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## ORDER IN CHAOS. SPATIAL ANALYSIS OF CREMATED HUMAN REMAINS IN URN BURIALS FROM PODLESIE, SITE 5, OLEŚNICA COMMUNE, ŚWIĘTOKRZYSKIE VOIVODESHIP<sup>1</sup>

### ABSTRACT

A sample of six cremated graves from the Lusatian Culture cemetery from Podlesie, site 5, has been subjected to a spatial analysis aimed at recognising anatomical provenance of bone fragments within the layers of the urn burial. Even though individual features have shown damage ranging from slight to severe, most of the burials have shown an indication of a repeated pattern, with skull fragments predominantly present in the upper layers ( $\text{Chi}^2 = 43.968$ ,  $\text{df} = 16$ ,  $p < 0.001$ ) and lower limb

fragments accumulated in the lower parts of the urn ( $\text{Chi}^2 = 28.635$ ,  $\text{df} = 16$ ,  $p = 0.027$ ). In the case of the torso (the term used to describe postcranial axial skeletal fragments together with pectoral and pelvic girdles' elements) and upper limb, the analysis has not shown statistically significant distribution between the layers. The analysis confirmed the advantage of the proposed method in determining the presence of the so-called 'anatomical order' within cremation burials.

**Keywords:** cremation, spatial analysis, Lusatian Culture, Podlesie, urn cremation burial, funeral ritual in cremation

### Introduction

Analysing cremated remains is a time-consuming process. Nonetheless, for many archaeological cultures, periods, and sites, these remains are the only available source of information on the individuals who once were producing all the available artefacts. According to the experience of the author, further corroborated by the recent publication by McKinley,<sup>2</sup> it is unpractical to expect the cremated remains to represent the same type of data that can be acquired from skeletal burials. The nature of cremation will destroy many of the elements that are necessary for a complete osteological analysis. The analysis, therefore, mainly focuses on the reconstruction of patterns in the state of preservation of the cremains, which can, among other things, indicate the presence of differences in the funeral rite.

One of the most common observations made during the excavation and analysis of a cremation grave is the spatial distribution of the remains within the burial. Traditionally, Polish publications, both archaeological and anthropological, are referring to this issue as the occurrence of the so-called 'anatomical order', and nearly every publication indicates whether the remains showed any anatomically logical order or fragments of different skeletal elements were intermixed indiscriminately.<sup>3</sup>

The terminology applied can be misleading, as typically this term is used for remains still presenting the original anatomical articulations between particular bones, indicating an undisturbed primary burial.<sup>4</sup> These conditions cannot be fulfilled in the case of pyre cremation, when the non-uniform character of the environment, together with possible interventions of people present during the ceremony (Fig. 1), may cause

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structive remarks allowed for improvements in the final version of the text.

<sup>2</sup> McKinley 2017, 14.

<sup>3</sup> Durczewski 1959, 140, 143; Piontek 1976, 199, 201; Pyżuk 2004, 42; Wróbel 2014, 226–227.

<sup>4</sup> Duday, Guillon 2006, 126.



Fig. 1. Modern cremation on a traditional pyre, Bagmati River, Pashupatinath, Nepal. Photo by Akiyoshi Matsuoka (CC BY-SA 4.0, online: <https://commons.wikimedia.org/w/index.php?curid=40503441>, accessed 5.04.2019).



Fig. 2. Bone-picking cremation ceremony (*kotsuage*) at the Doi Saien crematorium in Shikokuchuo, Ehime Prefecture, Japan. Photo by O -otamusune -i ku tanken-tai (Autumn Snake) (CC BY-SA 3.0, online: <https://commons.wikimedia.org/w/index.php?curid=1868211>, accessed 5.04.2019).

disruptions in the arrangement of skeletal fragments even in those rare cases when the whole pyre site is inhumated, forming a primary cremation burial (often denoted by the Latin term *bustum*).<sup>5</sup>

In the case of a cremation burial, the term is used typically to indicate that remains originating from a similar position within the body are placed together, implying a systematic and careful collection of the remains still occurring in some cases of modern cremations (Fig. 2). Unfortunately, in many cases, authors of publications do

not specify how the recognition of the anatomical order was made, sometimes only indicating that 'the anatomical order is present'.<sup>6</sup> Even in the cases of detailed descriptions, where the spatial distribution of the anatomical regions was used as an indicator of a funeral rite, *e.g.* a typical way of collecting remains from the pyre site, the individual data was not typically provided, rendering observations and conclusions subjective and hard to compare with other sites and burials.<sup>7</sup> Where data for individual burials are provided, results are presented in

<sup>5</sup> Noy 2000, 186; Deforce, Haneca 2011, 1338.

<sup>6</sup> Durczewski 1959, 143.

<sup>7</sup> Wróbel 2014, 226.

