



Metalle der Macht – Frühes Gold und Silber
Metals of power – Early gold and silver

6. Mitteldeutscher Archäologentag
vom 17. bis 19. Oktober 2013 in Halle (Saale)

Herausgeber Harald Meller, Roberto Risch und Ernst Pernicka



Tagungen des
Landesmuseums für Vorgeschichte Halle
Band 11/II | 2014

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Roberto Risch und
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Statistical and anthropological analysis of the Varna necropolis

Raiko Krauß, Steve Zäuner, and Ernst Pernicka

Zusammenfassung

Statistische und anthropologische Auswertung des Gräberfeldes von Varna

Ein an der Eberhard Karls Universität Tübingen und der Curt-Engelhorn-Zentrum Archäometrie gGmbH (CEZA) durchgeführtes Forschungsprojekt, das zwischen 2011 und 2013 durch die Deutsche Forschungsgemeinschaft (DFG) gefördert wurde, beschäftigte sich mit den Metallfunden und menschlichen Skelettresten aus dem kupferzeitlichen Gräberfeld von Varna I. Die Projektleitung für den archäometallurgischen Teil lag in den Händen von E. Pernicka; N. Conard leitete die anthropologischen Untersuchungen. Berichte über den Fortschritt der Forschungen wurden regelmäßig auf der Website der Universität Tübingen und im »Bulgarien-Jahrbuch« veröffentlicht. Zum Abschluss des Projektes sollen an dieser Stelle kurz die wichtigsten Ergebnisse der anthropologischen Auswertung und der statistischen Analysen vorgestellt werden.

Summary

A research project funded by the German Research Foundation (DFG) between 2011 and 2013, and carried out at the Eberhard Karls University of Tübingen and the Curt-Engelhorn-Centre Archaeometry gGmbH (CEZA), dealt with the metal finds and the human remains of the Copper Age necropolis at Varna I. The project manager for the archaeometallurgical part of the project was E. Pernicka; N. Conard was responsible for the anthropological part. Reports on the progress of the studies were regularly published at the University of Tübingen's website and in the »Bulgarien-Jahrbuch«. As the project is now completed, we would like to briefly present the most important results of the anthropological studies and statistical analysis.

History of research

The Varna I¹ necropolis was discovered by chance in 1972 when a cable canal was dug in the western industrial area of the port city (Ivanov 1974; 1975, 1). The curator for prehistoric archaeology and later director of the museum in Varna, I. Ivanov, was in charge to carry out the excavation, which he systematically continued until 1985. A final excavation campaign was conducted in 1991². Until now, only 36 graves comprising about 12 % of all uncovered graves in Varna were published in various articles³. It is obvious that the site is far from having been fully excavated. The published necropolis map suggests that the cemetery continues toward the south-west, north-east, and north. In the excavations, boundaries only appear to have been reached in the south and perhaps in the north-west.

Further work on the corpus of finds was not possible for some time because Ivanov died unexpectedly in 2001. A complete final publication is now being prepared by V. Slavčev from the Historical Regional Museum Varna (Slavčev 2010), who spent 2008 to 2010 in the Eurasia Department of the German Archaeological Institute (DAI) in Berlin on a research fellowship funded by the Alexander von Humboldt-Foundation. In terms of cultural history, the opulent burial sites of the coastal zone belong to the Varna

group of the Kodžadermen-Gumelnița-Karanovo (KKG) VI complex which extends from the Danube delta to the northern edge of the Rhodope Mountains in the mid and late 5th millennium BC. Previous attempts to define the grave finds as an independent culture group (Todorova 1986) were largely ignored by later research.

There is a significant difference in burial rites between the coastal group and the inland site. In the coastal group, the dead were mostly laid to rest on their backs, while inland, men and women were laid on their sides in a crouched position (Todorova 1982; Lichter 2001). All other criteria, in particular those regarding the material culture, are less suitable for differentiating the Varna Group from the KKG VI complex because both these groups were outstanding burials, even at a global scale and clearly differently treated than their average contemporaries in the region.

The piecemeal publication of individual burial complexes up to now has led to the impression that most of the graves in this cemetery with particularly large amounts of gold are so-called cenotaphs, that is graves without any recognisable burial but with grave goods. A critical review of the grave documentation, however, reveals a more differentiated picture. Many of these symbolic burials contain finds which were combined retrospectively (Bojadžiev/Slavčev 2011). One example of this is the grave no. 1, a particularly rich

1 The numbering helps to distinguish this necropolis from another group of graves 1.5 km west of the well-known Varna

necropolis, which is termed Varna II in the literature (Ivanov 1978a).

2 Information from V. Slavčev based on Ivanov's notes.

3 Ivanov 1975; 1978; 1988; 1991; Ivanov/Avramova 2000.



Fig. 1 Finds accidentally assigned to the burial no. 1.

Abb. 1 Die dem Grab 1 zugewiesenen Funde.

complex without any burial which was first found during the works on the cable canal. Several individual finds and entire complexes of finds, which were also discovered along the cable route, were assigned to the grave no. 1 retrospectively even though there was no stratigraphic association (Fig. 1). Several other »cenotaphs« could actually be normal burials in which the skeletal remains have decayed through taphonomic processes. Most of these cases are apparently child burials whose skeletal material is especially prone to decay. These remarks are by no means intended to deny that there are indeed some symbolic graves in the Varna necropolis but their number is smaller than previously thought.

Symbolic burials can be found in Varna in the three find complexes no. 2, 3, and 15 in which heads of figurines made of clay that are about half the size of a person were buried (Krauß/Slavčev 2012; Slavčev et al. forthcoming). These complexes were arranged like graves, including appropriate grave gifts, but figurines were buried instead of a corpse. Hoards were also found in a small grave-pit in the necropolis which has a smaller size than an inhumation grave, for example the complex no. 36, which was rich in gold.

The results of the metallurgical examinations in Varna I are presented by V. Leusch et al. in a separate contribution in these proceedings (cf. Leusch et al. in the present volume). However, more detailed results including the data will not be released until the final publication on these investigations

Anthropological analyses of the skeletal material in the necropolis

The following anthropological studies serve to complement the analyses already conducted in the field by Y. Yordanov (Institute of Experimental Morphology, Pathology, and Anthropology at the Bulgarian Academy of Sciences) and G. Marinov (Medical University of Varna). Furthermore, we now include the results of a metrical analysis of the morphognostic characteristics. In comparison to all other types of finds, the human remains of the necropolis have not yet been the subject of detailed research. After the preliminary publication of the Bulgarian colleagues' results (Yordanov 1978; Marinov/Yordanov 1978), essentially no other examina-



Fig. 2 Print of a 3D model of the skull from the burial no. 43.

Abb. 2 Print eines 3D-Modells des Schädels aus Grab 43.

tion of the skeletal material from Varna followed. The results of the new anthropological studies are a part of S. Zäuner's doctoral dissertation.

Among other goals the examination of the skeletal remains which were very poorly preserved was expected to provide insights into the question of horizontal and vertical kinship structures of the presumed elite. This investigation also sought to answer the question whether those people who were buried with rich grave goods lived in close proximity or whether they came from other areas and were only buried in Varna.

The question of kinship structures among the Varna burials cannot be satisfactorily answered at present, as environmental factors erased the information contained in the bone surface structure and the high degree of fragmentation only rarely allowed an analysis of the anatomical variations necessary for determining kinship structures. Surprisingly, several samples still contain collagen which may be used for genetic analyses (aDNA) in the future.

An analysis of the isotope ratios (in particular carbon-nitrogen-oxygen and sulfur) allows reconstruction of selected aspects of the dietary components of the population. Results obtained at Tübingen University show that so far no differences in dietary preferences can be recognised among the burials. Regardless of sex, all classes of the population consumed similar foodstuff comparable to the results presented by Honch et al. (2013). However, in that study samples of rich and poor graves were selected according to the traditional interpretation of the grave good contents while our sampling was based on new results of the anthropological study and also based on the newly developed internal chronology of the cemetery. This allowed a more precise selection, especially because it became clear that at an un-

known point of time after the excavation some of the bone material was mixed. In some cases up to three different individuals can be distinguished with the same grave number. So far, it is unclear which effect this had on earlier samplings concerning isotope ratios and radiocarbon dating.

On the question of the origin of those buried in Varna, analyses of the strontium isotope ratios can help to provide an answer, since the geological environment of the respective areas of origin is preserved in teeth and bones through the diet. By comparing the strontium isotope ratios of various individuals with local reference samples, it can at least be determined whether they originate from a geologically similar or different region. This research is still ongoing, because the variability of strontium isotope ratios in the region of Varna and further inland is not yet satisfactorily characterised.

