Sarunas MILISAUSKAS, Janusz KRUK
Marie-Lorraine PIPES, Elżbieta HADUCH

NEOLITHIC HUMAN BURIAL PRACTICES

the interpretation of funerary behaviors at Bronocice, Poland

INSTITUTE OF ARCHAEOLOGY AND ETHNOLOGY
Polish Academy of Sciences

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INTRODUCTION

CHAPTER 1

Introduction

Sarunas Milisauskas, Janusz Kruk and Marie-Lorraine Pipes

This book presents the results of the analyses of Funnel Beaker, Lublin-Volhynian, Funnel Beaker-Baden, and Corded Ware burial data from Bronocice, Poland. In addition, we describe the single burials from Olszanica, Dziekanowice and Michałowice. At the site of Bronocice a cemetery was located containing several burials as well as a vast settlement in which isolated burials, skulls and partial human remains were also encountered. All of these lived and died during the 1200 years span the site was occupied and frequented. Each individual is worthy of attention and tells a complex story derived in part from its skeletal remains, burial or depositional context, or its cultural association.

The archaeological record is rich and diverse in southeastern Poland. Large-scale excavations and regional surveys such as at Bronocice, were conducted in this region producing the kind of data that archaeologists need to investigate a variety of questions concerning culture change and process. The archaeological contributions of the Bronocice excavations have been described in numerous publications previously (Bakker *et al.* 1999, Haduch 2004, Hensel and Milisauskas 1985, Kruk and Milisauskas 1981a, 1981b, 1983, 1985, Kruk *et al.* 1996, Milisauskas and Kruk 1982, 1984, 1989, 1991, Milisauskas 2015, Milisauskas *et al.* 1993, Milisauskas *et al.* 2004, Milisauskas *et al.* 2012, Pipes *et al.* 2009, 2010, Pipes *et al.* 2014, 2015, Szostek *et al.* 2014). However, this is the first comprehensive examination of the burial remains from the site. Using multiple lines of evidence, including traditional forensic methods of analysis and isotopic and material culture studies, the results are interpreted in social and political contexts. Burial practices and funerary behaviors are examined in the greater context of central European cultures. The data include not only burials but also household pits in which fragmented human remains were analyzed. Floral, faunal, and a range of artifacts are discussed in terms of relevance to daily activities and significance in burial practice.

Burial practices varied greatly in prehistory. Differences in the mortuary patterns at many sites throughout central Europe can be correlated with culture, time and space. The deceased may be buried in cemeteries, in settlements between houses, and under house floors. Differences in burial preparation varied greatly, ranging from simple holes in the ground to interments under superstructures and the offering of grave goods, food offerings, and body adornments. Archaeologists often describe graves as "rich" or "poor", according to the quantity and arrangement of artifacts and the effort required to prepare the grave. At Bronocice, the majority of burials were 'poor' since they consisted mainly of Funnel Beaker dead.

Social customs can be derived at by considering such information as the elaboration of the burial site, the inclusion of food offerings and grave goods, the layout of the body, biological data, and personal possessions. It is assumed that these phenomena reflect the care of the living for the dead and say something about the person's status or value to the community. It is evident that living people determine how the deceased person is treated after death. Some living persons may view the dead individual as a major loss to society while to others his or her death would be considered as a blessing (Parker Pearson 1999).

The dead at Bronocice were frequently located in groups of two and three single burials, closely spaced and similarly oriented. The placement of burials relative to one another may represent social relationships, most probably family ties during this period, although other relationships may be reflected as well.

The book is broken into four sections each of which contains chapters that are grouped together by general topic. Part I describes the archaeological investigations at Bronocice, the occupational sequence and cultural chronology of the site, ceramic and lithic artifacts found in graves, an overview of the major cultures identified, and a summary of the burials revered and their cultural affiliations. Part II presents the results of the forensic analysis of the skeletal remains. Each of the burials is described in terms of skeletal elements, age at death, stature, sex, unique physical traits and ante-mortem modifications due to trauma. One chapter discusses the structure of the burial population in terms of sex, age and stature. The last chapter in this section focuses on health, diseases and injuries observed among the dead. Part III is a collection of articles that describe the artifacts and other materials recovered in association with the burials. One article focuses on the botanical evidence. Another examines the range of bone objects and their distribution within and outside burials. A distinct cultural patterning was apparent in the distribution of bone tools, worked bone and jewelry with regard to their use and deposition in and out of human burials. Therefore, we included a comparative analysis of the distribution of bone tools and jewelry from all contexts including those lacking human remains. Part IV departs from data driven descriptions and observations and ponders the social meaning embedded in the burials from Bronocice. One chapter considers burial practices over time, the importance of agents and their actions. The last chapter discusses patterning and variability observed at Bronocice within a regional context. Two articles are in the Appendix, trace element analysis and Oxygen isotopic composition of individuals buried in a Neolithic collective grave at Bronocice – weaning stress reconstruction and identification of origin.

PART I

The Cultural Sequence of Bronocice

(The Cultural)

CHAPTER 2

Funnel Beaker, Lublin-Volhynian, Funnel Beaker-Baden and Corded Ware Cultures

Sarunas Milisauskas and Janusz Kruk

The site of Bronocice is complex in many ways not the least of which is the presence of remains generated by several Neolithic cultural groups including Funnel Beaker, Lublin-Volhynian, Funnel Beaker-Baden, and Corded Ware. This chapter provides a brief overview of these archaeological cultures associated with human burials found at Bronocice.

The earliest cultural remains found at Bronocice were Funnel Beaker. This culture, also known in the literature as Trichterbecher or TRB, was distributed from the Netherlands to northwestern Ukraine and from Sweden to Slovakia (Figure 1). It is divided into five regional groups: western, northern, southern, eastern and southeastern; of which the last three are represented in Poland (Behrens 1959). It has been suggested that the earliest Funnel Beaker beakers originated from Late Mesolithic pottery types in Denmark, northern Germany and northern Poland between 4200 and 3900 BC (Czekaj-Zastawny *et al.* 2013). The earliest Funnel Beaker occupation in southeastern Poland dates around 3800-3700 BC (Włodarczak 2006). In Scandinavia it is the earliest Neolithic or farming culture. Whereas in central, eastern and southern Poland, Linear Pottery was the

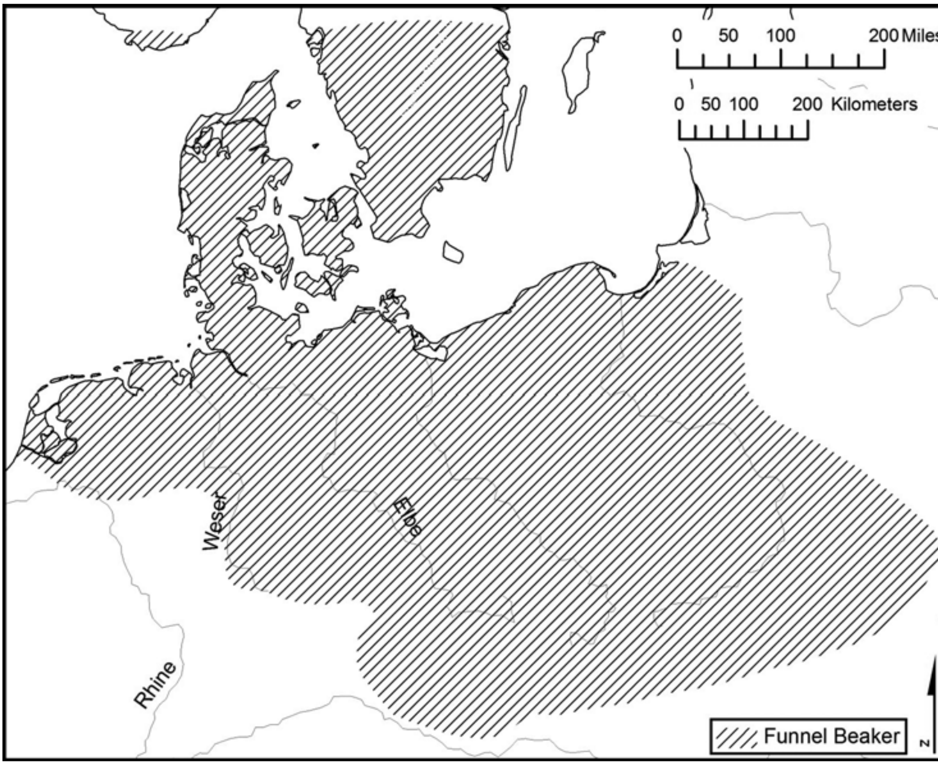

Figure 1. Distribution of Funnel Beaker sites
(After Jażdżewski 1936; Bakker, Vogel and Wiślański 1969, with modifications)

first farming culture appearing around 5500 BC, thus preceding Funnel Beaker occupation by some 1300 years (Milisauskas and Kruk 2011).

Certain ceramic pots such as beakers with funnels are distinctive of Funnel Beaker material culture. Within the large territory associated with Funnel Beaker culture there are apparent differences from the beginning in the material culture of different regional groups. For example, in western and northern Europe Funnel Beaker people constructed megalithic monuments of large stones with internal chambers (Bakker 1992, Midgley 1992, 2005, Müller 2011, Larsson *et al.* 2014), whereas in northwestern Poland, elongated Funnel Beaker burial mounds occur but of earthen construction, e.g., at Sarnowo (Jażdżewski 1936, Chmielewski 1952, Rzepecki

2006) (Figure 2). No large stone structures with burial chambers are found in the southeastern region of this culture (Libera and Tunia 2006, Tunia 2006, Kadrow 2011, Kröl 2011). Still, there are megalithic type stone constructions such as at Staszów, where a stone burial pavement was enclosed by stone embankments (Garbacz 2006). The two stone embankments measured 3.5 x 5 meters in tomb I and 3 x 4.5 meters in tomb II. The megalithic structures in southeastern Poland vary in construction, but are predominantly represented by long tombs with earthen mounds, sometimes cover over stone pavements, but they do not have chambers (Kruk 2006, Kadrow 2011). The mounds found at Słonowice lacked internal divisions (Figures 3 and 4) (Tunia 2006). Clearly the Funnel Beaker people in southeastern Poland were familiar with the megalithic tradition. Unfortunately through time these structures were more subject to destruction than constructions of stones weighing thousands of kilograms. Funnel Beaker burial remains have been found at 53 sites in southeastern

Figure 2. An elongated Funnel Beaker burial mound at Sarnowo Poland (Photo S. Milisauskas)

Poland, of which eighteen have megalithic structures. A total of four hundred fourteen burials were recovered from these sites. The Funnel Beaker people were buried in a variety of settings including settlement pits, cemeteries, and megalithic constructions, and most were buried on their backs in an extended position (Kadrow 2011).

There are four Funnel Beaker zones in the loess lands of southeastern Poland, including Kraków, Sandomierz, Lublin, and Volhynian, each with three occupational phases, I, II, III (Burchard *et al.* 1991). Bronocice phase 1 probably belongs to the earliest occupation. Numerous large settlements such as Ćmielów, Bronocice, Gródek Nadbużny, and Stryczowice, belong to phase II or the classic phase 3800-3400 BC. Smaller sites are also associated with this phase, such as Niedźwiedź, Zawarża, Kraków-Mogiła 62 and Klementowice. Phase III or the late Funnel Beaker phase, 3400-2900 BC, is distinguished from the previous phase by ceramic ornamentation in the Cracow and Volhynian loess lands, although economic and settlement organization were similar to those of Phase II.

Funnel Beaker people extensively exploited the uplands in the Bronocice region. The expansion into uplands led to more extensive clearing of forests and may have been associated with an increased emphasis on slash and burn farming and the herding of animals (Kruk 1980). Analysis of the Funnel Beaker settlement system indicates the appearance of ranked societies in southeastern Poland by 3700 BC. Milisauskas and Kruk (1984b) conducted a rank-size distribution analysis of the settlement system in the Bronocice region. Based on the results they demonstrated the existence of a settlement hierarchy which confirmed that Funnel Beaker was a ranked society. These ranked, kin-organized societies may well have been short-lived and unstable political formations. However, the extensive nature of the regional settlements and the great length of time they existed argue for a stable political structure.

An exchange system between Funnel Beaker communities in southeastern Poland is apparent based on non-local artifacts, especially flint products. Out of 384 Funnel Beaker burials in southeastern Poland, 19% had flint artifacts (Libera and Zakościelna 2006). A variety artifacts made of local and non-local flint was found at Bronocice, their density in pits varied from one to over 5000 pieces. The majority of artifacts were made of local Jurassic flint, but Świeciechów, banded, chocolate, Volhynian, and Baltic erratic flint were also utilized. The non-local flints are the end product of an extensive exchange system. For example, the source of the Volhynian flint is located over 250 kilometers to the east. The presence of cores, hammerstones, flakes, and chips indicate that some tools were produced at the site. Retouched flakes, retouched blades, endscrapers and axes were the most frequently recovered tool types.

The appearance of wheeled vehicles throughout most of Europe, including areas occupied by Funnel Beaker between 3500 and 3000 BC, marks a major socioeconomic development (Bakker *et al.* 1999, Sherratt 2006). Most of our data on wagons come from central, eastern and northern Europe (Piggott 1983, Höneisen 1989, Bakker 2004, Burmeister 2004, Schlichtherle 2004, Čufar *et al.* 2010).

There are three, possibly four, pieces of indirect evidence for the presence of four-wheeled wagons at Bronocice that include an incised ceramic vessel, a cattle horncore and a stone-lined ramp (Milisauskas and Kruk 1982; Bakker *et al.* 1999). An incised wagon motif was found on a Funnel Beaker vessel in a pit (Figure 5). An animal bone associated with the pot in the pit was dated by radiocarbon method, around 3400 BC (Bakker *et al.* 1999). The vessel represents one of the earliest pieces of evidence for the presence of wheeled wagons in Europe. The vessel measures 10.5 cm high and is incised with designs representing four symbolic themes (Figure 5). The wagon motif appears five times around the vessel. In addition, there are incisions that appear to represent trees, fields, and water. The motifs are probably a visual representation of the surrounding landscape and incorporate everyday activities and beliefs of a Funnel Beaker community.

Günther (1990) and Pollex (1999) see a more religious symbolism in the incised motifs. One of the motifs may represent a sun symbol; supposedly the "sun wagon" was pulled by cattle. The cult of the sun was epitomized in the Greek god Apollo who drove the sun in his chariot across the sky every day. Likewise Malecki (1995) emphasizes the religious and astronomic function of the incised motifs. Some of the motifs on Neolithic (Copper Age) carvings found on the rocks at Val Camonica in Italy are similar to those on the Bronocice vessel.

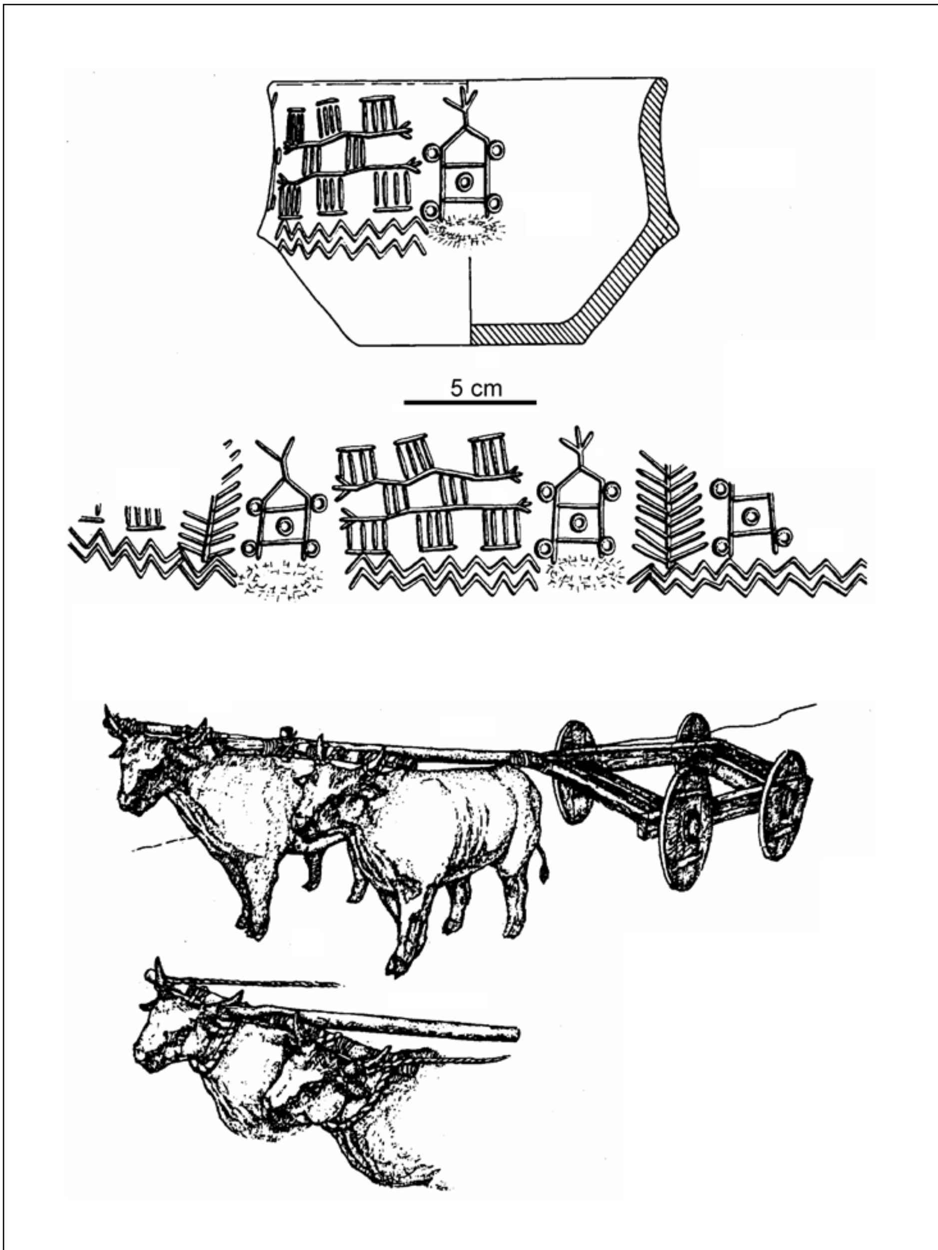

Figure 5. Motifs inscribed on the Bronocice vessel (top) and reconstructed illustration of oxen pulling a wagon

Figure 3. Funnel Beaker burial mounds at Słonowice, southeastern Poland (Courtesy of K. Tunia)

Figure 4. Aerial photo of the cemetery at Słonowice (Courtesy of K. Tunia)

Figure 7. Stone-lined ramp in Unit A3

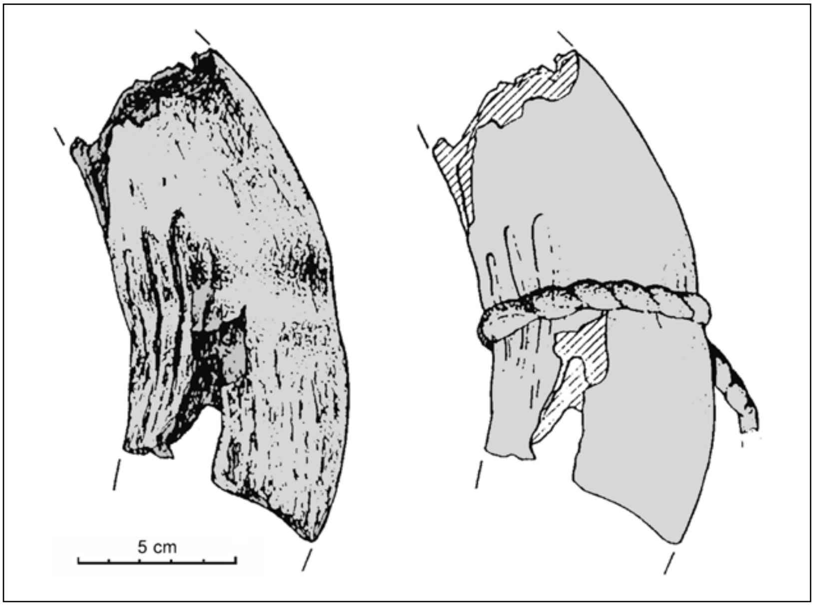

Figure 6. Cattle horncore with the impression of a rope from Bronocice

Bronocice also yielded a cord impression on a bovine horncore dated around 3100-2900 BC (Milisauskas and Kruk 1991). The part of the horn-core where the cord was tied measures 6.5 cm in diameter (Figure 6). This suggests that oxen were used for pulling plows and wagons, since they made up approximately 20-25% of the cattle recovered from that site. Oxen were already being castrated in the Early Neolithic and their use as Middle Neolithic draft animals should cause no surprise (Ghetie and Mateesco 1973; Döhle 1994). They can start working as draft animals at 3 or 4 years of age (Higham 1968: 87). Ox-carts are slow, traveling at no more than 2 km per hour (Evers 1988). Bogucki (1993) argued that cattle were used for pulling logs and firewood for households since the Early Neolithic.

Another piece of circumstantial evidence is a stone paved ramp from found in Unit A3 at Bronocice. The ramp appears to descend towards the lower level of barn basement. This was the only stone-lined feature at the site (Figure 7). The final piece of indirect evidence involves the burial complex of a high status female in Unit C5. Her remains were located near what appears to be the outline of an ox yoke seen in the wall profile of the excavation (Burial XX) (See chapter 15).

The second culture to appear at Bronocice was Lublin-Volhynian. It is found in north-western Ukraine and southeastern Poland, roughly from the Horyń (Goryn) River in the east to the Nidzica River in the west. This culture is also known by different names in the archaeological literature: including White Painted Pottery culture, Volhynian-Lublin Painted Pottery culture and Zimne-Złota culture. It existed from 4300/4200 to 3700/3600 BC. Bronocice is situated at the most western-most edge of this culture's territory. Lublin-Volhynian was the first Neolithic culture to have an extensive copper artifact production in southeastern Poland. In rare cases copper artifacts have been found in Funnel Beaker burials such as at the site of Szarbia (Baczyńska 1984).

Lublin-Volhynian sites were usually located on the loess soils; some were enclosed by ditches. The enclosed sites may have served a combination of needs including defense, enclosing animals and ritual activities. At Bronocice, the Lublin-Volhynian settlement was enclosed by an oval ditch, 168 by 210 meters, earthen embankment and a palisade. The total enclosed area was 2.4 hectares. The depth of the ditch was 2.2-2.9 meters and its width 1-2 meters.

Lublin-Volhynian burials have been found at 56 sites most of which are individual burials (Zakościelna 2009, Zakościelna *et al.* 2009). Fifteen small cemeteries have been found, with the number of burials in them ranging from 3 to 7. The deceased individuals were buried in pits dug for that purpose and not placed in trash pits.

The Lublin-Volhynian occupation lasted 1 or 2 generations. They were succeeded by another Funnel Beaker occupation that lasted until ca 3300 BC. However, around 3300 BC Funnel Beaker ceramics at Bronocice began to incorporate Baden stylistic motifs which indicates a growing influence from the west and south. Zastawny (2015) refers to this phenomena as "Badenization". The Baden culture or the Baden Complex sites are found in Austria, Slovakia, Hungary, northwestern Romania, the Czech Republic (Figure 8) and southern Poland, and they date from 3500 BC to 2800 BC (Horváth *et al.* 2008). In Furholt, Szmyt and A Zastawny's (2008) edited book, *The Baden Complex and the Outside World,*

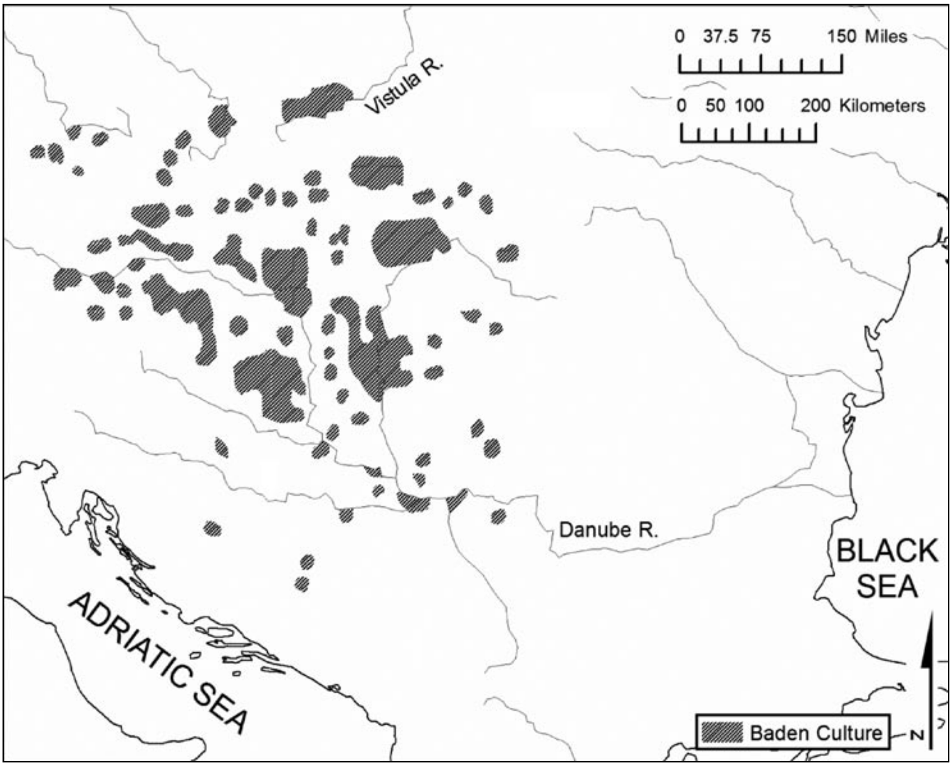

Figure 8. Distribution of Baden culture sites (after Sochacki 1970)

the the Baden Complex is dated from 3600 to 2900 BC. The Baden sites in the Kraków region of southeastern Poland belong to the so-called Zesławice-Pleszów and Mogiła groups of the Baden culture (Sochacki 1970, Zastawny 1999, 2008).

Furholt and Machnik (2006) date the Baden cultural presence in the Kraków area around 3050-2900 B.C. These dates would correlate with the Funnel Beaker-Baden Phase 6 occupation at Bronocice. In 2008, Furholt argued that Baden culture does not exist and that only the early Baden ceramic style spreads over parts of central and southeastern Europe. This raises a question about the appearance of Baden motifs at Bronocice, as to whether it represents the spread of a ceramic style or the actual presence of the Baden people. The isotopic analysis of some skeletons from burials in-

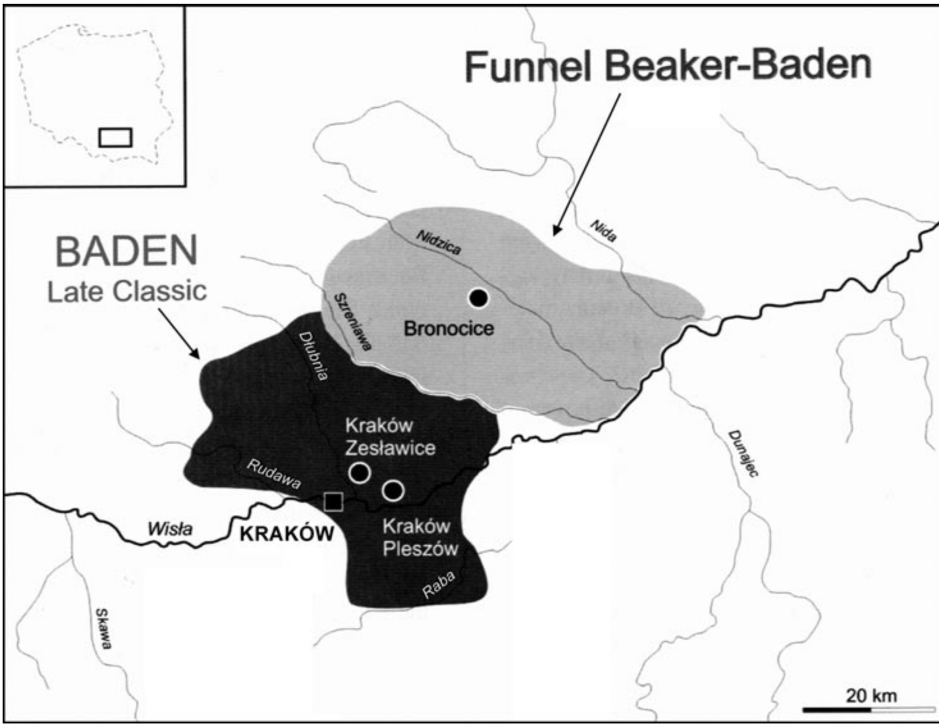

Figure 9. Baden and Funnel Beaker-Baden occupations in southeastern Poland (after Zastawny 2015 with modifications)

dicates that some individuals at Bronocice were of non-local origin (See Szostek *et al.* in the Appendix B). Baden culture sites are found around Kraków but not in the Bronocice region (Figure 9). It is likely the Baden ceramic style spread in some regions and in other areas people brought the ceramic style with them. At Bronocice and the adjacent regions, 35 sites show the evidence of "Badenization" of the ceramic assemblages (Zastawny 2015).

The final sequential Neolithic occupation at Bronocice was revealed at by a single Corded Ware burial. Another cultural group, Trzciniec of the Bronze Age, settled in the area around 1800 BC but no graves or human remains were found. The origin, economy, and ethnic affiliations of the Corded Ware culture have intrigued many European archaeologists. Corded Ware culture was widely distributed across central and northern

Europe, extending from the Rhine to the Upper Volga River, from Finland to the Alps and the Carpathians (Figure 10). It includes many local cultures such as the Swiss and Saxon-Thuringian, Single Grave culture, the Swedish Boat-Axe, the Finnish, and East Baltic Bay Coast (*Rzucewo, Haffküste*) culture, and the southeastern Polish and Middle Dnepr, Fatianovo culture. The entire complex occupied mostly the northern part of the deciduous forest zone. This culture plays a major role in explanations of late Neolithic socioeconomic changes. Many years ago Gimbutas (1956) and Childe (1926) suggested that the Corded Ware culture originated in the steppe regions of eastern Europe. Gimbutas also associated the Corded Ware culture with the appearance of male dominated cultures.

Around 2900-2800 BC the earliest Corded Ware pottery and burials appeared in the Carpathian foothills (southeastern Poland), suggesting to

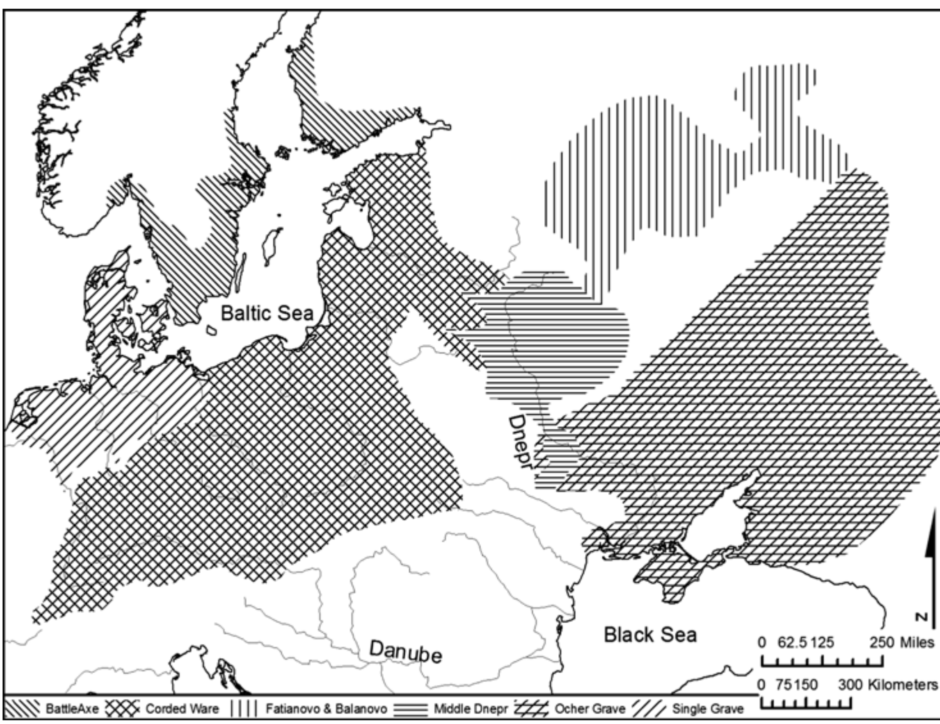

Figure 10. Corded Ware groups

some the intrusion of a new people into those regions (Machnik 1979). Similar developments are noted by Rimantienė (1992, 1996) in the East Baltic area and by Kristiansen (1989) in Denmark. Corded Ware burial mounds, seasonal camps and, much rarer, permanent settlements are known. The mortuary practices of the Corded Ware peoples are reflected by burial mounds and flat graves, i.e., without mounds. Originally, some of the flat graves probably had mounds, which were destroyed by subsequent farming activity. Some Corded Ware people were buried in pits dug into the ground with a mound of dirt piled up above the burial pit. Most frequently a grave contains a single skeleton in a contracted position. A Corded Ware non-mound burial was found at Bronocice and it is dated to around 2600-2500 BC. Given the richness of the grave is seems likely it was covered by a mound, possibly destroyed by later farmers.

The builders of Corded Ware mounds emphasized their location in the landscape by selecting the highest local elevations, standing as monuments to the dead and as symbols of death rituals for many years. They could have also symbolized territoriality or a group's claim to a landscape or the high social status of the dead.

In the Bronocice region, mounds were often surrounded by flat graves; a small necropolis typically held on average the remains of five individuals. However, the grave at Bronocice was alone. Assuming a life expectancy of twenty-five years, we estimate that 1500 individuals were buried in the 300 Corded Ware cemeteries in the region over a period of half-a-millennium. Applying the formula used by Acsádi and Nemeskéri (1970), we estimate a Corded Ware population of 125 people in the Bronocice region at any one time.

It is believed that the probable pastoral economies of some Late Neolithic cultures such as Corded Ware predisposed them to warfare. The numerous battle-axes recovered in their graves are cited in support of this notion. The battle-axe is a weapon and not a tool for chopping wood or other domestic activities. Vandkilde (2006) and Westermann (2007) suggest that the corded beakers and the shafthole axes found in Corded Ware male burials denote male identity. They assume that drinking rituals were practiced by warriors. Perhaps high ranking Corded Ware males were organized into warrior clubs (Vandkilde 2007: 68). The skeletons found in four Corded Ware burials at Eulau in Saxony-Anhalt, Germany, are evidence of violence or warfare around 2500-2400 BC (Haak *et al.* 2008). Thirteen individuals were killed; some of them were killed by blows on their heads or flint arrowheads.

In summary, burials found at Bronocice spanned 1200 years of occupation and several distinct cultures.

CHAPTER 3

Excavations at Bronocice

Janusz Kruk and Sarunas Milisauskas

Between 1967 and 1978, the Institute of the History of Material Culture Polish Academy of Sciences and the State University of New York at Buffalo conducted a program of archaeological excavation of Neolithic and Early Bronze Age sites in southeastern Poland. During the 1967-1969 field seasons the participating American institution was the University of Michigan. Large-scale excavations were conducted at Bronocice, Iwanowice, Niedźwiedź and Olszanica. Small-scale excavations were carried out Dziekanowice, Giebułtów, Kobylniki, Marcinów, Michałowice and Szarbia.

The Director and Principal Polish Investigator of this cooperative project was Witold Hensel and the Principal American Investigator was Sarunas Milisauskas. Jan Machnik, Janusz Kruk and Sarunas Milisauskas were the field directors. The financial support for this project was provided by the Smithsonian Institution, and the National Science Foundation. The objectives of this archaeological project were twofold: 1) to investigate the prehistoric environment, chronology, economy, settlement system, and social organization of the Middle Neolithic (TRB or Funnel Beaker culture) and Late Neolithic (Funnel Beaker-Baden) communities, and 2) to explore the origin of complex societies in the Nidzica River basin, southeastern Poland (Milisauskas and Kruk 1993).

The first steps for initiating the archaeological cooperative field project between the University of Michigan and later State University of New York at Buffalo and the Institute of the History of Material Culture (IHKM), Polish Academy of Sciences, were taken in the fall of 1965. The actual field work began with surveys of the Early Neolithic sites in 1966 by Sarunas Milisauskas, Janusz Kruk and Jan Machnik and ended with the survey of the western part of the Olszanica region in 1985. Initially, American and Polish archaeologists excavated individual Neolithic and Bronze Age sites of Michałowice, Dziekanowice, Olszanica, Iwanowice, and Niedźwiedź (Kruk 1969a, Kruk 1969b, Burchard 1977, Kadrow 1991, Kadrow and Machnikowie 1992, Machnikowie and Kaczanowski 1987, Milisauskas 1986, Hensel and Milisauskas 1985). Later American and Polish archaeologists jointly conducted a regional archaeological project in the Bronocice region of southeastern Poland (Kruk and Milisauskas 1981a, 1983, 1985, Milisauskas and Kruk 1984b, 1989, Milisauskas *et al*. 2012).

The cooperative American and Polish excavations revealed the presence of burials not only at Bronocice. Jan Machnik of the Polish Academy of Sciences excavated an Early Bronze Age cemetery at Iwanowice and Barbara Burchard of the same institution recovered some human remains at Niedźwiedź. Janusz Kruk and Sarunas Milisauskass found single burials at Dziekanowice, Michalowice and Olszanica. The human remains from Bronocice are the main focus of this monograph.

The Bronocice excavations were initiated in 1974 and continued for four field seasons (Figure 1). The chronological and cultural sequence in the Bronocice region involves several Neolithic cultures. Farming was well established in the region for over 1000 years by the time Bronocice was first settled (Kruk and Milisauskas 1999). The Linear Pottery culture is the earliest Neolithic occupation in the Bronocice region, dating from approximately 5400-4900 BC. With the disappearance of Linear Pottery ceramics, Lengyel-Polgár ceramics began to dominate in the Bronocice region around 4800-4600 BC. This stylistic change signified, in the traditional nomenclature, the beginnings of the Middle Neolithic in southeastern Poland. By 3900-3800 BC, the earliest Funnel Beaker material had appeared in the Bronocice region, disappearing around 3300 BC. Fortifications of

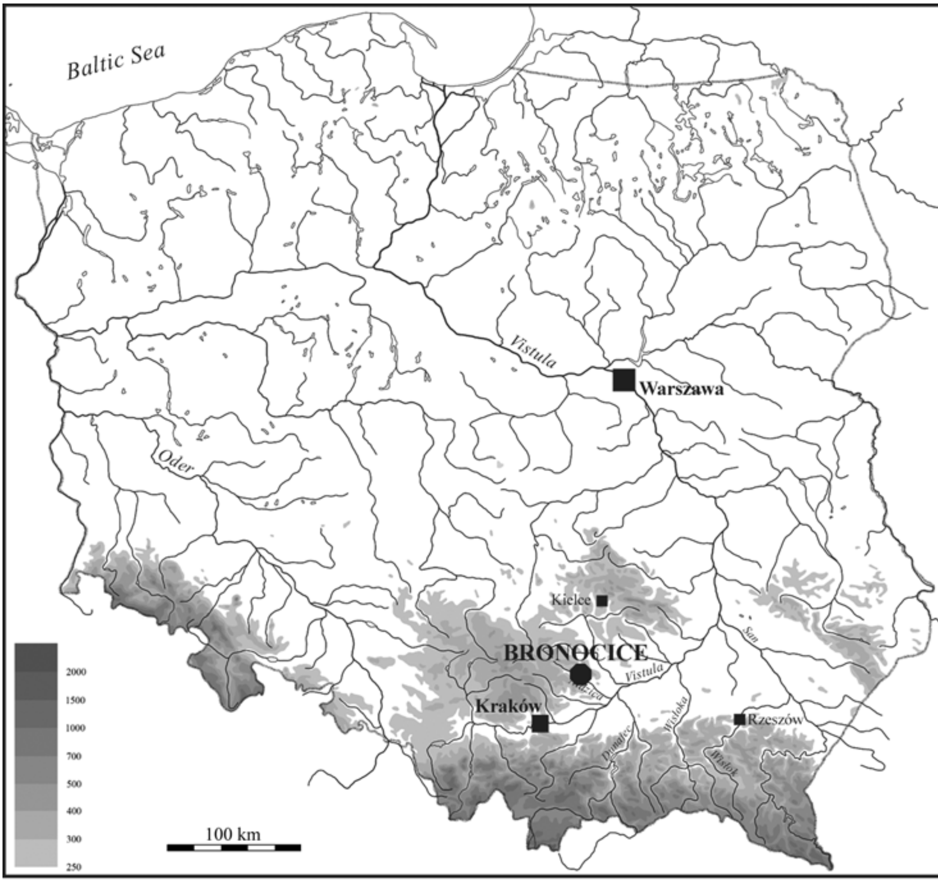

Figure 1. Location of Bronocice in Poland

the Lublin-Volhynian culture, dating to 3800 BC, were also found at the Bronocice site. Funnel Beaker-Baden, Globular Amphora and Corded Ware material characterize the Late Neolithic in the Bronocice region. It should be noted that we have previously called Funnel Beaker-Baden material “Baden-like” or simply “Baden”, but after extensive reanalysis we now conclude that these Late Neolithic ceramics at Bronocice cannot be considered typical Baden types. The earliest Funnel Beaker-Baden ceramics date to around 3300 BC while the Corded Ware material dates to around 2600/2500 BC (Table 1).

Table 1. Chronological Sequence at Bronocice

Phase*	Culture	Dates BC cal.
1	Funnel Beaker	3900-3800
2	Lublin-Volhynian	3800-3700
3	Funnel Beaker	3700-3500
4	Funnel Beaker	3500-3300
5	Funnel Beaker-Baden	3300-3100
6	Funnel Beaker-Baden	3100-2900/2800 2600-2500

* In previous publications the temporal designations used were referred to BR I, Lublin-Volhynian, BR II, BR III, BR IV, and BR V. The phase now denotes sequential occupations and is no longer tied to equivalent cultural phases from other sites.

The site of Bronocice is located in the Bronocice microregion (Figure 2). A circle with a 10-km radius (314 km^2), centered on the site of Bronocice, was used to delimit the microregion. The presence of sandy soils at the northeastern edge of the microregion determined the area's radius. The Bronocice microregion is located in the southeastern (Little) Polish Uplands and the Proszowice Uplands are located in its southern part, while the northern portion falls within the Miechów Upland. The extensive valley of the Nidzica River, a left bank tributary of the Vistula, bisects the microregion from west to east (Figure 3).

The Bronocice microregion consists of low loess covered elevations or hills. The altitude of the hills is 250-300 meters above sea level, but they rise only 50-100 meters above the valley bottom of the Nidzica River. Various geological formations are found in the microregion.

While the Miechów Upland section was formed during the Cretaceous epoch, the Proszowice Uplands were formed on the Miocene loams. These formations are covered by a layer of loess, which is over 5 m thick in some areas (Gilewska 1958). Chernozems are most commonly found in the microregion, followed by brown earth and alluvial soils. Sandy soils comprise only 8.3% of the microregion.

The location of all Funnel Beaker sites within Bronocice region was recorded by a systematic survey conducted in an area 314 km^2 centered

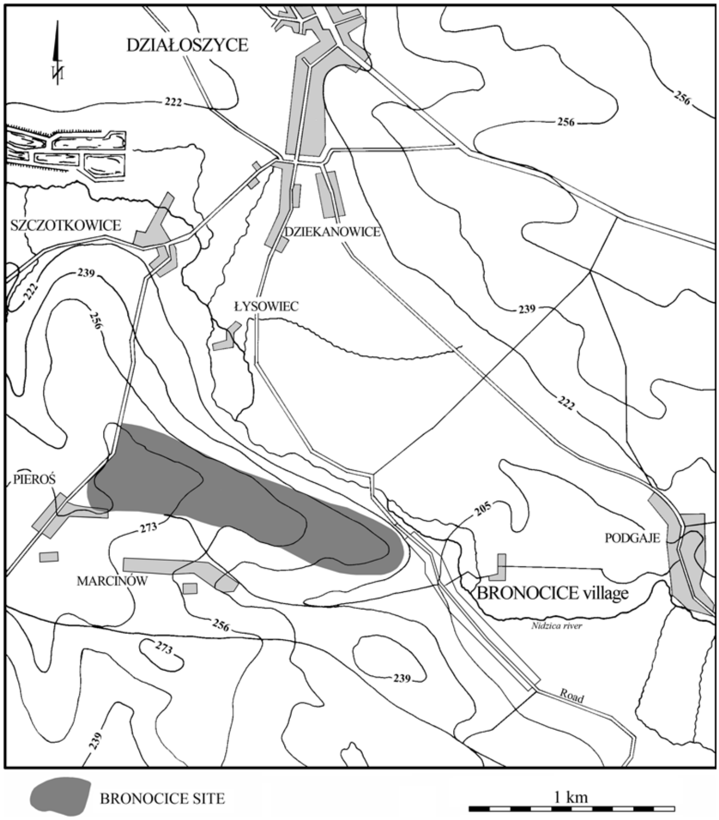

Figure 2. Area of excavations at the site of Bronocice

on the site of Bronocice (Kruk 1969, Milisauskas and Kruk 1984). This survey located 106 Funnel Beaker settlements and they ranged from 1 to 21 hectares in area at one time period.

The Bronocice site (50°21′00″N latitude, 20°19′30″E longitude) is located on the highest local elevation above the Nidzica River floodplain (Kruk and Milisauskas 1981a). Janusz Kruk discovered it in 1967 during a survey of this region, although it should be noted that as early as 1936, Konrad Jażdżewski reported a Funnel Beaker amphora from Bronocice (Kruk 1969). The length of the entire site is roughly 1600 meters and the width from 300 to 500 meters, totaling an area of over 50 hectares (Figure 4).

Table 2. Length of occupation and size of population and settlement at Bronocice

Culture	Phase	Length of Occupation	Settlement Size	Population Estimate
Funnel Beaker	1	100 years	2 ha	48
Lublin-Volhynian	2	100 years	2.4 ha	57
Funnel Beaker	3	200 years	8 ha	192
Funnel Beaker	4	200 years	21 ha	504
Funnel Beaker-Baden	5	200 years	26 ha	624
Funnel Beaker-Baden	6	200 years	17 ha	408

For excavation purposes, Bronocice was divided into three natural areas – A, B, and C – based on topographical variation. Areas A and B are 18 hectares in size each, while Area C is 16 hectares in size. Excavations were conducted in all three areas and the chronological, functional, and cultural variability was defined.

Excavations uncovered a complex settlement pattern consisting of storage and refuse pits, collapsed structures, pit houses, ovens, fortification ditches and animal enclosures, and burials, as well as enormous assemblages of artifacts and faunal remains (Figures 5-6).

Bronocice differed from most Funnel Beaker settlements in the region which were occupied for short spans of time, measured 1-2 hectares in size, and showed few signs of social differentiation. During the initial Funnel Beaker occupation at Bronocice (3900-3800 BC), the settlement was small, 2 hectares, practicing subsistence farming and cattle herding. By 3700 BC a two-level settlement hierarchy was in place within the region with Bronocice at its center. An economic shift occurred about 3600 BC with an intensified focus on sheep rearing (Milisauskas and Kruk 1984b). We have suggested that the site of Bronocice was the central place in the region (Milisauskas and Kruk 1984b). It is evident that in the surveyed region Bronocice was by far the largest settlement. The population and the settlement size at Bronocice were much greater than that of any other site (Table 2). Bronocice rose to a position of economic and possibly political dominance within the local region. It may be that its involvement in

Figure 3. Aerial photo of the site of Bronocice, north view

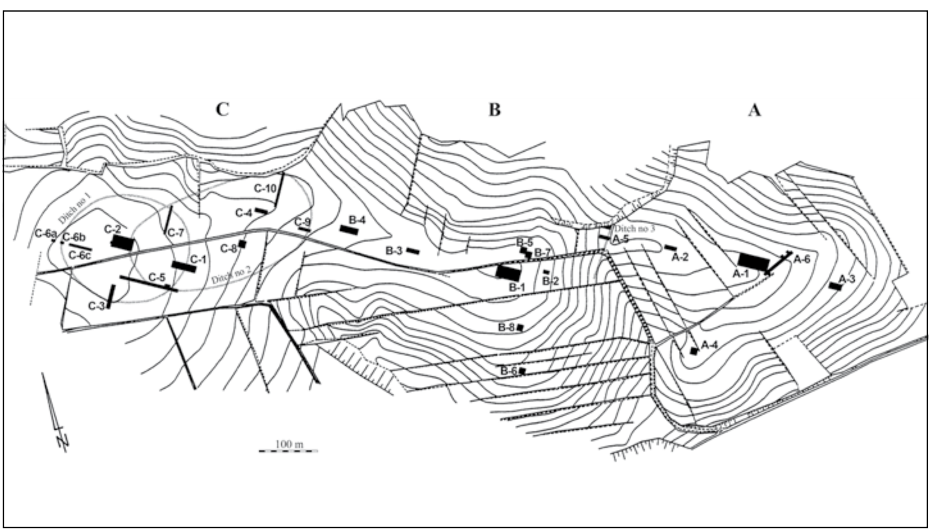

Figure 4. Excavation units at Bronocice

Figure 5. Excavation unit B1 at Bronocice revealing locations of pits

Figure 6. Fortification ditch from Phase 2, Lublin-Volhynian occupation

long-distance trade is in part responsible for its growing influence. Around 3700 BC long-distance economic practices expanded to include the lithics and other commodities, and the exportation of finished stone axes, lithics and possibly salt (Milisauskas and Kruk 1984b, 1989). This economic change is thought to be associated with the start of wool production and coincides archaeologically with significant changes within the settlement pattern and increases in fiber and textile production artifacts (3700-3100 BC) (Pipes *et al.* 2015). This is also the period when wheeled vehicles are thought to first appear (Bakker *et al.* 1999).

Upland slopes were initially heavily forested when Funnel Beaker groups began settling in these locations. However, during construction of the phase 1 Funnel Beaker settlement earlier burials were disturbed which

Figure 7. Pit 76-A1 Funnel Beaker Vessels

suggests that the location was already partially cleared. A paleoecological study indicated that upland clearing in the Bronocice micro region expanded greatly during the 4th millennium BC and eventually led to soil erosion (Kruk *et al.* 1996). Transformation of the upland landscape from heavily forested to grassland was confirmed by a malacology study done on loess soils from Bronocice and six surrounding sites (Kruk *et al.* 1996). Transformation of the landscape initially benefitted farming. However, faunal analyses at sites throughout the micro-region reveal that livestock herding grew in importance, especially at Bronocice. It is difficult to evaluate whether the landscape transformation was a determinant in the development or herding or if the latter caused the changes.

In addition, the data show that intensive slash and burn farming of the uplands contributed to the formation of grasslands. Snails adapted to dry and deforested environments, and species such as *Vallonia costata* Müller, *V. pulchella* Müller, and *Pupilla muscorum* L., comprise the data (Alexandrowicz, Śnieszko and Zajączkowska 1984). Finally, the presence of numerous goat/sheep at Bronocice indicates the existence of large open areas, i.e., cleared forests around the settlement. Various weeds associated with pastures and meadows are present at Bronocice.

The settlement area was inhabited differently by successive cultures. The first settlement occupied by Funnel Beaker people was located in Area C. It was a small settlement, approximately 2 ha, located principally in area C of Bronocice, whose duration was short, approximately 100 years (Milisauskas and Kruk 1984b).

This area was subsequently occupied by a small late Lublin-Volhynian group. The length of their occupation was short, perhaps lasting only one or two generations. During their time at Bronocice, they fortified the settlement by constructing a ditch and palisade. Construction of these defenses is a sign of social stress (Figure 6). After the Lublin-Volhynian settlement period, a large Funnel Beaker settlement occurred in the eastern part of the elevation in area A, which consisted of two Funnel Beaker occupation phases. The radiocarbon dates and typology of ceramics indicate that the Funnel Beaker occupation lasted for approximately 600 years at Bronocice and it is associated with three phases.

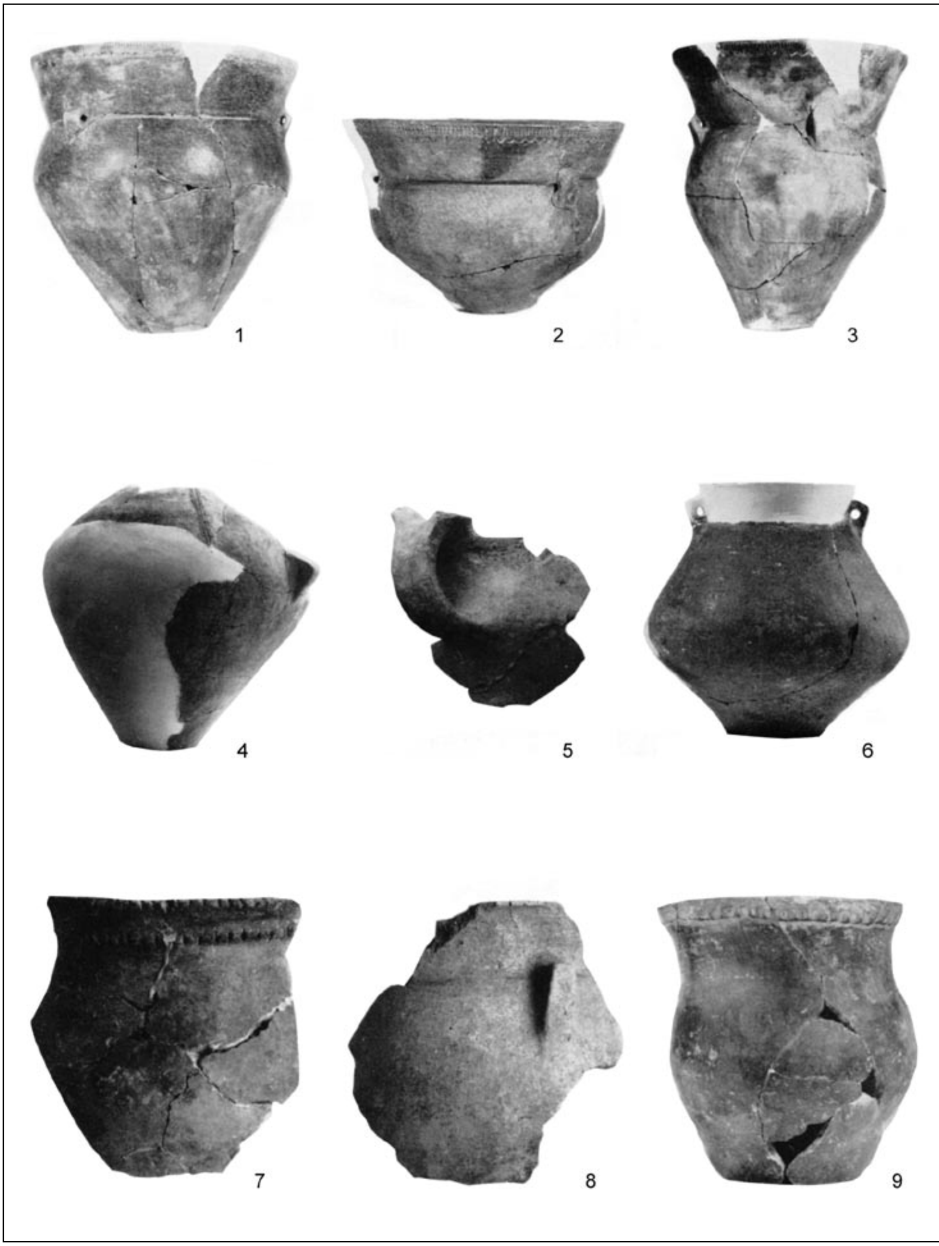

Figure 8. Funnel Beaker ceramics recovered at Bronocice

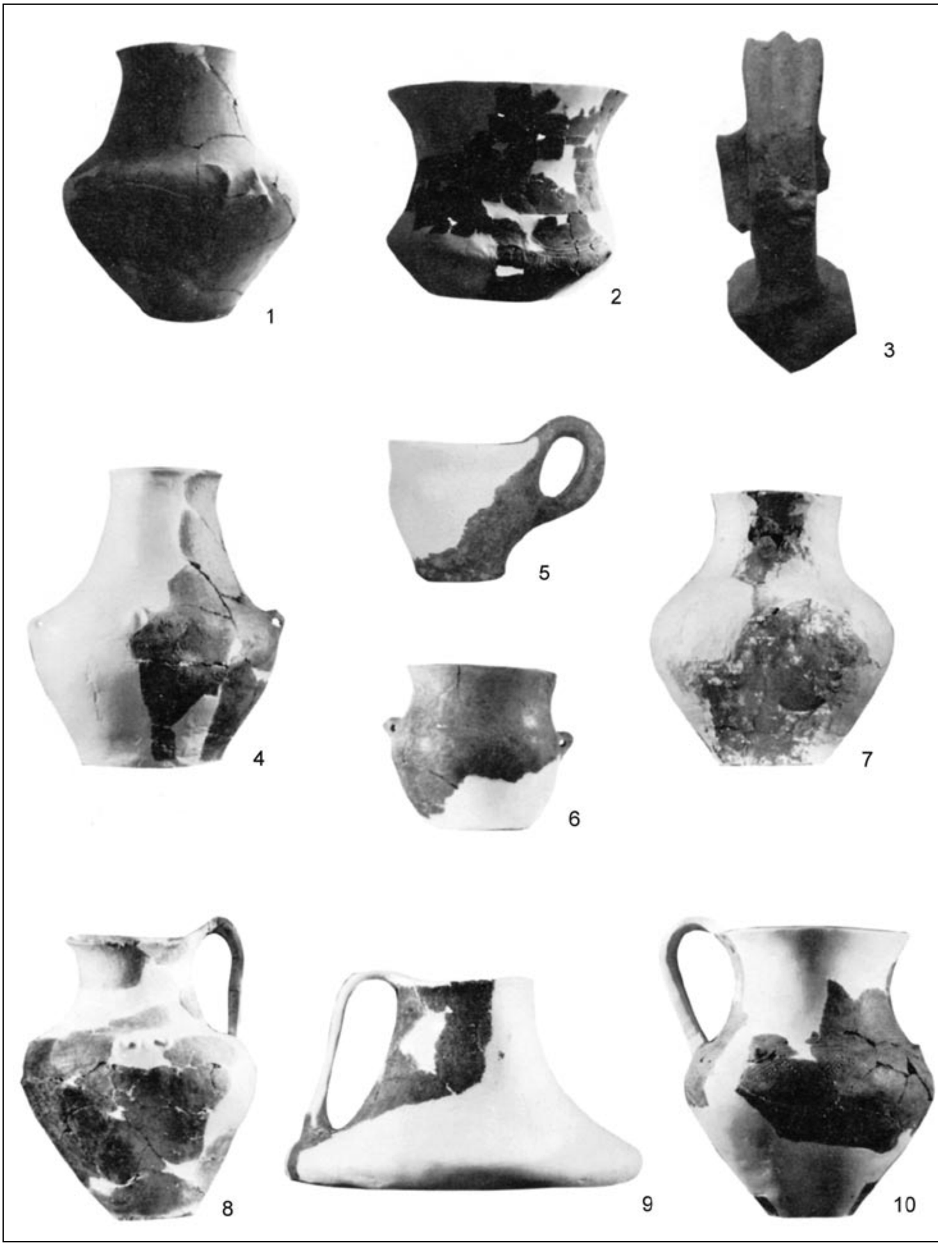

Figure 9. Funnel Beaker-Baden pottery recovered at Bronocice

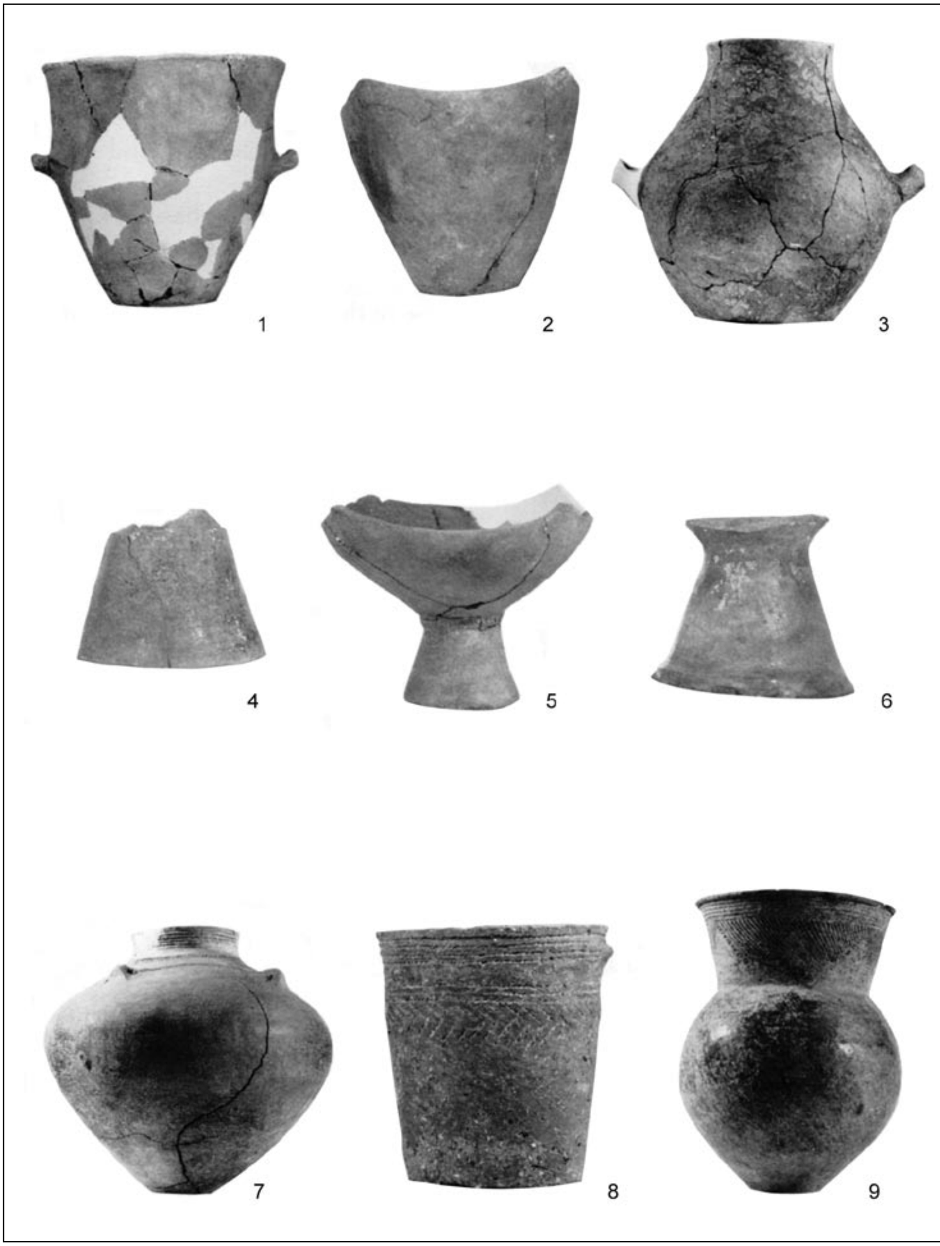

Figure 10. Lublin-Volhynian (1-6) and Corded Ware (7-9) pottery recovered at Bronocice

Based on ceramic typologies pits and other features were dated and associated with specific cultural occupations. Phase 3 represents the "classic" Funnel Beaker phase on the loess uplands (Figure 7). This phase settlement occupied an 8 ha area. Phase 4 is associated with the later development of the classic phase during which the settlement extended over 21 ha area (Figure 8). A Funnel Beaker cemetery located in area C is associated with either one or both of these phases. It is situated on the highest point of area C, where the earlier Funnel Beaker (Phase 1) and Lublin-Volhynian settlements had been previously located, thereby they erased the memory of the Lublin-Volhynian presence in area C. Phase 4 is followed by Phases 5 and 6, which are associated with a local Funnel Beaker-Baden group (Kruk and Milisauskas 1983: 272-276). The Funnel Beaker-Baden occupation occurred from 3300-2800/2700 BC, phases 5-6 (Figure 9). A gap of 200 years or more occurred before a Corded Ware man died and was buried in the center of the former Funnel Beaker-Baden settlement (Figure 10).

