Phase II, as well as from radiocarbon-undated cist graves in Huta and Stefankowice [Bronicki 2016a: 70, 195, Fig. 3 and 144: 2–6]. These specimens are made of local (Rejowiec), Volhynia or Dniester flint.

Amber tubular beads were found in pit graves in Świerszczów (Fig. 5B: 4), Depułtęcze Nowe-Kolonia (Fig. 6B: 3) and Sajczyce (Fig. 7A: 2) – from Phase II – and in Sahryń – in a radiocarbon-undated cist grave [Bronicki 2016a: 173 and Fig. 124: 4–6].

A boar's tusk was found in a Phase II cist grave in Depułtęcze Nowe-Kolonia (Fig. 6B: 2) and in a radiocarbon-undated pit grave in Strzyżów [Bronicki 2016a: 206].

Bone tools: a chisel, point-perforator and double-edged points are known solely from radiocarbon-undated graves: a pit one in Husynne Kolonia and cist ones in Sahryń and Stefankowice [Bronicki 2016a: 66–67, 173, 195, Fig. 19: 1, 124: 2–3, 145: 1].

CHRONOLOGY OF RADIOCARBON-UNDATED GRAVES

In the East Lublin subgroup, there are 31⁶ graves for which radiocarbon age determinations are not available. In the case of 12, it is not possible to make any chronological assessments because for the most part these are features discovered in the past by casual finders, whose reports on grave goods (destroyed or now lost) were sadly insufficient. The rest is made up of 'poor' graves which could have

⁶ After the age of the Tarnoszyn tomb has been determined, this group consists of 30 grave sites [Bronicki 2021: 242].

Table 5. Chronology of not radiocarbon dated graves of the Globular Amphora culture, East Lublin subgroup graves.

Sites	Phase I	Phase II		Phase III	
		older part	younger part	older part	younger part
Strzyżów					
Husynne-Kolonia					
Partyzantów-Kolonia					
Rudno, grave II					
Zamość					
Nadrybie Dwór					
Stadarnia					
Stefankowice					
Stołpie					
Sahryń					
Ślipcze					
Wytyczno					
Cyców					
Huta, grave II					
Kułakowice Trzecie					
Miedniki					
Poniatówka					
Tworyczów					
Wola Gródecka					

been robbed earlier. This group comprises graves from the following sites: Bezek, Branica Suchowolska, Dobryniów-Kolonia, Huta, Kryłów, Okalew, Putnowice-Kolonia, Rudno 1, Sajczyce 18, Tarnoszyn⁷, Wytyczno-Kolonia and Zbulitów Mały (see Bronicki 2016a).

Ultimately, the age of 19 features was estimated by comparing the styles of objects extracted from them with the inventories of radiocarbon-dated graves (Table 4). The credibility of chronological estimates, however, greatly varies because furnishings from several graves, consisting, for instance, of axes alone, cannot be assigned to a specific phase beyond doubt. The reason being that the shape of axes, due to their frequent repairs, need not be a good chronological marker [Borkowski, Migal 1996: 150–153]. Nevertheless, the analysis of co-occurrence

⁷ This grave was finally qualified for phase II [Bronicki 2021: 242].

of cultural elements helped add to the lists of finds related to particular phases. The additions included certain traits that had not occurred in radiocarbon-dated graves. Below, a preliminary indirect dating of the 19 sepulchral features is presented (Tables 4 and 5).

Cyców [Bronicki 2016a: 48–51]. Cist grave. A partially-preserved amphora with a wide, short (?) neck (IIA1) resembles a vessel from Sajczyce (Fig. 7A: 1) and indicates connections to Phase II. In turn, a Type-IIA1 amphora with a tall neck reminds one of specimens from features assigned to Phase III, located in Łopiennik Dolny-Kolonia (Fig. 7B: 1), Srebrzyszcze (Fig. 8A: 1–2, 6) and Czulczyce-Kolonia (Fig. 8B: 1, 4). A slender Type-IA2 amphora has a tall funnel-like-everted neck thus suggesting links to the ‘long-handled’ amphorae from the Srebrzyszcze grave dated to Phase III (Fig. 8A: 3–4). The ornament of chevrons indicates Phase III, that of impressed arcs – Phase II and III, while cord impressions – Phase II. However, the fact that a cord was used to make the chevrons suggests that the amphora should be assigned to Phase III. This conclusion extends the time when vessels were ornamented with a cord ornament to Phase III, too, which was not established on the basis of radiocarbon determinations. Dating: Phase III.

Husynne-Kolonia [Bronicki 2016a: 66–68]. Pit grave. A small Type-VB3 vase, thanks to its proportions, looks a lot like a much larger vessel of the same type from Krasnystaw (Fig. 6B: 7) assigned to Phase II. Axes may be dated in the same way because they resemble a tool from Świerszczów (especially the larger specimen; Fig. 5B: 10). Dating: Phase II.

Huta, Grave II [Bronicki 2016a: 69–71]. Cist grave. An axe with a rounded butt is similar to a tool from Srebrzyszcze (Fig. 8A: 7), which may suggest a connection of the grave to Phase III.

Kulakowice Trzecie [Bronicki 2016a: 122]. Cist grave. A flint axe with a relatively narrow butt resembles a tool from Łopiennik Dolny-Kolonia (Fig. 7B: 3), which may indicate Phase III.

Miedniki [Bronicki 2016a: 158]. Cist grave. A Kujawy tall-neck amphora (Type IIA1) indicates Phase III albeit there are no close analogies to it among vessels from radiocarbon-dated graves. A cord ornament forming a multiple broken line and chevrons suggests a connection to Phases II and III. Dating: Phase III.

Nadrybie Dwór [Zakościelna 2000: 51–57]. Cist grave. A Type-IIA1 amphora has a relatively short neck and strongly resembles a Phase II amphora from Krasnystaw (Fig. 6B: 1). A cord ornament forms chevrons – a trait of Phases II and III. Both axes are intermediate specimens between the Świerszczów type (Fig. 5B: 10; Phase II) and the Łopiennik Dolny-Kolonia type (Fig. 7B: 3; Phase III). If the grave chronology is determined on the strength of the shape of the short-neck amphora, the grave is assigned to Phase II. This finding, in turn, makes one conclude that chevrons appeared already in this phase, although they have not been observed on vessels from radiocarbon-dated graves. Dating: Phase II (younger section).

Partyzantów-Kolonia [Błędowska, Gałań 2006: 261–267]. Pit grave (?). An amphora resembling Type IIA1 has a short neck and reminds one of the Raciborowice-Kolonia (Fig. 5A: 1; Phase I) and Świerszczów (Fig. 5B: 1; Phase II) amphorae. A Type-IA1 globular amphora has a funnel-like-everted lip and a rather tall neck, which makes it similar to a vessel from Czulczyce Kolonia (Fig. 8B: 8), from a grave dated to Phase III. A Type-VIA3 vase (beaker) is not represented among the furnishings of East Lublin radiocarbon-dated graves. The same applies to a small amphora with a pear-shaped belly, hemispherical base and funnel-like-everted short neck. Cord-impressed and herringbone ornaments suggest dating to Phase II (or possibly Phase III). Flint bladelets were recorded in Świerszczów (Fig. 5B: 9), Deputycze Nowe-Kolonia (Fig. 6B: 4) and Sajczyce – in Phase II graves (Fig. 7A: 3). The pit grave form has been encountered in older phases. Dating: Phase II.

Poniatówka [Bronicki 2016a: 164–167]. Cist grave. A Type-VIA1 vase (beaker) very closely resembles a vessel from Łopiennik Dolny-Kolonia (Fig. 7B: 2), dated to Phase III. The ornament of chevrons is characteristic of Phase III (or possibly Phase II), while that of impressed arcs – of Phases II and III. The same is true of white paste inlays. An axe with a wide flat smooth butt represents the type that occurred in Łopiennik Dolny-Kolonia (Fig. 7B: 3; Phase III). Dating: Phase III.

Rudno, Grave II [Ścibior 1986: 111–119]. Cist grave. A globular amphora, probably of Type IA1 (classification uncertain due to a missing base) has a short neck, which is a trait of vessels belonging to older phases. Containers of rather similar proportions were extracted from a grave in Świerszczów (Fig. 5B: 6–7), dated to Phase II. The presence of impressed arcs points to Phases II and III. Flint bladelets appeared in Phase II in Świerszczów (Fig. 5B: 9), Deputycze Nowe-Kolonia (Fig. 6B: 4) and Sajczyce (Fig. 7A: 3). Dating: Phase II.

Sahryń [Bronicki 2016a: 168–173]. Cist grave. A Type-IIA1 amphora and two Type-IA1 vessels have tall necks, which is a marker of Phase III. A Type-IVA2 bowl resembles the most closely Type-VB3 vases from Świerszczów (Fig. 5B: 5) and Podlódów (Fig. 6A: 4), dated to Phase II. The ornament of chevrons was found to appear in late chronology graves (i.e. from Phase III), while that of a multiple broken line – in Phases II and III. White paste inlays, in turn, are found on vessels from Phase II (Sajczyce) and Phase III (Łopiennik Dolny-Kolonia and Czulczyce-Kolonia). Both axes resemble more closely the specimen from Łopiennik Dolny-Kolonia (Fig. 7B: 3; Phase III) than one from Świerszczów (Fig. 5B: 10; Phase II). Tubular amber beads are known from Phase II graves in Świerszczów (Fig. 5B: 4), Deputycze Nowe-Kolonia (Fig. 6B: 3) and Sajczyce (Fig. 7A: 2) and Phase III ones in Czulczyce-Kolonia [Bronicki 2016a: 57]. A bone double-edged point has only one analogy in the Srebrzyszcze grave (Fig. 8A: 9), while an awl-perforator – in Czulczyce-Kolonia (Fig. 8B: 6). Both analogies come from Phase III. A T-shaped pendant has not been found in any East

Lublin feature of a determined chronology. Dating: Phase II (younger section) – Phase III.

Stadarnia [Bronicki 2016a: 187–189]. Pit grave. A Type-IA1/1A3 globular amphora finds an analogy in Świerszczów (Fig. 5B: 8), in a grave dated to Phase II. A Type-IVA2 bowl resembles best Type-VB3 vases from Świerszczów (Fig. 5B: 5) and Podlodów (Fig. 6A: 4), dated to Phase II as well. The presence of the ornament of chevrons was confirmed in late-chronology graves (of Phase III) and possibly ‘classic’ ones (of Phase II). The form of a pit grave argues strongly for Phase II. A chevron ornament appears probably already in Phase II (towards its end?), but its presence in radiocarbon-dated graves has not been confirmed. Dating: Phase II (younger section?).

Stefankowice-Kolonia [Bronicki 2016a: 190–195]. Cist grave. The Kujawy amphora belongs to Type IIA1 (with a rather tall, poorly pronounced neck). It has no close analogies among radiocarbon-dated materials. The shape of its belly resembles best that of a vessel from Świerszczów (Fig. 5B: 1; Phase II), but the Stefankowice amphora has slenderer proportions and a clearly taller neck. This trait has been confirmed for Phase III. A Type-IA4 amphora, with a rounded base and pear-shaped belly [Wiślański 1966: 27], is incomplete (the lip portion is missing) and thus it cannot be determined whether its neck was tall or short and, consequently, to which phase it ought to be assigned. This vessel finds no analogy in the East Lublin subgroup. The ornament of a multiple broken line and chevrons must be placed in Phases II and III. Two axes with wide flat smooth butts resemble an axe from Świerszczów (Fig. 5B: 10; Phase II) – a slender specimen with a narrow butt (flat one, too) which resembles more the tool from Łopiennik Dolny-Kolonia (Fig. 7B: 4; Phase III). A bone chisel, quite similar to the Czulczyce specimen (Fig. 8B: 9), may indicate Phase III. Flint bladelets occurred in features in Świerszczów (Fig. 5B: 9), Depułtycze Nowe-Kolonia (Fig. 6B: 4) and Sajczyce (Fig. 7A: 3), i.e. Phase II features. Neither a circular amber disk nor T-shaped bone pendants have any analogies in radiocarbon-dated graves. Dating: Phase II-III.

Stołpie [Bronicki 2016a: 202–203]. Cist grave. A long, slender axe with a rather narrow butt, a flat smooth and slightly irregular one, does not resemble the Phase II Świerszczów specimen, nor other tools of the same category from Phase III graves. Perhaps, it has the most in common with the axe from Łopiennik Dolny-Kolonia (Fig. 7B: 4). A stone cist structure rather rules out Phase I. Dating: Phase II-III.

Strzyżów [Bronicki 2016a: 203–206]. Pit grave. An amphora with a wide, short neck (Type IIA1), similar to the vessels from Raciborowice-Kolonia (Phase I; Fig. 5A: 1) and Świerszczów (Fig. 5B: 1; Phase II), and a Type-VB3 vase, resembling a container from Krasnystaw (Fig. 6C: 7), point to Phases I and II. An axe with a narrow flat smooth butt resembles the tool from the Phase III grave in Łopiennik. The ornament of impressed arcs that is visible on a Type-VB3 vessel occurs in both Phase II and Phase III. Boar’s tusks were also found in graves in Łopiennik Dolny-Kolonia (Fig. 7B: 7; Phase III) and Depułtycze Nowe-Kolonia

(Fig. 6B: 2; Phase II). As is the case with axes, this category of finds is not a good age marker. Dating: Phase II (older section?).

Ślipcze [Bronicki 2016a: 207–209]. Pit grave. An amphora with a wide, short neck (Type IIA1), similar to the vessel from Sajczyce (Fig. 7A: 1) points to Phase II, while a globular amphora with a tall neck (IA1), similar to that from Czulczyce-Kolonia (Fig. 7: B: 8), and perhaps a chunky flint axe with a flat smooth butt, resembling a specimen from the same grave (Fig. 8B: 7), display traits characteristic rather of Phase III. The pit structure of the grave indicates a connection to older phases. Dating: Phase II/III (transitional period?).

Tworyczów [Bronicki 2016a: 215–216]. Cist grave. A Type-IIA1 Kujawy amphora (with a tall neck) is characteristic of Phase III. Vessels of very similar proportions are known from Phase III features in Łopiennik Dolny-Kolonia (Fig. 7B: 1), Czulczyce-Kolonia (Fig. 8B: 1, 4) and Srebrzyszcze (Fig. 8A: 1–2, 4). A Type-IA1/IA3 globular amphora most closely resembles a container from Świerszczów (Fig. 5B: 8; Phase II). A Type-VIA1 vase-goblet is similar to a vessel from Łopiennik Dolny-Kolonia (Fig. 7B: 2; Phase III), but has a wider lip and looks more like a bowl. The Łopiennik grave is dated to Phase III one trait of which is a chevron ornament to be found on the vase and amphora. The presence of arcs, in turn, points to Phases II and III, while cord impressions – to Phase II. It appears, however, that cord impressions, although their presence in radiocarbon-dated Phase III graves has not been confirmed, may be an ornament of that time interval, too. A similar situation is witnessed in the case of the Cyców grave (*see above*). Dating: Phase III.

Wola Gródecka [Nosek 1967: 243–244]. Cist grave. A very similar Type-IVA2 bowl was discovered in a grave in Srebrzyszcze, associated with Phase III. An arc ornament occurs in both Phase II and Phase III, while a cord-impressed ornament – in Phase II, but no doubt in Phase III as well, which is evidenced by chevrons made with cord impressions (e.g. on vessels from radiocarbon-undated graves in Cyców, Tworyczów and Miedniki). Dating: Phase III.

Wytyczno [Gurba 1954: 159–164]. Pit grave. Two partially-preserved amphorae may represent the Kujawy amphora type (IIA1) but one may just as well be a globular amphora with a tall neck (IA1?). The tall neck is a trait associated with Phase III found on vessels from Łopiennik Dolny-Kolonia (Fig. 7B: 1), Czulczyce-Kolonia (Fig. 8B: 1, 4) and Srebrzyszcze (Fig. 8A: 1–2, 4) and on globular amphorae from Czulczyce-Kolonia (Fig. 8B: 2, 8). A Type-IVA3 bowl has the closest analogy in a vessel from Świerszczów (Fig. 5B: 3), assigned to Phase II. Meanwhile, Type-VIIIB2 pots are known only from a pit in Podlodów, dated to Phase II (Fig. 6A: 1–2). The ornament of impressed arcs is associated with Phases II and III, cord impressions – with Phase II and most likely with Phase III as well, and chevrons – with Phase III. Cord impressions were used to make chevrons on the tall neck of the amphora, which was recorded already earlier in the case of amphorae from Tworyczów and Cyców (*see above*). Pot-like vessels known from

Podlodów need not be a good chronological marker, therefore, the presence of such a vessel in a Phase III grave need not arouse chronological controversies. Dating: Phase II/III (transitional period?).

Zamość [Bronicki 2016a: 221–222]. Badly damaged pit grave. Both flint axes have proportions resembling those of a tool from Świerszczów (Fig. 5B: 10). This, however, does not determine the chronology of the grave. Furthermore, a bottom shard of a vessel does not make the dating task easier, either (most likely, it is an amphora of an indeterminate type). The pit form of the grave suggests that it is of an older age. Dating: Phase II (?).

CONCLUSION

The above discussion is summarised in the lists of diagnostic traits for particular phases.

Phase I (3000/2950–2900/2850 BC) – preceding the rise of the East Lublin subgroup ('general GAC' horizon)

- Graves: pits (including double-chambered?)
- Ceramics: Kujawy amphorae, biconical deep bowls (beakers)
- Ornamentation: impressions of a vertical stanchion and broken line made with the same stamp, small conical appliqué knobs

Phase II (2900/2850–2650/2600 BC) – 'classic' phase of the East Lublin subgroup

- Graves: pits and cists
- Ceramics: globular, ovoid, pear-shaped low-neck Kujawy amphorae, barrel-shaped vessels, hemispherical bowls, vases/goblets, drums, S-shaped vessels (pots)
- Ornamentation: impressions of a vertical stanchion, broken line, herringbone (made with the same tool), incised lines, cord impressions (horizontal lines and loops, probably chevrons), appliqué knobs
- White paste incrustation
- Volhynia flint objects: axe with a wide flat smooth butt, blades, bladelets and flakes
- Amber objects: tubular and knob-shaped beads (of several varieties), probably a circular disk
- Bone objects: boar's tusks, probably T-shaped pendants

Phase III (2650/2600–ca 2400 BC) – ‘late’ phase of the East Lublin subgroup

- Graves: cists (including double-chambered), no pit graves
- Ceramics: tall-neck amphorae: Kujawy and globular ones, small wide-orifice amphorae with a poorly marked base, vases-goblets (beakers), hemispherical bowls with cylindrical necks, long, narrow handles double-perforated horizontally and occupying the entire height of the neck (from the shoulder to the lip rim)
- ‘Baroque’ ornamentation: relief strips, double appliqué knobs, chevrons, arc impressions, broken lines, cord impressions (including angular ornaments)
- White paste incrustation
- Flint objects: slender and chunky trapezium-shaped axes with flat or rounded butts, chisels, fine flake tools and debitage
- Amber objects: tubular beads, probably circular disks
- Bone objects: boar’s tusks, chisels, point-perforators, double-edged points

* * *

Future grave discoveries and new radiocarbon age determinations ought to verify the above suggestions as to the chronology the GAC East Lublin subgroup, expand and add to the specifications of cultural traits characteristic of particular phases.

REFERENCES

Bagińska J., Taras H.

- 1997 Jama kultury amfor kulistych z Podlódowa, stan. 2, woj. zamojskie. *Archeologia Polski Środkowowschodniej* 2: 31–34.

Błądowska A., Gałan M.

- 2006 Materiały ze zniszczonego obiektu kultury amfor kulistych w miejscowości Kolonia Partyzantów, pow. tomaszowski. *Archeologia Polski Środkowowschodniej* 8: 261–267.

Borkowski W., Migal W.

- 1996 Ze studiów nad użytkowaniem siekier czworościennych z krzemienia pasiastego. In: W. Brzeziński, W. Borkowski, W. Migal (Eds) *Z badań nad wykorzystaniem krzemienia pasiastego*. Studia nad gospodarką surowcami krzemiennymi w pradziejach 3, 141–165. Warszawa.

Borowska B., Bronicki A., Mazur G.

- 2000 A Grave of the Globular Amphora Culture at Czulczyce Kolonia, site 6, Sawin Commune, Lublin Voivodship. In: S. Kadrow (Ed.) *A Turning of Ages / Im Wandel der Zeiten. Jubilee Book Dedicated to Professor Jan Machnik on His 70th Anniversary*, 73–100. Kraków.

Bronicki A.

- 2000 Grób kultury amfor kulistych w Kolonii Czulczyce, stan. 6, gm. Sawin. *Archeologia Polski Środkowowschodniej* 5: 181–195.
- 2007 Box grave of the Globular Amphora Culture in Kolonia Depułtycze Nowe, site 12, Chełm Commune, Chełm District, Lublin Voivodship. *Sprawozdania Archeologiczne* 59: 203–234.
- 2010 Grób skrzynkowy kultury amfor kulistych w Sajczycach, stanowisko 66, gm. Sawin, pow. Chełm, woj. Lublin. In: S. Czopek, S. Kadrow (Eds) *Mente et rutro. Studia archaeologica Johanni Machnik viro doctissimo octogesimo vita anno ab amicis, collegia et discipulis oblate*, 133–152. Rzeszów.
- 2011 Skhidnolublińska (pid)grupa kultury kulastikh amfor na Khilmshchyni – pitannia shchodo nayavnosti u pokhovannyach znariad prashch, napifabrikativ ta predmiotiv z reyovieckogo kremenynu. *Naukovi studii. Istoriko-krajeznavchij muzey m. Vinniki* 4: 16–34.
- 2016a Obrządek pogrzebowy społeczności kultury amfor kulistych na Wyżynie Lubelskiej. In: P. Jarosz, J. Libera, P. Włodarczak (Eds) *Schylek neolitu na Wyżynie Lubelskiej*, 45–256. Kraków.

- 2016b (Pod)grupa wschodniolubelska kultury amfor kulistych na Chełmszczyźnie – zagadnienie wyposażania grobów w narzędzia, półsurowiec i materiał odpadkowy z krzemienia narzutowego rejowieckiego. In: W. Borkowski, B. Sałacińska, S. Sałaciński (Eds) *Krzemień narzutowy w pradziejach. Materiały z konferencji w „Mądralinie” w Otwocku, 18-20 października 2010*. Studia nad gospodarką surowcami krzemiennymi w pradziejach 8, 343–361. Warszawa.
- 2019 Chronologia podgrupy wschodniolubelskiej kultury amfor kulistych w świetle oznaczeń radiowęglowych. In: M. Szmyt, P. Chachlikowski, J. Czebreszuk, M. Ignaczak, P. Makarowicz (Eds) *Vir Bimaris. Od kujawskiego matecznika do stepów nadczarnomorskich. Studia z dziejów pogranicza bałtycko-pontyjskiego ofiarowane Profesorowi Aleksandrowi Kośko*. Archaeologia Bimaris – Dyskusje 5, 201–228. Poznań.
- 2021 *Pierwsi pasterze III tysiąclecia p.Ch. Groby podgrupy wschodniolubelskiej kultury amfor kulistych. Obrządek pogrzebowy. Chronologia*. Chełm.
- Bronk Ramsey C.
2017 OxCal v. 4.3. Oxford (www.rlaha.ox.ac.uk).
- Gabrysiak L.
2004 *Województwo lubelskie*. Lublin.
- Gołub S.
1996 Grave of the Globular Amphora Culture from site No. 8 in Krasnystaw (Prov. of Chełm, Poland). *Baltic-Pontic Studies* 4: 35–43.
1996a Grave of the Globular Amphora Culture from site No. 1 in Łopiennik Dolny Kolonia (Prov. of Chełm, Poland). *Baltic-Pontic Studies* 4: 44–50.
- Gurba J.
1954 Materiały do badań nad neolitem Małopolski. In: *Annales Universitatis Mariae Curie-Skłodowska. Sectio F* 9 (1957): 129–178.
- Jarosz P., Libera J., Włodarczak P.
2016 Schyłek neolitu na Wyżynie Lubelskiej – wprowadzenie. In: P. Jarosz, J. Libera, P. Włodarczak (Eds) *Schyłek neolitu na Wyżynie Lubelskiej*, 9–10. Kraków.
- Jarosz P., Włodarczak P.
2007 Chronologia bezwzględna kultury ceramiki sznurowej w Polsce południowo-wschodniej oraz na Ukrainie. *Przegląd Archeologiczny* 55: 71–108.
- Kadrow S., Szmyt M.
1996 Absolute chronology of the Eastern Group of Globular Amphora Culture. *Baltic-Pontic Studies* 4: 103–111.

Koško A., Szmyt M.

- 2011 Udział społeczności Niżu Środkowoeuropejskiego w poznawaniu środowisk biokulturowych Płyty Nadczarnomorskiej: IV-IV/III tys. BC. In: M. Ignaczak, A. Koško, M. Szmyt (Eds) *Między Bałtykiem a Morzem Czarnym. Szlaki międzymorza IV-I tys. przed Chr.* Archaeologia Bimaris – Dyskusje 4, 205–221. Poznań.

Mazurowski R.

- 1983 Bursztyn w epoce kamienia na ziemiach polskich. *Materiały Starożytne i Wczesnośredniowieczne* 5: 7–130.

Nosek S.

- 1951 Kultura amfor kulistych na Lubelszczyźnie. In: *Annales Universitatis Mariae Curie-Skłodowska. Sectio F* 5 (1954/1955): 55–158.
- 1967 *Kultura amfor kulistych w Polsce*. Wrocław – Warszawa – Kraków.

Panasiewicz W.

- 1996 Grób kultury amfor kulistych ze Ślipseza, stan. 17. *Archeologia Polski Środkowowschodniej* 1: 193–194.

Polańska M.

- 2016 Obiekty kultury amfor kulistych na stanowisku 2 w Raciborowicach-Kolonii, pow. chełmski. In: P. Jarosz, J. Libera, P. Włodarczak (Eds) *Schylek neolitu na Wyżynie Lubelskiej*, 17–34. Kraków.

Reimer P.J., Bard E., Bayliss A., Beck J.W., Blackwell P.G., Bronk Ramsey C., Buck C.E., Cheng H., Edwards R.L., Friedrich M., Grootes P.M., Guilderson T.P., Haflidason H., Hajdas I., Hatté C., Heaton T.J., Hoffmann D.L., Hogg A.G., Hughen K.A., Kaiser K.F., Kromer B., Manning S.W., Niu M., Reimer R.W., Richards D.A., Scott E.M., Southon J.R., Staff R.A., Turney C.S. M., van der Plicht J.

- 2013 IntCal13 and Marine13 Radiocarbon Age Calibration Curves 0–50,000 Years cal BP. *Radiocarbon* 55(4).

Sveshnikov I.

- 1983 *Kultura sharovidnykh amfor*. Arkheologiya SSSR. Svod arkheologicheskikh istochnikov VI-27, 1–27. Moskwa.

Szmyt M.

- 1996 *Społeczności kultury amfor kulistych na Kujawach*. Poznań.
- 1999 Between West and East. People of the Globular Amphora Culture in Eastern Europe: 2950–2350 BC. *Baltic-Pontic Studies* 8: 1–349.
- 2001 Społeczności kultury amfor kulistych w Europie Wschodniej. In: J. Czebreszuk, M. Kryvalcevič, P. Makarowicz (Eds) *Od neolityzacji do początków epoki brązu. Przemiany kulturowe w międzyrzeczu Odry i Dniepru*

- między VI I II tys. przed Chr.* Archaeologia Bimaris – Dyskusje 2, 167–193. Poznań.
- 2004 Wędrówki bliskie i dalekie. Ze studiów nad organizacją społeczną i gospodarką ludności kultury amfor kulistych na terenie Europy Środkowej i Wschodniej. In: A. Koško, M. Szmyt (Eds) *Nomadyzm a pastoralizm w międzyrzeczu Wisły i Dniepru (neolit, eneolit, epoka brązu)*. Archaeologia Bimaris – Dyskusje 3, 117–136. Poznań.
- 2014 Fourth-third millennium BC stone cist graves between the Carpathians and Crimea. An outline of issues. *Baltic-Pontic Studies* 19: 107–147.
- 1986 Nowe stanowiska grupy mazowiecko-podlaskiej kultury amfor kulistych. *Sprawozdania Archeologiczne* 38: 109–127.
- 1991 Kultura amfor kulistych w środkowowschodniej Polsce. Zarys problematyki. In: J. Gurba (Ed.) *Schylek neolitu i wczesna epoka brązu w Polsce środkowowschodniej (materiały z konferencji)*. Lubelskie Materiały Archeologiczne 6, 47–65. Lublin.
- Ścibior J.
- 1986 Nowe stanowiska grupy mazowiecko-podlaskiej kultury amfor kulistych. *Sprawozdania Archeologiczne* 38: 109–127.
- 1991 Kultura amfor kulistych w środkowowschodniej Polsce. Zarys problematyki. In: J. Gurba (Ed.) *Schylek neolitu i wczesna epoka brązu w Polsce środkowowschodniej (materiały z konferencji)*. Lubelskie Materiały Archeologiczne 6, 47–65. Lublin.
- Ścibior J., Kokowski A., Koman W.
- 1991 Zespoły grobowe kultury amfor kulistych z zachodniej części Wyżyny Wołyńskiej. *Sprawozdania Archeologiczne* 43: 79–108.
- Wiślański T.
- 1966 *Kultura amfor kulistych w Polsce północno-zachodniej*. Wrocław – Warszawa – Kraków.
- Włodarczak P.
- 2016 Chronologia absolutna cmentarzysk późno- i schyłkowoneolitycznych na Wyżynie Lubelskiej. In: P. Jarosz, J. Libera, P. Włodarczak (Eds) *Schylek neolitu na Wyżynie Lubelskiej*, 537–538. Kraków.
- Zakościelna A.
- 2000 Badania ratownicze cmentarzyska kultury amfor kulistych w Nadrybiu-Dworze, stan. 3, gm. Puchaczów, pow. Łęčna. *Archeologia Polski Środkowowschodniej* 5: 51–57.