Much of the skeletal material from Varna was brought to Tübingen for the analyses. In the course of the study, parts of 188 skeletons could be identified. Osteological investigations yielded the surprising result that the skeletal material of different graves which had been documented as individual burials contained bones from several individuals. Because such additional skeletal remains are not included in the very detailed documentation of the excavation, it is more likely that the mixing of the finds happened while they were stored at the Museum in Varna, rather than multiple burials going unnoticed during the excavation. Some results of earlier osteological studies (Yordanov 1978; Marinov/Yordanov 1978) could be confirmed but many others had to be corrected or supplemented. It seems unlikely that the extensive fragmentation of the bones was the result of deliberate destruction of the skeletons. The observed alterations of the skeletal material can unquestionably be explained by taphonomic processes.

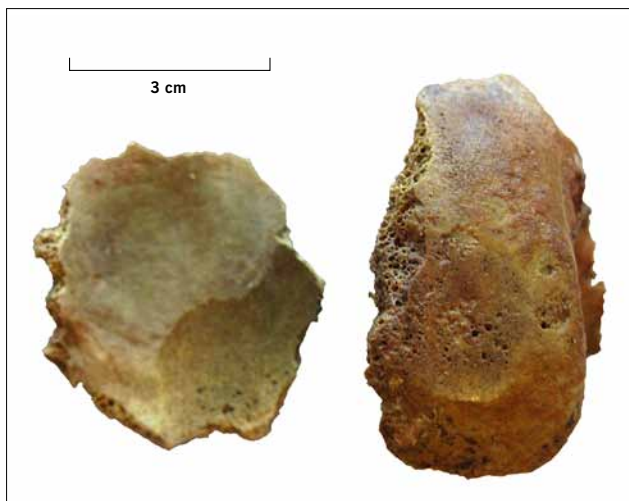


Fig. 3 The knee joint left leg from burial no. 43. Left: tibia, right: femur.

Abb. 3 Das Kniegelenk des linken Beins aus Grab 43. Links: Schienbeinknochen, rechts: Oberschenkelknochen.

The skull from the grave no. 43 was preserved in the Institute for Experimental Morphology in Sofia as a prominent exhibit. In the 1970s, Yordanov (1978) created a facial reconstruction based on this skull (Fig. 2). In spring 2012 there was an opportunity to examine the skull itself and it could be revealed that the facial features, in particular around the nose, were imaginary. This is remarkable insofar as this face is often used in school books and popular representations of Bulgarian history. In addition, the 2012 campaign also provided the opportunity to study skeletal remains preserved in the same institute from the Copper Age cemeteries of Košarica and Durankulak. Copper Age skeletons from Smyadovo and Košarna had already been included in the study in 2011.

The largely very poor preservation of the bones from the Varna necropolis already mentioned above considerably limits the information that can be obtained from the material. Under these circumstances, comparisons with better preserved finds become all the more important. Tell Yuncite in western Thrace plays a key role in this respect. Several of at least 70 skeletons found here were almost completely excavated. This settlement was destroyed by an attack and can thus provide a picture of the living population (Zäuner 2011; 2011a). Comparisons with results from the sites mentioned above show many similarities with regard to the physical condition of the Copper Age population in eastern Bulgaria to the extent that they can be reconstructed using the robustness of the bones. The majority of the individuals had a delicate physique, something which is also true for the individuals buried in Varna.

A remarkable individual find in the necropolis was the well-known grave no. 43⁴. The male buried in this grave was between 50 and 65, some 10 years older than had previously been assumed. The stature of the individual is noticeable. With an estimated height of c. 1.70 m (Yordanov 1978, 50),

the robustness of the bones is above the average for the Bulgarian Copper Age. In particular the bones of the lower arm display prominent muscle marks and stand in contrast to the weaker musculature of the upper arm. The leg muscles were also prominent. Interestingly, this skeleton also shows serious degeneration which is difficult to reconcile with the theory that the skeleton is that of a priest or a ruling personality. Such a person might be assumed not to have had to perform physical work but would have based his power on controlling the work of others (cf. Nikolov 1991, 163). Public perception on this point is heavily influenced by the reconstruction of the grave in the Museum Varna which displays a standard plastic skeleton. The original bones from the grave no. 43 show arthritis on the cervical spine, the hands, and the feet. The left hip and especially the left knee were also affected, where bone rubbed on bone, which may have caused severe pain (Fig. 3). It is more surprising that a squatting facet can be seen on his left tibia. This is an indication that the male usually squatted rather than sat, which suggests a working position. The presence of plaque on his teeth points to a diet containing protein. However, there is no evidence of cavities or so-called enamel hypoplasia, which is typically seen as an indicator of stress during childhood development and could point to periods of malnutrition. This implies a continuously good diet and could in itself be taken as a sign of the male's higher social status into which he was possibly born.

Until now, the interpretation of the grave no. 43 was mainly based on the rich grave goods and only in a small way on Yordanov's (1978) sparse anthropological data, some of which were corrected. Yordanov characterises the individual with the following words: »Facial expression presumably corresponds to that of a tribal leader or priest, [that means] a warrior, a physically powerful and wise man« (Yordanov 1978, 58). While the first two assumptions can neither be proven nor rejected, his age and the discovered pathological degeneration speak against a position as an active warrior. Something like a craftsman might be closer, although it cannot be excluded that he was also a warrior in his younger days. It is just not possible to assign the traces that muscle marks leave on the bone to only one kind of movement or activity. In addition, muscle patterns may change with age. In this case they show that the bones were exposed to great physical stress until shortly before the individual's death. The strong muscles of the lower arm even suggest continuous work. Furthermore, they hint to a kind of work that receives its power from the hand, for example working soft metals like copper or gold. Blacksmithing or fighting with axes would lead to stronger muscle marks on the upper arm and shoulder than those visible here. Altogether, the morphognostic characteristics of the skeleton render the thesis of a »parasite ruler« or priest living at the expense of his people (cf. Nikolov 1991, 163) highly unlikely. Rather, the compiled evidence indicates that the male buried in the grave no. 43 had to work for the visible wealth, that is, the social position expressed through the type of burial objects in the grave.

4 S. Zäuner, News from the old chief – Grave 43 of the Varna necropolis revised. Oral presentation at the 10th international Meeting of the

German Society of Anthropology (GfA), Bozen (Italy) September 2nd–6th 2013.

There are also indications of social care in the Copper Age society, for example in the burials at Yunacite. Here, the skeleton of an older woman who apparently had her hand amputated as a young adult (Zäuner et al. 2013) was discovered. She showed no signs of having a higher social position, but she lived several decades after this procedure and appears to have worked despite her handicap until her death. This woman must have been taken care of at least for the period until she was able to work again.

Both the one-handed woman from Yunacite as well as the man from the Varna grave no. 43 worked until shortly before their deaths and therefore at least maintained, if not achieved, their position within the community by work. Already these insights cast doubt on the interpretation of the »Varna« phenomenon as the expression of a society in which social differences between individuals were primarily based on economic strength (cf. Marazov 1988, 67f.). Moreover, not only could the rich graves symbolise craftsmanship abilities as suggested by J. Lichardus (1991, 186) and others, but the grave no. 43 could be the burial of an actual craftsman. The muscular lower arms in particular could be explained if the male had worked as a metal smith, for example.

Statistical analyses

Due to the comprehensive compilation of the finds and the preparation of catalogues for the individual types of finds by K. Dimitrov, V. Slavčev, O. Pelevina, and other Bulgarian colleagues, it is now possible to statistically analyse the burials and define an internal chronology of the cemetery of Varna I for the first time. All this information was entered into a database by students at Tübingen University in the context of two statistics seminars during the winter semesters 2011/12 and 2012/13⁵. The classification of the complexes based on their contexts was performed with the help of statistics and a correspondence analysis (CA) with the program package PAST.

Sex differentiation and burial position

It was not particularly surprising to discover that the male and female burials could be differentiated fairly well based on the types of grave goods. A clear differentiation of sex-specific grave goods could not be achieved in the past due to uncertain anthropological sex determination. The basis of our analysis was the data from the skeletal material which was examined by Zäuner, without prior knowledge of the artefact-based sex determination. When compared with the artefacts, there was a clear dominance of weapons as grave gifts in the men's burials. Male graves were also typically somewhat richer than those of women. In general, the wealth of most of the burials is striking. Only thirty graves contained no goods at all, but 22 of these were disturbed.