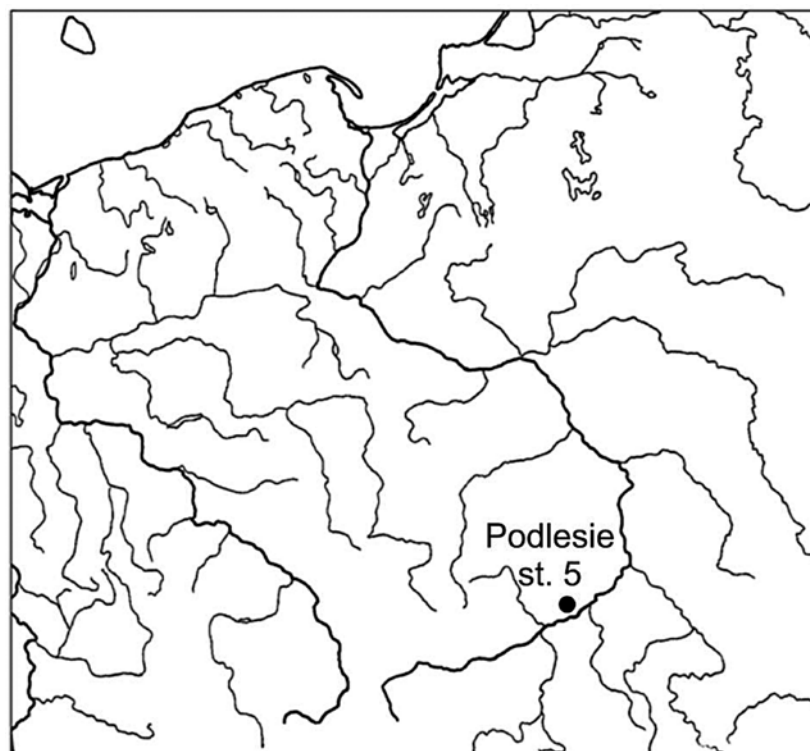


Fig. 3. Localisation of Podlesie, site 5, Oleśnica commune, Staszów district, Świętokrzyskie Voivodeship (drawing by P. Dziechciarz).

qualitative rather than quantitative manner, which does not facilitate the statistical approach.<sup>8</sup> The quantitative method of analysing the spatial distribution of bones should allow for greater objectivity of observation and facilitate comparison of different burials from the same or different sites, cultures, or chronological periods. As the method used by the author permits such an approach, the spatial analysis of the collection of cremation burials from the Lusatian Culture from Podlesie, site 5, presented below is used to assess its potential.

### Material

The analysed collection comes from 12 graves representing the Lusatian Culture from site 5 in Podlesie, Oleśnica commune, Staszów district, Świętokrzyskie Voivodeship (AZP 94-67/35) (Fig. 3). The site has been recognised as a flat burial ground with a dominating post-burial funeral rite that can be attributed to the Lusatian Culture. The site itself has been used as a sand pit by local farmers for a significant period of time (probably several dozen years), and an unrecognised number of features have been previously destroyed (Fig. 4). Some damage has also been reported in the case of the features

selected for the present analysis, and the burials range from nearly intact to nearly completely destroyed (see information in Tab. 1 and Fig. 5.a–d). The full description of archaeological findings has been presented by Paweł Dziechciarz in his bachelor thesis.<sup>9</sup> The analysis of the artefacts implies that the burial ground was used for a significant period of time, from Period IV of the Bronze Age to the beginning of the older Pre-Roman Period, which marks the end of the Lusatian Culture in the area. On the basis of its geographical location and the typology of the pottery, the site can be attributed to the Upper Silesia-Lesser Poland group of the Lusatian Culture.<sup>10</sup>

Due to the character of the present analysis, only graves that were explored in several mechanical layers were selected, resulting in a total number of six features under investigation. The burials differ in the number of exploration layers, as well as the state of preservation of the urns and chronology. Detailed information is presented in Tab. 1. Presumably, each of the burials contained the remains of one individual, as the detailed morphological analysis has not shown supernumerary morphological elements, with the weights obtained not indicative of multiple individuals within the burials (see also 'Results' section). The remains underwent standard sex and age determination (see Tab. 2).

<sup>8</sup> Piontek 1976, 199, 201.

<sup>9</sup> Dziechciarz 2015.

<sup>10</sup> Dziechciarz 2015, 40–41.

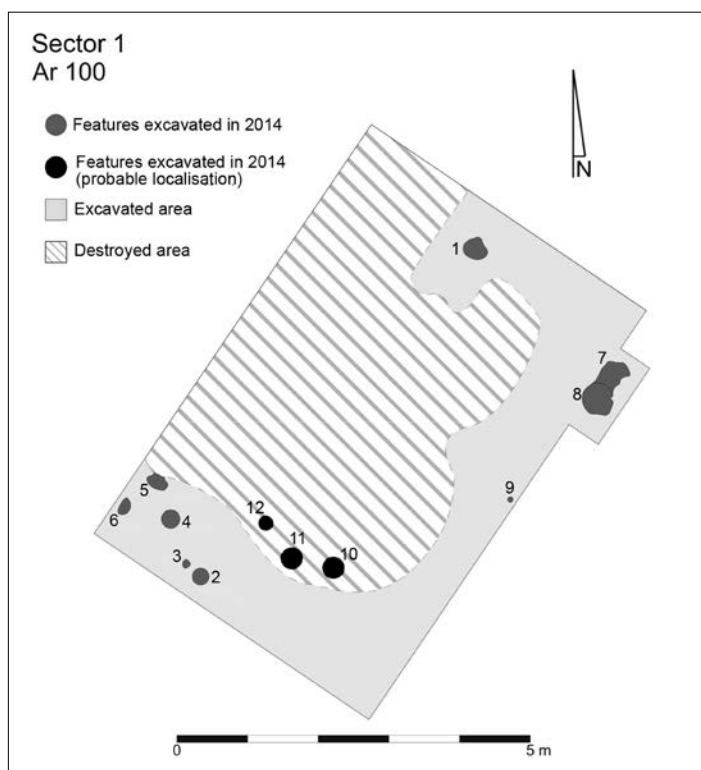


Fig. 4. Plan of the trench no. 1 and the location of the discovered archaeological objects with information on the destruction due to the digging of sand (drawing by P. Dziechciarz).