CHAPTER 4

Chronology of Burials at Bronocice

Janusz Kruk and Sarunas Milisauskas

In this chapter, we will try to determine the chronological position of individual burials. At Bronocice, 29 pits contained whole or partial human skeletons (Table 1). The burials had few or no grave goods. They occurred in the three areas of the site, however, the densest concentration of burials was found at the highest point area C. Some household pits in areas A and B contained whole or partial skeletons (Table 1). Isolated human remains such as single or a few bones were recovered in some household pits. A minimum of 55 individuals were identified from burials and household pits.

A section of Funnel Beaker cemetery was excavated in area C, with the majority of burials uncovered in shallow oval pits. Eighteen burials were assigned to the Funnel Beaker culture, fifteen of which were excavated in the cemetery area. The preservation of the skeletons was poor, with numerous bones missing. Inside the settlement, the Funnel Beaker burials, usually in an extended position, were associated with burial goods.

Considering all the chronological evidence, including stratigraphy, characteristics of burial ritual, artifacts and radiocarbon dates, seven occupation phases were established at Bronocice (Tables 1, 4). They are associated with four cultures: Lublin-Volhynian (of Lengyel-Polgár cycle),

Table 1. Bronocice. Neolithic pits with human remains. Chronology. Stratigraphy: > – older pit < - younger pit. Cultural sequence: L-V – Lublin-Volhynian; BR I – Funnel Beaker, early phase; BR II – Funnel Beaker, classic phase; BR III – Funnel Beaker, late phase; BR IV – early Funnel Beaker-Baden occupation; BR V – late Funnel Beaker-Baden occupation; CWC – Corded Ware Culture

Burial Number	Excavation Unit	Pit Number	Relative Chronology	Stratigraphy	C14 Dates	Complete Skeleton	Partial Skeleton	Skeleton in Burial Pit	Skeleton in Household Pit	Number of Individuals	Burial Goods	No Burial Goods	Observations
I	C2		BR II-III	I<17+18/C2 (BR I)		X		x		1		x	
II	C2		BR II-III	II<31/C2 (L-V)		X		x		1		x	
III	C2		BR II-III			X		x		1		x	
IV	C2		BR II-III			X		x		1		x	
V	C2		BR II-III			X		x		1		x	
VI	C2	19a/C2	L-V		5032±41 BP	X		x		2	x		
VII	A1	102/A1	BR III/IV		4450±40 BP	X			x	1		x	
VIII	C2	48/C2	BR III		4490±30 BP	X		x		1		x	
IX	C2	47/C2	BR II-III			X		x		1		x	Skeletal remains are in poor condition. Adult
X	B1	43/B1	BR IV	X>48/B1 (BR V) >51+53+101/01 (BR V)<42/B1 (BR III)			x		x	1		x	
XI	B1	67+18/ B1	CWC	XI<17/B1 (BR IV/V)	4000±40 BP	X		x		1	x		Catacomb grave
XII	C2		BR II-III	XII<56+57/C2 (L-V)		X		x		1		x	

XIII	B1	36+37/B1	BR IV	XIII<34+35/B1 (BR IV)	4540±58 BP 4449±58 BP	X		x		17	x		Collective burial
XIV	B1	100/B1	BR III/IV	XIV>99+102/B1 (BR V)	4650±30 BP	X			x	1			II/IV
XV	C1	87/C1	BR III/IV	XV<76/C1 (BR I)	4480±40 BP	X		x		2		x	Double burial
XVI	A1	125/A1	BR III/IV	XVI<117/A1 (BR II)	4490±40 BP	X			x	1		x	
XVII	C5	18/C5	BR II-III			X		x		1		x	
XVIII	C5	3/C5	BR II-III		4640±40 BP	X		x		1		x	
XIX	C5	4/C5	BR II-III	XIX<5/C5 (L-V)		X		x		1		x	
XX	C5	14/C5	BR II-III	XX>rów II/C5 (BR IV)	4978±40 BP	X		x		1		x	
XXI	Bd		BR IV				x		x	1		x	
XXII	B1	51+53+101/B1	BR V	XXII<X (BR IV)			x		x	1		x	Skull is missing the mandible (woman, juvenile – *ca* 18 years)
XXIII	B6		BR IV	XXIII<5/B6 (BR I)	4500±40 BP	X			x	1		x	Burial in household pit 5/B6, phase BR I
XXIV	B6	7/B6	BR IV				x		x	1		x	Fragmented skull bones.
XXV	A3	22/A3	BR IV				x		x	1		x	Fragmented skull bones and fragmented long bones of a woman, juvenile, 18-20 years
XXVI	C7	7a/C7	BR II-III	XXVI<rów I/C7 (L-V)		X		x		1		x	
XXVII	A4	1/A4	BR V				x		x	1		x	Fragmented skull bones
XXVIII	C2		BR II-III			X		x		1		x	Postc-cranial skeleton is damaged
XXIX	B8	2/B8	BR V		4290±40 BP		x		x	1		x	Post-cranial skeleton is damaged

Table 2. Relative chronology of Neolithic cultures at Bronocice

Phase	Culture	Cultural sequence
Phase 1 (BR I)	Funnel Beaker **(FB)**	Funnel Beaker culture in southeastern Poland, phase 1, Early Wiórek phase of the Funnel Beaker culture in the Polish Lowlands – Globular Amphora culture, phase I – Malice culture, Rzeszów phase – Tripillian culture, phase BII
Phase 2	Lublin-Volhynian **(L-V)**	The Lublin-Volhynian, IIIa phase – Funnel Beaker, phase 3 (classic) – Złotniki group, (Lengyel-Polgár culture) – Złotniki-Wyciąże group, early phase – Bodrogkeresztúr culture, phase A - Tripillian culture, phase CI
Phase 3 (BR II)	Funnel Beaker **(FB)**	Funnel Beaker culture in southeastern Poland, phase 3 (classic) – Wiórek phase of the Funnel Beaker culture in the Polish Lowlands – Złotniki group, (Lengyel- Polgár culture) – Złotniki-Wyciąże group, early phase – Lublin-Volhynian phase IIIa – Globular Amphora culture phase IIa – Tripillian culture phase CI
Phase 4 (BR III)	**Funnel Beaker (FB)**	Funnel Beaker culture in southeastern Poland, phase 4 (late) – Luboń phase of the Funnel Beaker culture in the Polish Lowlands – Wyciąże group (Lengyel-Polgár culture) – Złotniki-Wyciąże group's younger phase – Lublin-Volhynian phase IIIb – Globular Amphora culture phase IIb – Tripillian culture phase CII
Phase 5 (BR IV)	Funnel Beaker-Baden **(FB-B)**	Southeastern group of the Funnel Beaker culture, phase 5, (younger in the Volhynian Uplands and the Dnestr Basin) – Radziejów-Opatowice group of the Funnel Beaker culture – Globular Amphora phase IIb – Tripillian culture phase CII
Phase 6 (BR V)	Funnel Beaker-Baden **(FB-B)**	Southeastern group of the Funnel Beaker culture (younger in the Volhynian Uplands and the Dnestr Basin) – younger phase of the Radziejów-Opatowice group of the Funnel Beaker culture – Zesławice-Pleszów-Mogiła group of Baden culture – Globular Amphora phase IIIa – early phase of Złota culture Tripillian culture phase CII
Phase 7	Corded Ware **(CW)**	Kraków-Sandomierz group, phase III of the Corded Ware culture (loess uplands in the upper Vistula basin)

Funnel Beaker, Funnel Beaker-Baden and Corded Ware (Table 2). Human remains were recovered from features of six phases.

Radiocarbon dates were obtained from charcoal and bone at Bronocice. At present we have 65 radiocarbon dates, 59 of them are acceptable. The 27 charcoal dates were dated at the Dicarb Radioscope Company in Gainsville Florida in 1970s and 1980s. Human and animal bone was used for dating at Groningen, the Arizona AMS Laboratory and International Chemical Analysis Inc. in Miami, Florida. Arizona and Miami are AMS dates.

The fifteen burials in the cemetery in area C were dated by stratigraphic relationships and radiocarbon dates. There were no burials associated with the earliest Funnel Beaker occupation, phase 1. The Lublin-Volhynian burial VI is also associated with the early occupation, phase 2. Burial XX is older than the ditch II, which belongs to phase 5 (BR IV). There were no burial goods associated with these burials. We assume that the rare few flint flakes found in some of them were intrusive material. There are four radiocarbon dates associated burials in the cemetery. Burial XX dated at 3845-3713 BC is too early for the phase 3. The remaining three burials have dates that fall within phases 3 and 4. Thus the cemetery is datable to phases 3 (BR II) and 4 (BR III), the so-called classic phase of Funnel Beaker culture in southeastern Poland.

A double burial (VI, Table 1) belonging to the Lublin-Volhynian culture, was found in the center of the area enclosed by a ditch in the excavation unit C2 (Kruk, Milisauskas 1985). The burial pit consisted of two parts. The upper part had an oval outline on the surface and a layer of daub at the bottom. The lower part of the pit contained two skeletons. It is even possible that a small mound was constructed over the burial pit. No other Lublin-Volhynian burial had such construction of the pit or positioning of the skeletons in southeastern Poland (Kruk, Milisauskas 1985; Zakościelna 2009). This burial pit contained a 30-40 year old woman and a 30-year-old man (See Chapter 6 for a detailed description). Skeleton VI-2, a female, appears to have been the primary interment in the pit and was in a crouched position. Skeleton VI-1 was then added to the burial, but is in a supine position with the spread legs.

Two concentrations of burial goods were found in the burial pit. One concentration occurred in the upper part of the pit and another in the lower part by skeletons. The upper part of the pit contained a vessel, a sandstone slab, a truncated flint blade, a bifacial flint projectile point and an aurochs horn. In the lower part of the pit were a pedestaled vessel, a cup, an amphora and a pot with a high funnel neck were found. The burial goods are associated with the latest phase of this culture. Some attributes of the ceramics reflect the Bajč-Retz group' types, suggesting the latest phase of the Lublin-Volhynian culture (Kadrow, Zakościelna 2000; Zakościelna 2009).

Table 3. Bronocice. Absolute dates of phases

Phase	Culture	Dates cal BC
Phase 1	Funnel Beaker (BR I)	3900-3800
Phase 2	Lublin-Volhynian	3800-3700
Phase 3	Funnel Beaker (BR II)	3700-3500
Phase 4	Funnel Beaker (BR III)	3500-3300
Phase 5	Funnel Beaker-Baden (BR IV)	3300-3100
Phase 6	Funnel Beaker-Baden (BR V)	3100-2900/2800
Phase 7	Corded Ware	2600-2500

The radiocarbon date of the female skeleton, (3919-3775 BC; Table 4) falls within the chronological boundaries of the Lublin-Volhynian culture. It is earlier than the relative chronology dates based on ceramics and some radiocarbon dates in southeastern Poland (Zakościelna 2009). Even for the Lublin-Volhynian occupation at Bronocice, this radiocarbon date is quite early.

The remains of 17 individuals were uncovered in burial XIII-B1, Pit 36-B1 in area B (Kruk, Milisauskas 1982) (See Chapter 6 for a detailed description). The pit was rectangular in cross-section and had a volume of 11.50 m^3. It was dug into the southern part of Pit 38-B1, specifically for the purpose of burial. All of the bodies were placed within the burial at the same time. There was no evidence of any later disturbances of the burial. Besides the skeletons, the pit contained fragments of three vessels, flint artifacts, jewelry made of animal bones and mussel shells and animal bones (See Chapter 6 for a detailed description). The jewelry belonged to the individual skeletons, however, the remaining material may be intrusive from the older pit, 38-B1.

The remains of the three vessels can be used for determining the relative chronology of the collective burial. Of the two amphorae, one reconstructed amphora is similar to the Jevišovice C1 – Ohrozim types in Moravia (Neustupný 1959; Pavelčik 1973b; Kruk, Milisauskas 1982). This indicates that the collective burial is datable to the Bronocice Phase 5 (BR IV). The older pit 38-B1 likewise belongs to the Phase 5. Bones of two skeletons were dated by radiocarbon method at the University of Arizona

Table 4. Bronocice. Radiocarbon dates of human burials

No.	Grave	Lab. Code/No.	BP	Cal BC	Relative Chronology	Material type
1	VI	AA 90114	5032±41 AMS	3919-3775	L-V ph. 2	Bone
2	XX	AA 90115	4978±40 AMS	3845-3713	BR II-III ph. 3-4	Bone
3	XIV	ICA ID 14B/0737	4650±30 AMS	3520-3360	BR III/IV ph. 4-5	Bone
4	XVIII	ICA ID 15B/0614	4640±40 AMS	3520-3350	BR II-III ph. 3-4	Bone
5	XIII-5	AA 86144	4540±58 AMS	3348-3136	BR IV ph. 5	Bone
6	XXIII	ICA ID B/0416	4500±40 AMS	3360-3030	BR IV ph. 5	Bone
7	VIII	ICA ID 14B/0738	4490±30 AMS	3350-3090	BR III ph. 4	Bone
8	XVI	ICA ID B/0421	4490±40 AMS	3350-3020	BR III/IV ph. 4-5	Bone
9	XV	ICA ID B/0417	4480±40 AMS	3350-3020	BR III/IV ph. 4-5	Bone
10	VII	ICA ID B/0422	4450±40 AMS	3340-2930	BR IV ph. 5	Bone
11	XIII-1	AA 86143	4449±58	3288-3022	BR IV ph. 5	Bone
12	XXIX	ICA ID 15B/0611	4290±40 AMS	3020-2780	BR V ph. 6	Bone
13	XI	AA90 116	4000±40 AMS	2570-2486	CW ph. 7	Bone

Laboratory: XIII-1, 4449±58 BP, XIII-5, 4540±BP. These dates fit within the Phase 5 occupation. The variation between the two dates is about 100 years and this difference is difficult to explain.

Collective or multiple burials occur rarely during the middle and late Neolithic in central Europe. They occurred in the Lengyel culture (Pleslová-Štikova 1972), Altheim (Driehaus 1960, Michelsberg (Maier 1965), Baalberg (Preuss 1966) Baden and Globular Amphora (Wiślański 1969; Przybyła, Włodarczak eds. 2013).

A Corded Ware culture burial was found in the excavation unit B1 (See Chapter 6 for a detailed description). It had catacomb grave construction and contained a skeleton 50-60 years old male. The person was buried with numerous artifacts: 2 large pots, 1 miniature vessel, 1 cup, diorite axe 2 flint blades, bone chisel, axe and carved tooth bead. The associated artifacts and the construction of the catacomb are typical of the Kraków-

Sandomierz group of the Corded Ware culture. The four pottery vessels show similarities to the types of the Upper Silesian-Southeastern Poland group of the Corded Ware culture (Machnik 1966; Włodarczak 2006). Based on Włodarczak's (2006) chronological sequences for the Uplands of southeastern Poland, the Bronocice burial falls within phase IIIB, between 2500-2300/2200 BC. This is supported by the radiocarbon date of 2570-2486 BC of the burial (Table 4). It is some 200 or 300 years later than the last Funnel Beaker-Baden occupation at Bronocice.

Two trapezoidal pits, XIV and XVI, contained human burials with no associated grave goods or any evidence of funerary ritual. It appears that the deceased were thrown into the pits and were covered with soil. There are no layered stratigraphic levels in the pits. The pit with burial XIV was older than the nearby located feature of the Funnel Beaker-Baden occupation, phase 6 (BR V), (Table 1). The pit containing burial XVI was younger than the Funnel Beaker phase 3 (BR II) occupation (Table 1). Only radiocarbon dates for the two burials can provide more precise chronology. Burial XIV is dated 3520-3360 BC, which falls within the later phase 4 of the Funnel Beaker culture and the earlier Funnel Beaker-Baden occupation at Bronocice. Burial XVI has a radiocarbon date of 4490±BP.

Likewise the burial XXIII in the excavation unit B6 has no evidence of funerary ritual (Table 1). The burial pit was dug into an older feature associated with the early Funnel Beaker occupation, phase 1 (BR 1). The artifacts in the pit do not represent burial goods. A radiocarbon date of 3360-3030 BC for this burial places it in the phase 5 (BR IV) and the early part of the phase 6 (BR V).

Seven household pits in areas A and B had remains of human fragmented skulls and long bones (Table 1). Six of these pits had trapezoidal cross-sections, indicating they were trash pits. Only pit 1-A4 containing burial XXVII had a rectangular profile. Two of the pits, 51+53+101-B1 (burial XXII) and 2-B8 (burial XXIX) had layered pit fill, while the remaining five had homogeneous pit fill (Table 1). The ceramics from these pits belong to phases 5 and 6 of the Funnel Beaker-Baden occupation. Two of the pits had stratigraphic evidence. Pit 43-B1 (burial X) was younger than the Funnel Beaker phase 4 (BR III) and older than the Funnel Beaker-Baden occupation phase 6, thus it can be dated to phase 5 (BR II). The stratigraphic evidence that is the intersection of pits shows that pit 51+53+101-B1 (burial XXII, phase 6) was younger than the burial X of the phase 5.

One pit 2-B8 containing human remains in the excavation unit B8, burial XXIX, was datable to phase 6 (BR V) (Table 4). The radiocarbon date of 3020-2780 BC supports this chronological placement.

CHAPTER 5

Funnel Beaker and Funnel Beaker-Baden Burials

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and Marie-Lorraine Pipes

Introduction

This chapter focuses on human remains associated with the Funnel Beaker and Funnel Beaker-Baden cultural occupations. Burials associated with other cultures, including Lublin-Volhynian, Corded Ware and possibly Baden burial XIII, are discussed in the next chapter. Taken in its broadest sense the term burial is used here to indicate human remains from intact and disturbed graves, accidental interments, as well as human trophies found in household deposits. Table 1 summarizes the minimum number of individuals represented at Bronocice and the number of burials and types of human remains. The majority of formal and informal burials recovered at Bronocice occurred during the Funnel Beaker and Funnel Beaker-Baden occupations, phases 1, 3, 4, 5 and 6 (Table 1). Most of the burials followed typical Funnel Beaker burial traditions, though some clearly did not.

The first Funnel Beaker occupation was a small settlement located in Area C. Beginning in phase 3 a new settlement was founded in Area A possibly established by a different group of Funnel Beaker people (Figure 1). This later settlement, greater in size and population, was

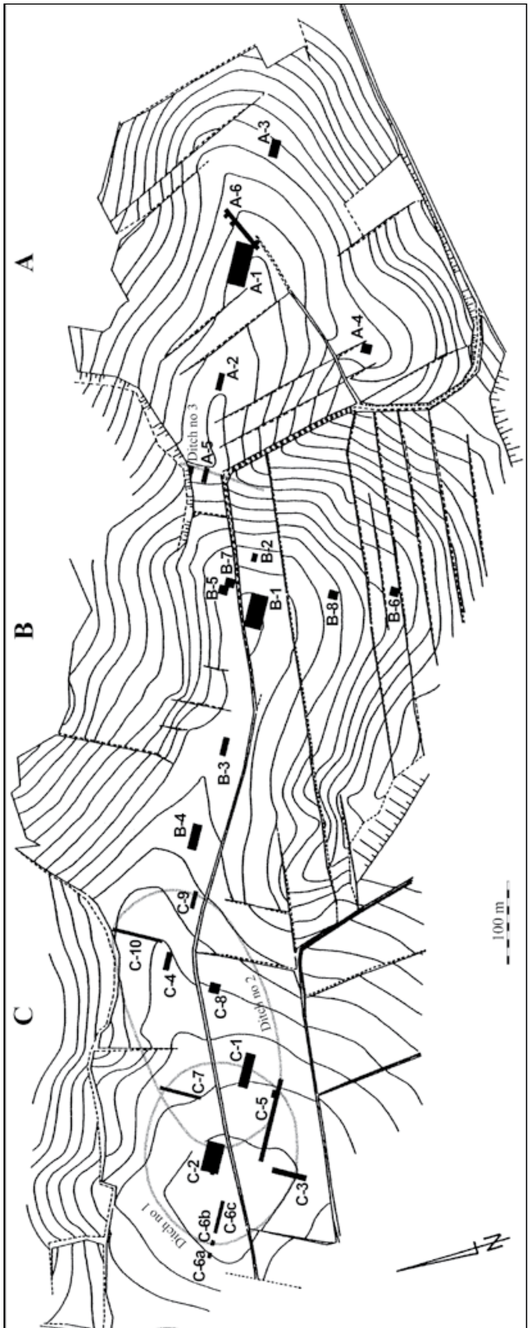


Figure 1. Excavation units at Bronocice

Table 1. Minimum number of burial contexts (MNB*) and individuals (MNI) at Bronocice, all phases and cultures

Phase	Culture	Area	Unit	MNB	MNI	Burials, Pits with Isolated Human Remains
1	Unclear	C	C2	3	4	Pit 46-C2, 49-C2, 61-C2
2	Unclear	C	C2	2	2	Pit 29-C2, 38-C2
	Lublin-Volhynian	C	C2	1	2	Burial VI
3	Funnel Beaker	C	C2	1	1	Burial I
		C	C2	1	1	Pit 14-C2
3/4	Funnel Beaker	C	C2	7	7	Burial II, III, IV, V, VIII,IX, XII
		C	C5	3	3	Burial XVII, XVIII, XIX
		C	C7	1	1	Burial XXV
4	Funnel Beaker	A	A1	2	2	Burial VII, XVI
		B	B6	1	1	Burial XXII
		C	C1	1	2	Burial XV
5	Baden or Funnel Beaker-Baden	B	B1	1	17	Burial XIII
	Funnel Beaker-Baden	A	A3	1	1	Burial XXIV
		A	B1	4	4	Burial X, XIV; Pit 11-B1, 95-B1
		B	B6	1	1	Burial XXIII
		B	B8	1	1	Pit 1-B8
		B	Road	1	1	Burial XXI
		C	C5	1	1	Burial XX
6	Funnel Beaker-Baden	A	A4	1	1	Burial XXVI
		B	B1	2	2	Burial XXVII, Pit 86-B1
7	Corded Ware	B	-	1	1	Burial XI
Total				37	56	

composed of related and non-related people. The resettlement of Bronocice after 3700 BC marked a major change in social attitudes towards use of the landscape. Most Funnel Beaker groups buried their dead in cemeteries located outside settlements. The phase 3 group at Bronocice divided the landscape into different use areas. The Lublin-Volhynian enclosure was used to contain livestock but was also designated a cemetery. It is

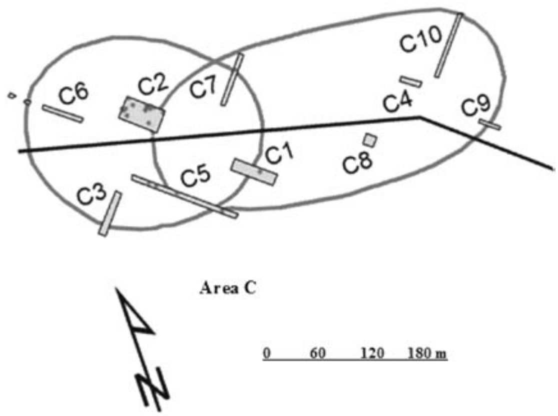


Figure 2. Burials from excavation units in Area C, phases 1-4

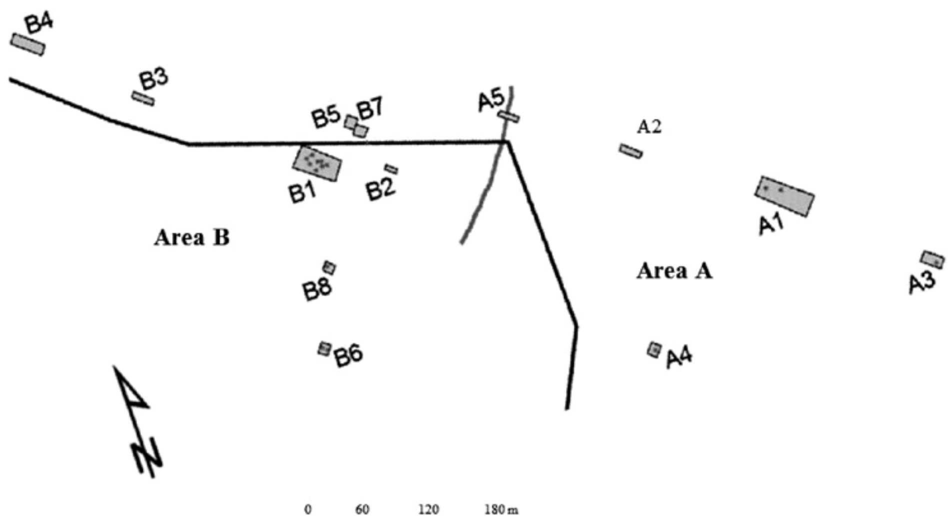


Figure 3. Burials from excavation units in Areas A and B, phases 4-5

unknown currently if the cemetery served other local settlements or if it was used exclusively by the people at Bronocice. The majority of Funnel Beaker burials dating to Phases 3 and 4 were found in Area C, primarily within the former Lublin-Volhynian fortified village though some were located outside and within the ditch. The densest concentration of burials, whole or partial, was found in the northern half of Unit C2 (Figure 2). In some cases groups of burials were oriented in the same direction (e.g 3-C5, 18-C5, 14-C5). In other cases burials were closely spaced but dissimilar in orientation. Though orientation varied extensively across the cemetery, all of the Funnel Beaker burials were similar in layout. The graves were rectangular in shape. They were single inhumations. The deceased were placed on their backs in fully extended position. Virtually no grave goods were found with them. The patterning observed in burial practices indicates that social rules or traditions were established for managing the dead. The use of the cemetery was probably controlled in terms of access, membership and location of burials.

During the later phases of Funnel Beaker-Baden occupation all human remains were encountered in the eastern portion of the site (Figure 3). However, the nature of the burials and the treatment of human remains differed considerably from the earlier phases.

Distribution of Burials

No burials were identified dating to the phase 1 Funnel Beaker occupation. However isolated human remains were recovered in Phase 1 house pits in Unit C2. There is some ambiguity as to whether or not the area was used previously as a burial ground by an unidentified group. The phase 1 and phase 2 occupations disturbed earlier burials during the construction of buildings and the excavation of interior pits. This suggests that by the time Funnel Beaker people settled in this location graves were unmarked and that no cultural memory of them existed. The earliest actual burials clearly associated with the Funnel Beaker cultural sequences date to the phase 3 occupation.

It is interesting to note that several of the burials dating to phases 3 and 4 were actually placed within earlier phase 1 and 2 foundations suggesting that the placement of burials was not random but instead deliberate. Perhaps the choice of burial site was based on extended family relationships, possibly ancestral ties to specific locations in Area C (Figure 4). At some point during Phase 4 burials began to take place within the settlement which by then had expanded from Area A into Area B. The use of Area C as a cemetery however continued into the early part of Phase 5. No isolated human remains were recovered dating to either phase 3 or 4.

There was a notable difference in the kinds of burials that were found during excavation dating to the phase 5 and 6 Funnel Beaker-Baden occupational sequences. The main distinction was that few actual burials were found relative to the population size of the settlement. This was surprising since the population soared to its greatest density during phase 5. Nearly all of the Funnel Beaker-Baden burials were located within the settlement. A single exception was found in Unit C5 (Burial XX). There were five burials containing skeletons including two formal Funnel Beaker-Baden burials (Burials X, XIV), two informal Funnel Beaker-Baden burials (Burials XXIV, XXI), and a single highly ritualized collective burial (Burial XIII). Like phases 1 and 2, isolated human remains were once again recovered from the fill of house pits. In some instances these remains likely resulted from construction events impacting earlier burials (Pits 11-B1, 95-B1, 1-B8, 86-B1) which would mean the area served as a cemetery or burial ground prior to the expansion of the settlement in that location. Unit B1 was occupied for a period of several hundred years. Perhaps these burials dated to the earliest phase 4 occupation and were no longer remembered by the descendant population. In three instances isolated human remains consisted of skulls (Burials XXIII, XXVI, XXII). The general lack of burials leads to the conclusion that a Funnel Beaker-Baden cemetery was located near the settlement. No evidence of cremation was found anywhere at Bronocice.

Chronology and Types of Burials

Phase 1 – Funnel Beaker Human Remains

No burials were found dating to Phase 1 during excavation. In previous publications a burial located in Pit 5-B6 (Area B) was dated to Phase 1. However, a new radiocarbon date indicates it belongs to phase 4. The main part of the settlement during phase 1was concentrated in the vicinity of unit C2. Three instances of isolated human remains were found in

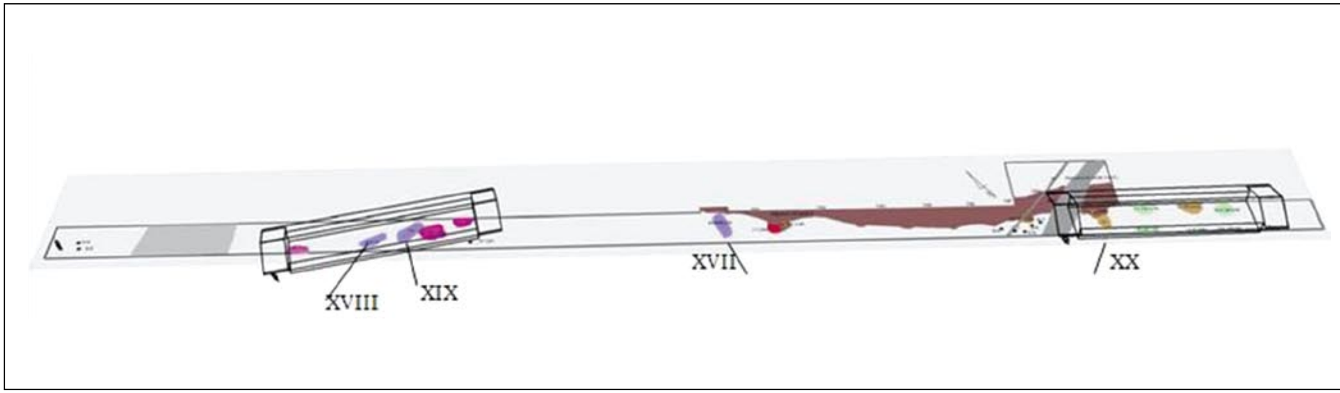


Figure 4. Unit C5, Phase 3-4 Burials XVIII, XIX, XVII, and XX. The first two burials were placed with the ruins of a Lublin-Volhynian structure while the last burial was placed in a structure of unknown affiliation

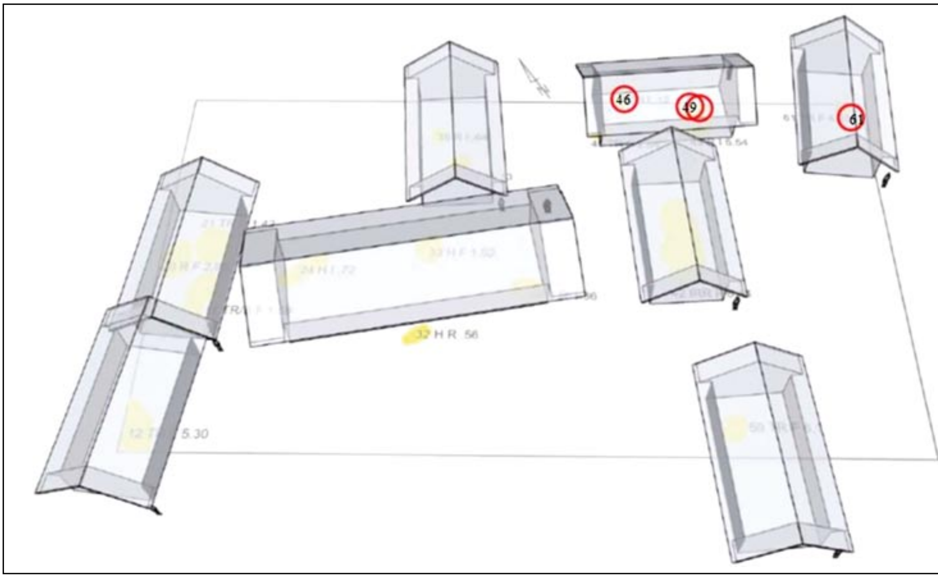


Figure 5. Phase 1, Unit C2, Funnel Beaker structures. Red circles indicate locations of probable earlier burials disturbed by their construction

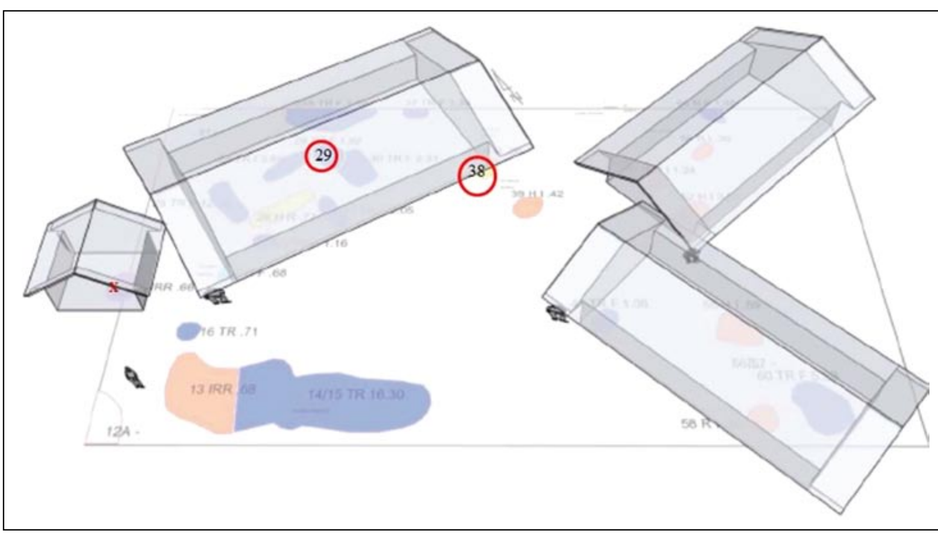


Figure 6. Phase 2, Unit C2, Lublin-Volhynian structures. Red circles indicate locations of probable earlier burials disturbed by their construction. X marks the location of the Lublin-Volhynian burial

Table 2. Type and Minimum Number of Burial (MNB) contexts and Individuals (MNI) at Bronocice

Phase	Culture	Depositional Context						Total MNI
		Extended Burial	Flex Burial	Trash Pit	Collapsed Structure	Ritual	Disturbed Burial	
1	Unclear	-	-	-	-	-	3	4
2	Unclear	-	1	-	-	-	2	3
	Lublin-Volhynian	-	1	-	-	-	-	2
3	Funnel Beaker	1	-	-	-	-	1	2
3/4		11	-	-	-	-	-	11
4		4	-	-	-	-	-	5
5	Funnel Beaker-Baden	3	-	1	1	1	3	9
	Baden or FB-B	-	-	-	-	1	-	17
6	Funnel Beaker-Baden	-	-	-	-	2	1	3
7	Corded Ware	-	1	-	-	-	-	1
Total MNB/MNI		19	3	1	1	4	10	56

pits 46-C2, 49-C2 and 61-C2 (Table 2, Figure 5). The three pits were located close together and were disturbed by the construction of a Funnel Beaker house and associated pit excavations. Pit 46-C2 contained a fragment of an adult skull. Pit 49-C2 yielded a single upper molar from an adult. Pit 61-C2 differed from the other two. It contained the isolated bones from two distinct individuals. One individual consisted of an immature adult and was represented by a lower forearm, upper and lower legs, and a foot. The range of elements suggests this was a flex burial. The second individual was a mature adult who was indicated by a foot. There is currently no way of knowing what culture these four individuals belonged to. They will not be described further in this chapter.

During phase 2 the settlement was occupied by a Lublin-Volhynian group. Like phase 1 the main settlement was placed in the vicinity of Unit C2. In three instances the construction of their pits impacted earlier burials (Table 2, Figure 6). These burials may have belonged to the phase 1 Funnel Beaker occupation, though it cannot be discounted that they dated to an earlier group. Each case yielded a single element: pit 29-C2 a thoracic vertebra, and pit 38-C2 an upper molar and a lower premolar, all from adults. Two of the three cases were recovered from the northern half of unit C2. This area yielded the densest concentration of human remains at the site. The only burial clearly associated with the Lublin-Volhynian occupation was found in pit 19-C2 which is described in the next chapter.

Phases 3 and 4 – Funnel Beaker Burials

One earlier burial was impacted by the construction of a large structure (Pit 14-C2). It consisted of an adult calcaneus. Sixteen formal extended burials were excavated belonging to the Funnel Beaker occupation which spanned phases 3 and 4. Thirteen of the burials were found in the cemetery located in Area C (Table 1, Figures 2, 4-6). The remaining three burials were found in Areas A and B. The extent of the cemetery is currently undefined. However, since the densest concentration of human remains was found in Unit C2, especially in the northern half, it is possible the main part of the cemetery is close to that location. Within the cemetery burials were also found in units C1, C5 and C7, of which unit C5 had the most burials (Figure 4). Unlike later phases, these graves were carefully prepared and located. They were long and narrow, oblong or rectangular, shaped pits. There is some indication in a few cases that the bodies were covered over with wooden planks. Area C was not only a cemetery but part of the earlier phase 1 settlement. It appears that several of these burials were deliberately placed within the ruins of earlier structures (Figures 4-6). The pattern was so consistent that the possibility must be considered that the dead were actually placed within their ancestral houses.

During Phase 4 burial traditions varied in terms of grave location and preparation. Area C was still used as a cemetery; there is one burial dating to this period was found in Unit C1 (Burial XV). However more burials were found within the settlement located in Areas A and B. During phase

3 and the transitional phase 3-4 graves were placed outside the settlement though they were located in the ruins of earlier structures. During phase 4 burials were now placed in internal house pits and the preparation of narrow rectangular burial pits was abandoned. A single extended grave was placed in the cemetery (Burial XV). It was unusual because it was a double burial consisting a young woman and young child. There were three burials placed within interior pits in Units A1 and B6. None of these burials exhibit classic Funnel Beaker burial treatment. Burial VII (102-A1) was a grave located inside a house floor. It consisted of the skeleton of an older woman who was placed face down in an extended position and provided with a few grave goods. Burials XVI (125-A1) and (no burial number) 5-B6 were similar in that the deceased were provided with grave goods. However, in these two cases the dead were placed inside house pits. It is possible that these individuals belonged to different cultural groups residing with the settlement.

Phases 5 and 6 - Funnel Beaker-Baden Burials and Human Remains

Funnel Beaker-Baden burials consisted of a different set of burial traditions. Very few Funnel Beaker-Baden burials occurred within the settlement. Probably there is a Funnel Beaker-Baden cemetery at Bronocice, but it has not been found. There were thirteen burial contexts within the settlements. A large collective burial (Burial XIII) containing seventeen individuals (Pit 36-B1) will be discussed in the following chapter. The remaining twelve burial contexts included three formal extended burials (Burials X, XIV, XX), two 'informal burials (Burials XXI, XXIV), three skulls (Burials XXII, XXIII, XXVI) and four pits containing partial human remains (Pits 11-B1, 86-B1, 95-B1, 1-B8) (Tables 1 and 2). The three formal burials followed earlier Funnel Beaker burial practice and consisted of skeletons placed on their backs in fully extended position. They all dated to phase 5. The two informal burials were quite different. One of them appears to have been killed in a building collapse (Burial XXI). The other appears to have been dumped face down in a house pit (Burial XXIV). In three instances only the head was buried in the pit. Perhaps these two heads were not intentional burials, but only represent the evidence of violence, internal or external. They may represent trophies. Two of the heads dated to phase 6. In four cases it is likely that earlier burials were disturbed. Pit 11-B1 contained an atlas and a carpal, 86-B1 of an upper molar and partial femur, 95-B1 of two vertebrae and a phalange, and 1-B8 of a femur.

General Observations

The preservation of skeletons varied considerably. In several cases it was very poor and so numerous skeletal elements were missing. Funnel Beaker burials contained few or no grave goods though some burials that may belong to other cultures as well as some of the Funnel Beaker-Baden burials had grave goods (Table 3). In several cases it was difficult to ascertain if the few artifacts recovered were deliberately included or simply part of the backfill dirt. Area C was densely occupied during the earliest occupational phases and so it is not surprising to find that artifacts littered the area.

The classification of burials as belonging to one culture or another is arguably confusing in some instances. In most cases there was no doubt that burials identified as either Funnel Beaker or Funnel Beaker-Baden were correct based not only on the arrangement of the skeletons within the grave but also the placement burials and the dates of artifacts accidently included in when they were backfilled. On occasion however, some burials did not exhibit the classic burial traits even though they dated to either the Funnel Beaker or Funnel Beaker-Baden occupations. In these instances the variability may be sufficient to cast some doubt about the cultural identity of these individuals, allowing for the possibility that they were actually non-local people residing in the settlement. In the following sections such individuals are clearly highlighted.

The positioning of some of these individuals within the burial pits is interesting. Burial VII of a 50 year old female was found in a prone position with her arm brought up to her chest. This positioning may be intentional, i.e. if the individual were to 'come to life' instead of digging up to get out of the grave, they would only dig themselves deeper. On the other hand, it could be that as the individual was pushed into the grave, they fell on their front and no additional maneuvering of the body was undertaken.

Table 3. Summary of Funnel Beaker and Funnel Beaker-Baden burial contexts containing grave goods

Phase	Burial Contexts	Grave Goods		
		Present	Absent	Unknown
1	3	-	-	3
2	3	1	-	2
3	2	-	1	1
3/4	11	-	11	-
4	4	3	1	-
5	9	4	-	6
6	3	-	-	3
7	1	1	-	-

The analysis of human remains from Area C revealed three interesting facts about that location and the groups that occupied and used it. First, Funnel Beaker and Lublin-Volhynian construction activities impacted earlier burials. The impact to these burials reveals that neither group was aware of the use of the area as a cemetery in earlier times. Second, the grouping and alignment of impacted burials indicates the area was used a cemetery and that their distribution was not a random collection of isolated burials. And third, it also makes it likely that the site location was not virgin in appearance but already partially cleared when Funnel Beaker people settled there.

Funnel Beaker and Funnel Beaker-Baden Burials

Phase 3 Burial – Area C

Burial I

Location:	Unit C2, Pit 17/18
Depth of burial:	Skeleton occurred at depth of 30 cm. The grave cut into a phase 1 pit
Preservation:	Poor
Type of remains:	Partial skeleton
Skeleton orientation:	Head southwest, legs northeast; face west
Age:	Maturus, 40-50 years
Sex:	Female
Height:	148 cm
Burial goods:	-

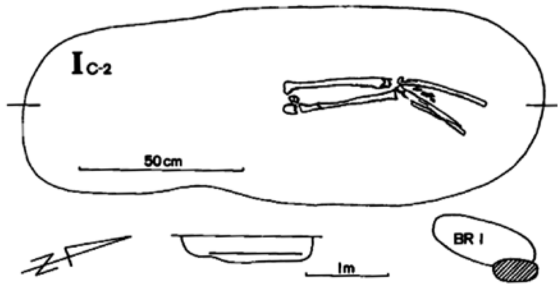


Figure 7. Plan of Burial I

Phase 3-4 Burials – Area C

Burial II

Location:	Unit C2, ar 5716/A.
Depth of burial:	Skeleton occurred at a depth of 30 cm. The burial did not impact any existing pits nor was it impacted by later construction.
Preservation:	Poor
Type of remains:	Partial skeleton
Skeleton orientation:	Head west, legs east, face south
Age:	Senilis
Sex:	Female
Height:	-
Burial goods:	-

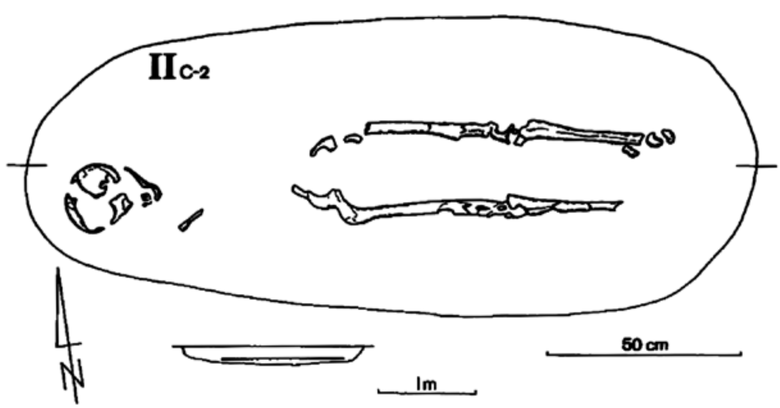


Figure 8. Plan of Burial II

Burial III

Location:	Unit-C2, ar 5717/B
Depth of burial:	The skeleton occurred at a depth of 30 cm. Did not impact any existing features nor was it damaged by later construction.
Preservation:	Poor
Type of remains:	Nearly complete skeleton
Skeleton orientation:	Head northwest, feet southeast
Age:	ca 25 years
Sex:	Female
Height:	-
Burial goods:	-

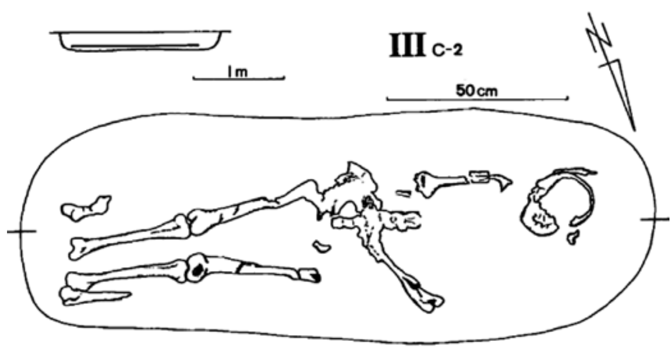


Figure 9. Plan of Burial III

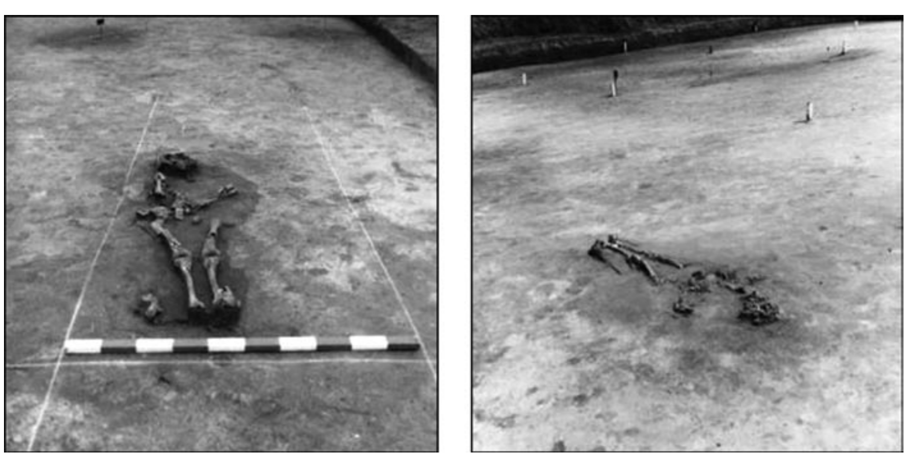


Figure 10. Two views of Burial III

Burial IV

Location:	Unit C2, ar 5717/D
Depth of burial:	Skeleton occurred at a depth of 35 cm l. Did not impact any existing features nor was it damaged by later construction.
Preservation:	Poor
Type of remains:	Partial skeleton
Skeleton orientation:	Head north, legs south
Age:	Adult
Sex:	-
Height:	-
Burial goods:	-

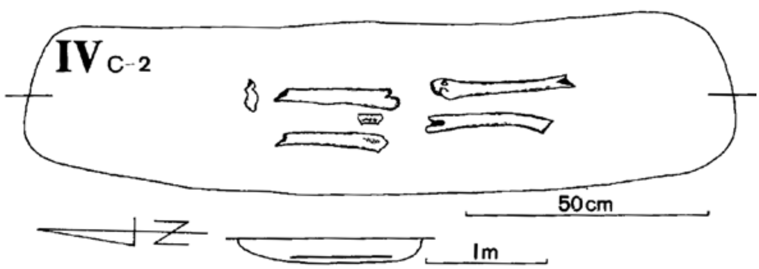


Figure 11. Plan of Burial IV

Burial V

Location:	Unit C2, ar 5718/A
Depth of burial:	Skeleton occurred at a depth of 30 cm. Did not impact any existing features nor was it damaged by later construction.
Preservation:	Poor
Type of remains:	Fragmentary skeleton
Skeleton orientation:	Head north, legs south
Age:	-
Sex:	-
Height:	-
Burial goods:	-

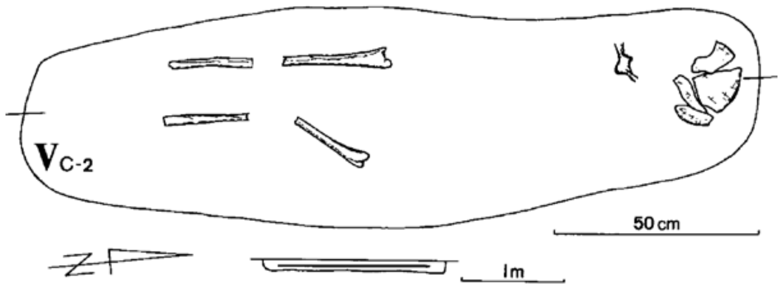


Figure 12. Plan of Burial V

Burial VIII

Location:	Unit C2, Pit 48
Depth of burial:	Skeleton occurred at a depth of 35 cm. Did not impact any existing features nor was it damaged by later construction.
Preservation:	Poor
Type of remains:	Fragmentary skeleton
Skeleton orientation:	Head south, legs north
Age:	Adult
Sex:	Female
Height:	-
Burial goods:	-

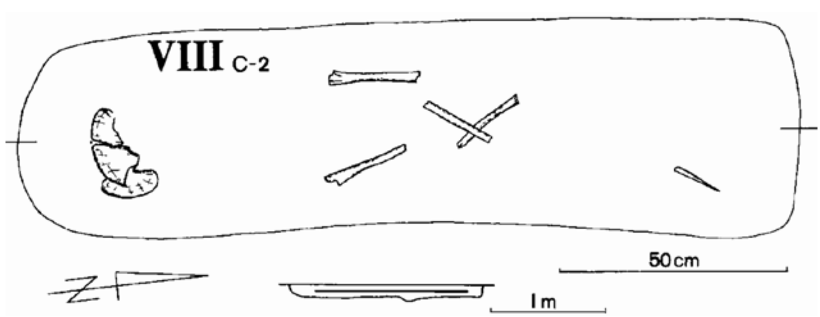


Figure 13. Plan of Burial VIII

Burial IX

Location:	Unit C2, Pit 47
Depth of burial:	Skeletal occurred at a depth of 30 cm. Did not impact any existing features nor was it damaged by later construction.
Preservation:	Poor
Type of remains:	Fragmentary skeleton
Skeleton orientation:	Head north, legs south
Age:	Adult
Sex:	-
Height:	-
Burial goods:	-

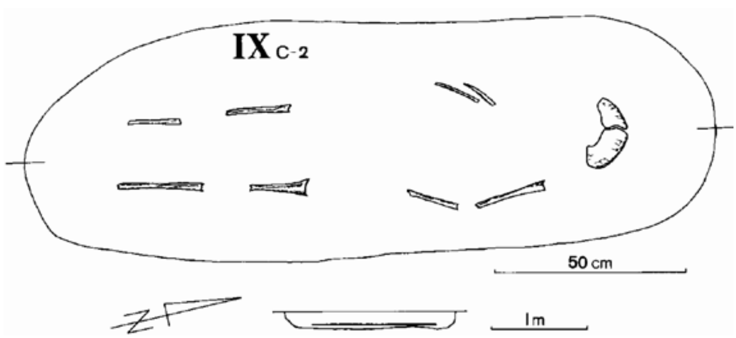


Figure 14. Plan of Burial IX

Burial XII

Location:	Unit C2, Pit 56
Depth of burial:	Skeleton occurred at a depth of 40-50 cm. Grave was cut into a phase 2 Lublin-Volhynian pit
Preservation:	Poor
Type of remains:	Fragmentary skeleton
Skeleton orientation:	Head northwest, legs southeast
Age:	Adult
Sex:	-
Height:	-
Burial goods:	-

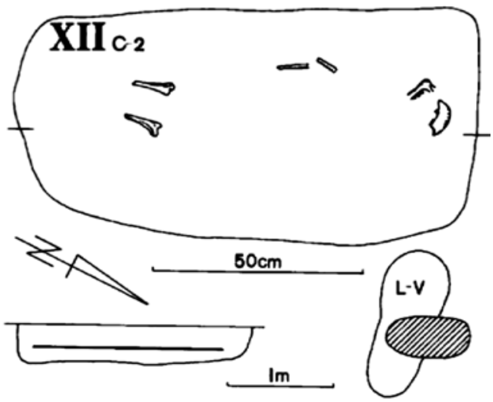


Figure 15. Plan of Burial XII

Figure 16. Photo of Burial XII in Unit C2

Burial XVII

Location:	Unit C5, Pit 18
Depth of burial:	Skeleton occurred at a depth of 38-50 cm. Did not impact any existing features nor was it damaged by later construction.
Preservation:	Poor
Type of remains:	Fragmentary skeleton
Skeleton orientation:	Head south, legs north
Age:	50 years
Sex:	Male
Height:	-
Burial goods:	-

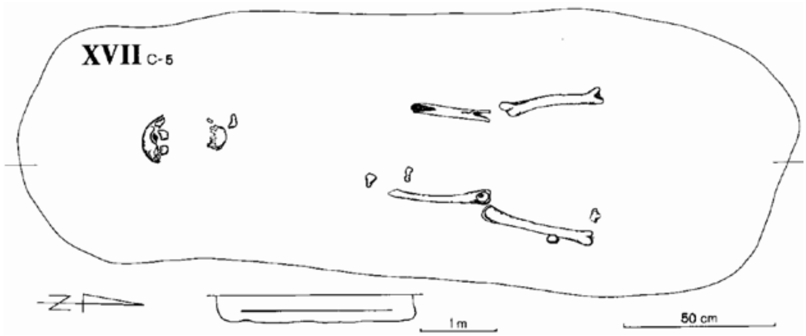


Figure 17. Burial XVII

Figure 18. Burial XVII

Burial XVIII

Location:	Unit C5, Pit 3
Depth of burial:	Did not impact any existing features nor was it damaged by later construction.
Preservation:	Poor
Type of remains:	Nearly complete skeleton
Skeleton orientation:	Head southwest, legs northeast, face upright
Age:	35 years
Sex:	Male
Height:	-
Burial goods:	-

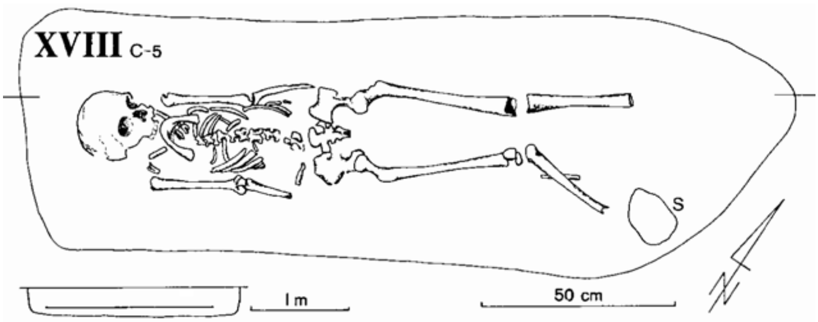


Figure 19. Plan of Burial XVIII

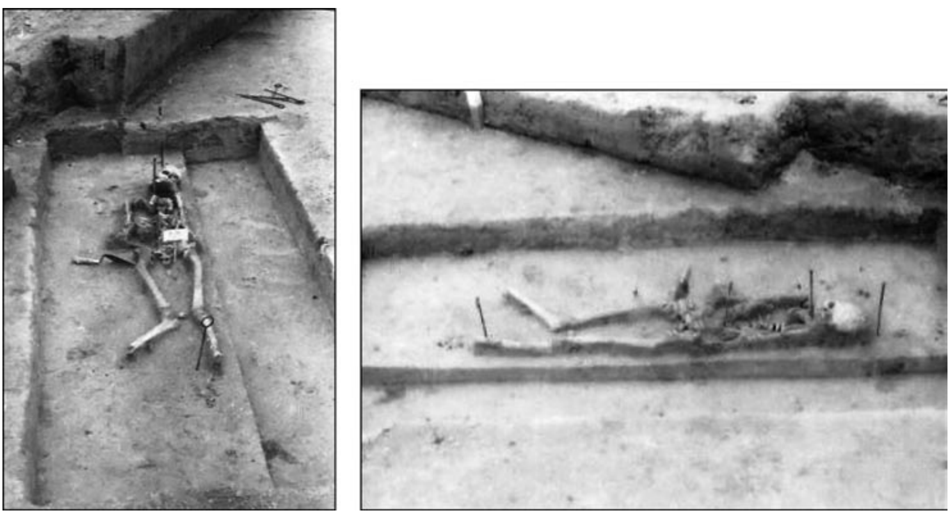


Figure 20. Photos of Burial XVIII in Unit C5

Burial XIX

Location:	Unit C5, Pit 4
Depth of burial:	Skeleton occurred at a depth of 35-45 cm. Burial cut into a phase 3-4 pit.
Preservation:	Poor
Type of remains:	Partial skeleton
Skeleton orientation:	Head southwest. Legs southwest, face upright
Age:	Mature adult
Sex:	Male
Height:	-
Burial goods:	-

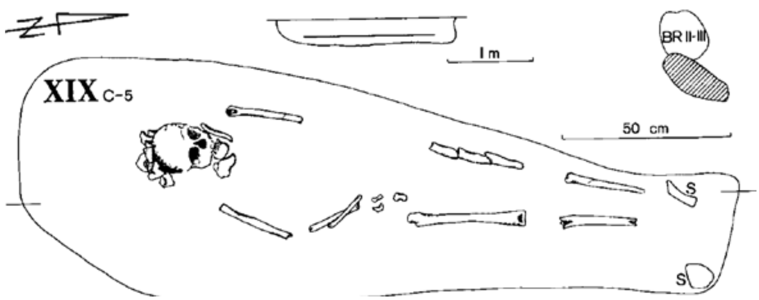


Figure 21. Plan of Burial XIX

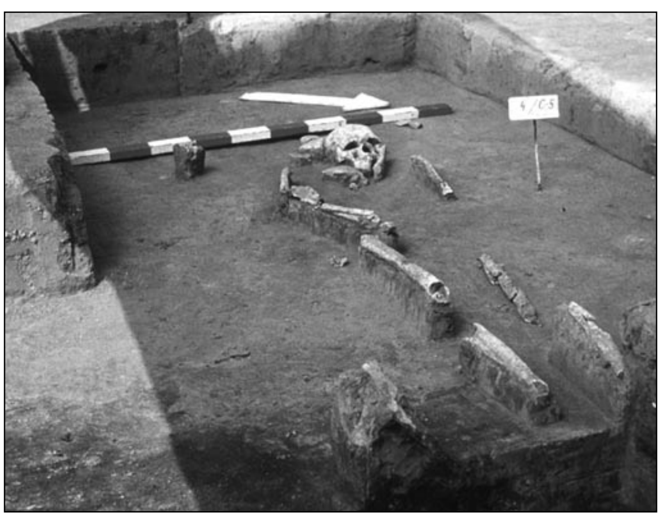


Figure 22. Photo of Burial XIX in Unit C5

Burial XXV

Location:	Unit C7, Pit 7A
Depth of burial:	
Preservation:	Poor
Type of remains:	Fragmentary skeleton
Skeleton orientation:	Head southeast, legs northwest
Age:	Mature adult
Sex:	Male
Height:	-
Burial goods:	

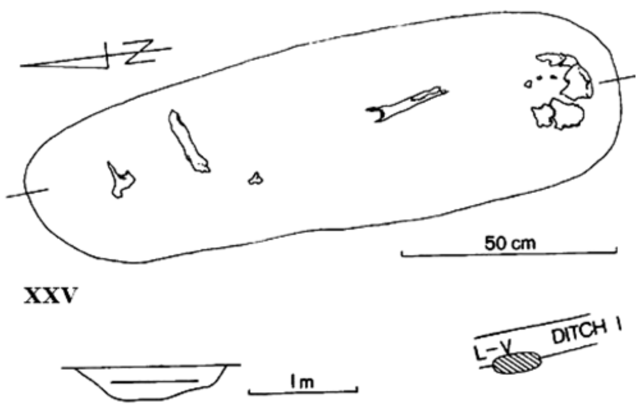


Figure 23. Plan of Burial XXV

Phase 4 Burials – Area A, Area B, Area C

Burial VII

Location:	Unit A1, Pit 102
Depth of burial:	Skeletal occurred at a depth of 30-50 cm. Did not impact any existing features nor was it damaged by later construction.
Preservation:	Well-preserved skeleton
Type of remains:	Complete skeleton
Skeleton orientation:	Head northeast, legs southwest, face down to the north
Age:	50+ years
Sex:	Female
Height:	159 cm
Burial goods:	Potsherds, loom weight, faunal remains

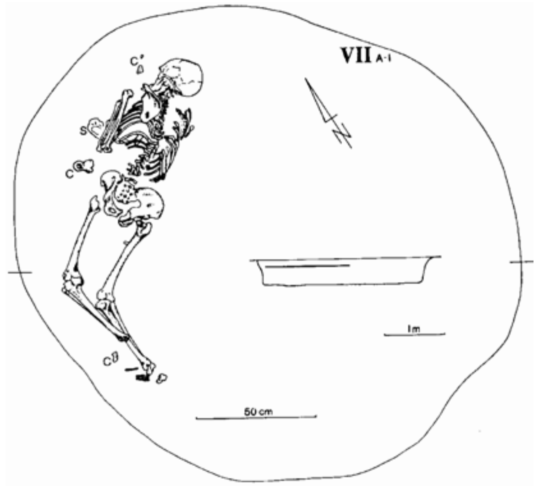


Figure 24. Plan of Burial VII

Figure 25. Burial VII in Unit A1

Burial XVI

Location:	Pit 125-A1
Depth of burial:	The grave cut into a phase 3 pit.
Preservation:	Excellent
Type of remains:	Complete skeleton
Skeleton orientation:	Head west, legs east, face southwest
Age:	7 years
Sex:	Unclear
Height:	-
Burial goods:	Potsherds, spindle whorl