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A GRAVE IN ILYATKA AND GLOBULAR AMPHORA SITE CLUSTER ON THE SOUTHERN BUG, PODILLYA, UKRAINE

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ABSTRACT

Discussed in the article, the multi-burial grave from Ilyatka (Staraya Sinyava district, Khmelnytskyi province, Ukraine) is the first feature of the Globular Amphora culture in the drainage basin of the upper Southern Bug to be subjected to comprehensive bioarchaeological and chronological analyses. The time when the remains of seven people (four men and three women) were deposited in it was determined to be 2700–2550 BC. The feature is part of a small site cluster on the upper Southern Bug, made up of 16 sites. The importance of the cluster follows from its location in one of the crucial communication hubs of the Ukrainian forest-steppe. This makes the cluster vital for the exploration of the forest-steppe settlement by Globular Amphora communities, their expansion towards the middle Dnieper area, and connections to Yamnaya culture groups.

Keywords: Globular Amphora culture, eastern group, Southern Bug catchment, absolute chronology, bioarchaeology

A small Globular Amphora culture (GAC) site cluster in the drainage basin of the upper Southern Bug, in eastern Podillya, Ukraine, has been known since the late 19th century. So far, 16 sites of the cluster have been identified [Szmyt 1999, Annexe 1; 2009; 2021; Zakhar'ev 2015]. When compared with other eastern group concentrations, for instance in Volhynia, western Podillya or on the Moldavian Upland, the cluster on the Southern Bug is far less numerous and made up of sites spread over a distance of about 100 km (Fig. 1). A special significance of the cluster, however, results above all from its location in one of the communication hubs of the Ukrainian forest-steppe. For this reason, it may help determine how far deep into the forest-steppe GAC communities settled and trace their links to steppe groups.

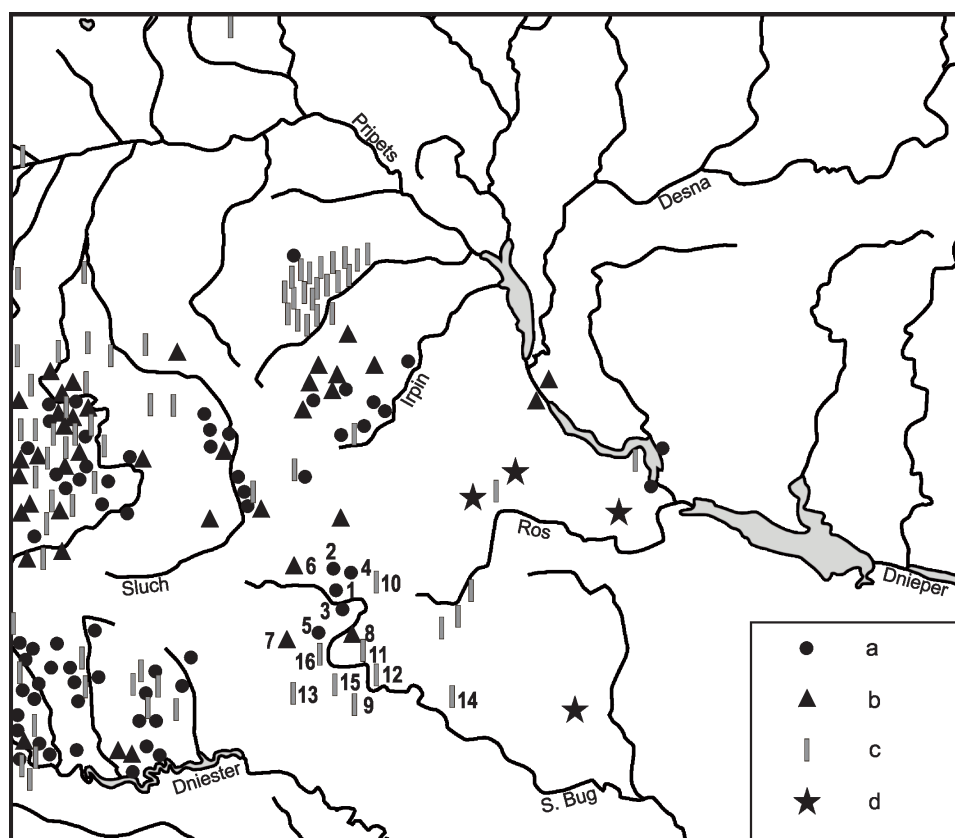


Fig. 1. Sites of the Globular Amphora culture on the Southern Bug.

Key: a – graves; b – pottery; c – flint axes; d – selected sites with GAC elements in other cultural contexts; 1 – 16 – sites mentioned in the text: 1 – Gorbasiv; 2 – Ilyatka; 3 – Letychev-Zavovk; 4 – Novaya Sinyava; 5 – Tartak; Pottery: 6 – Samchyntsy; 7 – Tokarivka; 8 – Vinnitsa; Axes: 9 – Bushynka; 10 – Golodky; 11 – Meleshkiv; 12 – Nikiforivtsy; 13 – Noskivtsy; 14 – Orlivka; 15 – Yaroshenka; 16 – Zhmerynka

In recent years, the significance of the site cluster on the Southern Bug has grown further still, owing to the dynamic development of archaeogenetic studies. The cluster supplied the first series of genetic analyses for the GAC eastern group published in 2018 [Mathieson *et al.* 2018]. Samples for the analyses were collected from the remains of three individuals buried in a grave in Ilyatka, explored by Volodymyr Zakhar'ev in 2011 [Zakhar'ev 2015]. Their thorough anthropological examination was conducted by Tetyana Rudych and Oleksandra Kozak [Rudych 2015; Kozak 2015]. Owing to their work, the Ilyatka grave is one of the best explored funerary features in terms of the bioarchaeology of the GAC eastern group even though it was badly damaged during its chance discovery. The results of the aDNA analysis of the individuals buried in the Ilyatka grave are used in genetic research on various aspects of the formation of Europe's genetic structure usually under the name of 'Ukrainian Globular Amphora' [Wang *et al.* 2019]. Moreover, for the genetically studied samples, three radiocarbon measurements were published [Mathieson *et al.* 2018, Suppl. Information 1].

This article revisits the Ilyatka grave by giving a complete catalogue of archaeological sources found in it, results of isotopic analyses and new findings on its absolute chronology. The latter rely on ^{14}C determinations of samples collected from the remains of all individuals buried there. Furthermore, it is an excellent opportunity to outline the entire GAC population settlement cluster on the upper Southern Bug.

A MULTI-BURIAL GRAVE FROM ILYATKA I, STARAYA SINYAVA DISTRICT, KHMELNYTSKYI PROVINCE

The grave was discovered by chance in 2011 within the limits of the village of Ilyatka, close to the town of Staraya Sinyava, on a site known as *Dolina Kokhaniv* (Ukr. Valley of Lovers). It was located in the middle of a slope of a small valley on the right bank of the Ikwa River, a tributary of the Southern Bug, approx. 200 m from the river water current.

When professional archaeologists arrived at the site, the grave had been partially disturbed by its first discoverers; two of the three slabs of its cover were moved aside and the grave fill underneath them was partially dug up. Consequently, the original form of the grave could be reconstructed using information supplied by the discoverers and compared with observations made in the course of exploration.

Grave form

The feature must have had the form of a pit covered by limestone slabs, but its outline could not be registered. The cover lay at a depth of approx. 0.45–0.48 m from today's ground level (Fig. 2: a). It was made of three slabs. The middle one was the most massive and because of that it stayed *in situ*. It was 2.14 m long, 1.49 m wide and 0.12–0.23 m thick. Its longer axis was oriented east-west. The eastern slab was 1.24 m long, 0.50–0.54 m wide and 0.10–0.19 m thick. It adjoined the central slab along the southwest-northeast axis. The crevice between the slabs was filled with small stones. The western slab was 1.12 m long, 0.54 m wide and 0.28 m thick. The unpaved bottom of the grave extended at a depth of 0.68–0.70 m from today's ground level.

Burials

Single human remains were recorded immediately underneath the central slab (more precisely: underneath its southwestern part), but a concentration of mixed bones was found at a depth of -0.55 m to -0.68–0.70 m. It occupied almost 1.5 sq. m and stretched E-W for 1.55 m and N-S for 0.95 m (Fig. 2: b). The concentration held disarticulated remains of five individuals: four males and one female which were probably replaced from their original position in course of the further burial [cf. other view: Zakhar'ev 2015: 14–15]. The smaller bones were placed on the ground layer while skulls were placed on top of them – three (males nos. 1, 2 and 3) in a row going from south to north and two (no. 4 of a male and no. 5 of a female) perpendicularly to it (Fig. 2: c-d). The long bones and pelvic bones, however, were placed above. The concentration occupied a roughly rectangular area, which may indicate that the pit walls were lined, for instance, with wooden logs, but no traces of wood were observed. The bone layer thickness stayed between 0.15 m in the western portion of the grave and 0.05–0.08 m in its eastern portion.

To the south of the main burial group, there sat a skull of a woman aged 25–35 years (no. 6), oriented with its calotte towards the south and facing west (Fig. 2: c-d). Next to it, a small stone lay and near it, fragments of an ornamented amphora were found together with a fragment of an unornamented vessel. The other bones of this burial must have been discarded when this part of the grave was dug up by its first discoverers.

In turn, 0.25 m west of the bone concentration, at a depth of 0.72–0.74 m, there lay an articulated skeleton of a woman aged 20–30 years (no. 7) in a supine position, with her legs and hands flexed and the head pointing north and facing west (Fig. 2: e). Next to her head, there sat a small flat piece of limestone. There were no other furnishings.

Between Burial 7 and the main burial group (Individuals 1–5), on the grave bottom two small limestone lumps sat next to each other. Another such lump was found 0.70 m west of the bone concentration and 0.75 m south of Burial 7.

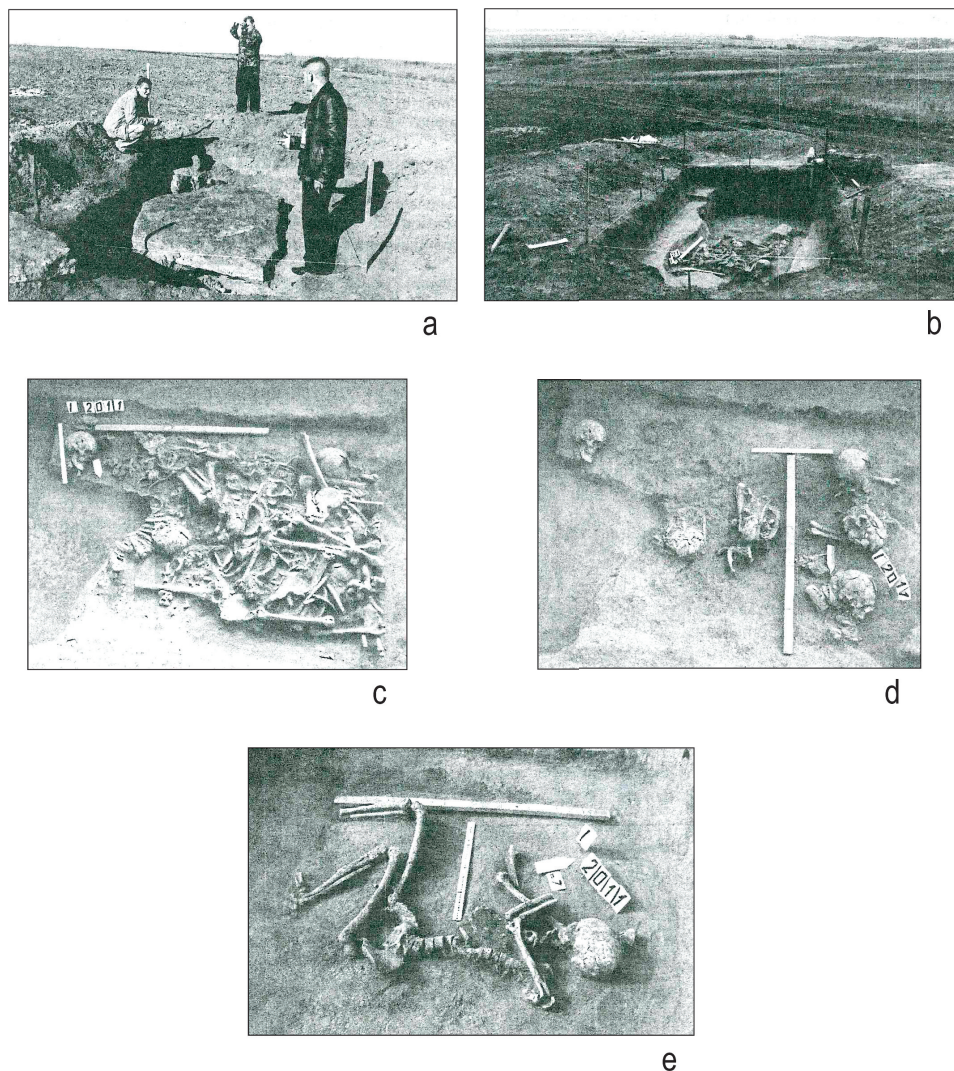


Fig. 2. Ilyatka, site I, Khmelnytskyi province. Grave of the Globular Amphora culture: a – stone cover, view from the east; b – layer of human bones, view from the west; c – main burial group (1-5) and skull of Burial 6, upper level; d – main burial group (1-5) and skull of Burial 6, lower level; e – Burial 7, view for the east. Foll. Zakhar'ev 2015

Grave goods

In the eastern portion of the grave, underneath the smaller cover slab, there were at least two clay vessels (a small globular amphora and another unidentified form). Their shards were found in the earth excavated from the grave and next to Skull 6. In the southeastern grave corner, in an undisturbed layer, two so-called

animal-bone buckles were found, with another two such objects being unearthed *in situ* as well but close to Skull 3. These objects are all surviving grave goods. Nothing is known of any other artefacts deposited with the burials.

Small amphora (Fig. 3: 1) – a small two-segment form with a globular base; type VB according to Szmyt [1999]. It was reconstructed in part, having been preserved in eight belly and lip fragments. The wall thickness is 0.5–0.6 cm. Technology: IIIB [see Czebreszuk, Koško, Szmyt 2006]. Ornamentation: two multi-element patterns cover its neck and belly. Both are built of the impressions of so-called fish scales (or arches whose chord has 0.2–0.3 cm; on the neck, their protrusions point down, while on the belly they point both up and down). On the neck, under the rim, there is a pair of perforations 0.2–0.4 cm in diameter. Underneath, there runs a band made up of three lines of arches; below there is another analogous band, further below runs a row of triangles filled with arches where the triangle sides are incised. The pattern on the belly is made up of triangles of arches only and interlaced bands of vertical arch impressions; this time their protrusions point up. The bands are mostly made up of two vertical rows of arches, but in a single case a band has only one row of such impressions.

Vessel (Fig. 3: 2–4) – preserved in fragments. It appears to have had two segments (the neck with a shoulder are preserved), a flat base and handles; perhaps an amphora or vase. Unornamented. Technology: IIIB. A saddle-like handle, type: A112 [see Czebreszuk, Koško, Szmyt 2006]. Flat base of indeterminate type.

Bone buckles – the first pair

- A. A bone buckle (Fig. 4: 1) was found in the SE corner of the grave, next to the other buckle (B). Dimensions: length: 12.5 cm, width: 5.0 cm, thickness: 0.4 cm. Preserved complete. It is shaped like the letter D and has a rectangular notch on the longer straight side. It is open-worked and has two sets of three holes each (0.4–0.5 cm in diameter) placed symmetrically on both sides of the notch. On one side, it bears a linear ornament.
- B. A bone buckle (Fig. 4: 2) was found in the SE corner of the grave, next to the other buckle (A). Preserved in three parts, it could be glued together, rendering it almost complete (a small bit is missing from one of the shorter sides). Its dimensions, form and ornamentation are similar, although not analogous, to those of Buckle A. What it differs in is two additional pairs of holes (0.2–0.3 cm in diameter) on the shorter sides, placed asymmetrically with respect to its axis (a shift towards the longer convex side).

Bone buckles – the second pair

- C. A bone buckle (Fig. 4: 3) was found in the bone concentration, in the NW corner of the grave, next to Skull 3, in pair with Buckle D. It is damaged (bits are missing from longer sides). Its dimensions are similar to those of Buckles

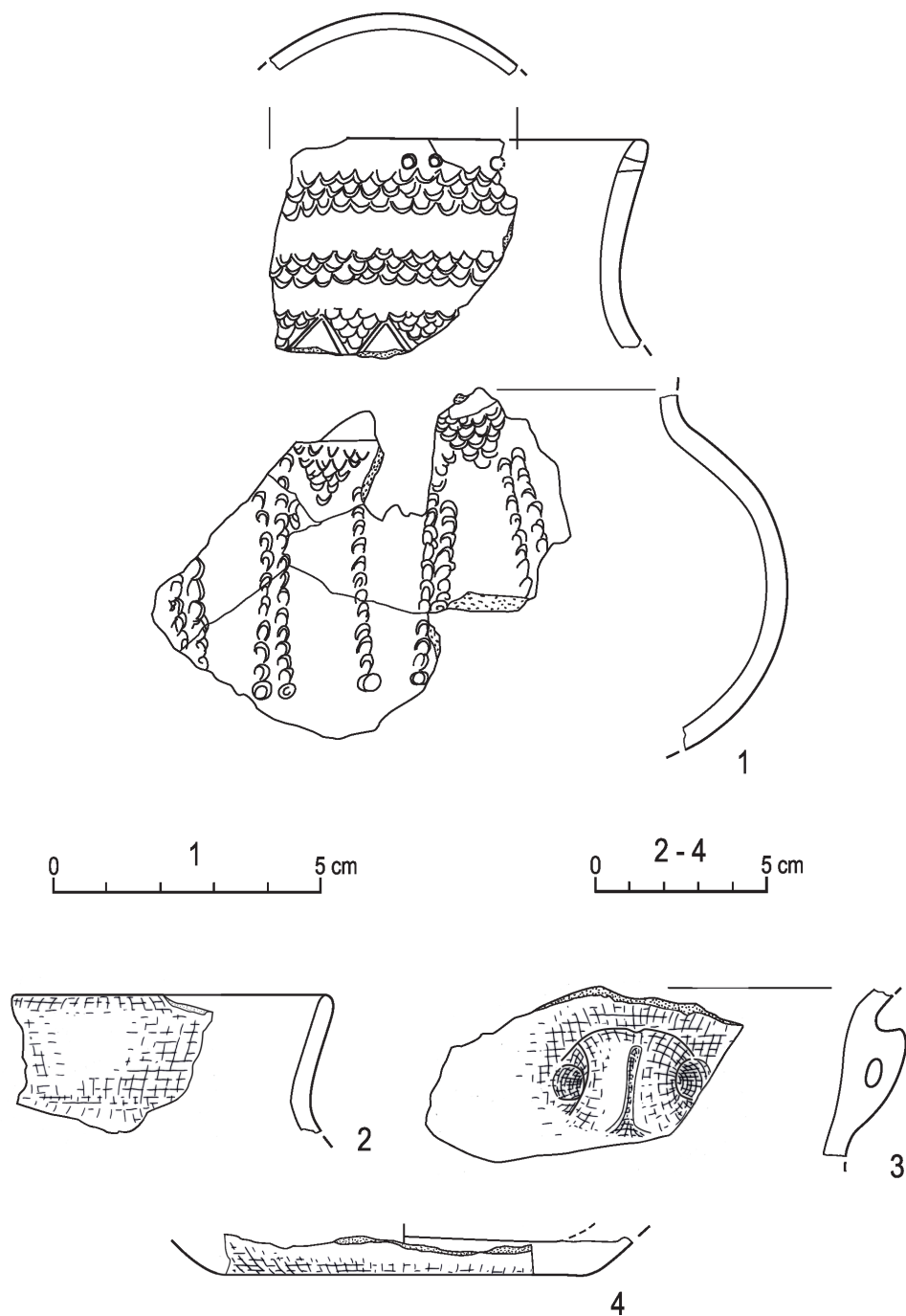


Fig. 3. Ilyatka, site I, Khmelnytskyi province. Pottery. Foll. Zakhar'ev 2015

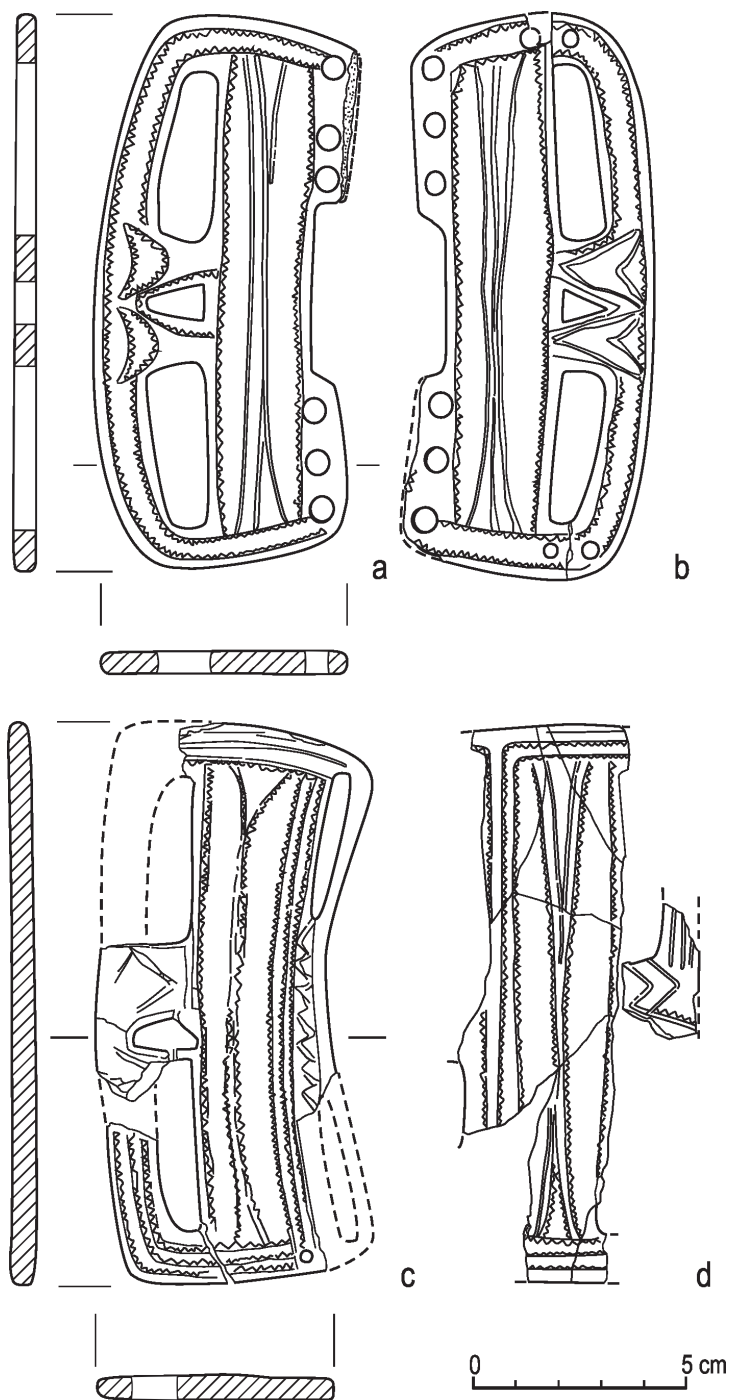


Fig. 4. Ilyatka, site I, Khmelnytskyi province. Bone buckles. Foll. Zakhar'ev 2015

A and B, but its form differs: the curve of one of the longer sides is gentler while the other longer side lacks a rectangular notch; it has a slight dent instead; on both sides of the dent, instead of two pairs of holes, there are longitudinal notches (2.9–3.0 cm long, 0.4 cm wide). On one side, it bears a linear and zigzag ornament.

- D. A bone buckle (Fig. 4: 4) was found in the bone concentration, in the NW corner of the grave, next to Skull 3, in pair with Buckle C. It is damaged (bits of longer sides are missing, while the central part is preserved). Its form, dimensions and ornamentation are probably similar to those of Buckle C.

Biological, genetic and isotopic description of the buried individuals

A detailed anthropological examination of the human remains was performed in the bioarchaeological laboratory of the Institute of Archaeology, National Academy of Sciences of Ukraine. The remains were described, analyzed osteometrically and odontologically, including the identification of sex and age, and compared by Tetyana Rudych [2015], while the traces of pathological lesions and traumas on the skulls and postcranial skeletons were studied by Oleksandra Kozak [2015]. Their crucial findings are given in Table 1. The morphological features on the skeletons put the persons from the grave slightly out from the hole GAC community. Pathological lesions are not entirely characteristic for the contemporary GAC populations. Healed and unhealed skull traumas in most individuals could be the evidences of interpersonal violence in the community possibly due to some extended contacts in the cluster. These is actual also for the traces of infectious diseases, which were found on the bones of most persons. The occupational markers on the occipital and postcranial bones as well as the signs of joint degeneration were probable consequences of long walking, heavy lifting, and archery.

The reported genetic examinations of three individuals from Ilyatka (no. 1, 2 and 7) revealed the dominance of the so-called ancient farmer ancestry (ca. 75%) combined with western hunter-gatherers ancestry (estimated until ca. 25%) [Mathieson *et al.* 2018]. Moreover, the results obtained for Ilyatka are fully consistent with the genetic characteristics of six GAC individuals from Kierzkowo, Poland. This allowed the conclusion that “individuals from two sites in Poland and Ukraine form a tight genetic cluster, showing genetic homogeneity over a large distance” [Mathieson *et al.* 2018].

Furthermore, we have now figures for stable isotope content in bones, specifically of carbon ^{13}C and nitrogen ^{15}N (Table 2). The series is very compact and shows a basic agreement of isotope content in all individuals: intra-site $\delta^{13}\text{C}$ range is 0.4‰, and intra-site $\delta^{15}\text{N}$ range is 0.6‰. The content of both isotopes indicates a diet of chiefly animal-origin products with a share of C_3 plants, with the food coming mainly from terrestrial eco-systems [cf. Gerling 2015, Fig. 6.16]. No significant differences were noticed between men and women. For the former,

$\delta^{13}\text{C}$ ranges from -20.1‰ to -19.8‰, while $\delta^{15}\text{N}$ – from 9.2‰ to 9.8‰. For the latter, the respective ranges are -20.2‰ to 19.9‰ and 9.3‰ to 9.5‰. This small variability can be explained by a similar diet of all examined individuals. Perhaps only the narrower variability range of $\delta^{15}\text{N}$ in women suggests a very close similarity of their diet and slightly greater differences in the case of males.

Table 1

Ilyatka, Khmelnytskyi Province. Basic anthropological data. Foll. Rudych 2015 and Kozak 2015

Individual	Sex	Age	Location and way of deposition	Traces of traumas and diseases	Comment
1	male	45-55	in the main concentration of bones; without anatomic order	Vertebral diseases, traces of meningeal reactions, dental diseases (abscess cavity, parodontopathy, calculus); chronic respiratory and middle ear inflammations, osteomyelitis of the tibia, signs of systemic infection disease.	Mathieson <i>et al.</i> 2018 (as sample ILK001)
2	male	40-50	in the main concentration of bones; without anatomic order	Blunt healed trauma (26×27 mm, depth 3-4 mm) on the right frontal bone; dental diseases (antemortal tooth lost, calculus, granuloma formation, parodontopathy), chronic respiratory and middle ear inflammations, signs of chronic infection disease on the skull. Healed trauma of the right knee (ligamentopathy).	Mathieson <i>et al.</i> 2018 (as sample ILK002)
3	male	20-25	in the main concentration of bones; without anatomic order	Probable surface healed trauma on the left frontal bone, healed fracture of the distal radius (Colle's fracture), traumatic ossification of the ligaments of the right leg. Traces of the possible latent TB meningitis, <i>cribra orbitalia</i> (trace of anemia); chronic respiratory and middle ear inflammation, dental calculus, extensive teeth enamel hypoplasia as a stress marker.	
4	male	25-35	in the main concentration of bones; without anatomic order	Probable perimortal trauma of the posterior right parietal bone (round unhealed penetrating injury with diameter ca.30 mm). Traces of possible latent TB meningitis; chronic inflammation of the middle ear and respiratory sinuses; dental diseases (calculus, parodontopathy), sever tooth abrasion with enamel chipping and tooth crown fracture. Slight periosteal reaction on the long bones.	