Tab. 1. List of the analysed burials with detailed information on exploration, state of preservation, and chronology (according to Dziechciarz 2015).

| Feature no. | Weight of the remains in grams | Number of layers | Layer thickness | State of preservation   | Age         | Sex | Chronology                                 |
|-------------|--------------------------------|------------------|-----------------|---|-------------|-----|--|
| 2           | 978                            | 5                | 3 cm            | Missing hip and shoulder, the lower part of the body mostly intact; the damage attributed to ploughing activity           | 40 yo       | ?   | Period V of the Bronze Age – Hallstatt D   |
| 3           | 1442.5                         | 5                | 3 cm            | The urn nearly completely destroyed due to environmental factors  | > 45 yo     | m?  | Hallstatt D – older Pre-Roman Period       |
| 5           | 626.5                          | 2                | 8 cm            | The urn severely damaged, only fragments of the body preserved, the remains evenly distributed within the pit             | > 45 yo (?) | ?   | Hallstatt D (?)                            |
| 8           | 837                            | 7                | 3 cm            | The upper part of the urn body and a shoulder missing, lower part well preserved; human remains found only within the urn | Adult       | ?   | Hallstatt D – early older Pre-Roman Period |
| 10          | 1188                           | 6                | 5 cm            | The feature heavily damaged by the digging of the sand  | 5–40 yo     | m   | Period V of the Bronze Age                 |
| 12          | 945                            | 5                | 5 cm            | The feature heavily damaged by the digging of the sand  | Adult       | m   | Hallstatt D                                |

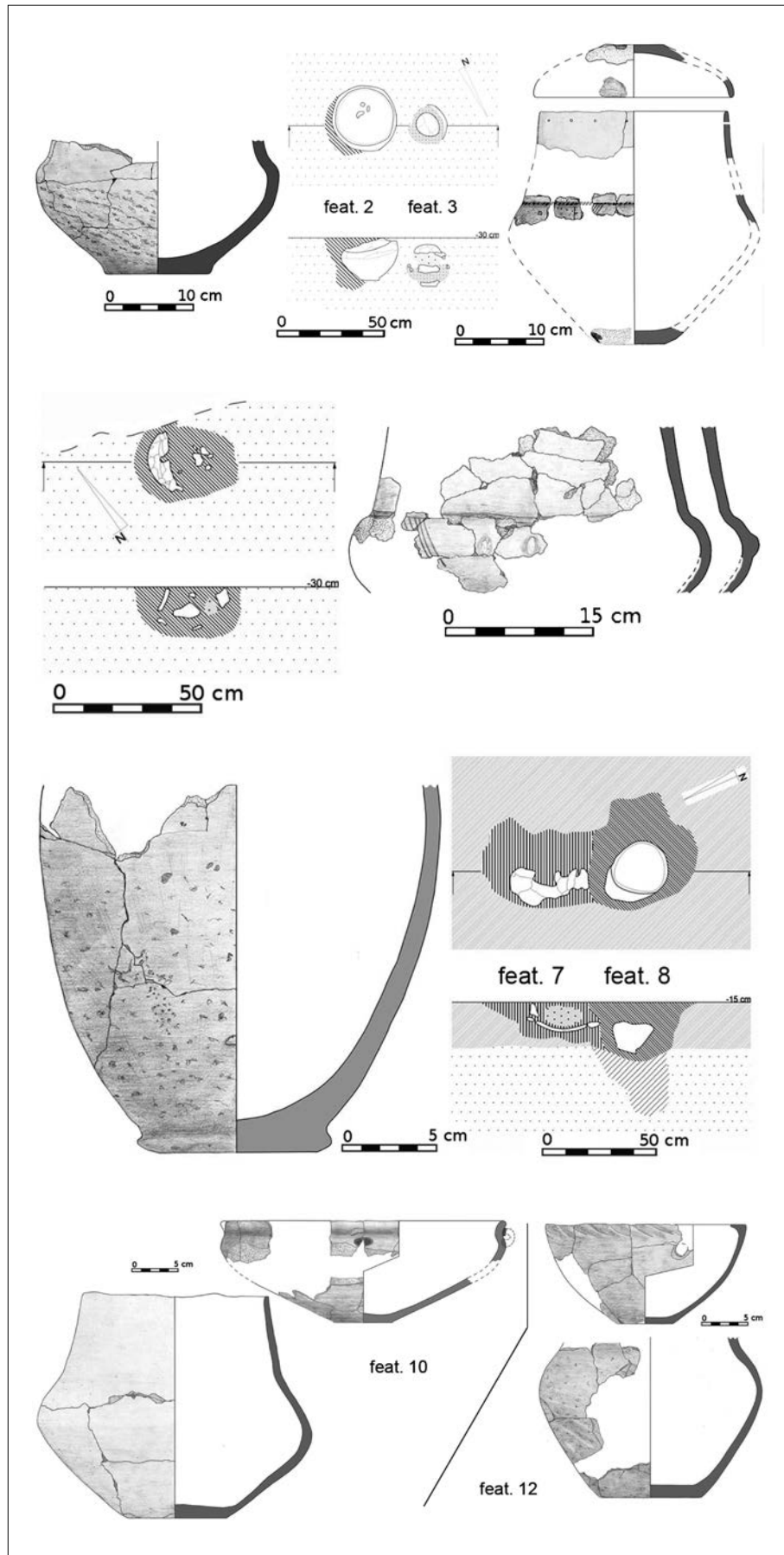


Fig. 5. Plans and stratigraphy of the analysed features with urn documentation: a. Features nos 2 and 3; b. Feature no. 5; c. Feature no. 8; d. Features nos 10 and 12 (only urns, see text for details) (drawing by P. Dziechciarz).

Tab. 2. Methods of determining the age and sex of the individuals within the individual burials.

| Feature no. | Age         | Method of age determination   | Sex | Method of sex determination  |
|-------------|-------------|---|-----|--|
| 2           | > 40 yo     | Cranial suture fusion <sup>a</sup>  | ?   | No diagnostic fragments  |
| 3           | > 45 yo     | Pubic symphysis scoring system (phase 5+); <sup>b</sup> cranial suture fusion <sup>a</sup>                      | m?  | Gracile and small mastoid process (score 2 – f); <sup>c</sup> blunt supraorbital margin (score 5 – m) <sup>c</sup> |
| 5           | > 45 yo (?) | Cranial suture fusion <sup>a</sup>  | ?   | No diagnostic fragments  |
| 8           | Adult       | General morphology of the bone  | ?   | No diagnostic fragments  |
| 10          | 35–40 yo    | Pubic symphysis scoring system (phase 4), <sup>d</sup> auricular surface scoring system (phase 5+) <sup>d</sup> | m   | Prominent supramastoid crest (m), <sup>c</sup> robust and large mastoid process (score 5 – m) <sup>c</sup>         |
| 12          | Adult       | General morphology of the bone  | m   | Blunt supraorbital margin (score 5 – m) <sup>c</sup>   |

<sup>a</sup> Meindl, Lovejoy 1985; after White *et al.* 2012, 392–393.