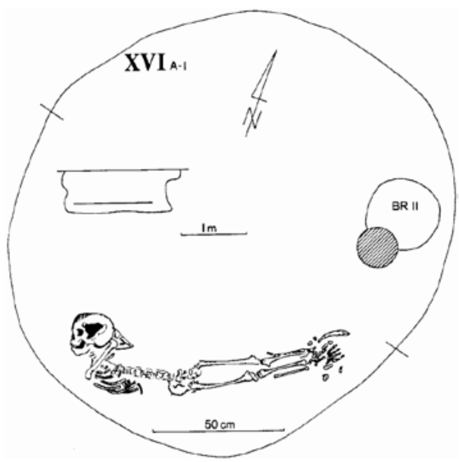


Figure 26. Plan of Burial XVI

Figure 27. Burial XVI in Unit A1

Burial XXII

Location:	Unit B6, Pit 5
Depth of burial:	
Preservation:	Excellent
Type of remains:	Complete skeleton
Skeleton orientation:	Head north, legs south, face west
Age:	
Sex:	Male
Height:	
Burial goods:	Bone bead at neck, ceramics, stone tools, spindle whorls

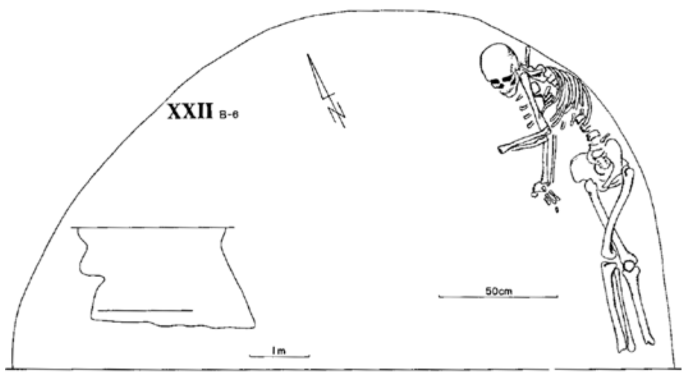


Figure 28. Plan of Burial XXII

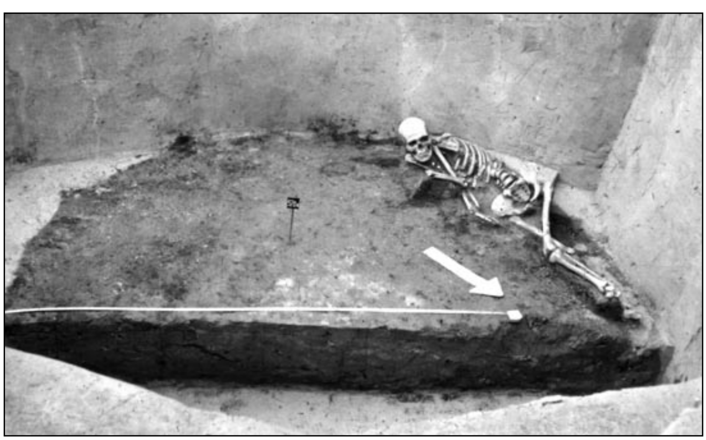


Figure 29. Burial XXII in Unit B6

Burial XV

Location:	Unit C1, Pit 87
Depth of burial:	Skeletons occurred at a depth of 125 cm. The burial cut into a phase 1 Funnel Beaker pit.
Preservation:	Excellent
Type of remains:	Two nearly complete skeletons
Skeleton orientation:	#1 - head north, legs south, face east; #2 - head north, legs south, face west
Age:	#1 - 17-18 years; #2 – 4 years
Sex:	#1 – Female; #2 – unclear
Height:	-
Burial goods:	-

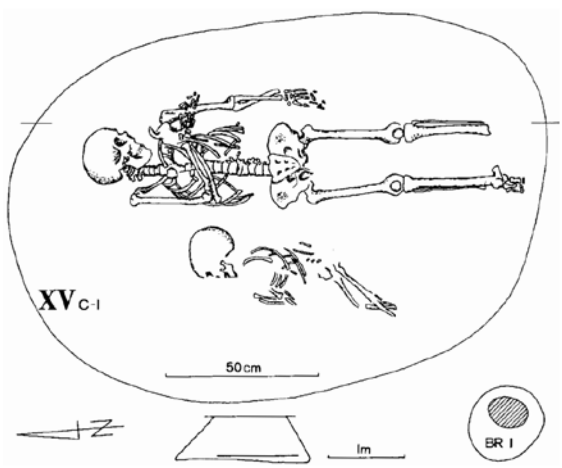


Figure 30. Plan of Burial XV

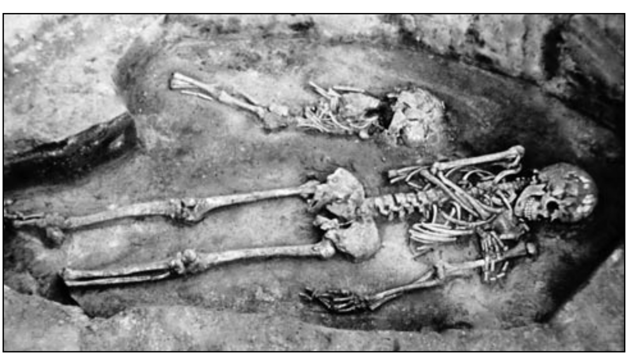


Figure 31. Burial XV in Unit C1

Phase 5 Funnel Beaker-Baden Burials – Area A, Area B, Area C

Burial XXIV

Location:	Unit A3, Pit 22
Depth of burial:	Skeleton occurred at a depth of 130-150 cm
Preservation:	Good
Type of remains:	Partial skeleton
Skeleton orientation:	Accidental interment, no orientation
Age:	18-20 years
Sex:	Female
Height:	-
Burial goods:	Faunal remains

Figure 32. Burial XXIV in Area A3

Burial X

Location:	Unit B1, Pit 43
Depth of burial:	Skeleton occurred at a depth of 50 cm. The grave impacted a phase 4 pit and was later affected by phase 6 pit construction.
Preservation:	Well preserved skeleton
Type of remains:	Nearly complete skeleton
Skeleton orientation:	Head northeast, legs southwest
Age:	30 years
Sex:	Female
Height:	154 cm
Burial goods:	Ceramic sherds, large stone

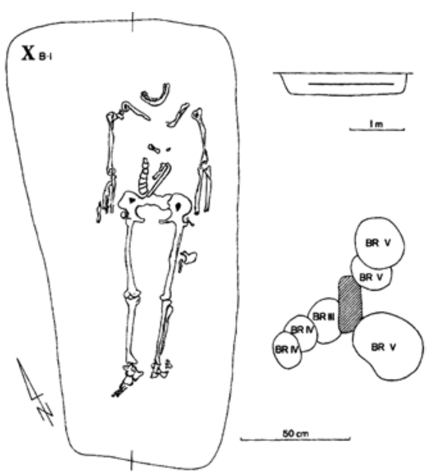


Figure 33. Plan of Burial X

Figure 34. Burial X in Unit B1

Burial XIV

Location:	Unit B1, Pit 100
Depth of burial:	Skeleton occurred at a depth of 150 cm within a step trapezoidal pit. Burial impacted by a phase 6 pit.
Preservation:	Well preserved
Type of remains:	Complete skeleton
Skeleton orientation:	Head south, legs north, face upright
Age:	30-35 years
Sex:	Male
Height:	168 cm
Burial goods:	Ceramic sherds, 2 flint pieces

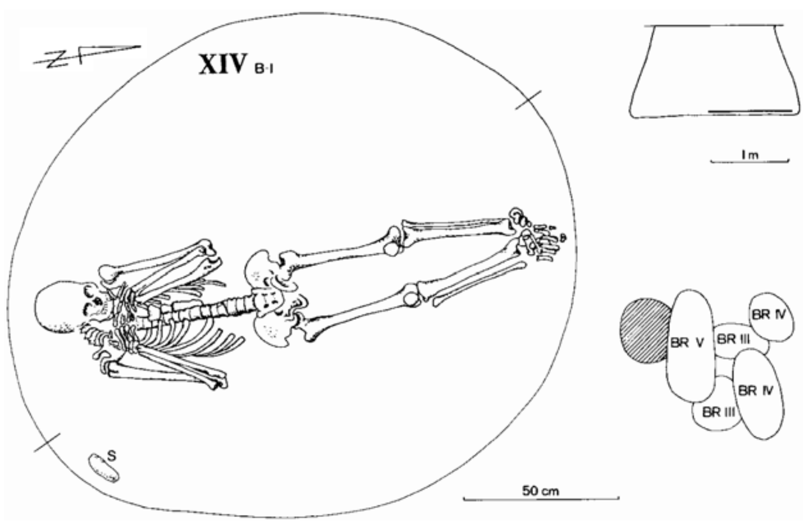


Figure 35. Plan of Burial XIV

Burial XXIII

Location:	Unit B6, Pit 2
Depth of burial:	Skull appeared at the 80 cm level
Preservation:	Good
Type of remains:	Skull
Skeleton orientation:	-
Age:	30-35
Sex:	Male
Height:	-
Burial goods:	-

Figure 36. Burial XXIII in Unit B6

Burial XXI

Location:	Area B-road, Pit 2
Depth of burial:	-
Preservation:	Good
Type of remains:	Partial skeleton
Skeleton orientation:	Head east, legs west, face down
Age:	8-9 years
Sex:	Unclear
Height:	-
Burial goods:	-

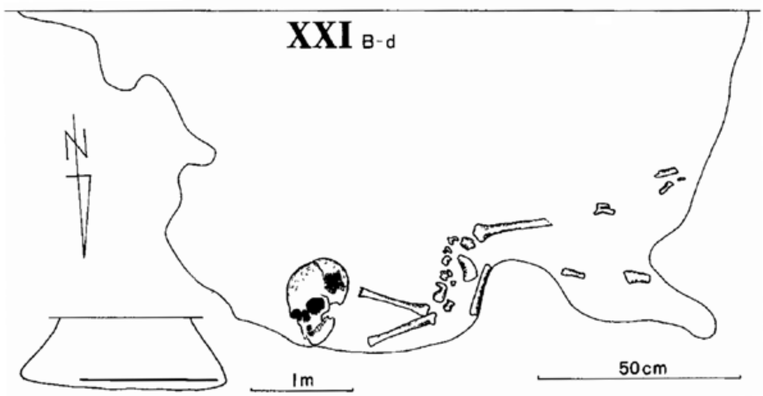


Figure 37. Plan of Burial XXI

Burial XX

Location:	Unit C5, Pit 14
Depth of burial:	The burial was placed with the phase 5 enclosure
Preservation:	Excellent?
Type of remains:	Complete skeleton
Skeleton orientation:	Head south, legs north, face west, extended but placed on left side
Age:	Adult
Sex:	Female
Height:	169 cm
Burial goods:	Two mussel beads, faunal remains

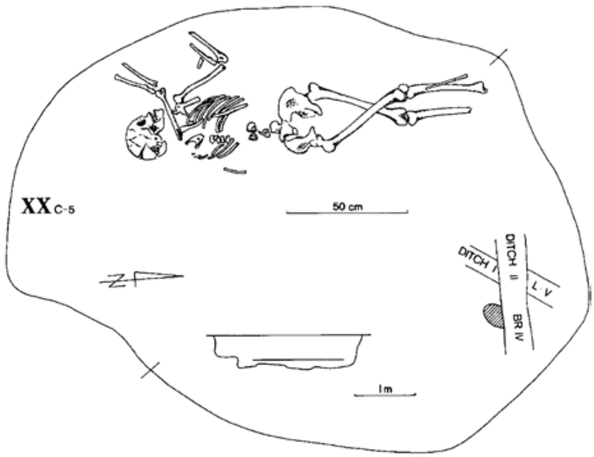


Figure 38. Plan of Burial XX

Figure 39. Burial XX in Unit C5

Figure 40. Burial XX in Unit C5

Phase 6 Burials – Area A, Area B

Burial XXVI

Location:	Unit A4, Pit 1
Depth of burial:	-
Preservation:	Poor
Type of remains:	Fragmentary skull, possibly dumped
Skeleton orientation:	-
Age:	-
Sex:	-
Height:	-
Burial goods:	-

Burial XXVII

Location:	Unit B1, Pit 51
Depth of burial:	Skull found at the 50-70 cm level
Preservation:	Poor
Type of remains:	Skull without mandible
Skeleton orientation:	-
Age:	18 years
Sex:	Female
Height:	-
Burial goods:	Potsherds, animal bones, burnt clay

CHAPTER 6

Lublin-Volhynian (VI), Corded Ware (XI) and Possibly Baden Burial (XIII)

Sarunas Milisauskas, Janusz Kruk, Elżbieta Haduch and Marie-Lorraine Pipes

Introduction

One of the most intriguing aspects of Bronocice is the well-defined presence of non-Funnel Beaker people at different points in time. The only occupation at Bronocice during which Funnel Beaker or the descendant Funnel Beaker-Baden culture group were not in control of the settlement was during the Lublin-Volhynian Phase 2 occupation. This was a transitional period during which Funnel Beaker groups settled into Lublin-Volhynian territory. The impact of surrounding Funnel Beaker groups on their psyche is manifest in the fact that the Lublin-Volhynian group eventually built a deep fortification ditch and palisade around their settlement. Visually, this construction marked the landscape in a way that Funnel Beaker people were unaccustomed to. One Lublin-Volhynian grave (Burial VI, Pit 19-C2) was found dating to this occupation and period of time (Table 1).

In Phase 5 some non-Funnel Beaker people came to Bronocice. The oxygen isotopic composition of individuals in the collective grave XIII suggest a non-local origin, possibly Baden, influx. All of the members of this group of people died at the same time, probably at the hands of Bro-

Table 1. Summary of the number of skeletons (MNI) from non-Funnel Beaker cultures at Bronocice

Phase	Culture	Burial #	Flex Burials
			MNI
2	Lublin-Volhynian	VI	2
5	Baden or Funnel Beaker-Baden	XIII	17
7	Corded Ware	XI	1
Total MNI			20

nocice residents. Their bodies were placed within a single grave (Burial XIII, Pit 36-B1). This collective grave raises many questions about identity, social interactions, relations and violence.

The other non-Funnel Beaker group observed at Bronocice was Corded Ware. A single warrior grave (Pit 67-B1, Burial XI) was found within the center of the former Funnel Beaker-Baden settlement area. The location of the grave suggests there may have been cultural or ancestral ties influencing the selection of the burial location.

The three cases of non-Funnel Beaker burials range roughly from 3700 BC to 2600 BC, thus the deceased were interred at different points in time over a 1000 year period. The time gap between them is great yet they share certain similar burial traditions. They were all flex burials and equipped with grave goods and food offerings. They were also all buried in circular pits. Burials VI and XIII contained multiple skeletons within the graves.

These patterns contrast sharply with Funnel Beaker burial traditions in which the dead were placed on their backs within shallow oval pits, usually without any grave goods or food remains at Bronocice. The flex position is reminiscent of earlier burial traditions associated with Linear Pottery and Lengyel cultures (Zakościelna *et al.* 2009). In rare cases in which a few objects were found in Funnel Beaker graves they were generally grinding stones, flint artifacts and broken pieces of ceramics. It was suggested in Chapter 5 that a few of these burials that diverged from tradition Funnel Beaker practices in terms of the location of burials, the placement of the bodies and the presence of personal effects, may have been non-Funnel Beaker individuals as well.

This chapter describes the three clear cases of non-Funnel Beaker graves that are associated with Lublin-Volhynian, Corded Ware and possibly Baden cultures.

Phase 2 – Lublin-Volhynian

The Lublin-Volhynian settlement was concentrated in Area C, the center of the settlement which enclosed by a ditch. A single Lublin-Volhynian burial (Burial VI) was found near the western edge of the excavation unit. Burial VI was a double burial containing the skeletons of an adult woman and an adult man. This burial was located in between a large barn and longhouse (see Chapter 5, Figure 5). The burial chamber measured 180 x 134 cm and consisted of an upper and lower chamber. Evidence of a fire and remains of daub suggest a wooden cover was placed over the burial chamber (Figure 1). Impressions of a wooden lid made of planks were evident in a layer of burnt clay, approximately 6 cm thick that covered the grave. The pit above the burial chamber was filled with dirt. It is likely that a small mound had been constructed over the burial pit. The upper chamber had an oval outline on the surface and its cross-section was rectangular. The lower chamber of the pit had a pear-shaped cross-section (Figure 2). About 50 cm had been removed from the top of the pit due to erosion.

Table 2. Contents of the burial chambers from Burial VI

Types of burial goods	Upper Burial Chamber	Lower Burial Chamber
Ceramic pots	Vessel in the shape of a flower pot (3)	Pedestaled vessel (#1) Cup (#2) Amphora with a low neck (#5) Pot with a high funnel neck (#4)
Stone and lithics	Truncated blade, sickle blade a knife, end scraper, retouched flake, tanged bifacial projectile point Sandstone slab	-
Bone objects	Aurochs horn, red deer antler, goat horn	-
Food offerings	-	Goat, cattle, pig butchered meat cuts

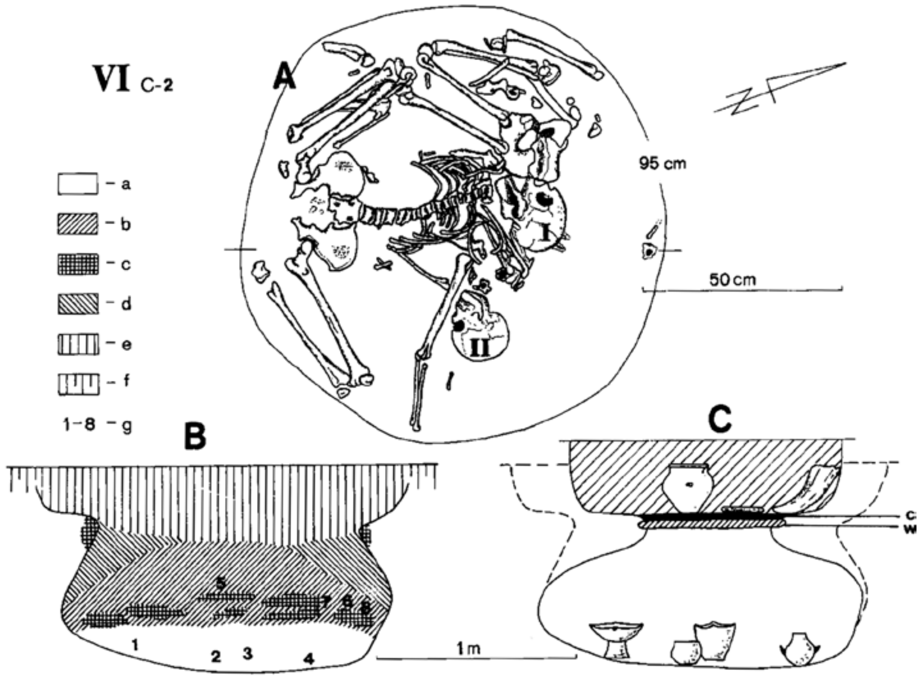


Figure 2. Plan view of the skeletons in the lower chamber of Figure 1. Top of Burial VI showing burn layer, soil profile and burial pit reconstruction (depth 90 cm)

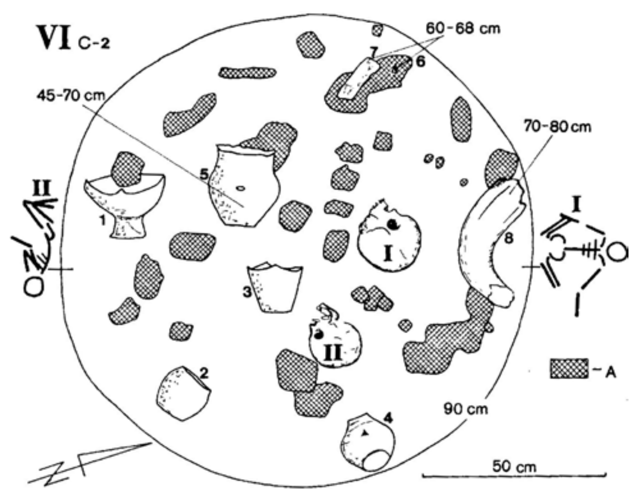


Figure 3. Plan view of the contents of the upper chamber of Burial VI (depth 90 cm)

Figure 1. Top of Burial VI showing burned planking layer

Figure 5. Burial VI, skeletons 1 and 2

Figure 15. Burial XI

Figure 16. Final view of Burial XI.
Note linear stains and dark area around skeleton

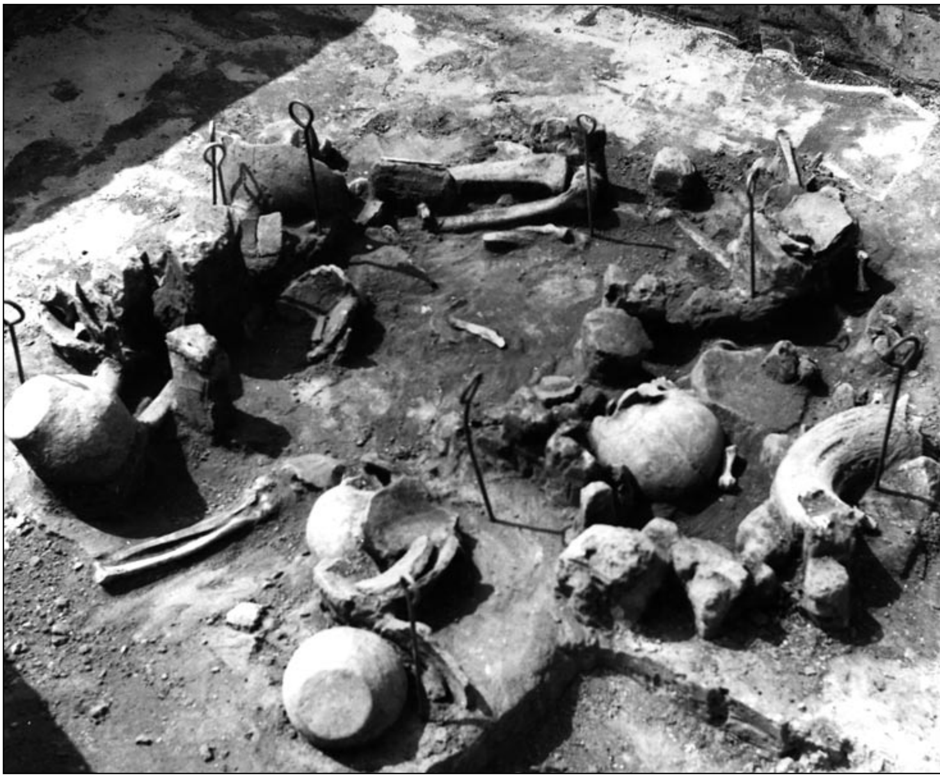


Figure 4. Upper chamber of Burial VI at 90 cm

Two concentrations of grave goods were found in the burial pit (Table 2). One concentration occurred in the upper part of the pit at a depth of 90 cm and another in the lower part in association with the skeletons (Figures 2-4). Thirteen animal bones were recovered in a layer in the central section of the lower part of the pit. The burial pit contained the skeletons of a 30-40 year old woman and a 30-year-old man at a depth of 95 cm from the surface. Their positioning within the pit is interesting. Skeleton 2, a female, appears to have been the primary interment in the pit and was in a flexed position on her left side and oriented E-W. Skeleton 1, a man, was then added to the burial, but is in a supine position with the legs splayed, as if pushed in to the pit and fallen on his back and little care taken to arrange them. His skeleton was oriented N-S (Figure 5).

The burial is exceptional in Lublin-Volhynian burial traditions. No other Lublin-Volhynian grave had such a burial pit construction nor skeletons placed in such a fashion (Kruk and Milisauskas 1985, Zakościelna 2009). Most notably, no other Lublin-Volhynian woman was ever accorded such a rich and highly ritualized burial. This woman's burial marks her as someone of great social importance. The man on the other hand was treated differently. Some suggest he was placed in a seated position though we are not convinced (Zakościelna 2009). He may have been included in the burial as her servant. It is also worth mentioning that it is very rare to find a Lublin-Volhynian burial so far west in their territory.

Phase 5 Possibly Baden Collective Burial XIII

During the 1974 field season the remains of 17 individuals were uncovered in burial XIII which was located in Unit B1, Pit 36-B1 (Figure 6). The pit was roughly circular at the top, measuring 140 x 130 cm in size. It measured 130 cm in depth (Figure 7) and its profile, once excavated, was rectangular in shape. It was dug into the southern part of Pit 38-B1. This pit was located within a wood lined cellar with a doorway (Figure 8).

In the layers of the pit above the skeletons (30 to 90 cm) 116 sherds, 14 flint artifacts, 54 animal bones and pieces of burnt clay were found. Burnt

Table 3. Summary of upper and lower pit contents of Burial XIII

Types of burial goods	Upper Burial Chamber	Lower Burial Chamber
Ceramic pots	Vessel in the shape of a flower pot (3)	Pedestaled vessel (#1) Cup (#2) Amphora with a low neck (#5) Pot with a high funnel neck (#4)
Stone and lithics	Truncated blade, sickle blade a knife, end scraper, retouched flake, tanged bifacial projectile point Sandstone slab	-
Bone objects	Aurochs horn, red deer antler, goat horn	-
Food offerings	-	Goat, cattle, pig butchered meat cuts

Table 4. Locations of the skulls in the burial

Skull no.	Elevation	Skull no.	Elevation
1	267.128	9	266.895
2	267.031	10	266.828
3	267.051	11	266.843
4	267.098	12	266.894
5	267.025	13	266.912
6	266.916	14	266.951
7	266.875	15	267.042
8	266.805	16	266.888

clay and animal bones were found at a depth of 30 to 90 cm. In the bottom of the pit 17 human skeletons were uncovered at a depth of 90-130 cm. In the skeleton level of the pit, 191 sherds, ten flint artifacts, 35 animal bones, a boar's tusk pendant, mussel bead necklaces and pieces of burnt clay were found (Table 3). The animal bones represented food offerings that included meat cuts from the rib, shoulder and loin of sheep, the head of a pig and pork cuts from the shoulder and forelimb, and a partial cattle head and beef cuts from the hind leg and lower forelimb.

Along with the skeletons, remains of three Funnel Beaker-Baden shaped vessels were found (Figure 9) belonging to Bronocice Phase 5. These vessels were not associated with any particular skeleton. Of the three vessels, one undecorated amphora (Figure 9) is similar to the latest Proto-Baden types in Moravia, Jevišovice C2-C1 and Ohrozim (Neustupný 1959; Pavelčik 1973a). Bones of two skeletons were dated by radiocarbon method at the University of Arizona Laboratory: XIII-1, 4449±58 BP, XIII-5, 4540± BP.

The grave was composed of five adults and 12 children. Table 4 gives the elevations (asl above sea level) of skulls in the pit. The oldest male was placed last in the center of the burial in a flex position. The adults included two women about 18 years old, two men aged 18 and 25 years, and a 15 year-old of undetermined sex. The 15 year old would have been considered an adult in Neolithic society. The children, none of which were sexed, ranged in age from six months to 10 years.

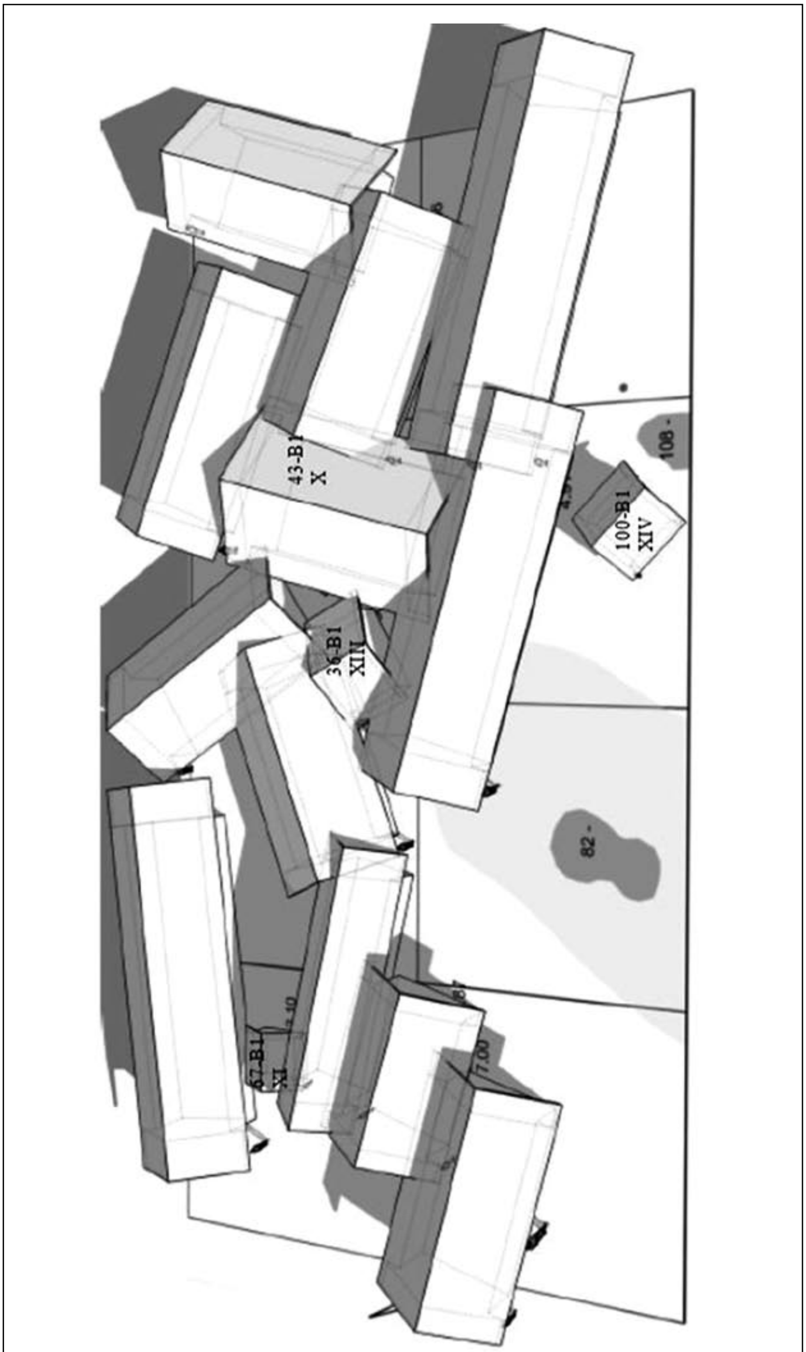
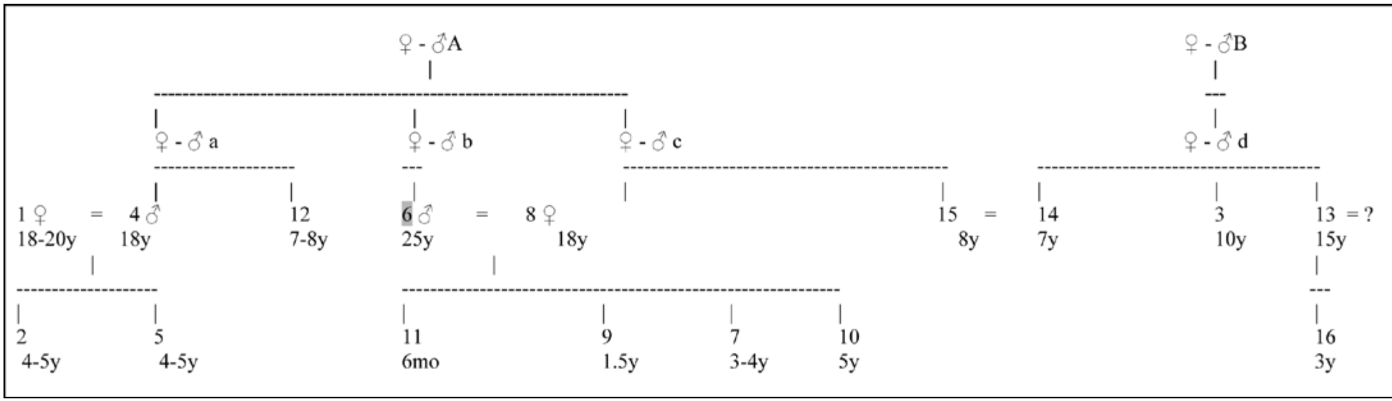


Figure 6. Unit B1 showing location of Burial XIII as well as contemporary Funnel Beaker-Baden burials X and XIV and the Corded Ware burial XI

Figure 7. Emerging skeletons in Burial XIII, Pit 36-B1

The burial was carefully arranged (Figures 10 and 11). Most of the bodies were placed in a circular pattern around the periphery of the pit. The archaeological evidence indicates that all of the bodies were placed within the burial at the same time. There were three group placements topped by a single individual (Table 5). Whether or not these represent related individuals or not could not be determined based on available data. Nonetheless, the arrangement of the bodies may be significant in terms social groupings. The first group to be placed in the burial consisted of skeletons

Table 5. Hypothetical family structure of the collective grave, lineages A and B



Notes:

- #1 may be related to lineage B as she was found cradling #3 and was located close to #14 and 13 who appear related based on the presence Carabelli's cusp.
- #17 does not appear in the images so its location in the grave is unknown.
- Highlighted individuals are those with genetic traits: yellow = Carabelli's cusp, orange = os epiptericum, blue = shovel shaped incisors and grey = both os epiptericum and shovel shaped incisors.
- #4 and #12 are siblings.

Figure 8. Possibly postmold stains (left) of the burial chamber wall

#13, 14, 15, and 16. They consisted of a 15 year adult, 7 year old, 8 year old and 3 year old. Skeletons #14 and 15 were both children aged 7 years and 8 years respectively. They were placed side by side. The one skull (#15) is at an awkward angle, suggesting the body was dumped in. This particular child is of interest because of a large shell necklace placed around the neck with over 300 beads.

The second group was composed of skeletons #7, 8, 9, 10, 11 and 12. These were composed of a 3-4 year old, 18 year old woman, 1½ year old, 5 year old, 6 month old and 7-8 year old.

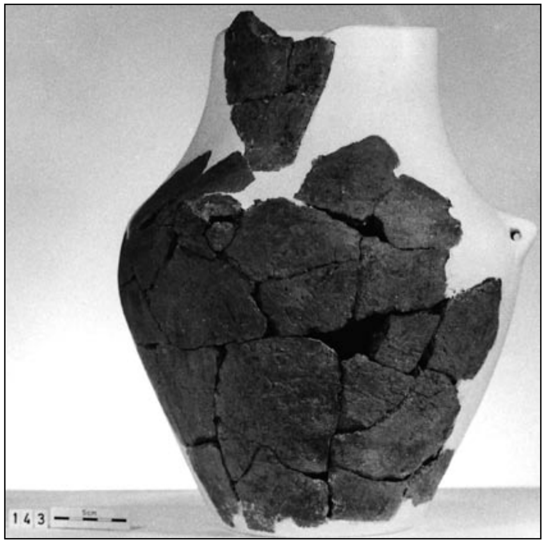


Figure 9. Funnel Beaker-Baden shaped vessel from Burial XIII

The third group placed in the burial included skeletons #1, 2, 3, 4 and 5. There was a woman aged 18-20 years, a 4-5 year old, 10 year old, 18 year old man, and another 4-5 year old.

Individuals #1-5 appear to form a family group though what kind is unclear. However, the woman cradles the man's head with her right hand while the heads of the children lean on her body.

The final body placed in the burial was individual #6, a man aged 25 years. He was positioned in the center. Because he was the last to be placed in the tomb it is possible he watched the others being killed before his own life was ended.

How and why these individuals died is unclear. The osteological report suggests no signs of trauma. These people stand apart from the Funnel Beaker-Baden community in several important ways. First, most of them were buried wearing necklaces made of shell beads, animal teeth and bones, or a combination of shell and bone. The necklaces mark them as a group unto themselves, apart from the rest of the people in the settlement who did not have a tradition of wearing jewelry.

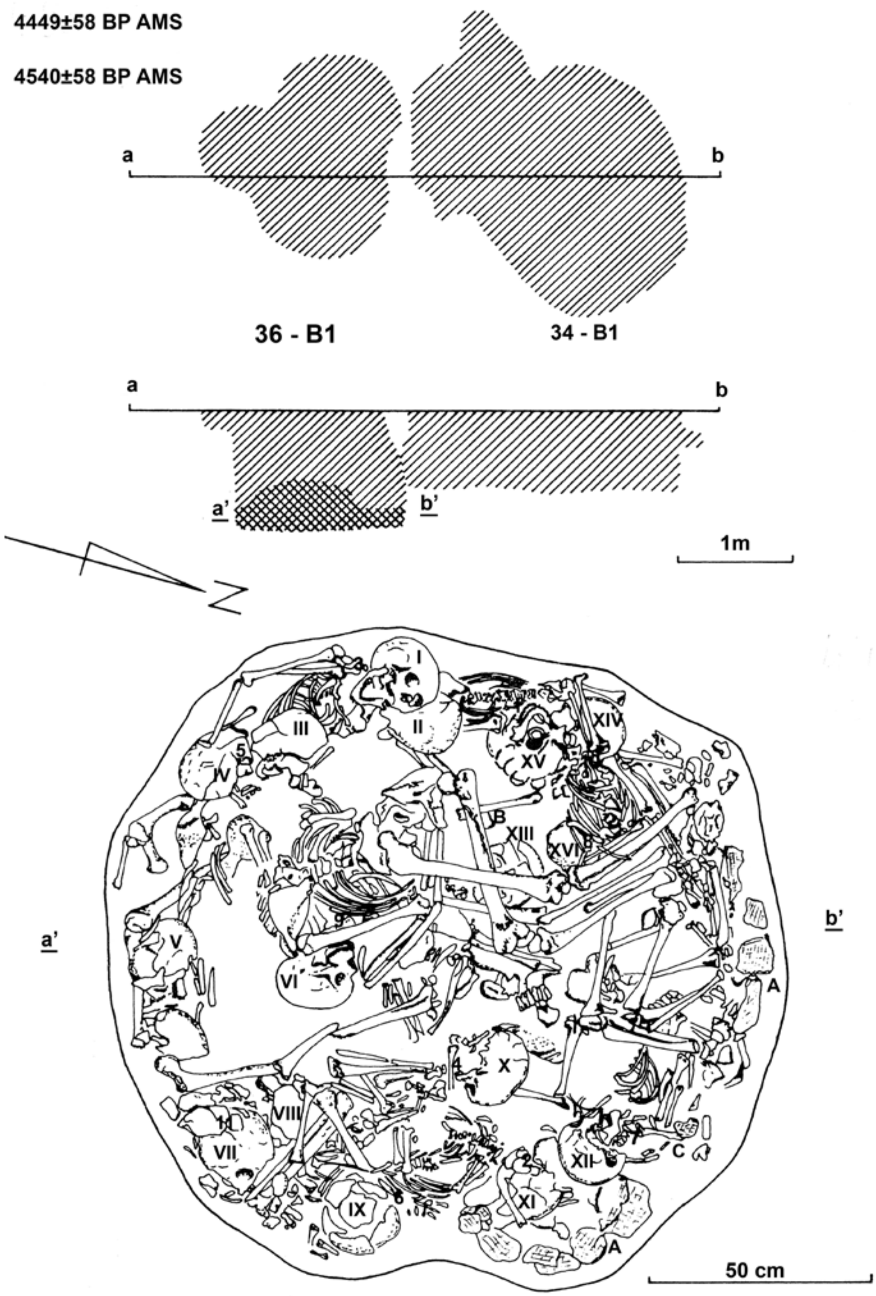


Figure 10. Plan views and profile of Burial XIII

Figure 11. Note remains of postmold stains of horizontal joists in the side walls of the excavation unit

Second, their burial together in a collective grave stands out as unique at Bronocice. While it is true that only a small part of the site was excavated, a significantly large area was nonetheless tested and several burials spanning a vast stretch of time were encountered.

Third, the placement of bodies was generally flexed with individuals placed on their sides. This is unlike the traditional Funnel Beaker pattern seen in Phases 3 and 4, and which appears to have been continued by Funnel Beaker-Baden in Phase 5. Two identified males (#4, #6) were placed on their left sides, while one of the women (#1) was placed on her back. The position of some children can also be determined. Individuals #3, 5, 7, 11, 13 and 15 lie on their right sides while individuals #9, 10, and 12 on the left sides. The rest were undetermined.

Fourth, three sets of population genetic markers were observed that were not seen on any other skeletons from any phase before or after. These include Carabelli's cusp (#s 3, 13, and 14), shovel shaped incisors (SSI) (#s 4, 8, 12, and 15), and os epitericum (#s 4, 6, 10, and 12). Two individuals shared two of the traits (#s 4 and 12). In terms of population genetics, at least 9 individuals were not Funnel Beaker-Baden, but possibly Baden. This is supported by isotopic study of the individuals in the collective burial XIII-B1 (See Appendix B).

Based on genetic traits, the ages at death of the individuals, and the placement of the bodies in the grave, a hypothetical family structure is proposed in Table 5. Two lineages are suggested, one very large comprising the majority of individuals (n=11), the other smaller consisting of four, possibly five, individuals. In Lineage A, three adults were likely related genetically possibly as cousins. One adult man closely related to a 7-8 year child (#12), and an adult woman (#8) was closely related to an 8 year old child (#15). Proximity suggests individuals 1 and 4 were a couple, as were 6 and 8. Proximity also suggests that individuals #2 and #5 belonged to the first couple and individuals #11, 9, 7 and 10 belonged to the second couple. Individuals #2 and #5 were the same age. Perhaps they were twins. In Lineage B it may be the individual #13 was the mother of #16. The woman (#1) associated with the Lineage A man (#4) may have been related to lineage B. She cradled the head of #3 and was close to #4 and #3.

Corded Ware Burial

A well preserved Corded Ware burial was found in excavation unit B1. It had a catacomb grave construction and contained the skeleton of an adult male. The dimensions of the catacomb were 227 cm (N-S), 170 cm (W-E) and 70 cm depth (Figure 12). This man was distinguished by his age, approximately 50-60 years and his tall stature 171.3 cm (5′6″). He was

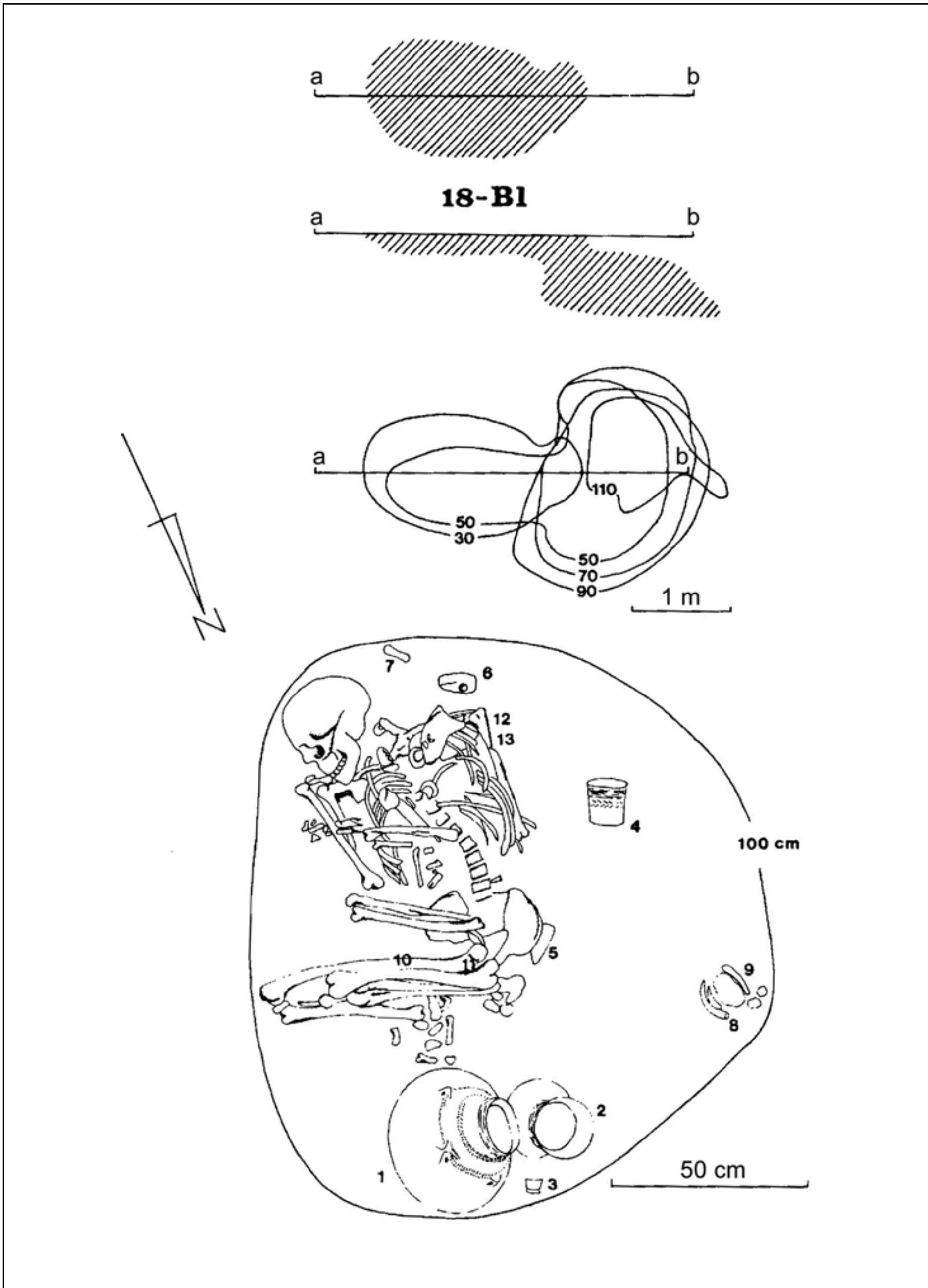


Figure 12. Plan views and profile of Burial XI

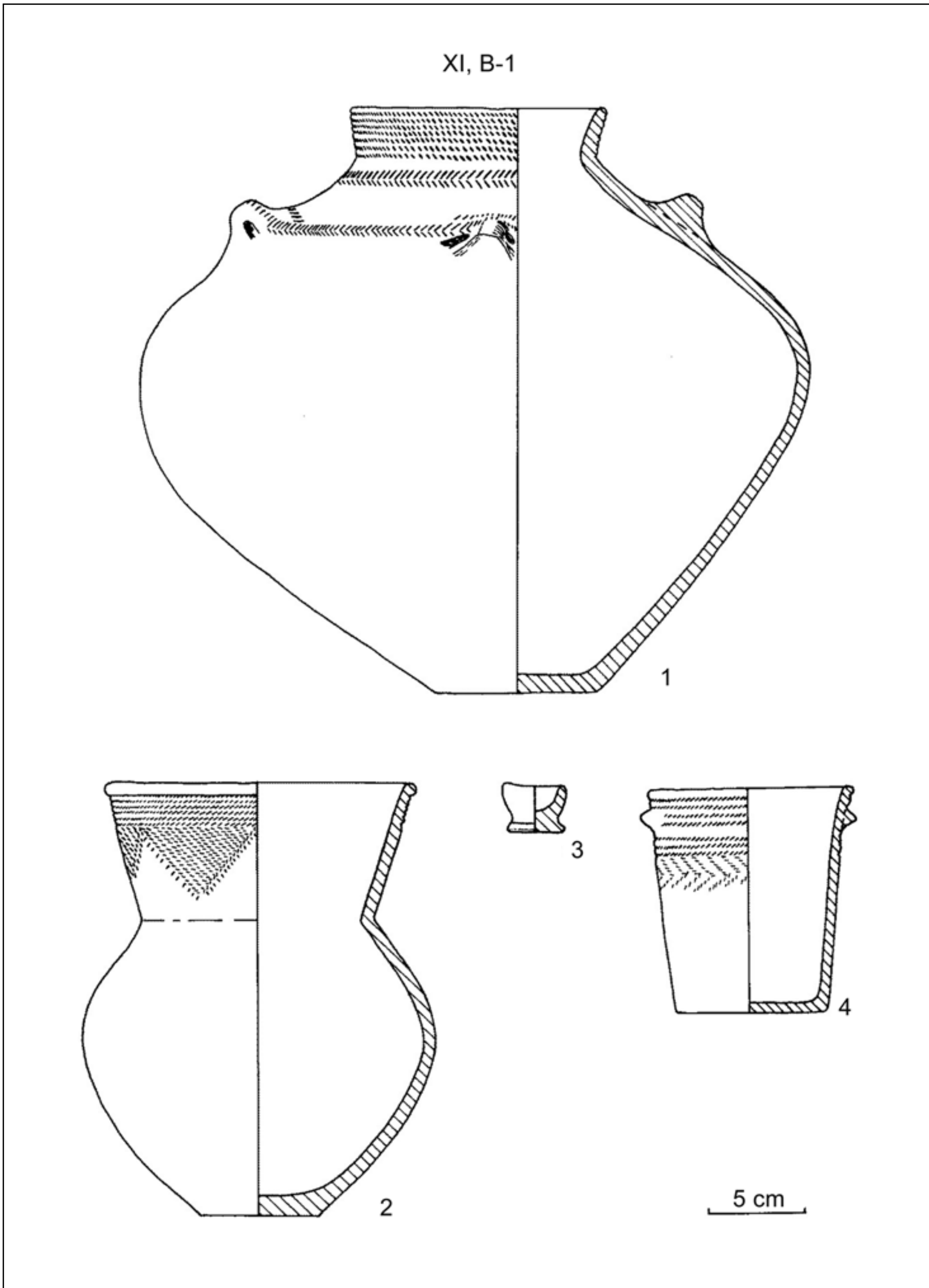


Figure 13. Pots found in association with Burial XI

Table 6. Summary of artifacts recovered from Burial XI

Materials	Artifact Description
Ceramic	2 large pots, 1 miniature vessel, 1 cup
Stone and flint	Blade, projectile point, adze, axe
Bone	Antler chisel, pig tusk knives, pin beater, awl
Jewelry	Carved tooth bead

Figure 14. Excavation of Burial XI Pit 67-B1. Note squared edge of burial

oriented N-S and the head to S. Analysis by Elżbieta Haduch showed that the deceased had evidence of arthritis and osteoporosis. In addition, the base of his skull showed signs of injury which he suffered prior to death and burial. Many artifacts were recovered from the burial including ceramics, stone tools, flint artifacts and bone objects (Figure 13; Table 6). The artifact inventory suggests those who created the burial had a great respect for the deceased. The inclusion of weapons suggests he was a warrior. The grave itself was originally square (see Figure 14). Staining around the skeleton suggests he was placed on organic bedding material (Figures 15 and 16).

CHAPTER 7

Neolithic Burials at Olszanica, Dziekanowice, Michałowice

Sarunas Milisauskas, Janusz Kruk and Marie-Lorraine Pipes

The social meaning and significance of variable burial traditions that occurred over the course of a millennium at Bronocice is best understood by looking at specific examples from cultures and sites that date before and after. Burials found at the sites of Olszanica, Dziekanowice and Michałowice provide good comparisons with those from Bronocice. Olszanica was an early Neolithic site primarily associated with the Linear Pottery culture. However there was a slightly later burial clearly associated with the Malice culture. The burial found at Dziekanowice belongs to the Modlnica phase of the Lengyel culture while that found at Michałowice is from the Pleszów phase of the Lengyel culture, both of which date between Linear Pottery and Funnel Beaker periods.

Olszanica

Olszanica is a large Linear Pottery culture site located at the northwestern edge of the city of Cracow. The site is situated on a loess elevation above the flood plain of the Rudawa River. The size of the site is estimated to be approximately 30 ha based on the distribution of flint artifacts. The results of the excavations conducted from 1967 through 1973 were published by Sarunas Milisauskas (1986). In addition to the Linear Pottery material, a few features and artifacts of other Neolithic cultures such as Malice, Funnel Beaker, and Corded Ware were also found.

The burial discussed below is associated with the Malice culture. Malice cultural material distributed across southeastern Poland, eastern Slovakia, Transcarpathian Ukraine, Upper Silesia, northern Moravia, and Kujavia (Kozłowski 1996). This culture followed the Linear Pottery occupation in southeastern Poland and is dated from 4800 BC to 3900 BC.

A Malice burial was excavated at Olszanica in 1973 (Milisauskas 2000). The first visible outline of the burial pit appeared at 30 cm level. Its outline was roughly round 190 x 180 cm at 35 cm level below the surface. The depth of the pit was 70 cm. The pit contained grave goods associated with a totally decayed skeleton including ceramics, 2 stone axes and 5 flint artifacts. Most of these artifacts occurred in the middle and lower parts of the pit. One of the flint artifacts was a trapezoid and the other a core. They were produced from the local Jurassic flint. Two polished stone axes were found in the burial pit. One is 12.3 cm in length, 2.2 cm thick and 4.3 cm in width (Figure 1). The other axe was a miniature type, triangular in shape, 4.2 cm in length, 0.9 cm thick and 3 cm in width (Figure 1). It was made of serpentine, the nearest source of which is in Silesia, approximately 200 km to the west. The cutting edges of the axes were sharp indicating that they were not used before their deposition in pit (Figure 3).

Four nearly complete pottery vessels were found, some of which were recovered in fragmented condition. The decorated plate with impressions on the lip and body is very characteristic for the classic and late classic phases of the Malice culture (Figure 2), whereas the non-decorated bowl is found in phases 1a-1c (Kamieńska 1973, Kaczanowska 1996, Kamieńska and Kozłowski 1990). The other pots were a pedestaled vessel (Figure 1) and a small jar which was decorated with impressions on the rim and body. Pedestaled pots are most common in all phases except 1a of the Malice culture. The decorated jar is very characteristic for the Malice ceramics and it is found throughout the Malice culture area. They appear in the classic phase (Ib) and last through the late phase (IIa and IIb). Based on the ceramic types, the burial pit can be dated to the late classic phase of the Malice culture, 4500-4100 BC (Kadrow 1996).

Figure 1. Malice pots and stone axes in pit 13-73-D3 at Olszanica

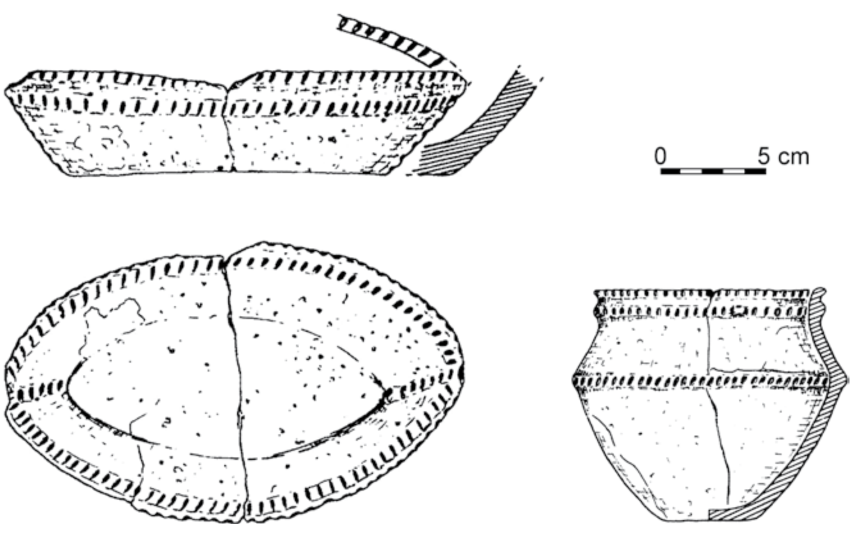


Figure 2. Ceramic vessels of the Malice culture at Olszanica

Figure 6. Malice burial at Michałowice

Figure 7. Close-up of skeleton at Michałowice

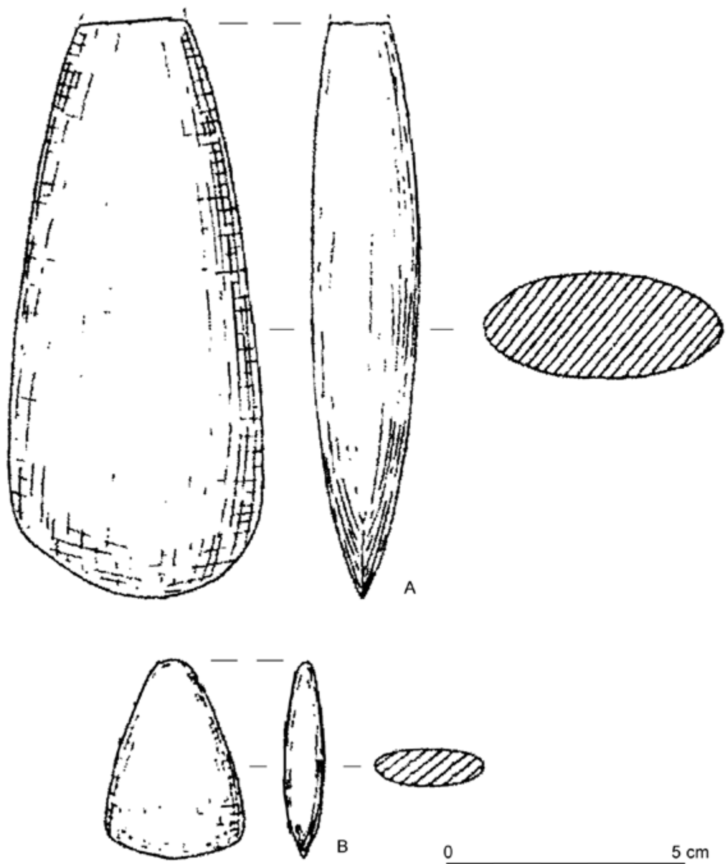


Figure 3. Stone axes of the Malice culture at Olszanica

The burial goods were made of local and non-local materials. Flint artifacts and presumably ceramics were made of local materials. There is a Jurassic flint source at the edge of the site. The axes were made of non-local stone; this is very characteristic of the various cultures belonging to the so-called Danubian tradition in southeastern Poland. Usually axes are associated with males in burials but the presence of the miniature axe at Olszanica makes this conclusion doubtful.

Table 1. Phosphate test results

Provenience	Phosphate contents
50 cm depth	Low
80 cm depth, eastern part of the pit	Medium
80 cm depth, western part of the pit	Low
90-100 cm depth, western part of the pit	High
90-100 cm depth, western part of the pit	Very high
90-100 cm depth, western part of the pit	Low

The existence of the burial in pit 13-73-D3 was determined by the shape of the pit, artifacts and phosphate tests. No human bones were preserved in the pit. Probably the moderately high acidity of the soil destroyed the human bones. Acidity tests conducted in pits at Olszanica indicate an average pH of 5 to 6 for the pit fill.

It is assumed that the area of the pit where the skeleton was located would have the highest phosphate concentration on account of the decay of bones. The method of phosphate analysis has been used by archaeologists since 1930's (Clark 1936: 19-21). The following results represent phosphate tests in pit 13-73-D3 (quadrant 957/A) (Table 1).

A test performed on plain loess in quadrant 937/D had a low content of phosphate. At 90-100 cm depth, phosphate tests were conducted in three different areas of the western part of pit 13-73-D3. Two areas had high and very high phosphate contents. Thus judging from the results of the phosphate tests, the skeleton was deposited at the bottom in the western part of the pit.

It is unclear if this was an isolated single burial or if there was a nearby cemetery containing multiple burials in an unexcavated area of the site. It is likely that there was a Malice settlement in the surrounding area. This would not be surprising since there are several settlements of this culture in the Cracow region.

The burial size and layout reveal that the skeleton was probably flexed. The contents of are typical of burial packages associated with high status males. Because the contents include

Their inclusion may also suggest a strong belief in an afterlife.

Dziekanowice

In 1967, small scale excavations were conducted at Dziekanowice by the Polish Academy of Sciences and the University of Michigan (Kruk 1969a, Jaśkowiak and Milisauskas 2001). Dziekanowice is located only 1 km from Bronocice, a large Funnel Beaker and Funnel Beaker-Baden culture site. At Dziekanowice, Linear Pottery, Lengyel, Funnel-Beaker, Lusatian, Roman Period, and Medieval ceramics occurred over an area of 680 x 200 m. Three excavation units were opened at Dziekanowice; the total excavated area was 170 square meters. The excavation units uncovered 23 pits, 2 hearths, and 2 burials consisting of 1 inhumation and 1 cremation.

Five pits contained material of the Modlnica group of the Lengyel culture and another pit contained a burial from this culture (Figure 4). The skeleton of a child 9 years old was lying on the right side in a flexed position at a depth of 70 cm. The head was oriented southeast and the face northeast (Figure 4). The skeleton was well preserved allowing for measurements to be taken (Table 2).

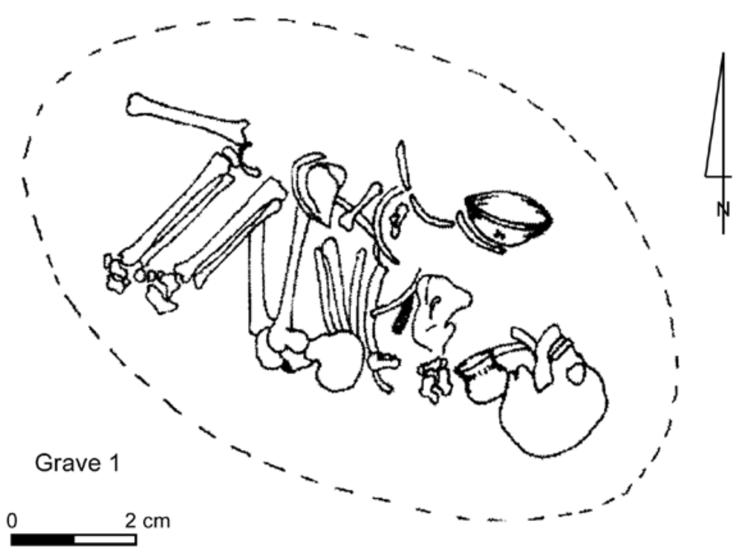


Figure 4. Burial at Dziekanowice

The burial goods consisted of two pots and a long Volhynian flint blade (118 x 28 mm) located between the ribs, either over the ribs or in the ribs. One vessel was a small pear-shaped cup without ornamentation (Figure 5) which lay near the neck of the child. The second vessel, a bowl with a funnel-like neck and small ripple knobs below the rim (Figure 5), was located near the breast. This vessel lay on the side with opening facing upward. The Modlnica phase was contemporary with the Lengyel III phase in Slovakia (Kamieńska 1967: 270). At Dziekanowice, the Pleszów-Modlnica

Table 2. Analysis of the Dziekanowice skeleton by Anita Szczepanek

Skull	Postcranial skeleton	Upper limb	Lower limb
Skull and mandible	Cervical vertebrae (7)	Right	Right
Frontal suture	Thoracic vertebrae (7)	Humerus with upper diaphysis	Femur with upper diaphysis
Left orbit, cribra orbital	Lumbar vertebrae (4)	Radius	Tibia with lower diaphysis
Primary teeth	Sacral (V)	Ulna, diaphyses not fused	Fibula, diaphyses not fused
Permanent teeth	Diaphysis of vertebrae, unfused		Talus
	Right ribs (9)	Humerus with upper diaphysis	Calcaneus
	Left ribs (9)	Radius	
		Left	Left
		Ulna, diaphyses not fused	Femur with upper and lower diaphyses
		Right and left scapulae	Tibia with lower diaphysis
		Carpal bones	Fibula, with diaphyses not fused
		Phalanx	Talus
			Calcaneus
Primary teeth			Phalanx
V IV III 0 0 I 0 0 III IV V			Pelvic bone: ilium, pubis and ischium not fused
V 0 0 0 0 I 0 0 III IV			Navicular
V Permanent teeth			
0 0 6 0 0 2 1 I 1 2 0 0 0 6 0 0			
0 0 6 0 0 2 1 I 1 2 0 0 0 6 0 0			Cuboid

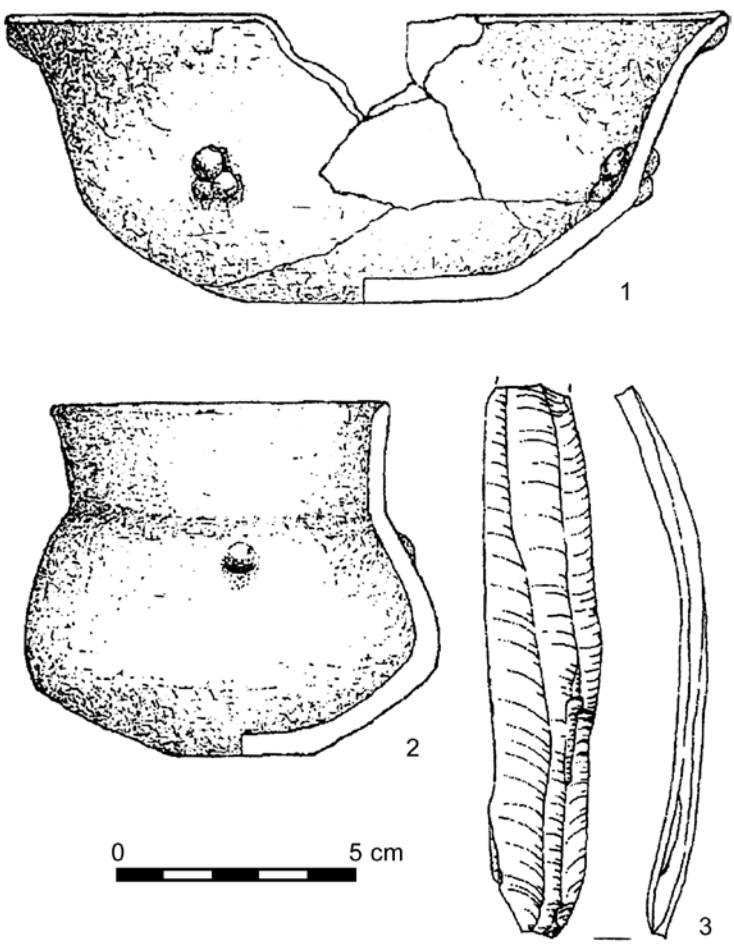


Figure 5. Ceramic vessels and flint blade from the burial at Dziekanowice

phase follows the Modlnica phase. This phase existed during the Lengyel-Polgar II cycle. The burial at Dziekanowice belongs to this phase.