Burial no.	No grave goods	Ceramic vessels	Silex artefacts	Polished stone tools	Use of ochre	Anthropological remarks
38	x	-	-	-	-	♀ (40 +)
73	x	-	-	-	-	< 6 months
77	x	-	-	-	-	Bronze Age
89	x	-	-	-	-	Bronze Age
136	x	-	-	-	-	
140	x	-	-	-	-	♀ (13 +)
175	x	-	-	-	-	
222a	x	-	-	-	-	
16	-	1	-	-	-	
91	-	1	-	-	-	
125	-	1	-	-	-	
225	-	1	-	-	-	(12–15)
239	-	1	-	-	-	♂ (50 +)
34	-	2	-	-	-	♂ (30–40)
42	-	2	-	-	-	♂ (30–40)
124	-	2	-	-	-	♂ (20 +)
141	-	2	-	-	-	(8–9)
160	-	2	-	-	-	(7–15)
199	-	2	-	-	-	
211	-	2	-	-	-	(20 +)
98	-	3	-	-	-	
161	-	3	-	-	-	
213	-	4	-	-	-	(40–60)
132	-	5	-	-	-	
224	-	1	1	-	-	♀ (40–45)
12	-	4	1	-	-	
114	-	2	1	-	-	
173	-	2	1	-	-	♂ (50 +)
186	-	2	1	-	-	
235	-	2	1	-	-	
238	-	4	2	-	-	
194	-	1	1	1	-	♂ (40 +)
260	-	1	-	1	-	
72	-	> 1	-	1	-	♂ (50–60)
127	-	-	1	1	-	♂ (25–35)
128	-	-	1	-	1	♂ (20 +)

Tab. 1 Compilation of burials without and with very poor grave goods.

Tab. 1 Zusammenstellung der beigabenlosen Gräber und der Gräber mit sehr ärmlichen Fundinventaren.

The other eight undisturbed graves which nevertheless had no gifts should be briefly discussed (Tab. 1, first 8 rows). The graves no. 73, 136, 175, and 222a are children's graves, and the grave no. 140 belongs to a very young woman (older than 13 years). In the grave no. 38, a woman over 40 years old was buried without any goods in a left crouched position. The graves no. 77 and 89 also have no burial objects, and each contains one young person buried in an unusual

5 The following students participated in the data entry: M. Albers, S. Bosch, M. Brenner, A. Brunner, K. Fellgiebel, S. Fröhle, D. Gabler, R. Parrilla Giraldez, A. Girod, T. Götz,

W. Griebel, S. Haag, M. C. Hagner, L. Horsch, L. Insberga, G. Oelke, M. Seil, A. Schneider, and S. Wettengl (all in winter semester 2011/12); L. Brandt, F. Brenker, A. Condit,

R. Gutbrod, A. Hasler, A. Igelmann, D. Kirschenheuter, C. Schmid, D. Schwarz, A. Stöger (all in winter semester 2012/13). J. Abele was the tutor in both courses.

Phase	Burial practice	Characteristic grave goods	Aspects of social differentiation	Date
1	Predominantly stretched out on the back or side. Few crouched burials.	Stone axes und adzes, antler picks, copper and spondylus jewellery, scatter of ochre, first hammer axes of type Pločnik and awls.	Largely egalitarian grave goods.	From 4650 cal BC onwards
2	Predominantly stretched out on the back or side. Few crouched burials.	Stone axes und adzes, copper and spondylus jewellery, hammer axes of type Varna and Devnja A.	Incipient »over-configuration« of some graves.	Around 4550 cal BC
3	Almost equal stretched and crouched burials. One first symbolic grave.	Furthermore spondylus jewellery, new type of copper weapons (Hammer axes of type Vidra A and Varna A, first copper adzes), golden implements (lip plugs, ring idols type C).	Differentiation between male and female burials and differences in grave goods.	Around 4500 cal BC
4	Almost equal stretched and crouched burials. Increasing number of symbolic graves.	Scarce copper jewelry, gold jewellery increases, dentalium jewellery. Number of copper tools increases significantly.	Differentiation between male and female burials and differences in grave goods. Single individuals stand out by copper weapons and numerous gold and shell jewellery from the other burials.	Around 4450 cal BC
5	Stretched and crouched burials. Exceptionally rich symbolic graves and depositions at the southern edge of the cemetery.	Decline of spondylus jewellery in favour of dentalium jewellery; new types of copper weapons (hammer axe of type Devnja B, chisel of type Varna B, spearheads, pick-axe). Strongly variable gold metallurgy. Marble vessels and copper pins.	Pronounced differences in grave goods. »Over-configuration« of prominent individuals. Large number of symbolic burials at the southern edge of the necropolis.	At least until 4400 cal BC

Tab. 2 Development of the Varna I cemetery according to a preliminary interpretation of the CA results, based on the types and inventories of 226 graves.

Tab. 2 Entwicklung des Gräberfeldes Varna I anhand der vorläufigen Interpretation der Resultate der Korrespondenzanalyse, die auf den Typen und Inventaren aus 226 Gräbern basiert.

position: they are all crouched on their backs with legs to the right. According to Slavčev, whose assessment is based on the entries in Ivanov's excavation diary, they date to the Bronze Age. In the Copper Age cemetery there are therefore only six graves without objects, all of which are either children or in one case a very old woman. Using a »core« of the cemetery which he defined himself, Lichardus identifies a burial group E which comprises graves with only ceramic inventories (Lichardus 1991, 177–181). However, considering all the burials, only 16 fall into this group. If we also include those graves which, besides pottery, comprise simple stone tools, then this number rises to 28 (Tab. 1, last 28 rows). Based on the individuals' skeletons whose age could be determined in this group, three are children and six are very old individuals. When put into perspective with the total number of burials, there are altogether very few individuals whose social standing can be explained by the person's age, and even this is only partially consistent. The fact that the age of the buried person is not a decisive criterion for

the number and quality of the burial gifts is further demonstrated by many graves of children and elderly individuals, who were buried with large amounts of gold jewellery and items made of rare materials.

Another important new insight is the observation that the burial position is not primarily a sex-differentiating characteristic (contrary to Lichardus 1991, 170; Lichter 2001, 96). The statistical analysis offers hints that the positioning of the body in the grave-pit can rather be considered as a chronological indication. At the beginning of the use of the cemetery, the dominant burial practice was to place the bodies, regardless of sex, stretched out on their backs. This type of burial position is related to the Late Neolithic tradition of the Hamangia Culture (cf. Lichter 2001, 62–64; Todorova 2002, 41–44), while the crouched side position dominates only later burials. Furthermore, it seems that more women than men were buried in a contracted position, which could, however, also be taken as a characteristic of social differentiation. Generally, the crouched side position is typical for

burials in the KGK VI complex (cf. Lichter 2001, 117; 129–132) and thus a characteristic of the inland cemeteries. It is, therefore, suggested that at the beginning of the use of the Varna necropolis the burial tradition of the Hamangia Culture near the coast dominated and in the course of time burials in the tradition of the inland KGK VI graves were added. The »old« Hamangia tradition of burials with the bodies stretched out on their backs was nevertheless continued to the end. However, this practice was only applied to the very rich burials, mostly of male individuals. Symbolic burials begin to appear around the mid-point of the use of the cemetery. Towards the end their number increases greatly and the grave goods in the complexes without skeletal remains become ever more luxurious. According to the current status of the statistical evaluation, the exceptionally rich symbolic burials all belong to the final phase of the cemetery. Among many different conclusions in comparison to the previous studies, this result is perhaps the most significant. According to T. Higham et al. (2007) the richest burials are not from the end of the cemetery, as we suggest, but from its beginning.

Tentative development of the cemetery

We come to the conclusion that the graves with the richest inventories are the later burials, based on a detailed statistical analysis of the grave assemblages, which includes a large variety of parameters such as burial depth, orientation, and position – although, precise data on the ceramic inventories are not yet available for many of the graves. Furthermore, we performed a seriation of the grave inventories using CA which is effectively supported by the independent typological and technological seriation of copper and gold objects. Although the study is not yet completed, we nevertheless present the progress to date, because it may change the view and interpretation of the Varna cemetery substantially. By applying the CA to altogether 226 graves (cf. data in Tab. 2), we have defined a sequence which can be divided into at least five phases that reflect the chronological development of the necropolis. Presently, we base this development on a phase model in which each phase is (pragmatically) defined by a roughly equal number of graves. We intend to refine this model in the near future. The model comprises four phases with 54 and one phase with 53 burials. Applying this division, the development of the cemetery can be outlined as shown in table 2.

It must still be determined whether the present order of the graves has a purely chronological relevance or whether – and at the moment we cannot exclude this possibility – the existence of very rich symbolic complexes skews the seriation towards its end. In particular, we have still to analyse the extent to which social aspects, as well as gender, may have influenced the seriation, in addition to chronological factors. However, as far as we presently can see, the graves which can be clearly identified as male or female are so regularly distributed throughout the seriation that sex can be

neglected for the sequence of the graves. Social aspects also have no significant impact, although we might attribute this to the fact that the vast majority of graves in Varna is rich. Those few burials which belong to Lichardus' group E (Lichardus 1991, 177–183) are distributed randomly, as far as we can judge from the graves that are certainly undisturbed. Only in the first two phases more poor graves are found and it is noteworthy that in the final two seriation phases we do not find any graves of group E at all.

Phase 1

The cemetery begins in the north and remains confined in this area during the first three phases (Fig. 4). It is noticeable that in this period the position of the buried is relatively uniform. The buried individuals are stretched out on their backs, or sides, and this positioning appears to be the norm.