<sup>b</sup> Brooks, Suchey 1990; after White *et al.* 2012, 396–400.

<sup>c</sup> Walker 1994; after White *et al.* 2012, 396–400.

<sup>d</sup> Lovejoy *et al.* 1985; after White *et al.* 2012, 400–404.

<sup>e</sup> Rösing *et al.* 2007, 80.

## Methods

The analysis was carried out according to McKinley's method.<sup>11</sup> This way of describing cremated remains takes into account most of the proposals given in the literature, allowing for a rather detailed but relatively easy to apply analysis. According to the recommendations, the burned remains from the analysed features were sieved with a set of calibrated sieves with 10, 5, and 2 mm mesh, and then each fraction was separately weighed. This division allows for determining the degree of material fragmentation. The next stage of the analysis involved the separation of identifiable fragments within each fraction and dividing them according to the anatomical position into five groups: skull, torso,<sup>12</sup> upper limb, lower limb, and unidentifiable fragments. Fragments belonging to each group were then individually weighed on a scale with the accuracy of 0.5 g. This process was repeated separately for the remains from each of the analysed layers.

## Results

The collected data clearly shows that probably none of the analysed burials can be expected to represent all fragments of the skeletons of the cremated individuals,

as implied by the recorded weights. Modern data indicates that remains of an adult should weigh from 876 to over 5000 grams, with the ranges for females from 876 to 4000 g and males – 1865 to 5379.<sup>13</sup> Within the researched sample, only the remains from the features nos 2, 8, and 12 fall within the lower end of the observed weights for the cremated female skeleton, but the last one belongs to a male individual. The observations do not allow to specify whether the 'missing' fragments are the result of burial practices, taphonomic damage to the graves, or exploration. Nonetheless, the anatomical analysis shows that, with the exception of the feature no. 8, all the burials contain fragments belonging to each of the distinguished skeletal regions (Fig. 6). Compared to expected values based on the weights of dry bones and presented as a model,<sup>14</sup> it could be surmised that the burials are not exhibiting any indication of an intentional selection of the remains. According to the available data, it is difficult to speculate about the cause of the different composition of the feature no. 8, as even its total weight falls in the lower end of the analysed features, and its RAI (rate of anatomical identification – percentage of the identified elements within each of the features, Tab. 3)<sup>15</sup> shows medium identification rate.

<sup>11</sup> McKinley 1994, 5–6.

<sup>12</sup> The term 'torso' is used in the paper as an indication of skeletal fragments originating both from postcranial axial skeleton as well as pectoral and pelvic girdles. This way of differentiating the anatomical position of the elements follows the method proposed by McKinley (1994) and allows for distinguishing the

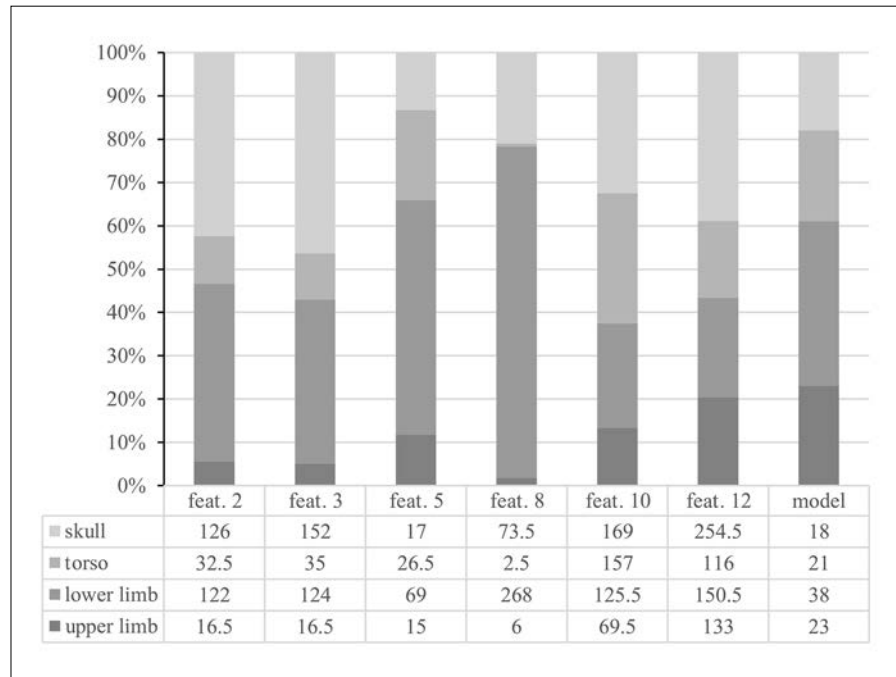
core of the body from the extremities, thus facilitating the interpretation of the heat-induced changes to the skeleton.

<sup>13</sup> Warren, Maples 1997; Bass, Jantz 2004.

<sup>14</sup> McKinley 1994, 6.

<sup>15</sup> Gonçalves 2012, 67.

Fig. 6. Ratio of the representation of different skeletal regions within each of the analysed features with information on the model data; the actual weights of the skeletal regions in grams are given in the graph's table (compiled by E. Jaskulska).