This burial is of interest because of the richness of the grave goods and their association with a child. The placement of the body on the right side suggests the individual may have been a male. The contents indicate this was an important child within the community. The presence of cribra orbitalia indicates that the child suffered from anemia due to iron deficiency.

Michałowice

In 1967, the Institute of the History of Material Culture, the Polish Academy of Sciences, and the University of Michigan jointly conducted small scale excavations at the multicultural site of Michałowice, located in the Cracow region of Poland (Kruk 1969b, Czekaj-Zastawny and Milisauskas 1997). The Neolithic material was distributed over a 200 x 400 meter area. Three units were excavated: they measured: 1) 5 x 5 m; 2) 5 x 10 m; and 3) 5 x 15 m. The excavation uncovered the remains of one burial pit and thirteen Neolithic pits, six of which were identifiable by culture. Within the pits, the cultural remains consisted predominantly of flint artifacts and ceramics belonging to various Neolithic cultures, including Linear Pottery, Bükk, and Malice cultures, and the Pleszów phase of the Lengyel culture. The ceramics associated with the Pleszów phase of the Lengyel-Polgar cycle consisted of 504 pottery sherds and 33 lithic artifacts.

At Michałowice, a Pleszów phase of the Lengyel culture burial was excavated in 1967 (Figure 6). The burial pit was oval and 15 cm deep. Its outline appeared about one meter below the surface. The skeleton was in a contracted position, oriented N-S, with the face in SE direction. In his right hand the deceased male held a bone point. Thirteen Jurassic flint artifacts, mostly blades, were deposited near at the face of the skeleton (Figures 7 and 8). This individual was of maturus-senilis age (50-60 years), and his height measured 163 cm. There were three pottery sherds under the pelvis of the deceased. Lech (1981) classified this individual as a flint artifact production specialist. Analysis of the flint artifacts usage marks indicate that they were used for a variety of tasks, such as wood, hide, and bone work suggesting however the individual may not necessarily have been a flint artifact production specialist.

This burial is of interest because it suggests the possibility that specialists were established as a social group during the middle Neolithic. The burial layout, as well as the specialized composition of the grave goods, reveals some aspects of this individual's social identity. The placement of the body was gendered as was the nature of the lithic assemblage.

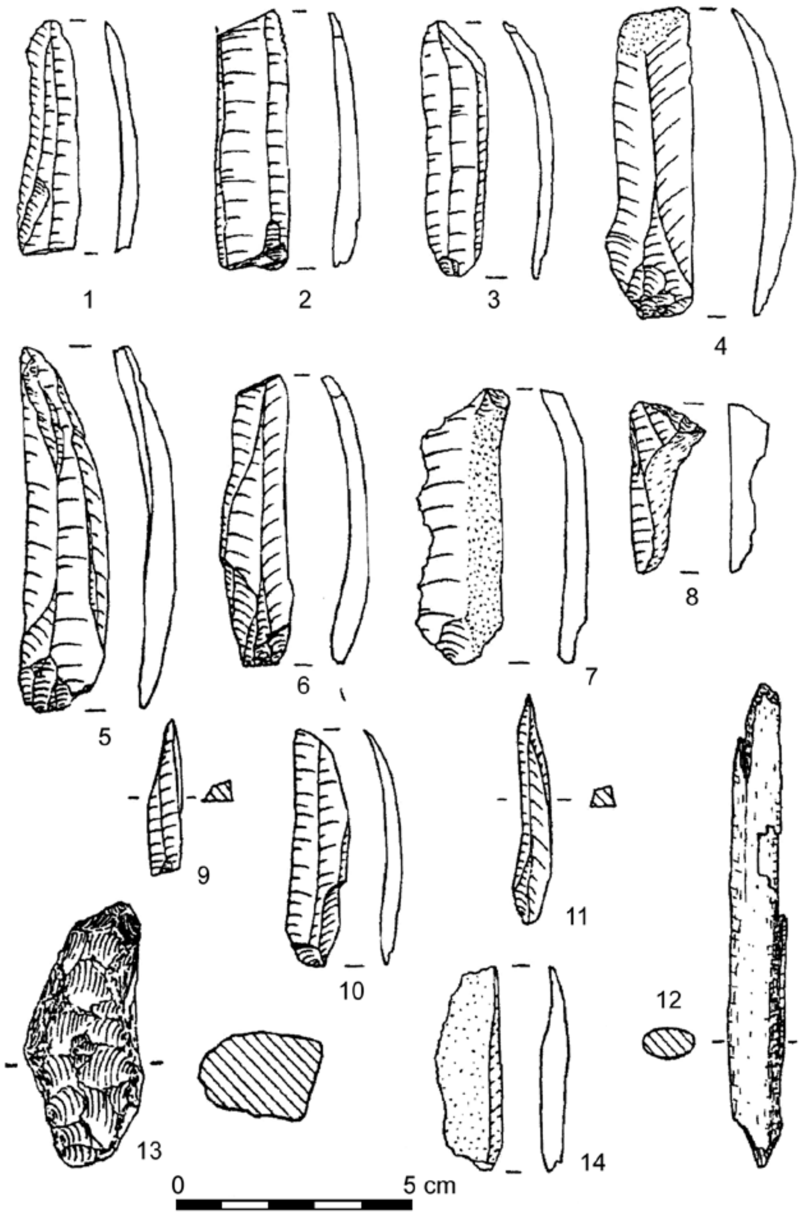


Figure 8. Flint artifacts and bone point at Michałowice

Discussion

These three burials are associated with synchronic indigenous cultural traditions within southern Poland. Following as they do in time they present similar patterns in terms of the layout of the graves, the association of grave goods with high status individuals, and the inclusion of meaningful objects identifying them by gender. Furthermore, each of these burials adds to the growing realization that at Bronocice the Lublin-Volhynian and Corded Ware burials incorporated aspects of ancestral traditions in terms of body placement, inclusion of the burial goods and their association with gender and social position.

PART II

Description of Skeletal Remains

(The Physical)

CHAPTER 8

Description of Skeletons

Elżbieta Haduch

Morphological analysis was conducted of the skull, the postcranial skeleton and teeth of most recovered individuals at Bronocice. Measurements were taken of the skulls and long bones. Some scholars use the metric and non-metric data of the skulls in studies of human evolution and variation (von Cramon-Taubadel 2014). The skeletal analysis provided information about the age, sex, stature, health, diseases and anomalies. The level of analysis varied from one skeleton to the next. Some poorly preserved skeletons were not examined. Those that appeared in unusual contexts received more intensive analysis.

The following burials were examined: I-XI, XIII-XXII.

BURIAL I

Poorly preserved skeleton of an adult female.

S k u l l e l e m e n t s

Only fragments of the braincase were preserved. The following bones of the skull were recovered: fragments of the parietal, occipital, sphenoid and the right temporal bone without the squamous part. The bones of the skull are thick (8 mm) because of diploe hypertrophy. The mastoid process is average (medium). Sagittal and coronal sutures show closure from the skull's interior. The lambdoid suture is in the initial phase of closure.

Postcranial elements

Most postcranial bones were not preserved. Only fragments of the femoral and tibial shafts, one metatarsal, talus, navicular, and both calcanea bones were recovered. Musculature markings are slightly developed.

BURIAL II

Poorly preserved skeleton of an old female.

Skull elements

Only the left side of the braincase could be reconstructed. The skull is elongated, average height and has a deep frontal notch (incisura frontalis). The squamous part of the occipital bone is convex and the superior nuchal line is weakly marked. The temporal line is clearly evident on the surface of the frontal bone. The mastoid process is of medium size. The sutures are completely fused. There is a depression in the lower section of the sagittal suture. Two fragments of the maxilla with alveoli of permanent teeth which show the presence of osteoporosis were recovered. The middle part of the mandible is also present. The alveolar process of the mandible is reduced. Molars alveoli are partly obliterated. Six permanent teeth were recovered and they exhibit a high degree of wear.

Teeth

mandible P_2 P_1 C I_2 – P_1 P_2

Postcranial elements

Postcranial bones consisted of the right clavicular shaft, fragments of hip bones, fragments of the femoral and tibial shafts and both tali. Musculature markings are moderately evident.

BURIAL III

A skeleton of an adult female.

Skull elements

Fragments of parietal bones, the right temporal bone and the left part of the frontal bone were found. The mastoid process is small. Fragments of the lambdoid and sagittal sutures are present. The coronoid process of the mandible and a small fragment of ramus of the mandible were recovered.

T e e t h

maxilla I^2 M^3

mandible C P_2

The teeth of the mandible are slightly worn; the incisor of the maxilla is worn to a medium degree. The molar of the maxilla has an incompletely developed root.

P o s t c r a n i a l e l e m e n t s

The bodies of the lumbar and sacral vertebrae (not fused) and a small fragment of epistropheus were recovered. The following bones were present: fragments of scapula, clavicles, the proximal shafts of ulnae, the distal shaft with the epiphysis of the right humerus, a fragment of the right humerus, a fragment of pelvis, shafts and epiphyses of femurs and tibiae, and fragments of a fibula and foot bones. The gluteal tuberosity and trochanter major of the linea aspera of the right femur are moderately developed, indicating the presence of strong muscles. The neck of femur is wide. The long bones are slender. Musculature markings are moderately evident. The epiphysis of the long bones are fused.

BURIAL IV

Burial of an adult.

P o s t c r a n i a l

Only a few bones were recovered: shafts of both femurs and tibiae, and fragments of a fibula and calcaneus.

BURIAL V

Burial of an adult.

S k u l l e l e m e n t s

Small fragments of a skull (calotta) (2 x 3 cm) were recovered. Parts of sutures are absent. A fragment of the mandible body has a moderately developed mental spine. The permanent teeth are heavily worn.

Teeth
mandible P M

Postcranial elements

Only small pieces of the shafts of the long bones and fragments of foot bones were recovered.

BURIAL VI

A double burial of an adult female and an adult male

Skeleton A

Adult male.

Skull elements

The skull was recovered in a fragmentary condition. When viewed from above the skull has an oval form; when it is viewed from behind it has a miter-like shape. It is well arched and possesses a flattened occiput. The external occipital protuberance is well developed. The superior nuchal line is present. The temporal line runs low and is evident on the squamous part of the temporal bone. The mastoid processes are large and broad. The forehead is of medium height and slightly slanting. The glabella is prominent and superciliary arches are strongly marked in the glabella region. The parietal eminences are clearly evident. The initial phase of suture closure is evident on the inner table of the sagittal suture. Eye sockets are low, trapezoidal and slightly oblique. The root of the nose is wide and low, profile of the nose is convex. The lower edge of the piriform aperture is smooth; the canine fossa is deep, as is the maxilla notch. The mandible exhibits a slight chin form and masseteric tuberosity well developed. The alveolar process of the maxilla and mandible are reduced.

Teeth
maxilla M^2 P^1 C I^2 – I^2 M^1 M^2
mandible M_3 M_2 M_1 P_2 P C – P_1 P_2 M_1 M_2 M_3

Postcranial elements

The following postcranial elements were present: fragments of ribs, cervical vertebra VII, thoracic and lumbar vertebrae, the sacral bone, scapulae, clavicles, humeri, ulnae, radii, femurs, tibias, fibulae, hip bone and foot bones. Musculature markings are clearly evident.

Skeleton B

Adult female

Skull elements

When the skull is viewed from above it has an asymmetrical pentagonal shape. When it is viewed from behind, it is spherical with a clear occiput. The occipital protuberance is not visible and the superior nuchal line is weakly marked. The forehead is slightly slanting, archwise. The glabella and superciliary arches are visible. Frontal eminences are clearly evident, and the mastoid processes are small. The sagittal suture is in the initial stage of closure. Eye sockets are medium size, and the root of nose is wide. The lower edge of the piriform aperture is sharply defined. Maxilla notches and canine fossa are faintly visible. The chin form is weakly marked.

Teeth

maxilla M^2 P^2 P^1 I^1 – I^1 I^2 C P^1 P^2 M^1 M^2

mandible M_2 M_1 P_2 P_1 I_1 – I_1 I_2 C P_2 M_1 M_2 M_3

Postcranial elements

The following postcranial elements were present: fragments of ribs, fragments of vertebrae, the sacrum, the left scapula, the left clavicle, humeri, radii, ulnae, carpal bones, the pelvis, femurs, tibiae, fibulae, and foot bones. The bones are of delicate form.

BURIAL VII

A very well preserved skeleton of an adult female.

Skull elements

A complete skull was recovered. When viewed from above, the skull has an elipsoides acutus shape; when it is viewed from behind it has a miter-like shape, and is well arched. The occiput protrudes in the upper section of the squamous part. Nuchal lines and external occipital protuberances are faintly marked. The mastoid processes are small and slender. The forehead is straight, protruding with weakly marked tubers. The superciliary arches are evident. The frontal notch is small. The temporal line is weakly marked on the frontal bones. The sagittal and coronal sutures show closure from the skull's interior; the metopic suture is present. The eye sockets are large, rectangular and slightly oblique. The root of the nose is wide and of medium height. The nose was prominent. The lower edge of the piriform aperture is sharp. The canine fossa on the right side is shallow; on the left side it has a slight form. The mandible possesses a prominent chin. The teeth are strongly worn.

Teeth

mandible M^2 M^1 P^1

Postcranial elements

The following postcranial bones were recovered: ribs, the body of the sternum, all vertebrae, the sacrum, both scapulae, the right clavicle, humeri, ulnae, radii, pelvic bones, femurs, tibiae and hand and foot bones. The bones are delicate and their muscular markings are only slightly evident.

BURIAL VIII

Poorly preserved skeleton of an adult, (probably) female.

Skull elements

Only two fragments of parietal bones were recovered.

Postcranial elements

The shafts of tibiae, the distal part of the right femur, the proximal part of a fibula, and fragments of a talus were recovered. The musculature markings are barely evident.

BURIAL IX
A skeleton of an adult.

P o s t c r a n i a l   e l e m e n t s
Only several shaft fragments of femurs were recovered.

BURIAL X
A skeleton of an adult female.

S k u l l   e l e m e n t s
When viewed from above, the skull has an oblong rhomboid shape; when viewed from behind, it has a strongly arched, rhomboid shape. The occiput is convex in the upper section of the squamous part. The external occipital protuberance and nuchal lines are subtly evident. The sutures are obliterated in the inner layer, but metopic suture is present. Only the body of mandible is present; the chin is prominent.

T e e t h
mandible $M_2\ P_2\ P_1\ C\ I_2\ I_1$ – $C\ P_1\ P_2\ M_1\ M_2\ M_3$

P o s t c r a n i a l   e l e m e n t s
The following postcranial bones were recovered: several fragments of ribs, thoracic and lumbar vertebrae, sacral Ist vertebra, and fragments of scapula, clavicle, humeri, ulnae, radii, hand bones, hip bones fragments and femora, tibiae, fibulae as well as foot bones. The musculature markings are slightly evident.

BURIAL XIII

Skeleton 1
A skeleton of a juvenile female.

S k u l l   e l e m e n t s
When viewed from above, the skull has an oblong rhomboid shape; when it is viewed from behind, it is miter-like. The superior nuchal line is

faintly marked; the external occipital protuberance is present. In the area of the "asterion" point, both sides exhibit a shallow depression. The forehead (frontal bone) is straight, curved and the frontal notches are moderate. The area of the glabella is weakly evident and the superciliary arches are likewise faintly evident. The temporal lines are weakly marked and the mastoid processes are moderate. There are wormian bones in the lambdoid suture. The sutures are not obliterated. Spheno-occipital synchondrosis is not fused. The eye sockets are rectangular and moderately slanted. The root of nose is low and wide . The lower edge of the piriform aperture is sharp. The maxilla notches are faintly marked and the canine fossa is flat. The chin form is moderate.

T e e t h

maxilla $M^2\, M^1\, P^2\, P^1$ – $P^1\, P^2\, M^1\, M^2$

mandible $M_2\, M_1\, P_2\, P_1\, C\, I_2\, I_1$ – $I_1\, I_2\, C\, P_1\, P_2\, M_1\, M_2$

P o s t c r a n i a l e l e m e n t s

Fragments of ribs, a fragment of Ist vertebra, thoracic vertebrae, lumbar vertebrae I and II were recovered. The bodies of the vertebrae are not fully ossified. The bones of the upper limbs: scapulae, the right clavicle, the shafts of the humeri, and bones of the right forearm as well as femurs, tibiae, and fibulae are present. The coracoid process of the scapula and the epiphyses of the long bones are not fused. The elements forming the hip bone also are not fused.

Skeleton 2

A skeleton of a child.

S k u l l e l e m e n t s

When the skull is viewed from above, it has a sphenoides obtusus shape; when it is viewed from behind, it is miter-like. The occiput is prominent and smooth. The forehead protrudes to the front and the frontal eminences are moderately developed. The parietal eminences are clearly evident. In the lower part of the lambdoid suture there is a shallow depression on both sides. Mastoid processes are small and not completely developed. The temporal lines are marked on the frontal bones. The sutures are not fused. Spheno-occipital synchondrosis is not ossified. The eye sockets are large and round. The canine fossa and the maxilla notches are shallow. The root of nose is low and wide. The lower edge of the nasal opening is smooth. The mandible is of delicate construction.

T e e t h
maxilla $m^2\, m^1\, c$ – $m^1\, m^2$

P o s t c r a n i a l e l e m e n t s
The body and vertebral arches of all sections of the vertebral column were recovered. The vertebral bodies and arches are not fully ossified and are not fused. Fragments of sternum and ribs were recovered. The upper limbs consisted of scapulae, clavicles, humeri, ulnae, and radii. The following lower limb bones were recovered: ilium, femurs, fibulae, left tibia, foot bones. Epiphyses of the long bones are not fused with the shafts.

Skeleton 3
A skeleton of a child.

S k u l l e l e m e n t s
The skull is elongated, medium height, with moderately marked parietal tubers. The forehead was straight. The frontal tubers are moderately evident. The superciliary arches are not marked. The frontal notches are shallow. The temporal lines are faintly marked. The left mastoid process is small. The sutures are not obliterated. The eye sockets are of medium size, rectangular and slightly slanted. The maxilla notches and the canine fossa are moderate. The lower edge of the piriform aperture exhibits traces of sulcus prenasalis. The chin form is weak.

T e e t h
maxilla $m^2\, m^1$
mandible $m_2\, m_1$ – $m_1\, m_2$

Postcranial elements

Fragments of ribs, one cervical vertebra, fragments of thoracic vertebrae and sacral bones were recovered. The following upper limb bones are present: the acromion of the scapula and the right clavicle. Fragments of the femurs, tibiae, fibula and bones of the left foot are present. The epiphyses of the long bones are not fused with the shafts.

Skeleton 4

A skeleton of a juvenile male.

Skull elements

When viewed from above, the skull has an oblong rhomboid shape; when it is viewed from behind, it is miter-like and of medium height. The forehead is slightly slanted and arched. The area of the glabella is moderately evident. The superciliary arches are only evident by the glabella. The occiput is rounded. The frontal notches are moderate. A shallow depression is present in the area of the "asterion" point. The nuchal lines are weakly developed. The external occipital protuberance appears in the form of a delicate crest. The temporal lines are clearly marked on the frontal bones. The mastoid process is large and wide. The epipteric bone is on the left side. The eye sockets are medium, rectangular and moderately slanted. The tuberculum marginal of the left zygomatic bone is well developed.

Teeth

maxilla $M^3\ M^2\ M^1\ P^2\ P^1\ C\ I^2\ I^1$ – $I^1\ I^2\ C\ P^1\ P^2\ M^1\ M^2\ M^3$

mandible $M_2\ M_1\quad P_1\qquad$ – I_1

Postcranial elements

Numerous fragments of ribs and vertebrae were recovered. The left scapula and a part of the left clavicle comprised the upper limb bones. The pelvic bones are not completely ossified. The right femur, tibia, fibula and the right foot bones were present. The musculature markings are very clearly marked.

Figure 1. Burial VII, pit 102-A1, female, maturus/senilis, skull, n. lateralis

Figure 2. Burial VII, pit 102-A1, female, maturus/senilis, skull, n. frontalis

Figure 3. Burial VII, pit 102-A1, female, maturus/senilis, skull, n. basilaris

Figure 4. Burial X, pit 43-B1, female, adultus/ maturus, skull, n. lateralis

Figure 5. Burial XIII-1, pit 36-B1, female, juvenis (18 years old), skull, n. lateralis

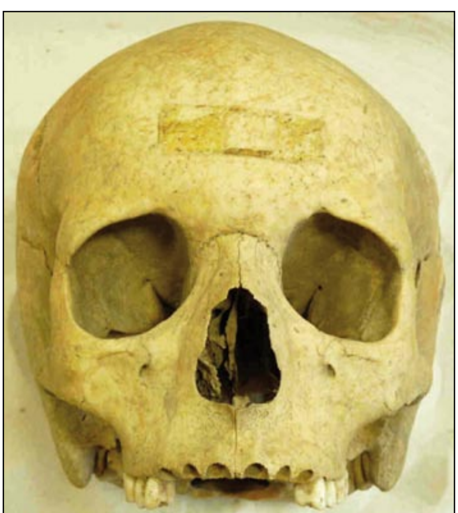


Figure 6. Burial XIII-1, pit 36-B1, female, juvenis (18 years old), skull, n. frontalis

Figure 7. Burial XIII-1, pit 36-B1, female, juvenis (18 years old), skull, n. basilaris

Figure 8. Burial XIII-2, pit 36-B1, infans I (5 years old), skull, n. lateralis

Figure 9. Burial XIII-2, pit 36-B1, infans I (5 years old), skull, n. frontalis

Figure 10. Burial XIII-2, pit 36-B1, infans I (5 years old), skull, n. basilaris

Figure 11. Burial XIII-3, pit 36-B1, infans II (10 years old), skull, n. lateralis

Figure 12. Burial XIV, pit 100-B1, male, 30-35 years old, skull-n. frontalis

Figure 13. Burial XIV, pit 100-B1, male, 30-35 years old, skull-n. l ateralis

Figure 14. Burial XVIII, pit 3-C5, male, maturus, skull, n. lateralis

Skeleton 5
A skeleton of a child.

S k u l l   e l e m e n t s
Only the left side of the skull is present. The skull is elongated and of medium height. The forehead is rounded. The superciliary arches are not marked. The frontal and parietal eminences are moderately developed. The occiput is rounded. The mastoid process is small. Two wormian bones are present in the left part of the lambdoid suture. The sutures are not fused. The root of the nose is wide. The maxilla notches are moderate and the canine fossa is missing. The lower edge of the piriform aperture is smooth. The left part of the mandible is present.

T e e t h
maxilla m^1 c i^2 i^1 – i^1 m^1 m^2
mandible m_2 m_1 i_1 – c m_1 m_2

P o s t c r a n i a l   e l e m e n t s
Only the shafts of the femurs, tibiae, and fibulae were recovered.

Skeleton 6
A skeleton of an adult male.

S k u l l   e l e m e n t s
There is only left side of the callota and a fragment of the right temporal bone. The skull is elongated and moderately arched, and the forehead is moderately slanted. The frontal tubers are moderately evident. The area of the glabella protrudes. The superciliary arches are marked in the glabella area. The occipital bone is convex. The left mastoid process is large. The temporal lines are marked on the frontal bone. The epipteric bone is present. The sutures are not fused. The eye sockets are large, rectangular and slightly slanted. The root of nose is of medium height and width, nose is convex. The maxilla notches are shallow. The canine fossa is deep.

Teeth

maxilla $M^3\ M^2\ M^1\ P^2\ P^1\ C\ I^2\ I^1$ – $I^1\ I^2\ C\ P^1\ P^2\ M^1\ M^2\ M^3$

mandible $M_3\ M_2\ M_1\ P_2\ P_1\ C\ I_2\ I_1$ – $I_1\ I_2\ C\ P_1 P_2\ M_1\ M_2\ M_3$

Postcranial elements

The following bones were recovered: fragments of ribs, a fragment of the sternum, all vertebrae, the left scapula, humeri, ulnae and radii. The iliac crests have not fully ossified. Femurs, tibiae, fibulae, and foot bones were present. The area of the muscle attachments are clearly marked.

Skeleton 7

A skeleton of a child.

Skull elements

The skull was recovered in fragments. When viewed from above, the skull has a rhomboid shape with clearly defined parietal eminences and narrow forehead. The frontal notches are weakly marked. The frontal eminences are small. The area of the glabella is flat. The superciliary arches are not developed. The temporal lines are weakly marked. The mastoid processes are very small. The sutures are not fused. The eye sockets are large and rectangular. The root of the nose is wide and low. The lower edge of the piriform aperture is smooth with traces of sulcus prenasalis. The maxilla notches are moderate; the canine fossa is very shallow.

Teeth

maxilla $m^2\ m^1$ $i^2\ i^1$ – $i^1\ i^2$ $m^1\ m^2$

mandible $m_2\ m_1$ – i_1 c $m_1\ m_2$

Postcranial elements

The following bones were recovered: fragments of ribs, bodies of the vertebrae (not fully ossified), the right scapula, and the right clavicle, shafts of the humeri, radii and ulnae. The hand bones, pelvic elements (not ossified), shafts of the femurs and a calcaneus were recovered. Epiphysis were not fused.

Skeleton 8
A skeleton of a juvenile female.

Skull elements
The following parts of the skull were recovered: parts of the parietal and temporal bones and fragments of the forehead. The area of the glabella is weakly convex. The superciliary arches are weakly marked. The mastoid processes are small. The sutures are not fused. The eye sockets are medium and rectangular. The lower edge of the piriform aperture is smooth. The maxilla notches are moderate and the canine fossa is deep.

Teeth
maxilla $M^2\ M^1\ I^2$ – $I^1\ I^2\ C\ P^1\ P^2\ M^1\ M^2$
mandible $M_1\ P_2\ P_1\ C\ I_1$ – $I_2\ C\ P_1\ P_2\ M_1 M_2$

Postcranial skeleton
The following bones were recovered: fragments of ribs and vertebrae, a fragment of the shaft of the humerus, fragments of the pelvis (the ischial tuberosity is not ossified), shafts of the femurs, tibiae, and fibulae and bones of foot. The musculature markings are well developed. Epiphysis were not fused.

Skeleton 9
A skeleton of an infant.

Skull elements
The skull's shape is elongated with strongly developed parietal tubers and moderately developed frontal tubers. The mastoid processes are not developed. The elements of the occipital bone are not fused. The anterior fontanelle measuring 1.5 x 1.5 cm. The sutures are not fully developed and not fused. Fragments of the maxilla and mandible were found.

Teeth
maxilla m^1 – $i^1\ i^2\ m^1$
mandible $i_2\ i_1$ – $i_1\ i_2\ m_1$

P o s t c r a n i a l s k e l e t o n

Fragments of ribs and vertebral bodies were recovered. The following bones of the upper limbs were found: the left scapula, the left clavicle, shafts of the humeri, ulnae, and radii. The left ilium, shafts of the femurs, tibiae, and fibulae comprised the bones of the lower limbs.

Skeleton 10

A skeleton of a child.

S k u l l e l e m e n t s

When viewed from above, the skull has an oblong rhomboid shape. The parietal tubers are distinct. The forehead is narrow and rounded. The occipital bone is distinct. The frontal notches are evident. The area of the glabella is flat and the superciliary arches are not developed. The mastoid processes are very small. The sutures as well as basilar and lateral parts of the occipital bone were not fused. The epipteric bone was present. The eye sockets are of medium size and almost square in shape. The root of the nose is medium and low. The lower edge of the priform aperture is smooth. The maxilla notches and the canine fossa are present. The chin is not developed.

T e e t h

maxilla $m^2\ m^1\ c\ i^2\ i^1$ – $i^1\ i^2\ c\ m^1\ m^2$

mandible $m_2\ m_1\ c\ i_2\ i_1$ – $c\ m_1\ m_2$

P o s t c r a n i a l e l e m e n t s

Fragments of ribs and vertebral bodies, not completely ossified, were recovered. Its arches are not definitively fused with the bodies. The left clavicle, coracoid process of the right scapula, shafts of humerus, bones of the right forearm, the both ilium, the right ischium and shafts of femurs were also found. Epiphysis were not fused.

Skeleton 11

A skeleton of an infant.

Skull elements

Fragments of the skull were recovered. The sutures were not fully developed. The anterior fontanelle was large, measuring 4 x 4 cm. Both parts of the frontal bones as well as parts of the occipital, sphenoid and temporal bone were not fused.

Postcranial skeleton

The following bones were recovered: fragments of ribs and vertebral bodies, shafts of the humeri, ulnae and radii, scapulae, fragments of the pelvis and shafts of the femurs.

Skeleton 12

A skeleton of a child.

Skull elements

When viewed from above, the skull's shape is ovoides acutus; when viewed from behind, it is miter-like. The superciliary arches are not developed. The mastoid processes are small. The epipteric bone occurs on the right side. The sutures are not fused. The eye sockets are medium, almost square. The root of the nose is wide and low. The lower edge of the piriform aperture is sharp. The maxilla notches are moderate and the canine fossa are shallow. The mandible has a weakly developed chin.

Teeth

maxilla $M^1\ m^2\ m^1\ c\ –\ I^1\ I^2\ c\ m^1\ m^2\ M^1$

mandible $M_1\ m_2\ m_1\ c\ I_1\ –\ I_1\ I_2\ m_1\ m_2\ M_1$

Postcranial elements

Fragments of ribs and all cervical, thoracic, lumbar and sacral vertebrae were recovered. They are not completely ossified. Scapulae, clavicles, humeri, ulnae, radii, pelvic elements, femurs, tibiae, fibulae, and foot bones were also found. Hip bones elements as well as the epiphysis of the long bones were not fused.

Skeleton 13

A skeleton of a child.

S k u l l   e l e m e n t s

The skull was reconstructed from bone fragments. The skull's shape is elongated with moderate frontal and parietal eminences. The occipital bone is rounded and smooth. The forehead is straight. The superciliary arches are not marked. The mastoid process is small. The sutures are not fused. The eye sockets are medium and rectangular. The canine fossa is shallow. The maxilla notches are of moderate size.

T e e t h

maxilla $M^2\ M^1\ P^2\ P^1\ C\ I^2\ I^1\ –\ I^1\ I^2\ C\ P^1\ P^2\ M^1$

mandible $M_2\ M_1\ P_2\ P_1\ C\ I_2\ I_1\ –\ I_1\ I_2\ C\ P_1\ P_2\ M_1\ M_2$

P o s t c r a n i a l   e l e m e n t s

The following bones were recovered: fragments of ribs, the manubrium sterni, fragments of scapula, the shaft of the right humerus, both ulnae and radii, and a small number of hand bones. Epiphysis were not fused.

Skeleton 14

A skeleton of a child.

S k u l l   e l e m e n t s

The skull's shape is elongated and asymmetrical. The forehead is very narrow. The frontal notches are shallow and the temporal lines are weakly marked. The epipteric bone is present. The mastoid processes are very small. The sutures are not obliterated. The lower edge of the piriform aperture is smooth. The canine fossa is flat. The maxilla notches are very shallow. The chin is not developed.

T e e t h

maxilla $M^1\ m^2\ m^1\ c\ i^2\ i^1\ –\ c\ m^1\ m^2\ M^1$

mandible $M_1\ m_2\ m_1\ c\ i_2\ i_1\ –\ i_1\ i_2\ c\ m_1\ m_2\ M_1$

P o s t c r a n i a l e l e m e n t s

The following bones were recovered: fragment of rib, the bodies of all vertebrae not fully ossified, the left scapula, fragments of clavicles, the shafts of humeri, ulnae and radii, bones of the hands, iliumae, femurs, tibiae, and fibulae. The epiphyses of the long bones as well as the parts of pelvis were not fused.

Skeleton 15

A skeleton of a child.

S k u l l e l e m e n t s

When viewed from above, the skull has an oblong rhomboid shape; when viewed from behind, it is miter-like. The forehead is narrow and elongated. The superciliary arches are not marked. The frontal notches are shallow. The mastoid processes are small and slender. The occipital bone is round. The nuchal lines and the external occipital protuberances are not marked. The epipteric bones are present on both sides. The sutures are not fused. The eye sockets are rectangular and slightly slanted. The root of the nose is wide; the nose was prominent. The lower edge of the piriform aperture is sharp. The maxilla notches are shallow. The canine fossa is moderate. The chin is weakly prominent.

T e e t h

maxilla $M^1\ m^2\ m^1\ c\ I^2\ I^1\ –\ I^1\ I^2\ c\ m^1\ m^2\ M^1$

mandible $M_1\ m_2\ m_1\ \ I_2\ I_1\ –\ \ I_2\ c\ m_1\ m_2\ M_1$

P o s t c r a n i a l e l e m e n t s

The following bones were recovered: numerous ribs, the manubrium and fragments of the body of the sternum, all the vertebrae not fully ossified, humeri, ulnae, and radii, fragments of pelvis, femurs, tibiae, fibulae and foot bones. Epiphysis of the long bones and pelvis elements were not fused.

Skeleton 16

A skeleton of a child.

Skull elements

The skull was recovered in fragments. It is elongated with a prominent occiput. The mastoid processes are not developed. The sutures are not fused. The maxilla notches and the canine fossa are moderate. The lower edge of the piriform aperture is smooth. The chin form is weakly developed.

Teeth

maxilla	$m^2\ m^1\ c\ i^2\ i^1$	–	$i^1\ i^2\ c\ m^1\ m^2$
mandible	m_2	–	$m_1\ m_2$

Postcranial elements

The following bones were recovered: fragments of ribs, the bodies and arches of all vertebrae are not fully ossified or fused, fragments of sternum, scapulae, clavicles, the shafts of the humeri, ulnae, and radii, fragments of pelvis, femurs, tibiae, fibulae, and foot bones. Epiphysis were not fused.

Skeleton 17

A skeleton of an infant.

Skull elements

Fragments of the skull were recovered. The sutures are not fully developed. The bodies and arches of the vertebrae are not fully ossified and not fused. Fragments of ribs, scapulae, the right clavicle, humeri and ulnae, a fragment of radius and the left femur were found too. The epiphyses were not fused.

BURIAL XIV

A skeleton of an adult male.

Skull elements

When viewed from above, the skull's shape is ovoides oblongus, and elongated. The forehead is slightly slanted. The frontal notches are shallow. The area of the glabella is moderately distinct. The temporal lines are moderate. The mastoid processes are large and wide. The occiput is rounded. The external occipital protuberance is moderately developed. The upper nuchal line is in the form of bone crest. There are wormian bones in the right part of the lambdoid suture. The sutures are in the beginning phase of obliteration. The eye sockets are of the medium size. The asymmetric piriform aperture has a lower edge and evidence of the sulcus prenasalis. The nose was prominent. The canine fossa is shallow and the maxilla notches are moderate. The massive mandible has a weakly developed chin form. Masseteric tuberosity is well developed. Fragments of the hyoid bone were recovered.

T e e t h
maxilla M^3 M^2 P^2 P^1 C I^2 I^1 – I^1 I^2 C P^1 P^2 M^1 M^2 M^3
mandible M_3 M_2 M_1 P_2 P_1 C I_2 I_1 – I_1 I_2 C P_1 P_2 M_1 M_2 M_3

P o s t c r a n i a l e l e m e n t s
The following bones were recovered: fragments of ribs, the sternum, all vertebrae, the sacrum and the bones of the upper and lower limbs. The long bones are slender but their musculature markings are clearly marked. The trochanters, linea aspera of femurs and tibial tuberosity are well developed.

BURIAL XV
Skeleton A
A skeleton of a young female.

S k u l l e l e m e n t s
When viewed from above, the skull's shape is bysoides oblongus, elongated and of medium height. The forehead is straight and rounded. The frontal tubers are moderately distinct. The frontal notches are average. The area of the glabella is not distinct. The superciliary arches are not evident. The temporal lines are weakly marked. The mastoid processes are moderate. The occiput is distinct. The upper nuchal lines are prominent. The wormian bones are present in the lambdoid suture. The sutures are not fused. The eye sockets are medium and rectangular. The root of the nose is

of medium width and low. The lower edge of the piriform aperture is smooth. The canine fossa and the maxilla notches are moderate.

T e e t h

maxilla $M^3\ M^2\ M^1\ P^2\ P^1\ C\ I^2\ I^1\ -\ I^1\ I^2\ C\ P^1\ P^2\ M^1\ M^2\ M^3$

mandible $M_3\ M_2\ M_1\ P_2\ P_1\ C\ I_2\ I_1\ -\ I_1\ I_2\ C\ P_1\ P_2\ M_1\ M_2\ M_3$

P o s t c r a n i a l e l e m e n t s

The following bones were recovered: fragments of ribs, the manubrium of the sternum, all vertebrae, the sacrum, fragments of both scapulae, and clavicles, humeri, ulnae, radii and hands bones. Femurs, tibiae, fibulae and foot bones were recovered too. The musculature markings are weakly marked. The sacral vertebra and epiphyses of the long bones are not fused. The iliac crest and ischial tuberosity were not fully ossified.

Skeleton B

A skeleton of a child.

S k u l l e l e m e n t s

The skull is elongated with distinct parietal eminences. The frontal tubers are moderate. The occipital bone is rounded and smooth. The mastoid processes are not developed. The sutures are not fully developed and not obliterated. The canine fossa is shallow. The lower edge of the piriform aperture is sharp. The chin form is almost not evident.

T e e t h

maxilla $m^2\ m^1\ c\ i^2\ i^1\ -\ i^2\ c\ m^1\ m^2$

mandible $m_2\ m_1\ c\quad i_1\ -\ i_1\quad m_1\ m_2$

P o s t c r a n i a l e l e m e n t s

The following bones were recovered: fragments of ribs, I and II cervical vertebrae, arches of the thoracic and lumbar vertebrae not fused with its bodies, both scapulae, shafts of humeri, ulnae, radii, femurs, tibiae, fibulae, and ilium. The epiphyses of the long bones were not fused with the shafts.

BURIAL XVI

A skeleton of a child.

Skull elements

When viewed from above, the skull's shape is sphenoides oblongus. The occipital bone is narrow, rounded and smooth. The frontal tubers are moderately distinct. The mastoid processes are very small. The lower sections of the sagittal and lambdoid sutures are fused from the external layer (synostosis praematura). The metopic suture is present. The eye sockets are medium, rectangular and slightly slanted. The root of the nose is wide and low. The lower edge of the piriform aperture is smooth. The canine fossa and maxilla notches are shallow.

Teeth

maxilla $M^1\ m^2\ m^1\ c\ –\ c\ m^1\ m^2\ M^1$

mandible $M_1\ m_2\ m_1\ c\ –\ c\ m_1\ m_2\ M_1$

Postcranial elements

All vertebrae were recovered, its bodies are not fully ossified. Both scapulae, clavicles, humeri, ulnae, radii, carpal bones, elements of the hip bones, femurs, tibiae, fibulae, and foot bones were present. Epiphysis of the long bones and pelvic elements were not fused.

BURIAL XVII

A skeleton of an adult male.

Skull elements

Fragments of the skull were recovered, consisting of fragments of the frontal and parietal bones. The maxilla notches are moderate. The superciliary arches are strongly developed. The coronal suture are obliterated in the internal layer. A fragment of the mandible indicates a weakly developed chin.

Teeth

mandible $P_1\ C\ I_2\ I_1\ –\ I_1\ I_2\ C\ P_1\ P_2$

Postcranial elements

The following bones were recovered: fragments of the pelvis, the shafts of femurs, tibiae and foot bones. The bone structure is massive.

BURIAL XVIII

A skeleton of an adult male.

Skull elements

When viewed from above, the skull's shape is ovoides; from behind, it is rounded. The frontal notches are shallow. The area of the glabella and the superciliary arches are distinct. The mastoid processes are large and wide. The external occipital protuberances and the nuchal lines are distinct. The sutures are in the beginning phase of closure. The eye sockets are small and low. The canine fossa is medium and the maxilla notches are shallow. The mandible has a moderately developed chin.

Teeth

maxilla $M^3\ M^2\ M^1\ P^2\ C\ I^2\ I^1\ -\ I^1\ C\ P^1\ P^2\ M^1\ M^2$

mandible $M_2\ M_1\ P_2\ C\ I_2\ I_1\ -\ I_1\ C\ P_1\ P_2\ M_1\ M_2$

Postcranial elements

The following bones were recovered: fragments of ribs, the bodies and arches of the thoracic and lumbar vertebrae, fragments of sacrum, fragments of clavicles, the left scapula, humeri, the upper parts of ulnae, fragments of the pelvis, femurs and tibiae. The limb bones are more slender built than the skull.

BURIAL XIX

A skeleton of an adult male.

Skull elements

The upper part of the braincase was recovered. It is moderately elongated and slightly slanted. The forehead is low. The glabella is prominent. Superciliary arches are present in the nose part. The frontal notches and the frontal eminences are medium. Sutures are not fused. Fragments of the viscerocranium are present. Mandible possesses a well prominent chin.

Teeth

maxilla $M^1\ P^2\ P^1\ C\ \ I^1\ -\ C\ P^1\ P^2\ M^1$

mandible $M_2\ M_1\ P_2\ P_1\ C\ I_2\ I_1\ -\ I_1\ I_2\ C\ P_1\ P_2\ M_1\ M_2$

Postcranial elements

Postcranial bones include the following: shafts of clavicle and humeri, femur and tibiae. The structure of the bones is medium.

BURIAL XX

A skeleton of an adult female

Skull elements

A part of the skull was reconstructed from bone fragments. When viewed from above, it had pentagonoid shape. The forehead is low and rounded. The glabella is flat. The superciliary arches are weakly developed. The frontal notches are medium. The temporal lines are only evident on the frontal bone. The occiput is prominent and smooth. The mastoid processes are medium. There is a wormian bone in the "bregma" point. Fragments of viscerocranium bones were present. The mandible possesses a slightly prominent chin.

Teeth

maxilla $M^3\ M^2\ M^1\ P^2\ P^1\ C\ I^2\ I^1 - I^1\ I^2\ C\ P^1\ P^2\ M^1\ M^2\ M^3$

mandible $M_3\ M_2\ M_1\ P_2\ P_1\ C\ I_2\ I_1 - I_1\ I_2\ C\ P_1\ P_2\ M_1\ M_2$ M3

Postcranial elements

Postcranial bones include the following: fragments of ribs, I^{st} cervical vertebra and fragments of thoracic and lumbar vertebrae and sacrum, fragments of both scapulae, left clavicle, humeri, ulnae, radii, hip bones, femurs, tibiae, fibulae and fingers. The bones are slender and have moderately marked muscular attachments.

BURIAL XXI

A skeleton of a child

Skull elements

The braincase was reconstructed from recovered fragments. When viewed from above, the skull has an elipsoid shape. When viewed from behind, it has a rounded shape. The forehead is convex and rounded. The frontal protuberances are small and the frontal notches are shallow. The glabella is weakly evident. The superciliary arches are weakly developed. The parietal protuberances are moderate. The mastoid processes are small. The wormian bones are present in the lambdoid sutures. The sutures are not fused. The canine fossa and the maxilla notches are shallow. The chin is not developed.

Teeth

maxilla M^1 m^2 m^1 c – c m^1 m^2 M^1

mandible M_1 m_2 m_1 i_2 – m_2 M_1

Postcranial elements

Postcranial elements include the following: fragments of ribs and vertebrae, fragments of pelvis, shafts of humeri, femurs, tibiae and fibulae. Foot bones were also present. Epiphyses were not fused.

BURIAL XXII

A skeleton of an adult female

Skull elements

A skull without a mandible was present. When viewed from above, the skull's shape is an elongated, sphenoid trapezoid. The forehead is straight and the glabella is not prominent. The superciliary arches are not evident. The frontal notches are medium and the mastoid processes are small. The occiput is prominent and rounded. The sutures are not obliterated. Spheno-occipital synchodrosis is not ossified. Orbits are medium and moderately slanted. The root of the nose is broad (wide). The nose is slightly convex.

Teeth

maxilla M^2 M^1 P^2 P^1 – I^1 I^2 C P^1 P^2 M^1 M^2

CHAPTER 9

Age, Sex and Stature Distribution
(Population Demographics)

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Age profiles, sex, and stature are key features of population demographics. The structure of a death population mirrors to some degree that of the living population. While age at death is not directly a measure of life expectancy it is useful in understanding fertility patterns and as a general indicator of a population's state of health (Sattenspiel and Harpending 1983). The sex ratio within a death population can be disproportionately representative of one over the other depending on burial traditions and other social factors. Stature is potentially affected by diet and nutrition, especially in early agricultural societies in which starvation was an expected part of life. Starvation influences stature in developing children.

The overall health of a population is dependent on many factors, not the least of which is diet (Larsen 1995). Disease and diet are comingled each affecting life expectancy rates (Power 1993). Bioarchaeologists have demonstrated a drop in general health in early agricultural populations though fertility rates and population growths increase (Lambert 2009). One study has shown that female health declined potentially from increasing reproductive demands resulting in higher frequencies of dental caries (Lukacs 2008).

The death population at Bronocice was insufficient to examine statistically. However, there were two groups consisting of several individuals that can be considered in a general way. The first group consisted of the Funnel Beaker burials dating to Phases 3 and 4. The second group was the collective burial from Phase 5. Both groups are represented by 17 individuals. Some broad observations may be made of the entire death population.

The total death population at Bronocice was 56 individuals, though several of these are represented by a single skeletal element. Of the 56 individuals, information about age, sex and stature was available for 44 individuals. In some cases the bones were absent or too deteriorated, while in others individuals were represented by skulls. A few individuals came from graves that were disturbed by building episodes in prehistory. Special attention was given to the occurrence of some morphological traits such as tooth morphology and sutural bones in the fontanelle region.

Age at death

Age at death estimates are derived from death patterns within a population and form the basis for life expectancy rates. Life expectancy is a basic measure of population health. Rates are affected by many variables such as sex, gender, wealth and poverty, subsistence practices, and access to food and water, as well as environmental factors within a region (Gulis 2000, Neumayer and Plümper 2007). There is a vast literature on life expectancy rates, growth and decline that addresses many of the socio-economic, political and other variables influencing populations in modern and historic times (Acemoglu and Johnson 2007, Cambois 1999, Veit 2014). These studies highlight the importance of considering some of these variables in prehistory as well. For example, in some modern societies women have very low life expectancy often due to high rates of childbirth, while in other societies it is because of dietary restrictions based on sex and gender (Ram 1993). Low life expectancy rates can also vary with a broader population if there is differential access to food, shelter and care due to social, economic and religious differences among groups (Powers

1993). Warfare and other forms of social conflict are also factors affecting life expectancy especially among males (Plümper and Eric Neumayer 2006). In egalitarian societies food sharing is traditional and expected. However, there are indications that in New World incipient hierarchical societies food sharing was common as well, perhaps because it was a means of sharing maintaining power (Danforth 1999)

Life expectancy is a reflection of age at death rates. Simply stated, the lower early death rates are, the higher the life expectancy will be. High infant death rates therefore are important indicators of poor public health whereas high rates of older people are indicators of good public health. These can vary within a given population when historical events such as catastrophes and periods of social unrest occur.

For these reasons understanding the significance of age at death patterns at Bronocice is complicated by the great length of time that the settlement was occupied and also by the presence of distinct cultural groups who lived and visited there. The entire death population cannot simply be grouped together. They must be separated into temporal groups and other factors considered in estimating life expectancy such as states of health. High rates of infectious disease, malnutrition and congenital birth defects were factors in some of the people from the site (Chapter 10).

Age data was available varying in quality from exact ages to general indicators. They were associated with eight temporal groups; the collective burial being separated into its own subgroup. In considering the meaning of the data it is necessary to add two other variables: 1) natural causes which include illness and malnutrition, and 2) unnatural causes which would include accidents and murder (Table 1).

The age at death and the sex of all juvenile and adults have been estimated using anthropological criteria (Ubelaker 1984, Buikistra and Ubelaker, ed. 1994, White and Folkens 2005). Metrics taken include dental development and crown position, parameters and proportions of the skulls, the proportions of the limbs, and also body height when alive, which is established on the basis of measurements of long bones (Olivier 1960, Trotter and Gleser 1952). Long bone measurements and body height of skeletons at Bronocice are presented in Tables 2, 3.

Table 1. List of individuals by population subgroup at Bronocice

Phase	Culture	Skeleton	Pit/Unit	Sex	Age	MNI
1	Funnel Beaker	-	46-C2	-	Adultus	
		-	49-C2	-	Adultus	
		-	61-C2	-	Adultus	
		-	61-C2	-	Young	
						4
2	Lublin Volhynian	VI-1	19-C2	M	30	
		VI-2	19-C2	F	30-40	
		-	29-C2	-	Adultus	
		-	38-C2	-	Adultus	
						4
3	Funnel Beaker	I	18-C2	F	40-50	
		-	14-C2	-	Adultus	
						2
3-4	Funnel Beaker	II	5716/A-C2	F	Senilis	
		III	5717/B-C2	F	25	
		IV	5717/D-C2	-	Adultus	
		V	5718/A-C2	-	Maturus	
		VIII	48-C2	F	Adultus	
		IX	47-C2	-	Adultus	
		XII	56-C2	-	Adultus	
		XVII	18-C5	M	50	
		XVIII	3-C5	M	35	
		XIX	4-C5	M	Adultus-Maturus	
		XXV	7A-C7	M	Maturus	
						11
4	Funnel Beaker	VII	102-A1	F	50	
		XVI	125-A1	-	7	
		XXII	5-B6	M	30-35	
		XV-1	87-C1	F	17-18	
		XV-2	87-C1	-	3-4	
		-	11-B1	-	Adultus	
		-	1-B8	-	Adultus	
		-	95-B1	-		
						8

Table 1. cont.

Phase	Culture	Skeleton	Pit/Unit	Sex	Age	MNI
5a	Funnel Beaker-Baden	X	43-B1	F	30	
		XIV	100-B1	M	30-35	
		XXI	21-B-road	-	8-9	
		XX	14-C5	F	Adultus	
		XXIII	2-B6	M	30-35	
		XXIV	22-A3	F	18-20	
		-	86-B1	-	Adultus	
						7
5b	Funnel Beaker-Baden or Baden	XIII-1	36-B1	F	18-20	
		XIII-2	36-B1	-	5	
		XIII-3	36-B1	-	10	
		XIII-4	36-B1	M	18	
		XIII-5	36-B1	-	4-5	
		XIII-6	36-B1	M	25	
		XIII-7	36-B1	-	3-4	
		XIII-8	36-B1	F	18	
		XIII-9	36-B1	-	1.5	
		XIII-10	36-B1	-	5	
		XIII-11	36-B1	-	.6	
		XIII-12	36-B1	-	7-8	
		XIII-13	36-B1	-	15	
		XIII-14	36-B1	-	7	
		XIII-15	36-B1	-	8	
		XIII-16	36-B1	-	3	
		XIII-17	36-B1	-	.6-.9	
						17
6	Funnel Beaker-Baden	XXVI	1-A4	-	Adult	
		XXVII	53-B1	F	18	
						2
7	Corded Ware	XI	67-B1	M	50	
						1

Table 2. Long bone measurements and body height of skeletons at Bronocice (adults – after Trotter and Gleser 1952, children * – after Olivier 1960)

no. of skeleton		I	II	III	IV	V	VIA	VIB	VII	VIII	IX	X	XIV	XVA	XVB	XVI	XVII	XVIII	XIX	XX	XXI	XXII
sex		f?	f	f	?	?	m	f	f	f	?	f	m	f	?	?	m	m	m	f	?	f
age		*M*	*S*	*A*	a^	a^	*A*	*M*	*M/S*	a^	a^	*A/M*	*M*	*J* 15-18y	*I* 3-4y	*I* 7y	*M/S*	*M*	*A/M*	*A*	*I* 8-9y	*J* 18y
long bones metrical traits [mm] (after Martin and Knussmann 1988)																						
humerus	p						318		302			*267*[1]	314									
	l						320	253	300				312			160						
radius	r						240		224			210	242			122						
	l						240		222			212	241			120						
ulna	r						261		247				264									
	l						261	210	243				260			135						
femur	r		*445*[1]	*410*[1]			434	358	398			373	451							420		
	l						436	351	397				451			229				416		
tibia	r	*297*[1]		*350*[1]			363	278	342			308	365									
	l	*297*[1]		*350*[1]			355	277	346			312	368									
body height [cm]		148	164	160			169	144	159			152	170			122*				157		

* after diameter of femoral shaft
[1] in situ
f – female, m – male
I – infans, J – juvenis, A – adultus, M – maturus, S – senilis, a^ – adult

Table 3. Long bone measurements and body height of skeletons from the collective grave at Bronocice (adults – after Trotter and Gleser 1952, children * – after Olivier 1960)

grave XIII		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
sex		f	?	?	M	?	m	?	f?	?	?	?	?	?	?	?	?	?
age (year)		J 18y	I 5y	I 10y	J 18y	I 4-5y	A	I 3-4y	J 18y	I 1.5y	I 5y	I 0.5y	I 7-8y	I 15y	I 7y	J I 8y	I 3y	I 0.5y
Long bones metrical traits [mm] (after Martin and Knussmann 1988)																		
humerus	p l	246	145 144				314	129 130		107 107		82 81	176 173		149 147	193 191	120	95 94
radius	r l	190	107 108					95 95	183	85 85	107		112	157	106 106	140 142	90	
ulna	r l	207	120 120					106 107	203	95 94	121	71 72	124	172	120 120	157 156	100 101	83
femur	r l		194 195			205	432 434	167 167		134 135		103 104	249 246		209 211	273 275	155 154	115
tibia	r l	278 274	158	253 250	310	163 162	350 350		258 255	109 110			195 196		170 171	214 211	124 124	
body height [cm]		*	111*	*	157	115*	165	99*	*	84*	*	65*	126*	*	116*	134*	94*	73*

* after diameter of femoral shaft
f – female, m – male
I – infans, J – juvenis, A – adultus, M – maturus, S – senilis, a^ – adult

Table 4. Distribution of age groups by subgroup

Phase Group	Infant <1 yr		Child 1-5 yr		Child 6-12 yr		Teenager 13-18 yr		Young adult 19-25 yr		Mature Adult 26-40 yr		Old Adult 41+ yr		Adult no age		Total	
	#	Rel. %	#	Rel. %	#	Rel. %	#	Rel. %	#	Rel. %	#	Rel. %	#	Rel. %	#	Rel. %	#	Rel. %
Pre-1	-	-	-	-	-	-	1	.75	-	-	-	-	4	.75	-	-	4	1.00
2	-	-	-	-	-	-	-	-	-	-	2	.50	-	-	2	.50	4	1.00
3	-	-	-	-	-	-	-	-	-	-	-	-	1	.50	1	.50	2	1.00
3-4	-	-	-	-	-	-	-	-	1	.10	-	-	2	.18	8	.72	11	1.00
4	-	-	1	.14	1	.14	1	.14	-	-	1	.14	1	.14	2	.30	7*	1.00
5a	-	-	-	-	1	.14	-	-	1	.14	4	.48	-	-	1	.14	7	1.00
5b	2	.12	6	.35	4	.23	1	.07	4	.23	-	-	-	-	-	-	17	1.00
6	-	-	-	-	-	-	1	.50	-	-	-	-	-	-	1	.50	2	1.00
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.00	1	1.00
Total	2		7		6		4		6		7		4		16		55	

* one individual un-aged

Table 4 summarizes age-at-death profiles for each phase. For most phases the great majority of individuals were adults. Teenagers, children and infants were virtually absent. Two children and one 18 year old were present in Phase 4. Phase 5 had a preponderance of children compared with adults. This is of course due to the high number of children found in the collective grave.

Sex

The sex ratios within the cemetery and among those buried within the same phases was unremarkable (Table 5). However the distribution of males to females from Phases 3-4 located within the cemetery was highly patterned. The majority of the burials recovered in Unit C2 were females. Only one male was found there. Otherwise, the majority of burials found in outer units such as C5 and C7 were males. During other phases no apparent pattern was discernable.

The skeletons from the Bronocice settlement are characterised by a relatively large degree of morphological similarity yet retain clear dimorphic differences in metrical skull traits. Male skulls are longer and wider, with higher and wider face and nose (Tables 6, 7). Females skulls have wider occiput. The most important indices based on comparison of the

Table 5. Ratios of women to men at Bronocice

Phase	Culture	Women	Men	MNI
Pre-1	?	-	-	-
2	Lublin Volhynian	1	1	2
3	Funnel Beaker	1	-	1
3-4	Funnel Beaker	3	4	7
4	Funnel Beaker	2	1	3
5a	Funnel Beaker-Baden	3	2	5
5b	Possibly Baden	2	2	4
6	Funnel Beaker-Baden	1	-	1
7	Corded Ware	-	1	1
TOTAL		13	11	24

Table 6. Cranial measurements at Bronocice

no. of skeleton		I	II	III	IV	V	VIA	VIB	VII	VIII	IX	X	XIV	XVA	XVB	XVI	XVII	XVIII	XIX	XX	XXI	XXII
sex		f?	f	f	?	?	m	f	f	f	?	f	m	f	?	?	m	m	m	f	?	f
age		*M*	*S*	*A*	a^	a^	*A*	*M*	*M/S*	a^	a^	*A/M*	*M*	*J* 15-18y	*I* 3-4y	*I* 7y	*M/S*	*M*	*A/M*	*A*	*I* 8-9y	*J* 18y
cranial metrical traits [mm] (after Martin and Knussmann 1988)																						
g-op	(1)						185	171					186	175	174	174		176		167	167	167
eu-eu	(8)						154	129				139	136	125	127	121		136		130	124	132
ft-ft	(9)						105	88					98	92	84	94		91	104	94		95
ba-b	(17)							127					135	145		139						
po-b	(20)							108				117	119	120		119		114			106	
zy-zy	(45)							122					126									120
zm-zm	(46)						101	86					100			77		100				89
n-pr	(48)						69	56					70	62		56						63
mf-ek	(51)						44	40					44	40		36		40				40
so-io	(52)						33	30					32	30		26		28				29
apt-apt	(54)						27	24					26	24		21						21
n-ns	(55)							42					51	44		38						45
go-go	(66)							90					105			75						

no. of skeleton	I	II	III	IV	V	VIA	VIB	VII	VIII	IX	X	XIV	XVA	XVB	XVI	XVII	XVIII	XIX	XX	XXI	XXII
sex	f?	f	f	?	?	m	f	f	f	?	f	m	f	?	?	m	m	m	f	?	f
age	*M*	*S*	*A*	a^	a^	*A*	*M*	*M/S*	a^	a^	*A/M*	*M*	*J* 15-18y	*I* 3-4y	*I* 7y	*M/S*	*M*	*A/M*	*A*	*I* 8-9y	*J* 18y
cranial indices																					
8: 1						83.2	75.4					73.1	71.4	73.0	69.5		77.3		77.8	74.2	79.0
17: 1							74.3					72.6	82.9		79.9						
17: 8							98.4					99.3	116.0		114.9						
20: 1							63.2					64.0	68.6		68.4		64.8			63.5	
20: 8							83.7				84.2	87.5	96.0		98.3		83.8			85.5	
9: 8						68.2	68.2					75.0	73.6	66.1	77.7		66.9		72.3		72.0
48:45							45.9					55.6									52.5
48:46						68.3	65.1					70.0			72.7						70.8
52:51						75.0	75.0					72.7	75.0		72.2		70.0				72.5
54:55							57.1					51.0	54.5		55.3						46.7

f – female, m – male
I – infans, J – juvenis, A – adultus, M – maturus, S – senilis, a^ – adult

Table 7. Cranial measurements from the collective grave at Bronocice

grave XIII		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
sex		f	?	?	m	?	m	?	f?	?	?	?	?	?	?	?	?	?
age (year)		J 18y	I 5y	I 10y	J 18y	I 4-5y	A	I 3-4y	J 18y	I 1.5y	I 5y	I 0.5y	I 7-8y	I 15y	I 7y	J I 8y	I 3y	I 0.5y
cranial metrical traits [mm] (after Martin and Knussmann 1988)																		
g-op	(1)	184	160		191	179	186			166	176		162	173	174	173		
eu-eu	(8)	146	131	131	134		146			120	130		141	127	130	141		
ft-ft	(9)	98	84		96			78		77	82	76	88			92		
ba-b	(17)	139	107										123			123		
po-b	(20)	123	103	115			114	102					112		112	109		
zy-zy	(45)	120	95	105		110	130	80			102		110			112		
zm-zm	(46)	86	70	70		80	98	65	90	63	70		79		72	80	69	
n-pr	(48)	66	48			51	71	45			54		53			53		
mf-ek	(51)	41	35	36	40	36	44	34	40		34		35	38		38		
so-io	(52)	30	32	32	30	30	34	28	30		30		29	30		29		
apt-apt	(54)	23	21	22		20	25	19	24	18	21		21		22	21	20	
n-ns	(55)	50	34				53	32			37		39			40		
go-go	(66)	84	74					70		64	73	56	72		66	77		

grave XIII	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
sex	f	?	?	m	?	m	?	f?	?	?	?	?	?	?	?	?	?
age (year)	J 18y	I 5y	I 10y	J 18y	I 4-5y	A	I 3-4y	J 18y	I 1.5y	I 5y	I 0.5y	I 7-8y	I 15y	I 7y	J I 8y	I 3y	I 0.5y
cranial indices																	
8: 1	79.3	81.9		70.2		78.5			72.3	73.9		78.0	73.4	74.7	81.5		
17: 1	75.5	66.9										75.9			71.1		
17: 8	95.2	81.7										87.2			87.2		
20: 1	66.8	64.4				61.3						69.1		64.4	63.0		
20: 8	84.2	78.6	87.8			78.1						79.4		86.2	77.3		
9: 8	67.1	64.1		71.6						63.1		62.4			65.2		
48:45	55.0	50.5			46.4	54.6	56.3			52.9		48.2			47.3		
48:46	76.7	68.6			63.8	72.4	69.2			77.1		67.1			66.3		
52:51	73.2	91.4	88.9	75.0	83.3	77.3	82.4	75.0		88.2		82.9	78.9		76.3		
54:55	46.0	61.8				47.2	59.4			56.8		53.8			52.5		

f – female, m – male
I – infans, J – juvenis, A – adultus, M – maturus, S – senilis, a^ – adult

distances between the individual points of measurements describe the Bronocice skulls as dolicho- and mesocranic, platycranic, with medium face. The similarity between female and male skulls is evident in their facial proportions and morphology with medium or low eye sockets and noses that are moderately wide and prominent in facial profiles and usually possess a low and wide base (Haduch 2004).