Typical grave gifts in the first phase include stone adzes and axes, picks made of deer antlers, and other objects which could be used as tools or, at least in the case of the antler picks, also as weapons. Copper is used as a raw material in Varna from the beginning. However, it is initially mainly used for decorative objects and jewellery with minimal material requirements. The main grave gifts recorded in this phase are small plate and wire objects such as finger rings and small rings, and also bracelets, although these are rare. The body decorations are otherwise dominated by spondylus bracelets and spondylus beads. At the end of this phase, though only documented in two graves, the first heavy tools appear, namely hammer-axes of the Pločnik type⁶. Significantly, this axe type is placed – by morphological criteria – at the very beginning of the development of axes (cf. Vulpe 1975, Fig. 1; Todorova 1981, annexe). This is readily understandable, since the simple form of the hammer-axe of the Pločnik type as well as the Varna type can both be produced in very simple moulds due to their flat shapes. In addition, three graves contain simple copper awls. Already in the early stages of the cemetery's use, there is one grave that contains a long flint blade (»flint super blade«), an object type that later becomes characteristic.

In terms of dating, the non-ceramic grave goods are well-exemplified by the three basic types of stone tools (adze, chisel, and axe), but also the numerous spondylus jewellery found in the grave no. 1 from the burial group Varna II (west of Varna), allows us to infer that phase 1 is chronologically close to the burial group of Varna II (Ivanov 1978a). This dating is important, since it provides independent confirmation of our conclusion that this end of the seriation represents the beginning (and not the end) of the cemetery development. The ceramics, and especially the standing pottery from the grave no. 1 in Varna II, corresponds to the materials that are attributed to the Hamangia Culture, stage IV of Durankulak by H. Todorova (2002, Fig. 26a). If one looks more closely at Todorova's suggested typological classification based on the materials from Durankulak, it

6 If one chooses the appearance of »innovative« grave gifts as the criterion for separating the individual phases, these graves

would already mark the beginning of the second phase. The first phase would then consist of graves only containing individual

copper jewellery but completely without heavy copper tools.

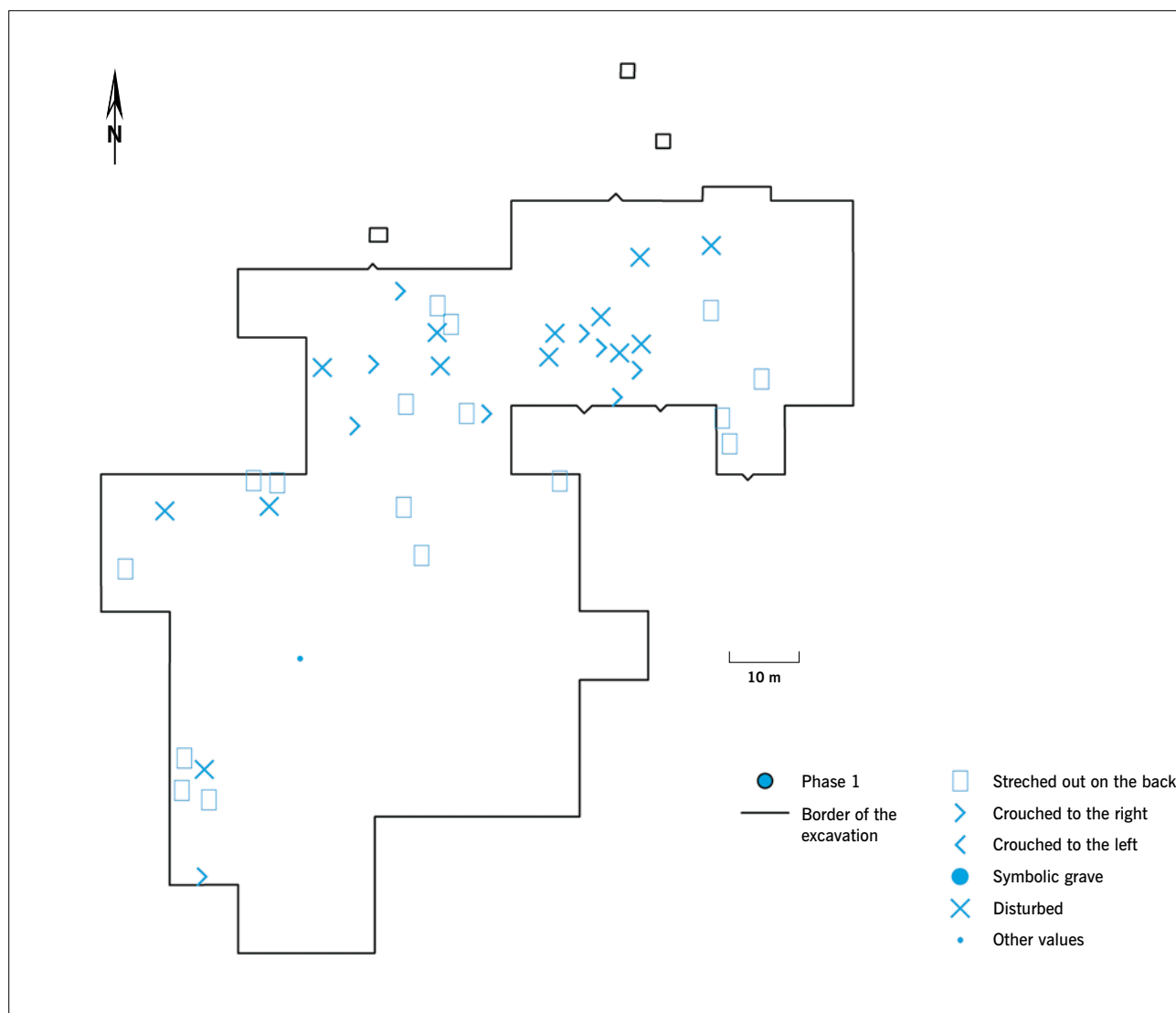


Fig. 4 Mapping of the phase 1 according to the seriation.

Abb. 4 Kartierung der Phase 1 entsprechend der Seriation.

becomes quite apparent that her Hamangia IV is nothing other than an early stage of the Varna Group (cf. Todorova 2002, Fig. 113). On the one hand, numerous vessel forms which only became characteristic in Varna can already be seen in this stage. On the other hand, typical Hamangia vessels such as bottles and lids with hat-like brims are no longer found. Hence, we conclude that the grave no. 1 of the grave group Varna II can be placed around the time of the oldest burials in the Varna necropolis at the latest.

Phase 2

At the beginning of the second phase, the bodies are still predominantly positioned stretched out on their backs. However, this soon changes to burials in a crouched side position (Fig. 5). In quantitative terms, once this new position is introduced, the number of individuals stretched out on their backs is only slightly greater than those crouched

on their sides. According to the new anthropological determinations, men and women were apparently equally laid to rest on their backs.

During phase 2, as before, the majority of burial goods still comprises spondylus bracelets and beads as well as copper jewellery made of wire and foil. A newly introduced Varna-type hammer-axe can be found in one grave. In another grave, there is a hammer-axe of the Devnja A type. The hammer-axes were weapons, something which can be judged from the fact that they take the place of the antler picks in the grave inventory (Hansen 2011, 66). The gradual replacement of the stone and antler weapons by tools made of the new material copper can be recognised particularly well in this phase. Nevertheless, the vast majority of burial goods are still stone axes, stone adzes, and other tools made of flint. But there occur also some heavy copper tools, if only rarely. It is in this phase, documented in one grave at the very end, that the first gold object, a lip plug, appears⁷. It could be debated whether this very earliest occurrence of

⁷ Here one could also define the start of a new phase with the appearance of the first gold object and the first symbolic grave, but gold

objects occur already in the grave no. 3 of the cemetery of Varna II.