Tab. 3. The rate of anatomical identification (RAI) of each feature, calculated as the percentage of the identified elements to the total weight of the cremains analysed.

| Feature no. | Total weight of remains in grams | Total weight of identified fragments in grams | RAI  |
|-------------|----------------------------------|---|------|
| 2           | 978                              | 297   | 30.4 |
| 3           | 1442.5                           | 327.5   | 22.7 |
| 5           | 626.5                            | 127.5   | 20.4 |
| 8           | 837                              | 350   | 41.8 |
| 10          | 1188                             | 521   | 43.9 |
| 12          | 945                              | 654   | 69.2 |

The amount of anatomically recognised fragments for each of the features analysed is presented in Fig. 7.a–f. Though most of the burials have been described as damaged, some indication of order can be observed. In most of the urns, the topmost layers consist primarily of skull fragments, and this position is statistically significant as confirmed by Chi<sup>2</sup> test (Chi<sup>2</sup> = 43.968, df = 16, p < 0.001), so it is not coincidental. To interpret the spatial distribution as a result of a methodical gathering of the remains from the pyre site, the lowest layers should show the predominance of lower limb bones, and the results of the statistical analysis confirm the validity of this observation (Chi<sup>2</sup> = 28.635, df = 16, p = 0.027). Such a situation is clearly visible in the features nos 2 and 8, but the features nos 3 and 10 also show an inclination for a similar distribution (Fig. 7.a–e). The lesser amount of

fragments recovered from the feature no. 5, with low RAI value, makes the observation less valid (Tab. 3, Fig. 7.c).

The positions of the torso and upper limb are not easily interpreted, mostly due to the small amount of identified fragments. The statistical analysis shows that the distribution can be coincidental, especially in the case of the least numerous upper limb fragments (torso: Chi<sup>2</sup> = 18.75, df = 12, p = 0.095; upper limb: Chi<sup>2</sup> = 8.5, df = 8, p = 0.386). If the remains were gathered methodically, then bone fragments from both regions should be located in similar layers, most likely in-between skull and lower limb fragments. In the case of the feature no. 10, where the amount of torso and upper limb fragments was highest, the latter is distributed similarly to a lower limb through the lower layers, while an upper limb was found mostly in the middle of the urn (Fig. 7.e).

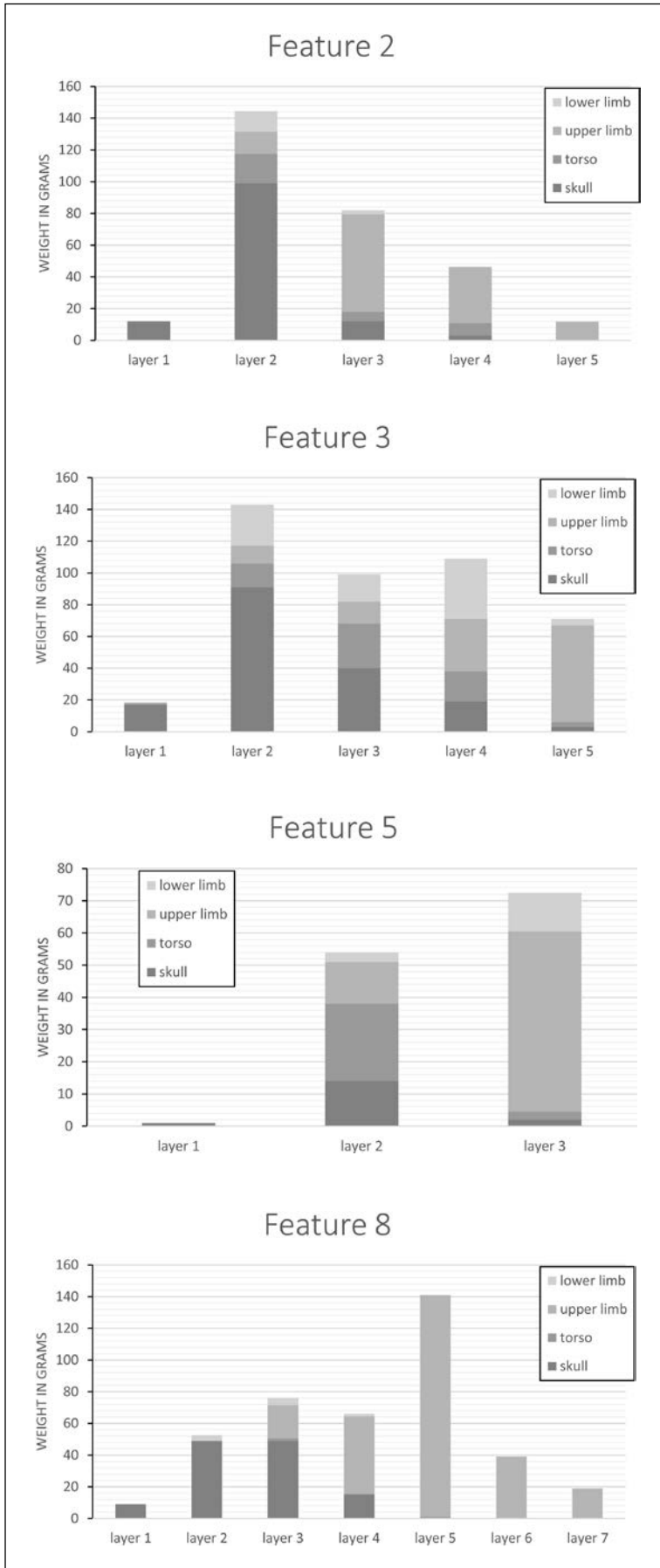


Fig. 7. Weights of fragments belonging to different skeletal regions within each of the excavation layers in the analysed features (compiled by E. Jaskulska).