On occasion there are supernumery independent bones between the bones of the skull in the fonatanelle region. A typical example of this is the epactal bone is the epipteric bone (ossicula fonticuli anterior lateralis or pterion ossicle) found in sphenoidal fontanelle. The epipteric bone – unilaterally or bilaterally – were only observed in the skulls from the collective grave (nos. XIII – 4, 6, 10, 12, 14, 15).

Stature

Children's body height was estimated based on the measurement of the femoral shaft (Olivier 1960). Age at the time of death was determined by employing dental criteria (Ubelaker 1984). When referring to the growth curves of modern populations, individuals from the collective grave were shown to have developed normally (Haduch 2004). Body height in adults is varied depending of the sexual dimorphism and individual body constitution.

Stature was calculated for two Funnel Beaker-Baden men and two women: Burial XIII-6 – 165 cm (male), and Burial XIV – 168 cm (male), Burial X – 154 cm (female) and Burial XX – 169 cm. We can estimate the stature for two Funnel Beaker females: Burial I – 148 cm and Burial VII – 159 cm. The male (167 cm) in the double Lublin-Volhynian burial was taller than the female (150 cm). The tallest person was the Corded Ware culture male (171 cm). The average stature for of the two Funnel Beaker-Baden women was 161.5 cm and for the two men 166.5 cm. This very small sample indicates that men were on the average 5 cm taller than women. However, the Funnel Beaker-Baden female in Burial XX, a very high status woman, was taller than the Funnel Beaker-Baden men.

Number of Offspring per Woman

The capacity of the Bronocice women to produce offspring is very difficult to estimate. Most pelvic bones were missing or damaged preventing estimating the number of births (Table 8). Using the Henneberg's (1976) method for the entire women's population at (Table 9) Bronocice, Funnel

Table 8. Pelvic Bones of Women at Bronocice

	Age Group	Status of Pelvic Bones
Burial I	(Maturus)	Missing
Burial II	(Senilis)	Fragments
Burial III	(Adultus)	Fragments
Burial VI/B	(Adultus/Maturus)	Damaged right side
Burial VII	(Maturus/Senilis)	Not damaged
Burial VIII	(Adultus)	Missing
Burial X	(Adultus/Maturus)	Fragments
Burial XIII/1	(Juvenis)	Missing
Burial XIII/8	(Juvenis)	Missing
Burial XV/A	(Juvenis)	Damaged right side
Burial XX	(Adultus)	Damaged left side
Burial XXII	(Juvenis)	Missing

Table 9. Women and Men Age Groups at Bronocice

Age groups (years)	Women	Men	Unidentified	Total
Infans I (0-6.9)	-	-	10	10
Infans II (7-14,9)	-	-	6	6
Juvenis (15-19.9)	4	1	-	5
Adultus (20-29.9)	2	2	-	4
Adultus/Maturus (30-39.9)	2	2	-	4
Maturus (40-49.9)	1	1	-	2
Maturus/Senilis (50-59.9)	1	1	-	2
Senilis (60-x)	1	-	-	1
Adultus	1	-	3	4
Total	12	7	19	38

Table 10. Statistical results based on Henneberg's (1976) method

R_{pot} – Potential Gross Reproductive Rate	0.58
TFR – Total Fertility Rate	5.91
MFS – Mean Family Size	4.47
ABI – Average Birth Interval	24.37 months
e^{0}_{20} for adult woman (20-29.9 years)	

Beaker and Funnel Beaker-Baden (Table 10) Elżbieta Haduch came up with the figures in Table 10.

Based on these figures, at Bronocice it is estimated that least 6 children were delivered per woman and that the family size consisted of 4 to 5 children. It is evident that these figures are very speculative.

CHAPTER 10

Health, Diseases and Injuries

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The human skeleton is a tableau upon which are written one's state of health, insults from disease and injury, and the inheritance of phenotype characteristics (Aufderheide and Rodrigues-Martin 1998, Larsen 2015, Weiss 2015). Some of these signs are genetic markers, some result over a lifetime through diet and physical experiences, and still others occurred from short lived events that occurred near or at the time of death. Forensic analysis provides the necessary tools for identifying and interpreting morphological traits that reveal information about the general state of health of a burial population (Larsen 2002). One of the factors in determining state of health is range and prevalence of diseases. Poor nutrition goes hand in hand with illness and disease (Power 1993).

At the site of Bronocice, which was occupied for over 1100 years, relatively few individual skeletons were recovered. It is questionable whether or not they are representative of the settlement since they measure less than one percent of the estimated population. The largest number of potentially contemporaneous individuals recovered, aside from those in the collective grave from Pit 36-B1, was found in the cemetery located in Area C. The cemetery was in use from 3650-2900 BC. Without radiocarbon dating all of the skeletons it difficult to know which of these people lived at the same time. Within the cemetery, a few clusters of burials may be related

Table 1. List of burials

Phase	Unit(s)	Potentially Related	MNI	^{14}C Date	Disease	Injury
1	C2	46C2, 49C2, 61C2, 29C2, 38C2	6		-	-
2	C2	VI	2	3847 ± BC	X	-
3	C2	I	1	-	-	-
3	C2	Pit 14C2,	1	3511 BC	-	-
3-4	C2	II, III	2		-	-
3-4	C2	IV, V, VIII, IX	4		-	-
3-4	C2	XII	1		-	-
3-4	C5	XVII, XVIII, XIX	3		X	-
3-4	C7	XXV	1		-	-
4	A1	VII	1	3165 BC ± 120	X	X
4	A1	XVI	1	3213 BC ± 95	X	-
4	B6	5-B6	1	3220 BC ± 97	-	-
4	C1	XV	2	3205 BC ± 99	X	X
5	A3	XXIV	1		-	-
5	B1	XIII	17	3200-3100 BC	X	X
5	B1	X, XIV, 11-B1, 95-B1	4		X	-
5	B6	XXIII	1		-	X
5	B8	1-B8	1	2920-2940 BC	-	-
5	B-road	XXI	1		X	X
5	C5	XX	1		X	-
6	A4	XXVI	1		-	X
6	B1	XXVII, 86-B1	2		-	X
7	B1	XI	1		X	-

based on grave proximity and orientation of the skeletons. These are listed in Table 1 which also indicates which burials may be related based on proximity and orientation of grave and genetic markers. It also indicates if signs of disease and injury were present on the skeletons.

Most of the skeletal remains were extremely poorly preserved which limited what could be done using standard forensic methods of analysis. That does not preclude possible genetic studies in the future. Nonetheless, some of the skeletal remains were preserved well enough to evaluate a few individuals in terms of their state of health and disease, as well as to consider potential family relationships among some of them. Injuries and illnesses as well as several pathologies were noted among the adults and children. Of the 56 individuals represented at Bronocice 19 skeletons (34%) provided data on health, illness, and injury and 17 (30%) on genetically informative phenotype characteristics.

Injuries and Indications of Violence

There were six individuals whose remains indicated clear or probable signs of injury and/or violence (Table 2). They included Burial XV Skeleton 1, Burial XIII Skeletons 7 and 11, Burial XXIII, Burial XXVI and Burial XXII, the latter three consisting of skulls. A few other burials suggested that violence played a part in their deaths based on the placement of their bodies. These included: Burials VII, XXI and XXIV. However, no traces of injuries were found on their skeletons which could have been a direct cause of death. The possibility that any one of these individuals met a violent death cannot be excluded. Social conflict was a problem since the time of Linear Pottery culture. By 3000 BC central Europe had a two millennia long tradition of mass death by violence (Milisauskas 2011: 191-195).

Table 2. List of individuals associated with violence or injury

Phase	Unit	Individual	Injury	Other signs of violence
4	A1	VII	-	Face down burial on house floor
4	C2	XV-1	Head wound	-
5	A3	XXIV	-	Collapsed house
5	B1	XIII- 11	Crushed skull	-
5	B-road	XXI	-	Face down burial in clay extraction pit
6	B6	XXIII	Decapitation	Ritual pit burial
6	A4	XXVI	Possible decapitation	?
4	B1	XXII	Possible decapitation	?

BURIAL XV, Skeleton 1

A bump on the frontal bone of the skull of skeleton Burial 15(1) from Pit 87-C1 indicates a head injury resulting from a blow to the head. This burial belongs to the Funnel Beaker-Baden culture, Bronocice 4 phase. It is possible that this female, approximately 18 years old, was killed for some unknown reason. However, it is also possible that she banged her head by falling or some other accident. She was buried with a small child, aged 3-4 years old whose skeleton did not exhibit any signs of violence or injury. They died at the same time and they were buried at the same time.

BURIAL XIII, Skeleton 11

Skeleton 11 belongs to the collective burial in Pit 36-B1. The skull is that of an infant aged at six months and is completely crushed. This may be the result of having been smashed either during life or immediately after deposition in the burial when other people were being added into the burial pit.

BURIALS XXIII, XXVI and XXII

Burials XXIII (Pit 2-B6), XXVI (Pit 1-A4) and XXII (Pit 51-B1) consisted of three skulls excavated without any post-cranial remains. Burial XXIII consisted of a man's skull placed in the center of a pit with the remains of wooden beams radiating out from the outer edge. The pit appears to have been wood-lined. The placement of the skull is ceremonial and points to a case of decapitation. Burials XXVI and XXII may also be decapitations. XXII belonged to a woman. All three skulls belong to Phase 6, a time during which Bronocice was diminished in economic power and the community apparently in a state of unease, so much so that a new fortification ditch and palisade were constructed around the settlement. This was also a time during which projectile points appear in greater numbers in household pits. While in two of the cases it might be debated whether the skulls resulted from decapitation, that is clearly the case with Burial XXIII.

BURIALS VII, XXI and XXIV

Three burials were similar in their burial treatment. While their skeletons did not indicate signs of violence their method of burial did. Two of the skeletons were buried facedown (Burials VII, and XXI). Burial VII is of particular interest. This is the skeleton of older female who was found face down on the floor of a house. Burial XXI was not placed in a prepared grave. Instead this young child appears to have been dumped face down in a clay extraction pit; the bottom of the bit was not flat but instead irregular indicating was not prepared for a burial. Burial XXIV consisted of a young woman who appears to have died in a house collapse.

Diseases and Signs of Poor Health

Signs of illness, disease, developmental disorders or congenital malformations, and other indicators of poor diet and health were apparent on some of the skeletal remains. These included c*ribra orbitalia*, *cribra femoris*, *enamel hypoplasia, osteoarthritis, spina bifida, craniostenosis, spondylolysis*, *perotic hyperatosis,* tumors, and erosion of the calvarium. In a 2004 publication Elżbieta Haduch (2004) summarized the percentages of various traits for 14 skeletons from the collective burial (Table 3). Some of these are conditions that result from different causative agents. In eight individuals *cribra orbitalia* was observed, four individuals had enamel hypoplasia, three older people had osteoarthritis, one individual exhibited craniostenosis, another individual had a tumor, and four other skeletons showed signs of cortical erosion of the skull (Table 4).

There were sporadic occurrences of so-called "skeletal stress indicators". Among them were cribra orbitalia and porotic hyperostosis which are often observed on skeletal remains. Cribra orbitalia may be associated with iron deficiency anemia. The orbital lesions form during childhood episodes of anemia. But Palkovich (1987: 529) suggests that "Rapid growth and acquired infections and parasites may be the cause of cribra orbitalia in the children aged 2-7 years." Stuart-Macadam (1991, 1992: 166) also favors parasitic stress. She stresses that "It has become apparent that factors such as ecology, hygiene, aggregation, disease, and the role of iron in the body's defense system are of far greater importance than diet in producing iron-deficiency anemia and porotic hyperostosis. All these factors

Table 3. Summary of traits from individuals from Burial XIII (from Haduch 2004)

Trait		N	%	Skeleton(s)
Canine fossa	Flat	8	57	1, 2, 5, 7, 10, 12, 13, 14
"	Medium	4	29	3, 9, 15, 16
"	Deep	2	14	6, 8
Shovel-shaped incisors		6	48	4, 8, 12, 13, 14, 15
Carabelli cusp (out of 10 individuals)		4	40	2, 3, 13, 14
Nasal rim sharpness (out of 12 individuals)	Smooth-flat	6	50	2, 5, 8, 10, 14, 16
"	Sulcus prenasales	3	25	3, 6, 7
"	Sharp	3	25	1, 12, 15
Occiput shape (out of 12 skeletons)	Rounded	6	50	4, 5, 12, 13, 15, 16
"	Prominent	5	50	1, 2, 9, 10, 14
Molar1 with 4 cusps		5	42	1, 2, 3, 4, 15
Os epiptericum		6	61	4, 6, 10, 12, 14, 15
Ossicula suturae lambdoidae (out of 13skeletons)		6	46	1, 5, 12, 13, 14, 15
Enamel hypoplasia (out of 10 skeletons)		4	40	3, 8, 12, 13
Cribra orbitalia		4	29	3, 8, 12, 13
Depression in the asterion area		4	29	1, 2, 4, 6
Os pterii (ossicula fonticuli antero-lateralis)		8	62	4, 6, 7, 10, 12, 14, 15, 16

ultimately affect the total pathogen load of population, which is the key to the occurrence of iron-deficiency anemia in past human populations."

Cribra orbitalia, in the form of small holes in the roof of the eye socket was present in three children: Burial XV skeleton 2, Burial XIII – skeleton 2, Burial XXI and one juvenile: Burial XXII as well as in four adults: XVIII, XIII skeleton 6, XIV, XX, (Table 4, Figure 1). Porosities are small in size of the first degree on the Hengen's Scale (Hengen 1971). It is interesting to note that the majority of individuals who suffered from this condition lived during Phase 5. In particular, the parietal bones of Burials XVIII, XXIII, and XX indicate they had porotic hyperostosis, characterized by

Table 4. List of morphological traits observed on individual skeletons associated with diseases and medical conditions Cribra Orbitalia

Phase	Pit/Unit	Burial Type	Burial/Skeleton	Age	Sex	Cribra orbitalis/femoris	Porotic hyperostosis	Enamel hypoplasia	Otits media	Osteoarthritis	Craniostenosis prematura	Sacrilization L5	Spondylosis	Tumor	Spina bifida
2	19-C2	Skeleton	VI-1	25-30	M	-	-	-	-	-	-	-	-	-	-
		Skeleton	VI-2	30-40	F	X	-	-	-	X	-	-	-	-	-
3	18-C2	Skeleton	I	45-50	F?	-	-	-	-	-	-	-	-	-	-
3-4	5716A/C2	Skeleton	II	60+	F?	-	-	-	-	-	-	-	-	-	-
3-4	5717B/C2	Skeleton	III	25+	F	-	-	-	-	-	-	-	-	-	-
3-4	5717D/C2	Skeleton	IV	adult	-	-	-	-	-	-	-	-	-	-	-
3-4	5718A/C2	Skeleton	V	adult	-	-	-	-	-	-	-	-	-	-	-
3-4	48-C2	Skeleton	VIII	adult	F	-	-	-	-	-	-	-	-	-	-
3-4	47-C2	Skeleton	IX	adult	-	-	-	-	-	-	-	-	-	-	-
3-4	56-C2	Skeleton	XII	adult	-	-	-	-	-	-	-	-	-	-	-
3-4	18-C5	Skeleton	XVII	50-60	M	-	-	-	-	-	-	-	-	-	-
3-4	3-C5	Skeleton	XVIII	30-40	M	X	X	-	-	-	-	-	-	-	-
3-4	4-C5	Skeleton	XIX	30-35	M	-	-	-	-	-	-	-	-	-	-
3-4	7A-C7	Skeleton	XXV	adult	M	-	-	-	-	-	-	-	-	-	-
4	102-A1	Skeleton	VII	50+	F	-	-	-	-	X	-	-	-	-	-
4	125-A1	Skeleton	XVI	7-8	-	-	-	-	-	-	X	-	-	-	-
4	5-B6	Skeleton	XXII	15-18	F?	-	-	-	-	-	-	-	-	-	-
4	87-C1	Skeleton	XV-1	16-18	F	-	-	-	-	-	-	-	-	-	-
		Skeleton	XV-2	3-4	-	X	-	-	-	-	-	-	-	-	-
5	22-A3	Skeleton	XXIV	18-20	F	-	-	-	-	-	-	-	-	-	-
5	43-B1	Skeleton	X	30-35	F	-	-	-	-	-	-	-	-	-	-

Table 4 cont.

Phase	Pit/Unit	Burial Type	Burial/Skeleton	Age	Sex	Cribra orbitalis/femoris	Porotic hyperostosis	Enamel hypoplasia	Otits media	Osteoarthritis	Craniostenosis prematura	Sacrilization L5	Spondylosis	Tumor	Spina bifida
5	36-B1	Skeleton	XIII-1	18-20	F	-	-	-	-	-	-	-	-	-	-
		Skeleton	XIII-2	4-5	-	X	-	-	-	-	-	-	-	-	X
		Skeleton	XIII-3	10	-	-	-	X	-	-	-	-	-	-	-
		Skeleton	XIII-4	18	M	X	-	-	-	-	-	-	-	X	-
		Skeleton	XIII-5	4-5	-	-	-	-	-	-	-	-	-	-	-
		Skeleton	XIII-6	25	M	X	-	-	-	-	-	-	-	-	X
		Skeleton	XIII-7	3-4	-	-	-	-	X	-	-	-	-	-	-
		Skeleton	XIII-8	18	F	X	-	X	-	-	-	-	-	-	-
		Skeleton	XIII-9	1.5	-	-	-	-	-	-	-	-	-	-	-
		Skeleton	XIII-10	5	-	-	-	-	-	-	-	-	-	-	-
		Skeleton	XIII-11	.6	-	-	-	-	-	-	-	-	-	-	-
		Skeleton	XIII-12	7-8	-	-	-	X	-	-	-	-	-	-	-
		Skeleton	XIII-13	15	-	-	-	X	-	-	-	-	-	-	-
		Skeleton	XIII-14	7	-	-	-	-	-	-	-	-	-	-	-
		Skeleton	XIII-15	8	-	-	-	-	-	-	-	-	-	-	-
		Skeleton	XIII-16	3	-	-	-	-	-	-	-	-	-	-	-
		Skeleton	XIII-17	.6-9	-	-	-	-	-	-	-	-	-	-	-
5	100-B1	Skeleton	XIV	30-35	M	X	-	-	-	-	-	-	X	-	-
5	B-road	Skeleton	XXI	8-9	-	X	X	-	-	-	-	-	-	-	-
5	2-B6	Skull	XXIII	30-35	M	-	-	-	-	-	-	-	-	-	-
5	14-C5	Skeleton	XX	adult	F	X	X	-	-	-	-	X	-	-	-
6	1-A4	Skull	XXVI			-	-	-	-	-	-	-	-	-	-
6	51-B1	Skull	XXVII			-	-	-	-	-	-	-	-	-	-
7	67-B1	Skeleton	XI	50+	M	-	-	-	-	X	-	-	-	-	-

Table 5. Individuals with Cribra Orbitalia (CO), Porotic Hyperostosis (PH) and Cribra Femoris (CF)

Phase	Pit/Unit	Burial/Skeleton	Age	Sex	Type
2	19-C2	VI-2	30-40	F	CF
3-4	3-C5	XVIII	30-40	M	CO, PH
4	87-C1	XV-2	3-4	-	CO
4	5-B6	XXII	15-18	F	CO
5	36-B1	XIII-2	5	-	CO
5	36-B1	XIII-4	18	M	CF
5	36-B1	XIII-6	25	M	CO, CF
5	36-B1	XIII-8	18	F	CF
5	100-B1	XIV	30-35	M	CO
5	21 B-road	XXI	8-9	-	CO, PH
5	14-C5	XX	adult	F	CO, PH

resorbed outer table of the frontal, parietal or occipital squama bone (Gleń-Haduch 1995). The probable causes of this condition are anemia due to iron deficiency from a variety of etiologies, malnutrition and over-production of red blood cells.

The female of Burial VI and specimens from Burial XIII skeletons 4, 6, 8 had *cribra femoris,* a non-specific nutritional or chronic disease marker (Figure 2).

Enamel hypoplasia

Enamel hypoplasia in the form of parallel linear depressions running along permanent teeth was confirmed in four cases (Burial XIII, skeletons 3, 8, 12 and 13, Table 5). The location of defects resulting from enamel mineralisation disorders made it possible to determine that the age at which the stress occurred was from two-and-a-half to four years (Goodman and Rose 1990).

Osteoarthritis

Osteoarthritis was observed in three adult individuals. It was present in Burial VII, a female aged at over 50 years, and Burial XI, a male aged approximately at 50 years. Both of these individuals had degenerative

Table 6. Individuals with enamel hypoplasia

Phase	Pit/Unit	Burial/Skeleton	Age	Sex
5	36-B1	XIII-3	10	-
5	36-B1	XIII-8	18	F
5	36-B1	XIII-12	7-8	-
5	36-B1	XIII-13	15	-

changes in their lumbar vertebral column. It was also present in Burial VI, Individual 2, a 30-40 years old female who had sacroiliac osteoarthritis (Figure 3). The osteofits surrounding auricular surface are of the medium degree. Osteoarthritis is an age related health problem.

P e r f o r a t i o n o f t h e T e g m e n T y m p a n i

On the right temporal bone of Skeleton 7 in Burial XIII there is a visible perforation of the tegmen tympani area and on the external surface of the squamous part of the temporal bone, immediately above the border of the external acoustic meatus. It is, possibly, the result of purulent inflammation in the middle ear (Haduch 2002, 2004).

T u m o r s

The left scapula of Skeleton 4 in Burial XIII had a thickening of the medial margin, the area of the distal attachments of the rhomboid muscle (posterior view) and serratus anterior muscle (anterior view), retracting and rotating scapula and fixing it to the thoracic wall.

Developmental or Congenital Disorders

Craniostenosis or *craniosynostosis* premature is a condition in which the cranial sutures close prematurely. Its etiology may be genetic in nature. Among the specimens from Bronocice one case was observed in a child, Burial XVI, aged at seven to eight years old. The sagittal suture is partly fused. The obliteration of the lambdoid suture is visible only on the external surface of the cranial vault. This kind of *craniosynostosis* does not

Figure 1. Burial XX, Pit 14-C5, Female, adult, cribra orbitalia

Figure 2. Burial VI, Skeleton 2, Pit 19-C2, Lublin-Volhynian. Femur from a woman aged 30-40 years exhibiting signs of cribra femoris

Figure 3. Burial VI, Skeleton 2, Pit 19-C2, Female, 30-40 years old, sacroiliac osteoarthritis

Figure 4. Burial XX, pit 14-C5, Female, adult, partial sacralization of L5

Figure 5. Burial XIV, pit 100-B1, 30-35 years old, bilateral spondylolysis

Figure 6. Burial XIII-6, pit 36-B1, Male, 25 years old, spina bifida

Figure 7. Burial XIII-4, pit 36-B1, Male, 18 years old, os epiptericum

Figure 8. Burial XIII-10, pit 36-B1, Child, 5 years old, os epiptericum

Figure 9. Burial XIII-12, pit 36-B1, Child, 7-8 years old, os epiptericum

**Figure 10. Burial XII-6,
pit 36-B1, male, 25 years old,
skull, n. lateralis,
os epiptericum**

**Figure 11. Burial XIV,
pit 100-B1,
Male, 30-35 years old,
skull-n. lateralis**

**Figure 12. Burial XIV, pit
100-B1, Male, 30-35 years
old, skull-n. frontalis**

produce intercranial hypertension and the brain is able to grow without damage. The cranium grew parallel to the closed sagittal suture, lengthening in antero-posterior direction causes *dolichocephaly*, without reduction of the cranial capacity. In this case the cranial index is 69.5.

This condition is rare. In modern populations it occurs 1 out 1800-3000 births. It is predominately associated with males, occurring in 3 out of 4 cases. Often the brain is unable to grow resulting in impaired vision, breathing, headaches and brain damage (Marchac and Renier 1989)

Burial XX, an adult female had a congenital disorder known as *sacralization* of the fifth lumbar vertebra (Figure 4). This fusing of L5 to the sacrum is sometimes associated with *spondylosis* and with lower back pain (Wazir 2014).

Spondylolysis is a lack of fusion between pars interarticularis of the vertebra. In effect, the ventral and dorsal parts of the vertebra are separated. It is most often seen in lumbar vertebra, especially the L5. *Spondylolysis* can be a congenital condition, or it may also be the result of trauma or physical activity. One individual, Burial XIV, an adult male, suffered from *spondylolysis* (Figure 5). Both of the individuals mentioned above would have experienced back pain.

Spina Bifida

Impaired development of the sacrum, in the form of *spina bifida*, appeared in two individuals from Burial XIII, Skeletons 2 and 6 (Figure 6) located in the space between the spinal apophysis S4 and S5.

Skull and Tooth Morphological Traits

The tooth morphology of Bronocice skeletons is important, especially for the collective grave. Shovel incisors, not frequent in western Eurasia populations (Scott and Turner 2004), occurs in six specimens from grave XIII (nos. 4, 8, 12, 13, 14, 15), though it is absent in the others. When looking at lower molars, most humans exhibit five cusps on the first molar. Four-cusp first lower molars are less common (Scott and Turner 2004). Among the individuals from the collective grave four-cusp lower first molars were observed in three cases (nos. XIII – 3, 4, 15) and twice in other burials (nos. VIA, VIB). The Carabelli's cusp trait world range is 1.9 – 36%, most frequently occurring in western Eurasia (Scott and Turner 2004). In Bronocice samples were present only in the dentition of the collective grave skulls (nos. XIII – 3, 13, 14).

Genetic morphological traits such as dental patterns can be identified and serve as possible indicators of family relationships. At the site of Bronocice several dental traits and one cranial trait were observed among some of the skeletons recovered from Pit 36-B1, the collective grave (Table 6). They included Carabelli's cusp, shovel-shaped incisors, and *os epiptericum*.

Carabelli's cusp

Carabelli's cusp is an accessory cusp located on the lingual aspect of the maxillary first molar. This trait can be used to show intra- or inter-

Table 7. Summary of genetic morphological traits among Burial XIII individuals

Ph.	Pit/Unit	Burial/ Skeleton	Age	Sex	Carabelli's Cusp	Shovel-shaped Incisors	Os epipterícum
5	36-B1	XIII-1	18-20	F	-	-	-
		XIII-2	5	-	-	-	-
		XIII-3	10	-	X	-	-
		XIII-4	18	M	X	X	X
		XIII-5	4-5	-	-	-	-
		XIII-6	25	M	-	-	X
		XIII-7	3-4	-	-	-	-
		XIII-8	18	F	-	X	-
		XIII-9	1.5	-	-	-	-
		XIII-10	5	-	-	-	X
		XIII-11	.6	-	-	-	-
		XIII-12	7-8	-	-	X	X
		XIII-13	15	-	X	X	-
		XIII-14	7	-	X	X	X
		XIII-15	8	-	-	X	X
		XIII-16	3	-	-	-	-
		XIII-17	.6-.9	-	-	-	-

Table 8. Non-metric traits of skeletons at Bronocice

no. of skeleton	I	II	III	IV	V	VIA	VIB	VII	VIII	IX	X
sex	f?	f	f	?	?	m	f	f	F	?	f
age (year)	*M*	*S*	*A*	a^	a^	*A*	*M*	*M/S*	a^	a^	*A/M*
4-cusped lower first molar	nda	nda	nda	nda	nda	+	+	nda	nda	nda	nda
meopic suture	nda	nda	nda	nda	nda	-	-	+	nda	nda	+
no. of skeleton	**XIV**	**XVA**	**XVB**	**XVI**	**XVII**	**XVIII**	**XIX**	**XX**	**XXI**	**XXII**	
sex	m	f	?	?	m	m	m	f	?	f	
age (year)	*M*	*J* 15-18y	*I* 3-4y	*I* 7y	*M/S*	*M*	*A/M*	*A*	*I* 8-9y	*J* 18y	
4-cusped lower first molar	-	-	nda	-	nda	nda	nda	-	-	nda	
meopic suture	-	-	-	+	-	-	-	-	-	-	

s lack of sphenoparietal suture – there is the suture between the frontal bone and squamous part of the temporal bone.
+ present
- not present
nda no data available
f – female, m – male
I – infans, J – juvenis, A – adultus, M – maturus, S – senilis, a^ – adult

population differences. Carabelli's cusp is more frequent in European than in Asian populations. Shovel-shaped upper incisors have prevalence in East Asian populations (Dahlberg 1951, Hillson 1986, Pietrusewsky and Douglas 2002). Carabelli's cusp is more frequent in males than in females (Hsu *et al.* 1999). The mode of inheritance has been challenged. Carabelli's cusp is present in the maxillary molars of four individuals of Burial XIII (Table 7).

Shovel-shaped Incisors

Six individuals show shovel-shaped incisors. Maxillary incisors are sometimes present the marginal ridges on the lingual area (Table 10). The

Table 9. Non-metric traits of skeletons from the collective grave at Bronocice

grave XIII	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
sex	f	?	?	m	?	m	?	f?	?	?	?	?	?	?	?	?	?
age (year)	*J* 18y	*I* 5y	*I* 10y	*J* 18y	*I* 4-5y	*A*	*I* 3-4y	*J* 18y	*I* 1.5y	*I* 5y	*I* 0.5y	*I* 7-8y	*I* 15y	*I* 7y	*J* I 8y	*I* 3y	*I* 0.5y
epipteric bone r l	- -	- -	nda	- +	nda -	+ +	- -	nda	nda	+ +	nda	+ -	nda	- +	+ +	Nda	nda
4-cusped lower first molar	+	-	+	+	nda	-	nda	-	nda	nda	nda	-	-	-	+	Nda	nda
metopic suture	-	-	-	-	-	-	-	nda	-	-	&	-	-	-	-	Nda	nda

\+ present
\- not present
& infant skull
nda no data available
f – female, m – male
I – infans, J – juvenis, A – adultus, M – maturus, S – senilis, a^ – adult

Table 10. Skeletons with Carabelli's cusp

Phase	Pit/Unit	Burial/Skeleton	Age	Sex
5	36-B1	XIII-3	10	-
		XIII-13	15	-
		XIII-14	7	-

Table 11. Skeletons with shovel-shaped incisors

Phase	Pit/Unit	Burial/Skeleton	Age	Sex
5	36-B1	XIII-4	18	M
		XIII-8	18	F
		XIII-12	7-8	-
		XIII-13	15	-
		XIII-14	7	-
		XIII-15	8	-

Table 12. Skeletons with os epiptericum

Phase	Pit/Unit	Burial/Skeleton	Age	Sex
5	36-B1	XIII-4	18	M
		XIII-6	25	M
		XIII-10	5	-
		XIII-12	7-8	-
		XIII-14	7	-
		XIII-15	8	-

trait has been "characteristic of eastern Asians and populations of eastern Asian descent (e.g., Amerindians, Eskimo, and Pacific populations)" (Pietrusewsky and Douglas 2002:49).

Os Epiptericum

The pteric region of the skull is variable. Occasionally at the pterion located in the sphenoidal fontanelle a suture bone will be present. There is very little in the current literature concerning variability in the appearance of this epactal bone in different populations. Currently the presence of the epipteric bones is calculated between 10-15% (Walulkar *et al.* 2014, Khatri *et al.* 2011). Os epiptericum is a genetic variability in the human cranium however the genetic aspect of its inheritance is under discussion.

There were six individuals from Burial XIII that had this trait including Skeletons 4, 6, 10, 12, 14, 15 (Table 11, Figures 7-10). No epipteric bones have been observed in the other skulls from Bronocice burials.

Summary

Three broad categories of information were considered in this chapter including evidence of injury or violence, diseases and genetic relationships (Table 1). Potential signs of physical violence were observed on skeletons from Phases 4, 5 and 6. These phases represent the most dynamic periods in the history of the settlement. People who lived or visited Bronocice at the time were part of a much larger movement of social and economic change and experienced growing tensions within the region. Unfortunately it remains difficult to state with any degree of certainty if nine cases in which violence was suggested resulted from deliberate acts or not (Table 2). Among these there are few points worth mentioning. Burial VII was old for her time, 50+ years, and had osteoarthritis. At the time that Burial XXI was deposited in a clay extraction pit the child was suffering from *cribra orbitalis* and *porotic hyperostosis* of the calvarium. Both individuals (Burials VII and XXI) would have been fragile.

In addition to these individuals several of the skeletons examined suffered from multiple conditions. Nine individuals had two conditions at the time of their deaths. Eight of them had *cribra orbitalia*. The ninth, Burial VI Skeleton 2, had *cribra femoris* and *osteoarthritis*. Burials XVIII, XX and XXI had *cribra orbitalia* and *porotic hyperostosis* of the cortical bone of the calvarium, as did Burial XX which also suffered from congenital *sacrilization* of the L5. Burial XIII Skeletons 2 and 6 had *spina bifida*, and skeletons 4, 6 and 8 show *cribra femori*s. Burial XIV had *cribra orbilalis* and *spondylolysis* (Figures 11 and 2). It seems there is a strong correlation between *cribra* of various forms and other diseases, especially erosion of the cortical bone of the calvarium (*porotic hyperostosis*). The only other common condition was *enamel hypoplasia* which was correlated with another illness

Table 13. Families suggested by the genetic data from Burial XIII

Skeleton	Age	Sex	Family 1	Family 2	Family 3
			Carabelli's Cusp	Shovel-shaped Incisors	Epipteric bone
2	4-5	-	-	-	-
3	10	-	X	-	-
4	18	M	-	X	X
5	4-5	-	-	-	-
6	25	M	-	-	X
8	18	F	-	X	-
10	5	-	-	-	X
12	7-8	-	-	X	X
13	15	-	X	X	-
14	7	-	X	X	X
15	8	-	-	X	X

of degenerative condition only one time, in burial XIII, skeleton 8. The question remains if these individuals are unusual when compared with other populations from the same region and cultures.

Within the collective burial three genetically informative traits were observed that indicated possible family relationships between 9 or 53% of the 17 individuals. These included Carabelli's cusp, shovel-shaped incisors, and os epiptericum. Three grouping are revealed loosely called "Families" (Table 13). Over half of the individuals can be grouped into three families. There is some overlap in family members as Skeleton 13 had Carabelli's cusp and shovel-shaped incisors while Skeletons 4, 12 and 15 had *shovel-shaped incisors* and *os epiptericum*. It is worth pointing out that in the skeleton 14 we can observe all of these traits: *Carabelli's cusp, shovel shape incisors* and *epipteric bones*. It is interesting to note that there seems to be a pattern in the age groupings by family and that in each one there is a high number of young children compared with adults.

PART III

Description of Burial Materials

(The Material)

CHAPTER 11

Description of Animal Burials

Marie-Lorraine Pipes, Janusz Kruk, Sarunas Milisauskas

Introduction

It has been the fate of most animals that ever came into contact with humans to be slaughtered for food, fur and other resources, as well as for spiritual and ritual purposes. Remains of animals were incorporated by humans into burial practices long ago (Bartosiewicz 2005, Gräslund, Jennbert 2007, Ewersen, Ramminger 2013). The frequency of animal burials and the range of species included in burial practices were common throughout prehistory, including the later Neolithic (Morey 2014, 2006). Dogs were the most commonly buried and/or sacrificed animal.

In general, animal remains found at archaeological sites tend to be fragmentary, often modified either by humans or other forces after being discarded. Only a small percentage of animals that ever interacted with humans were treated differently, both in life and in death. On rare occasions and for reasons sometimes obvious and others not, some animals were buried whole and intact. Encountering animal burials tends to prompt questions about the social meaning of these animals, the significance of burial within a given culture, and about the relationship between some humans and certain animals. Why were these specific individuals selected and not others? Animal burials from prehistoric sites are often assumed to represent sacrifices, especially when they occur in human burials or are located in close proximity to burial sites. Clear signs of sacrifice may be inferred when cut marks appear along cervical vertebra or skulls are crushed from poll-axing. However, in other instances burial location and age at death suggest that some animals were honored as working animals or pets.

It was during the Neolithic that the beginnings of true "sacrifices", the deliberate slaughter of a precious animal with no consumption intended, began. These were likely sacrificial gifts to the gods presumably offered in return for celestial favors. It was not until the Bronze Age that domesticated animal burials became common. At that point their skeletons are found in and around cemeteries and are associated with burials of important members of society (Kołodziej 2010, Szmyt 2006). In Poland the Globular Amphora culture is especially known for sacrifices of cattle (Szmyt 2006, Pollex 1996). These types of animal burials were like human burials in that they were given a high degree of respect and reverence.

Unlike other late Neolithic/Copper Age and early Bronze Age sites none of the animal burials from Bronocice were buried with humans or in close proximity to burials (György 2013). Some animal burials were determined not to be sacrificial in nature based on the location, placement and treatment of the bodies. Whether sacrificial or not, all burials were embedded with social meaning, though interpretation borders on speculation due to few facts and insufficient archaeological context.

The interpretation of animal burials is dependent on the spatial and depositional contexts from which they were recovered, as well as physical evidence potentially revealing how they died. Discussions of animal burials often include partial burials and animals dismembered as sacrifices (György 2013, Pollex 1999, Szmyt 2005). However this discussion of the animal burials at Bronocice focuses mainly on whole animal burials.

At the site of Bronocice animal burials were extremely rare. Some were clearly sacrificial in nature, others were not. While all animal burials may be said to embody some degree of ritual simply because of the act of interment, not all of them were ritually sacrificed. Sacrificial animals included one roe deer (Phase 5) and seven head of cattle from a single pit feature, while non-sacrificial animals included several dogs, pigs and a few sheep. The small number of animal burials recovered dated to different phases of occupation and were associated with Funnel Beaker and Funnel Beaker-Baden cultural groups.

Most of the animal burials consisted of dogs. However the majority of dogs at Bronocice were not treated this way, appearing most often as butchered remains in dietary refuse deposits (Table 1). The role of dogs as companions, guies and guardians is thought to be ancient dating back to the Paleolithic period (Munt and Meiklejohn 2007, Stewn and Welinder 2007). In fact dogs found buried in early Iron Age tombs in Greece are believed to represent guides and guardians in the afterlife (Day 1984).

Dogs became increasingly common with the advent of large scale herding. Their value as working animals cannot be overstated. A good herd dog is still considered a valuable asset among cattle and sheep herders today. The recovery of dog burials within household contexts at Neolithic sites may be a sign of respect on the part of its owner. Additionally, it cannot be ruled out that there existed an emotional attachment between owner and dog as well. The emotional attachment between humans and some species of animals is a common occurrence in modern society but is also well as being documented in historical records. The emotional bond felt by a person to an animal often results in privileged treatment not only in life but in death (Losey *et al.* 2011).

In addition to dogs a few sheep and pigs seem to have been singled out for burial as well. There only a few cases in which it they were clearly buried. There are several ambiguous cases where an articulated quarter carcass may have spoiled and been disposed of as a result. Like dogs, the majority of sheep were slaughtered for food. Their butchered remains were recovered from household deposits dating to all phases and associated with diverse contexts and cultures at Bronocice. There are indications that some animals that were cared for as neonates died in houses and were buried near or under hearths.

The burial treatment of a small number of non-sacrificial animals at Bronocice suggests that they were special to the households in which they were buried. The paucity of extraordinary treatment of animals in death suggests that human-animal bonds were rare and highlights the fact that this was atypical of the disposal of most animal remains. Unlike the Bronze Age, during which times sacrificial animals were often placed near human burials, animal burials at Bronocice were mainly placed in the bottom of house and barn pits. They never occurred in association with human remains nor were they placed in close proximity to human burials.

There were two instances of animal ritualized burials that merit discussion. In one instance a sacrificed roe deer was found in the cellar of a house. In the other instance, seven cattle were found slaughtered in the basement of a barn that was subsequently burned. Though not a classic example of an animal burial or of a sacrifice, this is nonetheless a socially loaded event worth examining. It is thought that this event was the result of a raid on the settlement.

Dog Burials

Dogs were buried in two basic types of features, cellar pits and storage pits, that were located inside houses and barns. In every case, dogs were recovered in the lowest level of pits. In two cases dogs were buried in the same pit as a sheep (Pit 26-A1 and 1-B8). No grave goods were associated with any of them.

Table 1 summarizes the minimum number of buried dogs versus the minimum number of individuals represented by butcher waste and dietary refuse. Over the course of time dogs increased in frequency at Bronocice. The importance of dogs in sheep herding is well documented and so it is not surprising that the number of dogs increased when the flocks began to grow. Phase 4 and 5 had the highest frequencies of dogs. They were generally found butchered in household dietary refuse deposits. However, beginning in Phase 3 and lasting to Phase 6 a small number of dogs were treated differently; generally buried under house cellar floors, a practice which seems to be uniquely Funnel Beaker. Two dogs, an adult and a neonate, were found in Pit 38-A1, a storage pit inside a large barn dating Phase 3. A juvenile was found in Pit 64-A1, a storage pit inside a house dating to Phase 3-4. A subadult was found in Pit 68-A1, a large cellar inside a house dating to Phase 4. A subadult and a juvenile dog were placed under a hearth in cellar Pit 5-B5 though it was not burned

Table 1. Comparison of the number of dog burials (MNB) and the minimum number of buried individuals within burials (MNI/Burials) versus the number of pits (Pits) containing partial dog remains and the minimum number of individuals (MNI/Food) consumed as food

Phase	Date Range	Culture	Burials		Food		TOTAL
			#Burials	MNI	#Pits	MNI	MNI
1	3900-3800 BC	Funnel Beaker	-	-	5	5	5
2	3800-3700 BC	Lublin-Volhynian	-	-	1	1	1
3	3700-3500 BC	Funnel Beaker	1	2	3	3	5
4	3500-3300 BC	Funnel Beaker	4	5	19	19	24
5	3300-3100 BC	Funnel Beaker-Baden	3	4	28	28	32
6	3100-2900 BC	Funnel Beaker-Baden	3	3	9	9	12
TOTAL			11	14	64	65	78

Table 2. Types of pits in which dogs were buried

Phase	Date Range	Culture	House		Barn
			Cellars	Storage Pit	Storage Pit
3	3700-3500 BC	Funnel Beaker	-	-	2
4	3500-3300 BC	Funnel Beaker	4	1	-
5	3300-3100 BC	Funnel Beaker-Baden	1	3	-
6	3100-2900 BC	Funnel Beaker-Baden	2	-	1
TOTAL			7	4	3

(Phase 4) (Figure 1). Another juvenile dog from 57-B1 was treated similarly (Figure 2). There were 3 burial pits containing four dogs dating to Phase 5. They included an adult dog in Pit 14-A3, an adult and subadult in Pit 65-B1 and a subadult in Pit 1-B8. Pits 14-A3 and 65 B1 were storage pits located inside houses, whereas Pit 1-B8 was a cellar inside a large house associated with a lithics workshop. Two subadults and one adult dog were found in Pits 2-B2, 4-B7 and 74-C1, all dating to Phase 6. Pits 2-B2 and 74-C1 were part of large cellars in houses, Pit 4-B7 was a storage pit in a barn. The animal buried in 2-B2 (Phase 6) was a immature (Figure 3). It was found buried under a crushed ceramic tile floor.

In general the most common burial location for dogs was inside houses (Table 2). With one exception dating to Phase 6, dog burials located inside barns date earlier in time suggesting the value of certain dogs increased over time. Dog burials inside houses have been seen at other Funnel Beaker sites, for example at the site of Niedźwiedź (Burchard 1977). Dog burials were also observed at the Bodrogokereztur settlement of Balatonőszöd Temetői dűlő (Tünde 2010). But these were clearly associated with human burials.

Sheep Burials

In comparison with the number of sheep consumed at Bronocice there were very few sheep burials (Table 3). The first sheep burial occurred during the Lublin-Volhynian (Phase 2) occupation and was found within the settlement. It was found at the bottom of Pit 28-C2, a cellar located within a longhouse. This individual was a fully articulated adult skeleton with horns. There was a sheep burial from Phase 3 found in Pit 26-A1. It was found in a shallow pit which may have been a daub pit that was later covered by a barn. It contained not only the sheep but also a pig. Based on its dentition this was an old individual. One fully articulated sheep was found in Pit 71-A1dating to Phase 4 (Figure 4) which was also located within a barn. The staining in and around the latter individual suggests that the barn burned down and that the animal possibly died in the blaze. The final two sheep were lambs found in the cellar of a house, Pit 1-B8 (Phase 5). This was also the location where a pup was found. This pit yielded a few isolated humans remains consisting of an adult foot and thigh believed to be from an earlier burial disrupted when the house was constructed. This structure also contained the remains of a lithic workshop which was identified based on a vast quantities of lithic debitage, raw materials and finished tools. With the exception of the two lambs and a pup in Pit 1-B8 there is little to suggest that these animals were treated with great care or deference. The lambs may have been brought into the house because they had been rejected by their mother or they were weak. Whatever the reason they received special care. It may be that animals in

Figure 1. Dog burial in 5-B5, Phase 4

Figure 2. Dog burial in 57-B1

Figure 3. Dog burial in 2-B2, Phase 6

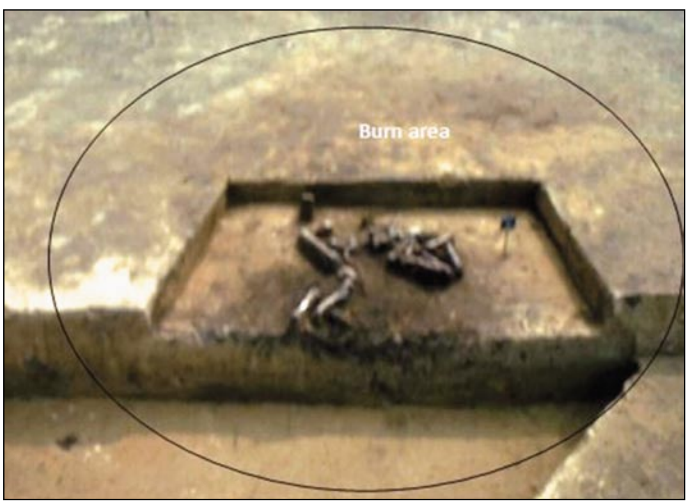

Figure 4. Sheep/goat burial in 71-A1

Figure 5. Pit 6-B7. Articulated pig spinal column

Figure 6. Pit 21-A3. Seven head of cattle slaughtered during a possible raid on the settlement. Signs of fire are evident in the unit wall (arrow)

Figure 7. Patch of clay, initially thought to be a hearth, under which the roe deer burial was recovered (Pit 22-B1, Phase 5)

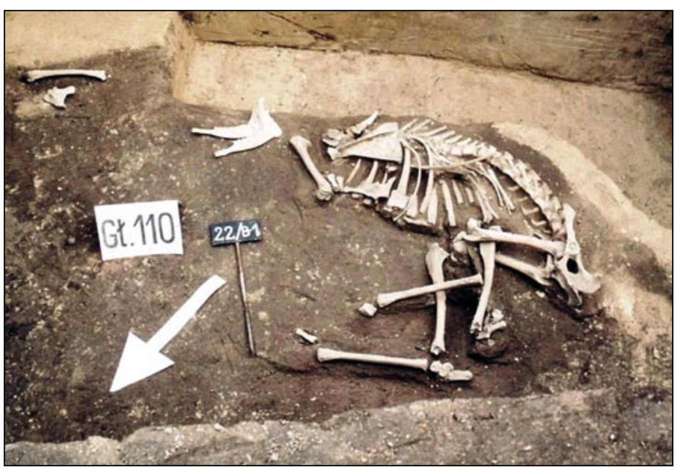

Figure 8. The roe deer skeleton exposed in Pit 22-B1, Phase 5

Table 3. Comparison of the number of ovicaprine* burials (MNB) and the minimum number of buried individuals within burials (MNI/Burials) versus the number of pits (Pits) containing partial ovicaprine remains and the minimum number of individuals (MNI/Food) consumed as food

Phase	Date Range	Culture	Burials		Food		Total MNI
			#Burials	MNI	#Pits	MNI	
1	3900-3800 BC	Funnel Beaker	-	-	13	24	24
2	3800-3700 BC	Lublin-Volhynian	1	1	15	20	21
3	3700-3500 BC	Funnel Beaker	1	1	22	37	38
4	3500-3300 BC	Funnel Beaker	1	1	45	75	76
5	3300-3100 BC	Funnel Beaker-Baden	1	2	62	102	104
6	3100-2900 BC	Funnel Beaker-Baden	-	-	18	30	30
TOTAL			4	5	175	285	293

* Sheep, sheep/goat, goat

general that were buried inside houses are evidence of winter deaths when the ground was frozen.

Pig Burials

Pig burials occurred during Phases 3 to 5. As was the case with sheep, they were infrequently buried. Their value as food was no doubt considered to be great (Table 4). The age at death of buried pigs was always less than a year old. They occurred in Pits 26-A1, a large barn (Phase 3), 24-B1, a house cellar with a hearth (Phase 4), 6-B7 (n=3), a house cellar with a hearth (Ph5), and 6-B4, house cellar (Phase 6) (Figure 5). There is an interesting pattern seen in the location of piglets. With the exception of the Phase 3 individual, the remaining five piglets were found in houses, two near a hearth. The fact that they were not eaten but instead buried inside the houses suggests perhaps these were fragile individuals that someone attempted to save. Pigs have no real mating season though births tend to occur during the spring and fall. It may be that during particularly difficult weather weak individuals were tended inside homes.

Table 4. Comparison of the number of pig burials (MNB) and the minimum number of buried individuals within burials (MNI/Burials) versus the number of pits (Pits) containing partial pig remains and the minimum number of individuals (MNI/Food) consumed as food

Phase	Date Range	Culture	Burials		Food		TOTAL
			#Burials	MNI	#Pits	MNI	MNI
1	3900-3800 BC	Funnel Beaker	-	-	13	26	26
2	3800-3700 BC	Lublin-Volhynian	-	-	10	20	20
3	3700-3500 BC	Funnel Beaker	1	1	20	25	26
4	3500-3300 BC	Funnel Beaker	1	1	40	57	59
5	3300-3100 BC	Funnel Beaker-Baden	1	3	63	89	90
6	3100-2900 BC	Funnel Beaker-Baden	1	1	24	36	37
TOTAL			4	6	170	254	260

Cattle Burials

No intentional cattle burials occurred in the settlement. However, seven head of cattle were slain and the building within which they were found set on fire afterwards (Figure 6). It is possible that this deliberate destruction of valuable animals was the result of social conflict. Other signs of fire in the settlement were found. Whether they were synchronous or not is unclear. The location of the structure in which the cattle burials were found was on the outer edge of the settlement (Pit 21-A3). This area appears to have been a large farm consisting of a main house and series of barn rebuilt from Phase 3 to Phase 5. It is unclear which structure the pit was associated with. However the structure was a barn with a walkout basement. The pit was located in close proximity to the human remains found in Pit 22-A3 (Burial# XXIV, Phase 5). That individual, a young woman aged 18-22 years, died in a house collapse. There is no date for the cattle burial but it is possible that the two events were related. No attempt was made to retrieve the woman's body. Perhaps other people from the farm were killed or taken away and her death and the location of her body were unknown to the community. The death of seven head of cattle, all of which were polled, represented a great economic loss to the owner as well as to the community. Polled cattle are often considered to be dairy cattle. If these were indeed dairy cattle then the community lost more than just meat and traction but also an important source of milk and dairy products such as cheese, butter and yogurt.

Roe Deer Burial

On adult roe deer burial was recovered. This wild animal was recovered from Pit 22-B1 and dates to Phase 5. The pit within which it was found was a cellar inside a large house. The skeleton was fairly complete though the cranium was missing. During the excavation a patch of clay overlying the burial was mistaken for a hearth (Figure 7). The burial was placed under the cellar floor and sealed with clay (Figure 8). This was the only "hearth" burial for which photo documentation was available. It is possible that the dog, sheep and pig burials found under hearths mentioned above were misidentified as well. No marks of any kind were found on the roe deer skeletal elements. The house in which the animal was found is adjacent to a small circular daub hut (6-B1). The hut is enigmatic. There was no cellar or hearth within this structure, though lithics, ceramic sherds, and a bone chisel from a horse metapodial were recovered. Its function remains unclear but its unique shape and size, and its proximity to the roe deer burial, suggest it may have had a special function, perhaps ritual, within the settlement.

Summary

There were overall few animal burials, either intentional or not, identified at Bronocice. When Bronocice is compared with the Baden settlement at BalatonőszödTemetői dűlő (Tünde 2010) in Hungary the paucity of animal burials appears to be meaningful. Funnel Beaker society differed in social practice from its surrounding neighbors and immediate predecessors. The simple nature of human burial practice, the lack of personal ornaments such as jewelry, and the lack of portable art, all point to a very different ideology. It is tempting to suggest that Funnel Beaker people were less interested in elaboration and leaned towards simple traditions.

The difficulty in dealing with animal remains is determining whether or not partial animal remains represent sacrifices or simply discarded meat (Tünde 2010). Such is the case for example with a partially articulated pig spinal column from Pit 6-B7 (Figure 5).

In some instances animal burials were unintentional while in other instances they were deliberate. Some of the deliberate burials appear to have resulted from disposal of carcasses that were probably considered unfit for human consumption. They may have been buried inside due to frozen ground or inclement weather. Rotting carcasses are a nuisance that attract predators. It is likely to have been a strong motivator in burying organic remains.

In the case of dogs there appears to have been an emotional component involved in some of their burials. Many of the dogs were young. Perhaps these pups were of a special breed of dogs with greater value than others. The emotional value of some animals may be tied to cultural values such as an appreciation of exceptional performance, intelligence or loyalty of a few individuals. In some cases the value might be based on the role the animal played in society, such as an extremely good hunting or herding dog, or a prolific ewe. The roe deer on the other hand potentially represents something different such as a sacrificial animal. This individual was buried during phase 5, a period in which ritualized behavior was increasingly observed at Bronocice. The destruction of seven head of cattle from this same period however represented an enormous loss to the farmer and to the community in terms of wealth, meat, milk and offspring.

There were two instances in which sheep and pig and sheep and dog burials occurred together, (Pits 26-A1 and 1-B8).These co-occurrences are interesting. In the case of 26-A1, the pit was located in a barn. The presence of the two skeletons suggests the animals died and were buried at that location. In the case of Pit 1-B8 which was a cellar house pit the presence of both species in death suggest that their owners were involved in sheep production. The increasing presence of dogs over the course of the millennium correlates with the intensification in sheep rearing. Dogs were important in herding and managing sheep.

In summary, the interpretation of fully articulated animals at Bronocice was dependent on the burial contexts within which they were found. Some were clearly embedded with social meaning, others were note.

CHAPTER 12

Plant and Charcoal Remains from the Burials at Bronocice

Maria Lityńska-Zając, Janusz Kruk, Sarunas Milisauskas

In this chapter we present the results of the palaeobotanical analysis of the small samples of plant remains found in the burials at Bronocice. Only a few macroscopic plant remains were preserved in the graves of the two phases of Funnel Beaker-Baden culture. Plant remains were also found in a grave of the Corded Ware culture (Milisauskas and Kruk 1984a). Interestingly, there were no plant remains in the Funnel Beaker burials. Palaeobotanical data from all six phases at Bronocice has been described in Milisauskas *et al.* 2004 and Milisauskas *et al.* 2012.

Palaeobotanical data were recovered by two methods: water flotation and examination of daub. One method involved water separation. 6300 cm^3 soil samples were collected from each feature and flotated through sieves of 0.2 mm and 0.5 mm mesh (Milisauskas *et al.* 2012). Macroscopic plant remains were separated into categories based on species. The flotation samples were analyzed by Richard Ford and Maria Lityńska-Zając. The identification of plant remains from impressions in daub pieces was carried out by Maria Lityńska-Zając. Fragments were cleaned using a soft brush and their surfaces examined. They were then broken to expose plant impressions preserved within. Richard Ford, Maria Lityńska-Zając and Zofia Tomczyńska analyzed the charcoal remains. Analysis of the botanical material from the Corded Ware burial was carried out by Richard

Table 1. Cereal Species Identified on Funnel Beaker-Baden Sites of the Loess Uplands of Western Regions of Southeastern Poland

Latin name	Common Name	Number of sites with cereal remains
		Funnel Beaker-Baden
Avena sativa+Av.sp.	Oat	1
Hordeum vulg.	Barley	2
Triticum monococcum	Einkorn	1
Triticum dicoccum	Emmer	2
Triticum monoc. vel dicoc.	Einkorn/Emmer	2
Triticum spelta	Spelt wheat	1
Triticum aestivum	Bread wheat	1
Panicum miliaceum	Millet	1

I. Ford, Museum of Anthropology, University of Michigan. Each seed and fruit, fragment of spikelet or chaff was counted as one specimen. All of the material (the diaspore, their imprints, and the charcoal) were classified according to standard procedures of archaeobotany (Lityńska-Zając and Wasylikowa 2005: 198-300).

The number of charred diaspores in the flotation samples was low. The small numbers of seeds and fruit may account for the absence of some plants species in different occupation phases. A large number (n = 215) of cereal fragments from features of phase 4 pits were unidentifiable at the species level.

A variety of cereal species were cultivated by the Funnel Beaker-Baden people in southeastern Poland (Table 1) but few plant remains were found in the four burial pits of the Funnel Beaker-Baden culture at Bronocice (Table 2). Among these were burnt grains of hulled emmer wheat (Triticum dicoccon), einkorn (T. monococcum) and spelt (T. spelta), thus these species were cultivated at Bronocice (Milisauskas *et al.* 2012). There were also edible seeds of lentil (Lens culinaris). Also found were found the remains of maple (Acer sp.), and oak (Quercus sp). In the daub fragments from Funnel Beaker and Funnel Beaker-Baden features from there were numerous imprints of hulls, straw, and unidentifiable cereals (Cerealia indet.) (Milisauskas *et al.* 2012). These finds are difficult to interpret. Diaspore

Table 2. Plant remains from the graves of Funnel Beaker-Baden culture at Bronocice

Taxa name	Kind of remains	State of preservation	Phase 5		Phase 6	
			graves			
			XIII	XXII	XXIV	XXVIII
			number of specimens			
Triticum dicoccon	c	I	3			
		Ch				2
T. monococcum	c	Ch				2
T. spelta	c	Ch		4		
Cerealia indet.	c & l	I	numerous			2
Lens culinaris	s	Ch				2
Acer sp.	w	Ch			1	
Quercus sp.	w	Ch			1	

Explanations: type of remains: c – caryopsis, s – seed, w – wood, l – leaves and chaff fragments; state of preservation: i – imprint, ch – charred

and wood were likely lying on the soil surface and swept into the pits when they were being filled. The daub fragments were probably deposited in the same way. Plant imprints on dried or burnt clay results from their addition of organic temper in the production of pottery vessels. Cereal remains in burials could also have resulted be from the cremation process. According to A. Mueller-Bieniek (2012), the plant remains from the cemetery at Paprotki-Cologne, cereal "were [...] undoubtedly funeral pyre element" (Mueller-Bieniek 2012: 24). However, we have no evidence for cremations at Bronocice.

Data on the Corded Ware use of plants in central Europe are predominantly derived from the analysis of plant imprints in ceramics. The Bronocice burial produced some plant remains from the pit fill and from the contents of a Corded Ware ceramic vessel. There were also charcoal samples in the feature: one of oak and 55 of pine in five samples.

Despite the unusual source of the evidence and the small sample size, we conclude that the Corded Ware culture dependent on domestic plants for its subsistence (Table 3). Cereals such as emmer wheat (*Triticum dicoccum*) predominate, but garden plants were also found, peas (*Pisum sativum*) and lentils (*Lens esculenta*) (Table 3). Also present were the wild plants,

Table 3. Corded Ware Plant Remains from Bronocice

Species	Common Name	Pit 18-B1	Pit Fill Sample	Pot No.1	Daub-Imprints
Cerealia	Cereals		7	41	7
Triticum dicoccum Schubl	Emmer		3	4	
Triticum aestivium	Bread Wheat			1	
Triticum spelta	Spelt		1		
Hordeum vulgare	Barley			4	
Lens culinaris	Lentil		1		1
Pisum sativum	Pea			2	
Bromus sp.	Brome grass			1	
Chenopodium album	Goosefoot		2		
Gramineae	Grass Family		1		

brome (*Bromus sp.*) and goosefoot (*Chenopodium album*). This evidence strongly suggests that the Corded Ware people were cultivating cereals and garden crops at Bronocice.

Kadrow (1994) has suggested that the early Corded Ware populations practiced pastoralism in southeastern Poland, obtaining agricultural produce from Funnel Beaker-Baden communities. The Bronocice burial is dated to the Cracow-Sandomierz II phase, which is post – Funnel Beaker-Baden occupation. At this time only Corded Ware people inhabited the Bronocice region, thus there was little possibility of their trading or raiding for cereals, etc. It is reasonable conclusion that Corded Ware people were at least part-time farmers by 2640±225 – 2480±165 BC.

The study of plant materials from Corded Ware graves in southeastern Poland is rare, only a few sites have yielded plants remains. Such data has recently been summarized by Lityńska-Zając (2004) and little has been written on the subject since.

In addition to Bronocice, remains of wood charcoal have been found in burial pits at the following Corded Ware sites; Bierówka mound B (Gancarski, Machnikowie 1986, 1990; Lityńska 1990), Jasło (Gancarski, Machnikowie 1986, 1990; Lityńska 1990), Krzyż, (Lityńska-Zając 1997), Pałecznica (Liguzińska-Kruk 1989; Lityńska-Zając 2004), Wola Węgierska (Machnik,

Table 4. Frequency of tree remains in graves of Corded Ware culture in southeastern Poland (Lityńska-Zając 2004, table 3)

Site	Bronocice	Bierówka B (1)	Krzyż (2)	Pałecznica (3)	Wola Węgierska (4)	Zagaje Stradowskie (5)	Zielona (6)
taxa name	number of specimens						
Acer sp.		2					
Alnus sp.		3			20	8	61
Carpinus betulus		8					
Corylus avellana							22
Fraxinus excelsior					181		
Pinus sylvestris	38	10	1	2	32	43	1
Populus sp.							47
Populus sp. vel *Salix* sp.		6		3			16
Quercus sp.	4	28		287	12	6	24
Tilia sp.		3	4		59		2
Ulmus sp.		1			8		
Rosaceae indet.					3		
Coniferous trees				2	1		
Deciduous trees					12		161
undermined - wood							34
bark							8

Sosnowska 1998; Maria Lityńska-Zając 2004), Zagaje Stradowskie (Burchard 1998; Lityńska-Zając 2004) and Zielona (Włodarczak 2004; Maria Lityńska--Zając 2004; Table 4). The species most frequently recovered are oak and pine, which were also the taxa most commonly occurring in the region in the mid-3rd millennium B.C. It can therefore be assumed that these species were the most commonly used as fuel and that the charcoal came from the immediate vicinity of these sites. The remains of other trees appear occasionally, suggesting no great selectivity in the gathering of fuel.