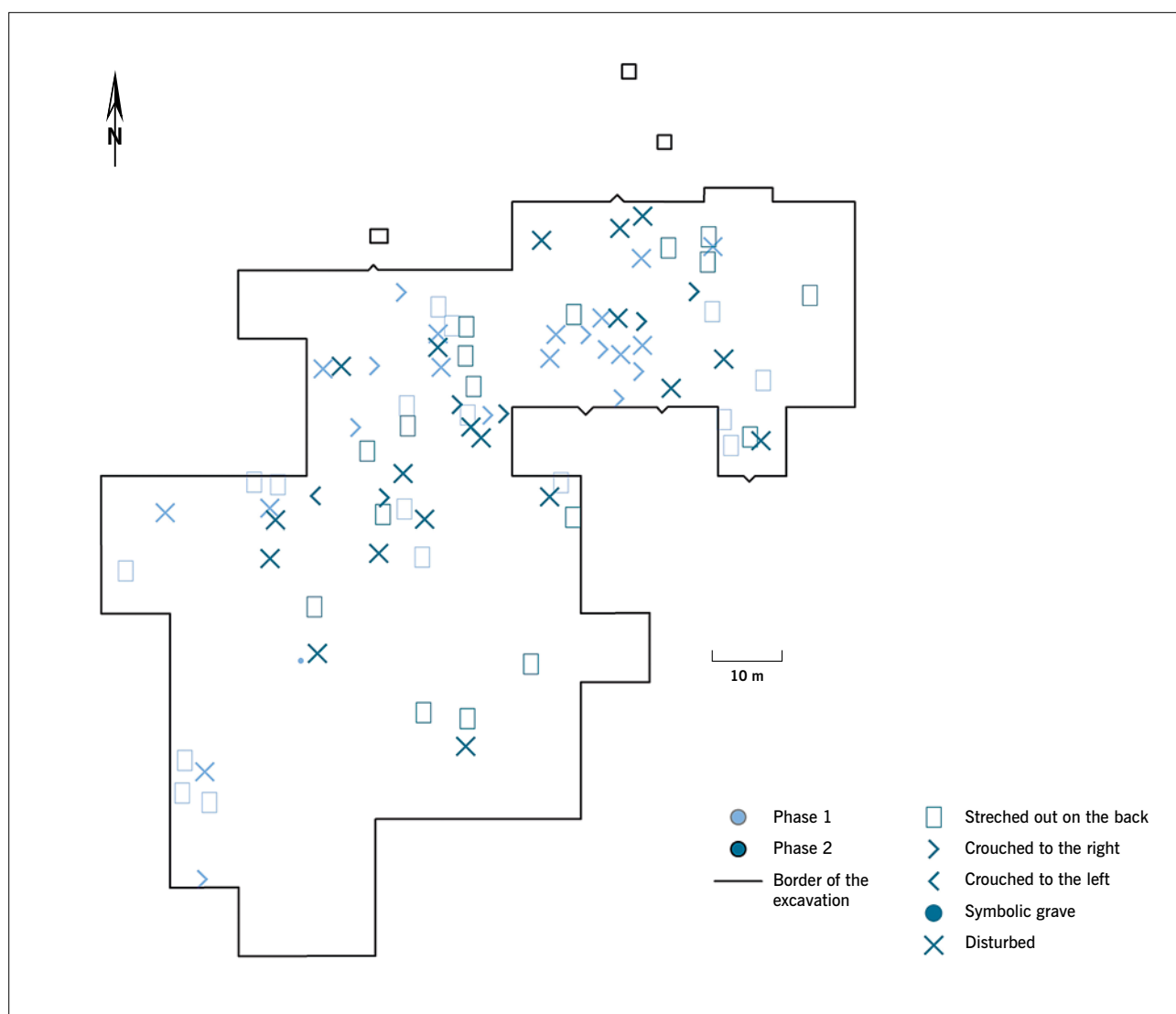


Fig. 5 Mapping of the phases 1 and 2 according to the seriation.

Abb. 5 Kartierung der Phasen 1 und 2 entsprechend der Seriation.

gold (which we have dated according to its position in the Varna seriation) generally marks the beginning of the use of gold in the region. However, the existence of 31 beads of simple gold foil in the grave no. 3 in the Varna II cemetery (Ivanov 1978a) provides evidence for an older tradition. Looking only at the non-ceramic grave goods, without any difficulties one could place this burial at the beginning of the seriation of the Varna I cemetery. The ceramics from Varna II, however, leave no doubt that this specific grave belongs to the phase Hamangia IV, that is, the earliest Varna, and thus directly before or at the very beginning of the development of the Varna cemetery. These arguments combined suggest that the use of gold should be recognised as predating the beginning of Varna I.

Phase 3

Starting in the third phase, the number of crouched-position burials is almost the same as those stretched out on their backs. In this third phase, the first symbolic grave with no skeletal remains appears (Fig. 6).

Copper ring jewellery occurs for the last time. Now copper tooth rings are seen in burials. This phenomenon can possibly be explained »therapeutically«, i. e. in terms of dentistry. It was first observed for teeth in the burials at the Durankulak cemetery (Yordanov/Dimitrova 2007). New shapes of hammer-axes, that occur for the first time in this phase, are of the more delicate types, Vidra A and B (according to Todorova 1981), and in one grave there is also the first chisel of the Varna A type and, from another, a copper flat adze. Also noticeable is a rapid decline in the number of graves with antler tools, which are successively replaced by copper weapons. It is only in this phase that several gold objects appear together in one grave. They are all still small objects with minimal use of material, such as lip plugs, small trim pieces with little gold, and the first ring idols of type C (according to Todorova/Vajsov 2001, 68 f.). Technologically speaking, the production of such gold pieces is still rather simple.

In terms of parallels to phase 3, the 31 gold beads from the grave no. 3 of the burial group Varna II would fit well in regards to technology. Because the chronological position of the grave is well-fixed at the very beginning of the Varna development, dated by the ceramic burial goods, this can

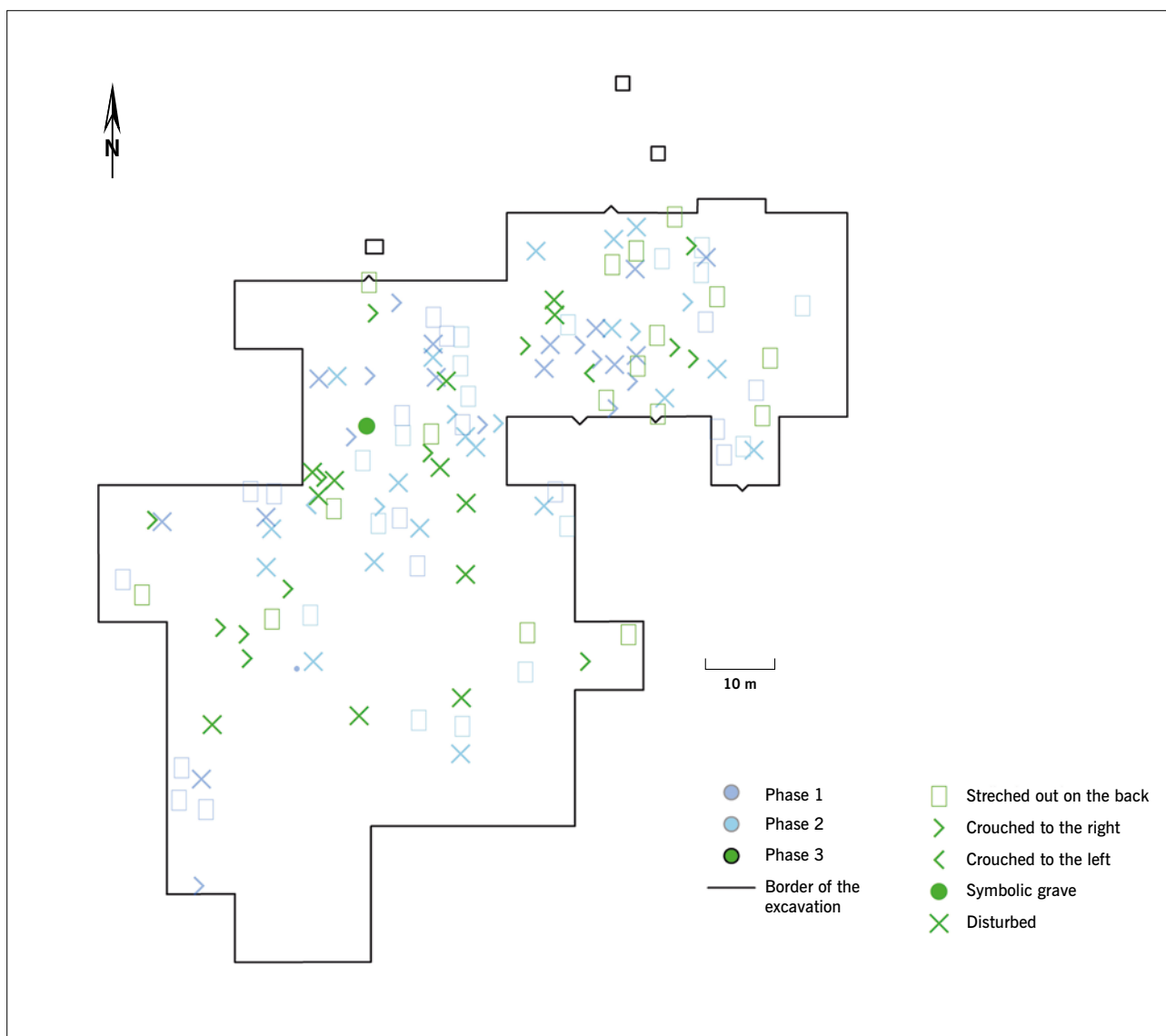


Fig. 6 Mapping of the phases 1–3 according to the seriation.

Abb. 6 Kartierung der Phasen 1–3 entsprechend der Seriation.

only mean that simple gold objects were already being produced some time prior to the Varna necropolis. By whatever measure, the use of gold objects is very rare within the first three Varna phases. The vast majority of jewellery is still made of copper or spondylus.