Individual	Sex	Age	Location and way of deposition	Traces of traumas and diseases	Comment
5	female	30-35	in the main concentration of bones; without anatomic order	Probable trauma (fracture) of the sacrum; chronic inflammation of the middle ear and respiratory sinuses, rhinitis; dental diseases (calculus, caries, granulomas, parodontopathy); severe tooth abrasion with enamel chipping; possible traces of latent TB leptomeningitis	
6	female	25-35	deposited SE from the main concentration; in anatomic order	Healed surface depression (diam. 13 mm) on the left parietal bone; subacute inflammation of the maxillary sinus; traces of meningeal reaction (possible latent TB meningitis), dental diseases (caries, calculus, parodontopathy); severe abrasion with enamel chipping	
7	female	20-30	deposited W from the main concentration; in anatomic order	Chronic inflammation of the middle ear and respiratory sinuses; traces of meningeal reaction (probable latent TB meningitis); dental diseases (calculus), teeth enamel hypoplasia. Severe taphonomic changes.	Mathieson <i>et al.</i> 2018 (as sample ILK003)

Absolute chronology of Ilyatka burials

As already mentioned, the archaeogenetic studies were accompanied by the ^{14}C dating of samples collected from Individuals 1, 2 and 7; the determinations have laboratory designations of MAMS-0072–MAMS-0074 [Mathieson *et al.* 2018, Suppl. Information]. In 2020, radiocarbon age determinations were performed on bone samples collected from all the seven individuals buried in the Ilyatka grave. For this purpose, the Poznań Radiocarbon Laboratory used the AMS method (determinations Poz-129625–Poz-129631). It is worth adding that the stable-isotope content values discussed above rule out a reservoir effect, i.e. making the radiocarbon age of bone remains older. All age determinations are shown in Table 2.

A comparison of both sets of determinations (MAMS and Poz) reveals a discrepancy between them. The MAMS determinations are clearly older than Poz ones: by 151 radiocarbon years (Individual 1), 142 years (Individual 2) and 150 years (Individual 7). Agreement ranges are small, although it is possible to calibrate jointly each pair. However, due to the systematic time shift of the MAMS series, mentioned above, a decision was made to exclude it from further considerations

Individual	Lab. no.	Sample	Age 14C (BP)	Age cal BC		Stable isotopes	Comments
				68.3% probability	95.4% probability		
1	MAMS-0072	human bone	4221±22	2893 (40.1%) 2869calBC 2801 (28.2%) 2778calBC	2900 (47.0%) 2857calBC 2806 (40.7%) 2752calBC 2723 (7.8%) 2701calBC		Mathieson <i>et al.</i> 2018 (as sample ILK001)
	Poz-129625	human bone	4070±35	2835BC (6.1%) 2819BC 2666BC (7.8%) 2646BC 2636BC (41.1%) 2568BC 2526BC (13.3%) 2497BC	2851BC (11.4%) 2809BC 2747BC (3.4%) 2726BC 2698BC (80.7%) 2476BC	$\delta^{13}\text{C} = -19.8\text{‰}$ $\delta^{15}\text{N} = 9.2\text{‰}$	0.9%N 4.6%C, 1.9%coll
	MAMS-0073	human bone	4192±22	2881 (15.8%) 2862calBC 2805 (41.6%) 2756calBC 2719 (10.9%) 2704calBC	2889 (24.1%) 2846calBC 2812 (50.2%) 2742calBC 2731 (21.1%) 2675calBC		Mathieson <i>et al.</i> 2018 (as sample ILK002)
2	Poz-129626	human bone	4050±35	2627BC (38.1%) 2561BC 2539BC (30.1%) 2492BC 2856BC (20.8%) 2807BC 2751BC (10.8%) 2723BC 2701BC (33.0%) 2622BC 2596BC (3.7%) 2585BC	2843BC (5.0%) 2814BC 2672BC (90.5%) 2470BC	$\delta^{13}\text{C} = -20.1\text{‰}$ $\delta^{15}\text{N} = 9.4\text{‰}$	0.8%N 4.4%C, 3.2%coll
	Poz-129627	human bone	4120±35		2871BC (26.3%) 2799BC 2780BC (69.2%) 2576BC	$\delta^{13}\text{C} = -19.9\text{‰}$ $\delta^{15}\text{N} = 9.5\text{‰}$	1.0%N 5.2%C, 2%coll
	Poz-129628	human bone	4045±35	2624BC (35.4%) 2560BC 2539BC (32.9%) 2491BC 2860BC (22.8%) 2806BC 2754BC (13.8%) 2721BC 2703BC (31.7%) 2627BC	2839BC (3.5%) 2816BC 2670BC (91.9%) 2469BC	$\delta^{13}\text{C} = -19.9\text{‰}$ $\delta^{15}\text{N} = 9.8\text{‰}$	2.5%N 8.5%C, 4.7%coll
5	Poz-129629	human bone	4130±35		2872BC (27.7%) 2798BC 2782BC (67.7%) 2580BC	$\delta^{13}\text{C} = -20\text{‰}$ $\delta^{15}\text{N} = 9.5\text{‰}$	1.1%C 5.3%C, 3.4%coll
6	Poz-129630	human bone	4070±35	2835BC (6.1%) 2819BC 2666BC (7.8%) 2646BC 2636BC (41.1%) 2568BC 2526BC (13.3%) 2497BC	2851BC (11.4%) 2809BC 2747BC (3.4%) 2726BC 2698BC (80.7%) 2476BC	$\delta^{13}\text{C} = -19.9\text{‰}$ $\delta^{15}\text{N} = 9.3\text{‰}$	3.6%N 11.4%C, 5.4%coll
	MAMS-0074	human bone	4225±22	2894 (44.9%) 2871calBC 2799 (23.4%) 2781calBC	2901 (52.6%) 2861calBC 2806 (36.7%) 2754calBC 2721 (6.1%) 2703calBC		Mathieson <i>et al.</i> 2018 (as sample ILK003)
	Poz-129631	human bone	4075±35	2837BC (7.7%) 2818BC 2667BC (51.9%) 2570BC 2519BC (8.7%) 2500BC	2857BC (13.6%) 2807BC 2751BC (4.8%) 2722BC 2701BC (61.1%) 2554BC 2546BC (15.5%) 2487BC 2482BC (0.5%) 2476BC	$\delta^{13}\text{C} = -20.2\text{‰}$ $\delta^{15}\text{N} = 9.5\text{‰}$	1.1%N 5.3%C, 2.9%coll

and rely on the Poznań series for establishing the absolute chronology of burials from the Ilyatka grave. It must be made clear that this may prove difficult as the dates fall on one of the plateaus of the calibration curve, spanning the period of *c.* 2850–2650 BC.

Observations made while exploring the Ilyatka grave and compared with the general knowledge about the funerary customs of GAC populations support several competing hypotheses. Crucial for judging them, the characteristics of the grave in question can be listed as follows:

- (a) It lacks any stone walls; its cover consists of three stone slabs, with the largest one being placed in the centre
- (b) Human remains in the main burial group were disarticulated and covered by the largest cover slab
- (c) Burial 7 and possibly also Burial 6, placed on both sides of the main group, were articulated.

Characteristic (a) makes the Ilyatka grave atypical among the grave forms of the GAC eastern group, especially the Podillya subgroup. Typically, this group's graves take the form of a cist with walls of stone slabs. Often, their bottoms and covers are stone slabs as well [cf. Szmyt 1999: 25–26]. Such grave chambers could be entered, allowing for successive deposition of dead bodies. However, there is also evidence of several dead bodies being interred in them on a single occasion [Szmyt 1999: 28–29]. As no such structure is found in Ilyatka, it appears that the feature was used only once. But then again, the grave may have been opened and closed several times by removing or at least moving aside the stone slab over the grave pit.

Characteristic (b), namely the disarticulation of the remains of Individuals 1–5, is encountered in both the entire GAC oecumene and its eastern group, including Podillya. We know of such situations as, for instance, when making space for a new burial, the remains that had been deposited previously were moved aside thereby changing their arrangement into a disarticulated one. A case in point is Khartonivtsy II [Szmyt 1999: 28]. Perhaps then in Ilyatka too, the state that the main burial group was in resulted from the 'cleaning' of the grave space for new burials.

Characteristic (c), in turn, namely the presence of at least one or perhaps two articulated burials, and lying in an artificial order at that (on both sides of the main burial group), brings to mind the sophisticated arrangements of dead bodies of people or animals known from various GAC groups. An example is offered by a grave from Kolodiezno, Volhynia, in which eight dead bodies were symmetrically arranged on both sides of the main burial [Szmyt 1999: 29]. This characteristic may indicate that both articulated burials were deposited at the same time or after a short time interval.

In sum, the three characteristics of the Ilyatka grave support at least four hypotheses:

- (1) All the burials, i.e. the main group (Individuals 1–5, disarticulated) and the two burials outside it (Individuals 6 and 7), were interred at the same time
- (2) Individuals 1–5 were placed first in the grave, followed by Individuals 6 and 7 (interred at the same time), which means that it was used twice
- (3) Individuals were interred in the grave in three phases:
 - a. first Individuals 1–5, followed by Individual 6 and Individual 7
 - b. first Individuals 1–5, followed by Individual 7 and Individual 6.
- (4) The grave witnessed seven successive burials, i.e. it was used in seven phases, with the remains of Individuals 1–5 being moved aside (disarticulating them in the process) prior to the interment of Individuals 6 and 7.

The hypotheses were tested using the modelling functionalities of the Oxcal v4.4.2 software [Bronk Ramsey 2020]. It turned out that none of them could be disproved.

Model 1. Assuming that all the individuals were buried in the grave in one phase, its beginning would fall on 2671–2595 BC while its end – on 2616–2556 BC (probability of 68.3%; Fig. 5). Furthermore, a joint calibration of all seven determinations (Poz-129625–Poz-129631) proved fully admissible using the *Combine* function. A date thus obtained fits into the interval of 2629–2575 BC (probability of 68.3%) or 2670–2571 BC (probability of 95.4%).

Model 2. With two phases, the beginning of the grave use falls within the range of 2646–2590 BC (probability of 68.3%) or 2729–2576 BC (probability of 95.4%), while the end – within the range of 2621–2551 BC or 2658–2419 BC, respectively (Fig. 6).

Model 3. Plausibly, there could have been three phases in both version A and version B. In model 3A, the period of grave use stays between the ranges of 2641–2588 BC and 2622–2557 BC (probability of 68.3%) or 2720–2573 BC and 2660–2446 BC (probability of 95.4%). In model 3B the period of grave use stays between the ranges of 2642–2589 BC and 2620–2544 BC (probability of 68.3%) or between 2705–2576 BC and 2658–2376 BC (probability of 95.4%).

Model 4. The series of determinations under discussion can also serve to build a model where seven dead bodies were successively deposited in the grave, i.e. a model in which there were seven phases of grave use. Its beginning would then fall within the range of 2701–2611 BC (probability of 68.3%), while the interment of dead bodies would end, with the same probability, within the range of 2616–2556 BC (Fig. 7).

In sum, it can be assumed that the Ilyatka grave was used over a period, covering the 27th and the first half of the 26th century BC. This period can hardly be narrowed due to a plateau in the calibration curve. It cannot be ruled out that the seven dead bodies were deposited in the grave on a single occasion or in several phases (two, three or even seven).

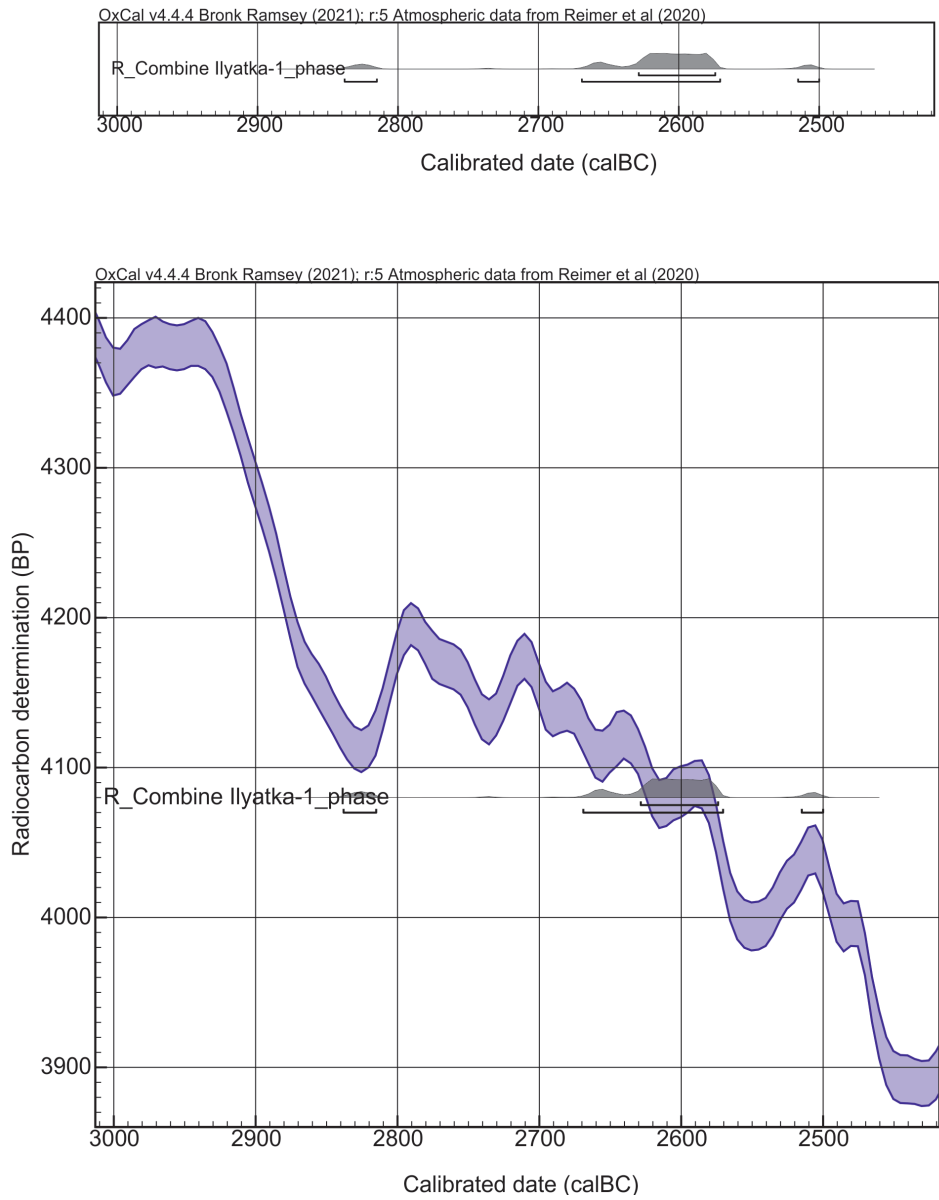


Fig. 5. Ilyatka, site I, Khmelnytskyi province. Model 1 (one phase). Calibration in Oxcal v4.4.4 [Bronk Ramsey 2021]

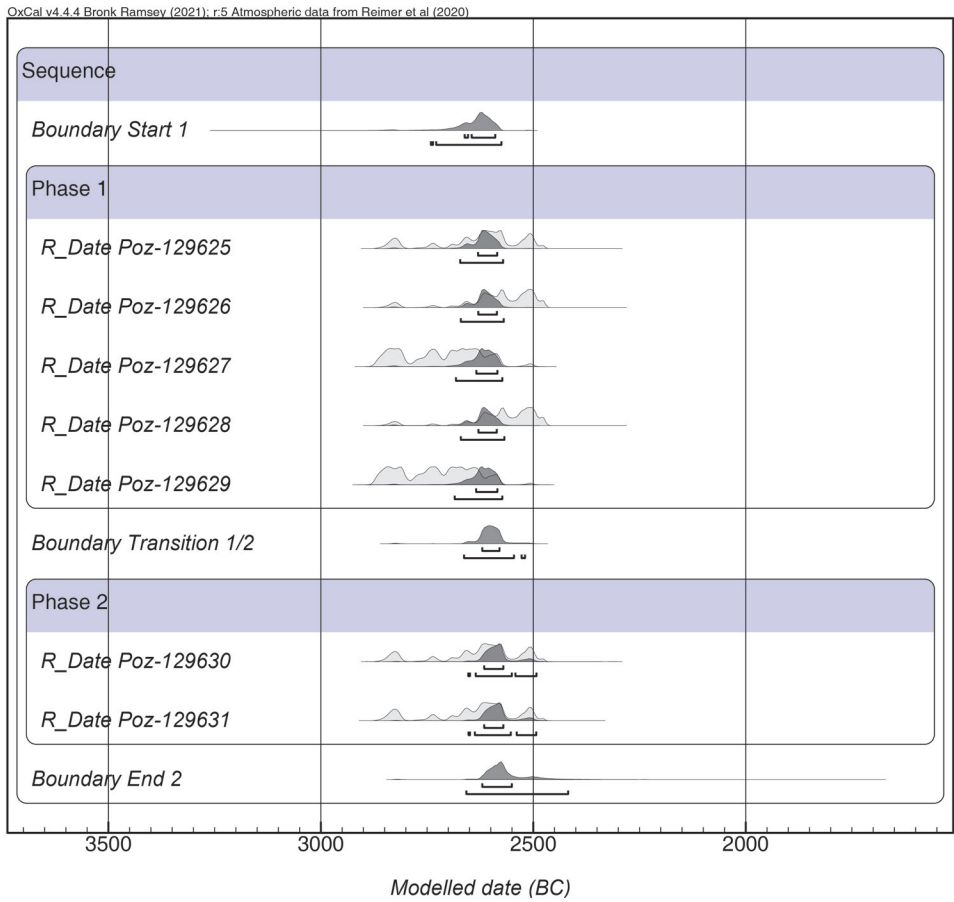


Fig. 6. Ilyatka, site I, Khmelnytskyi province. Model 2 (two phases of burial depositions: first 1-5, then 6 and 7). Calibration in Oxcal v4.4.4 [Bronk Ramsey 2021]

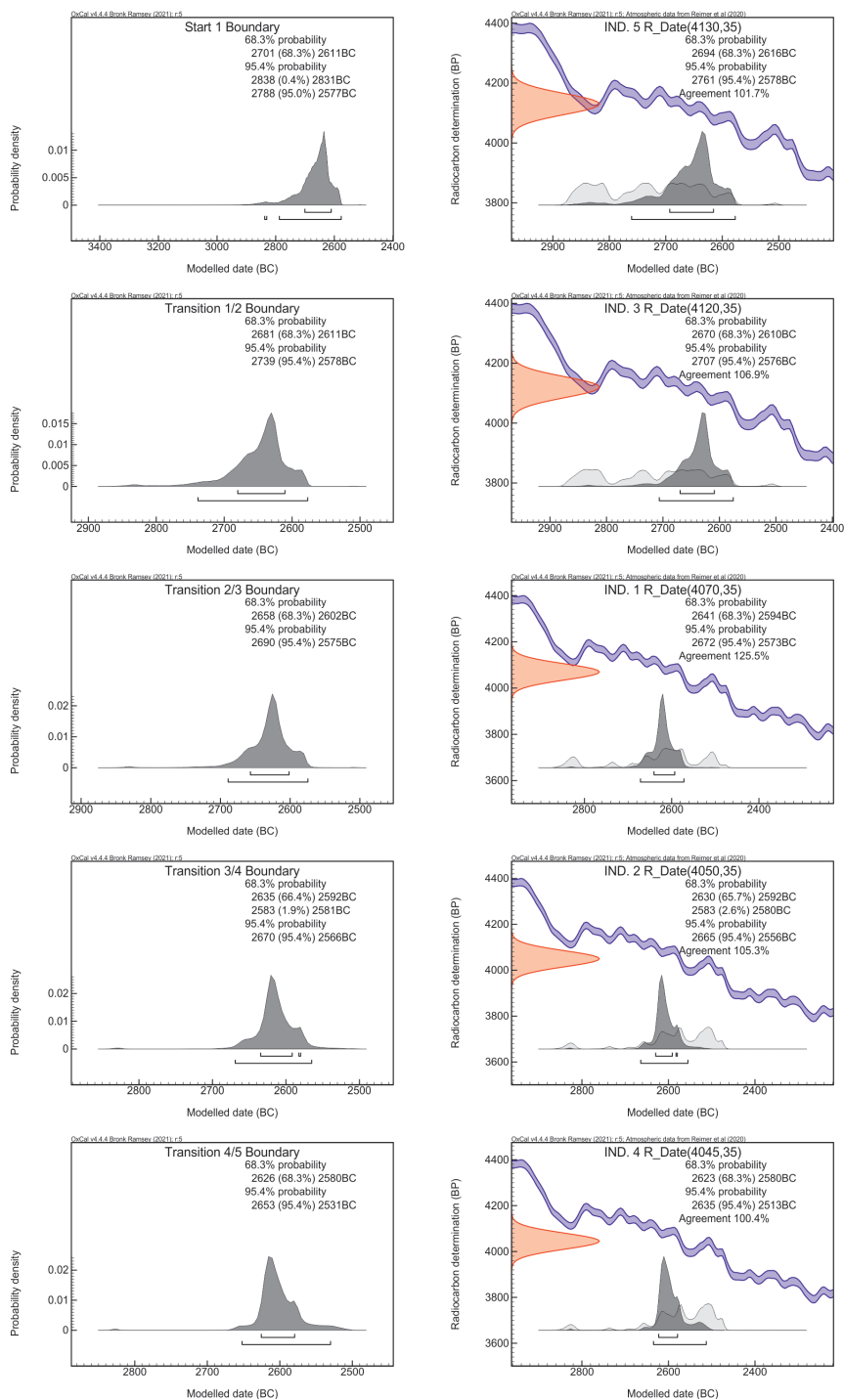


Fig. 7A. Ilyatka, site I, Khmelnytskyi province. Model 4 (seven phases of burial depositions). Calibration in Oxcal v4.4.4 [Bronk Ramsey 2021]

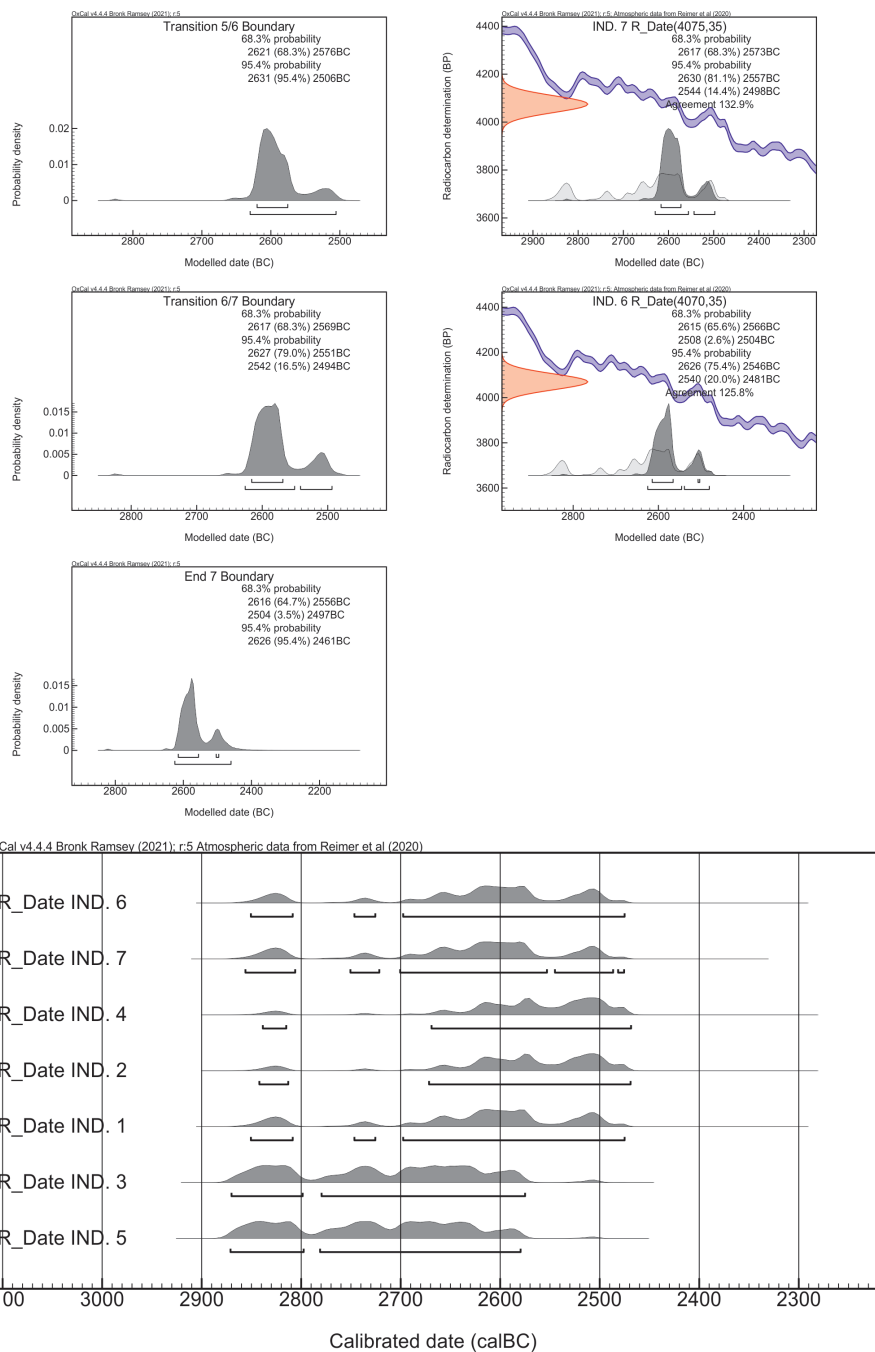


Fig. 7B. Ilyatka, site I, Khmelnytskyi province. Model 4 (seven phases of burial depositions). Calibration in Oxcal v4.4.4 [Bronk Ramsey 2021]

GLOBULAR AMPHORA CULTURE SITE CLUSTER ON THE UPPER SOUTHERN BUG

The GAC site cluster on the Southern Bug, eastern Podillya, is small (Fig. 1), currently comprising 16 explored sites. The first was discovered in the late 19th century during amateur excavations at Novaya Sinyava [Neyman 1889: 42–44]. In all likelihood this was a destroyed grave from which only one vessel survived and two shards of another one. The 1930s witnessed the discovery of another grave at Tartak [Sitsinski 1930], while in the 1960s and 1970s two other graves were exposed at Letychev-Zavovk and Gorbasiv [Prihodnyuk 1970; Maleyev, Yakubovskiy 1974; Sveshnikov 1983: 52–53; Maleyev 1986: 99–103; Zakhar'ev 2015: 15–20]. Already in the 21st century, the grave in Ilyatka, discussed here, was discovered. On two successive sites, GAC pottery shards were unearthed: Samchyntsy [Sveshnikov 1983: 54] and Tokarivka (unpublished material from excavation by M. Szmyt, V. Rud' and P. Włodarczak). From Vinnitsa, we know of an intact vessel which may come from a grave but no information on its context is available [Sulimirski 1968: 197; Sveshnikov 1983: 53–54]. This series of finds is supplemented by eight chance finds of flint axes, showing technological and typological traits consistent with GAC standards, from Bushynka, Golodky, Meleshiv, Nikiforivtsy, Noskivtsy, Orlivka, Yaroshenka and Zhmerynka [Szmyt 2009; 2021].

Altogether, 16 GAC sites were explored in the area in question, including five graves, three sites that yielded pottery characteristic solely of the GAC, and eight stray finds (without a context) of flint axes, resembling GAC forms. All these sites were discovered by chance. They are distributed over a distance of about 200 km, from Samchyntsy in the northwest to Orlivka in the southeast (Fig. 1). They are mostly located in the hinterland of the upper Southern Bug valley, in smaller valleys joining it.