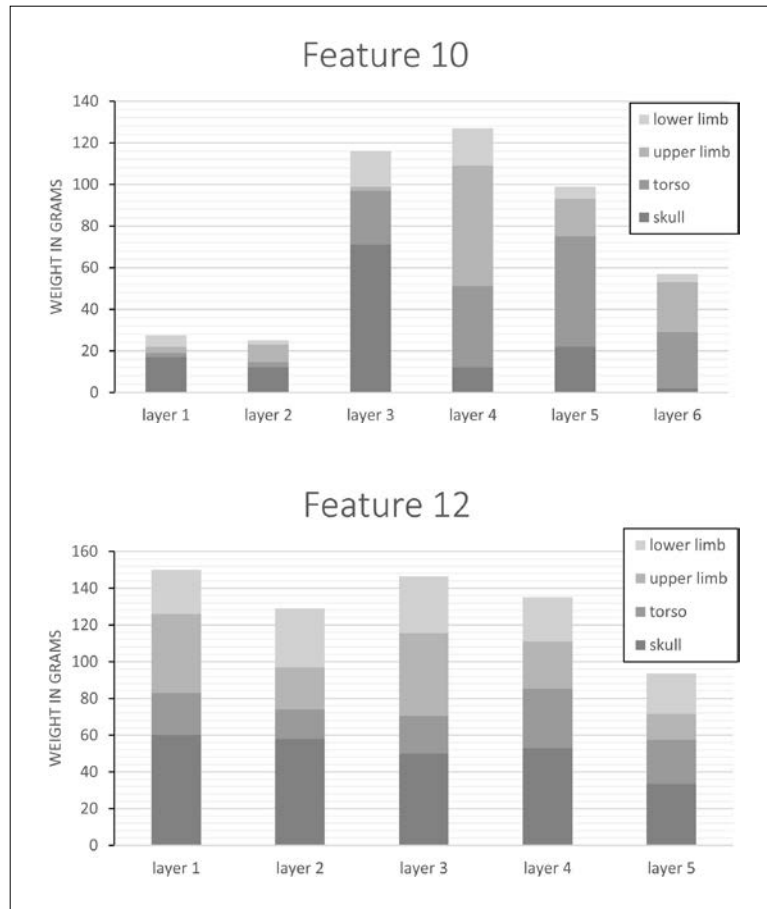


Fig. 7. cont.

The absence of any visible pattern in the spatial distribution of the fragments within the feature no. 12 is quite evident (Fig. 7.f). Each skeletal region is represented throughout all the layers in similar amounts, which could probably be interpreted as an indication of a lack of methodical gathering of the cremated remains from the pyre site unless the observation is a result of post inhumation damage, which in the case of the feature no. 12 was reported as significant.<sup>16</sup>

The position of the bone fragments within the urn could also result from the movement of the remains inside the vessel during the handling of the urn or post inhumation, due to microtremors of the surrounding soil. In this condition, it seems plausible to expect that the smallest fragments would move within the vessel, gathering in the lower part, while the largest elements would stay mostly in the original position, with their size impeding their movement. As lower limb fragments tend to be larger due to the durability and size of leg bones, this process could influence the observed position of the

fragments. To verify this hypothesis, the fragmentation of all the remains (including the unidentified fragments) within the layers has been analysed. The results are presented in the graphs in Fig. 8. The analysis does not confirm the hypothesis that the smallest fractions would gather in the lower part of the vessels in any of the analysed features, suggesting restricted movement of the remains, which should not affect the spatial distribution.

## Discussion

The proposed method allows for a relatively easy to achieve and comprehensible presentation of the spatial distribution of cremated fragments within an urn. The most interesting observation is the clear disparity of the burial described as the feature no. 12, where no indication of the different anatomical origin of the fragments has been observed between the layers. There are several possible explanations of the unique character of this burial. One of the most obvious could be the state

<sup>16</sup> Dziechciarz personal communication.

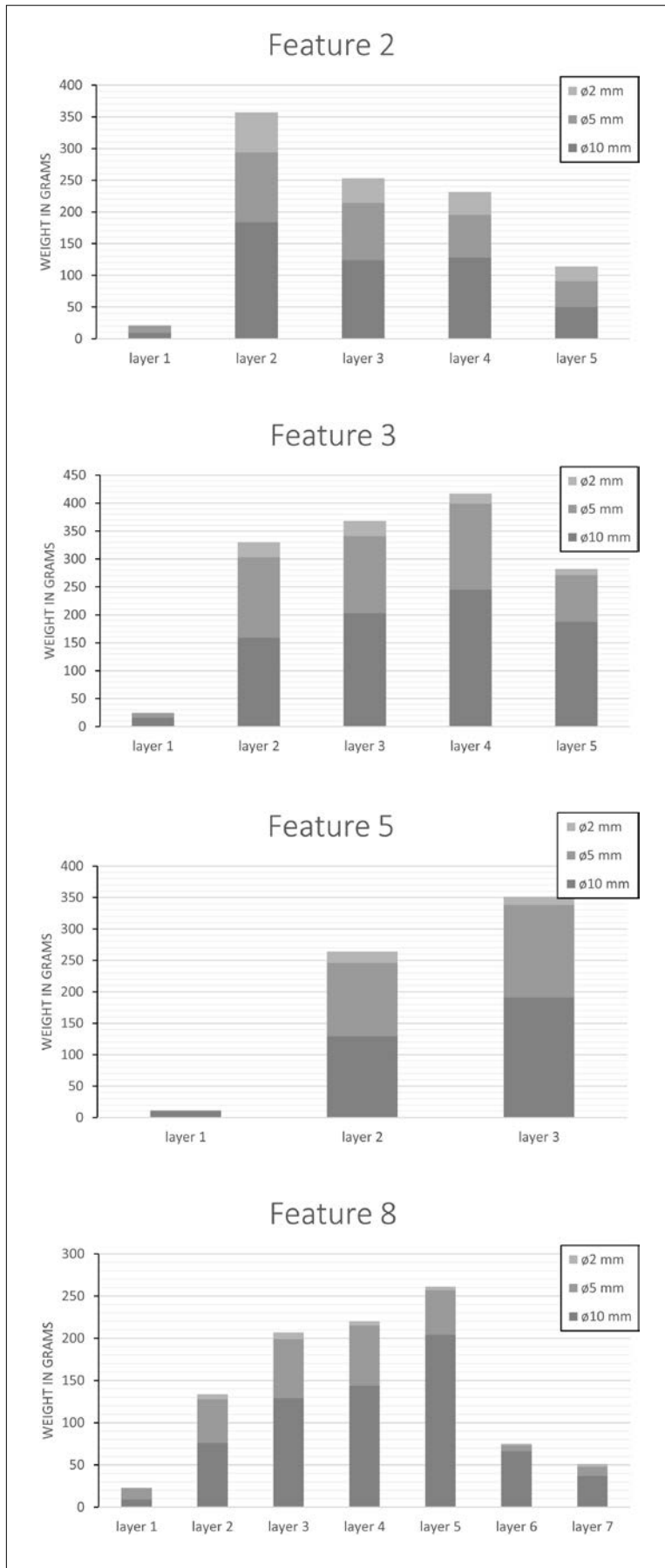


Fig. 8. Weights of bone fragment fractions within each of the excavation layers in the analysed features (compiled by E. Jaskulska).