In several graves, an »over-configuration« of burial gifts can now be recognised, for example in the use of ochre, grave gifts of antler picks and stone tools as well as, in some cases, heavy copper tools and smaller individual objects made of gold.

Phase 4

In phase 4, the individuals crouched on their sides outnumber those laid to rest on their backs. There are now many symbolic burials without skeletal remains. Such »symbolic« burials are at the edges of grave groups and, it appears, that they may have been used to separate these groups from each other. In terms of horizontal stratigraphy, an increased shift of burial activity to the south can be seen (Fig. 7).

The weapons of antlers and stone have been replaced almost entirely by those made of copper and the number of copper tools increases significantly. A first significant appearance of artefacts of gold metallurgy is reflected in the graves with necklaces that display numerous gold beads, as well as trim pieces of gold, most likely attached to garments. This could be interpreted as representing the introduction of a new fashion. Alternatively, one could consider whether only the burial conventions had changed, and that these objects were already produced earlier, but were placed in graves for the first time only in this phase. However, deciding between these alternatives is part of a more general problem, since it touches on the wider interpretation of archaeological data, and this cannot be further discussed here. What we observe, for the first time, is that cast gold objects enter some of the Varna graves. Concerning the production of gold objects of the previous phases, the gold foil was first cast, and then thin strips were cut out and formed to their final shapes (see Leusch et al. in the present volume). In phase 4, however, we observe that the gold foil strips were directly produced by casting. Increasingly, jewellery of dentalium beads appears

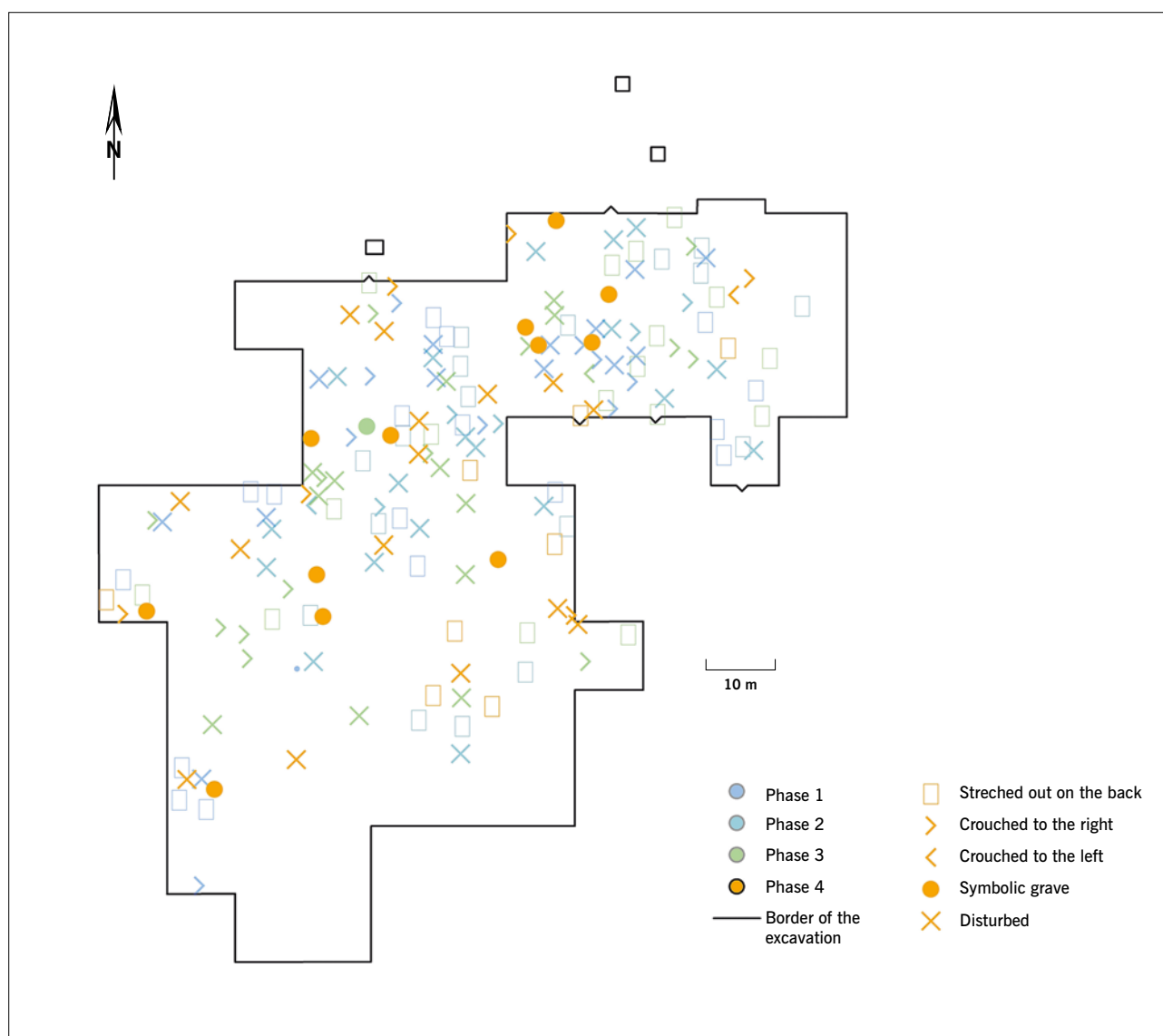


Fig. 7 Mapping of the phases 1–4 according to the seriation.

Abb. 7 Kartierung der Phasen 1–4 entsprechend der Seriation.

and, successively, dentalium jewellery replaces the older spondylus jewellery. The »over-configuration« of graves continues in this phase, as can be seen by the multiplication of heavy copper tools in many of the graves, the burial of several gold objects together, and in the flint super blades.

Phase 5

As far as we know from our current statistical evaluation, the final phase of the cemetery is dominated by symbolic graves (Fig. 8). The few real burials are with bodies stretched on their backs and in crouched position. The final phase is characterised by the almost complete disappearance of tools made of antler and stone, which are only seen as ceremonial tools, »upgraded« using gold appliqué. In parallel, we note a significant increase in the number of heavy copper tools in the graves. Again new types of tools, like the hammer-axes of type Devnja B, chisels of type Varna B (according to Todorova 1981), copper spearheads, and a unique pick-axe occur. Copper jewellery is almost completely replaced by gold

jewellery. The only small tools made of copper are needles with one end rolled up and pins with double spiral heads, beginning in the fourth phase. With the gold objects, a significant increase in the number of the objects can be observed and a diversification of types. Not until this stage, it is characteristic to see decorative shafts on the ceremonial weapons, for example, adorned with gold trim and coverings. Large, massive gold objects also first appear in this phase with solid cast breastplates and bracelets as well as complex, three-dimensional objects (astragal, hammer-head, moulded beads).

An outdated use of some objects can now be seen in some graves. The best example is the well-known grave no. 43, in which an adult male was buried with rich grave goods. On the one hand, his grave contains elements of the older phases but at the same time, it contains completely new types of finds. One older object is the copper hammer-axe of the Pločnik type; in the seriation, this is the absolutely final occurrence of its kind. The spondylus jewellery also points to older phases and had been gradually phased out. Dentalium jewellery, which can also be found in this grave, now