Despite their still relatively small number, the presence of GAC settlement remains in the area under discussion is significant. At this juncture, two aspects are worth noting: **(a)** connection to the eastern direction of the expansion of GAC populations, ultimately leading towards the drainage basin of the middle Dnieper and **(b)** location in the broad borderland adjoining the oecumene of the Yamnaya (Pit-Grave) culture population.

a. The middle Dnieper area was penetrated by GAC populations. This is evidenced by sources discovered on both western and eastern banks of the Dnieper. In the west, GAC sites were identified in the northwestern belt of the forest-steppe, stretching between the confluences of the Irpin and Dnieper in the north and the Ros and Dnieper in the south. These are, for instance, grave remains from Kanev and a campsite at Khodosovka-Dibrova as well as flint axe finds at Doslidnitskoe and Tuta Dmitrovskaya [Sveshnikov 1983: 36; Szmyt 1999, Cat. 1D; Lysenko,

Szmyt 2011: 239–244]. Two GAC sites are known from the eastern part of the Dnieper valley: Kyiv-Nikolskaya Slobodka and Bile Ozero 1 [Sveshnikov 1983: 36; Szmyt 1999, Cat. 1C: 26; Rozdobudko, Yurchenko 2005; Łysenko, Szmyt 2011: 239–243].

The characteristics of pottery and bone goods from the sites on the Dnieper show that the GAC communities that penetrated this area came from both Volhynia and Podillya. The latter region is suggested by, for instance, a ‘fish scales’ ornament and bone buckles [Łysenko, Szmyt 2011, Fig. 2: 1,4; 5], hence, exactly the same characteristics as those observed in Ilyatka. From this perspective and considering the geography of forest-steppe routes [Koško, Kločko 2011], one must conclude that the settlement cluster on the Southern Bug was located in a ‘transit area’ and helped people migrate to the Dnieper area. The shortest route in terms of geography may have run along the Ros valley, which starts about 50–60 km east of the GAC settlement cluster on the Southern Bug.

b. The forest-steppe zone between the Carpathians and Dnieper river is where direct contacts were possible between GAC and Yamnaya culture communities. That they did indeed come into contact is shown by a large number of sources such as ‘pure’ GAC or Yamnaya culture graves as well as syncretic features. The latter respected the principal rules of a ‘Yamnaya’ funerary ritual, supplementing it with single GAC artefacts – mostly vessels [Szmyt 2021: 416–419]. At present, most archaeological information concerns the western end of the forest-steppe (on the Prut and Dniester rivers), less information is available on its eastern end (on the middle Dnieper), while the least is known about its central portion on the Southern Bug [Szmyt 2021: 425–426].

The Ilyatka grave changes this situation. First and foremost, its established absolute chronology – if only a broad one – bears out the presence of GAC communities on the Southern Bug in the 27th and in the first half of the 26th century BC. Another grave from this region which was radiocarbon dated (Poz-129657 4120 ± 35 BP), one from Zaychiki [Zakhar’ev 2015: 15–20], indicates a possibility that GAC groups could be present there as early as the 28th or even the second half of the 29th century BC.

However, the Ilyatka grave has a peculiar characteristic which finds no analogy in the GAC. Typical of it, a stone cist is missing from the grave and replaced only by slabs covering burials. Importantly, formally similar arrangements are found in the Yamnaya culture. Such graves covered by stone slabs were documented on the middle Dniester and on the lower Southern Bug at the closest. In the Dniester Barrow Complex, in the vicinity of Yampil, a stone slab cover was found in Prydnistrianske, barrow IV, feature IV/4 [Kločko *et al.* 2015, Fig. 29–30] and in Pysarivka 2/3 [Ivanova, Toshev 2015, Fig. 18:9]. On the lower Southern Bug, stone slab covers were recorded for instance in Bugskoye, barrow 2/grave 7 [Shaposhnikova *et al.* 1986, Fig. 20:4], Bugskoye, barrow 3/grave 2 and 16 [Shaposhnikova *et al.* 1986, Fig. 21:4,8], Bugskoye, barrow 6/grave 18

[Shaposhnikova *et al.* 1986: Fig. 24:4,6], Pokrovka, barrow 1/grave 6 and barrow 3/grave 4 [Shaposhnikova *et al.* 1986, Fig. 29:1-3,10] or Novoyurevka, barrow 1/grave 15 [Shaposhnikova *et al.* 1986, Fig. 29:13].

The Ilyatka grave, however, does not correspond fully to Yamnaya culture graves. In the Yamnaya graves stone slabs cover a relatively deep pit, most often rectangular in plan and cross-section, whereas in Ilyatka, the pit outline could not be detected. Thus, tying a design untypical of the GAC, namely a stone cover lacking any additional stone structure, to patterns drawn from the Yamnaya culture is a hypothesis calling for further study. It is worth recalling that genetic tests did not reveal any elements of steppe origin in the three analyzed individuals from Ilyatka.

CONCLUSION

Discussed in this article, the multi-burial grave from Ilyatka is the first GAC feature from the drainage basin of the upper Southern Bug to be subjected to comprehensive bioarchaeological and chronological analyses. The time of its use when the remains of seven people (four men and three women) were deposited in it was determined to be 2700–2550 BC. The feature is part of a small GAC site cluster on the upper Southern Bug, made up of 16 sites. The importance of the cluster follows from its location in one of the crucial communication hubs of the Ukrainian forest-steppe. This makes the cluster vital for the exploration of the forest-steppe settlement by GAC communities, their expansion towards the middle Dnieper area, and connections to Yamnaya culture groups. Perhaps a borrowing from the latter unit, the Ilyatka grave form featured, untypically of the GAC, a stone slab cover placed over burials. This hypothesis requires further study. However, it should be noted that this is also important in the light of current genetic research results. For the time being, no steppe elements have been revealed in the genetic makeup of the GAC population [Mathieson *et al.* 2018; Schroeder *et al.* 2019]. On the other hand, other studies indicate the possibility of reverse gene flow: from the GAC population to the Yamnaya culture population [Wang *et al.* 2019]. Research into this intriguing problem will continue.

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REFERENCES

Bronk Ramsey C.

2021 Oxcal v4.4.4. Oxford (www.rlaha.ox.ac.uk).

Czebreszuk J., Koško A., Szmyt M.

2006 Zasady analizy źródeł ceramicznych z okresu późnego neolitu oraz interstadium epok neolitu i brązu. In: A. Koško, M. Szmyt, *Opatowice – Wzgórze Prokopiaka* I. Studia i materiały do badań nad późnym neolitem Wysoczyzny Kujawskiej I, 39–64. Poznań.

Gerling C.

2015 *Prehistoric Mobility and Diet in the West Eurasian Steppes 3500 to 300 BC*. TOPOI. Berlin Studies of the Ancient World 25. Berlin/Boston.

Ivanova S. V., Toshev G. N.

2015 The Middle-Dniester Cultural Contact Area of Early Metal Societies. The Frontier of Pontic and Baltic Drainage Basins in the 4th/3rd-2nd Millennium BC. *Baltic-Pontic Studies* 20: 7–39.

Klochko V. I., Koško A., Potupchuk M. V., Włodarczak P., Żurkiewicz D., Ivanova S.

2015 Tripolye (Gordinești group), Yamnaya and Catacomb Culture Cemeteries, Prydnistrianske, Site 1, Yampil Region, Vinnitsa Oblast: an Archaeometric and chronometric Description and a Taxonomic and Topogenetic Discussion. *Baltic-Pontic Studies* 20: 183–255.

Koško A., Kłocko V. I.

2011 Szlaki tranzytowe bałtycko-pontyjskiego międzymorza, wczesne etapy rozwoju: IV/III – połowa I tys. Przed Chr. Zarys projektu badawczego. In: M. Ignaczak, A. Koško, M. Szmyt (Eds) *Między Bałtykiem a Morzem Czarnym. Szlaki Międzymorza w IV – I tys. przed Chr.* Archaeologia Bimaris – Dyskusje 4, 11–18. Poznań.

Kozak O.

2015 Do pytannya pro fizichni havantazhennya ta zakhvoryuvannya naselennya kulturi kulyastikh amfor Khmel'nitschini (po materyali grupovogo pokhovannya z s. Ilyatka). In: V. A. Zakhar'ev (Ed.) *Starozhystnosti kulturi kulyastykh amfor na Podilli. Zbirnik stattej ta povidomlen. Pamyati Yu. Maleyeva*, 61–112. Khmelnytskyi.

Łysenko S. D., Szmyt M.

2011 Środkowe Naddnieprze jako graniczny areał osadnictwa ludności kultury amfor kulistych. In: M. Ignaczak, A. Koško, M. Szmyt (Eds) *Między*

Bałtykiem a Morzem Czarnym. Szlaki Międzymorza w IV – I tys. przed Chr. Archaeologia Bimaris – Dyskusje 4, 239–246. Poznań.

Maleyev Y. M.

1986 Pokhovannya kultury kulastykh amfor na Khmielnytschini. *Visnik Kiivskogo Universitetu. Istorichni Nauki* 28: 98–103.

Maleyev Y., Yakubovskiy V.

1974 Raskopki grobnitsy kultury sharovidnykh amfor na Yuzhnom Buge. In: *Arkheologicheskiye otkrytiya 1973 g.*: 305. Moskva.

Mathieson I., Alpaslan-Roodenberg S., Posth C., Szécsényi-Nagy A., Rohland N., Mallick S., Olalde I., Broomandkhoshbacht N., Candilio F., Cheronet O., Fernandes D., Ferry M., Gamarra B., Fortes G. G., Haak W., Harney E., Jones E., Keating D., Krause-Kyora B., Kucukkalipci I., Michel M., Mittnik A., Nägele K., Novak M., Oppenheimer J., Patterson N., Pfrengle S., Sirak K., Stewardson K., Vai S., Alexandrov S., Alt K. W., Andreescu R., Antonović D., Ash A., Atanassova N., Bacvarov K., Gusztáv M. B., Bocherens H., Bolus M., Boroneanţ A., Boyadzhiev Y., Budnik A., Burmaz J., Chohadzhiev S., Conard N. J., Cottiaux R., Čuka M., Cupillard C., Drucker D. G., Elenski N., Francken M., Galabova B., Ganetsovski G., Gély B., Hajdu T., Handzhyiska V., Harvati K., Higham T., Iliev S., Janković I., Karavanić I., Kennett D. J., Komšo D., Kozak A., Labuda D., Lari M., Lazar C., Leppek M., Leshtakov K., Vetro D. L., Los D., Lozanov I., Malina M., Martini F., Sweeney K. M., Meller H., Mendišić M., Mirea P., Moiseyev V., Petrova V., Price T. D., Simalcik A., Sineo L., Šlaus M., Slavchev V., Stanev P., Starović A., Szeniczey T., Talamo S., Teschler-Nicola M., Thevenet C., Valchev I., Valentin F., Vasilyev S., Veljanovska F., Venelinova S., Veselovskaya E., Viola B., Virag C., Zaninović J., Zäuner S., Stockhammer P. W., Catalano G., Krauß R., Caramelli D., Zariņa G., Gaydarska B., Lillie M., Nikitin A. G., Potekhina I., Papathanasiou A., Borić D., Bonsall C., Krause J., Pinhasi R., Reich D.

2018 The genomic history of southeastern Europe. *Nature* 555/7695, 197–203. DOI: <https://doi.org/10.1038/nature25778>

Neyman C.

1889 Notatki archeologiczne z Podola rosyjskiego. *Zbiór wiadomości do antropologii krajowej* 13: 34–44.

Prikhodnyuk O.M.

1970 Megalitichna kulyasta amfora z s. Zavovk Khmelnytskoy oblasti. *Arkheologiya* 23: 206–207.

Rozdobudko M.V., Yurchenko O.V.

2005 Znakhidki kulyastykh amfor na livoberezhzhi Serednogo Dnipra. In: *Arkheologichni doslidzhennya na Ukraini 2003-2004 rr.*: 276–279. Zaporizhzhya.

Rudych T.

- 2015 Antropologichniy material z rozkopok hovikh mogilnikh kompleksiv kulturi kulyastikh amfor na Podilli. In: V. A. Zakhar'ev (Ed.) *Starozhystnosti kulturi kulyastykh amfor na Podilli. Zbirnik stattej ta povidomlen. Pamyati Yu. Maleyeva*, 25–60. Khmelnytskyi.

Schroeder H., Margaryan A., Szmyt M., Theulot B., Włodarczak P., Rasmussen S., Gopalakrishnan S., Szczepanek A., Konopka T., Jensen T.Z.T., Witkowska B., Wilk S., Przybyła M.M., Pospieszny Ł., Sjögren K.-G., Belka Z., Olsen J., Kristiansen K., Willerslev E., Frei K.M., Sikora M., Johannsen N.N., Allentoft M.E.

- 2019 Unraveling ancestry, kinship, and violence in a Late Neolithic mass grave. *PNAS* 116(22): 10705–10710. DOI: <https://doi.org/10.1073/pnas.1820210116>

Shaposhnikova O.G., Fomenko V.N., Dovzhenko N.D.

- 1986 *Yamnaya kulturno-istoricheskaya oblast (yuzhnobugskiy variant)*. Arkheologiya SSSR. Svod arkheologicheskikh istochnikov V1-3. Kiev.

Sitsinskij Y.

- 1930 Materiali do arkheologii Zakhidnogo Podilya. In: *Zapiski VUAK* 1: 24–44. Kyiv.

Sulimirski T.

- 1968 *Corded Ware and Globular Amphorae North-East of the Carpathians*. London.

Sveshnikov I.K.

- 1983 *Kultura sharovidnykh amfor*. Arkheologiya SSSR. Svod arkheologicheskikh istochnikov 1-27. Moskva.

Szmyt M.

- 1999 Between West and East. People of the Globular Amphora Culture in Eastern Europe. *Baltic-Pontic Studies* 8: 1–349.
- 2009 Eastern Destinations of Central European Cultural Patterns. The case of Globular Amphora Culture (end of the 4th – middle of the 3rd millennium BC). *Baltic-Pontic Studies* 14: 232–251.
- 2021 Yamnaya and Globular Amphora Culture Relationships: facts and gaps. In: V. Heyd, G. Kulcsár, B. Preda-Bălănică (Eds) *Yamnaya Interactions. Proceedings of the International Workshop held in Helsinki, 25-26 April 2019*. *Archaeolingua* 44. The Yamnaya Impact on Prehistoric Europe 2, 415–434. Budapest.

Vinokur I.S., Gutsal A.F., Penyak S.I., Timoshchuk B.O., Yakubovskiy V.Y.

1984 *Dovidnyk z archeologii Ukraini. Khmelnytskaya, chernivetskaya, zakarpatskaya oblasti*. Kyiv.

Wang C. C., Reinhold S., Kalmykov A., Brandt G., Jeong C., Cheronet O., Ferry M., Harney E., Keating D., Mallick S., Rohland N., Stewardson K., Kantorovich A. R., Maslov V. E., Petrenko V. G., Erlikh V. R., Atabiev B. C., Magomedov R. G., Kohl P. L., Alt K. W., Pichler S. L., Gerling C., Meller H., Vardanyan B., Yeganyan L., Rezepkin A. D., Mariaschk D., Berezina N., Gresky J., Fuchs K., Knipper C., Schiffels S., Balanovska E., Balanovsky O., Mathieson I., Higham T., Berezin Ya. B., Buzhilova A., Trifonov V., Pinhasi R., Belinskij A. B., Reich D., Hansen S., Krause J. & Haak W.

2019 Ancient human genome-wide data from a 3000-year interval in the Caucasus corresponds with eco-geographic regions. *Nature Communications* 10, 590. DOI: <https://doi.org/10.1038/s41467-018-08220-8>.

Zakhar'ev V. A.

2015 Novi pokhovannia kulturi kulyastykh amfor bilya sil Ilyatka i Zaychiki na Khmelnichchini. In: V. A. Zakhar'ev (Ed.) *Starozhystnosti kulturi kulyastykh amfor na Podilli. Zbirnik stattej ta povidomlen. Pamyati Yu. Maleyeva*, 5–24. Khmelnytskyi.

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FUNERAL COMPLEXES OF THE GLOBULAR AMPHORA CULTURE FROM THE VICINITY OF OSTROG, VOLHYNIA, UKRAINE

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ABSTRACT

A funeral complex of the eastern group of the Globular Amphora culture was excavated in an Eneolithic cemetery at the Ostrog-Zeman site, Volhynia, Ukraine, in 2006. The complex consisted of a human tomb and an animal burial located nearby. The tomb, built of small stone slabs and oriented with its long sides along the east-west axis, was divided into two almost identical parts (chambers) – eastern and western. A pot and an amphora were deposited in the eastern chamber, near the transverse wall. At least four people were buried in the western part, destroyed in modern times. The furnishings of this part comprised four amphorae and one bowl. Two meters to the northwest of the tomb, an animal burial without any artefacts was found; it included three skeletons of cattle (bulls) and one of a young pig. Analysis of pottery showed that it belonged to the period around 2950 BC and was synchronous with the early graves of the Volhynian subgroup, e.g. in Tovpyzhyn and Mykolaiv. At the same site, relics of a Globular Amphora culture settlement were also discovered, represented by pottery clusters. To some extent, they confirmed the relative chronology established for the tomb. In the context of these new discoveries, materials from the tomb recovered in 1900 in Mezhyrich-Filvarka (actually – Mezhyrich-Pidvarka), located in the

vicinity of Ostrog, are re-analysed and re-published. The relevance of the re-publication stems from the need to clarify the technical details of the description of items from the tomb and their proper graphic documentation.

Keywords: Globular Amphora culture, eastern group, Volhynian subgroup, human grave, animal burial

INTRODUCTION

In 2006, a funeral complex of the eastern group of the Globular Amphora culture (GAC), consisting of a stone cist grave and an animal burial located nearby, was exposed during the excavations of an Eneolithic cremation cemetery carried out by the present author together with K. Bunyatyan and V. Samolyuk. Previous information on the discovery was published in the form of short reports [Pozikhovskiy, Samolyuk 2006: 155–158; 2007: 310–313].

The site is located on the high left bank of the Viliya River, in the so-called Zeman Tract (ancient local name: Zagumenki). In the south, north and west, the cape-like ledge is geographically bounded by narrow valleys, in the east – by a floodplain. It belongs to the Mizotsky hilly ridge of the Volhynian plateau and is, in fact, its eastern edge, which borders on the valley of Little Polissya (Fig. 1). Both features were found in the western sloping part of the cape.

HUMAN GRAVE IN OSTROG-ZEMAN

The tomb was found at a depth of 0.3–0.4 m from the surface. It had a roughly rectangular shape, which was oriented with its long axis along the east-west line and had dimensions of 3.5×1.6 m.

According to V.K. Pyasetskiy, the tomb was built of two types of locally sourced stone – Sarmatian oolitic limestone and Upper Proterozoic fine-grained quartz sandstone. The dimensions of the limestone slabs ranged from 0.95×0.4×0.1 m to 0.5×0.28×0.5 m and less, and the dimensions of sandstone tiles and fragments – from 0.35×0.25 to 0.2×0.2 m and less. About 0.5 m³ of limestone and 0.7 m³ of sandstone were used for the construction of the tomb. Its walls were made of slabs put on edge in several rows and tilted outwards; in cross and longitudinal sections, they were trapezoidal. The northern longitudinal wall was made

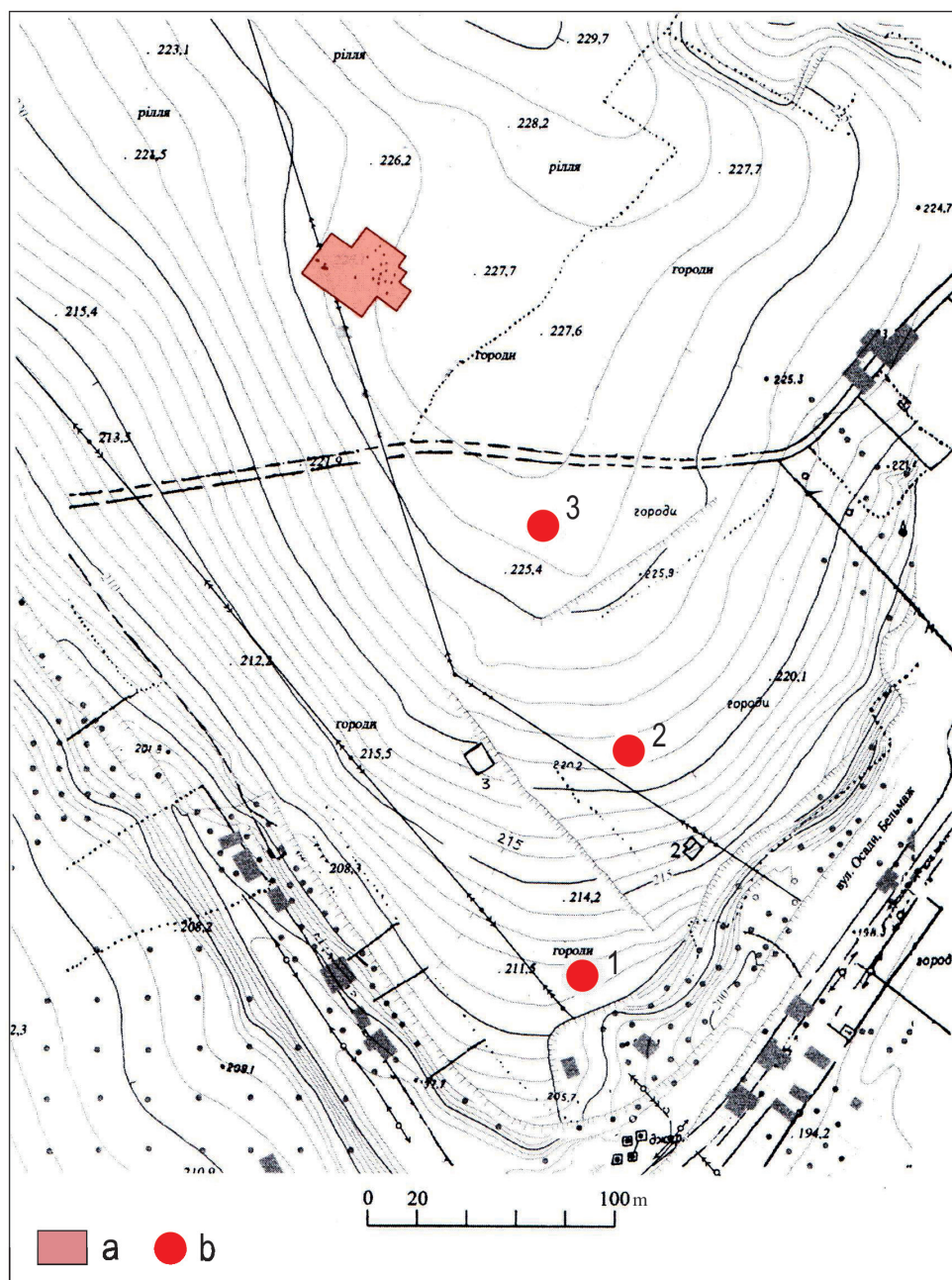


Fig. 1. Ostrog-Zeman, Rivne Province. Location of the site: a – location of the Eneolithic cemetery; b – pottery clusters

of massive sandstone slabs arranged in several rows, thinner ones were used for the southern wall. The front-end walls were wide in the northern part. One interesting detail drew attention: the western narrow wall was triangular in plan. The slabs used for the tomb walls were dug 0.05-0.08 m into the sterile soil. The burial chamber bottom was lined with thin limestone tiles while the tomb top was covered with limestone slabs, which were possibly arranged in the form of a "hut" (Fig. 2).

The tomb was divided into two chambers – western and eastern. Human burials were deposited only in the western chamber. Unfortunately, it was badly damaged, which is clearly visible in its cross-section (Fig. 2). Mixed bones of at least four humans and fragments of five vessels were found in the fill among crushed tiles. The intact eastern chamber, covered by a massive top slab, contained two undamaged vessels (Fig. 3 and 4).

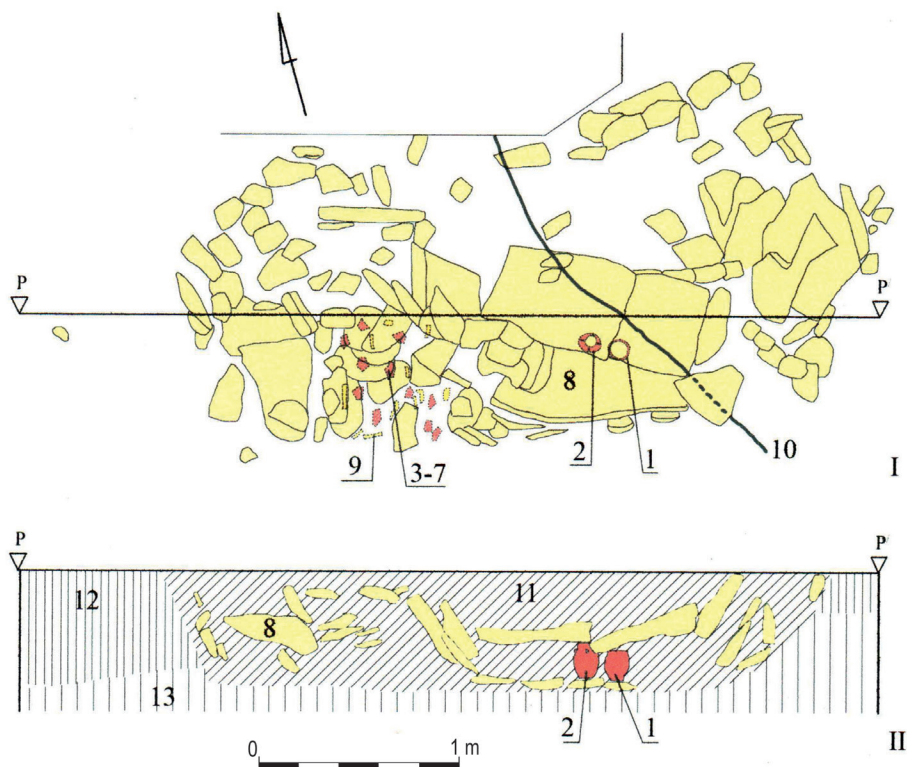


Fig. 2. Ostrog-Zeman, Rivne Province. Human grave of the Globular Amphora culture: I – plan of the grave; II – cross-section. Drawn by V. Samolyuk

Key: 1- intact vessels; 3-7 – pottery shards; 8 – top slab; 9 – human bones; 10 – modern installation; 11 – filling of the grave; 12 - subsoil; 13 – virgin soil.



1



2

Fig. 3. Ostrog-Zeman, Rivne Province. Human grave of the Globular Amphora culture: 1 – view from the north; 2 – view from the east. Photo by V. Samolyuk



1



2

Fig. 4. Ostrog-Zeman, Rivne Province. Human grave of the Globular Amphora culture: 1-2 – view from the south. Photo by V. Samolyuk

In total, only seven clay vessels were discovered in both chambers of the tomb: five amphorae, one pot and one bowl.