Species represented in burials may have resulted from deliberate selection for use in funeral rites, but the possibility cannot be ruled out that the charcoal fragments were not directly associated with the construction of the burial. Plant remains may have entered the features by natural processes as secondary fill. Even in the case of some of the earliest burials those that incorporated niches it is possible that later collapse caused these inclusions. They may also have been the results of surface fires preceding the formation of the graves, and thus may not be associated with the Corded Ware culture at all. Only at Bierówka mound B is charcoal directly related to the burial, since the fragments came from a burned oak structure that was preserved *in situ*.

CHAPTER 13

Bone, Teeth, and Shell Objects from Burial Contexts

Marie-Lorraine Pipes, Janusz Kruk and Sarunas Milisauskas

Introduction

The materials selected for inclusion in a grave presumably reflect the belief system shared by the living and their dead. It is of course an assumption since the dead have no control over where, when, or how the living dispose of their bodies, nor of the objects placed with them. The meaning of a prehistoric grave and the treatment of the body, loaded as they may be with cultural significance, remain difficult to interpret in terms of ideology and belief systems. To complicate matters, traces may linger of earlier ancestral customs and practices which may be distinctly divergent from the ideology of the time at which someone dies.

The range of objects chosen for inclusion in mid to late Neolithic sites in southern Poland burials was limited. This is of worth noting since these objects form a subset of a broader range of potential objects which reveals that a cultural filter was in operation. Chosen objects can be considered a 'burial package' which reflects the social identity of the deceased, e.g. status, gender, or occupation. These materials may also have had personal meaning and value such as a gift from someone special, a favorite possession, or a merit badge.

At the site of Bronocice burial goods were restricted culturally and temporally. Discovery of burials goods was primarily limited to the Lublin-Volhynian, Funnel Beaker-Baden and Corded Ware graves. However there were a few other intact and disturbed burials, that contained burial goods and which are currently considered to be local Funnel Beaker or Funnel Beaker-Baden populations. An argument is made here that these burials should be reassigned to non-local Funnel Beaker individuals. The argument about the non-local people is based partly on well-documented Funnel Beaker burial customs at Bronocice that are generally void of burial goods, and partly on the recovery of specific kinds of artifacts, namely jewelry, that are also not part of Funnel Beaker living traditions. By examining the distribution of jewelry, e.g. beads and pendants made of bone, teeth, and shell, it will be shown that Funnel Beaker and Funnel Beaker-Baden people at Bronocice did not adorn themselves in life or in death with jewelry and that the recovery of such items in any burial is a clear indication that the individual belonged to non-local populations. Other artifacts found in burials potentially signal outsiders as well. The inclusion in burials of objects used in daily life, such as awls, chisels and other items, was also not a Funnel Beaker or Funnel Beaker-Baden burial practice at Bronocice. Again, by looking at the distribution of these types of objects it can be shown that Funnel Beaker people disposed of daily use objects within household pits, not burials, a clearly proscribed practice which did not consider material goods necessary for the dead.

Bone, Teeth and Shell as Raw Materials

Bone, antler, horn, teeth, and shell were common raw materials used to fashion tools, weapons, jewelry, and other objects in ancient societies. They have fairly good preservation on Neolithic sites in southern Poland and consequently the absence of grave goods made from these materials should not necessarily be considered the result of poor preservation. At Bronocice grave goods included tools and personal objects. All worked bone was subsumed under the tool category with the exception of bone and shell beads and pierced teeth that were considered jewelry.

In general, tools were made from the bones of wild mammals though there a few exceptions. Wild mammal species, such as wild boar, aurochs, red deer, roe deer, and horse, were economically important but for reasons other than just food. The tusks of wild boar have been recovered from many Neolithic burials and appear to have used as awls, decorations and possibly knives. Generally red deer and roe deer were represented by antler, skull and foot elements. Antlers were typically made into awls and axes. Horse was rare in this region during the Neolithic though it became increasingly common over time. Horse longbones and teeth were used to make awls and pendants. Typically body ornaments such as beads and pierced teeth were generally made from mollusk shells and teeth, especially those of dog. Occasionally beads were made of bird and small mammal longbones and the pierced teeth of horse. Domesticated mammals were also sometimes used for tools. Occasionally the ribs of cattle were used to makes sword beaters.

Description of Burials Goods

Phase 1 – Funnel Beaker 3900-3800 BC

The settlement was occupied by Funnel Beaker people who lived in Area C (Figure 1).

There were no intact burials associated with Phase 1. Three earlier burials were disturbed by the construction of one, possibly two, structures in Unit C2 during the first phase. Four individuals were represented by a small number of isolated skeletal specimens recovered from household pits 61-C2, 49-C2, and 46-C2. Pit 61-C2, a trapezoidal shaped pit, was only partially excavated because it was located at the edge of the excavation unit, as were Pits 46-C2 and 49-C2. The human remains were found in the bottom of the pit whereas household refuse was recovered mainly from above. There was an awl made from a roe deer antler that may have belonged to this burial (Figure 2). A horse tooth was also recovered which is unusual and rare for this period. Both of these types of artifact types

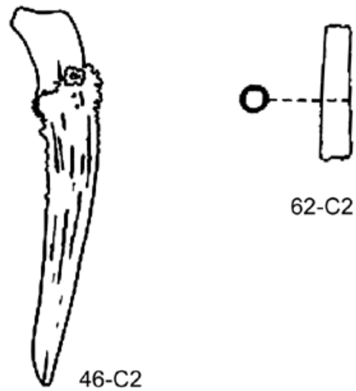

Figure 2. Bone objects: left, roe deer antler, right, bone Bead

were found elsewhere at the site always in association with human burials. Therefore it is possible that these two objects were associated with the human remains found in this pit. Another possible burial good was found in the Phase 5 trench next to the Pit 61-C2. This object consisted of a bone pendant. Since pendants were not a Funnel Beaker tradition at Bronocice, the object may have belonged to someone from another cutlure.

Phase 2 – Lublin-Volhynian 3800-3700 BC

During Phase 2 Lublin-Volhynian people settled in Area C, in the same location as the earlier Funnel Beaker settlement (Figure 1). During their occupation at least two people (Burial VI) died in the settlement and were buried together in an elaborated burial pit located in Unit C2. In addition to this formal burial there were three household pits that yielded isolated human skeletal remains. The latter cases, like those found in Phase 1 pits, likely represent earlier burials disturbed by later pit construction.

Lublin-Volhynian burial practices were quite elaborate, often containing an array of ceramic vessels, copper objects consisting of earrings and, bracelets, flint blades and points, shell beads, boar tusks, bone awls, pierced animal teeth, and an occasional copper axe (Zakościelna 2009, Zakościelna et al 2009). Burial VI (Pit 19-C2) was in fact highly elaborated.

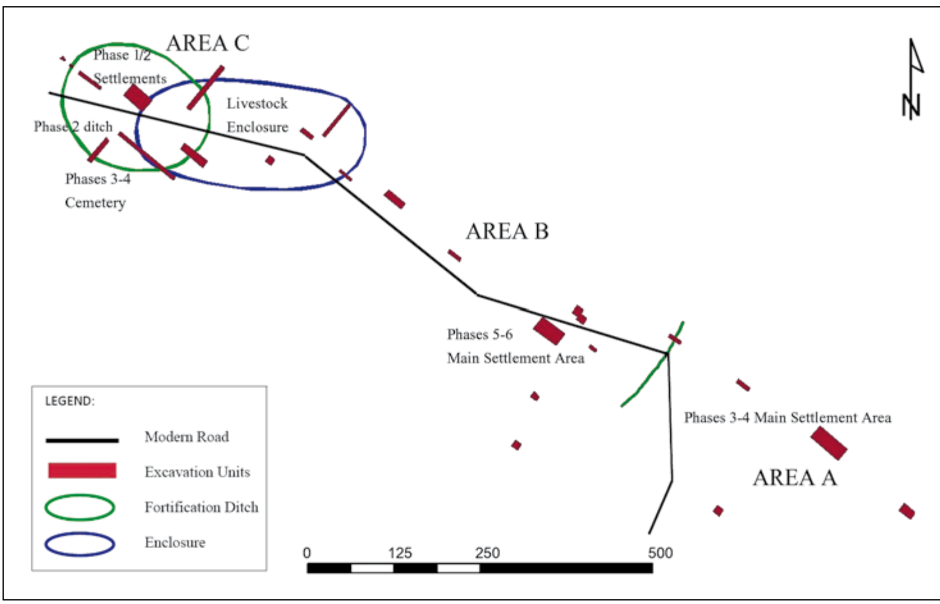

Figure 1. Site plan

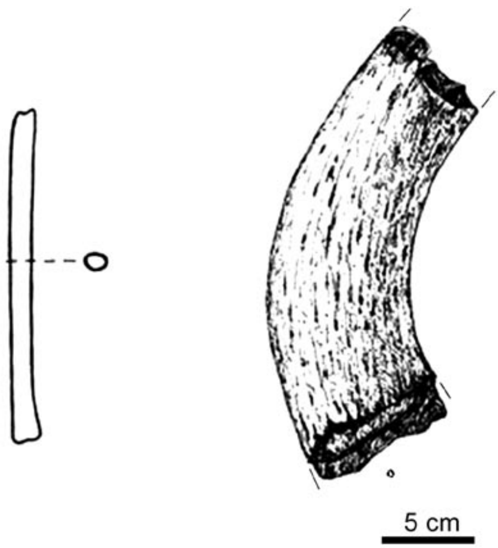

Figure 3. Objects from the Burial in 19-C2. Left, unidentified bone tool made from a bird longbone. Right, aurochs horncore

The burial pit was two-chambered, with a superstructure consisting of a platform upon which a pot, an auroch's horncore (Figure 3) and a lithic core were placed. Pots were also placed within the burial chamber itself. Faunal remains included tools, food offerings and possibly symbolic objects. Food remains included meat bearing elements from goat, pig, and cattle and a few cranial bones. A bone tool was present, a smoothed longbone shaft from a small animal (Figure 3), as well as an aurochs horncore, a red deer antler, a goat horn, and a cow mandible. The presence of cranial bone from four species is of interest. They do not represent food remains nor are they artifacts since they were not worked in any way. Their inclusion therefore points to something else, likely a symbolic association. The aurochs horncore is the only one ever found associated with a Lublin-Volhynian grave (Zakościelna 2009, Zakościelna *et al.* 2009). In fact, there is no other grave that has one in the region associated with any culture.

On the other hand Lublin-Volhynian burials often contain copper objects, marine shells, antler axes and knives made of pig canines. None of these artifact types were present in the burial though some lithic and stone objects were included (See Chapter 6, Table 2). Perhaps the rare and exotic objects were considered necessary for someone of high status and the aurochs horncore, red deer antler, goat horn and cattle mandible were substitutions. Or maybe the objects included here were specific for a high status female.

Phases 3-4 – Funnel Beaker 3700-3300 BC

Beginning in Phase 3 the settlement occupation shifted to Area A and the former settlement in Area C became a cemetery. A total of 16 burials were excavated dating to the later Phase Funnel Beaker occupations. Only one disturbed burial was found which was located in Pit 14-C2. Most of the Funnel Beaker burials were located in C2 though a few were found in C5 and one in C7 (Figure 1). Most of these dated to Phase 3-4, three dated to Phase 4.

The four Funnel Beaker burials dating to Phase 4 contained grave goods. All of these burials differed from Funnel Beaker practices in some way such as location and layout of the body. Each of these burials was located within a structure. Burial VII was that of an adult woman, burial XVI of a child, and burial XXII of an adult man. Burial VII was placed face down on a house floor, while burials XVI and XXII were located in house cellars, not in the cemetery. The placement of burials inside houses indicates a different cultural tradition. The man was positioned on his right side, while the child was facing west. All three burials contained pottery

Figure 4. Bone bead found in the neck region of the man in pit 5-B6, Burial XXII

sherds and textile production artifacts though no bone tools were present. The man in burial XXII wore a bone bead around his neck (Figure 4). The formal burial in Pit 87-C1 (Burial XV) was more typical of Funnel Beaker practices but was unusual in that it contained two skeletons, a woman aged 17-18 years and a child aged 3-4 years. One piece of worked bone was recovered in the fill above the skeletons which was perhaps associated with them. All of these burial features, including location, placement of the body, jewelry, and grave goods, point to these being non-local Funnel Beaker individuals.

Phases 5 and 6 – Funnel Beaker-Baden 3300-2900/2800 BC

During Phase 5 the settlement at Bronocice reached its greatest size spreading across most of the site but with a primary concentration in Area B. During Phase 6 the settlement shrank in size with the main settlement now located in Area B and a new fortification ditch was built around it (Figure 1).

Human remains from Phase 5 were found in three formal burials, a collective burial, two informal burials, one ritualized skull burial, and three household pits with isolated human most probably from disturbed burials. The four formal burials expressed great variability. Three Funnel Beaker-Baden burials were recovered; two from Area B1 and a third from Area C5. It is unclear if these burials were placed inside houses or not. The shape of these burial pits was rectangular, unlike some which were reutilized house pits and a house floor. The placement of burials within Area B1 is interesting considering the area was densely packed with standing structures by Phase 5. The presence of disturbed burials in this area reveals it was used earlier as a cemetery prior to the expansion of the settlement and construction of houses. Perhaps Burials X and XIV were placed there early in Phase 5 when it was still a fairly open area.

There were 2 formal burials similar to Funnel Beaker burials of the previous phase, Burials X and XIV in Pits 43-B1 and 100-B1. Burial X, a woman, did not have any jewelry or food offerings though there were a few ceramic sherds and a large stone. Pit 100-B1 (Burial XIV) contained the skeleton of a man who was buried with a few ceramic sherds and two pieces of flint and a worked cattle ulna. The man had his fists up by his cheeks. The layout and composition of these two burials shows continuity with Funnel Beaker burial rites and traditions though inclusion of a few items reveals the influence of other cultures.

The third burial (Burial XX) contained a high status female whose grave was distinct in a number of ways. First, the grave was located on the outer edge of the settlement. Area C5 was more than a kilometer away. The grave was near a house and located on the outside of the animal enclosure. Second, the woman was placed on her left side. And third, she was buried with jewelry consisting of two mussel beads. Her burial was enclosed in a circular mound, traces of which were visible in the soil. A series of postmolds were also visible in the soil as were traces of an ox yoke and possible platform from a wagon in the profile of the excavation unit.

The collective burial found in Pit 36-B1 (Burial XIII) contained 17 individuals recovered from Pit 36-B1. The grave was composed of five adults and twelve children. Most of the bodies were placed in flex positions and arranged in a circular pattern around the periphery of the pit. The oldest male was placed last in the center of the burial. In associated with twelve of the burials were several necklaces and a pendant, three partial pots, and food offerings (Table 1).

There were two basic types of necklaces, those made entirely of shell beads, and those made of a combination of mammal teeth and in some cases shell beads used as spacers (Figure 5). The most unique necklace was a carved piece of bone made into a pendant (Individual #7). Shell necklaces varied considerably in terms number of beads whereas variability in the diameter or width of the beads was slight. Consistency in the size and thickness of beads indicates a standardized method of production.

The largest shell necklace had over 300 beads and was associated with an 8 year old (Individual 15, Figure 6). Two other fairly large necklaces were found, one with a woman (Individual 1, 79 beads) and another with a 6 month old baby (Individual 11, 90 beads). Pierced teeth necklaces were more varied in appearance and composition though they displayed a sense of balance and deliberate patterning. Shell bead spacers were similar in size to those used in shell necklaces. The pierced teeth generally consisted

Table 1. Description of the Necklaces from Pit 36-B1

Skeleton #	Age at Death	Sex	Composition of Necklaces			Description of Necklaces
			Bone	Shell	Combination	
1	18-20	F	-	X	-	79 shell beads
2	5	-	-	-	-	-
3	10	-	-	-	-	-
4	18	M	-	X	-	7 shell beads
5	4-5	-	-	-	-	-
6	25	M	-	-	X	7 horse incisors and 2 shell beads
7	3-4	-	X	-	-	Squared pendant, denticulated pattern around edge
8	18	F	-	-	-	-
9	1.5	-	-	-	X	2 shell beads, 1 pig incisor
10	5	-	-	X	-	19 shell beads
11	6 mo	-	-	X	-	90 shell beads
12	7-8	-	-	-	X	2 dog incisors, shell bead?
13	15	-	X	-	-	1 horse tooth, 1 animal bone
14	7	-	X	-	-	2 dog incisors, 2 horse teeth, 3 dog teeth
15	8	-	-	X	-	301 shell beads
16	3	-	X	-	-	4 dog incisors
17	6-9 mo	-	-	-	-	Pierced tooth

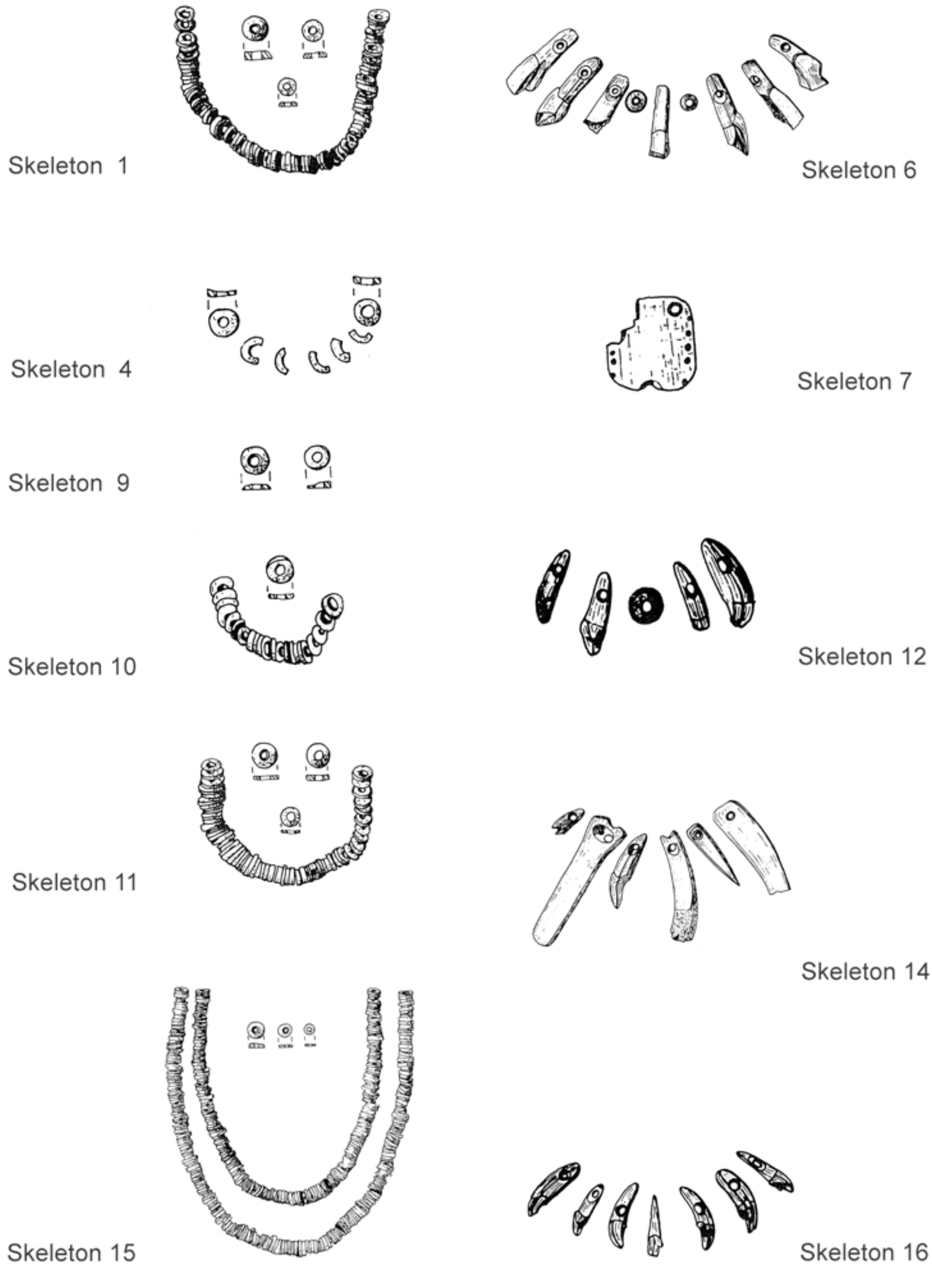

Figure 5. Drawings of the necklaces from Burial XIII: Shell (left), teeth and bone (right)

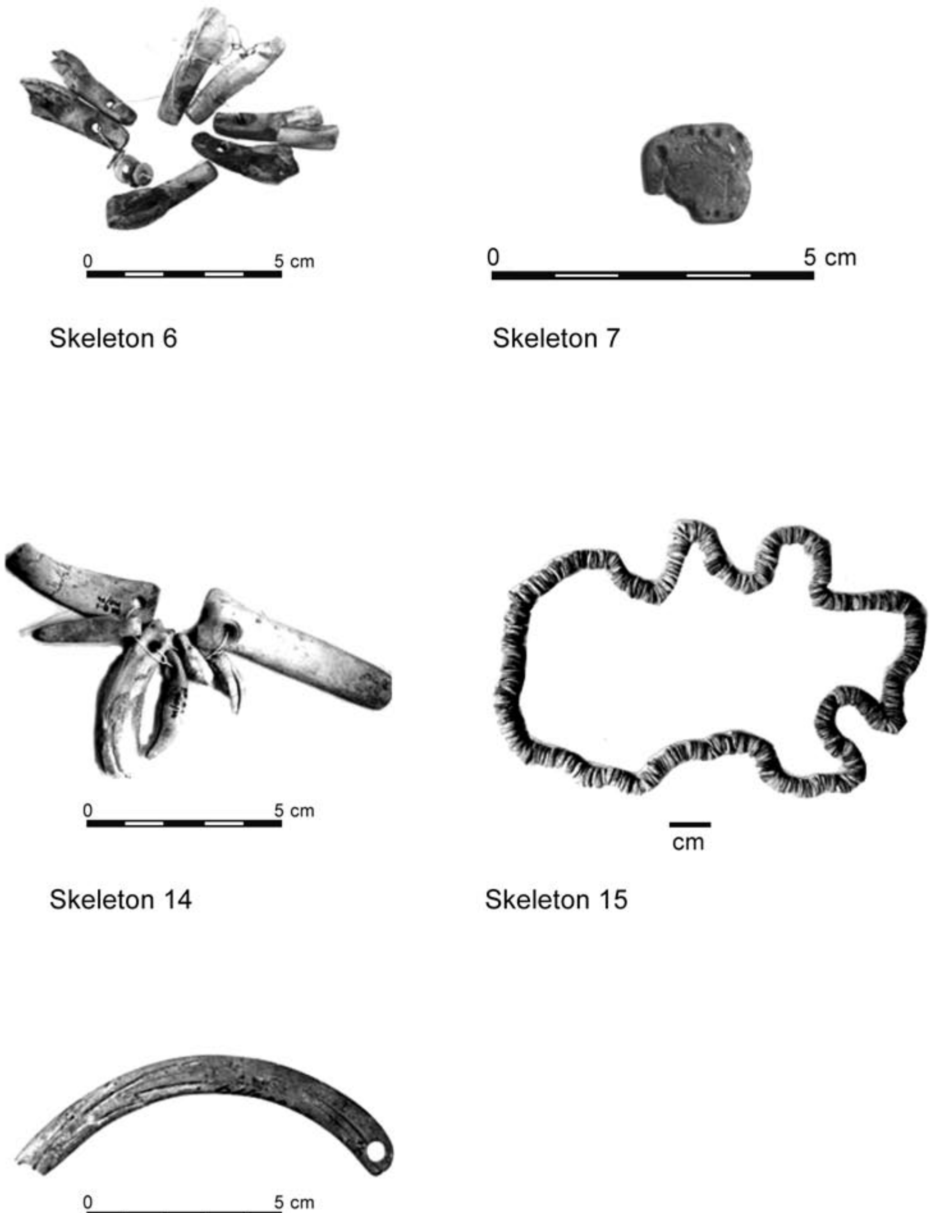

Figure 6. Photographs of the necklaces from Burial XIII

of dog canines and incisors though there were also a few horse, cattle, and domesticated pig teeth.

At a glance there was no clear pattern in terms of who wore a necklace or not. Age was not a factor as three toddlers and one baby had jewelry. Nor did sex appear to be a factor as one woman had a necklace while the other did not. Gender roles, however, are clearly implicated but difficult to understand. The skeletons were generally complete, though some of them were missing skeletal elements. This suggests the possibility that some ornamentation did not preserve as well.

The woman (#1, 18-20 years) and the man (#4, 18 years) wear the same type of jewelry whereas the children do not (#3, ten years and #2, five years). The woman (#1) also had a necklace with a large number of shell beads (n=79). Another individual (#11), a six month old baby, also had a necklace with lots of beads (n=90+ beads). These necklaces represent great investments in time and personal wealth. This necklace represents wealth and status and suggests that this individual was the focus of the group. Individual #7 also bore an elaborate necklace made of dog and horse teeth, and perforated bone. Beyond them lies another child, (#12, seven to eight years in age) also wearing a necklace made of a few dog teeth and shell beads.

These people were not Funnel Beaker. First, their burial together in the collective grave stands out as unique not only at Bronocice but within the greater region. While it is true that only a small part of the site was excavated, nonetheless an extremely large area was tested and several burials encountered spanning a vast stretch of time. Second, the placement of bodies was generally flexed with bodies placed on their sides unlike the traditional Funnel Beaker pattern which appears to have been continued by Funnel Beaker-Baden in Phase 5. Third, body placement was gendered: two identified males (#4, #6) were placed on their left sides while one of the women (#1) was placed on her back. The position of some children can also be determined. Individuals #3, 5, 7, 11, 13 lie on their right sides while #9, 10, and 12. The rest were undetermined. And fourth, besides the collective nature of the burial, jewelry is the best indicator that these people were not local since Funnel Beaker and Funnel Beaker-Baden people did not wear jewelry. The necklaces marked the wearers in a visual way

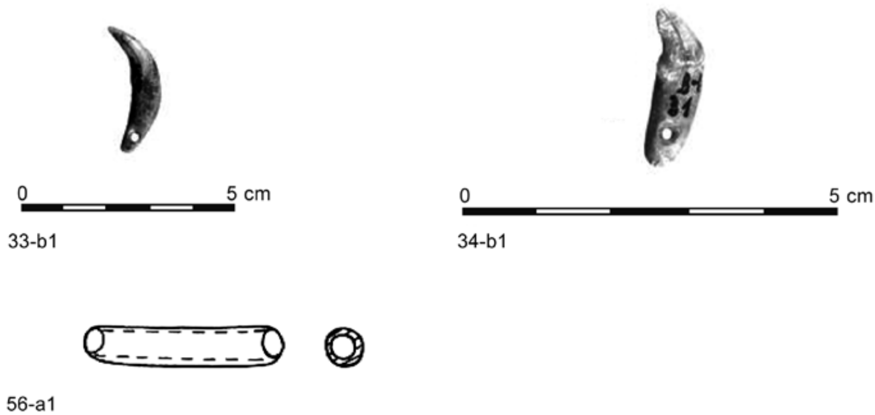

Figure 7. Examples of bone bead and dog pierced teeth from household pits

possibly signaling status, gender, rank, ethnicity, etc. Of the 169 excavated pits dating to Phases 5 and 6, jewelry was found in only eight pits. Only one piece was found in a burial, Pit 14-C5, Phase 4/5 Funnel Beaker/ Funnel Beaker-Baden burial, consisting of two shell beads. The remaining five pieces consisted of pierced teeth and a bone pendant from Pits 31-B1, 33-B1, 34-B1, 56-A1 and 62-C2 (Figure 7). Three of these pits were located very close to the mass grave.

There were two informal burials, XV and XXI. Burial XV held the skeleton of an 18 year old female. It appears the building collapsed on her. There were no bone tools. Burial XXI was found in Pit 2-B-Road. It contained the remains of an 8-9 year old child of undetermined sex. This individual was placed face down in a poorly prepared grave shaft that had an uneven bottom. An awl was found in the pit.

Pit 2-B6 (Burial XXIII) contained a ritualized deposit consisting of the skull of a 30-35 year old man carefully positioned in the bottom of the pit. No bone objects were found. Isolated human remains were found in Pits 11-B1, 95-B1and 1-B8. No bone tools were present in 11-B1. In 95-B1 there were 2 awls and a chisel, while in 1-B8 there were two worked pieces of cattle bone, an awl and a pierced dog canine. This particular pit was unusual in many ways. It also contained a dog burial and was the site of a lithic workshop.

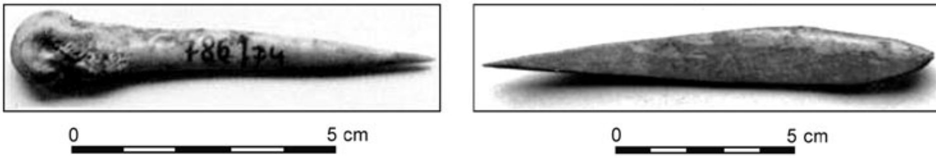

Figure 8. Awl and pin beater from Pit 86-B1 in which was found isolated human remains

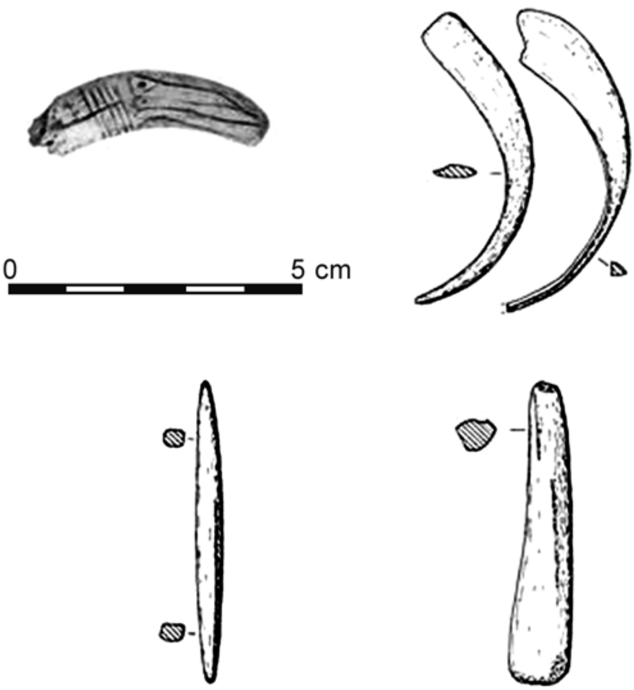

Figure 9. Objects from Burial XI. Clockwise: carved bone bead, tusk knives, antler chisel, awl or beater

No articulated burials were found dating to Phase 6. Instead, two skulls and isolated human remains came from household Pit 1-A4 (Burial XXVI), Pit 51-B1 (Burial XXVII), and Pit 86-B1. Pit 1-A4 did contain pottery and a few pieces of flint. Pit 51-B1 included potsherds, lithics, weaving related artifacts, animal bones and burnt clay and 2 bone awls. These skulls and the one in 2-B6 from Phase 5 might be considered grave goods themselves since they were treated as objects deliberately buried in ritualize fashion. An awl and a beater were recovered from Pit 86-B1 (Figure 8).

Phase 7 – Corded Ware 2600-2500 BC

One Corded Ware burial was recovered in Area B1. The skeleton was that of a 50 year old man lying in a flex position on his right side (Figure 9). His burial was elaborate and included pottery, lithics, floral and faunal remains. Faunal remains consisted only of tools and jewelry. There were two knives made of pig canines, a red deer antler tool and a carved tooth. The formal layout of the burial, the position of the body and the arrangement of the material remains are very typical of Corded Ware burials. The food offerings, the personal items and the tools reveal a belief in an afterlife in which these materials were needed to sustain the individual as well as to represent their identity.

Distribution Patterns

Distinct pattering was apparent in the distribution and deposition of non-subsistence faunal remains, especially bone tools and jewelry in burials and household pits, and by culture and phase. Table 2 indicates the total number of pits containing bone tools and jewelry. It also indicates how many bone objects were found in pits without human remains, pits with isolated human remains, and burials. At Bronocice, the use and disposal of tools was managed differently by each cultural group. A number of important patterns can be seen with regard to bone tools: 1) They were present in household deposits from all phases; 2) There was an absence of bone tools in all Funnel Beaker burials. Bone tools were associated with the Lublin-Volhynian, Funnel Beaker-Baden and Corded Ware burials.

At Bronocice, cognitive use and disposal of tools was different for each cultural group. For the Funnel Beaker people tools were made for and used by the living and were to be disposed of in trash pits. The lack of tools in Funnel Beaker burials suggests that tools were not associated with

Table 2. Summary of pits containing bone and shell objects by depositional context. Depositional contexts: A – Non-burial pits, B – Pits with isolated human remains, C – Burials

Bone and Shell Artifacts	Phase 1 Funnel Beaker			Phase 2 Lublin-Volhynian			Phase 3 Funnel Beaker			Phase 4 Funnel Beaker			Phase 5 Funnel Beaker-Baden			Phase 6 Funnel Beaker-Baden			Phase 7 Corded Ware		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Number of Pits	3	1	-	4	2	1	15	-	-	40	-	1	55	3	1	21	2	-	-	-	1
Number of Bone Tools																					
Awl	1	1	-	4	2	-	9	-	-	25	-	1	31	2	-	15	1	-	-	-	-
Chisel	1	-	-	-	-	-	4	-	-	13	-	-	11	1	-	3	-	-	-	-	1
Hoe/Axe	-	-	-	-	-	-	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Perforator	-	-	-	-	-	-	-	-	-	-	-	-	6	1	-	2	-	-	-	-	-
Loom Beaters	-	-	-	-	1	-	7	-	-	8	-	-	4	-	-	3	1	-	-	-	-
Arrowhead	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Carved object	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-	-	1
Unidentified Tool	1	-	-	1	1	1	12	-	-	23	-	1	35	-	27	23	5	-	-	-	1
Subtotal	*3*	*1*	-	*5*	*4*	*1*	*33*	-	-	*72*	-	*2*	*87*	*6*	*27*	*47*	*7*	-	-	-	*3*
Number of Beads/Pendants																					
Shell Bead	-	-	-	-	-	-	-	-	-	-	-	-	-	-	503	-	-	-	-	-	-
Pierced Teeth	-	-	-	-	-	-	-	-	-	1	-	-	3	1	-	-	-	-	-	-	-
Bone Bead	-	-	-	-	-	-	-	-	-	-	-	1	-	-	26	-	-	-	-	-	-
Subtotal	-	-	-	-	-	-	-	-	-	*1*	-	*1*	*3*	*1*	*529*	-	-	-	-	-	-
Bone – Other Object	-	-	-	-	-	-	-	-	-	-	-	-	1	1	4	-	-	-	-	-	1
Total Artifacts	3	1	-	5	4	1	33	-	-	74	-	3	91	8	560	47	7	-	-	-	4

an individual's identity, their sex, gender, status or other social markers in death and that they were not needed by the individual in death. The distinct depositional practices of Funnel Beaker people indicate a clear separation between the living and the dead. For the Lublin-Volhynian, some of the Funnel Beaker-Baden and Corded Ware people tools were important to both the living and the dead.

There were a couple of important patterns seen in the distribution and disposal of jewelry as well. Most of the jewelry was limited to pierced dog canines and mussel shell beads. There were a few unique items such as horse teeth and carved bone beads. In general jewelry was rare during all phases and for most of the people living at Bronocice. With the exception of the man in Pit 5-B6, clearly not Funnel Beaker, and one pierced dog canine both in a household pit from Phase 4, jewelry was temporally restricted to mainly to Phase 5. One bone bead was recovered from the Corded Ware burial dating much later in time. Jewelry was recovered from the collective grave and one other burial in 14-C5 from Phase 5.

Jewelry was also restricted spatially. The great majority of beads and pendants were recovered from the collective burial in Pit 36-B1. The distribution of three other pieces of jewelry is of interest. Two teeth were recovered from pits 33-B1 and 34-B1, neither of which yielded isolated human remains, but which were located in the immediate vicinity of Pit 36-B1. Another dog tooth was recovered from Pit 1-B8. The contents of this pit were unusual and included ritualized faunal remains consisting of nine right side mandibles, and three burials consisting of a dog and two lambs. It may be that all of these remains are connected through a series of events in the past having to do with the people found in the collective burial. The remaining pieces of jewelry were bone beads from pits 62-C2, 56-A1, and 5-B6. The association bone bead found with the skull from Pit 5-B6 is highly suggestive of the presence of an outsider. The limited distribution of jewelry suggests that it was not commonly worn by Funnel Beaker, Lublin-Volhynian, or Funnel Beaker-Baden at Bronocice and that these beads and pendants represent outsiders. Therefore it can be said that jewelry was embedded with social meaning and most likely a sign of outsiders possibly a mark of rank, ethnic identify or other cultural symbols.

Funnel Beaker and Funnel Beaker-Baden people at Bronocice had a cultural tradition that was void of outward signs of identity such as wearing body ornaments in life and in death. The dead found in burials associated with other earlier cultures as well as contemporaneous non-local populations often possess jewelry. Out of over 600 pits jewelry was found in four non-burial deposits consisting in each case of a single pierced dog canine. Perhaps these groups chose other ways to embellish themselves, perhaps through clothing, since this was a community of weavers.

Conclusion

Overall this study focused on the importance of comparing distributions of specific types of cultural materials from burials and other contexts in order to understand concepts of use, deposition and association with the living and the dead. Tools, jewelry and food offerings served to inform about conceptual relationships between people and material objects. The use and discard as well as the deposition of material objects in burials were decision-making behaviors predicated on social norms and traditions. The distribution of bone tools and jewelry was highly patterned in terms of when and where, with whom, or whether or not, they appeared in burial contexts. The analysis revealed that variability in burial layout, treatment and disposal of the dead, and the contextual deposition and use of material objects, were tightly correlated by culture and time period. While it may be impossible to know the intellectual motivations for certain acts archaeologically we can observe the end results through excavation and data recovery. Archaeological patterns can be contrasted between distinct cultural groups and used to identify ideologies based on behavior.

CHAPTER 14

Faunal Remains as Food Offerings from Burial Contexts

Marie-Lorraine Pipes, Janusz Kruk and Sarunas Milisauskas

Introduction

All faunal remains from burial contexts were classified basically as food offerings, grave goods, or jewelry. Food offerings placed within burials were considered were symbolic foods meant to be consumed by the dead. The inclusion of food remains in burials is a clear sign of the belief in the afterlife. They are representations of spiritual beliefs which require sustenance for the deceased in another world or for the journey they make to the underworld.

At Bronocice very few burials contained food offerings. The great majority of burials contained the skeleton remains of Funnel Beaker people and contained no food remains, a clear indication of a distinctly different ideology. It should be noted that in a few instances it was unclear if faunal remains represented the incorporation of midden or yard scatter during the construction of a burial pit or intentionally deposited foods. This ambiguity is partly due to the presence of faunal in the upper levels of some burials. The cultural identity of these burials has already been debated elsewhere but the reader should be reminded that they may well have been people from other cultures and the presence of faunal remains intentional.

There were three burials in which food remains were very clearly deposited; the Lublin-Volhynian double burial in Phase 2, the collective burial in Pit 36-B1, and the Corded Ware burial in Phase 7. In the first two cases food offerings consisted of domesticated mammal remains, while in the third case they consisted of cereals. Animal remains included parts of cattle, sheep/goat and pig. Some of the remains were joints of meat and others cranial and foot bones. The association of domesticated mammals with food is important because it reveals one aspect of the relationship these species had with people.

Description of Faunal Remains

Phase 1 – Funnel Beaker 3900-3800 BC

No intact burials were identified dating to Phase 1. Instead isolated human remains were recovered likely representing disturbed burials that predate the Phase 1 occupation and which were impacted by the construction of structures in Unit C2. Four individuals were represented by a few skeletal specimens recovered from household pits 61-C2, 49-C2, and 46-C2 (Table 1). Human remains were mixed in with faunal specimens. In each of these pits domesticated mammals predominated though some wild mammals and bird were also present (Figure 1). Most faunal remains represented food however a few feet, heads and jaws were also present (Figure 2). These faunal remains appear to be related to daily life and were not associated with the human remains.

Phase 2 – Lublin-Volhynian 3800-3700 BC

Food remains were found in association with the Lublin-Volhynian burial (Burial VI). They were also recovered from pits containing isolated human remains, Pits 29-C2 and 38-C2. As was the cases with the Phase 1 isolated human remains, these are probably from earlier burials disturbed by construction episodes. Domesticated mammals were more frequent than wild mammals and bird in the burial and household deposits (Table 2,

Table 1. Summary of Phase 1 faunal remains associated with human remains, Minimum Number of Bones (MNB)

Species	Pit 46-C2	Pit 49-C2	Pit 61-C2
	MNB	MNB	MNB
Domesticated Mammals			
Cattle	7	36	5
Dog	-	3	-
Pig	5	10	-
Sheep	-	2	-
Sheep/Goat	1	13	3
Wild Mammals			
Hamster	-	1	-
Horse	1	-	-
Red Deer	-	2	-
Wild Boar	-	1	-
Bird			
Unidentified Bird	-	1	-
Total MNB	14	69	8

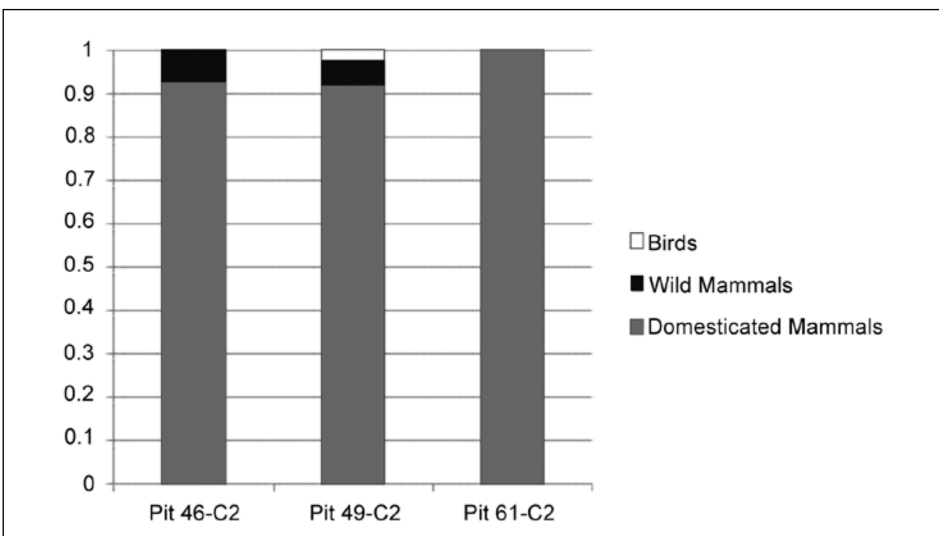

Figure 1. Phase 1, relative frequencies of domesticated mammals, wild mammals and birds in deposits containing isolated human remains

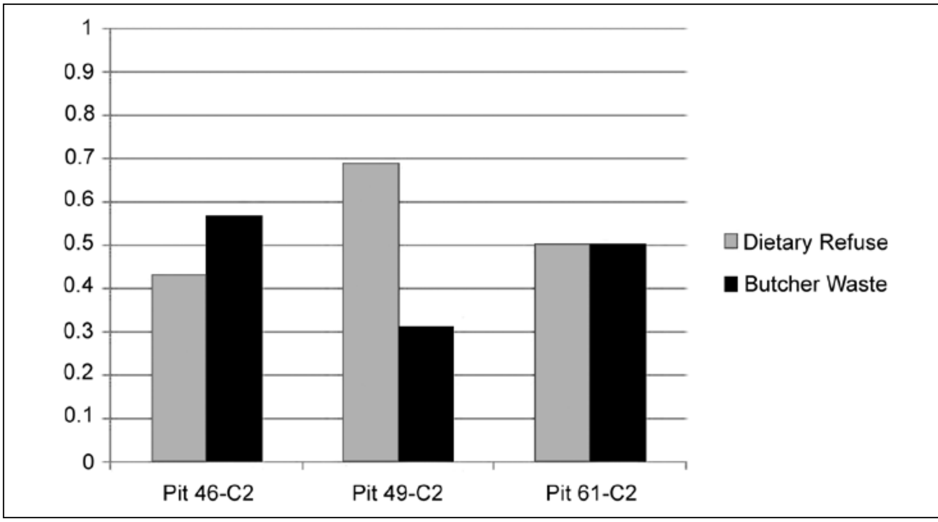

Figure 2. Phase 1, relative frequencies of meat bearing elements and butcher waste in pits that yielded humans remains

Table 2. Summary of Phase 2 faunal remains associated with human remains, Minimum Number of Bones (MNB)

Species	Burial VI	Pit 29-C2	Pit 38-C2
	MNB	MNB	MNB
Domesticated Mammals			
Cattle	7	22	6
Goat	3	-	-
Pig	1	7	8
Sheep	-	2	-
Sheep/Goat	1	13	-
Wild Mammals			
Aurochs	2	-	-
Hamster	-	3	-
Horse	-	1	-
Red Deer	1		-
Bird			
Unidentified Bird	-	1	-
Total MNB	15	49	14

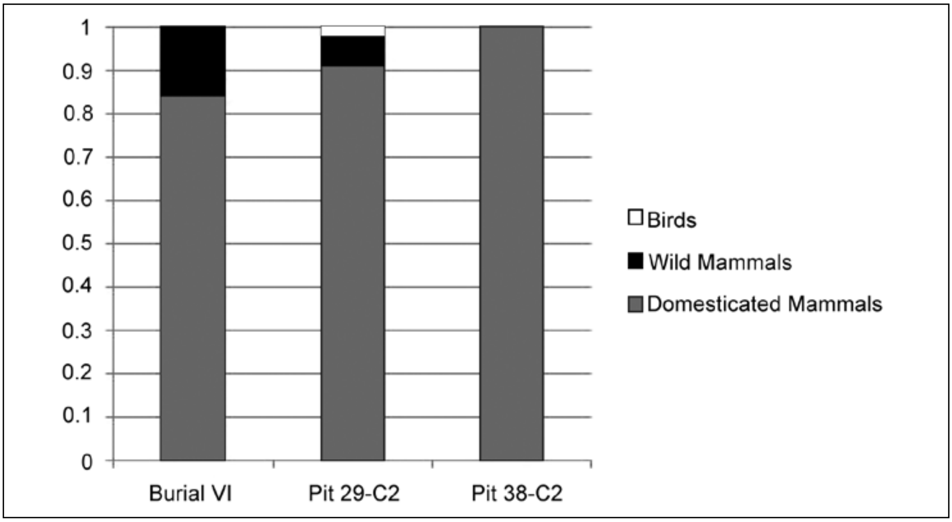

Figure 3. Phase 2, relative frequencies of domesticated mammals, wild mammals and birds in Burial VI and deposits containing isolated human remains

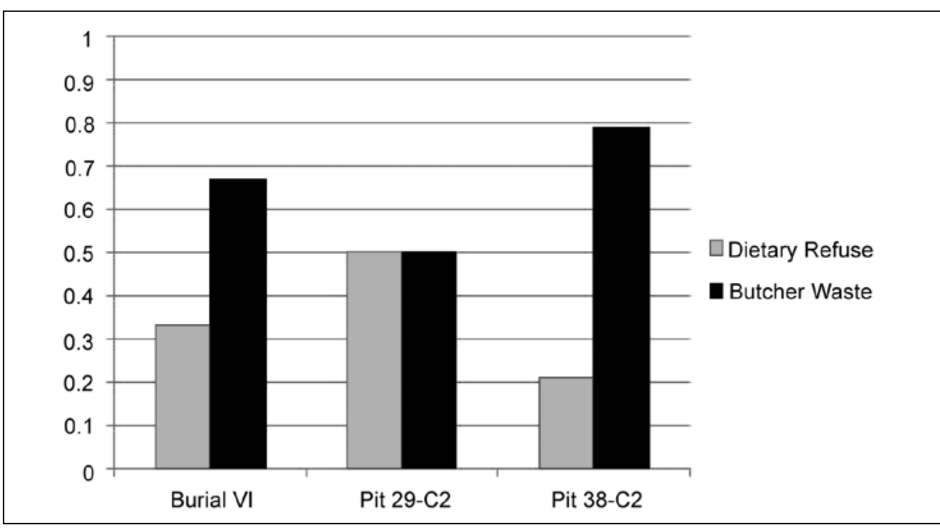

Figure 4. Phase 2, relative frequencies of meat bearing elements and butcher waste in Burial VI and deposits that yielded isolated human remains

Figure 3). The faunal remains from the double burial included bone artifacts as well as food remains though mainly the latter (Figure 4). Goat was indicated by a partial skull, lumbar vertebra and a rib. Pig consisted solely of a shoulder blade. Cattle included a food, mandible, and hipbone. Overall, they do not represent a lot of food though it is debatable how much meat people consumed on a regular basis during the Neolithic.

Phases 3-4 – Funnel Beaker 3700-3300 BC

The burials from Phases 3-4 rarely contained any faunal remains. Faunal remains were recovered from three burials and one household pit spanning Phases 3-4 (Table 3). Within the three burials, faunal remains were limited to domesticated mammal species, whereas the household pit contained a mix of wild and domesticated mammals (Figure 5). Cattle remains occurred most frequently. Burial I, dating to Phase 3, contained a small number of faunal remains all of which were composed of domes-

Table 3. Summary of Phases 3-4 faunal remains associated with human remains, Minimum Number of Bones (MNB)

Species	Burial I	Burial VII	Burial VIII	14-C2
	MNB	MNB	MNB	MNB
Domesticated Mammals				
Cattle	8	6	1	27
Dog	1	-	-	-
Goat	1	-	-	-
Pig	5	2	-	7
Sheep	-	-	-	
Sheep/Goat	6	3	-	1
Wild Mammals				
Aurochs	-	-	-	1
Hamster	-	-	-	9
Red Deer	-	-	-	6
Roe Deer	-	-	-	11
Wild Boar	-	-	-	1
Total MNB	21	12	1	63

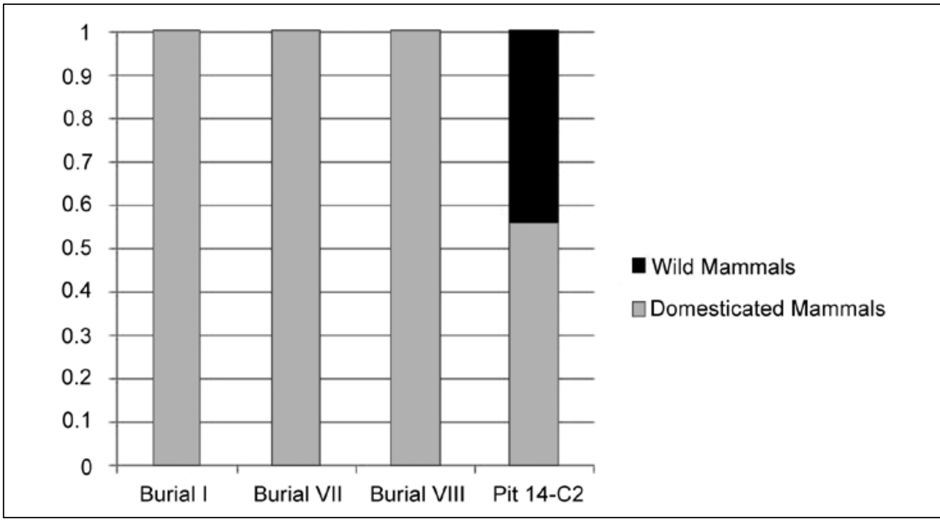

Figure 5. Phases 3-4, relative frequencies of domesticated mammals and wild mammals from burials and Pit 14-C2 which contained isolated human remains. No bird remains were recovered from any of these deposits

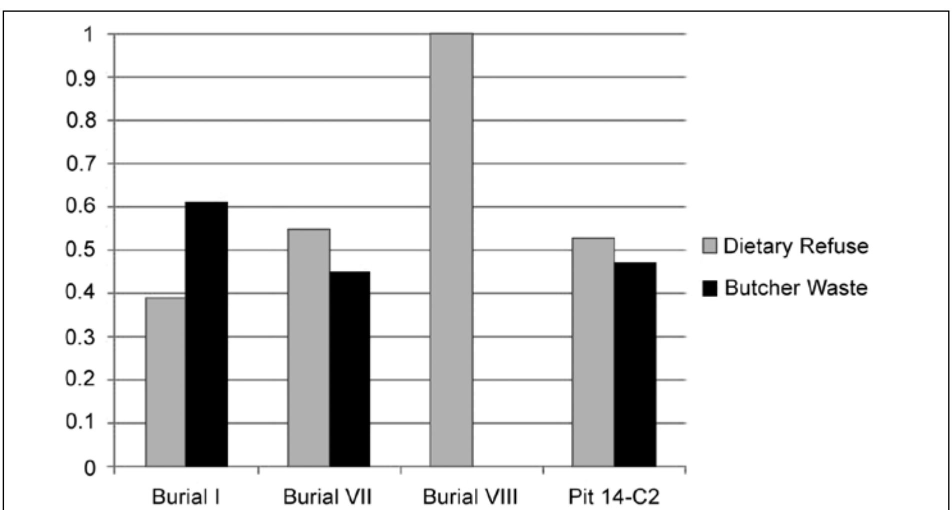

Figure 6. Phases 3-4, relative frequencies of meat bearing elements and butcher waste in burials and Pit 14-C2 which contained isolated human remains

ticated mammal remains and included cattle, dog, goat, pig and sheep/goat. There were some similarities in terms of the kinds of elements recovered for each species including mandibles, shanks, and feet and only occasional elements from the thigh, hip and thorax (Figure 6). Burial VIII dated to Phase 3-4. It contained two cattle shanks. Burials VII dated to Phase 4.

Phases 5 and 6 – Funnel Beaker-Baden 3300-2900/2800 BC

Faunal remains representing food remains were found in the collective burial (Burial XIII), one accidental burial (Burial XXIV), one extended burial (XXVII), one ritually buried skull (Burial XXIII) and four pits with isolated human remains were associated with (Table 5). The faunal remains

Table 4. Summary of Phases 5-6 faunal remains associated with human remains, Minimum Number of Bones (MNB)

Species	Burial XXIII	Burial XXIII	Burial XXIV	Burial XXVII	Pit 86-B1	Pit 11-B1	Pit 95-B1	Pit 1-B8
	MNB	MNB	MNB	MNB	MNB	MNB	MNB	MNB
Domesticated Mammals								
Cattle	17	2	8	1	174	8	22	136
Dog	-	-	1	-	6	-	7	6
Goat	-	-	-	-	-	-	-	-
Pig	11	1	2	-	26	-	10	23
Sheep	-	-	-	-	1	-	1	1
Sheep/Goat	10	1	4		8	-	16	6
Wild Mammals								
Aurochs	-	-	-	-	-	-	-	-
Hamster	-	-	-	-	-	-	-	-
Horse	-	-	-	-	-	-	1	-
Red Deer	-	-	1	-	6	-	6	4
Roe Deer	-	-	-	-	-	-	1	-
Wild Boar	-	-	-	-	1	-	1	1
Bird								
Crane	-	-	-	-	-	-	-	1
Total MNB	38	4	16	1	222	8	65	158

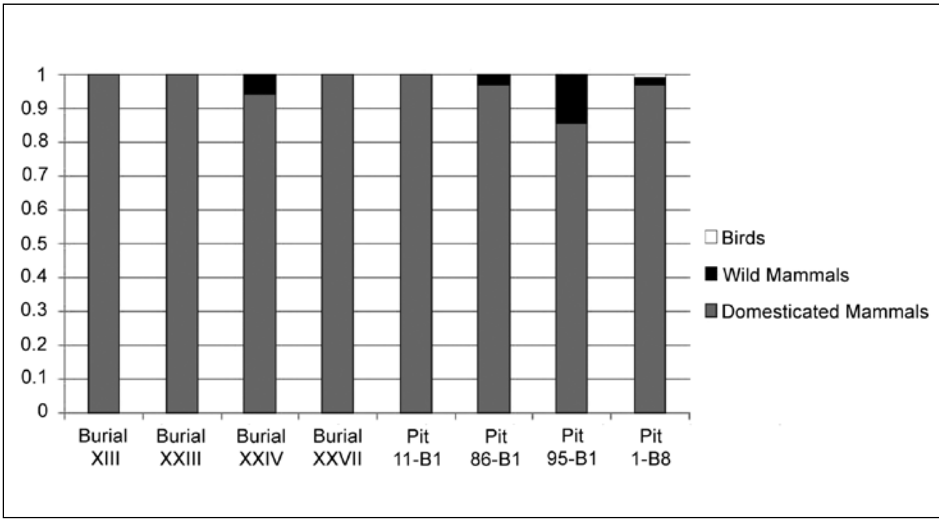

Figure 7. Phases 5-6, relative frequencies of domesticated mammals and wild mammals from burials and pits that contained isolated human remains

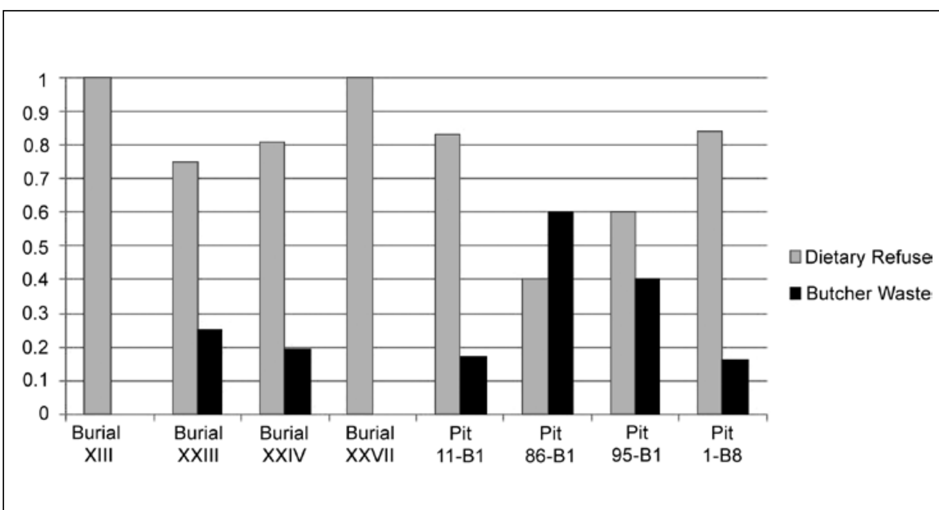

Figure 8. Phases 5-6, relative frequencies of meat bearing elements and butcher waste in burials and pits that contained isolated human remains

in the collective burial were placed there deliberately and were composed of cattle, pig and sheep/goat. In the remaining deposits most of the faunal remains consisted of domesticated mammal remains (Figure 7). Red deer was the most common wild mammal species. It was represented by meat bearing elements as well antlers and foot bones. Pit 1-B8 is of special interest because it contained animal burials as well as human remains (see Chapter 11). This pit was in a structure that has been identified as a lithic workshop. Another unusual find in this pit was the leg of a crane. No real association can be inferred between Burial XXIV and faunal remains since it appears this person was the victim of a house collapse. Also, the relationships between the small number of bones and the skull (Burial XXIII) are unclear. They included meat cuts from sheep/goat, pig and cattle as well as a skull fragment (Figure 8). Perhaps they were offe-rings. Burial XXVII had a clear association with faunal which consisted of an ankle from a cow.

Phase 7 – Corded Ware 2600-2500 BC

No faunal remains representing food were recovered from this burial.

Discussion

The presence and absence of animal bones representing food remains was highly patterned. There only a few burials overall in which a relationship existed between the burial and food remains in the form of animal bones. In these cases, the great majority of faunal remains found in association with burial and isolated human remains were composed of domesticated mammals. Faunal remains identified as food were clearly associated with the Lublin-Volhynian burial (Burial VI), the collective grave which may be Baden (Burial XIII), and a small number of burials dating to the Funnel Beaker (Burials 17-C2, 48-C2, 102-A1) and Funnel Beaker-Baden phases (Burial XXII).

It is interesting to note that the inclusion of meats as food was limited essentially to Lublin-Volhynian and likely Baden burials. These examples represent a continuity of earlier ideas within the region.

PART IV

Social Aspects of Burial Traditions at Bronocice

(The Social)

CHAPTER 15

Burying the Dead
Burial Traditions at Bronocice

Marie-Lorraine Pipes, Janusz Kruk, Sarunas Milisauskas

Introduction – The living and the dead

Burial is a uniquely human rite of passage. The first archaeological evidence for burial practices appears in the Upper Palaeolithic (Pettitt 2010), coinciding with signs of increasing social awareness and resulting in the transformation of social relationships between the living and the dead. The ritual act of disposing of a body is a cultural coping mechanism for dealing with death and social loss. While it may be argued that all human behaviors are ritualized to some extent, burial and other social practices dealing with the dead are undeniably so. The very act of disposing of the dead through burial, cremation or other methods is ritualistic, varying in degrees of elaboration. Based on observations of burial patterns across time, space and culture, it can be stated that burial traditions are among the most conservative and enduring practices. As such they are a complex web of cultural identity, attitudes and relationships between the living and the dead, the end product of collective consciousness, and norms of social behavior. It is reasonable to assume that in the remote past the dead were often times buried by relatives or people with whom they shared social connections. The physical manifestations of burial practices therefore are statements of shared social values and ideology between the living and the dead.

Cultural traditions are influenced by social pressures which may affect ritual behavior by incorporating new ideas and practices, or by discarding or modifying older ones. Continuity in burial practices is apparent in the archaeological record (Stutz and Tarlow 2013). Many studies have shown that burial traditions continued with only slight modifications for extended periods of time, sometimes changing abruptly either because new cultural groups appeared or when existing cultures adopted new ideologies (Borić 2013, Zakościelna 2009, Zakościelna *et al.* 2009). Inconsistencies in burial practices documented within cemeteries that are associated with a dominant major cultural group have been interpreted as variable expressions of the same culture but not as evidence of other cultures residing within the same settlement (Jankowska 2009). It is a mistake to assume that every person recovered from a site shared the same cultural background when dealing with a large complex settlement such as Bronocice in which people from different cultures lived and traded on a regular basis over the centuries.

Dichotomies in burial practices were apparent at Bronocice. For example, Funnel Beaker culture buried their dead outside the settlement within the cemetery. Other cultural groups at the site either chose to bury their dead within the settlement or were excluded from using the cemetery. It is unclear if there was a cultural barrier excluding people from other cultures. Some of the cultural groups at Bronocice included burial goods with their dead while others did not. For some cultures, gender was indicated by the placement of the body while not by others. And last, grave site elaboration ranged from simple to complex depending on cultural identity. We suggest that the variability recorded among contemporary burials at Bronocice indicates the burials of non-Funnel Beaker people, some of whom may have temporarily or permanently in the community when they died. Data derived from the examination of architectural features and disposal practices of material culture remains, as well as the location, placement and treatment of the dead associated with each cultural group, were used to contextualize the analysis and interpretation of burials practices at Bronocice. Each culture followed a set of traditional practices for handling the dead including where to locate their remains, how to treat the bodies, and what to include or exclude in their burials. Each of these burial characteristics was considered a potential indicator of a person's culture, social identity, and ideology.