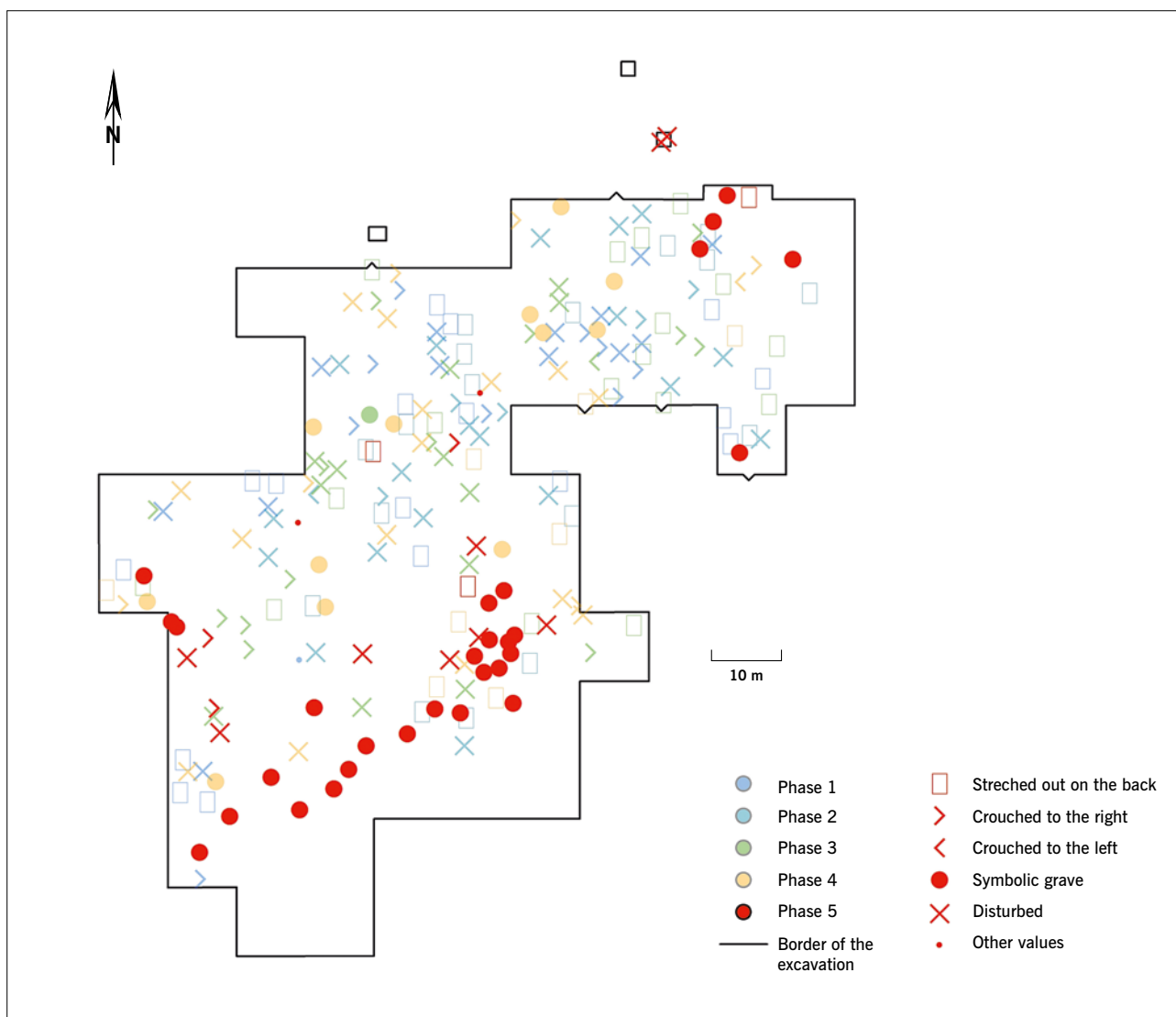


Fig. 8 Mapping of the phases 1–5 according to the seriation.

Abb. 8 Kartierung der Phasen 1–5 entsprechend der Seriation.

(nearly) completely replaces spondylus. What we mean by »nearly« is that the male in the grave no. 43 is indeed wearing a spondylus bracelet, but which was broken and has been repaired multiple times. Moreover, the repairs were covered with gold foil (Fig. 9). There are many types of gold objects which are seen for the first time in this grave such as round appliques and trim as well as coverings for the ceremonial tools (that are reconstructed in the grave). Regarding the total development of the copper tools, a spearhead with a tang and a double spiral-headed pin in particular, can be classified as new types. The individual in the grave no. 43 thus has old insignia of status which could stand for a genealogically-based right to rule, as has been continually emphasised (Marazov 1988, 72f.; Lichardus 1991, 181–191; Nikolov 1991, 163f.), and contemporary objects which are, in the end, most relevant for dating purposes. For this reason alone, this grave cannot be dated at the beginning of the cemetery's use. It must belong to a more developed phase (for a different opinion, cf. Higham et al. 2007, 647–652).

An antler pick in the very rich symbolic grave no. 4 should also be considered as an antiquity. The symbolic dimension of this grave is suggested with three versions of

this weapon in three materials: antler, stone, and copper (Fig. 10). This »transformation« of one type of weapon shows, on a small scale, what can be seen at many other places in the development of the entire cemetery – the gradual replacement of weapons made of antler and stone by copper tools. The spatial distribution of the symbolic graves in the final phase is particularly enlightening, as it shows an intentional delimiting of the cemetery from the outside world and thus allows the ritual nature of the symbolic graves to be clearly recognised. Similar to a system of ditches, along the border between the living and the dead on the south side of the cemetery towards the lake, collections of finds which could each represent the real gifts for one person were seemingly deposited as part of various rituals (Lichardus 1991, 186; Marazov 1991, 151). This personification of the finds is even more apparent in the complexes no. 2, 3, and 15, each of which contains a figure with a clay head about half the size of a person. This clay head was placed along with the appropriate grave goods (Krauß/Slavčev 2012; Slavčev et al. forthcoming). It is possible that these closely-placed complexes served as a specially marked access area to the cemetery.

Consequences for the absolute dating of the necropolis

With the now advanced, although still incomplete, publication of the new radiocarbon dates from Varna, a working group led by T. Higham and J. Chapman has evolved the idea that the use of the cemetery began with the richest complexes (Higham et al. 2007). However, as we conclude in this paper from a multitude of observations, the chronological progression of burials based on CA exactly reverses this view. What we recognise is a successive development of innovative elements within the burial community, and this development culminates in the final phase of the cemetery, to which we date the richest graves.

Another consequence of the analysis of the Varna ^{14}C ages by Higham and Chapman is that the cemetery ends around 4400 cal BC, which represents a date some 200 years older than the traditional chronology (cf. Bojadžiev 1992; Görsdorf/Bojadžiev 1996). The internal arrangement of the burial progression in five phases, on the one hand, clearly shows that the gold and copper-rich complexes appear at the end of the cemetery's development.

On the other hand – and now taking a closer look at the published ^{14}C data – the chronological sequence we have achieved makes it clear how the ^{14}C data is distributed across the time span: while the dating of phases 1 and 2 is roughly confirmed by radiocarbon dating, the phases 3 and 4 are only based on isolated data. For the final fifth phase of the cemetery, in contrast, so far only one single date using a human bone from the grave no. 43 has been determined. As shown above, this burial is unique in many respects. We have based its archaeological dating at the end of the cemetery on the combination of many older burial objects along with a variety of completely new objects, and in particular of gold objects, the design of which can only be understood as the outcome of some long experience in developing the necessary metallurgical technology (Fig. 11).

Although further chronological discussion is beyond the scope of the present paper, we would like to mention that preliminary ^{14}C studies were carried out by B. Weninger (Köln), in which the CA rank positions of the ^{14}C dated graves were used as background for the application of the Gaussian Monte Carlo Wiggle Matching (GMCWM; Benz et al. 2012). First results of these studies are shown in figure 12. Most importantly, the late dating of the gold-bearing graves and in particular of the grave no. 43 is confirmed by GMCWM. There is no remaining ambiguity to this conclusion. As can be seen from figure 12, even despite the seemingly wide spread of dates around the wiggles of the calibration curve (which is statistically altogether quite acceptable), from a statistical perspective it is absolutely impossible to invert this sequence. We have no doubts that this statement will remain valid, even after minor adjustments of the grave sequence according to CA. At least, we can confirm one specific result obtained by Higham et al. (2007), namely, that the ^{14}C dates do not show any significant reservoir effect. Previously, Higham et al. (2007) have based this result on the pairwise comparison of the ^{14}C ages obtained on human and animal bones, taken from the same grave. Making use of the newly established CA sequence, we can now extend this result to include the ^{14}C ages obtained from animal and human bones



Fig. 9 Spondylus bracelet from the burial no. 43 with multiple traces of repairs, covered with gold foil.

Abb. 9 Spondylus-Armring aus Grab 43 mit mehreren, mit Goldfolie verdeckten Reparaturspuren.

from different (i. e. not identical) graves. In the final publication we will provide the necessary documentation for this conclusion, which is based on the pairwise numeric comparison of the respective ^{14}C ages, directly, with the ^{14}C values of the atmosphere. Already now, due to the overall quite acceptable spread of ^{14}C ages around the calibration curve, the validity of this result can (indirectly) be taken from figure 12. Formulated in another way, should there exist a reservoir effect, it will be so small (or large) as to get lost behind the statistical noise of the combined methods (CA, calibration curve construction, ^{14}C measurements). Hence, and to this point we agree with Higham et al. (2007), the previously conjectured distortion of the ^{14}C chronology due to the reservoir



Fig. 10 Detail of the *in situ* photograph of the symbolic burial no. 4. »Transformation« of an antler pick (highly decomposed, orange arrow) into copper (yellow arrow) and stone weapons (red arrow). The shaft of the stone axe is »gilt« with tubular gold foils and the spike covered with a small piece of gold foil.

Abb. 10 Detailansicht des *in situ*-Fotos des symbolischen Grabes 4. Die »Transformation« einer Hacke aus Hirschgeweih (stark zersetzt, oranger Pfeil) in Waffen aus Kupfer (gelber Pfeil) und Stein (roter Pfeil). Der Schaft der Steinaxt ist mit Goldfolie »aufgewertet«, den Axtkörper bedeckt ein kleines Stück Goldfolie.

effect of the human bones from several graves, including the grave no. 43, seems very unlikely.