1. Pot (eastern chamber). The vessel (Fig. 5) has slender elongated proportions, flat bottom with an external flange, is ornamented with fingerprints, the maximum protrusion of the belly is at 3/4 of its height, the transition to a conical, slightly concave neck is highlighted by a sharp rib. Below the rib, paired groups of sphero-conical ledges are symmetrically placed. The surface of the vessel is black polished and bears horizontal traces of smoothing with a narrow object on the neck. Carefully mixed ceramic mass contains stone temper, fine sand and pyrite. Dimensions: Ø rim – 20.6 cm; Ø bottom – 10 cm; Ø maximum convexity – 23–25 cm; height – 21.5 cm; wall thickness – 0.5–1 cm.
2. Amphora (eastern chamber). The ovoid shaped vessel (Fig. 6) has a flat bottom with a fringe. Four looped handles are placed on sloping shoulders with faint oval indentations noticeable above them; the neck is concave. The outer surface is black at the top, the belly is beige-brown, with traces of scratches; the inner surface is black. Such kinds of temper as fine sand, pyrite (natural impurity) and broken stone are used in the ceramic mass. Dimensions: Ø rim – 8.8 cm; Ø bottom – 10 cm; Ø maximum convexity – 20 cm; height – 26 cm; wall thickness – 0.5–0.7 cm.
3. Amphora (western chamber). The vessel (Fig. 7) is roughly spherical in shape, it has a flat bottom, separated from the lower part by a ledge. There are four tape-like handles on its shoulder, the nearly cylindrical neck is separated from the belly by a ledge. Rectangles formed by impressions of a rectangular stamp are seen on the neck, shoulders and handles. Their bottom rows differ: there is a double horizontal band on the bottom part of the shoulder and on handles, and a single band on the neck; both are made with a V-shaped stamp. A horizontal row of impressions of a rectangular stamp can be seen under the edge of the rim. Both surfaces are grey, but there are brown spots on the outside. The surface was neatly smoothed on both sides. The ceramic mass is levigated and tempered with burnt flint of various granulations as well as natural impurities of fine sand and pyrite. The surface is floury to the touch. Dimensions: Ø rim – 17 cm; Ø bottom – 11.6 cm; Ø maximum convexity – 32 cm; height – 26.2 cm; wall thickness – 0.6–1 cm.
4. Amphora (western chamber). The vessel (Fig. 8: 1) has an ovoid body, gradually transitioning into the high neck. Two arched handles are attached to the shoulder at the lower end, and to the neck at the upper. The bottom is flat, without

- a flange. The surface of the item is even, smoothed, in some places peeled, grey and brown coloured. The mass is levigated and contains natural admixture of fine sand and pyrite. Dimensions: Ø rim – 6.6 cm; Ø bottom – 5.2–5.4 cm; Ø maximum convexity – 9 cm; height – 9.6 cm; wall thickness – 0.3–0.4 cm.
5. Amphora (western chamber). The vessel (Fig. 8: 2) has a spherical body, concave neck, two arched handles attached at one end to the shoulder, and at the other – to the top of the neck; the bottom is flat. The surface is smooth, bumpy at the bottom, light brown at the top and dark gray at the bottom. The mass is dense, of a gray-brick colour, and contains a lot of fine sifted sand. Dimensions: Ø rim – 6.6 cm; Ø bottom – 8 cm; Ø maximum convexity – 10.6 cm; height – 9 cm; wall thickness – 0.4–0.6 cm.
 6. Amphora (western chamber). A spherical vessel (Fig. 9) with a cylindrical neck and two or four arched handles on its shoulders. Triangular festoons made in the style of ‘fish scales’ decorate the neck and shoulders. The surface is smooth, polished (there are some losses of polishing), of black and brick-red colours. The ceramic mass is levigated and has a natural admixture of fine sand and pyrite, there are also very small inclusions of a white colour (possibly crushed shell or flint). Dimensions: Ø rim – 8.6 cm; Ø maximum convexity – 11.8 cm; height – 12.6 cm; wall thickness – 0.3–0.4 cm.
 7. Bowl (western chamber). A spherical vessel (Fig. 10) has a cylindrical neck and two arched handles at its base. The neck is decorated with three horizontal rows of ‘herringbones’, while the upper part of the shoulders is decorated with rhombuses. The surface is well smoothed, even, brown with black spots. The clay mass contains an admixture of small fractions of burnt flint. Dimensions: Ø rim – 10.8 cm; Ø maximum convexity – 12.2 cm; height – 8.3 cm; wall thickness – 0.35–0.45 cm.

ANIMAL BURIAL IN OSTROG-ZEMAN

Two meters northwest of the human grave, an animal burial was found. It consisted of three skeletons of cattle (exclusively bulls) and one piglet (identification by O. Zhuravlev). Two skeletons of bulls and a piglet were laid on their backs, another skeleton was laid obliquely over them (Fig. 11). The burial was oriented similarly to the tomb and was located in the same stratigraphic horizon. The completeness of the skeletons suggests that they were thrown into a pit, the walls of which may have been reinforced by a wooden structure.

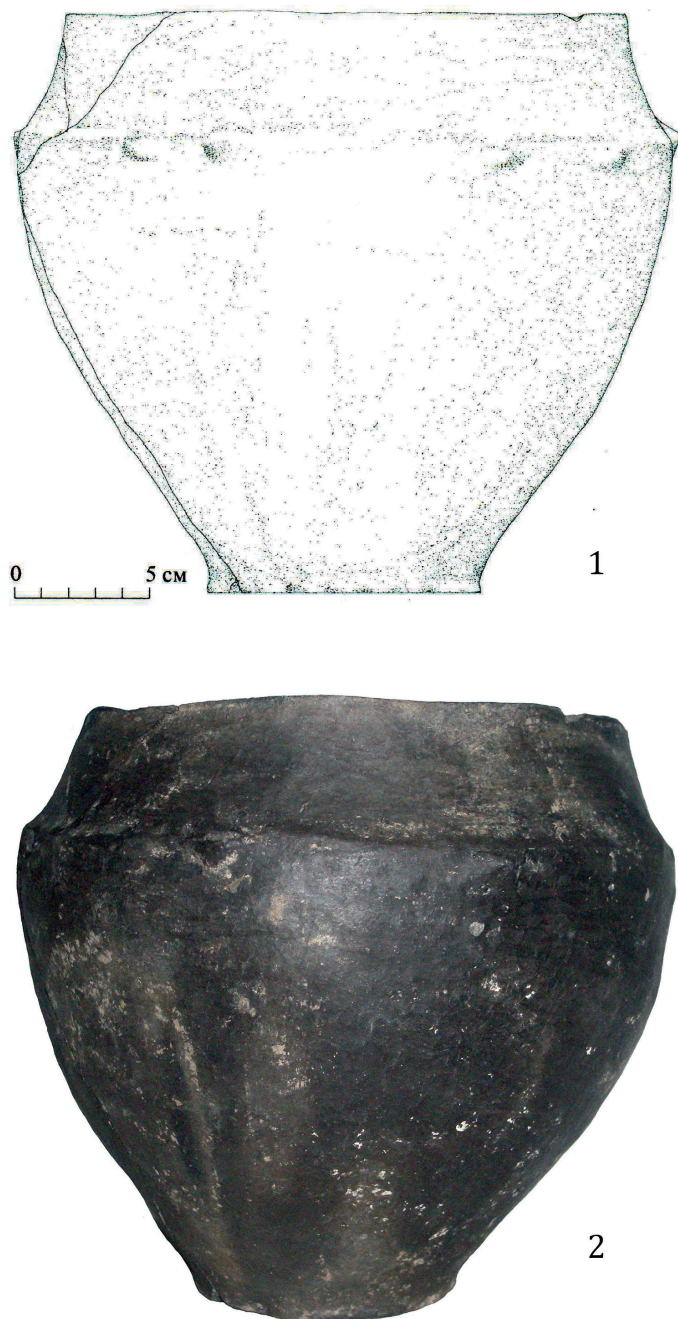


Fig. 5. Ostrog-Zeman, Rivne Province. Human grave of the Globular Amphora culture, eastern chamber: 1-2 – pot. Drawn by V. Samolyuk

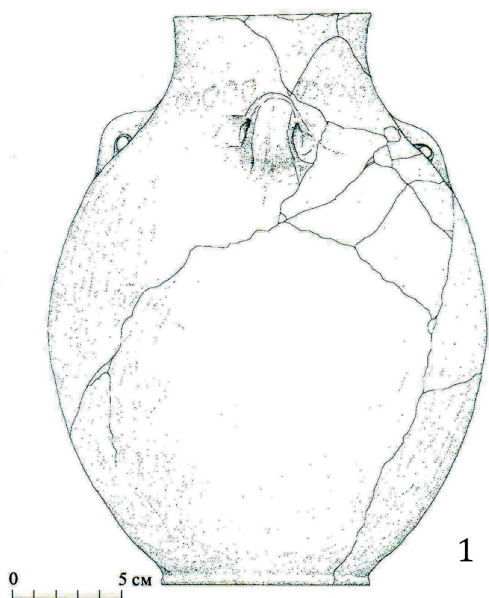


Fig. 6. Ostrog-Zeman, Rivne Province. Human grave of the Globular Amphora culture, eastern chamber: 1-2 – amphora. Drawn by V. Samolyuk

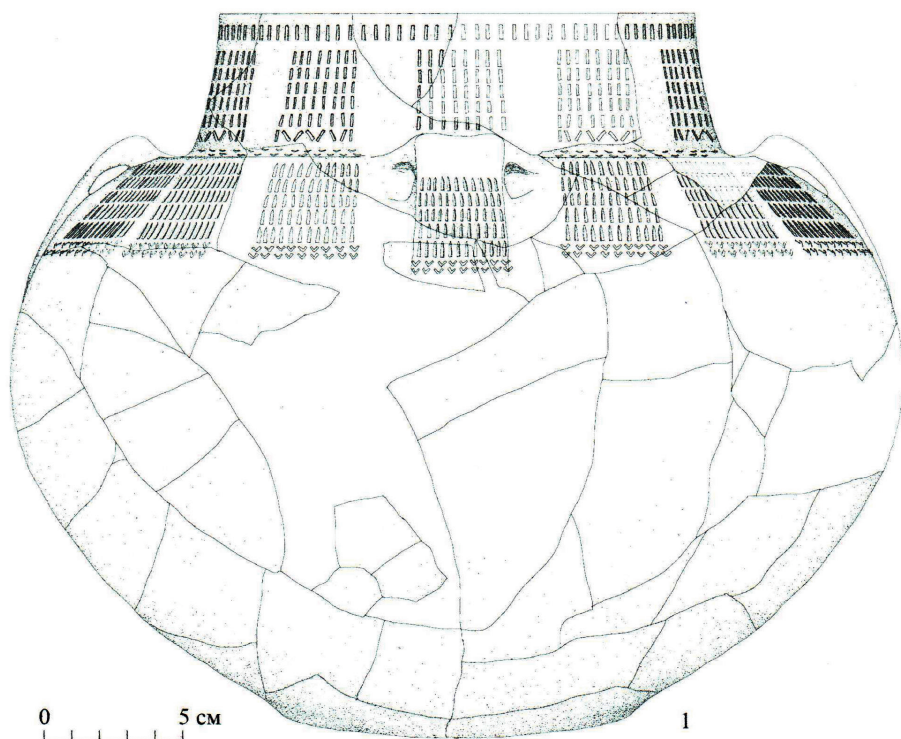


Fig. 7. Ostrog-Zeman, Rivne Province. Human grave of the Globular Amphora culture, western chamber: 1 – amphora. Drawn by V. Samolyuk

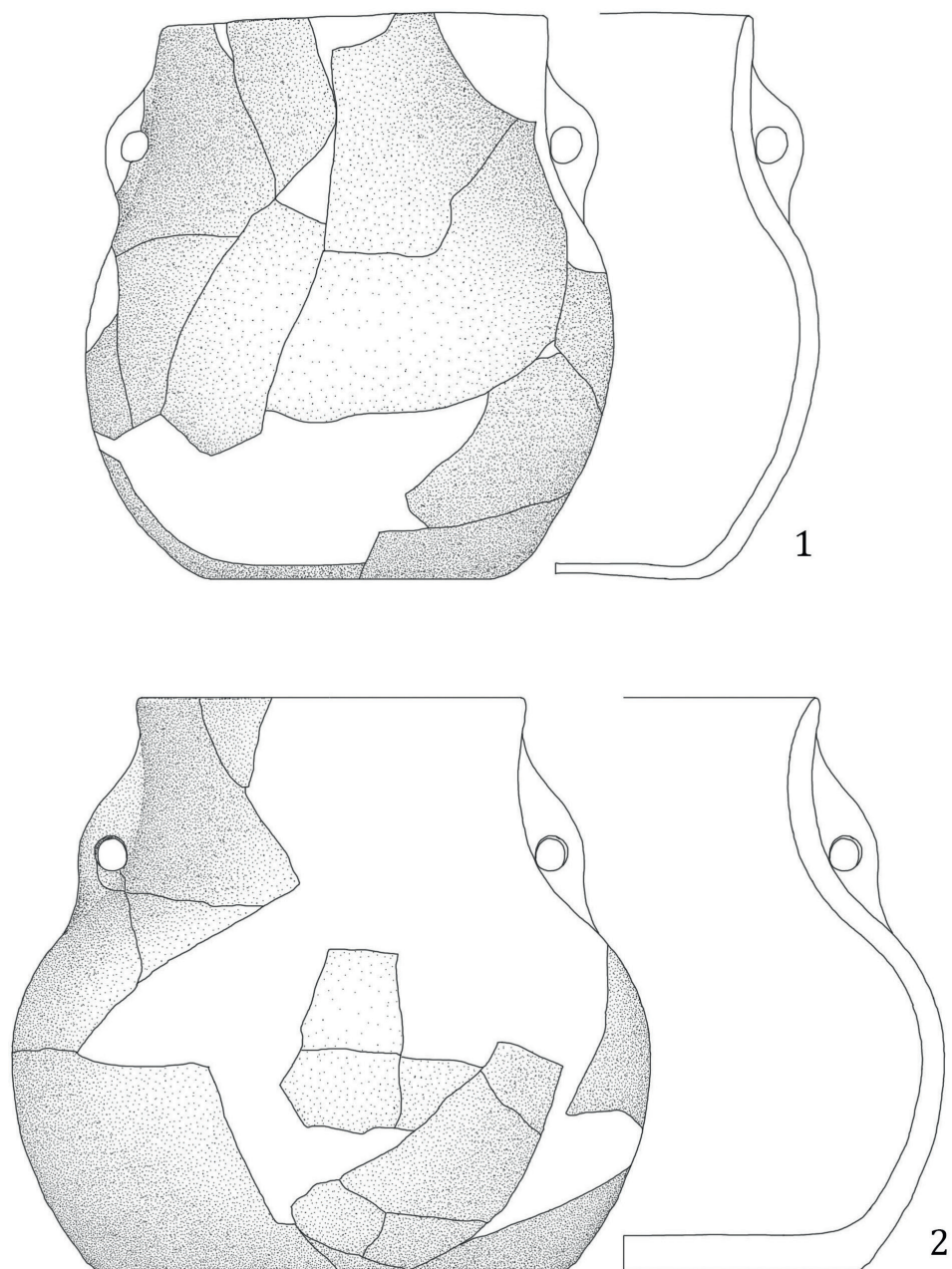


Fig. 8. Ostrog-Zeman, Rivne Province. Human grave of the Globular Amphora culture, western chamber: 1-2 – amphorae. Drawn by V. Samolyuk

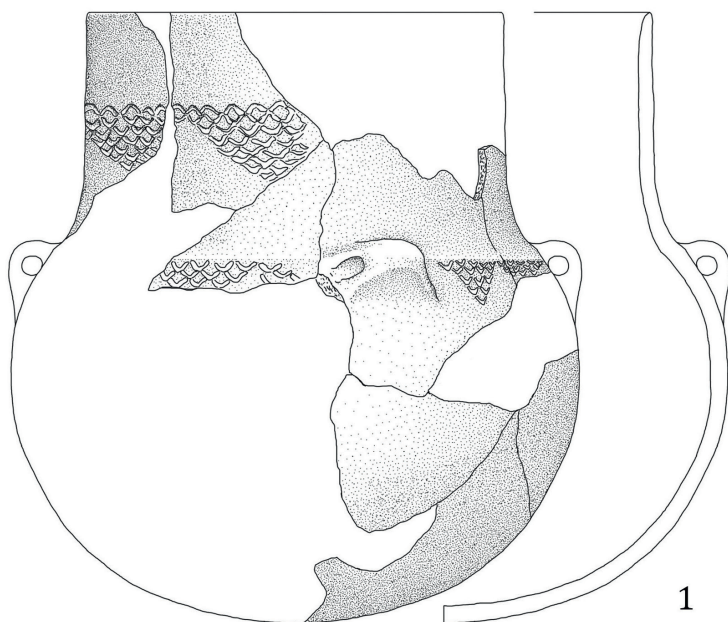


Fig. 9. Ostrog-Zeman, Rivne Province. Human grave of the Globular Amphora culture, western chamber: 1-2 – amphora. Drawn by V. Samolyuk



Fig. 10. Ostrog-Zeman, Rivne Province. Human grave of the Globular Amphora culture, western chamber: 1-2 – bowl. Drawn by V. Samolyuk

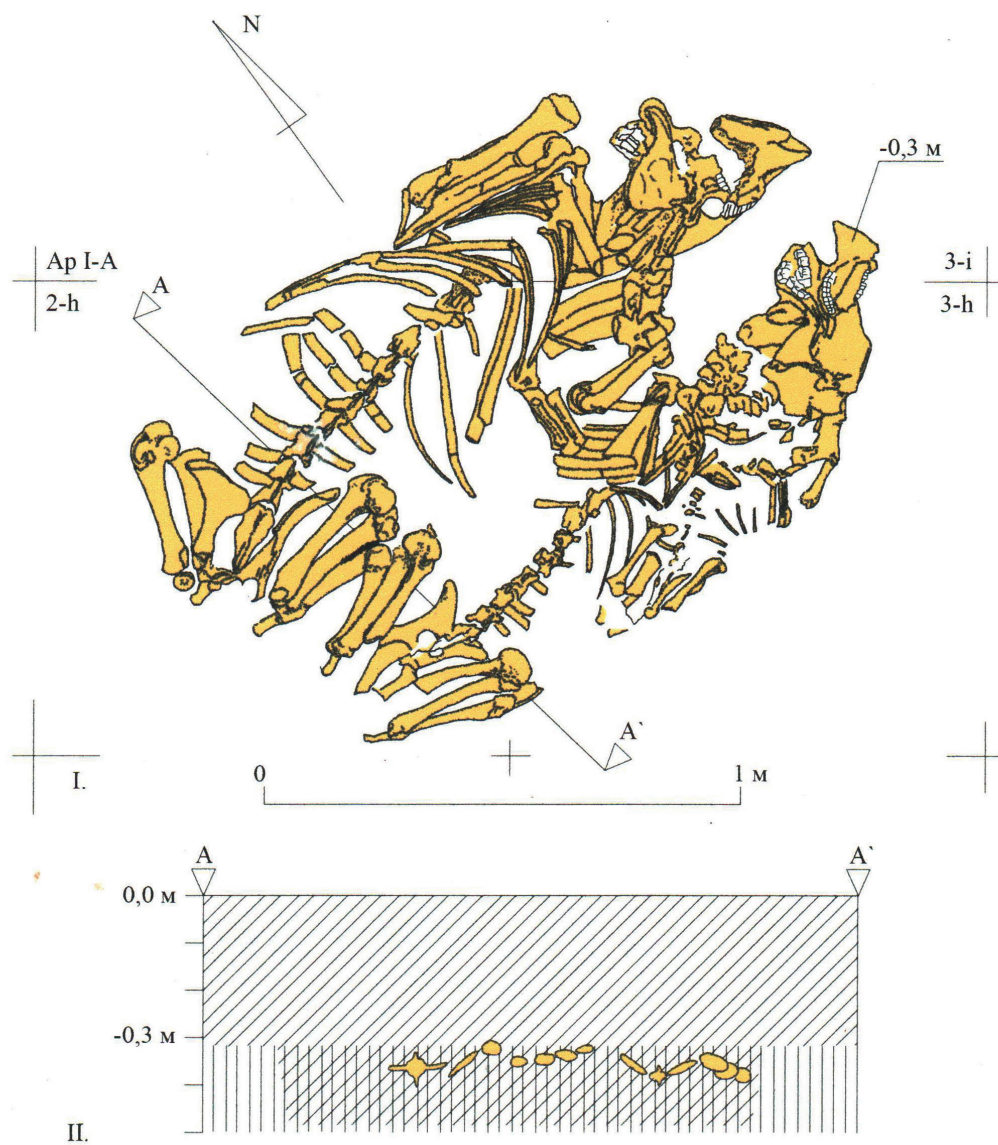


Fig. 11. Ostrog-Zeman, Rivne Province. Animal burial of the Globular Amphora culture: 1 – plan of the feature; 2 – cross-section. Drawn by V. Samolyuk

ANALYSIS OF THE FUNERAL COMPLEX FROM OSTROG-ZEMAN

The burial complex from *Ostrog-Zeman* consists of a human tomb and an animal burial. The tomb, whose walls were made of small vertically placed slabs, was divided into two almost identical parts (chambers) and covered by similar slabs, allegedly arranged in the form of a 'hut'. The small size of the slabs can be explained by the fact that the layer of tiled limestone, in its deposit located north of the tomb, is small and badly weathered.

Construction of the tomb as well as its east-west orientation is typical of Volhynian and Podolian subgroups of the GAC eastern group. However, its division into two parts is not quite traditional in the east and is known only in the Volhynian subgroup in the form of a so-called inner porch, as seen in Kikova, Grave I, Kolodyazhne, Grave II, and Vysoke [Sveshnikov 1983: 29, 32, 35]. The porch was small, its width did not exceed 0.5-0.7 m. However, taking into consideration the unsatisfactory condition of the field documentation, only the existence of a porch in Tomb II in Kolodyazhne is definite [Sveshnikov 1983, Fig. 7].

Two vessels were found close to the partition, in the eastern, well-preserved chamber of the tomb from *Ostrog-Zeman*. Most likely they were furnishings of the symbolic burial. Due to the modern-time robbery of the western chamber, we can only assume that at least four people were buried there.

Animal burials (intact or fragmented body/bodies) are common in the GAC. However, in the eastern group, they were usually part of grave goods deposited inside stone tombs. Absence of animal burials outside tombs can be easily explained. As a rule, GAC funerary features were discovered by chance and during their exploration attention was primarily paid only to tombs themselves. Whereas, when the area around a tomb was excavated, it was possible to identify both human graves and animal burials. The case in point is a site at Zastinka, in the Podolian subgroup: in 1969, during rescue excavations a burial of two pig skeletons covered with sandstone slabs was found three meters from a human stone cist grave [Sveshnikov 1983: 39].

A number of complexes consisting of a human grave and animal burial located nearby are known from the GAC central group [Szmyt 2017: 249-250]. For instance, 23 GAC features were found in the area of 15 ares in the village of Sadowie, Opatów commune (Poland), with 13 containing burials of bulls and pigs, either partial or complete [Pasterkiewicz 2017, Fig. 3; 2020, Fig. 2]. A spatial analysis showed that two or three animals occurred in each such feature. The species composition is similar to that found at Zastinka and *Ostrog-Zeman*: cow, pig, one sheep or goat [Pasterkiewicz 2017: 285]. Similar features, which are widely known in the GAC central group, were called 'sacrificial pits' by Zygmunt Krzak [1977: 60]. Another example, is a funeral complex at site Koszyce 3 in the Małopolska Upland, where several pigs were deposited near a multi-burial

human grave [Przybyła *et al.* 2013]. Similar complexes were also found in the GAC western group, such as in Zauschwitz [Bergemann 2018: 314-316]. The complex including a human grave and accompanying animal burial in Ostrog-Zeman is the only one known in Volhynia so far, but finding next ones is a matter of time.

The pottery from the burial is no less interesting. According to the method of ceramic mass formation, it is divided into two groups. The mass of the first group is thoroughly mixed and firm to the touch; that of the second, is levigated and floury to the touch. The material can be divided into the following groups, according to the technology employed: with the temper of stone and natural impurities of fine sand and pyrite (the amphora and the pot from the eastern chamber); with the temper of burnt flint of various granulation and natural impurities of fine sand and pyrite; with the temper of a very large quantity of fine-sifted sand; with a purely natural admixture of fine sand and pyrite. The last three groups of temper were recorded in the western chamber.

Morphologically, three types of vessels are identified: amphorae (five items), a bowl and a pot (last two are represented by single specimens). The amphora from the eastern chamber (Fig. 6) owing to its proportions belongs to Type VBI, according to the scheme of Marzena Szmyt [2010, Fig. 4]. Similar vessels were found in Mykolaiv and Yaholnitsa in the eastern group [Sveshnikov 1983, Pl. III, 9; XV, 1] and in Klementowice, Cemetery B, Grave I – a site within the central group [Nosek 1967, Pl. XXV, 10]. Such amphorae have elongated ovoid proportions, flat bases with or without flanges, and bear no ornament. The vessel from Ostrog-Zeman has an ornament of oval-shaped recesses.

The pot from the eastern chamber (Fig. 5) belongs to Type III [Szmyt 2010, Fig. 4]. Its distant analogy comes from a grave of the GAC central group in Krasnystaw, Site 8 [Sieradzka 2017, Fig. 6: 2]. Both vessels are decorated with hemispherical bosses.

More diverse pottery, in terms of design, came from the western chamber. An amphora which can be attributed to Type VBIII [Szmyt 2010, Fig. 4] features rich ornamentation (Fig. 7). Vessels similar in shape are known in the Volhynian subgroup of the GAC from sites Vilkhove, Varkovytchi, Ivannya [Sveshnikov 1983, Pl. IV: 6-7, 9], and from a flat grave in Mykhalkivtsy [Pozikhovskiy, Bunyatyan 2012, Fig. 2: 1]. Amphorae of the same shape are also known in the central group, e.g. from Graves II and VII in Sandomierz, Site 78 [Ścibior, Ścibior 1990, Fig. 4: a; 25: a]. Vessels from these sites have one thing in common: vertical rectangles – formed by impressions of a rectangular stamp – covering their shoulders. On an amphora from Ostrog-Zeman, the same ornamentation is also placed on handles and the neck.

The next three amphorae differ from the previous ones by smaller size. One, having an ovoid body (Fig. 8: 1), is close to Type VBII, but has a flat base [Szmyt 2010, Fig. 4: 40]. No reliable analogies in the eastern GAC group were found. The

amphora with a wide base (Fig. 8: 2) has analogies in several graves, e.g. from Mezhyrich and Suiełtsi, Grave II [Sveshnikov 1983, Pl. VII: 2; XI: 4].

The last amphora from the western chamber deserves special attention. The vessel has a spherical body, a cylindrical neck and handles on its shoulders; the neck and shoulders are decorated with two rows of festoons in the form of 'fish scales' (Fig. 9). It belongs to Type VBII [Szmyt 2010, Fig. 4]. The motif of 'fish scales' is characteristic of the Podolian subgroup of the GAC eastern group [Sveshnikov 1983: 15]. Pottery with such a motif was also found on the southern edge of the Volhynian subgroup, as evidenced in Mezhyrich-Karpaty, Suiełtsi, Grave II [Sveshnikov 1983, Pl. V: 5; XII: 1; Pozikhovskiy, Bunyatyan 2012, Fig. 3: 1], and Novomalyn. Vessels with a similar ornament were found in some settlements, e.g. in Vilbivne [Pozikhovskiy, Bunyatyan 2012, Fig. 7: 4]. An amphora decorated with triangular festoons in the form of 'fish scales' was also found in Klementowice, Cemetery B, Grave I, in the central GAC group [Nosek 1967, Fig. 157: 23].

A bowl with a spherical body and a cylindrical neck stands out among the rather typologically uniform set of pottery from the western chamber (Fig. 10). Bowls of such forms are unknown either in the Volhynian or Podolian subgroups of the GAC and are close to Type II according to Szmyt [2010, Fig. 4]. They are common, however, in the central group, above all, in its western part, in the contact zone with the GAC western group [Nosek 1967, Pl. IX: 2; Wiślański 1966, List III, Type IV A3].

FUNERAL COMPLEX IN OSTROG-ZEMAN: CONCLUSION

Two chronological horizons, an early and late one, have been identified in the preliminary publication of GAC materials from Ostrog-Zeman, based on the study of technological groups [Pozikhovskiy, Samolyuk 2007: 313]. An amphora with a wide base was attributed to the early horizon. At that time, such a vague definition was justified. However, in the following years, excavations covered an area to the south of the Eneolithic cemetery. GAC relics were identified there in the form of three clusters of pottery, scattered at a considerable distance from each other (Fig. 1). Probably, they testify to the existence of a settlement, consisting of at least three residential complexes. However, absence of any ground features significantly limits the possibility of drawing any analytical conclusions. The analysis of ornament style and vessel morphology and the presence of a bowl typical of the Gordinești group of the Trypillia culture allowed attribution of the findings from Cluster 1 to the early stage of the Volhynian subgroup of the GAC eastern group [Pozikhovskiy, Rybicka 2019: 810–812]. At first glance, the difference between the pottery from settlement clusters and the grave is obvious. It should be noted,

however, that only the northern part of Cluster 1 and even less of Clusters 2 and 3 have been studied. Still, there are several similarities, starting with technological traits. Both contexts (settlement and grave) yielded pottery that was made of ceramic mass of two types: solid and levigated, with admixtures of flint lumps of various granulation and fine-sifted sand. Finally, it should be kept in mind that the pottery from the settlement clusters is more diverse, so the ceramic assemblages of the grave and settlement can be the subject of discussions until the exploration of the monument is completed.

What chronological framework can be applied to the burial complex from *Ostrog-Zeman*? A detailed chronology, relying on the meticulous analysis of burials and ceramics, has been developed for the GAC eastern group [Szmyt 2010]. Thus, the Volhynian subgroup existed between 3000/2950 BC and 2400/2350 BC [Szmyt 2010: 68]. The Podolian subgroup is probably a bit younger: from about 2880 BC until 2500 BC [Szmyt 2010: 69]. Marzena Szmyt proposed periodization schemes for these subgroups relying on the seriation of burial complexes, correspondence analysis, and statistical tests. Thus, as a result of the correspondence analysis for ceramics from the burials of the Volhynian subgroup, four groups have been distinguished. The earliest Group VA includes burials from Tovpyzhyn and Mykolaiv, Group VB (the largest) – from Ivannya, Suiemtsi I, Ulvivok, Mezhyrich, Ostrog, Kikova I, Group VC – from Kikova II, and Group VD – from Skolobiv and Suiemtsi II. The first two groups are especially important for determining the chronology of the burials from *Ostrog-Zeman*. Group VA is characterized by ‘herringbone’ ornaments and impressions of a two-strand cord. In turn, in Group VB, there is a festoon ornament including cord one. According to Szmyt observations, these groups are marked by continuity [Szmyt 2010: 58]. As a result of the superimposition of radiocarbon date determinations, Group VA can be dated from 2950 BC to 2750 BC, and Group VB – from 2750 BC to 2500 BC [Szmyt 2010, Fig. 17].