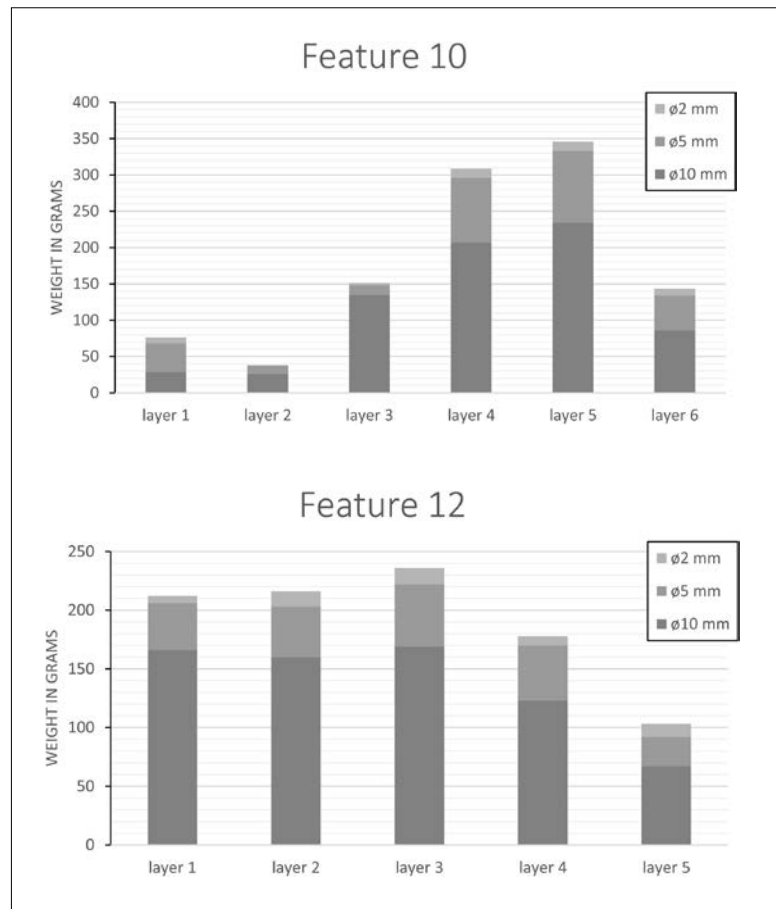


Fig. 8. cont.

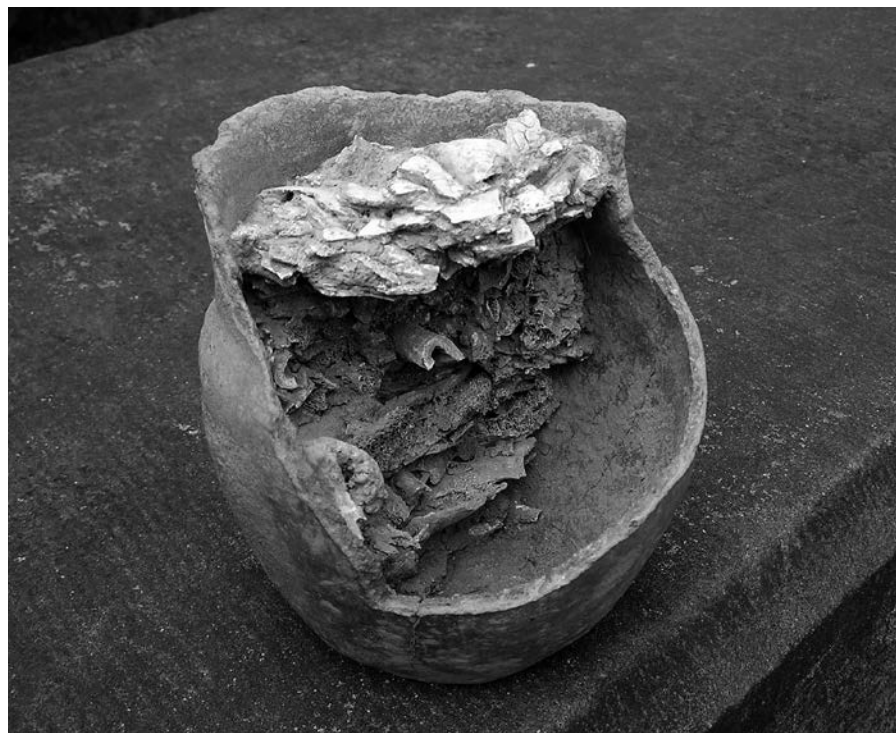


Fig. 9. Example of an invasive spatial analysis from Targowisko, sites 10 and 11 (from Wróbel 2014, 227, fig. 8).

of preservation, as the feature is described as coming from the mostly destroyed part of the cemetery, and the state of the find has not allowed for the documentation of the grave structures.<sup>17</sup> This assumption seems to be implausible as other analysed features present a similar level of damage, and even the neighbouring feature no. 10 differs in its layers' morphological composition (Figs 4, 7.e–f). Other possible explanations do not seem valid either: the proposed chronology, the amount of the remains, nor the biological profile of the individual vary significantly from the rest of the findings (see also Tab. 1).