In order to test our proposed late dating of the final phase of Varna, and in order to improve the determination of the overall length of time covered by the cemetery, in spring 2012 further samples were taken from the skeletal material of the graves no. 167 and 288 stored at Varna. Following anthropological analysis, ^{14}C -AMS dates of these samples were obtained from the Klaus-Tschira-Laboratory of the CEZA and are included in figures 11 and 12. In addition, we have dated bone material from the grave no. 43 again, which confirms the result reported by Higham et al. (2007).

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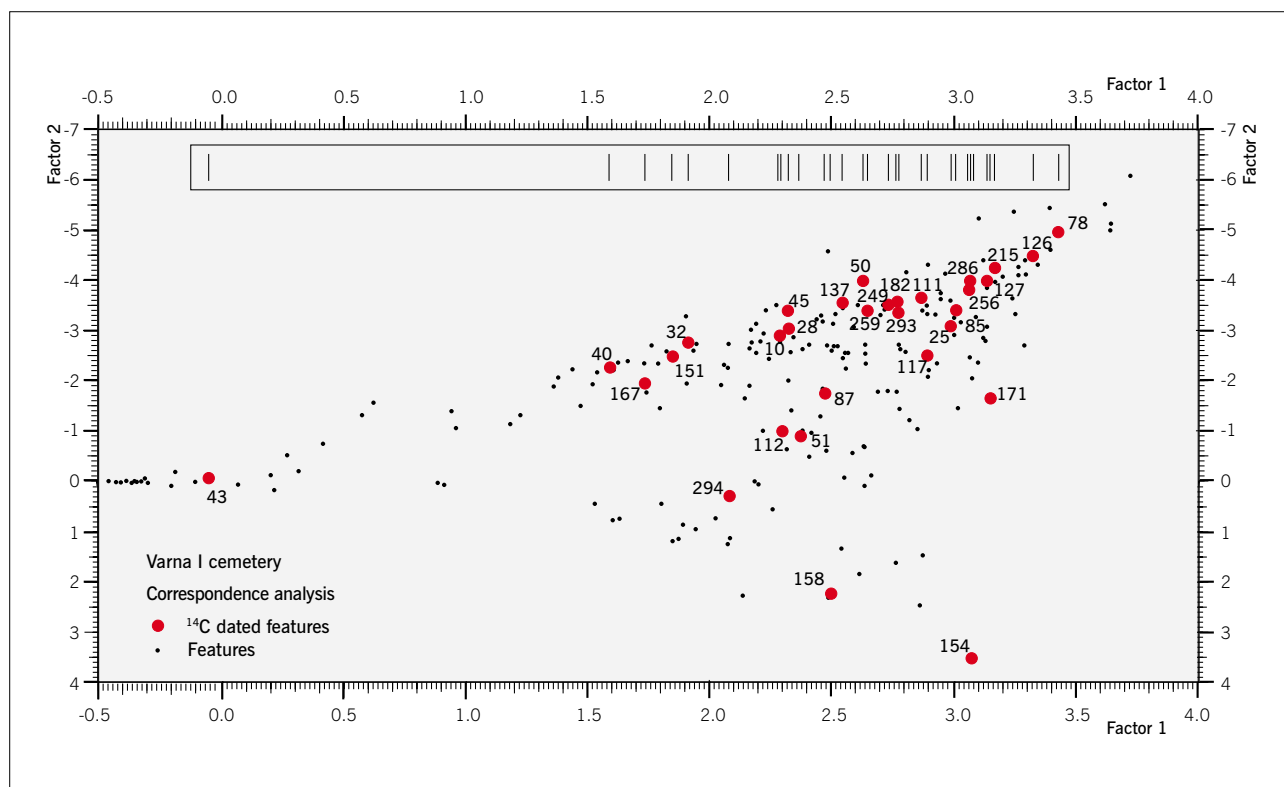


Fig. 11 Positioning of the ^{14}C dated burials according to correspondence analysis.

Abb. 11 Positionierung der ^{14}C -datierten Gräber anhand der Korrespondenzanalyse.

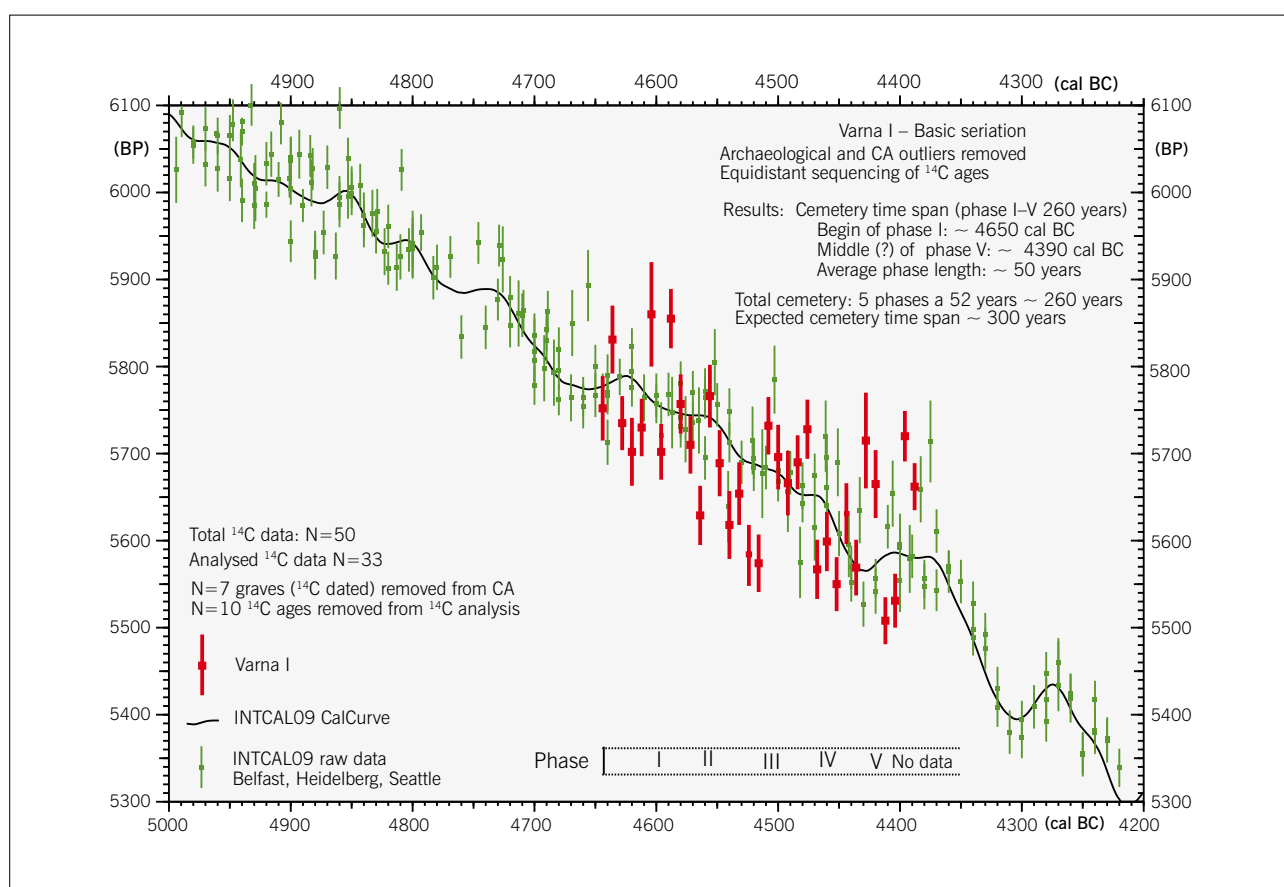


Fig. 12 Calibration of the Varna dates according to their rank position in the CA.

Abb. 12 Kalibrierung der Daten von Varna anhand ihrer Position in der Korrespondenzanalyse.

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| 2 | 3D scan ADA 3D OOD, Sofia; photo S. Zäuner | 10 | I. Ivanov, Varna | 12 | B. Weninger, Köln |
| 3 | S. Zäuner | 11 | graphic B. Weninger, Köln; ¹⁴ C dates from the Mannheim AMS laboratory (MAMS) were provided by B. Kromer, CEZA, and dates from Oxford AMS by | Tab. 1–2 | R. Krauß |
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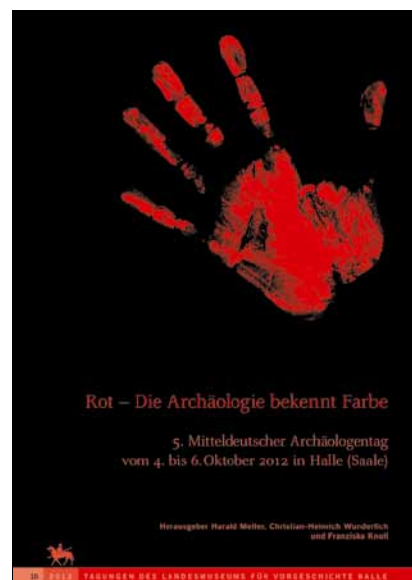
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