Unfortunately, due to the loss of human and animal bones, radiocarbon analysis for the *Ostrog-Zeman* site is currently impossible. However, taking into account ‘herringbone’ ornaments on the amphorae with elongated proportions, vessel with a wide base and bowl with a spherical base, the grave from *Ostrog-Zeman* should be dated to the period from 2950 BC to 2750 BC. Such an early dating is supported by the presence of a bowl of the Gordinești type in Cluster 1 and similarity between ceramic mass in Cluster 1 and the human grave. The amphora with ‘fish scales’ stands out a bit against this background. Szmyt suggests that contacts between the Volhynian and Podolian subgroups took place about 2750 BC [Szmyt 2010, Fig. 17]. As we can see, this happened a little earlier.

Increasing the number of calibrated dates, investigating settlement structures, and comprehensively analyzing the findings will either confirm or refute the suggested dating of the monument.

In 1900, a crouched burial in a stone tomb was discovered in a field in the vicinity of the village of Mezhyrich near Ostrog. It was accompanied by grave goods: three small amphorae and three axes. In the archaeological literature this tract of land is known as Mezhyrich-*Filvarky*, although the name of the area is misinterpreted, it should read Mezhyrich-*Pidvarky*. The site is located on the high right bank of the River Svytenka (Zbytenka). The monument was first published by Leon Kozłowski, who provided only a description of the finds and circumstances of the burial discovery [Kozłowski 1924: 187–188].

Kozłowski counted the burial from Mezhyrich among Podolian cist graves, which, on the strength of cord ornaments on vessels, were dated by him to a later stage of the GAC [Kozłowski 1924: 97-98]. For the first time, drawings of the two amphorae from this grave, which are now preserved in the collection of the State Historical and Cultural Reserve of Ostrog, were published by Igor Sveshnikov after World War II [Sveshnikov 1957, Pl. III, 10-11]. The finds from the grave were fully illustrated only in 1983 [Sveshnikov 1983, Pl. VII]. Some items from the grave were also used in several generalizing works on the archaeology of Ukraine [Sveshnikov 1974, Fig. 39: 3; 1985, Fig. 74: 8]. Two axes from the grave became the subject of an analytical study by Jerzy Libera. However, he mistakenly attributed them to the village Mezhyrichchia, now Chekno [Libera 2009, Fig. 4: 7-8].

The need to re-analyse the materials from the grave is caused by the inaccurate descriptions of the vessel technology and not very good illustrations of the pottery and flint products. The refined descriptions of the finds can be found below.

1. A globular amphora with slightly inverted rims (Fig. 12: 1). The surface is dark grey with brown spots, smoothed and even. The ceramic mass contains natural impurities of sand, pyrite, and a small amount of fine burnt flint. Dimensions: Ø rim – 6.5 cm; Ø maximum convexity – 9-10.2 cm; height – 9,1-10,2 cm. It belongs to Type VBII [Szmyt 2010, Fig. 4: 42].
2. A globular amphora with a cylindrical neck and arched handles on the shoulders (Fig. 12: 2). The surface is dark grey with brown spots, smoothed and even. The ceramic mass contains natural impurities of sand and pyrite as well as an intentional admixture of fine grog. It belongs to Type VBII [Szmyt 2010, Fig. 4: 42].
3. A flint axe (Fig. 13: 1), trapezoidal in plan, quadrangular in cross-section. Made of grey Western Volhynian Turonian flint. Dimensions: length – 12.4-12.9 cm; butt width – 2.7 cm; blade width – 4.5 cm; thickness – 1.8-1.9 cm.

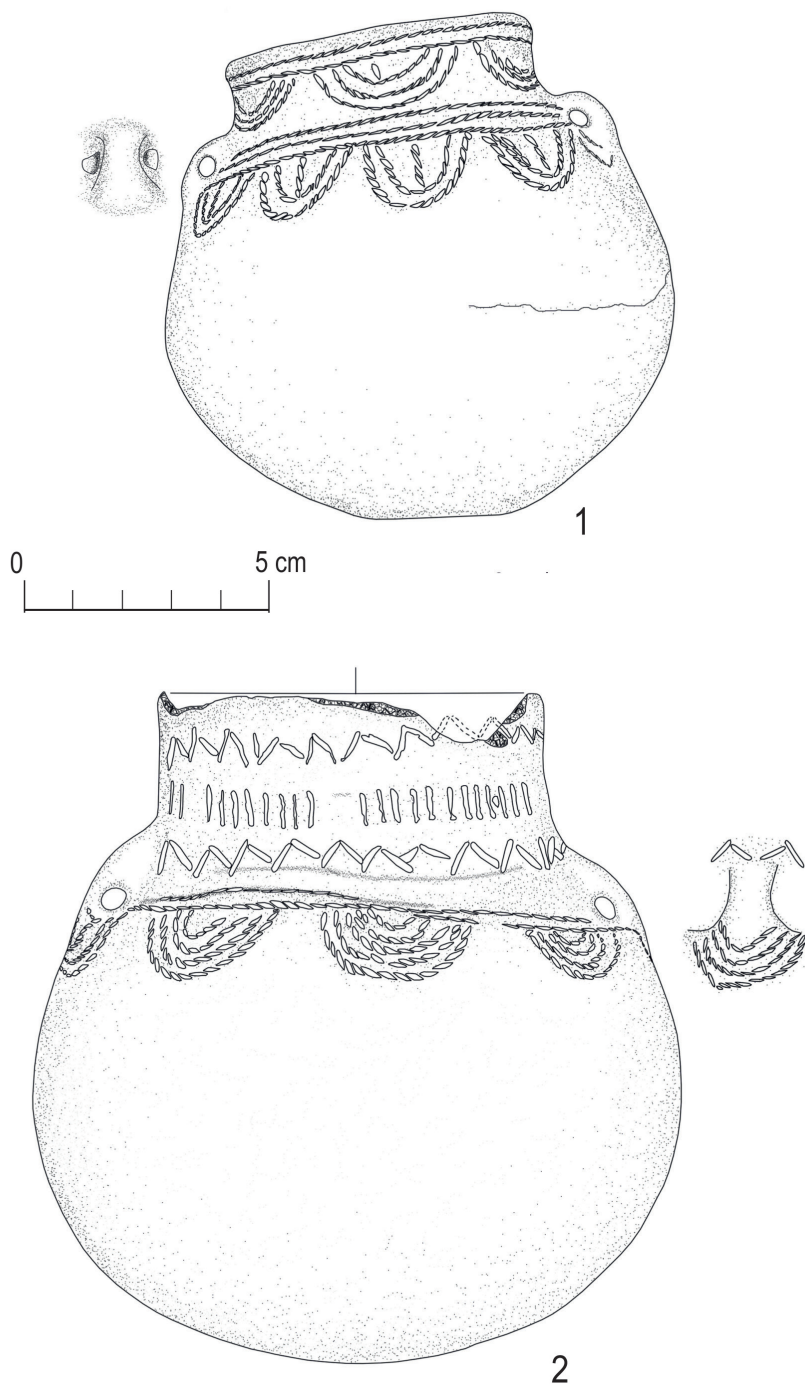


Fig. 12. Mezhyrich-Pidvarki, Rivne Province. Amphorae. Drawn by D. Verteletskyi

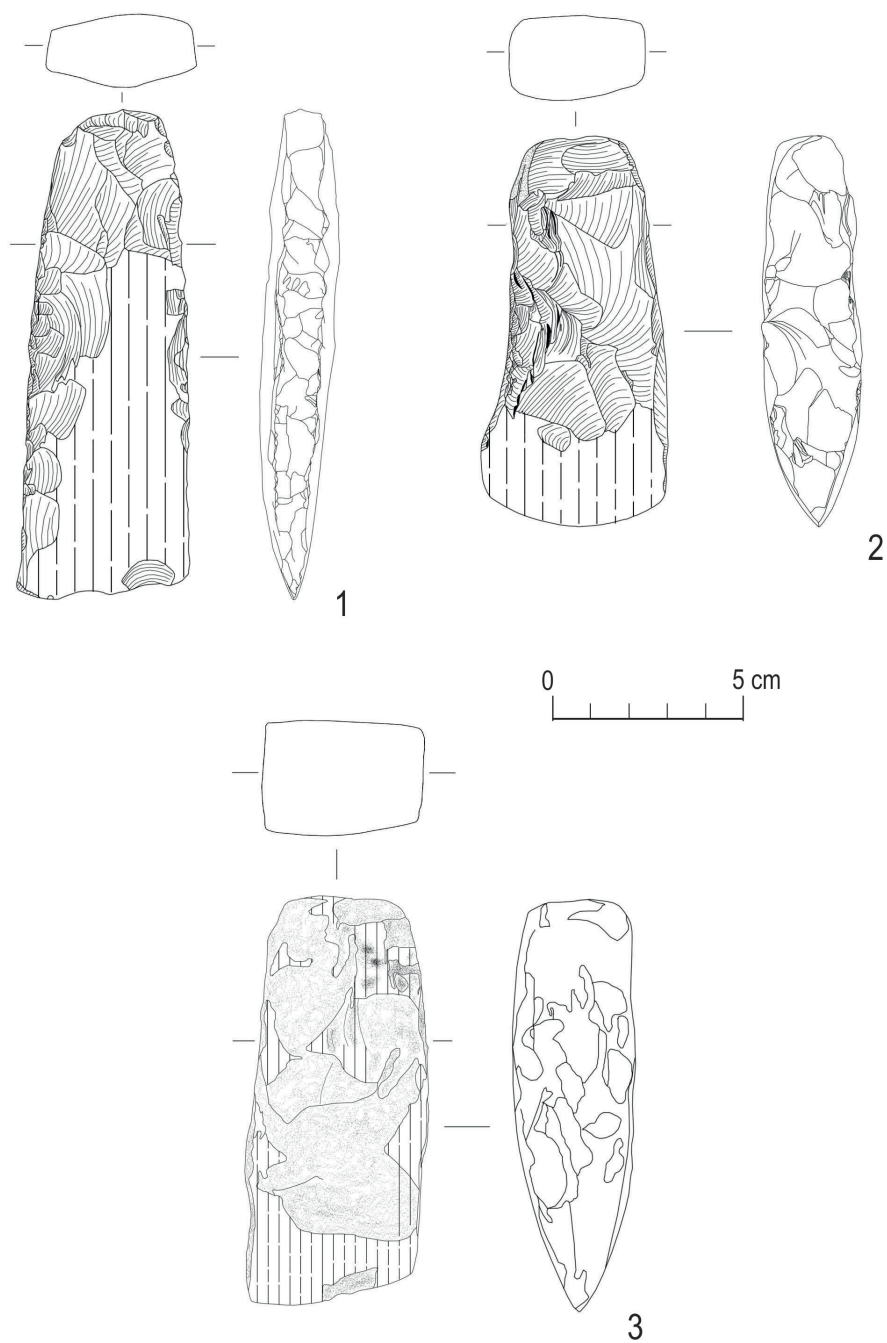


Fig. 13. Mezhyrich-Pidvarki, Rivne Province. Flint axes. Drawn by D. Verteletskyi

4. A flint axe (Fig. 13: 2), trapezoidal in plan, quadrangular in cross-section. Made of milky grey Western Volhynian Turonian flint. Dimensions: length – 9.8-10.5 cm; butt width – 3.0 cm; blade width – 4.1 cm; thickness – 2.7-3.2 cm. While analyzing the axes of the Corded Ware culture and GAC, Libera noted that items with a rough surface finish were more typical of the former, while in the latter they were rare [Libera 2009: 174].
5. A flint axe (Fig. 13: 3), trapezoidal in plan with an extension in the blade part. Made of milky grey Western Volhynian Turonian flint. Dimensions: length – 9.6-9.8 cm; butt width – 2.7 cm; blade width – 4.7 cm; thickness – 1.9-2.6 cm. It is similar in the surface treatment method to the previous axe (no. 4), which has an extension, resembling boat-shaped stone axes.

In 1983, Sveshnikov published the lower part of an amphora as part of the Mezhyrich grave goods [Sveshnikov 1983, Pl. VII: 4]. When the careful description of the finds made by Kozłowski is consulted, it seems questionable whether the mentioned fragment belongs to the GAC at all. Today this pottery fragment is lost.

REFERENCES

Bergemann S.

- 2018 *Zauschwitz (Landkreise Leipzig): Siedlungen und Gräber eines neolithischen Fundplatzes*. Universitätsforschungen zur Prähistorischen Archäologie 314. Human Development in Landscapes 13. Kiel – Bonn.

Kozłowski L.

- 1924 *Młodsza epoka kamienna w Polsce*. Lwów.

Krzak Z.

- 1977 Cmentarzysko na „Gajowiznie” pod względem archeologicznym. In: J. Kowalczyk (Ed.) *Cmentarzysko amfor kulistych w Złotej Sandomierskiej*, 9-79. Wrocław – Warszawa – Kraków – Gdańsk.

Libera J.

- 2009 Czy siekiery krzemienne mogą być wyznacznikiem kultury amfor kulistych? In: H. Taras, A. Zakościelna (Eds) *Hereditas praeteriti. Addimenta archaeologica et historica dedicata Joanni Gurba Octogesimo Anno Nascendi*, 169–179. Lublin.

Nosek S.

- 1967 *Kultura amfor kulistych w Polsce*. Wrocław – Warszawa – Kraków.

Pasterkiewicz W.

- 2017 Wyniki badań archeologicznych na cmentarzysku z późnego neolitu w Sadowiu koło Opatowa. *Materiały i Sprawozdania Rzeszowskiego Ośrodka Archeologicznego* 38: 281–289.
- 2020 The first radiocarbon dates for the Globular Amphora culture cemetery in Sadowie in the Sandomierz Upland. *Analecta Archaeologica Ressoviensia* 15: 53–75.

Pozikhovskiy O., Bunyatyan K.

- 2012 Pamyatky kultury kulyastykh amfor w okolytsakh Ostroga. *Arkheologiya* 2: 54–67.

Pozikhovskiy O., Rybicka M.

- 2019 Ceramika z osady kultury amfor kulistych ze stanowiska Ostrog-Zeman na Zachodnim Wołyniu. In: M. Szmyt, P. Chachlikowski, J. Czebreszuk, M. Ignaczak, P. Makarowicz (Eds) *Vir Bimaris. Od kujawskiego matecznika do stepów nadczarnomorskich. Studia z dziejów międzymorza bałtycko-pontyjskiego ofiarowane Profesorowi Aleksandrowi Koško*. Archaeologia Bimaris – Dyskusje 5: 799–812. Poznań.

Pozikhovskiy O., Samoliuk V.

2006 Doslidzhenniya gruntovogo mogilnyka IV-III tys. do n.e. w m. Ostroh-Zeman. *Naukovi zapisky. Rivnenskyj oblastnyj kraeznavchyy muzey* 4: 155–158. Rivne.

2007 Doslidzhenniya gruntovogo mogilnyka doby eneolitu - rannioy bronzы w m. Ostroh. *Archeologiczni Doslidzhenniya v Ukraini 2005-2007*, 310–313. Kyiv – Zaporizhzhya.

Przybyła M.M., Szczepanek A., Włodarczak P. (Eds)

2013 *Koszyce, stanowisko 3. Przemoc i rytuał u schyłku neolitu*. Ocalone Dziedzictwo Archeologiczne 4. Kraków – Pękowice.

Sieradzka E.

2017 Stylistyka ceramiki grupy wschodniej kultury amfor kulistych – ujęcie strukturalne. *Materiały i Sprawozdania Rzeszowskiego Ośrodka Archeologicznego* 38: 13–25.

Sveshnikov I.K.

1957 *Megalitychni pokhovannya na Zakhidnomu Podilli*. Lviv.

1974 Plemena kultury kulastykh amfor. In: Chernysh A.P. (Ed.) *Starodavne naselennya Prikarpattya i Volyni (doba pervisnoobshynnoho ladu)*, 152–158. Kyiv.

1983 *Kultura sharovidnykh amfor*. Arkheologiya SSSR. Svod arkheologicheskikh istochnikov I-27. Moskva.

1985 Kultura sharovidnykh amfor. In: I.I. Artemenko (Ed.) *Arkheologiya Ukrainy SSR*. Vol. 1, 280–291. Kyiv.

Szmyt M.

2010 Between West and East. People of the Globular Amphora culture in Eastern Europe. *Baltic-Pontic Studies* 8: 1–349. 2nd edition.

2017 Collective graves, flint axes, and cows. The people of Globular Amphora Culture on the Vistula and Odra. In: P. Urbańczyk, P. Włodarczak (Eds) *The Past Societies. Polish Lands from the first evidence of human presence to the Early Middle Ages. Vol. 2. 5500 – 2000 BC*, 211–273. Warszawa.

Ścibior J., Ścibior J.M.

1990 Sandomierz 78 – wielokulturowe stanowisko z przełomu neolitu i epoki brązu. Badania ratownicze v 1984 roku. *Sprawozdania Archeologiczne* 42: 157–201.

Wiślański T.

1966 *Kultura amfor kulistych w Polsce północno-zachodniej*. Wrocław – Warszawa – Kraków.

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NEW EVIDENCE ON THE INTERACTION BETWEEN THE YAMNAYA AND GLOBULAR AMPHORA CULTURES

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ABSTRACT

In the first half of the 3rd millennium BC in the steppe Ukraine, stone tombs with an entrance appeared which are similar in design to the burial structures of the Globular Amphora culture. Two were investigated in the Molochnaya River basin near the Kamyana Mohyla monumental site. These unique structures differ from the stone cists of the Yamnaya culture as well as the burial constructions of the preceding Eneolithic period. Probably, the distribution of stone tombs with an entrance in the North Pontic area is connected with the influence of the Globular Amphora culture.

Keywords: Azov Sea area, Kamyana Mohyla, Early Bronze Age, Yamnaya culture, Globular Amphora culture, stone tomb

In 2017, the archaeological expedition of the Institute of Archeology, Ukrainian Academy of Sciences, excavated a burial place in the Kamyana Mohyla National Historical and Archaeological Reserve, located 2 km to the east of the Mirne village, Melitopol district, Zaporizhzhya oblast, and 200 m to the North of the Kamyana Mohyla hill (Fig. 1).

Kamyana Mohyla monadnock consists of a few 14-million-years-old blocks of sandstone that formed in the deposits of the Sarmatian Sea. Rising above a river



- settlement
- burial place

Fig. 1. Location of the excavated area near the Kamyana Mohyla hill: 1 – Kamyana Mohyla 1 settlement; 2 – Kamyana Mohyla 2 settlement; 3 – stone tomb and ritual complex

valley, it always drew the attention of ancient populations of the region. Numerous petroglyphs were made within the site along with slab cracking that created caves and grottoes. More than 60 rock art locations from the Mesolithic to the Modern Age were found there [Radchenko *et al.* 2020]. About 10 settlements, including two multilayer ones, and numerous kurgans of various periods were discovered in the vicinity of Kamyana Mohyla, too (Fig. 1). Site 1 has been excavated for the last 10 years within the framework of a joint Swiss-Ukrainian project [Kotova *et al.* 2017].

MATERIALS

The excavated burial place was severely damaged by plowing and the root system of acacia trees. Any visible traces of a burial mound (kurgan) were lacking on the surface. The following sequence of soil horizons was traced: chernozem (19-24 cm thick), light gray loam (35-50 cm), brown loam with crushed shells (40-60 cm) and the underlying light loam.

Three burials and a ritual complex were discovered in the investigated area (Fig. 2: a).

Burial 1 was located at a depth of 38–40 cm from the surface in a layer of light gray loam. It included a flexed skeleton lying on its left side with the head oriented north and lacking any grave goods. A radiocarbon date for human bones was unsuccessful due to the low content of collagen.

Burial 3 was linked to the Early Middle Ages [Makhortykh *et al.* 2019].

Burial 2 in the stone tomb and the ritual complex belonged to the Early Bronze Age.

Burial 2 was found in a stone tomb which was constructed on the original ground level – brown loam with crushed shell (Fig. 2: b). Its stone covering could have been destroyed by plowing and small fragments of sandstone in the upper part of light loam near the northwestern section of the tomb can be considered its remains. The tomb had a rectangular shape (2.35×1.66 m) and northeast-southwest orientation. Its longer walls consisted of sandstone slabs, measuring $1.82 \times 0.67 \times 0.31$ m and $1.82 \times 0.69 \times 0.33$ m. They were supported by smaller stones (0.5×0.3 m). The eastern wall was probably built of small sandstones mixed with silty soil. The original entrance was located in the southwestern sector of the tomb. From the outside, it was covered with small rubble mixed with clay. This soil was probably brought from multilayer Site 1 near the Kamyana Mohyla hill. This is evidenced by a shard of the second period of the Azov-Dnieper culture, found among the rubble in the central part of the entrance (Fig. 3: 3). In addition,

the use of small stones to regulate the height and position of the slabs was recorded under the southern slab and the base of the entrance.

The flexed skeleton lay on the left side, with its head oriented to the east with a deviation to the north (Fig. 2: b). It had belonged to a young man less than 25 years old according to identification by Dr. L.V. Litvinova.

An *Unio* shell was found at the bottom of the tomb. A fragment of limestone with traces of processing was among the stones from the destroyed covering (Fig. 3: 1-2). In the upper part of the tomb fill, animal bones were found: two ribs of cattle, a slate bone (\rightarrow scapula?) and a third phalanx of a domesticated horse. The metatarsal bone of cattle and the slate bone of a domesticated horse were found near the tomb (identification by palaeozoologist Dr. O. P. Zhuravlev).

Radiocarbon dates were obtained for the bones of humans and animals from the stone tomb. Hereinafter, the dates are calibrated by the Quickcal 2007 ver.1.5 software, using the calibration curve CalPal 2007_HULU. The age of the human skeleton is set at 4116 ± 23 BP (BE-8040.2.1) or 2831–2635 BC. The rib of a domesticated bull from the upper part of the tomb fill is dated to 4142 ± 23 BP (BE-8041.2.1) or 2839–2675 BC. The common interval for the bones of animals and humans is 2831–2675 BC, and it determines the time of construction of the stone tomb, which corresponds to the Early Bronze Age in the steppe zone of eastern Europe (3000–2500 BC) [Kaiser 2019: 20].

The ritual complex consisted of two features. They were located not far from Burial 3 (Fig. 2: a), which was accompanied by an early medieval vessel. Burial 3 was found at a depth of 0.24–0.26 m from the benchmark, but the Bronze Age complexes were found at a depth of 0.63–0.70 m. The first feature included a pot of the Yamnaya culture, which lay bottom up at a distance of 6 m to the north of the tomb. The pot, 14 cm high, had an admixture of sand, a flat base, a low rim, and hatches on its surface (Fig. 4). It should be emphasized that to Yamnaya culture, we assign only sites synchronous with the upper layer of the Mikhailovka settlement, which is dated to the early 3rd millennium BC. The sites and burials of the Repin and Rogachik types, we attribute to the previous cultural-chronological horizon.

The second feature was located 1.40 m to the west of the pot. It included animal bones, which are identified by Dr. O. P. Zhuravlev as the skull parts of a young bull and the bones of its limbs. Radiocarbon analysis estimated their age at 3976 ± 21 BP (BE-8044.4.1) or 2554–2478 BC.

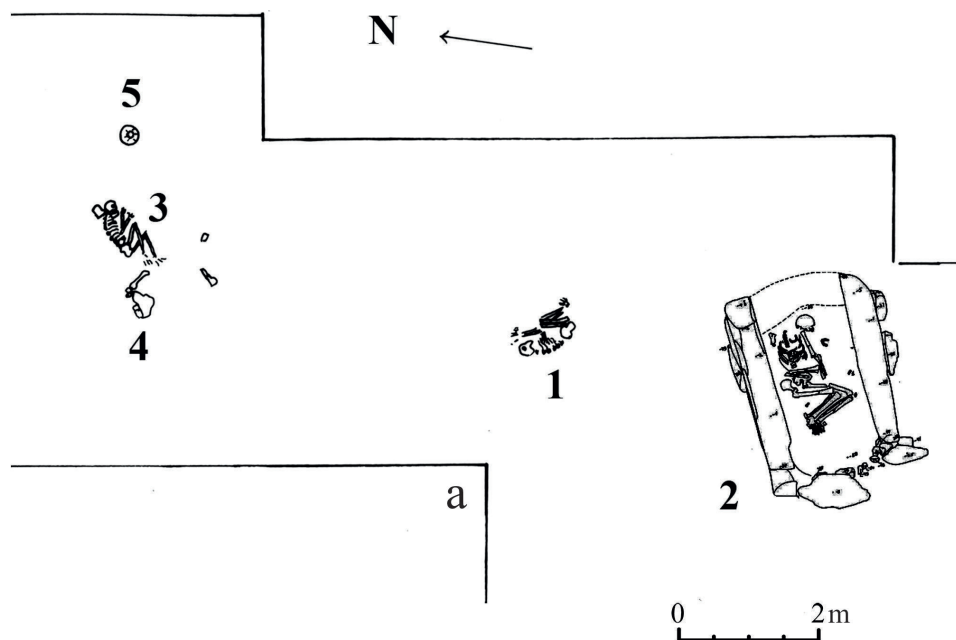


Fig. 2. Burials near the Kamyana Mohyla. Plan: 1 – burial 1; 2 – burial 2; 3 – burial 3; 4 – bones of cattle; 5 – a pot of the Yamnaya culture; 2 – burial 2

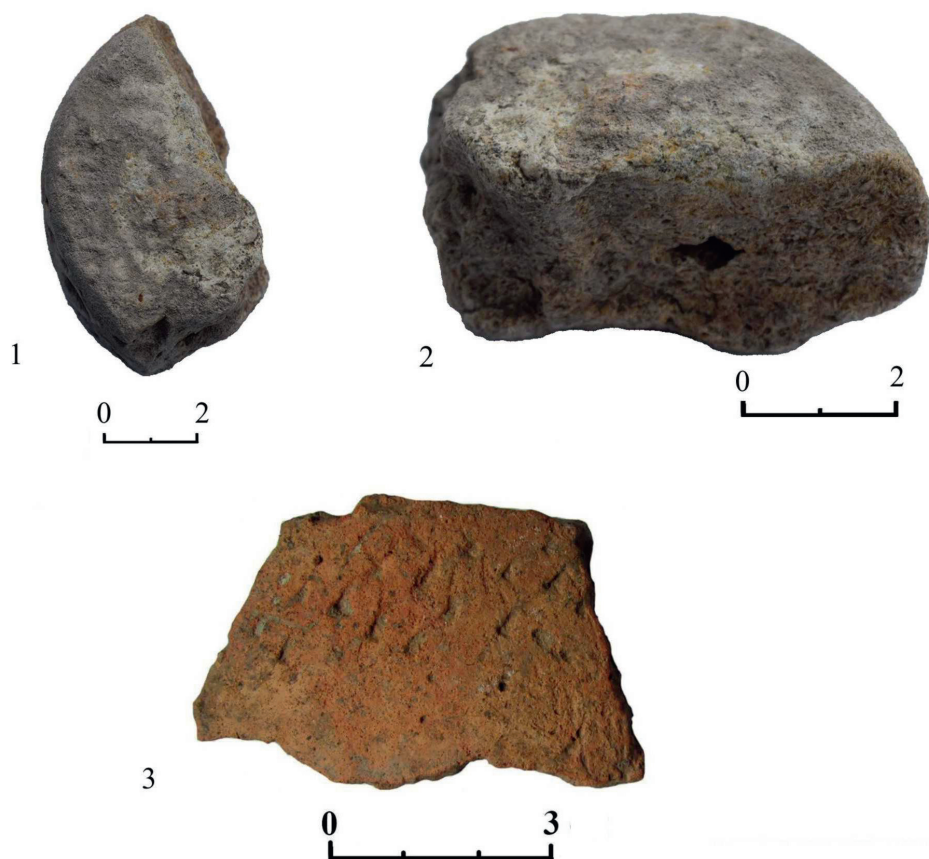


Fig. 3. Burial 2: 1, 2 – fragment of the stone tool from the burial 2; 3 – fragment of the Azov-Dnieper vessel from the burial 2

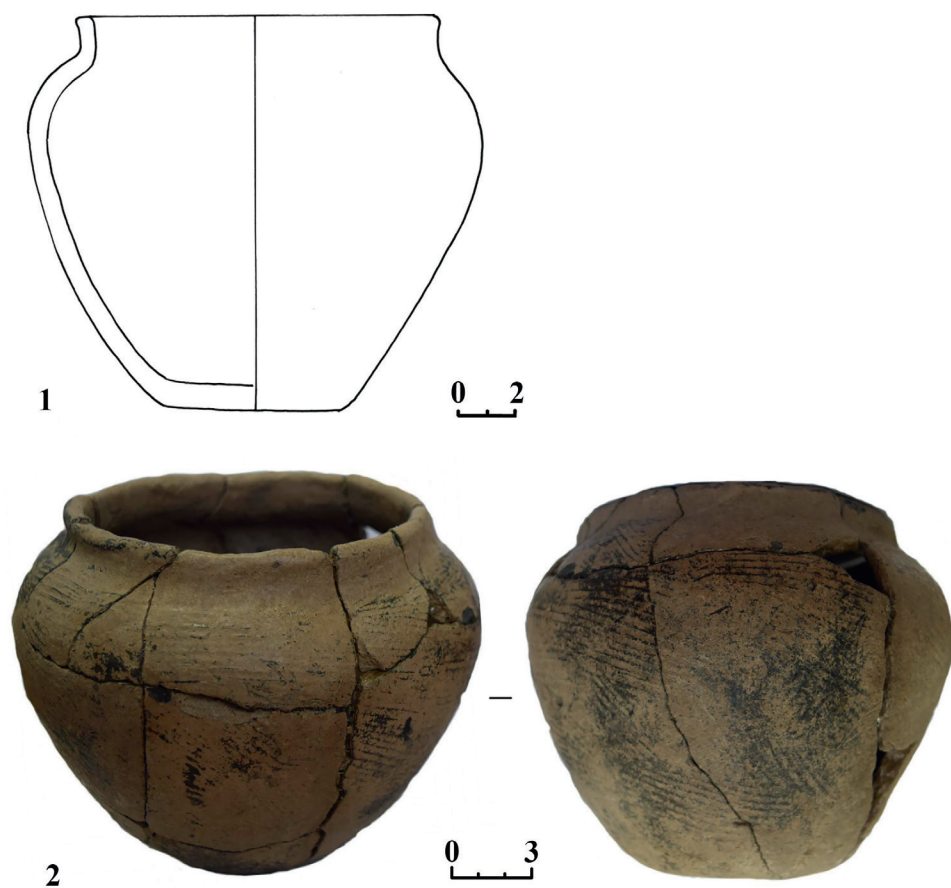


Fig. 4. Pot of the Yamnaya culture from the ritual complex

The radiocarbon dates for Burial 2 (2831–2675 BC) and the ritual complex with the Yamnaya culture pot (2554–2478 BC) demonstrate the successive use of this place located nearby Kamyana Mohyla by the populations of the Early Bronze Age.