A very interesting case is presented by the feature no. 3, which is described as heavily-damaged (Tab. 1) and is documented also in Fig. 5.a. Contrary to expectations, the spatial analysis of the remains shows some order between the layers (Fig. 7.b). This observation has been explained by Paweł Dziechciarz, who confirmed the destruction of the urn but indicated that the urn's fill remained largely intact, forming a visible *in situ* shape of the ceramic vessel.<sup>18</sup>

The present analysis seems to confirm the value of the proposed method in providing quantitative data describing the spatial distribution of the remains within the urn, allowing for implementing the statistical analysis in order to determine the probability of the observation. It should be noted that this type of information is also easy to gather without relying on a much more invasive methodology involving the destruction of the artefacts,

an example of which is presented in Fig. 9. An alternative approach has also been implemented in research, where the spatial observation was based on the localisation of each of the available fragments in a three-dimensional space, either through a non-invasive method, like CT scanning,<sup>19</sup> or during excavations through 3D scanning or photogrammetry, allowing for further statistical analysis of the position of each bone fragment.<sup>20</sup> The method proposed here does not require additional instruments and produces a description in the form of patterns facilitating a comparison of data coming from different sources.

## Conclusions

The present analysis has not provided clear information whether the observed patterns of spatial distribution indicate any ritual practices, as the number of the investigated features is too low for generalisation. Further research on the site can answer the question whether the lack of any order within the feature no. 12 is a unique or at least uncommon trait within the burials on the site. If the documented pattern is repeated in further observations, the argument for the intentional placement of the different skeletal parts within the urn will be confirmed, allowing for further investigation whether the process can be used for reconstruction of funerary rite of the Lusatian Culture.

## Bibliography:

- Bass W.M., Jantz R.L. 2004 Cremation weights in east Tennessee, *Journal of Forensic Sciences* 49(5), 901–904.
- Deforce K., Haneca K. 2011 Ashes to ashes. Fuelwood selection in Roman cremation rituals in northern Gaul, *Journal of Archaeological Science* 39(5), 1338–1348.
- Duday H., Guillon M. 2006 Understanding the circumstances of decomposition when the body is skeletonized, (in:) A. Schmitt, E. Cunha, J. Pinheiro (eds), *Forensic Anthropology and Medicine*, Totowa, 117–157.
- Durczewski D. 1959 Kilka grobów z cmentarzyska kultury pomorskiej w Ostrowie Wielkopolskim, *Przegląd Archeologiczny* 12, 137–144.
- Dziechciarz P. 2015 *Materiały z cmentarzyska kultury lużyckiej w Podlesiu, pow. Staszów z sezonu 2014*, unpublished BA thesis, University of Warsaw.
- Gonçalves D.M. da Silveira 2012 *Cremains. The Value of Quantitative Analysis for the Bioanthropological Research of Burned Human Skeletal Remains*, unpublished PhD thesis, University of Coimbra, online: [https://www.academia.edu/attachments/30205381/download\\_file?st=MTUINDY0MDM4OSw5NS40OS4xMDkuMTQsNDE5ODQ4Nw%3D%3D&cs=swp-toolbar](https://www.academia.edu/attachments/30205381/download_file?st=MTUINDY0MDM4OSw5NS40OS4xMDkuMTQsNDE5ODQ4Nw%3D%3D&cs=swp-toolbar), accessed 16.05.2013.
- Harvig L., Lynnerup N., Ebsen J.A. 2012 Computed tomography and computed radiography of late Bronze Age cremation urns from Denmark: an interdisciplinary attempt to develop methods applied in bioarchaeological cremation research, *Archaeometry* 54, 369–387.

<sup>17</sup> Dziechciarz 2015, 18.

<sup>18</sup> Dziechciarz 2015, 18.

<sup>19</sup> Harvig *et al.* 2012.

<sup>20</sup> Pankowská *et al.* 2017.

- McKinley J.I. 1994 The Anglo-Saxon cemetery at Spong Hill, North Elmham, pt. VIII: the cremations, *Anglian Archaeology Report* 69.
- McKinley J.I. 2017 Compiling a skeletal inventory: cremated bone, (in:) P.D. Mitchell, M. Brickley (eds), *Updated Guidelines to the Standards for Recording Human Remains*, Reading, 14–19.
- Noy D. 2000 'Half-burnt on an emergency pyre': Roman cremations which went wrong, *Greece & Rome* 47(2), 186–196.
- Pankowská A., Spěváčková P., Kašparová H., Šneberger J. 2017 Taphonomy of Burnt Burials: Spatial Analysis of Bone Fragments in Their Secondary Deposition, *International Journal of Osteoarchaeology* 27(2), 143–154.
- Piontek J. 1976 Wyniki badań przepalonych szczątków kostnych z cmentarzyska kurhanowego ludności kultury pomorskiej w Marcinowie, woj. Zielona Góra, *Sprawozdania Archeologiczne* XXVIII, 197–202.
- Pyżuk M. 2004 Antropologiczna interpretacja szczątków kostnych populacji kultur przeworskiej i wielbarskiej z Kołozębia, pow. Płońsk, *Archeologia Polski* XLIX, 33–48.
- Rösing F.W., Graw M., Marré B., Ritz-Timme S., Rothschild M.A., Röttscher K., Schmeling A., Schröder I., Geserick G. 2007 Recommendations for the forensic diagnosis of sex and age from skeletons, *HOMO – Journal of Comparative Human Biology* 58(1), 75–89.
- Warren M.W., Maples W.R. 1997 The anthropometry of contemporary commercial cremation, *Journal of Forensic Sciences* 42(3), 417–423.
- White T.D., Black M.T., Folkens P.A. 2011 *Human Osteology*, London.
- Wróbel J. 2014 Analiza antropologiczna cmentarzyska ciałopalnego z Targowiska, stan. 10 i 11, pow. wielicki, (in:) A. Zastawny (ed.), *Via Archaeologica. Źródła z badań wykopaliskowych na trasie autostrady A4 w Małopolsce*, Vol. 8, Kraków, 221–229.