Burial Traditions at Bronocice

The archaeological remains at Bronocice included a large settlement area, fortification ditches, animal enclosures, pits and other structural remains, at least one cemetery possibly two, several burials in varying contexts, artifacts, and other ephemeral features. These data sets provided information about short-term and long-term attitudes towards death and social relationships between the living and the dead. The richness of the site provided the opportunity to examine the physical expression of ritualized behaviors and to document trends in continuity and change in traditional cultural practices. The burials spanned eleven hundred years and reflected burial traditions associated with four main cultural groups including Lublin-Volhynian, Funnel Beaker, Funnel Beaker-Baden, and Corded Ware. Burial practices from each of these cultures are well known from several sites, some of which are situated within the Bronocice microregion and others found far outside that range (Czekaj-Zastawny, Kadrow and Zakościelna 1999). The majority of the burials were associated with Funnel Beaker culture and were located in the cemetery in Area C. However, not all contemporary burials followed Funnel Beaker protocols. Rather, some burials exhibited subtle features which may point to traditions of non-Funnel Beaker people or new traditions that evolved through interactions with members of other cultures. For example, a few burials were found that incorporated aspects of different burial traditions such as indicating gender by placing the body on a side but maintaining an extended position. The blending of elements from different burial traditions adds a certain ambiguity as to which culture is represented.

Two basic burial patterns were practiced at Bronocice over time. The most common pattern consisted of non-gender specific extended burials without burial goods or grave elaboration and which were normally located in the cemetery. This pattern was associated with Funnel Beaker culture and was practiced at this site for 700 years. Extended burial practice was common in hunter gatherer societies that existed throughout north and central Europe during the Late Palaeolithic and Mesolithic periods, though some flex burials have been observed as well (Pettitt 2010). Funnel Beaker people appear to have moved into the region from the north of the Bronocice region. Funnel Beaker burial patterns seen at Bronocice suggest an ancient practice linked with hunter gatherer ancestors.

The less common burial pattern seen at Bronocice consisted of gendered flexed burials with grave goods and grave elaboration which were always located within the settlement in houses or other structures. Flex burial patterns were typical of cultural groups descended from Linear Pottery culture and is seen throughout southeastern Poland. The continuity of this burial practice was observed in this region long after Linear Pottery culture was replaced by other locally evolved groups such as Lengyel and Malice cultures. Descendant groups maintained their ancestral practices. At Bronocice, the presence of Lublin-Volhynian, Funnel Beaker-Baden, and Corded Ware burials reveal ancestral burial traditions.

Cemetery and Settlement

The cemetery in Area C was created early in Phase 3 and was used and maintained by Funnel Beaker people (Figure 1). With the exception of the Lublin-Volhynian burial, which dates to Phase 2, no non-Funnel Beaker people were buried in Area C. The patterning observed in the distribution and location of burials speaks to underlying social factors. Other contemporary burials occurred within the settlement areas located in the eastern portion of the site. These burials exhibited features that were atypical of Funnel Beaker burial practices which suggests these individuals belonged to other cultures. Area C was a culturally marked space reserved for use by members of Funnel Beaker society. The settlement on the other hand was occupied by the living and the dead. The structures or houses within which burials placed were mostly formal interments, but the dead were placed in cellars. The co-occurrence of two contemporary burial traditions, those occurring in the cemetery and those occurring in the settlement, leads to the conclusion that location of a burial was socially proscribed.

Area C – the Funnel Beaker Cemetery

Area C was important to Lublin-Volhynian, Funnel Beaker and Funnel Beaker-Baden people. The location was center stage for the living and dead over a period of 900 years (Phases 1-5). It should be remembered that neither Funnel Beaker nor Lublin-Volhynian occupations were the first in the area since the construction of their houses impacted earlier burials. Area C was utilized extensively over the course of time as a settlement area, livestock enclosure, and cemetery. It was a place where burial events occurred and last rites performed. Perhaps it was a place for communing with the dead as well. For descendant populations, Area C may have been seen as a place of ruin and great antiquity, inhabited by their ancestors' ghosts.

Several key features were discovered in this area. The first included the Lublin-Volhynian fortification ditch and palisade, the remains of houses and barns, and burials. During the time spent preparing this publication new insights were gained about Area C. It was already known that Funnel Beaker and Funnel Beaker-Baden people used the area as a cemetery. However reanalysis of archaeological field records and photographs and the addition of new radiocarbon dates not only expanded our understanding of how the area was used but also revealed the presence of new burial structures and features. A series of postmolds measuring over 70 meters in length in Unit C6 were recognized as the remains of a long barrow. The Phase 2 Lublin-Volhynian ditch destroyed part of the postmold line which means it predates that occupation. Another feature discovered recently is the presence of a mound burial in Unit C5 dating to Phase 5. Decorative features were identified which were found to be associated with two burials in Unit C5 that consisted of in situ circular decorations probably made of wood (Figure 2).

Settlement Areas

A few burials occurred outside of the cemetery. With two exceptions it seems fairly certain at this point that these individuals were not Funnel Beaker or Funnel Beaker-Baden people. These exceptions include two Phase 5 Funnel Beaker-Baden burials located in Unit B1 which appear to be Funnel Beaker-Baden or possibly Baden. The settlement in Area A had fewer burials and human remains than did Area B. Burials and human remains were far more abundant in Area B and were more elaborate. This suggests that Area B, especially in the vicinity of Unit B1, had places designated as ceremonial. Some of the burial events were highly elaborated such as collective burial and the placement of skulls in structures. The types of burials diverged considerably from those in the cemetery. There are two burials in which the bodies were placed face down (Figures 3-4). The care given to all other interments suggests the placement was intentional, perhaps a sign of disrespect. Perhaps these individuals had committed some crimes or maybe no family members were present to oversee the treatment of their remains. Another burial appears to be the result of a building collapse. Collapsing buildings were not uncommon but leaving

Figure 4. Burial VII 102-A1. There is an in situ interlocking circular decoration in the soil near the left corner of the image

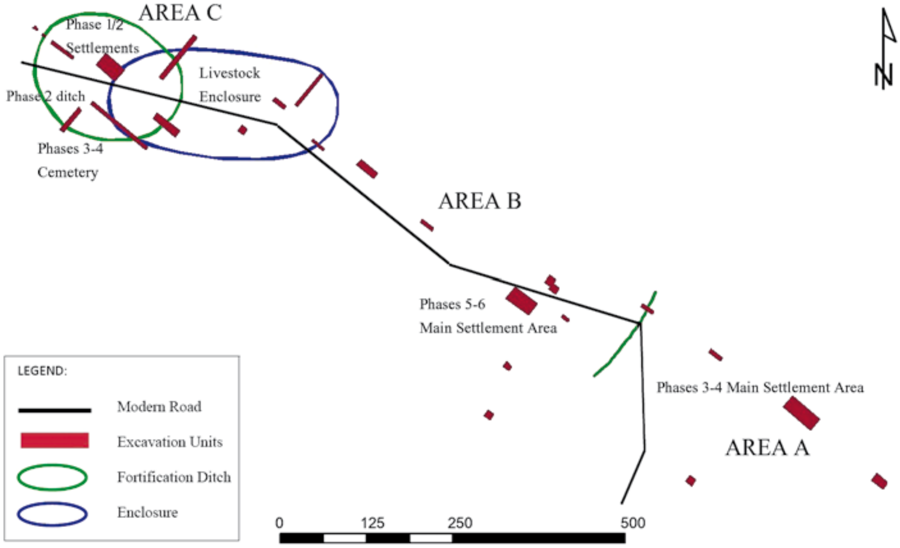

Figure 1. Bronocice location of excavation units, ditches, and the modern road. Areas highlighted in red indicate units with burials, human remains, and the long barrow

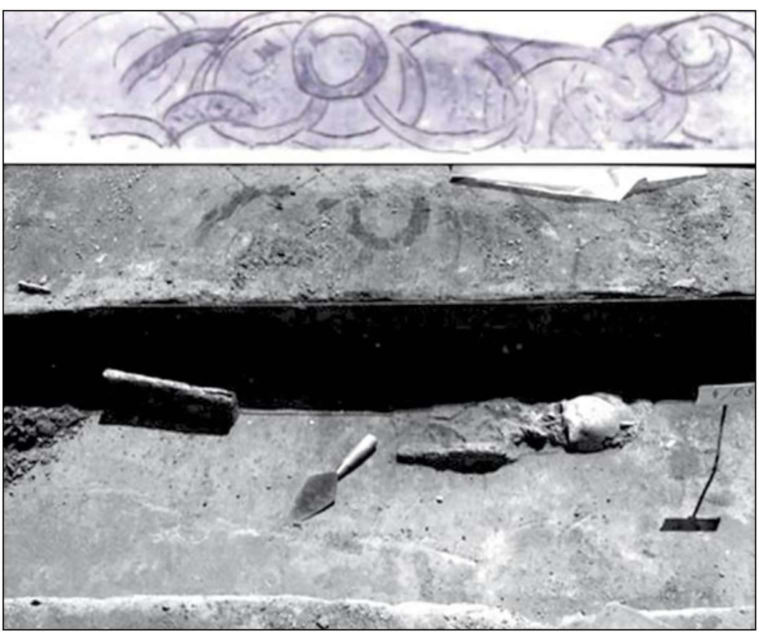

Figure 2. Photo and illustration of the decorated box lid from Burial XIX Pit 4-C5

Figure 3. Burial XXI, 8-9 year old child apparently discarded in a pit

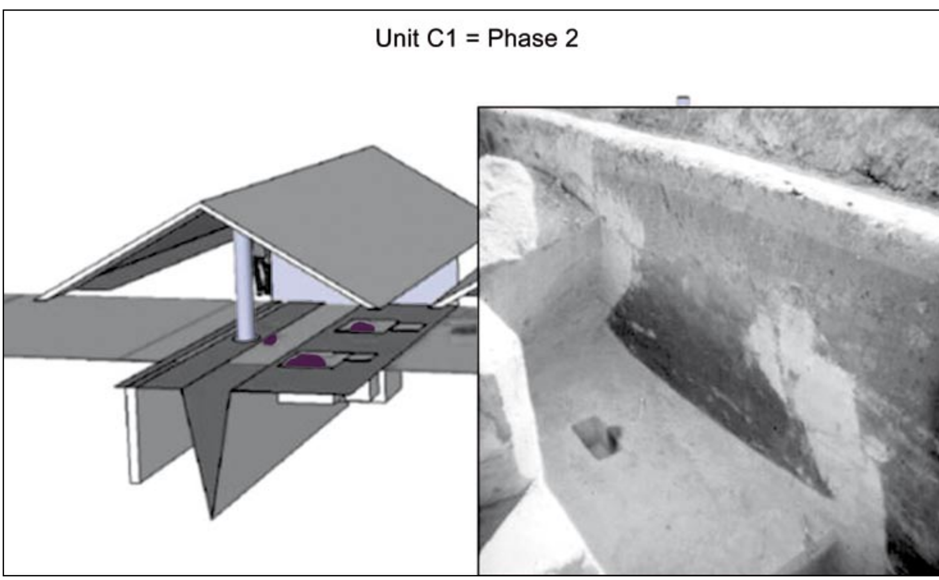

Figure 5. Structure on left spans the fortification ditch. Photo on right is the pit inside structure and steps leading into the fortification ditch

Figure 6. Opening of Burial VI, Phase 2 Lublin-Volhynian, showing the burned wooden platform

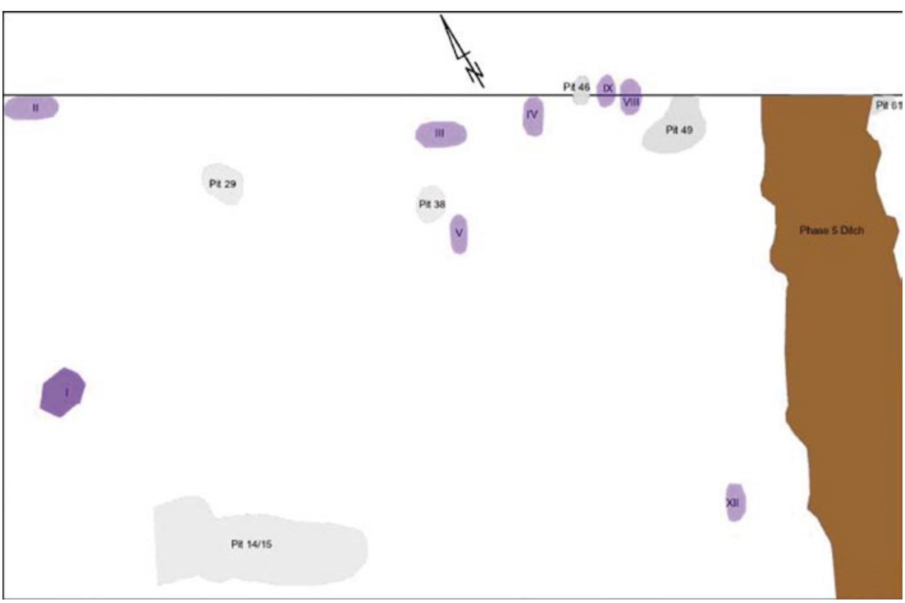

Figure 7. Phase 3-4 Clusters of Funnel Beaker burials in Unit C2

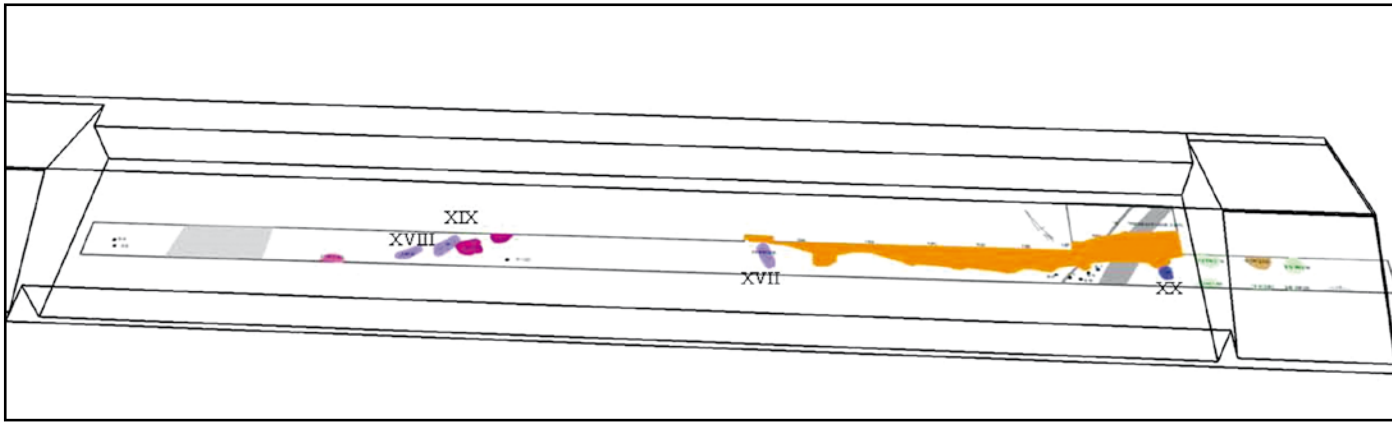

Figure 8. Unit C5. Burial XX is located near the Phase 5 ditch. The pattern of postmolds found throughout the excavation unit suggests there may have been a long barrow across all of the burials

Figure 9. Burial XV Pit 87-C1

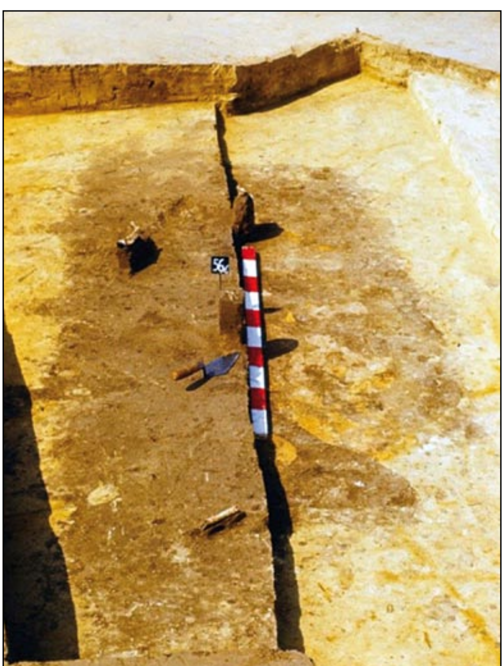

Figure 10. Funnel Beaker wood lined grave shaft, Burial XII in C2

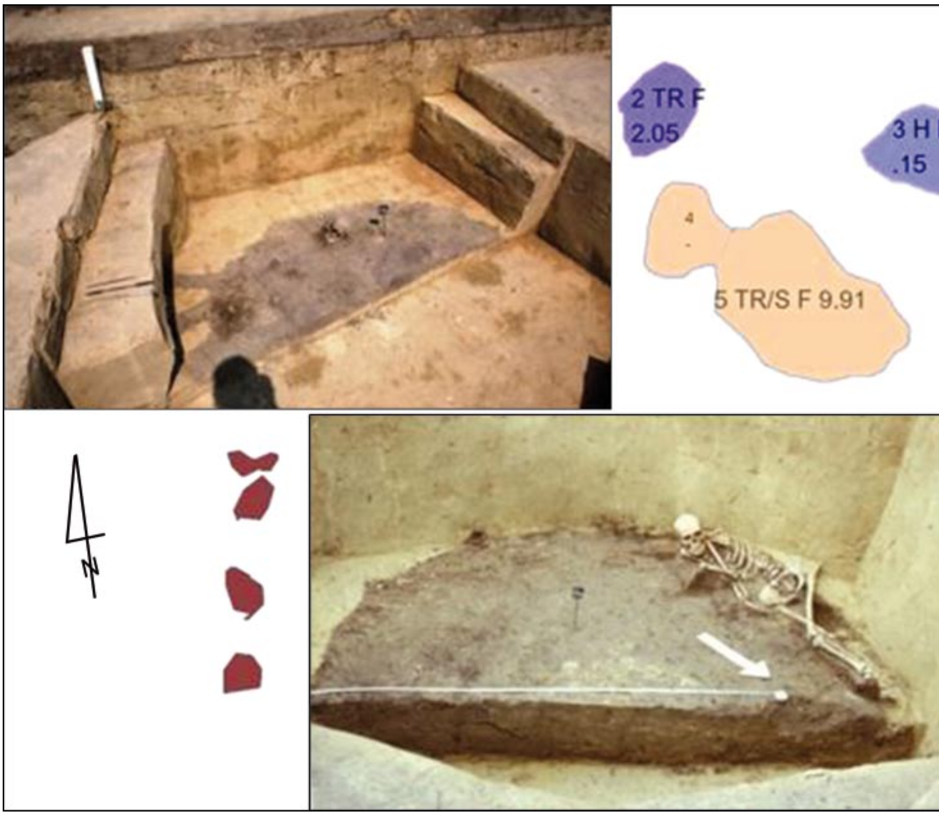

Figure 11. Location of Unit B6 pits 2-B6 that contained the skull of a man 30-35 years old (Burial XXIII) and 5-B6 that contained the skeleton of an adult man (Burial XXII)

a body inside was. The lack of concern over retrieval of the deceased as well as the deviation from typical forms of burial suggests a breakdown in traditional practices.

Phase 1 Funnel Beaker (3900-3800 BC)

The initial Phase 1 settlement was small and similar in size with other Funnel Beaker settlements of the period. Funnel Beaker people appeared at Bronocice around 3900 BC and planted the heart of their settlement in Unit C2. Since no burials were found dating to the early occupation of the site it does not appear that they used Area C as a burial ground. Since Funnel Beaker people favored the use of cemeteries their remains were likely located elsewhere. Area B, located to the east was the last area into which the later Funnel Beaker-Baden settlement expanded around 3300 BC. During the construction of their homes and outbuildings earlier burials were disturbed, including Pits 11-B1, 95-B1, and 86-B1 and 1-B8. So it may that Phase 1 Funnel Beaker people buried their dead in that vicinity and that an earlier cemetery has yet to be detected.

Lublin-Volhynian Phase 2 (3800-3700 BC)

The Phase 2 Lublin-Volhynian settlement was initially unfortified. Archaeologically this was documented by the presence of earlier pit features which were truncated by the construction of the fortification ditch and palisade wall. Like the Funnel Beaker, the center of this community was in Unit C2. Access into the fortified settlement was through a gatehouse that was situated over the ditch (Figure 5). The area enclosed by the fortifications measured about 2½ hectares (roughly 168-210 meters in diameter – Figure 1). The enclosure was large enough to contain their livestock and likely small fields under cultivation. Perhaps the size of the enclosed area was an attempt to outdistance the damage arrows might inflict. Neolithic weapons technology was most effective in interpersonal or short distance conflict. Bows and arrows had a very limited range and impact (Sunyol 2013).

Lublin-Volhynian people raised livestock and grew crops but they were clearly involved in more complex activities. They were connected to other Lublin-Volhynian communities via trade routes and shared certain technological skills, such as working with copper. They were known for their trade in certain kinds of lithics which they traded over great distances (Kaczanowska 1985). Other Lublin-Volhynian settlements such Złota, Gródek and Zimne were also fortified. The fortifications are a sign of social complexity and social differentiation. Fortifications are the end products of planning and execution of a large scale project as well as the organization of labor involved in the acquisition of materials and overseeing of construction. Beyond that however, the fact that several settlements were fortified at this time signals increasing security concerns at the regional level and the presence of an integrated communication system.

Structural size variability is another sign of social hierarchies. Within the fortified settlement at Bronocice, the structures varied in size. One of the structures had an enormous cellar which suggests a number of interpretations. Perhaps it was a great hall associated with a community leader. Or perhaps it was a storage facility for the community's stores. The pattern is distinct from the earlier and later Funnel Beaker communities. It is symbolic of different attitudes towards material possessions.

Confirmation of an existing social hierarchy is demonstrated in Lublin-Volhynian burials which typically included burial goods that varied in volume as well as degree of elaboration (Czekaj-Zastawny 2009). The Lublin-Volhynian burial was located in Unit C2. This rich double burial was of a high status female and a low status male. The grave included pots, wild mammal specimens, and lithics all of which were carefully arranged. The richness of this particular burial also broke with tradition since most highly elaborated burials were generally given to elite males. A few other outside burials are also known as well one other elaborated female burial at Książnice Wielkie (Kadrow 2008, Zakościelna 2009). In the case at Bronocice, the placement of the burial within the heart of the community was intentional. The grave would have been marked. During excavation it was noted that the burial had been burned (Figure 6), possibly an indication of the Lublin-Volhynians expulsion from the region by Funnel Beakers. The woman and her attendant remain enigmatic. There is no other burial like it within this culture. Her importance and value to the community is highlighted by the location of the burial and its visibility to those who outlived her.

Funnel Beaker Phases 3 (3700-3500 BC) and 4 (3500-3300 BC)

The Phase 3 Funnel Beaker people who settled in the eastern portion of the site in Area A may not have been directly related to the group that earlier settled in Area C. Analysis of architectural remains and artifact deposits reveal that while they may have shared many of the same cultural traditions, the Phase 3 group had a permanent, more structured and complex settlement (Pipes *et al.* 2014). There were traders and crafts people within the settlement involved in fiber and textile production and in the acquisition and trade of lithics and livestock (Pipes 2014, Milisauskas and Kruk 1989). The settlement included houses, sheds and barns, and an animal enclosure. They also began using the old settlement area as a cemetery. This clear separation of the living and the dead was maintained until sometime during Phase 5. It demonstrates a conceptualization of the landscape within the immediate area.

The placement of burials within the cemetery in Area C was highly patterned. With the exception of Burial XX, the burials are dated generally to Phases 3 to 4 and found in Units C1, C2, C5 and C7, with a majority located in Unit C2. Why Funnel Beaker people used the area for burials is open to speculation. Mound burials and megalithic burials are strongly associated with Funnel Beaker culture (Herbich and Tunia 2009, Jankowska 2009, Midgley 2004, 2010,). Perhaps the crumbled mounds of earlier longhouses were still visible on the landscape and assumed to be long barrows by the Phase 3 Funnel Beaker group. There are a couple of features that suggest this possibility. First, there are clusters of burials located within earlier houses (Figure 7). Clustered burials, especially those that share the same orientation, likely occurred within a short period of time. The orientation and proximity of these burials suggests people knew where others were buried and that the graves were marked. Clustering of burials may also signal that these individuals were socially connected. Furthermore the dispersed nature of burial clusters suggests other factors were in operation determining their placement, possibly family plots associated with their ancestors.

There were eight actual burials and another six pits containing disturbed remains from at least 7 individuals in Unit C2. Of the eight burials, six were aligned more or less north-south. In one case the head was placed to the south, the remaining five had their heads to the north. The remaining two burials were aligned east-west with the head at the west end. The burials in the eastern portion of the Unit C2 are aligned northeast-southwest while those in the western portion of the site area aligned northwest-southeast. Unit C5 contained four burials, three of which date to Phase 3-4 and the fourth to Phase 5. All of the burials lie in the same linear plane though their orientation varies (Figure 8). Only two burials form a clear cluster (XVIII and XIX). All four burials have the head generally to the south suggesting body orientation was intentional. Seemingly random post-molds were found through Unit C5, some of which appear in Figure 8. It is possible that this is the remains of another long barrow. If so then it was in alignment with the one in Unit C6 (Figure 1).

The Burial in Unit C1 (XV) was unusual in that it contained a young woman and a toddler. The child was placed on its right side, which would mark it as a male in some cultures such as Lublin-Volhynian and Corded Ware (Figure 9). In fact, Burial XX at Bronocice was that of a woman and she was lying on her left side. Both individuals have their heads at the north end. Burial XXV in Unit C7 was placed within the old Phase 2 ditch. It is possible that locating the burial in the old ditch was intentional and that the feature retained some cultural significance.

All of the Phase 3-4 burials in Area C are similar in two specific ways: they are extended burials with no gendering of the body except for the infant in Burial XV, and they contain no grave goods. But it would be a mistake to assume that grave elaboration did not exist since preservation was not great. Containment of the dead was evident in the majority of burials in the cemetery. Most of these appear to have been placed in rectangular wood lined pits (Figure 10). In at least one instance the remains of a lid were detected during excavation. The lid in Burial XIX bore a decorative pattern consisting of interlocking circles (Figure 11).The Phase 5 burial in Unit C5 also preserved signs of decoration as did a Phase 4 burial in Unit A1.

By Phase 4 the settlement had expanded considerably more doubling in size. Consequently the initial settlement expanded from Area A into Area B. By this time livestock imports were a significant part of the economy as was textile production. A recent XRF study of sheep remains from Bronocice revealed that sheep imports occurred on a large scale beginning in Phase 3. This information when combined with age at death profiles and DNA indicated that sheep imports happened once a year during late spring early summer (Pipes 2014). Sheep were second in economic importance behind cattle. Most likely cattle were also brought in annually. Along with livestock would have come shepherds and traders most likely from the Carpathian basin where the fourth millennium BC Bodrogkeresztúr economy revolved around pastoralism (Virág/Bondár 2003). Other types of enterprises appear to have increased production as well including an axe maker, salt refining and a pottery (the massive hearth in Unit B3). A bakery was also established Unit A2. House sizes became more varied. Some structures were located in remote parts of the site which suggests they were outlying farms or large barns. The heart of the settlement eventually shifted from Unit A1 to Unit B1 by 3300 BC.

The first indicators of non-Funnel Beaker people appeared during this expansion. Small amounts of pottery from other cultures, such as comb and Pit and Globular Amphora, were recovered as well as decorated spindle whorls and loom weights (Pipes et al 2014). There were three burials that diverged completely from Funnel Beaker traditions. Distinct features of these burials included the location of the burials, the placement of the bodies, and the presence of artifacts and jewelry. In each case the individual was buried within a structure, two were placed in cellar pits (Burials XVI and XXII), while the other was inside a rectangular feature possibly lined with clay which may have been a sealed area inside a house (Burial VII). All were associated with artifacts. Burial VII, a woman of about 50 years had potsherds, a loom weight and faunal remains. Burial XVI, a child of about 7 years, had potsherds and a spindle whorl. And Burial XXII in Unit B6, an adult male, had a bone bead at the neck, ceramic sherds, stone tools and spindle whorls (Figure 11). In each case the individual was placed within an extended position though none were on their back. The location of the man in Unit B6, the layout of the body and the fact that he was wearing a beaded necklace identifies him as an outsider to the community at a time when insiders were being buried in Area C. The woman was face down, the child had its head severely twisted to the right and the man's head was propped up on his left hand with his body tilted on its left side. The woman's position was odd and suggests she was disrespected. The three burials are so distinct from Funnel Beaker burials that it is likely they are from other groups. What is most significant about them is their exclusion from the cemetery regardless of whether or not they actually were from other groups.

Phases 5 (3300-3100 BC) and 6 (3100-2900/2800 BC)

By Phase 5 the settlement was increasingly influenced by Baden culture. The ceramic assemblage shows a melding of Funnel Beaker and Baden elements. Most households were now engaged in fiber and textile production (Pipes *et al.* 2014). Within the micro-region the dispersed settlement pattern of earlier phases changed. Settlements now clustered around Bronocice adding to the degradation of the local environment. The archaeological record revealed several indicators of increasing social tensions within and outside of Bronocice.

There are signs that the settlement experienced one or more serious fires, possibly resulting in at least one death due to a collapsed building in Unit A3 (Burial XXIV). The fact that the body was not retrieved indicates either a lack of concern, a lack of awareness of the death of this person, or a lack of ability to retrieve the body. In one of the buildings in this area seven head of cattle were slaughtered, their throats slit, and their carcasses abandoned. The value of cattle during the late Neolithic was great. They represented not only wealth but an important source of labor, dairy, meat and other resources. Cattle were occasionally sacrificed in some Neolithic and Copper Age cultures such as Globular Amphora sacrifice (Whittle 1996). But when sacrificed they were ritually buried near human burials which was not the case here. In this instance the cattle were slaughtered and abandoned then the building was burned. The enormity of the event suggests the settlement was raided.

The skeleton of a child found face down in a trash pit (Burial 2 B-road) may be a sign of social tension as well. The grave lacks evidence of preparation for the body. The floor of the grave is uneven. The placement of the body face down is reminiscent of the woman found in Pit 102-A1 (Burial VII). The lack of care given to this burial suggests a person unvalued by the community, perhaps lacking family to bury the body. The body seems casually discarded.

Other signs of increasing social tensions are also evident in the presence of three skulls found within household cellars as well as the collective grave containing the remains of 17 people, most of whom were children. The skulls were found in different places throughout the settlement. They were found in Unit B1, B6 and A4 (Figure 1). The position of one skull in the center of a pit points to a ritualized context. This particular skull (Burial XXIII) was located in a pit adjacent to Burial XXII which dates to Phase 4 (Figure 1). That individual is believed to have been an outsider. Considering the great size of the settlement area the proximity of the two burials may not be coincidence. The other two skulls (Burials XXVI and XXVII), dating to Phase 6, are the only human remains from this phase. They appear to have been dumped in the pits rather than carefully placed. Perhaps they were discarded after their historic significance was no long relevant to the living. It is worth mentioning that since no other heads were found at the site over an 1100 year occupation skulls represent extremely rare objects. Furthermore, those individuals were not treated with the same care and concern given to Funnel Beaker-Baden residents strongly suggesting they were outsiders.

The collective grave was highly ritualized and was an intentional show of power. The placement of the oldest male on top of all other individuals was deliberate, not random. The wealth of personal adornments found in association with their skeletons marks them as outsiders, most likely Baden, and reveals their high status within their own culture. Funnel Beaker people at Bronocice did not wear jewelry. In a few rare instances at Bronocice pierced teeth, or bone or shell beads were found among the dead and in household trash deposits. But jewelry was not part of the material culture of Funnel Beaker and Funnel Beaker-Baden culture. The death of 17 people, likely murdered, and their highly elaborated burial ceremony,

Figure 12. Pedaled feature with articulated ox neck lying adjacent to Burial XX in C5

sent a message to people inside and outside the community. Such an event would have been known throughout local communities as well as where the 17 came from. It is probable that there were serious political ramifications that impacted the economic strength of the settlement afterwards. The construction of the Phase 6 ditch and palisade postdates this event.

There were two classic Funnel Beaker style burials which were located surprisingly within the settlement. They were both found in unit B1 and included Burials X and XIV. Both of these were extended burials. However they each contained a few burial goods which may have gender implications. While both included ceramic sherds, the woman (Burial X) also had a grinding stone and the man (Burial XIV) had two flint pieces. A third burial was more clearly gendered. Burial XX in Unit C5 was greatly elaborated which may be part of a mound burial. A set of postmolds, as well as the presence of several smaller features were placed within this structure. The burial consisted of a woman placed in extended position lying on her left side. She possessed two mussel beads and a scraper. Next to the grave was a unique in situ feature consisting of a series of interlocking circles

Figure 13. Profile view of Burial XX (left feature) before the skeleton was excavated, the possible yoke and box lid above it (right feature)

Figure 14. The continuation of the possible yoke can be seen in the left profile. Circular in-situ feature located slightly northeast of the burial which is located in the right hand corner of the photo. Lower right area is the articulated ox neck

creating the impression of a pedaled flower (Figure 12). Within the feature was an articulated neck of an ox (Figures 13 and 14). This burial in particular shows a trend towards greater grave elaboration.

Phase 7 (2600-2500 BC)

The Corded Ware burial at Bronocice consisted of an adult male aged about 50. It is typical of the Corded Ware burials dating to the period. It was elegant in design and laid-out with attention to detail including the position of the body, the arrangement of burials goods, the range of ceramic pots and their placement within the grave. This type of burial package has been found in many other Corded Ware burials. This was a flex burial, the body placed on the right side, and the contents including knives made from the canines of a pig, a few pieces of lithics, stone axe, pottery, and a carved bone bead (Figure 15). Most of the elements included in this burial can be traced back to the Neolithic tradition associated with cultures such as Lengyel and Lublin-Volhynian. However, there are a few differences worth discussing. The first is the location of the burial. The burial was placed within the most recently occupied settlement at Bronocice. Many Corded Ware burials are found in areas used by earlier cultures including those of Funnel Beaker people. The other notable feature is the lack of animal foods. This is a break with earlier burial traditions that in-

Figure 15. Burial Corded Ware bead, Burial XI, 67-B1

cluded food as part of the provisioning of the dead. Its absence points to an ideological shift concerning the meaning of grave elaboration. In earlier flex burials the deceased were given objects and food. Archaeologists speculate that starvation was a constant worry for people in the Neolithic. Providing the dead with food may have been born out of that cultural anxiety.

The Corded Ware burial is an interesting contrast to the Lublin-Volhynian burial because it shares similarities. Both of the burials contained high status individuals. The two burials are similar in the placement of the body of the main occupant. Both are flexed but placed on different sides presumably due to because gender differences. Both burials are elaborate with deliberate positioning of material objects within the tombs. Included in the burial goods are objects of personal adornment as well as tools and possibly weapons.

Summary

The data presented here provide a basis for arguing against the archaeological practice of assigning all contemporary burials at a site to the same culture without first considering variability as potential indicators of multiculturalism. At a site such as Bronocice, known to have been heavily involved in livestock trade which involved the presence of non-local people on an annual basis, the practice is problematical because it effaces cultural identity. In communities such as Bronocice, people from many cultures and backgrounds passed through and resided in the settlement. The dominant culture left the strongest impression of cultural identity, but in death other cultures also expressed their own identities. Subtle differences in body placement, orientation, presence/absence of burial goods, the locations of burials whether in cemeteries or settlements, as well as the type of features within which the dead were placed, are important indicators of cultural identity.

Archaeological surveys have located countless cemeteries in southern Poland that were associated with Linear Pottery, Lengyel, Lublin-Volhynian, Funnel Beaker, Globular Amphora, Baden and Corded Ware cultures. Some cemeteries were reused by different cultural groups over time. They were sometimes dominated by one specific culture, such as Area C at Bronocice, signaling the important ideological association given to the location. As was the case at Bronocice, contemporary burials situated outside the cemetery may signal individuals who belonged to a different culture and who may not have been eligible for burial in the cemetery. This practice exists today since non-Christians cannot be buried in a Christian cemetery.

Furthermore, isolated human remains found in random pits should not be automatically assumed to represent dismembered bodies. Instead, they need to be evaluated as they may signal the presence of earlier burials disturbed during later construction. At Bronocice the only exceptions were skulls found in household pits which appear to have been treated as artifacts, objects or possessions of unknown social value.

Isolated remains from disturbed burials may contribute further insights into local practices. First, those who disturbed the burials may not have had any cultural memory of the area having served as a cemetery and the burials may have been unmarked. In the case of Bronocice, it seems the first Funnel Beaker people to settle in Area C buried their dead elsewhere. It may be that the isolated human remains found in Area B were associated with the Phase 1 Funnel Beaker settlement, the area having served as the initial burial ground. The disruption in occupation that occurred when the Lublin-Volhynian occupied the site between Phases 1 and 3 was either of sufficient length to result in lost memory or the subsequent Funnel Beaker group that resumed occupation at Bronocice belonged to a different group who did not have ties to the burial ground in Area B. It was not until Phase 4 that houses were built in the area, a gap of 300 years.

Understanding the ideology of cultures who left no writing nor illustrations is elusive at best. And yet there are some fundamentals concepts that can be determined and assessed in comparison with other burials and cemeteries in southern Poland. First one can consider simply the act of disposing of the dead: placement of the body and inclusion or exclusion of grave goods. There two standard placements of the body observed at Bronocice, flexed to the right or left depending on sex, and flat back extended. Additionally the casual disposal of other bodies speaks to social ruptures of norms of behavior. Flexed burials always included grave goods while extended burials did not. There were exceptions in the case of extended burials. A few included some artifacts, such as Burial VII. In that instance the woman was placed face down and given a broken pot and loom weight. She may not have been Funnel Beaker. Regardless her burial stands out in stark contrast to the other burials at the site.

What can we say about ideology when these burial traditions are considered locally and in the broader regional context? First it is clear that burial was considered the preferred tradition by all three cultures that lived at Bronocice. No cremations were found. Modern religious beliefs provide some ethnographic comparison as to the meaning of disposal by fire or by burial. Fire may be associated with purification rituals. Fire may be equated with ancient notions of sacrificial offerings. In modern US society, cremation is a practical tradition born out of increasing lack of burial space. Burial is often equated with returning to the earth's womb. Burial anchors the body to the earth and gives permanence to the dead. Needless to say the Urnfield cultures did that as well.

There is meaning as well in deciding whether to include burial goods or not and the kinds of materials considered appropriate. Burial goods were not included in Funnel Beaker burials at Bronocice. The deliberate exclusion signals an ideological reasoning which indicates the dead did not need worldly possessions. For Lublin-Volhynian and Baden people food and other material culture was a necessity. And in the case of Corded Ware people, burial goods were important as signs of identity but not necessarily because they needed them, inferred by the lack of meat. Vandkilde (2006, 2007) and Westermann (2007) suggest that the corded beakers, as for example from Bronocice, and the shafthole axes found in Corded Ware male burials denote male identity. Probably high-ranking males were organized in warrior clubs and drinking rituals were practiced (Vandkilde 2007: 68, Vencl 1994).

Neolithic burial practices are still poorly understood and require a refinement of investigative methods. There is too great an assumption that all individuals buried within a community were members of that group. Variability seen in burial practices at sites may not reflect gender differences but may instead point to the presence nonlocal individuals. It is clear that long distance trade and movement of people were important social activities throughout the Neolithic and that non-local people died away from their homes. Their burials reflect the traditions and ideologies of those who placed them in their tombs. Rather than assuming that all burials are from the culture associated with a site occupation it might be more informative to consider patterning cross-culturally. It is easier to do when presented with cases like the Lublin-Volhynian and mass burial found Bronocice in which burial patterns are so distinct that they cannot be mistaken for the local tradition. But there are also subtle differences seen in many cemeteries that mark some individuals, especially women, as potentially being non-local born as well. Cross culturally it is common for women in agricultural societies to marry outside their native community. That does necessarily imply they come from another culture. However, at sites like Bronocice some of the Funnel Beaker women buried with small amount of grave goods may have belonged to groups living in communities closer to others cultures in which grave goods were traditional.

Settlements often have centralized locations in which many social activities take place. The placement of the collective burial in the center of the settlement was deliberate. It has been observed that Neolithic collective burials were often located in settlement or nearby (Szczepanek 2013).

CHAPTER 16

General Observations on the Bronocice Burials

Sarunas Milisauskas, Janusz Kruk and Marie-Lorraine Pipes

Over the last two hundred years there have been many excavations of archaeological sites throughout central Europe including in southeastern Poland. The data from many projects remains unknown, in part because of the regions turbulent history but more generally because of the amount of time needed to fully synthesize such information. A vast and complex site such as Bronocice requires diligence and patience for an understanding of the meaning of the data. Our approach has been thematic, focusing on different aspects of the site and material culture rather than attempting a single comprehensive site report. We feel this has been productive in shedding light on the settlement hierarchy, chronology, culture history, economics, architecture, small scale craft production, gender and symbolic issues.

In preparing this volume we have been surprised at some of the new information which has emerged about the burials and the cemetery at Bronocice. Based on disturbed humans found in Phases 1 and 2 structures, burials had occurred here before the first settlement existed. So the area was already culturally marked. Similarly, area B was used as a cemetery before the later settlement expanded into it. It is clear that the cemetery is more than just a collection of single graves. At least one long burial barrow is present, as is indicated by a row of postmolds in the excavation units in Area C. Locations of burials within earlier structures suggest ancestral ties. We have gained a better understanding of grave elaboration of Funnel Beaker burials. The Lublin-Volhynian burial is now understood to be one of the most elaborated female graves in the region not only because of its contents and unusual layout but also in being located at the western edge of their territory. This woman was important in her community.

Identity is one of the issues in this study. The remains of some dead say something about who they were culturally while others are more ambiguous, appearing to share aspects of one culture while expressing traits of others. In at least two instances the dead were buried in a non-traditional manner, that is, face down, hinting they were disgraced in death. The collective burial in Area B points to the presence outsiders. An earlier study has already established that Funnel Beaker people at Bronocice did not wear jewelry (Pipes *et al.* 2010). Most individuals in the collective burial wore necklaces made of bone, shell and teeth, suggesting they came from another culture, likely Baden. An analysis of genetic markers indicates that two family groups are represented; some of the individuals were probably siblings. At least one pair of adults may have been married and some of the children, their offspring.

The interpretation of field results revealed several important trends within the occupation. The core of the settlement changed over time. During the first two phases it was in Area C, in the vicinity of Unit C2. The settlement was relocated to Area A, with the main residential and activity area in Unit A1. Towards the end of phase 4 the core shifted to Area B with the main occupation in Units B1, B2 and B5/B7. Throughout the history of the settlement outbuildings consisting of barns and probably farmhouses were located on the outer edges. Another important trend was the changing size of structures over time. During the first four occupational sequences longhouses appeared to have been common. However, beginning late in phase 4 smaller houses appeared in the core of the settlement. Specialized areas appeared with the start of textile production. The high concentrations of fiber and textile production artifacts found in house pits within Units B1, B2 and B5/B7 indicate that this was a weaver's neighborhood (Pipes *et al.* 2015). Other areas appear to have been associated with workshops producing stone axes and flint tools. Unit A2 had a series of large ovens that dated to phases 4-6 suggesting that bread was baked communally over a period of several hundred years, possibly as a solution to increasingly expensive fuel because coppicing became a trade. And last, barns and possibly farmhouses were located within the large enclosures found in Area C. The increasingly complex internal arrangement of the settlement reflects the social and cultural evolution of the community (Pipes *et al.* 2015).

The Late Neolithic was an unstable time in the greater region. Settlement patterns shifted in the Tripolye culture, to the east in Ukraine. The disappearance there of large sites, big houses, female figurines and painted pottery seems to have begun about 3500 BC and was almost complete by 3000-2800 BC. Around 3100 or 3000 BC, most large settlements disappeared in central Europe. The Bronocice data also indicates that some social turbulence occurred; non-local people appeared in the region and fortifications again were constructed. How are we to interpret these undoubted changes in the archaeological record? Were they caused by local developments or by external forces such as the influx of new people? Ceramic data show the stylistic influence of the Baden culture and the skeletal data indicate the presence of some outsiders at Bronocice. There are no simple answers, but various developments are associated with changes occurring at this time.

We can make some general observations about the health of different groups at Bronocice. There are 21 Funnel Beaker and 17 Funnel Beaker-Baden burials. The collective grave XIII of 17 individuals comprises 81% of the Funnel Beaker-Baden sample. The Lublin-Volhynian and Corded Ware cultures are represented by single burials.

Skeletal samples are small, thus it is difficult to make comparisons with other sites in southeastern Poland. At Bronocice the percentage of children is high in the Funnel Beaker-Baden or Baden sample while the Funnel Beaker sample consists mainly of adults. However, we can make some general observations about changes among the site's inhabitants over time.

We assume that individuals in multiple burials such as XIII, were interred at the same time. The collective burial XIII has 17 individuals mostly children buried at the same time, and is thus an excellent sample for analysis.

Table 1. Comparison of morphological and dental traits among Funnel Beaker and Funnel Beaker-Baden populations at Bronocice

Trait	FB		FB-B	
	N	%	N	%
Cribra orbitalia and femoris	3	14	7	33
Shovel-shaped incisors	0	-	6	29
Os epiptericum	0	-	6	29
Carabelli cusp	0	-	4	19
Enamel hypoplasia	0	-	4	19
Spina bifada	0	-	2	10

The skeletal data indicates that from phase 3 there was biological continuity in Bronocice's population. Only in phase 5 does the oxygen isotopic composition of individuals in the collective grave suggest a non-local in origin, possibly Baden, influx. A comparison of morphological and dental traits such as shovel-shaped incisors, between Funnel Beaker and Funnel Beaker-Baden populations also indicates differences (Table 1; Haduch 2004). This is consistent with observations based on variation in grave goods, such as the absence or presence of jewelry. Ceramic data reflect the merging of Funnel Beaker and Baden traditions. Some 15-20 kilometers south of Bronocice there are actual Baden culture sites. As the collective grave indicates this population's interaction was not always peaceful.

The health of the Bronocice people was probably affected by changes or innovations in farming and stockbreeding. Farming demanded hard physical labor and it was practiced from the beginning of the site occupation. The Bronocice people relied heavily on domestic plants and animals for subsistence. Emmer wheat was the most common cereal and cattle the most common domesticated animal. Studies of faunal material indicate that wild animals played a minor role in the diet (Pipes *et al.* 2009, Milisauskas *et al.* 2012).

Signs of illness, disease, developmental disorders, congenital malformations and other indicators of poor diet and health were apparent on some of the skeletal remains. These included *cribra orbitalia*, *cribra femoris*, *enamel hypoplasia, osteoarthritis, spina bifida, craniostenosis, spondylolysis,*

Figure 1. Corded Ware Burial at Pałecznica (courtesy of Z. Liguzińska-Kruk)

perotic hyperatosis, tumors, and erosion of the calvarium. Some of these conditions do have causes other than diet.

The health of Bronocice populations declined through time. Our data indicates that the Funnel Beaker were healthier than the Funnel Beaker-Baden people. This development is perhaps reflected by the presence of pressure or increase in *cribra orbitalia* in the Funnel Beaker-Baden populations. Poor hygiene and nutritional deficiency can account for some of this pathological change. Haduch's (1995) study of 36 skeletons from the uplands of the southeastern Poland suggests that the Corded Ware culture that followed the Funnel Beaker-Baden occupation enjoyed better health. For example, only 6 (16.7%) of the sample had *cribra orbitalia*. Trace element analysis from Bronocice indicates that there are differences between younger and older individuals in the collective burial XIII-B1, "but we cannot determine on the basis of this analysis whether this is due to regional differences in diet, or a change in dependence on marine food sources which is usually strongly correlated with a sharp barium depletion feature. Similarly, the strong correlation between the Sr/Ca and Ba/Ca ratios in the Funnel Beaker population may indicate that this group was more sedentary and less likely to consume foods from different regions, whereas the later Funnel Beaker-Baden and Corded Ware groups may have either moved more frequently or consumed more food from different source regions or environments" (Kamphaus *et al.* in this volume).

We have estimated the age of 15 Funnel Beaker skeletons. It is evident that the age distribution is unbalanced; there is only one child burial. There are a number of burials with elderly individuals (50+years). Six are adult females, ranging in age from 18 to 50-60 years. Three of them are very old for that period, 40-50, 50 and 50-60 years. The five males range in age from 20-30 to 50 years. Only one was at least 50 years old while three of the females were 50 years or older. We have not included in our calculation those remains classified merely as adults. It should be noted that the Corded Ware individuals from Bronocice (50-60 years) and the Pałecznica (60-70 years) were very old for the Neolithic period. Besides their good genetic health they must have had a good diet and no major health problems. They both were tall Neolithic men, the Bronocice warrior was (171.5 cm, 5′8″), and the Pałecznica one was (167 cm, 5′5″; Figure 1).

The Funnel Beaker culture is characterized by different types of burials in southeastern Poland, non-megalithic and megalithic, and not all of them lack burial goods. It is evident that funerary practices differed among the Funnel Beaker populations. Florek (2006) defines as megalithic burial structures as being built of stone, stone and earth or wood and earth in southeastern Poland. Non-megalithic burials occur in trash pits, burial pits and in rectangular pits with floors and walls lined with stones (Florek 2006). For example, at the small cemetery in Docharzów, seven burial pits with stone construction were excavated. Two burials had 2 deceased persons without any burial goods. However, two out of six burials with stone construction at Kichary Nowe had burial goods: one had a flint burin and two Volhynian flint flakes, while the other had an amphora, a collared flask, a Volhynian flint drill, bone needle, awl and a copper dagger (Kowalewska-Marszałek *et al.* 2006). The nearby site of Szarbia, 3 km from Bronocice, had two burials, one with a mug and the other with four pots, a spindle whorl, hammerstone-grinder and a retouched Jurassic flint flake (Baczyńska 1984). The Szarbia site occupation coincides with the late Funnel Beaker phase 4 at Bronocice.

What is the meaning of variability in Funnel Beaker burial practices in southeastern Poland? Bronocice, one of the largest Funnel Beaker sites in the region, yielded the simplest burials, without any burial goods. Burials are often supposed to reflect levels of sociopolitical complexity, but distinguished individuals at Bronocice did not appear to have received richer burials. Social elaboration took a different form other than grave goods. Also burial XIX clearly showed signs of a canopy suggesting a ceremony took place before the grave was filled in.

There are numerous Corded Ware burials in southeastern Poland. The early presence of this culture in the Bronocice region is indicated by the Pałecznica burial, 6 km south of Bronocice, dating 2800-2700 BC. The Bronocice burial is dated around 2600 BC and reflects changes in burial rituals. It has numerous burial goods. In the burial at Pałecznica the adult male was interred in an extended position, but with no burial goods (Figure 1). His higher status was expressed by his central location in the mound.

The Bronocice Corded Ware burial probably originally was covered by a mound. The deceased was buried in a flexed position with numerous artifacts, unlike burials in earlier phases. It is evident that some changes had occurred in the Corded Ware beliefs or at least in their behavior.

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APPENDICES

APPENDIX A

Quantitative Analysis of Trace Element Components

Ben Kamphaus, Janusz Kruk, Sarunas Milisauskas
and T. Douglas Price

Statistical analysis was performed on several trace element attributes found in human skeletal remains from Bronocice, Łękawa, Samborzec, Słonowice, Szarbia, and Wójeczka. The Bronocice data comes from four cultures, Funnel Beaker, Lublin-Volhynian, Funnel Beaker-Baden and Corded Ware, thus it represents the largest sample of data for this analysis (Table 1). The samples from other sites were from Corded Ware culture. One Bronze Age sample came from Słonowice (Tables 2 and 3). The samples were analyzed in the Laboratory for Archaeological Chemistry at the University of Wisconsin-Madison by T. Douglas Price.

The objective of this study is to determine the dietary practices of Neolithic populations in southeastern Poland and if the diets of these cultures varied through time. The Bronocice data ranges from the earliest Funnel Beaker occupation around 3900 BC to the latest Corded Ware presence 2600/2500 BC. Faunal and botanical remains indicate that Funnel Beaker economy was based on subsistence farming and livestock herding. Livestock herding grew in importance especially during the Funnel Beaker-Baden and Corded Ware occupations.

An initial test showed that the Bronocice remains may have been subject to higher levels of diagenesis than normal, since many of the calcula-

Table 1. Chronological Sequence at Bronocice

Phase	Culture	Dates BC cal.
1	Funnel Beaker	3900-3800
2	Lublin-Volhynian	3800-3700
3	Funnel Beaker	3700-3500
4	Funnel Beaker	3500-3300
5	Funnel Beaker-Baden	3300-3100
6	Funnel Beaker-Baden	3100-2900
7	Corded Ware	2600-2500

Table 2. List of specimens used for trace element analysis from Bronocice, Łękawa, Samborzec, Słonowice, Szarbia, and Wójeczka

ID	UW	Site	Unit	Culture	Chronology	Burial	Bone	Age Class	Age	Sex
1	1093	Bronocice	A1	3	3300-2900	XVI	Rib	juvenis	7	
2	1094	Bronocice	B1	3	3300-2900	XIII-5	tibia	juvenis	4.5	
3	1096	Bronocice	B1	3	3300-2900	XIV	Rib	adultus	32.5	M
4	1101	Bronocice	A3	3	3300-2900	XXIV	Rib	adultus	19	F
5	1102	Bronocice	B1	3	3300-2900	XIII-1	Rib	adultus	19	F
6	1103	Bronocice	B6	3	3300-2900	XII	Rib	adultus	32.5	M
7	3006	Bronocice	B1	3	3300-2900	X	Rib	adultus	30	F
8	3007	Bronocice	Bd	3	3300-2900	XXI	Rib	juvenis	8.5	
9	3008	Bronocice	B1	3	3300-2900	XIII-2	Rib	juvenis	5	
10	3009	Bronocice	B1	3	3300-2900	XIII-3	Rib	juvenis	10	
11	3010	Bronocice	B1	3	3300-2900	XIII-4	Rib	adultus	18	M
12	3011	Bronocice	B1	3	3300-2900	XIII-6	Rib	adultus	25	M
13	3012	Bronocice	B1	3	3300-2900	XIII-7	Rib	juvenis	3.5	
14	3013	Bronocice	B1	3	3300-2900	XIII-10	Rib	juvenis	5	
15	3014	Bronocice	B1	3	3300-2900	XIII-11	Rib	juvenis	0.6	
16	3015	Bronocice	B1	3	3300-2900	XIII-12	Rib	juvenis	7.5	
17	3016	Bronocice	B1	3	3300-2900	XIII-13	Rib	juvenis	15	
18	3017	Bronocice	B1	3	3300-2900	XIII-14	Rib	juvenis	7	
19	3018	Bronocice	B1	3	3300-2900	XIII-15	Rib	juvenis	8	
20	3019	Bronocice	B1	3	3300-2900	XIII-16	Rib	juvenis	3	
21	3020	Bronocice	B1	3	3300-2900	XIII-17	Rib	juvenis	0.8	
22	1095	Bronocice	C2	1	3700-3500	IX	long bone	adultus	35.9	

Table 2. cont.

ID	UW	Site	Unit	Culture	Chronology	Burial	Bone	Age Class	Age	Sex
23	1097	Bronocice	C5	1	3700-3300	XVII	long bone	senilis	50	M
24	1098	Bronocice	C5	1	3700-3300	XIX	Rib	adultus	35.9	M
25	1099	Bronocice	C1	1	3700-3300	XV	Rib	adultus	18	F
26	1100	Bronocice	C2	1	3700-3300	V	long bone	adultus	35.9	
27	3001	Bronocice	C2	1	3700-3300	IV	femur	adultus	35.9	
28	3002	Bronocice	C5	1	3700-3300	XVIII	Rib	adultus	35	M
29	3003	Bronocice	C5	1	3700-3300	XX	Rib	adultus	35.9	F
30	1104	Bronocice	B1	4	2600-2500	XI	Rib	senilis	50	M
31		Słonowice		4	2700-2400	2=3	Rib			
32		Szarbia		4	2700-2400	3=8	Rib	maturus	45	F
33		Łękawa		4	2700-2400	3	Rib	adultus	25	M
34		Wójeczka		4	2700-2400	1=1	Rib			
35		Wójeczka		4	2700-2400	2=2	Rib	adultus	35.9	M
36		Wójeczka		4	2700-2400	3=3	clavicle	senilis	50	M
37		Samborzec		4	2700-2400	19	Rib			
38		Samborzec		4	2700-2400	21	Rib	senilis		M
39		Samborzec		4	2700-2400	23	Rib	maturus		F
40	3004	Bronocice	C2	2	3700-3650	6=1	Rib	adultus		M
41	3005	Bronocice	C2	2	3700-3650	6=2	Rib	adultus		F
42		Słonowice		5	1700-1500	16=10	Rib	maturus		M
43		Słonowice		5	1700-1500	17=2	Rib	juvenis		M

tions involved consider the comparative ratio of Ba to Sr to Ca in population subsets, Ba/Sr has been plotted against the Ca/P ratio, resulting ratio determines the relative level of diagenesis in each bone specimen (Reiche *et al.* 2003). While indicators of diagenesis may be high, it does not seem to exert any significant influence on the distribution of Ba/Sr values in the population.

Caution is advised in interpreting these results, but the analysis was done and must be reported in consideration of the fact that the bone samples analyzed were destroyed.

This study initially followed the methodology outlined by Burton and Wright (1995) and Burton (1996) in using Ba/Ca and Sr/Ca measures to analyze differences in biopurification of dietary Ca due to relative levels of plant, meat, and dairy components in the diets of different populations. Biopurification refers to the process by which higher levels of Calcium are used in the creation of new bone in comparison with other trace elements, such as Barium and Strontium, as calcium occurs in higher ratios as one moves up the food chain. These data were transformed to log values following Burton and Price (2002) in order to facilitate a normal distribution of the trace element values.

By applying a simple two-sided T-test between each of the sample populations (samples being defined by culture affiliation, excluding those two cultures which had insufficient sample sizes – the Lublin-Volhynian and Bronze Age groups) the Sr / Ca ratio was found to differ at a highly significant level ($p < .001$) between Funnel Beaker and Funnel Beaker-Baden groups, and at a slightly less significant one ($p < .001$) between Funnel Beaker-Baden and Corded Ware groups, although not between Funnel Beaker and the Corded Ware culture. It is noteworthy that Funnel Beaker and Corded Ware are not adjacent in time, but are separated by the Funnel Beaker-Baden culture.