Vessels similar to the pot from the ritual complex are reconstructed for the upper layers of the Generalka 2 settlement on Khortytsya Island, Zaporizhzhya oblast [Tuboltsev, Radchenko 2018] and Mikhailovka in the Kherson oblast [Lagodovska *et al.* 1960]. Generalka 2 also has a similar age: *c.* 3086–2295 BC [Radchenko, Tuboltsev 2019]. Quite numerous analogies to the discussed pot are also known from the burials of the Yamnaya culture in Ukraine: Vysokoe, Kurgan 20,

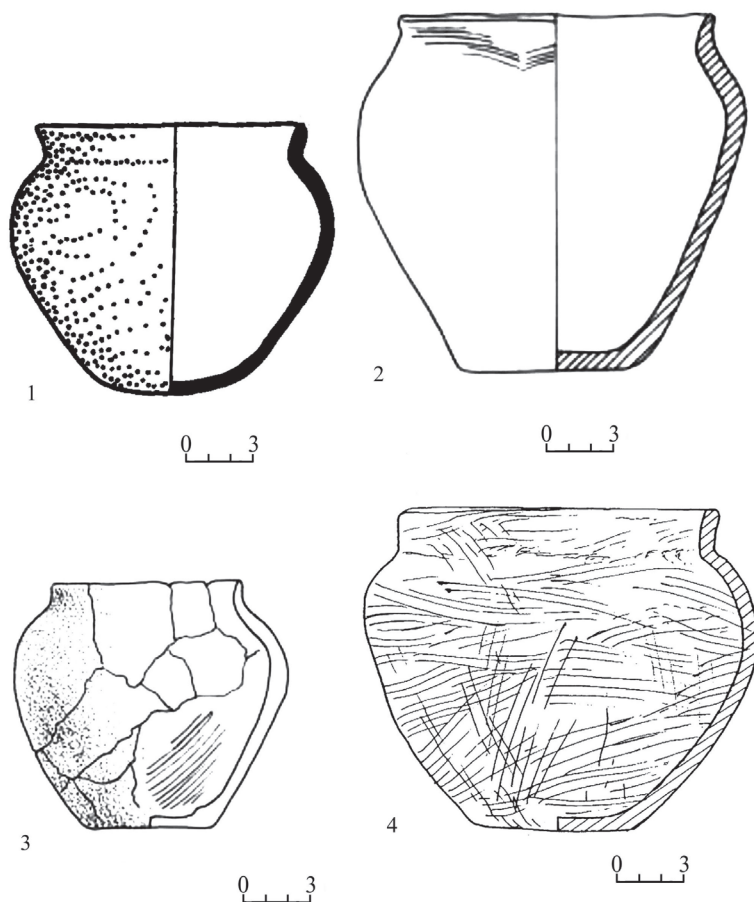


Fig. 5. Pots of the Yamnaya culture: 1 – Vysokoe, kurgan 20, burial 8 [after Samoilenko 1988]; 2 – Dubinovo, kurgan 1, burial 13 [after Ivanova *et al.* 2005]; 3 – Soldatskaya Slava kurgan, burial 9 [after Ivanova *et al.* 2005]; 4 – Stara Katerinovka, kurgan 30, burial 4 [after Chernykh, Daragan 2014]

Burial 8; Dubinovo, Kurgan 1, Burial 13; Kurgan Soldatskaya Slava, Burial 9; Stara Katerinovka, Kurgan 30, Burial 4; Novopilipovka, Kurgan 1, Burial 26; Akkermen 2, Kurgan 4 (Fig. 5; 6: 1–2) [Vyazmitina *et al.* 1960; Samoilenko 1988; Ivanova *et al.* 2005; Chernykh, Daragan 2014].

A part of Catacomb culture vessels from the Molochnaya River basin have some common traits with the pot from the ritual complex. However, in terms of proportions, they belong to high bowls, having a rim diameter that exceeds the height of the vessel: Akkermen 1, Kurgan 7, Grave 1 and Kurgan 20, Grave 1 (Fig. 6: 3–4), Yushanly, Kurgan 1 (Fig. 6: 5).

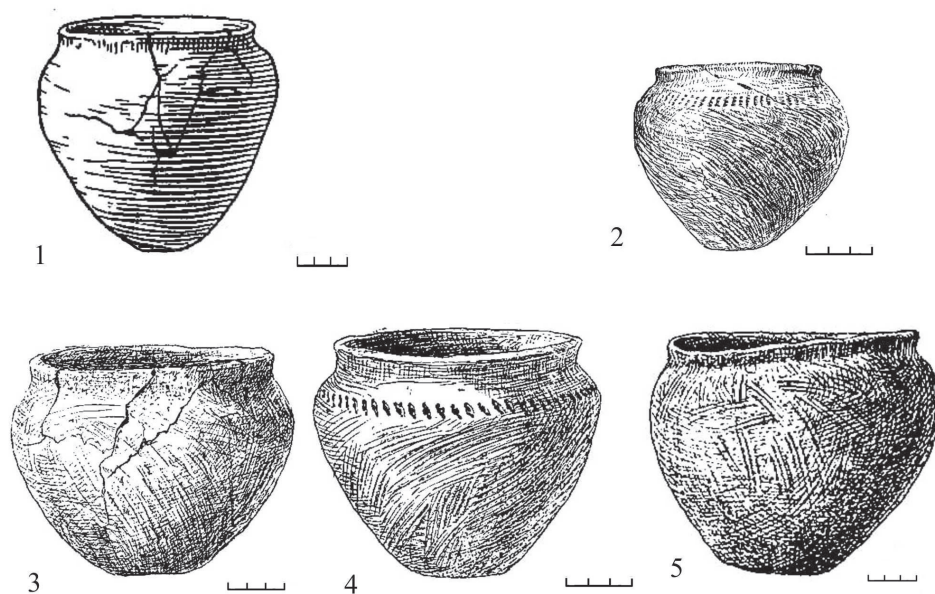


Fig. 6. Pots of the Yamnaya (1–2) culture and high bowls of the Catacomb culture (3–5): 1—Novopilipovka, kurgan 1, grave 26; 2—Akkermen 2, kurgan 4; 3—Akkermen 1, kurgan 20, grave 1; 4—Akkermen 1, kurgan 7, burial 14; 5—Yushanly, kurgan 1 [Vyazmitina *et al.* 1960].

Ritually overturned vessels are found in the burials of the Catacomb and Yamnaya cultures in the steppe Ukraine [Vyazmitina *et al.* 1960: 107, 127; Demchenko 2013]. Our materials demonstrate that the Yamnaya people used overturning pots also in ritual complexes. Of all the ethnographic, mythological and archaeological parallels given in the literature [Kovaleva 1989; Demchenko 2013; Sotnikova 2015], the data on the Late Bronze Age in the Ural region are the closest to the ritual complex of Kamyana Mohyla. Sacrificial assemblages were studied there, consisting, like our one, of overturning vessels, skulls, and leg bones of animals [Sotnikova 2015]. Common to them is a small size of vessels with an uneven bottom making them wobbly, which implies that they were not used in everyday

life, as well as the absence of any ornamentation. It is possible that these vessels were made to be used exactly in various rituals. In our case, the absence of a grave allows us to make an assumption about the connection of the Kamyana Mohyla complex with the ritual of driving away of disease, when, as a result of magical actions, a disease was transferred to a sacrificial animal. An inverted vessel made for this ceremony could contain a harmful being, such as a disease, which people hoped to destroy [Demchenko 2013].

Our vessel contained soil inside. It could have been produced by decomposing food, which also suggests another rite, when turning over a filled vessel ‘communicates the sense of returning to earth what was taken from it, in order to again obtain fertility and wealth from earth’ [Sveshnikova, Tsivyan 1979]. In prehistory, a similar ceremony was relevant for the Ukrainian steppe with its regular droughts and, especially, for the population of the Yamnaya culture, who lived in the conditions of the arid maximum, when there was much less moisture in the steppe zone than today [Spiridonova, Lavrushin 1997: 154–155]. The ritual and everyday significance of the bull, whose bones were found in the cult complex, for the population of the studied steppe region is reflected in the rock paintings of the Kamyana Mohyla hill, rich in characteristic and expressive images of wild bulls and cattle [Radchenko, Nykonenko 2019].

The Kamyana Mohyla stone tomb is a unique structure, not typical of the steppe people in Ukraine. To search for its analogies, it is necessary to clarify first the applicable terminology. The present authors draw a distinction between stone cists and stone tombs. The latter are few in number and differ from cists by the presence of an entrance, which theoretically made it possible to use tombs for several successive burials. Secondly, it is important whether a cist or tomb is surmounted by a kurgan or not. Thirdly, the location of a cist or tomb may differ: in a pit dug in the original ground level or sunk into an older burial mound. The history of stone burial structures on the Pontic steppe and their evolution are considered in a special article [Kotova *et al.* 2020]. Here, only a brief overview is given of the development of stone burial structures on the Pontic steppe.

The first such structures emerged in the Early Eneolithic, at the beginning of the 5th millennium BC, in the second period of the Azov-Dnieper culture. Its people piled up stones above large burial pits in the Nikolsky and Yasinovatka 1 cemeteries. After corrections, these cemeteries can be dated to 4900–4700 BC [Kotova 2018: 63]. They demonstrate contacts with the Balkan population of the third period of the Hamangia culture [Kotova 2016], who actively used stones in burial rites [Bojadziev 2002].

Stone cists on the Pontic steppe are also known in the Early Eneolithic [Manzura 2000: 245] in the burials of the Sredniy Stog culture [Kotova 2008], which is sometimes called the Novodanilovka [Telegin *et al.* 2001] or Skelya [Rasamakin 2004: 204–206] culture. About 4700–4300 BC, this steppe population built cairns above graves and partially lined burial pits with stone slabs. Early Eneolithic

burials with stone structures were placed in pits uncovered by kurgans. Like the Azov-Dnieper population, the Sredniy Stog people borrowed stone structures from the Balkans, owing to close contacts with the bearers of the Hamangia and Varna cultures.

In the steppe Dnieper and Azov Sea regions, the Middle Eneolithic (4300–3650 BC) is represented by the Dereivka culture and the Lower Mikhailovka group [Kotova 2013]. For the Dereivka culture, only stone cromlechs (i.e. stone kerbs) and cairns above graves are currently known. There were also wooden burial tombs on the ancient horizon [Kotova 2013: 66, 135]. At present, there are no burials in stone cists known of with ceramics of the type corresponding to the layer of Mikhailovka or with radiocarbon dates, assigning them to the Middle Eneolithic. Thus, an interruption is assumed of the tradition of building stone cists in the Pontic steppe for about 800–1000 years.

Stone cists appeared in the Pontic steppe again in the second half of the 4th millennium BC, but, as distinct from the Early Eneolithic, they were covered by kurgans this time. The archaeological sites of this chronological period in the Lower Don basin belonged to the Late Eneolithic – Early Bronze Age Konstantinovka culture, which had evolved from the eastern part of the Dereivka culture under the Maikop culture influence [Kotova 2013]. Taking into account the dating of the Maikop culture of 3800–3100 BC [Kohl, Trifonov 2014: 1578] or 3900–3000/2900 BC [Korenevskiy 2016: 12], the rise of the Konstantinovka culture can be dated to the first quarter of the 4th millennium BC. The stratigraphic position of the cultural layer with Konstantinovka materials under the Repin culture layer at the Razdorskoye 1 site [Kiyashko 1994] suggests that the Konstantinovka population was assimilated by the Repin population. In general, the Repin culture sites in the Don and Northern Donets river basins can be dated by radiocarbon dates and imports of Repin vessels in the middle layer of Mikhailovka (3700/3650–3200/3000 BC) [Kotova, Spitsyna 2003]. The available materials suggest the coexistence of Repin and Konstantinovka culture population groups in the Northern Donets basin around 3600–3450 BC [Kotova 2013: 151]. Hence, the decline of the Konstantinovka culture on the Lower Don can be dated to the end of the third quarter of the 4th millennium BC.

One burial in a stone cist has been associated with the Konstantinovka culture (Khapry, Grave 1, Kurgan 8). The stone cist of small slabs holding a flexed skeleton lying on its back was built in a pit and was surrounded by a cromlech (Fig. 7) [Faifert 2014]. Next to it, two vessels were found. One was typical of the Konstantinovka culture (Fig. 7: 3) while the other had a polished decoration and was similar in shape to Maikop culture vessels (Fig. 7: 2). Trifonov noted that the polished decoration appeared in the Maikop culture in the second half of the 4th millennium BC [Trifonov 2014: 281–282]. Thus, taking into account the dating of the Konstantinovka culture (3750–3250 BC), the Maikop-like vessel from the Khapry burial limits the age of this burial to 3500–3250 BC.

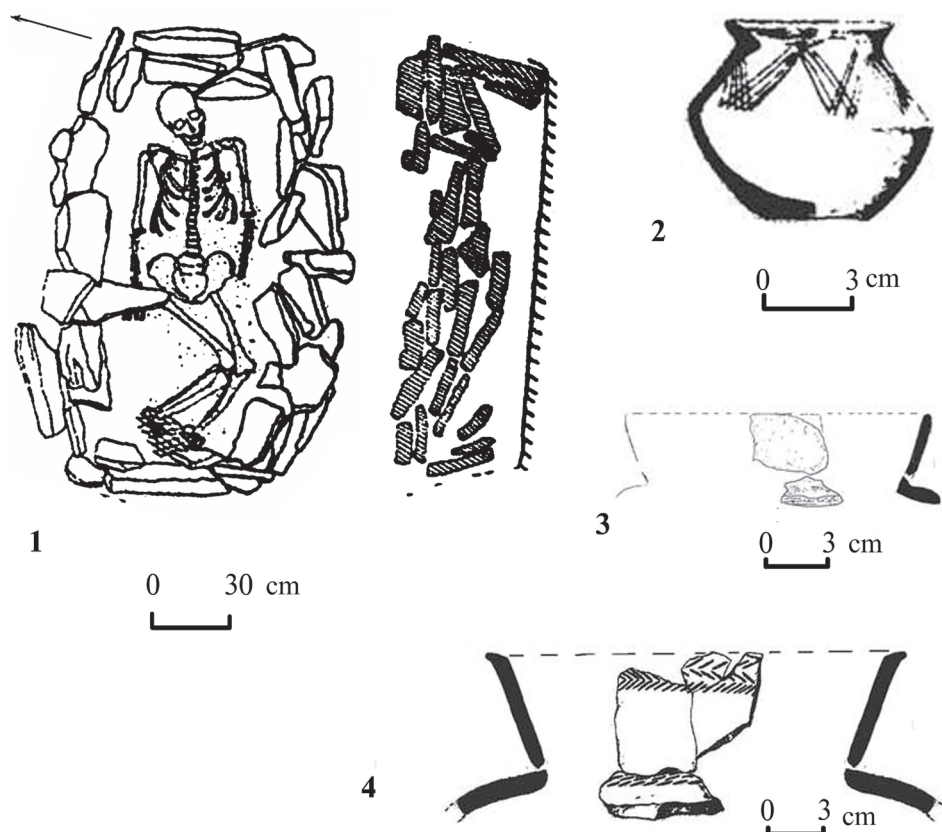


Fig. 7. Burial of the Konstantinovka culture: Khapry, kurgan 8, grave 1. After Faifert 2014

According to Trifonov, the formation of the Zhivotilovska-Volchansk group of burials was connected with the migration of Maikop colonists across the Pontic steppe in the second half of the 4th millennium BC [Trifonov 2014]. The burial at the village of Konstantinovka near Melitopol in the Molochnaya River valley can be assigned to the same chronological period. In it, a destroyed skeleton lay in a stone cist standing on the ancient horizon under a kurgan. The grave goods comprised a stone axe, flint tools (including an asymmetrical point of the Maikop type), and a pot similar to Maikop pottery [Rassamakin 2004: 160].

The second half of the 4th millennium BC in the steppe Dnieper basin and western Azov Sea region is associated with the monuments of the Rogachik culture [Spitsyna 2017]. They are dated to 3600/3550–3200/3000 BC [Kotova, Spitsyna 2003] and held to be synchronous with the monuments of the decline of Tripolye CI (the lower horizon of the middle layer of Mikhailovka as shown by the imports of Tripolye ceramics of the Koshylovetska group) and Tripolye CII (the upper horizon of this layer). Vessels of the Rogachik culture accompanied burials with

extended and flexed skeletons [Kotova, Spitsyna 1999]. Stone structures, as before, were represented by cairns above graves and cromlechs, however, there were also a few stone cists: Lyubimovka, Kurgan 14, Burial 7 (Kherson oblast); Baratovka, Kurgan 1, Burial 17 (Mykolaiv oblast); Primorskoe, Kurgan 4, Burial 2 (Donetsk oblast). It is possible that burials 6, 8, 9, 11, 28a, 28b, and 30 in stone cists from Starogorozhenko, Kurgan 1, belonged to the Rogachik culture too [Kotova *et al.* 2020].

Some extended burials lying on their back in stone cists under kurgans are known in the steppe Dnieper basin in the second half of the 4th millennium BC: Bogdanovsky quarry, Kurgan 2, Graves 3 and 17; Valovoe, Kurgan 1, Grave 7; Zavadskie Mogily, Kurgan 7, Grave 1; Marievka, Kurgan 14, Grave 7; Nagornoye, Kurgan 1, Grave 1; Novovorontsovka, Kurgan 1, Grave 8 [Rassamakin 2004]. Their stone cists were constructed on the original ground level or on the top of an Eneolithic kurgan (Nagornoye). Like extended burials in pits, these burials are associated with the post-Mariupol or Kvityana culture [Rassamakin 2004: 206–208]. However, an analysis of the inventories of extended burials in graves without stone constructions has shown that their pottery finds analogies in the settlements of the Dereivka culture and the lower layer of Mikhailovka [Kotova 2013], or in the middle layer of Mikhailovka as well as at the Nizhny Rogachik site, which belonged to the Rogachik culture [Kotova, Spitsyna 1999]. Unfortunately,

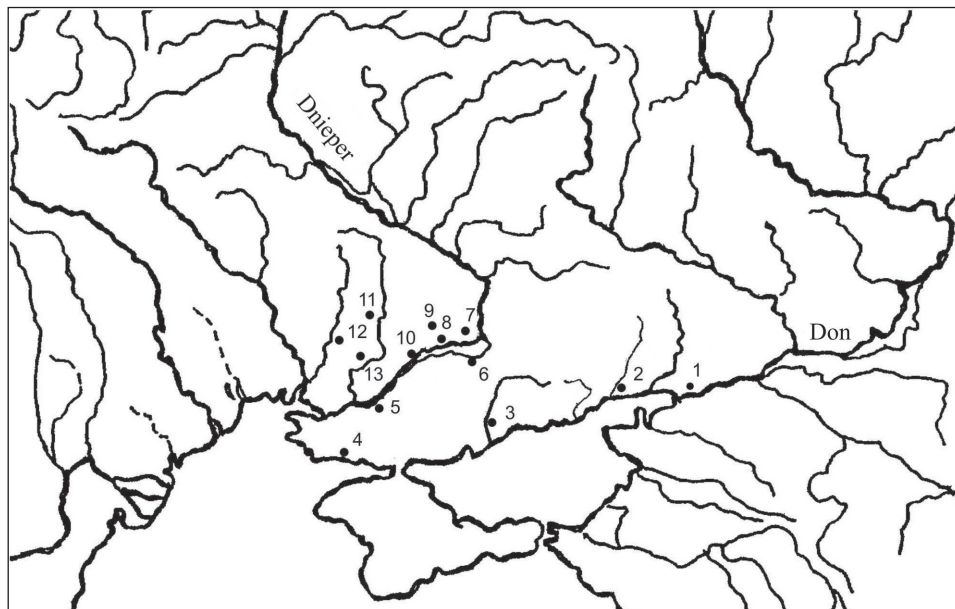


Fig. 8. Stone structures of the second half of the 4th millennium BC in the North Pontic area: 1-2 – stone cists in pits under the kurgans; 3-13 – stone cists on ancient surface under the kurgans; 1 – Khapry; 2 – Primorskoe; 3 – Konstantinovka; 4 – Skadovsk; 5 – Lyubimovka; 6 – Balki; 7 – Marievka; 8 – Nagornoye; 9 – Bogdanovsky quarry, Zavadskie Mogily; 10 – Novovorontsovka; 11 – Valovoe; 12 – Starogorozhenko; 13 – Baratovka

no pottery is found with the burials in stone cists. Nonetheless, the stratigraphy of the kurgans and other indirect signs allow us to date them to the end of the 4th millennium BC [Kotova *et al.* 2020].

The territorial distribution of stone cists in the second half of the 4th millennium BC is worthy of note (Fig. 8). Stone cists in pits were found only in the eastern region, in the Kalmius-Don interfluvium: Primorskoe and Khapry. There are two explanations for this fact:

- 1) In this region, a continuous tradition of stone cist construction was preserved throughout the 5th and first half of the 4th millennia BC, but such burials have not been excavated yet.
- 2) Few stone cists in burial pits under kurgans appeared in the northern Azov Sea region among the Konstantinovka culture population in the middle of the 4th millennium BC under the influence of the Maikop culture. This hypothesis is supported by the existence of burials of the Zhivotilovska-Volchansk type, which demonstrates the spreading of Maikop grave goods to the Azov and Dnieper regions in 3500–3250 BC.

While stone cists in pits were typical of the eastern region, in the western Azov Sea area and steppe Dnieper and Ingul basins, stone cists were built on the then ground surface. A part of skeletons in the western area lay extended on their back, while others were flexed on the side. Only one individual (Starogorozhenko, Kurgan 1, Grave 28b) was laid on his back, but with a tilt to the right side. A different picture is seen in the eastern region, where one skeleton was flexed on the back (Khapry), while the other was flexed on the left side (Primorskoe).

Regarding the second wave of the spreading of stone cists on the Pontic steppe, especially ones constructed on the original ground level, Rezepkin's hypothesis deserves a mention. It concerns the connection between the megalithic structures of the North Caucasus and the influence of the Funnel Beaker culture [Rezepkin 2012: 94–106]. It is exactly of this culture that stone burial structures on the original ground level with skeletons extended on the back or flexed on the side were typical. Funnel Beaker sites in Ukraine occupied the basins of the Upper Dniester and Western Bug rivers. Their inhabitants had close contacts with the Tripolye CII people in the second half of the 4th millennium BC [Videiko 2000]. At the same time, Tripolye culture bearers maintained close links with the Rogachik population which were reflected in the distribution of stone axes and imported vessels in steppe burials. The Tripolye settlements with the Funnel Beaker elements are located not far from the Rogachik culture area in the Dnieper-Ingul interfluvium, where stone cists on the original ground level are concentrated. Future studies of the DNA of steppe population and its comparison with the DNA of Tripolye and Funnel Beaker cultures people will help to clarify the problem of the appearance of the second wave of stone cists on the Pontic steppe. But even now it can be noted that, if the Funnel Beaker culture influenced the formation of the megalithic

structures of the North Caucasus, the wave went through the Lower Dnieper and Crimea, and not through the northern Azov Sea and Lower Don regions. Unfortunately, incomplete publications of finds exacerbated by the lack of radiocarbon dates do not allow a reliable analysis of the Crimean materials.

The Early Bronze Age (3000-2600 BC) witnessed an increase in the number of stone cists in steppe burials (Fig. 9). Formerly, most of them were considered in the context of the Kemi-Oba culture, especially ones in painted stone cists. Currently, researchers associate them with the Yamnaya culture. Toshchev considered in detail the history of the study of such monuments [Toshchev 2007]. These burials do not include vessels similar to the pottery from the Repin site or the middle layer of Mikhailovka and Rogachik. Yet, their clay pots have numerous parallels in the sites synchronous with the upper layer of Mikhailovka (sites of the Yamnaya culture, according to our terminology).

The Early Bronze Age burials with stones constructions are divided into several groups:

- 1) Kurgan burials with stone cists in a pit, where the cist and pit are similar in size (Fig. 10: 1): Northern mining and processing plant of Krivyy Rig, Kurgan 1, Grave 14; Novokryvorizky mining and processing plant, Kurgan 2, Grave 2; Vesnyane, Graves 3, 5; Alkalia, Kurgan 33, Grave 1; Sanzheyka, Kurgan 1, Grave 1, etc. [Subbotin 1995; Teslenko, Grebennikov 2002; Melnik, Steblina 2013].
- 2) Kurgan burials in stone cists that are smaller than the burial pit (Fig. 10: 2): Malaya Aleksandrovka, Kurgan 1, Grave 6; Tomarino, Kurgan 14, Grave 5; Shevchenko, Kurgan 29, Grave 3; Staroselie, Graves 3, 4; Starye Belyary, Kurgan 1, Grave 14; Katarzhino, Kurgan, 1 Grave 1; Tatarbunary, Grave 2, etc. [Shilov 1977; Ivanova *et al.* 2005; Rassamakin, Evdokimov 2010; Rassamakin 2014]. Some of the stone cists have their walls decorated with ocher ornaments (Katarzhino, Tomarino, etc.).

Human bones from two burials of this group were dated. The age of the burial in Starye Belyary is 4030 ± 80 BP (Ki-11209), and in Shevchenko – 4680 ± 90 BP (Ki-13869) and 4542 ± 49 BP (Bln-5777). The dates obtained for the latter burial are considered too early by Rassamakin as a result of the reservoir effect because they contradict the stratigraphy of the mound, where Grave 3 was dug into Mound 5 in Kurgan 29 together with Grave 19 and thus should have a similar age. At the same time, Grave 19 is also dated ambiguously: 3965 ± 70 BP (Ki-14719) and 3530 ± 80 BP (Ki-13867) [Rassamakin 2014: 497–498 and Table 1]. Judging by the location of the stone cist in a large pit dug into an earlier mound, it really has to date to the first half of the 3rd millennium BC and belong to the Yamnaya culture. It is exactly of the Yamnaya burials that this arrangement of stone cists is typical, which is not known among the monuments of the second half of the 4th millennium BC.

- 3) Kurgan burials in stone cists constructed on the original ground level or an older mound (Fig. 10: 3): Andrusovka, Kurgan 2, Grave 17; Balki-Vysoka Mogila, Grave 4; Balki, Kurgan 4, Grave 1; Baratovka, Kurgan 1, Grave 8; Velikoaleksandrovskiy Kurgan, Grave 7; Vesnyane, Kurgan 1, Grave 2; Voikovo, Grave 1; Dovga Mogila, Chertomlyk group, Grave 6; Krasne, Kurgan 1, Grave 4; Moiseevka, Kurgan 1, Grave 4; Soldatska Slava, Grave 9; Starogorozhenko, Kurgan 1, Grave 1, etc. [Shaposhnikova *et al.* 1977; Androsoy, Melnik 1991; Mozolevsky, Pustovalov 1999; Rassamakin 2004]. Some of these stone cists have their walls decorated with ocher ornaments (Andrusovka, Moiseevka, Starogorozhenko) or with carved linear geometric patterns (Vysoka Mogila).
- 4) Stone tombs with an entrance: Kurgan 11, Grave 14, group Akkermen 1, between the villages of Novopilipovka and Zarechne (Zaporizhzhya oblast); Kurgan 1, Grave 6 near the village of Baratovka (Mykolaiv oblast); Grave 2 of Kamyana Mohyla. All these structures have a different design, but the presence of an entrance is common to all (Fig. 11). Only the Kamyana Mohyla tomb was not covered with a kurgan.

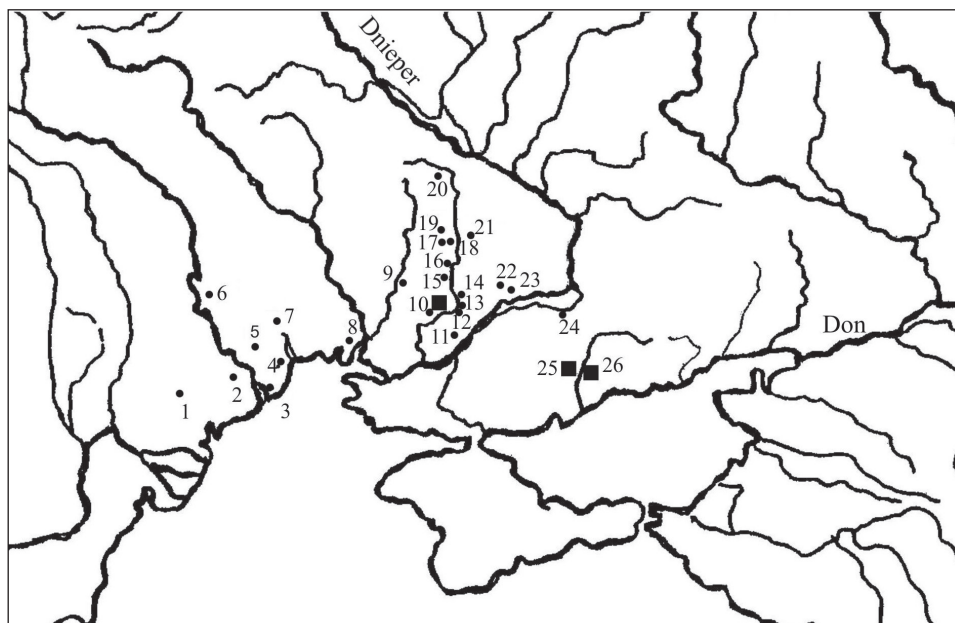


Fig. 9. Burials with stone structures under the kurgans of the 3rd millennium BC in the North Pontic area: 1 – Tatarbunary; 2 – Alkaliya; 3 – Sanzheyka; 4 – Starye Belyary; 5 – Katarzhino; 6 – Krasne; 7 – Soldatskaya Slava; 8 – Vesnyane; 9 – Starogorozhenko; 10 – Baratovka; 11 – Tomarino; 12 – Malaya Aleksandrovka; 13 – Velikoaleksandrovka; 14 – Staroselie; 15 – Zeleniy Gai; 16 – Voikovo; 17 – Dolgintsevo; 18 – Northern mining and processing plant of Krivy Rig; 19 – Moiseevka; 20 – Aleksandria; 21 – Andrusovka; 22 – Shevchenkovo; 23 – Chertomlyk; 24 – Balki; 25 – Kamyana Mohyla; 26 – Akkermen

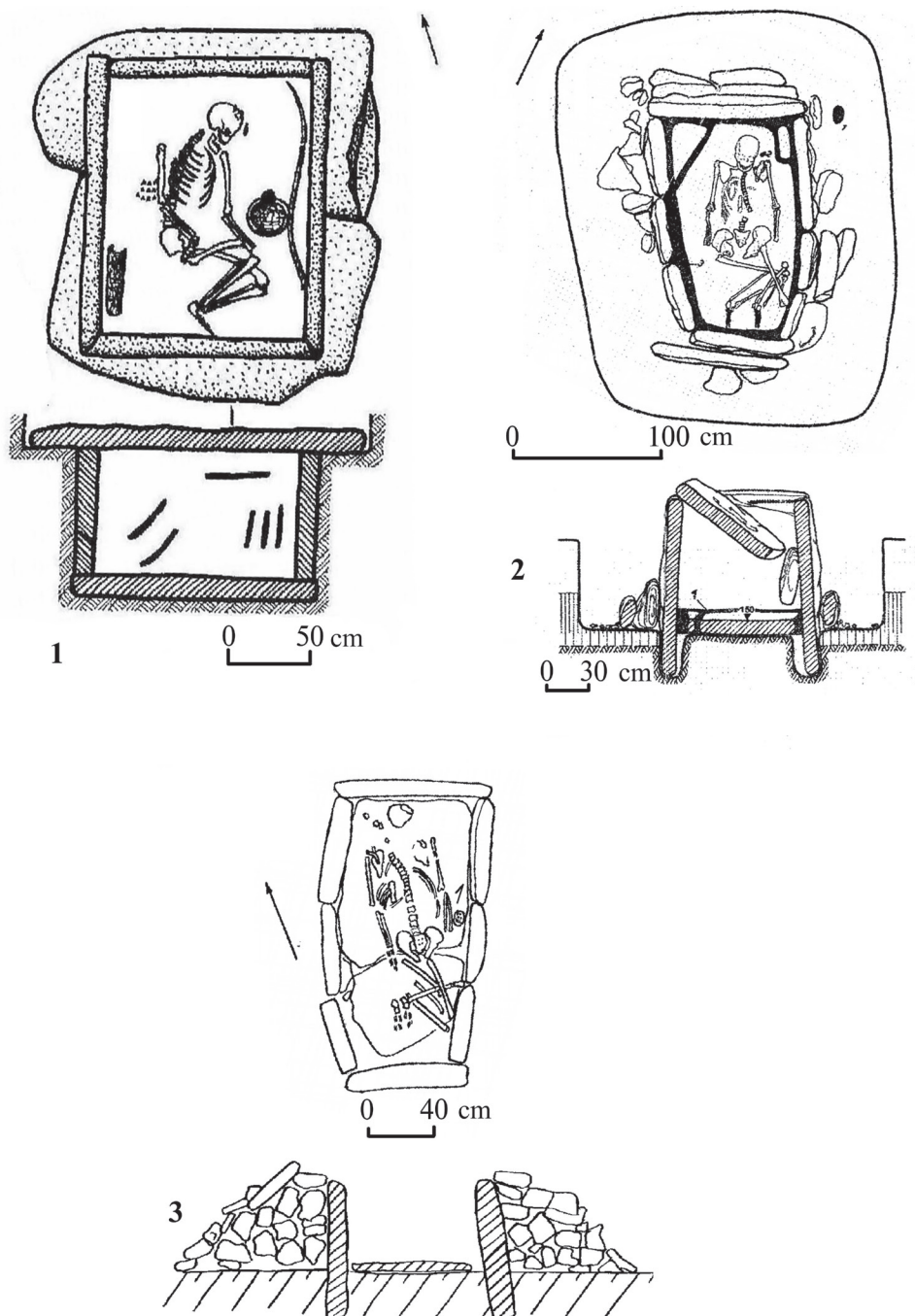


Fig. 10. Types of stone burial structures of the Yamnaya culture: 1 – Alkaliya, kurgan 33, grave 1; 2 – Tomarino, kurgan 14, grave 5; 3 – Baratovka, kurgan 1, burial 8. After Subbotin 1995; Rassamakin 1996; Rassamakin, Evdokimov 2010

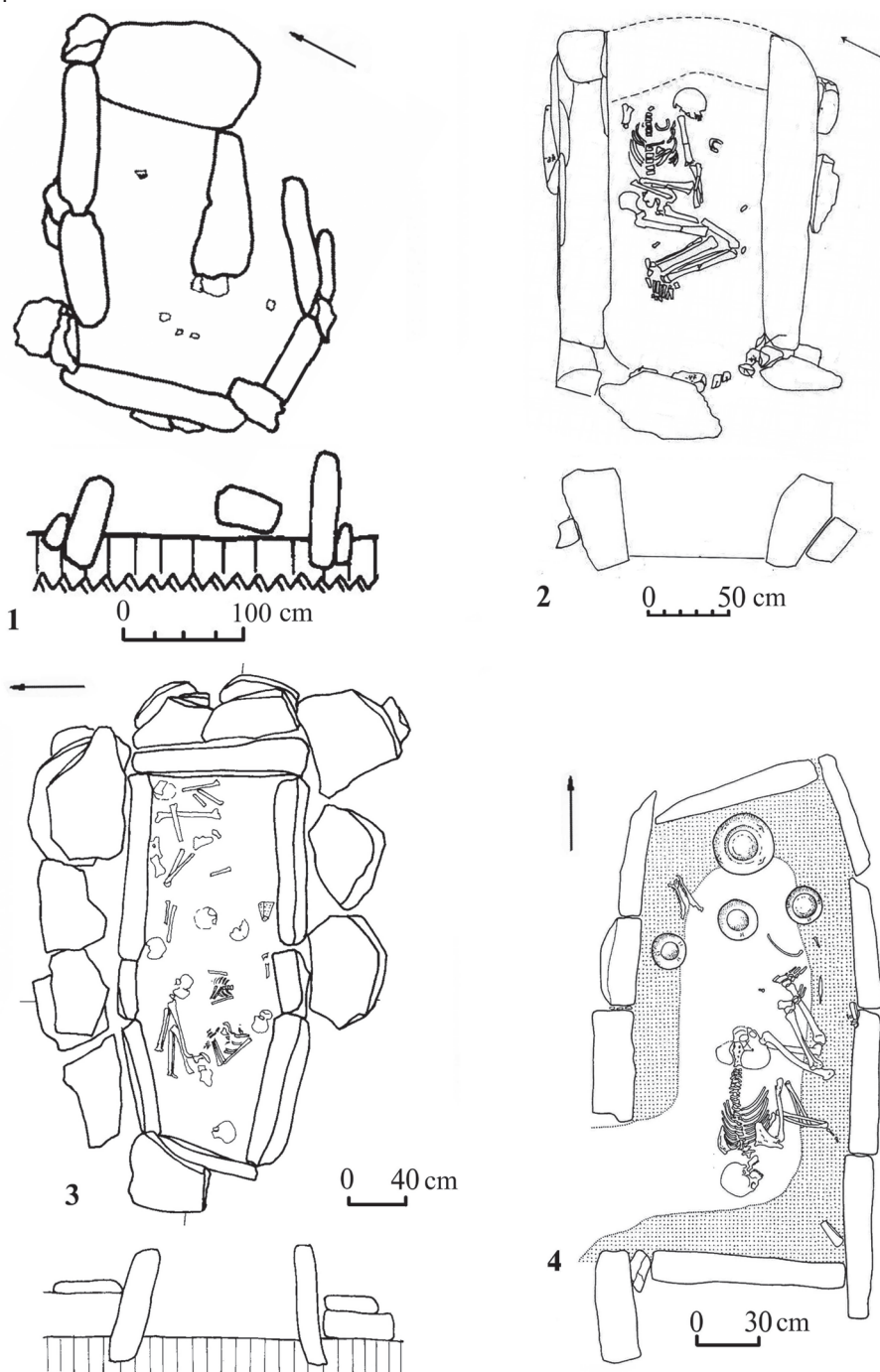


Fig. 11. Examples of stone tombs from the North Pontic area (1-3) and central group of the Globular Amphora culture (4): 1 – Akkermen 1, kurgan 11, burial 14; 2 – Kamyana Mohyla, burial 2; 3 – Baratovka, kurgan 1, burial 6; 4 – Sahryn 1. 1, 3 – after Rassamakin 2004; 4 – after Szmyt 2010

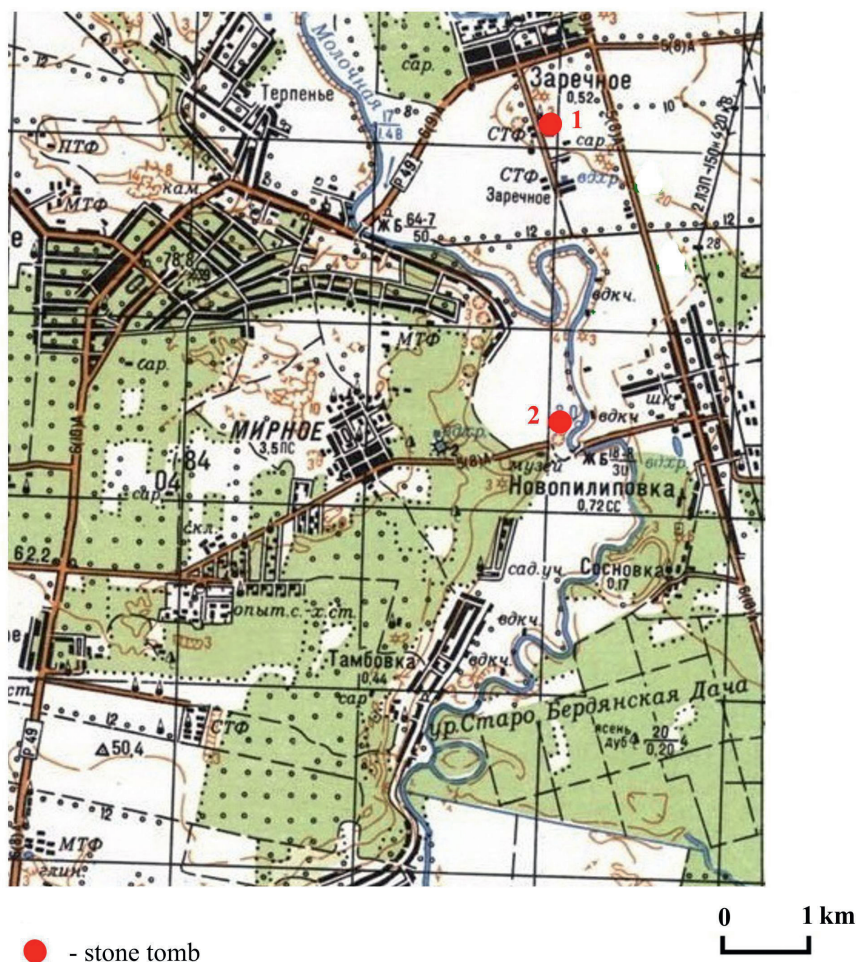


Fig. 12. Localization of the stone tombs in the vicinity of Kamyana Mohyla: 1 – Akkermen 1, kurgan 11, burial 14; 2 - Kamyana Mohyla, burial 2.

Kurgan 11, Grave 14, group Akkermen 1 was located not far from Kamyana Mohyla (Fig. 12). It was attributed by the authors of the excavations to the Yamnaya culture [Vyazmitina *et al.* 1960: 116]. The tomb was built on the original ground level under a kurgan and surrounded by a cromlech. It was rectangular and oriented southwest–northeast (Fig. 11: 1). Taking into account the seasonal deviations of the sun, it can be assumed that the tomb was oriented with its long walls along the west-east line and that it was built in August or May. Its outer slabs were covered with red ocher. It is possible that the remains of a sanctuary are associated with this tomb. Thus, the Akkermen burial is distinguished by a more complex funeral ritual and construction than the stone tomb of Kamyana Mohyla. In both cases, bones of domestic animals were present in the tomb: in Akkermen, teeth and fragments of the lower jaw of a sheep were identified, in the Kamyana

Mohyla burial – bones of cattle and a horse. An interesting feature of both stone tombs is a kind of entrance arranged in their southwestern part.

The tomb in Baratovka was constructed on the original ground level [Rassamakin 2004: 152–153]. Its western wall stood 0.30–0.40 m below the upper edge of the other walls. There was an entrance opening covered by a higher slab (Fig. 11: 3). In the tomb, six skulls and two whole skeletons were found. The skeletons were flexed on their side, painted with ocher and oriented south with their heads (?). The grave goods included a piece of ocher in the form of a truncated pyramid.

Rassamakin attributes the Baratovka and Akkermen burials to the Late Eneolithic [Rassamakin 2004]. Szmyt considers them a result of the Globular Amphora culture influence [Szmyt 2010: 148–150]. We support her idea and trace some elements of the Kamyana Mohyla tomb to the Globular Amphora culture. For example, the entrance with an unfolded slab in the Kamyana Mohyla tomb finds an analogy in burial Sahryn 1 in southeastern Poland (Fig. 11: 4). However, while the three tombs from the steppe Ukraine have long-wall orientation along the east-west line, taking into account the seasonal deviations of the sun, the Sahryn 1 tomb was oriented with its long sides along the north-south line. The entrance to it, however, was located in the southwestern part, like in the tombs in Akkermen and Kamyana Mohyla. The entrance to the Baratovska tomb was from the west.

Owing to the available radiocarbon dates, our excavations near Kamyana Mohyla show a clear sequence of complexes: the burial in the tomb was deposited earlier (about 2831–2675 BC) than the ritual complex with a typical Yamnaya pot (2554–2478 BC) was used. The stratigraphic position of the other two tombs from the steppe Ukraine also indicates that they were constructed in the first half of the 3rd millennium BC. Consequently, in Kurgan 11 of the Akkermen group, the tomb of Grave 14 preceded the Yamnaya burials. In the Baratovka kurgan, the stone tomb in Grave 6 was built later than Grave 17, dated by Serezlievka type figurines to the end of the 4th millennium BC, but preceded the Yamnaya burials, including Grave 8 in a stone cist [Rassamakin 2004: 176]. Thus, all the three stone tombs, which closely resemble the authentic Globular Amphora burial structures, appeared in the steppe Ukraine around 2850–2670 BC.

The infiltration by Globular Amphora people into the Western Bug basin and the formation of the eastern group of this culture took place around 3000–2950 BC. Its stable contacts with the Yamnaya culture are recorded after 2700 BC [Szmyt 2010: 203–205]. These contacts are observable in ceramic imports and imitations and are confirmed by imported stone items [Iwanowa *et al.* 2014]. Perhaps the stone tombs from Kamyana Mohyla, Akkermen and Baratovka record the first penetration of the steppe by Globular Amphora people, and it is the representatives of this culture or their direct descendants that were buried in them. Further study of ancient DNA may clarify this issue.

REFERENCES

Androsov A., Melnik A.

- 1991 Kurgany rannego bronzowego wieku z zoomorfnymi konstrukcjami. In: I. Kovaleva (Ed.) *Problemy arkheologii Podneprovya*, 35–50. Dnepropetrovsk.

Bojadziev J.

- 2002 Die Grabanlagen der prähistorischen Gräberfelder von Durankulak. In: H. Todorova (Ed.) *Durankulak I*, 71–80. Sofia.

Chernykh L., Daragan M.

- 2014 *Kurgany epokhi eneolita-bronzy mezhdurechya Bazavluka, Solenoi i Chertomlyka*. Kurgany Ukrainy 4. Kiev – Berlin.

Demchenko O. V.

- 2013 Rytual perevertannia posudu v pokhovalnomu obriadi katakombnoi kultury ta sproby interpretatsii yoho znachennya. *Zapysky istorychnoho fakultetu ONU im. I. I. Mechnykova* 23: 15–28.

Faifert A.

- 2014 *Kurgannye pogrebeniya rannego bronzowego wieku Nizhnego Podonya*. Rostov-na-Donu.

Ivanova S., Petrenko V., Vetchinnikova N.

- 2005 *Kurgany drevnikh skotovodov mezhdurechya Yuzhnogo Buga i Dnestra*. Odesa.

Iwanowa S., Kośko A., Włodarczak P.

- 2014 Komponent tradycji kultur ceramiki sznurowej. Amfory w grobach kultury jamowej północno-zachodniego Nadczarnomorza. In: A. Kośko, M. Potupczyk, S. Razumow (Eds) *Naddniestrzańskie kompleksy cmentarzysk kurhanowych społeczności z III i z pierwszej połowy II tysiąclecia przed Chr. w okolicach Jampola, obwód winnicki*, 351–386. Poznań.

Kaiser E.

- 2019 *Das dritte Jahrtausend im osteuropäischen Steppenraum*. Berlin.

Kiyashko V.

- 1994 *Mezhdru kamnem i bronzoi*. Rostov-na-Donu.

Kohl P., Trifonov V.

- 2014 The prehistory of the Caucasus: internal development and external interactions. In: C. Renfrew, P. Bahn (Eds) *The Cambridge World Prehistory III* (7): 1571–1595. Cambridge.

Korenevskiy S.

- 2016 Problemnye situatsii “post-ubedijskogo perioda” v Predkavkaze. *Stratum plus* 2: 1–26.

Kotova N.

- 2008 *Early Eneolithic in the Pontic steppes*. Oxford.
- 2013 *Dereivskaya kultura i pamyatniki nizhnemikhailovskogo tipa*. Kharkov.
- 2016 The contacts of the Eastern European steppe people with the Balkan population during the transition period from Neolithic to Eneolithic. In: V. Nikolov, W. Schier (Eds) *Der Schwarzmeerraum vom Neolithikum bis in die Früheisenzeit [6000–600 v. Chr.]: Kulturelle Interferenzen in der zirkumpontischen Zone und Kontakte mit ihren Nachbargebieten*. *Prähistorische Archäologie in Südosteuropa* 30, 311–320. Rahden/Westf.
- 2018 Revisiting the Neolithic chronology of the Dnieper steppe region with consideration of a reservoir effect for human skeletal material. *Sprawozdania Archeologiczne* 70: 47–66.

Kotova N., Makhortykh S., Dzhos V., Radchenko S.

- 2020 Eneolithic and Early Bronze Age stone burial constructions of the North Black Sea region. *Revista Arheologică, serie nouă* XVI (2): 31–49.

Kotova N., Spitsyna L.

- 1999 Keramika pozdneeneoliticheskikh pogrebeniy stepnoj Ukrainy i yeyo analogii v materyalakh poseleniy. *Starozhytnosti Stepovoho Prychornomorya i Krymu* 7: 22–31.
- 2003 Radiocarbon chronology of the “middle” layer of the Mikhailovka settlement. *Baltic-Pontic Studies* 12: 121–131.

Kotova N., Tuboltsev O., Kiosak D., Spitsyna L., Makhortykh S., Tinner W., Nielsen E., Dzhos V.

- 2017 Preliminary results of excavations at the multilayer Kamyana Mohyla 1 site (2011–2012). In: S. Makhortykh, A. de Capitani (Eds) *Archaeology and Paleoecology of the Ukrainian Steppe*, 28–51. Kyiv.

Kovaleva I.F.

- 1989 *Social and spiritual culture of the Bronze Age tribes (based on materials from the left-bank Ukraine)*. Dnepropetrovsk.

Lagodovska O., Shaposhnikova O., Makarevich M.

- 1960 *Mykhailivske poselennya*. Kyiv.

Makhortykh S., Kotova N., Dzhos V.

- 2019 Neordinarnoe pogrebenie epokhi rannego srednevekovya v Severo-Zapadnom Priazove. *Visnik NIAZ Kamyana Mohyla* 4: 34–40.

Manzura I.

2000 Vladeuschie skipetrami. *Stratum plus* 2: 237–295.

Melnyk O., Steblyna I.

2013 *Yamna kultura serednej techii Ingultsa*. Krivyy Rig.

Mozolevskiy B., Pustovalov S.

1999 Kurgan “Dovga Mogyla” z grupi Chortomlyka. *Kulturologichni studii* 2: 116–140.

Radchenko S., Kotova N., Nykonenko D., Dzhos V., Volkov A., Tuboltsev O., Kiosak D.A.

2020 Complex rock art object in the Ukrainian steppe. *Rock art research* 37(2): 1–17.

Radchenko S., Nykonenko D.

2019 Western edge of steppe rock art. *Expression* 24: 49–62.

Radchenko S., Tuboltsev O.

2019 Causewayed enclosures in Ukraine? A new look at an Early Bronze Age site on the Ukrainian steppe. *Antiquity* 93(369): 18.

Rassamakin Y.

2004 *Die nordpontische Steppe in der Kupferzeit*. Archäologie in Eurasien 17. Mainz.

2014 Absolutnaya khronologiya pogrebeniy iz kurgana 29 u s. Shevchenko (Shakhter). In: V. Chernykh, M. Daragan (Eds) *Kurgany epokhi eneolita-bronzy mezhdurechya Bazavluka, Solenoi i Chertomlyka*. Kurgany Ukrainy 4, 495–504. Kiev – Berlin.

Rassamakin Y., Evdokimov G.

2010 Kurgan u s. Tomarino s pogrebeniem v raspisnom kamennom jaschike. *Materialy ta doslidzhennya z arkhologii Skhidnoj Ukrainy* 10: 100–122.

Rezepkin A. D.

2012 *Novosvobodnenskaya kultura (na osnove materialov mogilnika „Klady”)*. Sankt-Peterburg.

Samoilenko L.G.

1988 Kurgany yamnoj kultury v bassejne reki Bazavluk v Dneprovskom stepnom Pravoberezhze. In: O.G. Shaposhnikova (Ed.) *Novye pamyatniki yamnoj kultury stepnoj zony Ukrainy*, 64–78. Kyiv.

Shaposhnikova O.G., Fomenko V.N., Balushkin A.M.

1977 Kurgannaya grupa bliz s. Starogororozhena. In: O.G. Shaposhnikova (Ed.) *Drevnosti Poingulya*, 99–145. Kyiv.

Shilov Y.

1977 Pershij ta chetvertij Starosilski kurgany. *Arkheologiya* 22: 48–64.

Sotnikova S.V.

2015 Andronovskie ritualnye komplekсы s perevernutymi sosudami: sravnitel'naya kharakteristika i interpretatsiya. *Problemy istorii, filologii, kul'tury* 3: 231–245.

Spiridonova E.A., Lavrushin Ya.A.

1997 Korrelyatsiya sobytij golotsena arkticheskoy, borealnoj i aridnoj zon Vostochnoj Evropy. In: A. L. Janshin (Ed.) *Chetvertichnaja geologija i paleogeografija Rossii*, 151–170. Moskva.

Spitsyna L.

2017 Rogachitska ta repinska kul'tury v koli kultur piznego eneolitu-rannej bronzy Skhidnoj Evropy. *Arkheologija* 2: 3–12.

Subbotin L.

1995 Grobnitsy kemi-obinskogo tipa Severo-Zapadnogo Prichernomorya. *Rossiyskaya arkheologiya* 3: 193–196.

Sveshnikova T.N., Tsivyan T.V.

1979 K funktsijam posudy v vostochnogermanskom folkrole. In: V. D. Korolyuk (Ed.) *Etnicheskaya istorija vostochnykh germantsev (drevnost i srednie veka)*, 147–190. Moskva.

Szmyt M.

2010 Between West and East. People of the Globular Amphora Culture in Eastern Europe: 2950–2350. *Baltic-Pontic Studies* 8: 1–349. 2nd edition.

Telegin D., Nechitailo A., Potekhina I., Panchenko Y.

2001 *Srednestogovskaya i novodanilovskaya kul'tury eneolita azovo-chernomorskogo regiona*. Lugansk.

Teslenko D., Grebennikov Y.

2002 Pogrebeniya v kamennykh grobnitsakh iz kurgana u s. Vesnyanoe na Nikolaevschine. In: I. Kovaleva (Ed.) *Problemy arkheologii Podneprovya*, 82–90. Dnepropetrovsk.

Toshchev G.

2007 *Krym v epokhu bronzy*. Zaporizhzhya.

Trifonov V.

2014 Zapadnye predely rasprostraneniya majkopskoj kul'tury. *Izvestija Samarskogo nauchnogo tsentra* 16 (3): 276–284.

Tuboltsev O., Radchenko S.

2018 Generalka 2 and causewayed enclosures: primery otrazheniya polyarnogo mirovozreniya drevnego naseleniya Evropy. *Stratum plus* 2: 119–148.

Videiko M.

2000 Tripolye and the cultures of Central Europe. Facts and the character of interactions: 4200 – 2750 BC. *Baltic-Pontic Studies* 9: 13–68.

Vyazmitina M.I., Ilins'ka V.A., Pokrovska E.F., Terenozhkin O.I., Kovpanenko G.T.

1960 Kurgani bilya s. Novo-Pilipivki i radgospu Akkermen. *Arkheologichni pamyatki URSR* 8: 22–135.

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