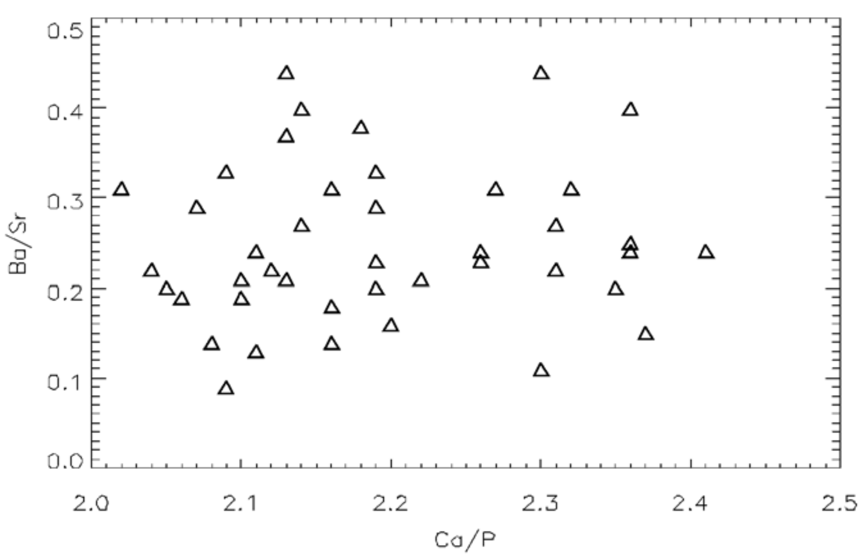

Figure 1. Ba/Sr variation plotted against Ca/P measure of diagenesis

Table 3. Trace element analysis data from six sites

ID	UW	Site	Unit	Culture	Chronology	Burial	Bone	Age Class	Age	Sex	al	ba	Ca	fe	k	mg	mn	na	p	sr	zn	ca/p	ba/sr	ba/ca	sr/ca
1	1093	Bronocice	A1	3	3300-2900	XVI	Rib	Juvenis	7		306	217	411424	457	458	1161	89	3118	174367	857	624	2.360	0.253	0.000527	0.002083
2	1094	Bronocice	B1	3	3300-2900	XIII-5	Tibia	Juvenis	4.5		842	142	392214	837	817	1253	74	4756	176624	665	424	2.221	0.214	0.000362	0.001696
3	1096	Bronocice	B1	3	3300-2900	XIV	Rib	Adultus	32.5	M	205	127	401440	330	412	1094	284	4135	170534	644	792	2.354	0.197	0.000316	0.001604
4	1101	Bronocice	A3	3	3300-2900	XXIV	Rib	Adultus	19	F	242	97	383286	485	649	1148	69	4544	166737	868	358	2.299	0.112	0.000253	0.002265
5	1102	Bronocice	B1	3	3300-2900	XIII-1	Rib	Adultus	19	F	251	93	390447	249	623	1124	190	4410	164790	615	275	2.369	0.151	0.000238	0.001575
6	1103	Bronocice	B6	3	3300-2900	XXII	Rib	Adultus	32.5	M	373	161	383745	365	629	1107	315	3961	169319	521	310	2.266	0.309	0.000420	0.001358
7	3006	Bronocice	B1	3	3300-2900	X	Rib	Adultus	30	F	248	200	373753	632	472	820	1027	5264	180219	691	463	2.074	0.289	0.000535	0.001849
8	3007	Bronocice	Bd	3	3300-2900	XXI	Rib	Juvenis	8.5		234	108	387793	282	478	833	160	3660	186608	788	359	2.078	0.137	0.000278	0.002032
9	3008	Bronocice	B1	3	3300-2900	XIII	Rib	Juvenis	5		215	134	377394	69	435	1197	309	5160	179627	635	142	2.101	0.211	0.000355	0.001683
10	3009	Bronocice	B1	3	3300-2900	XIII-3	Rib	Juvenis	10		174	52	384351	135	359	894	328	4264	183525	575	300	2.094	0.090	0.000135	0.001496
11	3010	Bronocice	B1	3	3300-2900	XIII-4	Rib	Adultus	18	M	138	116	383142	55	436	1372	57	4768	174484	706	138	2.196	0.164	0.000303	0.001843
12	3011	Bronocice	B1	3	3300-2900	XIII-6	Rib	Adultus	25	M	117	104	383083	67	397	1415	183	4755	177569	743	357	2.157	0.140	0.000271	0.001940
13	3012	Bronocice	B1	3	3300-2900	XIII-7	Rib	Juvenis	3.5		126	189	384790	170	376	1206	94	5157	181882	810	314	2.116	0.223	0.000491	0.002105
14	3013	Bronocice	B1	3	3300-2900	XIII-10	Rib	Juvenis	5		211	168	385387	179	591	1627	80	4811	187689	830	273	2.053	0.202	0.000436	0.002154
15	3014	Bronocice	B1	3	3300-2900	XIII-11	Rib	Juvenis	0.6		153	296	381609	249	506	1256	373	4975	189204	967	332	2.017	0.306	0.000776	0.002534
16	3015	Bronocice	B1	3	3300-2900	XIII-12	Rib	Juvenis	7.5		154	281	393622	53	497	1979	30	5338	188086	862	209	2.093	0.326	0.000714	0.002190
17	3016	Bronocice	B1	3	3300-2900	13-13	Rib	Juvenis	15		139	103	413409	258	349	1790	264	4905	195841	778	965	2.111	0.132	0.000249	0.001882
18	3017	Bronocice	B1	3	3300-2900	XIII-14	Rib	Juvenis	7		142	142	384368	102	503	1016	321	4905	186685	750	455	2.059	0.189	0.000369	0.001951
19	3018	Bronocice	B1	3	3300-2900	XIII-15	Rib	Juvenis	8		158	198	416146	128	395	1873	133	5501	190250	854	271	2.187	0.232	0.000476	0.002052
20	3019	Bronocice	B1	3	3300-2900	XIII-16	Rib	Juvenis	3		156	142	384307	164	449	942	110	4827	187996	649	253	2.044	0.219	0.000369	0.001689
21	3020	Bronocice	B1	3	3300-2900	XIII-17	Rib	Juvenis	0.8		204	147	385960	527	436	1318	814	4527	183487	778	360	2.103	0.189	0.000381	0.002016
22	1095	Bronocice	C2	1	3700-3500	IX	long bone	Adultus	35.9		253	89	400614	103	306	822	203	4024	170086	358	150	2.355	0.249	0.000222	0.000894
23	1097	Bronocice	C5	1	3700-3300	XVII	long bone	Senilis	50	M	426	78	410773	210	658	900	58	4405	170643	322	151	2.407	0.242	0.000190	0.000784
24	1098	Bronocice	C5	1	3700-3300	IXX	Rib	Adultus	35.9	M	566	169	391679	519	572	757	1127	4207	165662	427	710	2.364	0.396	0.000431	0.001090
25	1099	Bronocice	C1	1	3700-3300	XV	Rib	Adultus	18	F	335	134	396770	304	541	763	54	3567	170863	433	218	2.322	0.310	0.000338	0.001091
26	1100	Bronocice	C2	1	3700-3300	V	long bone	Adultus	35.9		502	79	389861	169	540	806	454	3739	165197	333	178	2.360	0.237	0.000203	0.000854
27	3001	Bronocice	C2	1	3700-3300	IV	femur	Adultus	35.9		247	51	390747	26	510	769	64	3466	178356	257	135	2.191	0.198	0.000131	0.000658
28	3002	Bronocice	C5	1	3700-3300	XVIII	Rib	Adultus	35	M	362	64	381970	282	361	740	90	4762	179264	305	166	2.131	0.210	0.000168	0.000798
29	3003	Bronocice	C5	1	3700-3300	XX	Rib	Adultus	35.9	F	293	75	395804	102	366	1042	13	4760	175384	331	159	2.257	0.227	0.000189	0.000836
30	1104	Bronocice	B1	4	2600-2500	XI	Rib	Senilis	50	M	261	119	385310	371	673	1175	372	5401	166961	543	635	2.308	0.219	0.000309	0.001409
31		Słonowice		4	2700-2400	2=3	Rib				244	116	385542	122	155	967	86	4508	177049	308	108	2.178	0.377	0.000301	0.000799
32		Szarbia		4	2700-2400	3=8	Rib	Matures	45	F	99	134	378262	545	154	911	360	5436	178901	548	673	2.114	0.245	0.000354	0.001449
33		Łękawa		4	2700-2400	3	Rib	Adultus	25	M	269	118	384707	237	273	897	731	4628	175873	401	413	2.187	0.294	0.000307	0.001042
34		Wójeczka		4	2700-2400	1=1	Rib				245	97	391969	637	346	866	303	4519	173094	406	642	2.264	0.239	0.000247	0.001036
35		Wójeczka		4	2700-2400	2=2	Rib	Adultus	35.9	M	357	79	392500	128	261	768	226	4272	170181	296	126	2.306	0.267	0.000201	0.000754
36		Wójeczka		4	2700-2400	3=3	clavicle	Senilis	50	M	112	60	383744	19	236	801	172	4201	177545	331	220	2.161	0.181	0.000156	0.000863
37		Samborzec		4	2700-2400	19	Rib				116	129	381520	415	140	968	72	4677	179334	350	268	2.127	0.369	0.000338	0.000917
38		Samborzec		4	2700-2400	21	Rib	Senilis	60.9	M	124	105	380514	267	344	988	89	6206	177475	262	621	2.144	0.401	0.000276	0.000689
39		Samborzec		4	2700-2400	23	Rib	Matures	45.9	F	68	160	392867	128	108	1213	164	4153	171106	367	181	2.296	0.436	0.000407	0.000934
40	3004	Bronocice	C2	2	3700-3650	6=1	Rib	Adultus	30	M	128	112	398294	127	296	943	102	4510	184206	357	143	2.162	0.314	0.000281	0.000896
41	3005	Bronocice	C2	2	3700-3650	6=2	Rib	Adultus	35	F	141	118	389314	151	253	1035	23	5120	177831	361	162	2.189	0.327	0.000303	0.000927
42		Słonowice		5	1700-1500	16=10	Rib	Matures	45.9	M	128	232	383093	145	82	840	14	2820	179600	522	187	2.133	0.444	0.000606	0.001363
43		Słonowice		5	1700-1500	17=2	Rib	Juvenis		M	38	202	383377	88	210	1121	14	2422	179409	740	155	2.137	0.273	0.000527	0.001930

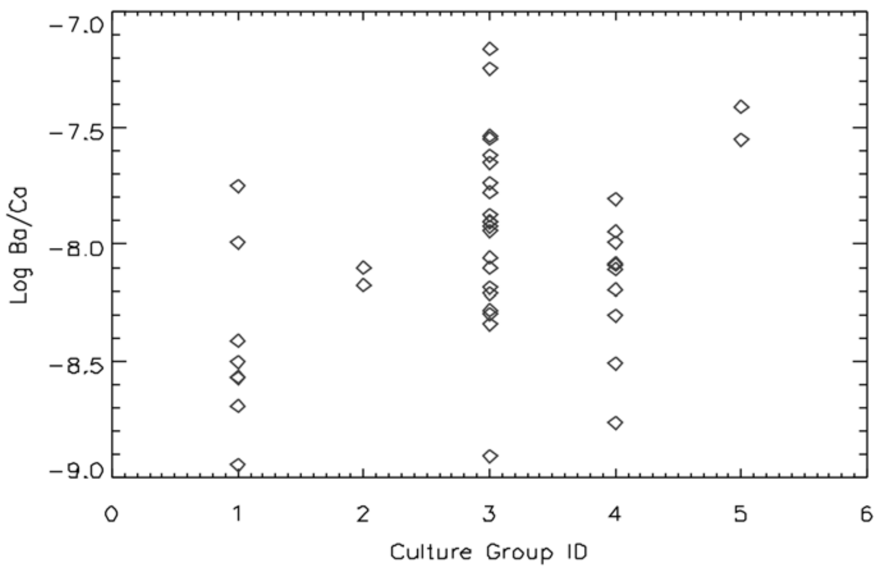

Figure 2. Log of Ba/Ca plotted per each sample, grouped by culture group affiliation. The third group (Funnel Beaker-Baden) is by far the most diverse. (1) Funnel Beaker (2) Lublin-Volhynian (3) Funnel Beaker-Baden (4) Corded Ware (5) Bronze Age

In Figure 1, while several of the points lie outside of the normally accepted range, we can rule out a predictable influence of diagenesis.

It is difficult to interpret the differences between these groups (Figure 2). Even omitting the possibility that due to diagenesis, the present soil state may have influenced trace element variation more than past diets, it still may not be true that increased consumption of meat occurred over time.

According to Burton and Wright (1995) and Burton (1996), meat is demonstrably low in calcium, and if milk and dairy products are not consumed and the diet has access to plants high in calcium, then an increase in meat consumption by as much as o to 70% in the diet may be masked. Also trends in Sr/Ca and Ba/Ca that suggest an increase in meat consumption could also result from an increase in high calcium plant consumption or changes in the preparation habits of either meat or plants. In addition, the influence of region of origin on diet cannot be ruled out.

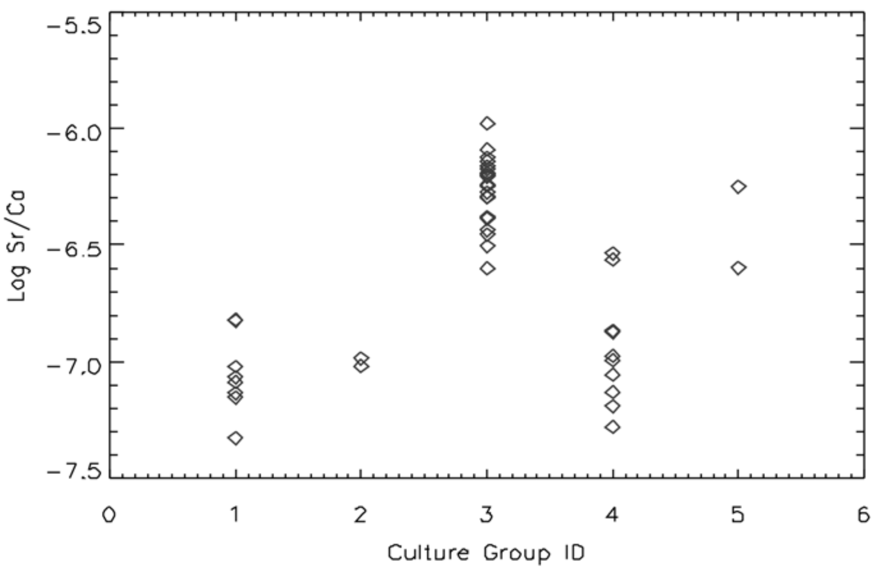

Figure 3. Log Sr/Ca values. The value range is much tighter for each cultural group. (1) Funnel Beaker (2) Lublin-Volhynian (3) Funnel Beaker-Baden (4) Corded Ware (5) Bronze Age

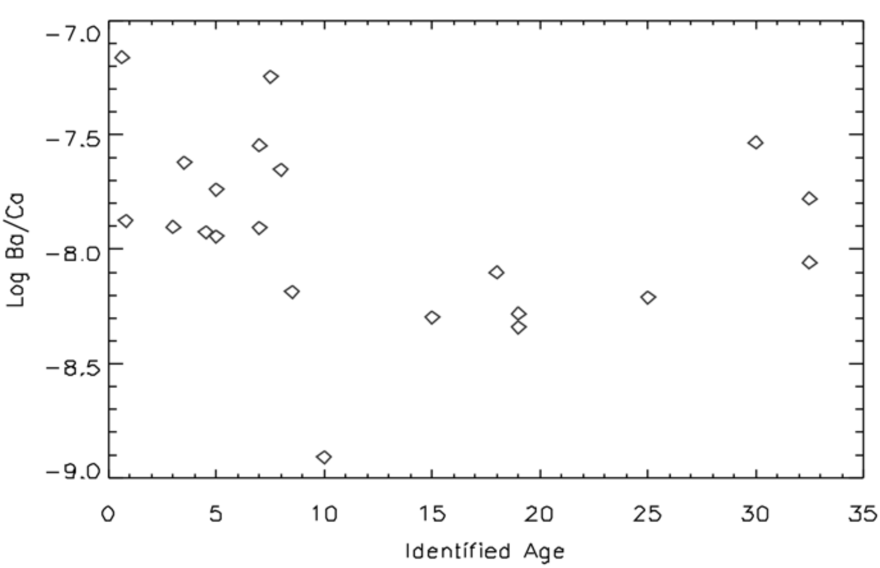

Figure 4. Log Ba/Ca plot values for all individuals of the Funnel Beaker-Baden group

In Figure 3, Ba/Ca values for the Funnel Beaker-Baden group are noticeably more variable than those with other groups, although all groups clustered more neatly in Sr/Ca values than Ba/Ca values. Figure shows how the age of individuals influences the Log Ba/Ca values, though this is not the case with the Log Br/Ca values.

This relationship was investigated statistically. With a division made between individuals aged over 10 and individuals aged 10 and under, a T-test of variance of sample means proved to be significant at $p < .001$. This differed from the earlier T-test between populations as the assumption of equal variance did not hold (Levine's Test provided α value at 0.1, making this assumption problematic). A regression function fitted to age as the explanatory variable for Log Ba/Ca was significant, but only at $p < .1$, and a more suitable regression was sought.

Figure 4 reveals that there is a clear difference between the youngest and oldest individuals and the individuals aged between 10 and 25. We term this difference the Barium depletion feature.

Figure 5 shows that the clear variation due to age in the Br/Ca plot is not apparent here. There is no strontium depletion feature. The Barium

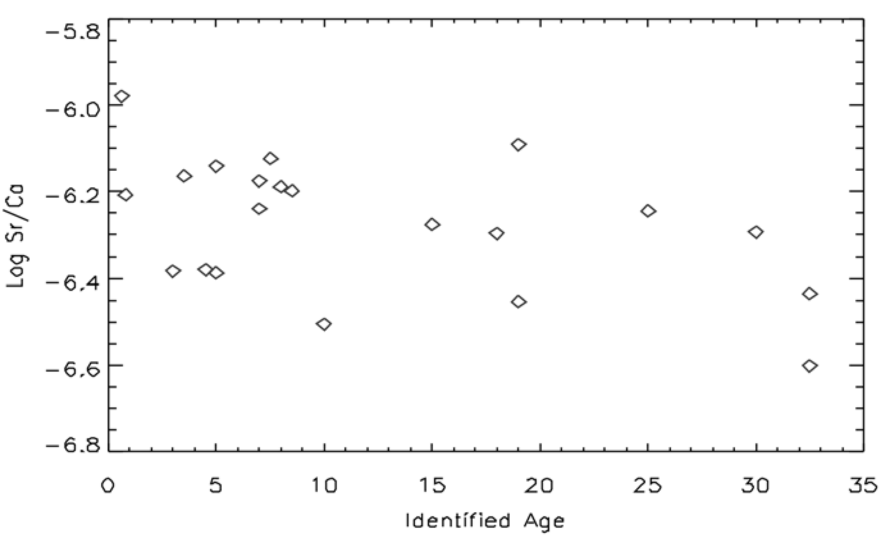

Figure 5. Log Sr/Ca plot values for each of the individuals of the Funnel Beaker-Baden group

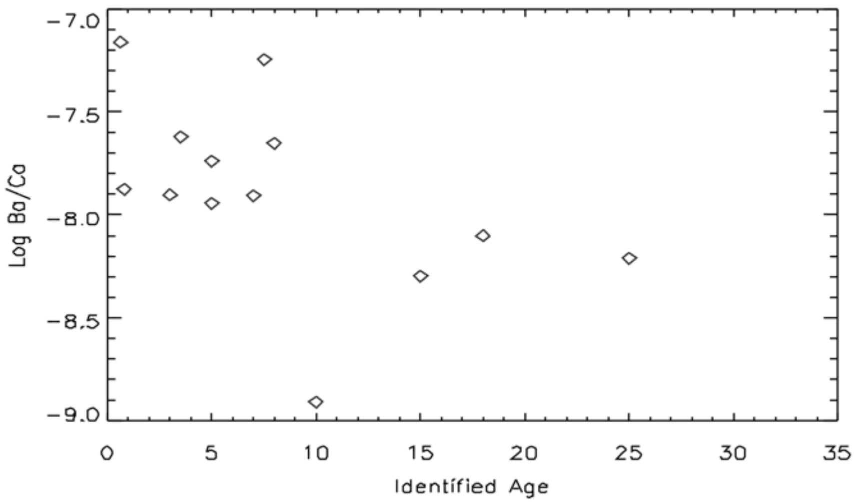

Figure 6. Log Ba/Ca values plotted against age for the individuals buried in grave XIII-B1. There is no overlap in Log Ba/Ca values between the 10 and over group and the under 10 group

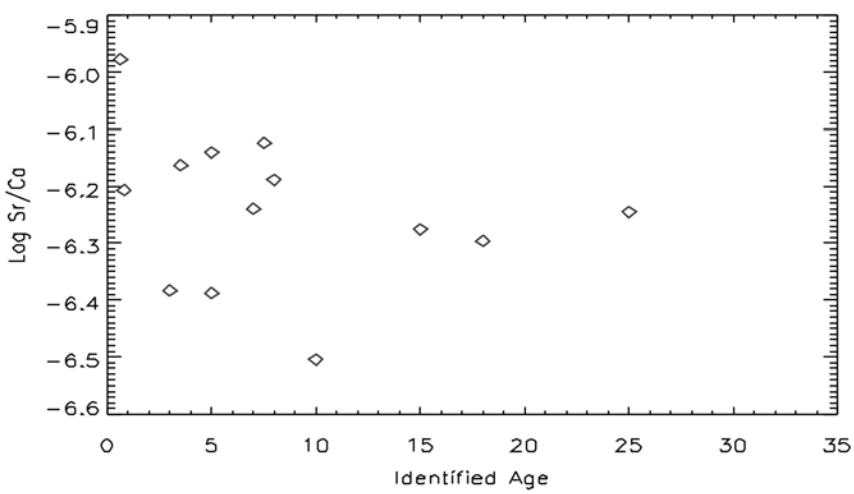

Figure 7. Log Sr/Ca values plotted against age for the individuals from grave XIII-B1. While there is a general downward trend in strontium, there is no clear depletion feature, as with the Ba/Ca group

depletion feature is most notable in those individuals in the mass burial XIII-B1. Once again there is no strontium depletion feature in this sample (Figure 7).

If the for biopurification of dietary calcium explains the variation between the samples then it should impact Ba and Sr values similarly (Burton, Price, and Middleton 1999). This is true to some extent for the entire Bronocice sample (Figures 2 and 3), but not for the Funnel Beaker-Baden sample, nor, especially, that of burial XIII-B1. As the age groups on the burial XIII-B1 are also significantly different from one another ($p < 0.001$), other explanations must be sought. The variation of barium but not strontium in one sample suggests that the Ba/Ca ratio is not an indicator of the increased biopurification of calcium (Burton, Price, and Middleton 1999). Burton, Price, and Middleton (1999) and Burton and Price (1999) describe three factors which may affect this ratio:

1) Regional variability of food source, due either to the mobility of the community or of its food source – from exchange of grain to ranging of herds and can be somewhat analogous to strontium isotopes in migration studies (see also Burton *et al.* 2003).

2) A large marine component in the diet

3) The effects of diagenesis.

As the results of the analysis are contingent upon the hypothesis (garnered from visual examination of the data) that the Sr/Ca and Ba/Ca values are correlated in some cases and not others; this assumption must be tested quantitatively.

Fitting a regression to the relationship between the Sr/Ca and Ba/Ca values produced an R2 coefficient of .86 for Burton, Price, and Middleton (1999), which the authors interpreted as strong enough to suggest biopurification as a suitable cause for Ba and Sr elevation in their data. In comparison, the overall R2 value for the entire set of trace element data from Bronocice is only 0.379 and for the Funnel Beaker-Baden sample it is a mere 0.272, neither statistic is significant at $p < 0.05$.

To see if the biopurification hypothesis is valid between any of the sample populations, a regression was attempted between Sr/Ca and Ba/Ca for the other two culture groups with a significant sample size. In the case of the Funnel Beaker (Culture 1) sample population, the R2 for the

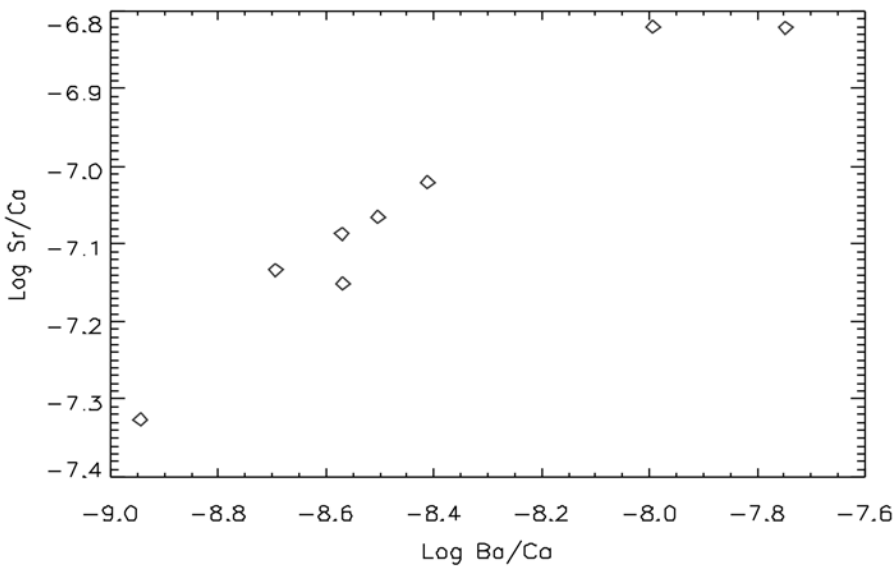

Figure 8. Plot of Log Sr/Ca against Log Ba/Ca for all individuals of the Funnel Beaker sample population, demonstrating the high correlation between the strontium and barium values in this case

correlation between Sr/Ca and Ba/Ca (Log values) is 0.935 – and significant at $p < .001$. While it was expected that there may be a similarly strong correlation between Log Sr/Ca and Log Ba/Ca values within the Corded Ware population, this correlation proved to be a rather insignificant one with R2 at 0.156 and $p > 0.1$.

The lack of correlation between Sr/Ca and Ba/Ca in the Funnel Beaker-Baden group makes it impossible for us to conclude that biopurification is the cause of the difference between it and the earlier Funnel Beaker population. The lack of correlation between Sr/Ca and Ba/Ca in both the Funnel Beaker-Baden and the later Corded Ware group prevent us from pinpointing biopurification as well. It is likely that something in diet composition changed after the Funnel Beaker period. But the strong correlation between Sr/Ca and Ba/Ca is not present again (at least not in this sample).

Age and gender groups within others cultures and for the site sample were tested using the two sided T-test method as well, but no general gender or age differences in diet were found to be significant at $p < 0.05$. Other measures, including Zn/Sr ratios (after Szostek *et al.* 2003) were also tested and found to be insignificant as measures of difference between these samples.

Conclusions

It may well be that trace element ratio variations may be due to diagenesis and the impact of local soil conditions on skeletal remains during the time between individuals' deaths and analyses of the trace element components. Even if this is not the case, we are still hard-pressed to draw any strong conclusions from the data. This is unfortunate. Biopurification, migration, and dietary differences are all possible explanations of trace element variations, yet none can be demonstrated.

There are differences between the younger individuals in Grave XIII-B1 and older individuals in the same burial, but we cannot determine on the basis of this analysis whether this is due to regional differences in diet, or a change in dependence on marine food sources (usually strongly correlated with a sharp barium depletion feature). Similarly, the strong correlation between the Sr/Ca and Ba/Ca ratios in the Funnel Beaker population may indicate that this group was more sedentary and less likely to consume foods from different regions, whereas the later Funnel Beaker-Baden and Corded Ware groups may have either moved more frequently or consumed more food from different source regions or environments.

Trace element studies seemed promising when the laboratory analysis was performed (Katzenberg and Harrison 1997). But after much criticism (see Burton and Price 2002; Sandford and Weaver 2000) archaeology has largely abandoned it in favor of other avenues to past diets (Meigs and Knudson 2004). These other types of analysis – e.g. stable isotope analysis (e.g. Knudson *et al.* 2004), or aggressive exploration for extant DNA in the samples, etc. – would all be helpful in discriminating among these possibilities. For example, trace element analysis has been successfully used in conjunction with more recently developed techniques to explore the possibility of residential mobility (Knudson and Price 2007). The different possibilities suggested in this study are worth exploring and it is hoped that future analysis of these samples may resolve some of these issues.

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APPENDIX B

Oxygen Isotopic Composition of Individuals Buried in a Neolithic Collective Grave at Bronocice – Weaning Stress Reconstruction and Identification of Origin

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Introduction

Studies of the migrations of human groups and/or the proportions of non-local individuals in chronologically and culturally diverse populations do not aim only at population dynamics. They also provide valuable supplements to our knowledge about groups using different economic, cultural, and social strategies of life. In such studies stable oxygen isotope analysis is a useful tool. Oxygen in the human organism comes from diverse sources, but the major factor that affects isotopic composition in tissue is available drinking water. Isotopic ratios in bones and teeth reflect those typical of the area where an individual developed and lived. These

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are assessed by measuring isotope concentrations in apatite samples from the bones of animals sharing the environments of the human groups under study.

The aim of this research is to determine if individuals buried in the collective burial XIII-B1, pit 36-B1, at Bronocice were members of the local community inhabiting the settlement during the Funnel Beaker-Baden Phase 5. An attempt was also made to determine the community's breastfeeding practices. A femur sample and root dentin samples from the permanent (adult) and milk (children's) teeth were subjected to stable oxygen isotope analysis. Samples were taken from 22 individuals, including 17 in the pit 36-B1, collective burial (one adult, three juveniles and eight infant I, five infants II) and five found within the area of settlement (four adults and one child). Analysis was also conducted on 21 animal bone samples.

Stable Isotope Analysis

The analysis of the stable isotopes of oxygen ($^{18}O/^{16}O$) occupies a central place among the biochemical studies performed on skeletal material. The basis for its use was provided by Longinelli (1984), whose methodology has served as the foundation for its use in archaeological contexts today. In that study, the link between $^{18}O/^{16}O$ ratio in environmental water and the mineral fraction of human bone tissue was confirmed. When combined with hydrological observations linking the isotopic composition of oxygen in environmental water and the geographic and climatic conditions in the area in question, the method makes it possible to reconstruct the habitat both of individuals and human groups (e.g. Wright and Schwarcz 1996; Dupras and Schwarcz 2001; Hoogewerff *et al.*, 2001; White *et al.* 2004a, 2004b; Knudson 2009; Szostek *et al.* 2011; Kozłowski *et al.* 2014; Włodarczak *et al.* 2011). Such analyses have been useful for tracking the seasonal movements of both animals and people (e.g. Rubenstein and Hobson 2004; Britton *et al.* 2009; Henton *et al.* 2010; Shaw *et al.* 2010), the migration of individuals between groups, and the origins of settlements in given areas (e.g. White *et al.* 1998; White *et al.* 2004b; Prowse *et al.* 2007; Szostek *et al.* 2014). Studies of this type also facilitate the assessment of past climate changes (e.g. Longinelli 1984; Ayliffe and Chivas 1990; Bocherens *et al.* 1995; Fricke *et al.* 1998; Daux *et al.* 2005). Though this method is most often employed to reconstruct migrations, it can be applied in other research. It enables the age at which a child ceased to be breast-fed to be determined, and so can be used to supplement the stable carbon and stable nitrogen analysis of children's bones and teeth (Wright and Schwarcz 1999; Richards *et al.* 2002; Fuller *et al.* 2006).

Oxygen occurs in three stable isotopes – ^{16}O, ^{17}O and ^{18}O – in the following proportions: ^{16}O – 99.758%, ^{17}O – 0.0373% and ^{18}O – 0.204% (Hoefs, 2004). In nature, it is possible to observe the isotopic fractionation of oxygen in different components of the environment. Variations in the $^{18}O/^{16}O$ ratio in environmental water result largely from geographic and climatic factors in a given area. The most important of these are geographic latitude and continental, altitude, temperature, and seasonal effects (Gat 1996; Bowen and Wilkinson 2002; Hoefs 2004). In addition, the different $\delta^{18}O$ levels in environmental waters depend on local differences in precipitation and these levels also decrease with height above sea level and declining air temperature (White *et al.* 1998; Knudson and Price 2007; McGlynn, 2007).

Elements, including oxygen, are absorbed by living organisms either directly or indirectly from the resources available in the surrounding ecosystem, air, soil, water, food *etc*. This leads to equilibrium of elements and isotopes between plants, animals, and people and the environment in which they live. This equilibrium is reflected in the isotopic composition of their tissue (West *et al.* 2006). The $\delta^{18}O$ level of body water in warm-blooded animals is determined by the balance between assimilated and excreted oxygen (Bryant and Foerlich, 1995). In humans, the main source of such oxygen is water that has been drunk, which comprises around 70% of the complete oxygen pool in the body (Daux *et al.* 2008). The remaining percentage comes from water contained in food, water originating from metabolic changes occurring during eating, and from atmospheric air. Oxygen is excreted by urination, sweat, and exhaled carbon dioxide, and water vapour (Luz and Kolodny 1989; Stepańczak *et al.* 2014).

Drinking water is thus the main source of the isotopic variation of oxygen in both body water and bone and tooth tissue (Lécuyer *et al.* 1996; Daux *et al.* 2008). For prehistoric and most historic human populations, the main source of drinking water was environmental water, i.e. streams, rivers, lakes etc. occurring on the land settled by given groups (Dupras and Schwarcz, 2001; White *et al.* 2004a). Although the oxygen metabolism occurring on the environmental water → body water → bone tissue path is accompanied by oxygen isotope fractionation. There is an observable linear dependency between the $^{18}O/^{16}O$ ratio of environmental water and bone tissue (Longinelli 1984; Lécuyer *et al.* 1999).

Studies must establish the $^{18}O/^{16}O$ ratio in a given environment, which serves as a point of reference for the results of analyses of the isotope composition of human bones and teeth from a particular site (Knudson 2009). There are two ways to do this. The local oxygen isotope level may be established by measuring isotope ratios in the environmental water i.e., storm water, watercourses and, more rarely, water in lakes (Dupras and Schwarcz 2001; Prowse *et al.* 2007; Eckardt *et al.* 2009). The reference level may be determined on the basis of isotope concentrations in apatite samples isolated from the bones of animals sharing the environment of the human groups under study (Bentley *et al.* 2005; Shaw *et al.* 2010), This study is based on the both method. The remains of less mobile animals, which do not graze freely on open space or graze in spaces of only modest size, provide the best archaeozoological data concerning local geochemical and climatic conditions since they express even the most subtle isotopic changes occurring in a given area (Bentley *et al.* 2004; Pearsall 2008; Pellegrini and Longinelli 2008; Yanes *et al.* 2009).

The basis for reconstructing the life history of a given individual is the constant histological and elemental remodelling of the bone. The pace of this process affecting the compact portion of long bones reaches 4-8%/year in adults, which means that the oxygen isotope composition in this tissue represents the final years of an individual's life (Manolagas 2000). In children, the process lasts about a year due to the intense pace of bone development, growth and modelling. It lasts only a few months in the case of newborns (Parfitt *et al.* 2000; Williams *et al.* 2005; Turner *et al.* 2007).

In teeth enamel, no elemental remodelling occurs after growth and mineralisation have been completed (Balasse 2003; Reid and Dean 2006; Prowse *et al.* 2007). Elemental turnover is observed in primary dentin, but this appears to be of little importance over the course of an individual's life (Balasse 2003; Reid and Dean 2006). Thus it is the elemental (and therefore the isotopic) composition of childhood and adolescence, the period of tooth development, that is preserved in both enamel and dentin (Balasse 2003). Knowledge of the sequence of development and the rate of mineralisation of the enamel and dentin of individual teeth might be used for tracking an individual's activity, such as migrations and diet, through the successive stages of childhood (White *et al.* 2004a; Dupras and Tocheri 2007; Prowse *et al.* 2007). Thus, the comparative analysis of oxygen isotope ratios in various types of teeth and in the bones of the postcranial skeleton makes it possible to detect changes in an individual's residence at various stages in their biological development.

This research aims to answer the following questions of: are the individuals buried in the collective burial grounds, members of a local community inhabiting the settlement, and is it possible to identify individuals among the buried who changed their residences over the course of their life? The presence of adult individuals and children representing every age group in the collective grave, also permits some analysis of breastfeeding practices. The age at which a child was weaned is crucial because it not only establishes this fact and also the period during which it was fed its mother's milk, but within the context of the diversification associated with the fractionating of oxygen isotopes, it helps to reconstruct the potential mobility of children.

Sample description

The graves of the "Funnel Beaker-Baden" Phase of settlement (phase 5, 3300-3100 cal. BC) were found in pits at depths of 50 cm to 150 cm. The skeletons were arranged in different ways. Some supine, others were laid on their side. The skeleton from grave VII-A1 (Kruk and Milisauskas 1981) was laid face down, while in grave XV-B1 the remains of two individuals, a woman and a child laid on her right hand side, were found. The collective grave of 17 individuals (pit 36-B1, grave XIII-B1) was uncovered at the bottom of a circular pit with a diameter of about 180 cm and a depth of 90-120 cm. (Fig. 1). Single human skeletons were found in four pits from phase IV and in three pits from phase V. Generally, these consisted of a few skeletal elements within non-burial pits (Pipes *et al.* 2010). It

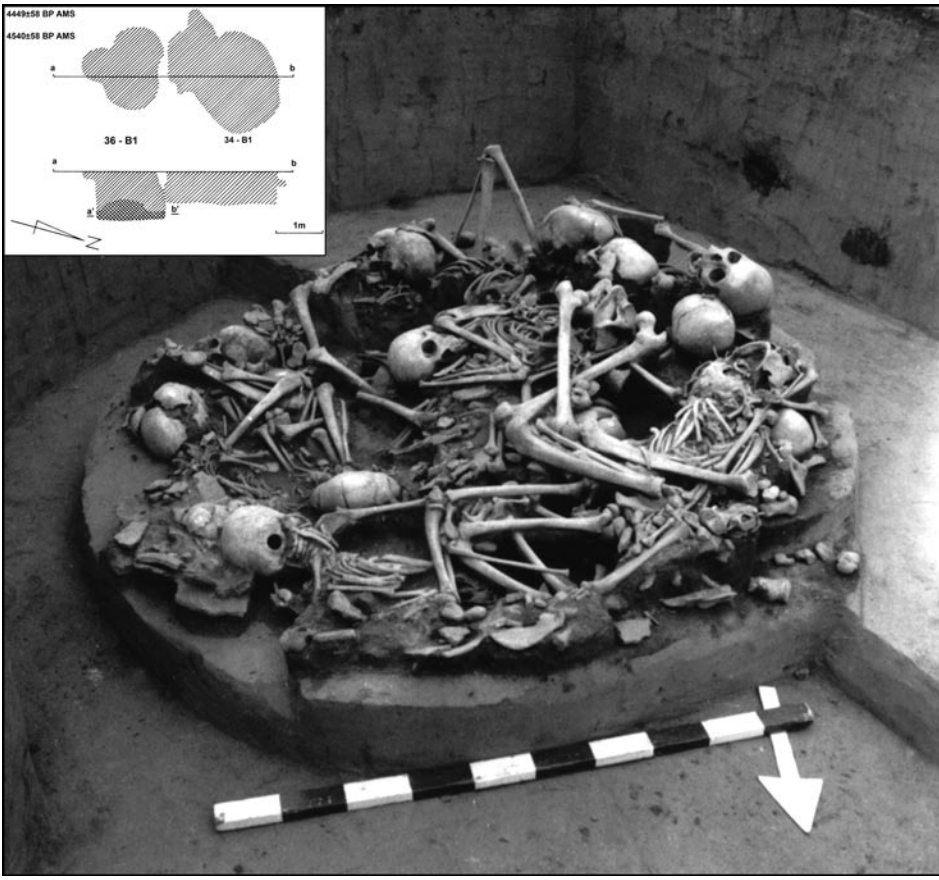

Figure 1. Collective grave XIII-B1 from Bronocice settlement with stratigraphic plan

seems likely that they represent accidental inclusions caused by later disturbances. There are no isolated human remains from phases II and III. This may correspond to periods of regional prosperity and stability.

The arrangement of the skeletons in the collective grave was not random. In the center, on the top, there were the remains of an adult male, while the majority of the juveniles and children skeletons were situated at the circumference of the pit, in the eastern and the southwestern part. The remaining skeletons were lying between them, occupying the free space (Haduch 2004).

The age of death of these individuals was estimated using anthropological criteria (Ubelaker, 1984). These include the parameters and proportions of their skulls, the proportions of their limbs and also body height when alive, established on the basis of measurements of long bones (Haduch 2004).

The skeletons from the Brononice site are to a large degree of morphological similarity with visible sexual dimorphism in the metrical parameters. Analysis of anthropometric characteristics and macroscopic comparison of selected, significant diagnostic morphological traits allowed us to establish that the burial XIII-B1 adult and juveniles are consistent in these characteristics with other skeletons from the Bronocice settlement that represent the same time horizon (Haduch 2004).

Material and methods

A femur and rib samples and root dentin samples were taken from permanent adult and milk children's teeth and subjected to oxygen isotope analysis. Bones and teeth taken from 22 individuals, including 17 from the multiplle grave (one adult, three juveniles, thirteen infants and children) and other five found in this settlement, (four adults and one child). In the case of seven adults, a fragment of the compact bone of a femur and a tooth (first permanent premolar – three individuals; second permanent premolar – four individuals) were obtained for analysis. In the case of the two non-36-B1 adults analysis was based on teeth alone (Individual XIV-B1 – second permanent premolar; Individual XV-C1,-1 – second permanent premolar). In these cases, despite repeated attempts, it was not possible to isolate from bone a phosphorus fraction suitable for spectrometric analyses. Rib and tooth fragments were obtained from six children (first milk molar – one individual; second milk molar – five individuals), and a femur and first milk molar from one child. For the remaining six children, the isotopic analysis was conducted only on rib samples. In total, the oxygen isotope composition of 36 bone and tooth samples was determined (Tab. 1). Analysis was also carried out on 21 animal bone samples (11 from sheep, and 10 from cows) in order to establish the $^{18}O/^{16}O$ ratios typical of the environment in the Bronocice area during the

Funnel Beaker-Baden phase. The remains of these animals were associated with examined human remains. The methods used on the human skeletal material were the same.

A fragment of the long bone was cut off using a diamond-disc cutter and the remained spongy bone was removed. The dentin was collected from the top part of the root. All bone fragments were carefully cleaned using a mechanical method and washed in ultrasonic cleaner using spectrally pure water. The bone and dentin samples were dried in a drying oven at a temperature of 50°C. The collected skeletal elements were then ground in a Retsch MM600 ball mill.

Each dentin and bone sample was subjected to infrared spectroscopy method using a Fourier Transform-Infrared Spectrometer (FTIR), according to the methodology proposed by Wright and Schwarcz (1996). In order to determine the degree of advancement of diagenetic processes, the reciprocal band intensity (peak height) relations were analysed at four wave numbers: 565 cm^{-1} ($_{v4}PO_4$), 605 cm^{-1} ($_{v4}PO_4$), 1035 cm^{-1} ($_{v3}PO_4$) and 1415 cm^{-1} ($_{v3}CO_3$), and also at a narrowing in the region ~590 cm^{-1} appearing between bands 565 and 605 cm^{-1}. Two indicators commonly applied to diagenetic research were determined: the Crystallinity Index and carbonate/phosphate indicator (CO_3/PO_4 ratio) (Wright and Schwarcz, 1996; Dupras and Schwarcz, 2001; White *et al.*, 2004a; Lebon *et al.*, 2010).

The CI Index of the dentin and bone samples was determined on the basis of the height of the absorption bands at wave numbers 605 and 565 cm^{-1} characteristic of the asymmetrical bending vibrations of apatite phosphate groups and the narrowing between them at – 590 cm^{-1} according to the formula: $CI = (A_{565}+A_{605})/A_{595}$ (Wright and Schwarcz 1996). The carbonate-phosphate indicator (CO_3/PO_4 ratio) was determined as the band intensity ratio at wave numbers 1415 and 1035 cm^{-1}, characteristic of asymmetrical stretching vibrations of carbonate and phosphate groups ($CO_3/PO_4 = A_{1415}/A_{1035}$) (Wright and Schwarcz 1996).

The analysis of stable oxygen isotopes was conducted on phosphorus groups isolated from the apatite that forms the inorganic part of bones and teeth. The phosphates were separated from bone and tooth apatite using a method proposed by O'Neil *et al.* (1994), and prepared in the form of silver phosphate crystals for further analysis (Ag_3PO_4). The silver phosphate samples were subjected to spectrometric measurement of the oxygen isotope composition, which was conducted at the Radioisotope Applications Laboratory at Silesian Polytechnic in Gliwice. Each sample was measured three times and the results were averaged. The results of the spectrometric analysis were expressed in the form of a relative measurement (using "delta" notation), where the oxygen isotope ratio of the investigated sample was related to the oxygen isotope composition of a standard and expressed in per milles (Benson *et al.*, 2006), according to the formula:

$$\delta^{18}O(‰) = \frac{{}^{18}O/{}^{16}O_{sample} - {}^{18}O/{}^{16}O_{standard}}{{}^{18}O/{}^{16}O_{standard}} \times 1000$$

Silver phosphate prepared from an NIST 120c sample was used as an oxygen isotope composition standard. During the calculations, a $\delta^{18}O$ for NIST 120c equal to 21.7‰ in relation to the VSMOW scale was adopted as a benchmark (Lécuyer *et al.* 2007; Chenery *et al.* 2010). Consequently, all the results included in this paper of the oxygen isotope analysis of the investigated bone and tooth samples are expressed on the VSMOW scale (Coplen 1994).

Results and discussion

Diagenesis

An evaluation of diagenetic processes was conducted, which employed direct comparison of the value of the analysed indicators with the accepted ranges of variation in modern bones as well as a model of dependencies between indicators and the final oxygen isotope concentrations in the investigated bone tissue samples. According to data available in the literature, the CI (Crystallinity Index) in diagenetically unchanged human bone and dentin samples attains values ranging from 2.4 to 3.0. Crystallinity ranging from 3.0 to 3.6 is the result of minor diagenetic changes, probably not connected with the mineral part of bone tissue, but the result of gradual loss of the organic fraction. CI values higher than 3.6 provide evidence

Table 1. Isotopic and infrared characteristics for the analysed individuals (stars symbol represented diagenetical changes)

Burial no.	Units	Age	Sex	Root dentine				Bone			
				tooth type	CI index	CO_3/PO_4 ratio	$\delta^{18}O$	bone type	CI index	CO_3/PO_4 ratio	$\delta^{18}O$
Human samples											
XIII-1	B1	18-20	F?	P2	2,82	0,40	18,85	femur	2,69	0,57	19,27
XIII-2		4-5	?	m2	3,60	0,23	16,21	rib	2,93	0,35	17,35
XIII-3		10	?					rib	4,42*	0,15	15,87
XIII-4		18-20	M?	P1	3,16	0,35	15,46	femur	4,33*	0,21	20,33
XIII-5		4-5	?					rib	3,22	0,42	22,46
XIII-6		25	M	P2	3,04	0,40	21,68	femur	2,74	0,51	18,76
XIII-7		3-4	?					rib	3,85*	0,25	15,48
XIII-8		18-20	F?	P2	2,95	0,38	11,89	femur	4,17*	0,14*	19,01
XIII-9		1,5	?	m1	2,58	0,62	16,44	rib	2,69	0,48	12,84
XIII-10		5	?					rib	2,98	0,43	14,38
XIII-11		6 months	?					rib	2,68	0,50	16,97
XIII-12		7-8	?	m2	2,70	0,50	10,67	rib	3,30	0,32	15,35
XIII-13		15	?	P1	3,20	0,33	13,03	femur	3,62*	0,19	20,93
XIII-14		6-7	?	m2	3,16	0,35	22,21	rib	3,53	0,39	12,71
XIII-15		8	?	m2	2,66	0,47	21,94	rib	2,60	0,58	13,90
XIII-16		3	?	m2	3,07	0,40	13,73	rib	2,84	0,45	19,46
XIII-17		6-9 months						rib	3,21	0,33	12,14

Human samples											
VII	A1	50	F	P1	2,73	0,46	15,88	femur	2,99	0,69	13,55
X	B1	30	F	P2	3,27	0,24	13,99	femur	3,05	0,60	17,84
XIV		30-35	M	M2	3,29	0,26	15,10				
XV-1	C1	17-18	F	P2	3,10	0,38	10,92				
XV-2		3-4	?	m1	3,20	0,27	13,53	femur	3,16	0,30	12,79
Animal samples											
XV	C1		cow						3,11	0,33	12,12
XV			sheep						2,82	0,41	14,31
XIII	B1		cow						2,65	0,50	15,38
XIII			sheep						2,71	0,52	9,33
I	C2	1Z	sheep						2,99	0,38	19,39
I		2Z	cow						2,82	0,70	15,69
I		4Z	sheep						3,14	0,28	18
XI		5Z	sheep						3,63*	0,31	18,47
XI		6Z	sheep						2,91	0,37	19,37
XI		7Z	cow								17,71
VI		8Z	sheep						2,91	0,43	16,79
VI		9Z	sheep						3,39	0,20	22,77
VI		10Z	cow								16,83
VI		11Z	cow						2,95	0,57	16,39
XIII		12Z	sheep						2,92	0,55	18,36
XIII		13Z	sheep						3,30	0,22	19,16
XIII		14Z	cow						2,61	0,53	16,07
XIII		15Z	cow						3,21	0,20	17,75
XV		16Z	sheep						2,93	0,31	19,29
XV		17Z	cow						2,93	0,31	18,47
XV		18Z	cow						2,93	0,31	18,83

of structural and chemical changes to the nonorganic portion of bone and dentin, while crystallinity in excess of 4.2 indicates deep diagenetic changes in the osteological material (Berna *et al.* 2004; Lebon *et al.* 2010). In this analysis, reference is made to this scale. In the case of the CO_3/PO_4 indicator, both high and low values beyond the 0.15–0.7 range for bone or enamel can indicate changes in the mineral part of the osteological material. Results below 0.15 may be associated with the degradation of the fraction of biogenic carbonates or with the building into the crystalline network of secondary apatite with low carbonate content, e.g. francolite. In contrast too-high values of the CO_3/PO_4 indicator may indicate that the samples have been contaminated by calcite (Nagy *et al.* 2008; Yoder and Bartelink 2010).

In analysed five bone samples coming from the collective grave (individuals nos. XIII-3, XIII-4, XIII-7, XIII-8, XIII-13), the CI values exceeded the upper limit of the norm (Table 1). In the case of the CO_3/PO_4 indicator, only one bone sample (individual no. XIII – 8) was found to be slightly below the lower limit of the range for a modern bone. Due to the above, the samples which exceeded the ranges of the established diagenetic norms were excluded from further analysis.

Oxygen isotopes and reconstruction of origin analysed individuals

The isotopic composition of oxygen corresponding to the life environment of individuals from the collective grave and from the graves scattered around the settlement was determined on the basis of measurements of $^{18}O/^{16}O$ ratios in phosphates isolated from animal bones found at this site (Bentley *et al.* 2004; Shaw *et al.* 2010). Fragments of bones of 11 sheep and 10 cows were used for this purpose, which were found next to human skeletons. In addition, the bone $\delta^{18}O$ value was referenced against the isotopic level in the precipitation occurring over the Kraków area (the Bronocice region is about 40 km from Kraków). In the case of Poland and in particular, the southern part of the country, the variability in oxygen isotope ratios for the precipitation water is high, due both to the diverse climate (hot summer months and cold winter months) and the specific topography of the terrain (uplands and valleys). In the Kraków area, the average oxygen isotope ratio amounts to 9.83‰ with standard deviation of 3.27‰. The range of variability of the oxygen isotope level occurring in the Kraków

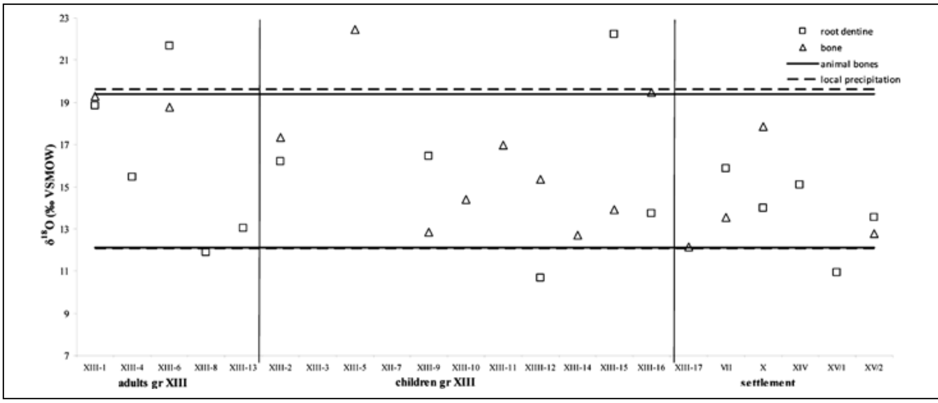

Figure 2. δ^{18}O isotope values depicted by serial bone and dentine analysis (lines indicated the range of oxygen ratios in phosphates of animal bones and local water precipitation range)

area was established based on the value of two standard deviations (Roberts *et al.* 2013), resulting in a local level between 16.37‰ and 3.29‰. This range corresponds to a δ^{18}O range of bone phosphate from 12.07 to 19.63‰ (Daux *et al.* 2008). The use of oxygen isotopes to determine migration is based on the relationship between the oxygen isotope composition of human bone and contemporary isotopic variation in its content in the precipitation within the studied region.

It should be borne in mind that isotope values attained from animal bones possess almost the same range of variability with respect to meteoric water coming from the investigated microregion (12.12-19.39‰ and 12.07-19.63‰ respectively) (Fig. 2).

In analysing the intra-individual variability within the studied tissues, it was observed that one adult specimen (XIII-6) and two children (XIII-5, XIII-15) possessed higher isotopic values originating from long bones than the upper isotopic limit of the environmental background. It should be added that an investigation of human migrations can only identify those individuals who are not local, and always risks failing to classify migrants from isotopically similar places to the site of the analysed grave (Roberts *et al.* 2013). Also, oxygen isotope processes such as evaporation and boiling water can raise water δ^{18}O value above the local precipitation range (Brettel *et al.* 2012). In the case of other individuals, the isotopic composition of the bone and dentine did not deviate from the environmental range of isotopic variability of the site in Bronocice. The isotopic composition of the analysed tissues demonstrated in these cases does not rule out their local origin.

In the case of specimen XV-1 and two individuals from collective grave (XIII-8 and XIII-12) a value of $\delta^{18}O$ lower than the isotopic range for the environment was noted. The difference between the lower limit of the isotopic background for the environment and the values determined in the bone tissue of the individuals mentioned above are from 0,18‰ to 1,4‰ and could suggest their non-local origin. This would confirm the thesis of a number of authors regarding the occurrence of exogamy, frequently of a patrilocal nature, in prehistoric communities (Haduch 1997; Schweissing and Grupe 2003; Bentley *et al.* 2004; Haak *et al.* 2008). However, such an interpretation should be treated with the utmost caution because the precise point of reference is difficult to determine. Firstly, it is worth noting that some of the cattle and sheep would certainly have spent long periods of time outside the permanent settlement, wandering from pasture to pasture during the vegetation period. Therefore, from an environmental perspective, their source of nutrition would have varied from that portion of the herd which remained within the settlement and was provided for by means of an enclosure system. The latter would most often have applied to young animals, calves, animals which were suckling their young, and cows, goats, and ewes that supplied milk for human consumption (Milisauskas *et al.* 2012). Secondly, the isotope value for the natural environment determined on the basis of modern local precipitation values may differ from that encountered several thousand years ago. All the more so, since, as was already mentioned, the climate in that period was cooler and the precipitation more intense. The lowermost isotope limit could be lower than that established in this paper. This evidence inclines the authors to interpret the data with caution and refrain from conclusively determining the analysed specimen as non-local.

Stable isotopes and age of weaning

The analysis of stable oxygen isotope ratios is also used in weaning studies (Wright, Schwarcz 1998, White *et al.* 2004). Isotope fractionation of oxygen during mother's milk synthesis results in breast-fed children having a 2–3% higher oxygen isotope ratio in their tissues than their mothers, who drink water. Switching the child's diet over to solid or mixed food causes a drop in stable oxygen isotope concentrations as a consequence of the elemental reconstruction until these concentrations reach levels typical of adults (Wright, Schwarcz 1999).

In order to determine the age of weaning children, whose skeletons were found at the site of Bronocice, an analysis of bone sample $\delta^{18}O$ values was conducted to determine the stage of development by comparing to the level of oxygen isotopic in known adults (Figure 3).

It turned out that only two samples (bone of individual XIII-5 and dentin m2 of individual XIII-15) exceeded the upper limit of the isotopic variability of adults. On this basis, it can be concluded that only these two infants were probably breastfed for a period of more than 1.5 years based on dentin mineralization of tooth m2 that usually occurs around age 2

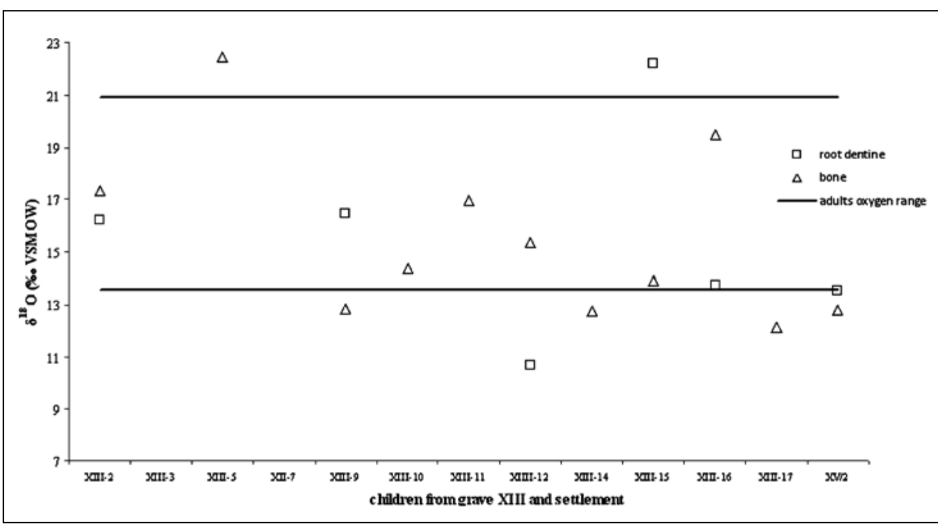

Figure 3. Oxygen isotope data for children skeletons analysed in relation to adults isotopic range

(White, Folkens 2000). Other infants were probably fed for a shorter period of time.

It should be emphasized that no isotopic analyses were performed concerning the weaning of children at other Neolithic sites in Poland, which would allow for direct comparison of results.

Many authors discuss child weaning as a process initiated at approximately 6-12 months of age, but could extend up to 3-4 years. For example, White *et al.* (2004a) examining the level of oxygen, nitrogen, and carbon isotopes of mummies from the Nile, Nubia (modern northern Sudan) showed that their population of children was breastfed until 3 years of age. The situation is similar in the case of two of the three medieval groups from sites in Weinigumstadt (Dittmann and Grupe 2000) and Wadi Halfa (White *et al.* 2004a). However, in the population of Wharam Percy (Richards *et al.* 2002) children were completely weaned by 1.5-2 years of age and transitioned to solid foods.

One of the more problematic aspects of research on the process of weaning, especially across a population, is to determine the scope of $\delta^{18}O$ which is the standard for the analysis of oxygen isotope in the tissue of children. Based on previous studies of the proportion of $^{18}O/^{16}O$ in the bones of adults, within our study sample it was determined that the individuals were all of local origin. Similar to other works on the weaning process of children, the study used oxygen isotope analysis (White *et al.* 2004; Williams *et al.* 2005) as well as nitrogen and carbon stable isotope analysis as a standard (Dupras *et al.* 2001; Richards *et al.*, 2002; Fuller *et al.* 2006). It should be noted that this level has been established for skeletons from Bronocice based on the remains of nine individuals 5 of which were women (potential mothers). However, this information is also valuable for the characterization of Bronocice LBC people.

Some attention should be given to the double grave XV-C1 containing the skeletons of a young woman (17-18 years) and an approximately three-year-old child (Figure 4). Isotopic analysis suggests that both individuals, who appear to have died at the same time, are local.

Double and triple burials are frequently encountered in the Baden culture. In Hungary, out of 355 skeletal burials, 9.3% are double burials and 1.1% are triple (Köhler 2008). Burial practices and aDNA analysis indicate

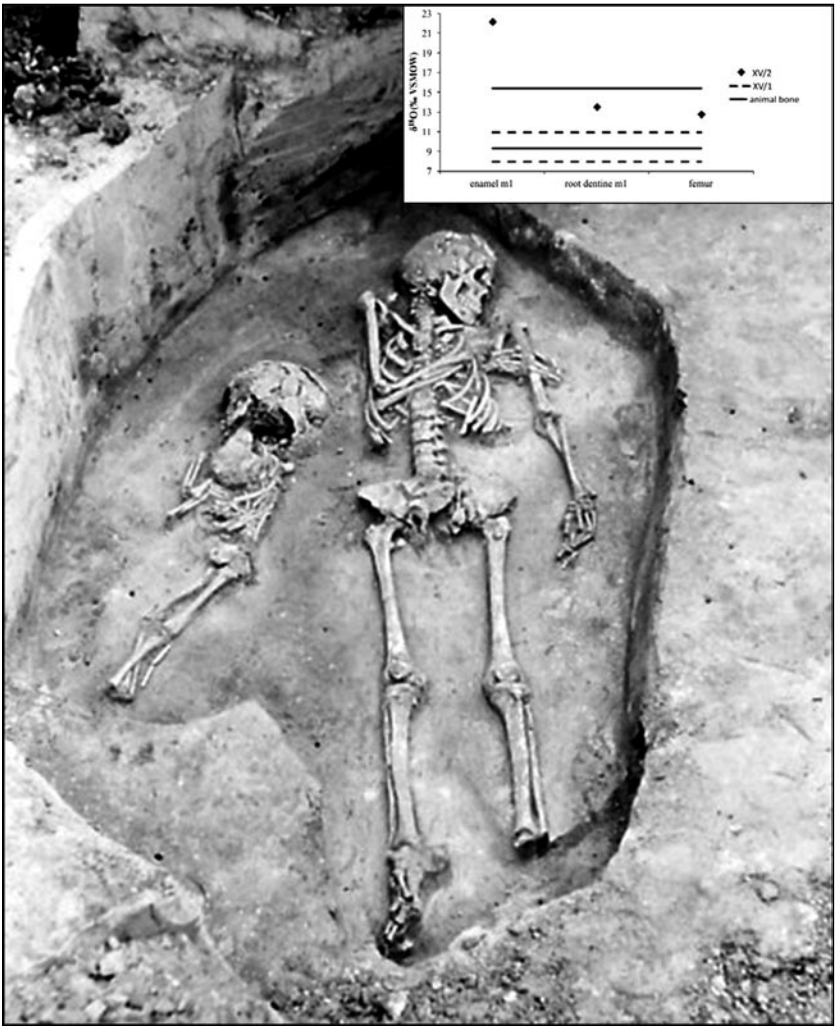

Figure 4. Double burial from Bronocice settlement and variation in $\delta^{18}O$ values during the ontogenetic phases of the individuals from grave no. XV-C1

that it is individuals related matrilineally who are buried in double or triple graves (Haak *et al.* 2008).

In the case of the grave XV we can assume that these are the remains of a mother and child or at least, closely related individuals. It was the only example of such a grave at this site. For this reason its analysis of the ske-

Table 2. Range of weaning age from selected archaeological sites. These data are presented alongside those obtained in this study

Archaeological site	Dating	Isotopes	Weaning process		Authors
			Beginning	Ending	
Kaminaljuýu (Guatemala)	ca 400 BC	$^{13}C/^{12}C$ $^{15}N/^{14}N$ $^{18}O/^{16}O$	-	ca 4 years	Wright and Schwarcz (1999)
Westwang Slack (England)	IV-II BC	$^{13}C/^{12}C$ $^{15}N/^{14}N$	ca 1 year	ca 2,5 years	Jay *et al.* (2008)
Kellis (Egipt)	I-V CE	$^{13}C/^{12}C$ $^{15}N/^{14}N$ $^{18}O/^{16}O$	ca 6 mth	ca 3 years	Dupras *et al.* (2001); Dupras and Tocheri (2007)
Weinigumstadt (Germany)	VI-VIII CE	$^{15}N/^{14}N$	ca 1 year	ca 3 years	Dittmann and Grupe (2000)
Wadi Halfa (Nubia, Sudan)	VI-XV CE	$^{13}C/^{12}C$ $^{15}N/^{14}N$ $^{18}O/^{16}O$	-	ca 3 years	White *et al.* (2004a)
Wharam Percy (England)	X-XVI CE	$^{13}C/^{12}C$	-	1,5-2 years	Richards *et al.* (2002)
Cracow (Poland)	IX/X-XI CE	$^{18}O/^{16}O$	ca 6 mth	ca 2,5 years	Stepanczak (2012)
Bronocice (Poland)	BR IV: 3060 – 2200/2100 BC	$^{18}O/^{16}O$	ca 8 mth	2 years	this research

leton of the child was broadened to include an oxygen isotope analysis of enamel originating from the first molar milk tooth.

The isotopic variability of the child's tissue was compared to that of the woman's. The isotopic level determined for enamel of tooth m2 is higher by seven per milles in the other tissues of the child. It is thus probable that the child was weaned at approximately seven months of age. In conclusion we suggest that the period of maternal feeding in Funnel Beaker-Baden Bronocice was diverse, was not linked to the age of the child, and could last into the second year of life. Other researchers into this issue have obtained similar results (Tab. 2).

Conclusions

Analyses of stable isotopes of oxygen and strontium are good research tools enabling the identification of allochtonous individuals buried at diverse archaeological sites (Bentley *et al.* 2004; White *et al.* 2004a, 2004b; Shaw *et al.* 2010). In their studies, Schwessing and Grupe (2003) compared results obtained by archaeometric methods with archaeological data of graves with the aim of documenting the fraction of immigrants buried at Neuburg an der Donau in Germany dating to the period of Roman influence (330-400 CE). It was determined that the number of immigrants defined on the basis of isotopic analyses was 16% higher in comparison to findings resulting from analyses of archaeological artefacts.

In the case of Bronocice the homogeneity of inhabitants of this settlement has been documented in anthropological analysis. Anatomical studies performed by Haduch (2004) did not show significant morphological differences between individuals from this settlement and those buried in the collective grave. Further evidence for the homogeneity of the analysed group of individuals is provided by the observations made during the exploration of Grave XIII (Pit 36-B1).

The fill of Pit 36-B1 was uniform and of a dark brown colour. Pit 36-B1 partially cut through trapezoid-shaped Pit 34-B1 and also contained a uniform fill. Archaeological observations indicate that that the pit of collective Grave 36-B1 was dug out for the one-off burial of a group of people who died at the same time and was not used for any other purpose. The deceased were laid in the bottom and covered over immediately. There were no indications that the feature had been disturbed again in any way (Kruk and Milisauskas, 1982). Although the artifacts such as the jewellery found with the individuals in Pit 36-B1 might reflect non-local origin, and/or signalled gender, rank and ethnicity, among other factors (Pipes *et al.*, 2010), the hypothesis of the local origin of the group inhabiting the area within the larger Bronocice region cannot be excluded.

In the loess-rich area of southeastern Poland (Małopolska), there was no isotopic diversity within the hydrological environment. In summary, the group analysed inhabited a large settlement in the Bronocice region and were of local origin.

Breast feeding practices were diverse; they were not linked with the age of the child. In the case of four children, it was determined that they were breastfed over different periods of time ranging from about eight months to two years. This is consistent with results obtained by other researchers (Richards *et al.* 2002; Jay *et al.* 2008). It seems that at Bronocice there was not any single feeding strategy for children. The weaning process was most probably as diverse as it is today and was not conditioned by cultural pressure or adaptive strategy, but by available resources and the physiological capacity of the mother.

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This book presents the results of the analyses of Funnel Beaker, Lublin-Volhynian, Funnel Beaker-Baden, and Corded Ware burial data from Bronocice, Poland. In addition, we describe the single burials from Olszanica, Dziekanowice and Michałowice.

At the site of Bronocice a cemetery was located containing several burials as well as a vast settlement in which isolated burials, skulls and partial human remains were also encountered. All of these lived and died during the 1200 years span the site was occupied and frequented. Each individual is worthy of attention and tells a complex story derived in part from its skeletal remains, burial or depositional context, or its cultural association.

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