Bell Beaker common ware and Giant Beakers. A Final Neolithic to Early Bronze Age settlement model based on the sequence of site Altgaul, Brandenburg

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Abstract

A well-preserved Final Neolithic to Early Bronze Age settlement stratigraphy on the western edge of a lowland area in east Brandenburg allows the possibility to derive a model of Final Neolithic settlement dynamics. The obtained sequential evidence of features and intra-site patterning would have been difficult to detect under regular preservation conditions. Both the settlement pattern as well as the typochronological development of specific vessel forms, derived from the stratigraphic sequence, can serve as an explanation for larger spheres of interaction within second half of the 3rd millennium BC. Of great importance is the close relationship of Bell Beaker common ware and the Giant beaker horizon as settlement pottery within the sequence. The analyses of the sequence from Altgaul and the results presented in this paper are taken from my doctoral thesis (Lehmphul in press).

Introduction

The settlement system at the end of the Neolithic and at the beginning of the Early Bronze Age especially in Middle Europe was considered to be only partially investigated, until a few decades ago, due to a lack of well preserved and settlements researched by modern standards. The majority of the finds are either only relatively closed finds e.g. layers and a few features, e.g. pits, or have been recorded in the form of stray finds on surface sites. Johannes Müller described settlement archaeology in the second half of the third millennium BC as an “extreme challenge” (Müller 2008, 393). In 1993 Knut Rassmann noted “there are no traces of specific settlement pottery for Late Neolithic and Early Bronze Age in Northeast Germany” (Rassmann 1993, 68) and ten years later he formulated a desideratum to evaluate influences of Bell Beaker culture in northeast Germany regarding the simultaneous regional cultures and groups (Rassmann 2003, 85). The settlement sequence from the site Altgaul provides a contribution to the scientific discussion addressing the issue of settlement archaeology at the turn of the 3rd to 2nd millennium BC.

The site

The site Altgaul 2, Lkr. Märkisch-Oderland is located about 65 km east of Berlin on the western edge of the Oderbruch – a wetland area within the Oder river valley (Fig. 1). It lies between two geomorphologically distinct areas: a hilly ground moraine to the west and a wide, flat river valley to the east. The excavations were carried out in advance...
to the construction of an onshore gas pipeline by teams of the Brandenburg State Office for the Preservation of Monuments. The first excavation took place between September 2008 and March 2009. A second, adjacent area was excavated during the summer of 2010.

Within the excavation a complex stratigraphy was documented. A large number of Late Bronze Age and Early Iron Age complexes could be separated by horizontal stratigraphy (Lehmphul 2012 a). However, the preservation of a complex Final Neolithic to Early Bronze Age stratigraphy is of great importance for the settlement archaeology of the late 3rd millennium and the beginning of the 2nd millennium BC. The Final Neolithic and Early Bronze Age phases were remarkably well preserved. This was largely due to the gradual accumulation of drift sand which covered features such as the remains of houses, post-structures, and the oldest known plough marks in eastern Germany. As all features dating to the Late Bronze Age and Early Iron Age had been dug into the Aeolian deposits a clear separation from the later Early Bronze Age features was possible, thus aiding in our understanding of the site’s relative chronology (Lehmphul 2012 b, fig. 2).

A variety of excavation methods were employed to ensure the stratigraphic integrity of the artefact assemblages originating from the occupation layer between two main phases of Aeolian deposition, the layers under the accumulation of drift sand, and the individual features. Pits, postholes, and hearths were block-sectioned. Due to the complex stratigraphy of the site the occupation layers and Aeolian deposits were stratigraphically excavated. Fortunately the contrasts between individual stratigraphic units made it possible to distinguish them. A Separation of four different occupation layers in and under the drift-sand-formations became possible. Among the most impressive features are the plough marks (Lehmphul 2012 b, fig. 4; Lehmphul 2013, 22–23 and fig. 4) and a heap or midden. It offered insights into the disposal behavior of its inhabitants and serves as a clear evidence for an above ground waste disposal (Lehmphul 2013, 22; Heyd 2004, 201). More than 80% of every find class (pottery, flint, animal bones) had been recovered from deposited layers. The average depth of the features like postholes and pits varies between 30 and 40 centimeters, similar to the average depth of a modern plough. Without these extraordinary preservation conditions, there would have probably been nothing left aside of a scatter of flint artefacts and stone tools.

The sequence of dune accumulation was recorded in a number of geoarchaeological sections, covering about 260 metres in total. There was constant alternation between individual thick layers of
drift sand and fossilised old surfaces or occupation layers. The understanding of this development became vital to the reconstruction of individual occupation-phases and their dating.

The dating of stratigraphy

The Final Neolithic to Early Bronze Age part of the sequence can be grouped into five stratigraphic phases (1, 2a, 2b, 3 and 4). In principal the distinction of phases is based on the alternation of the different cultural layers with Aeolian deposits like drift sand accumulations of different thickness (see Fig. 2). Phase 1 consists of three house structures varying in size, form, and orientation, a fence consisting of double stake-holes, and a circular structure composed of stake-holes. Due to their stratigraphic relation, some of the plough marks could also be dated to the beginning of Phase 1. Another house can be assigned to Phase 2a. In Phase 2b a feature that can be referred to as rubbish heap or midden as well as a high density of plough marks are present (Lehmphul 2013, 22, fig. 3). This indicates a complete shift within the usage of the central area, from a settlement area in phase 1 to an arable farming area in Phase 2b (Fig. 3).

Phase 3 is a settlement horizon situated between the first and the second main drift sand accumulation (Fig. 2). It was a compact layer containing postholes and some shallow pits. Some of the posts where arranged in a row, indicating post structures as well as a certain time depth during this phase. It implies a continuity of settlement, despite the changing environmental conditions evident through the dune accumulation. The final phase 4 followed the second drift sand accumulation. Due to massive Late Bronze and Early Iron Age activities and its subsequent destruction of the underlying layer it is only represented by individual pits (Lehmphul 2012 b, see fig. 2).

Additional to the relative age of the individual phases and their associated structures, the absolute age and temporal dimension of the stratigraphy is important. This allows indications for the most probably periods of at least local changes in the material culture. As the sequence outlines chronological relations for the stylistic and formal-typological changes within the pottery.

The probabilistic characteristics of 14C-dates, their position in the course of the calibration curve, and most importantly the obtained structural archaeological evidence, such as the post structures in the phases 1 and 2a or soil formation processes in phase 2b, give strong indications for a long habitation (Tab. 1).
Supported by radiocarbon dates the postulated chronological frame as well as the continuous inhabitation is further demonstrated by the regular occurrence of specific artifact types (flint daggers of type-I and Zapfenkeile) in the individual phases (Fig. 4). Hardening the evidence for house structures and a prolonged activity in every of the five phases, it is very likely, that the genesis of the stratigraphy was not within a short episode. According to the modelled radiocarbon dates there is a time span within the two sigma range of 1 15 to 580 years for the accumulation of the whole sequence.

The Bayesian model displayed in Table 2 based on eight radiocarbon dates. The index (A model), specified for the Bayesian model, is a value that indicates the degree of agreement of the entire Bayesian model with the non-modelled dating probabilities. The value is above 120 and therefore shows a very good consistency and provides a stable model. Linking the one sigma range with the archaeological information a duration of 50 to 75 years can be assumed for each individual phase. Correlated to the frequency and intensity of the recorded house structures and activities, this leads to a duration of estimated 300 years for the whole sequence. This Bayesian model, of 50 to 70 year phase intervals allows to study variations, breaks, continuities, and development of the material culture de facto on a scale of one to two generations per phase (Tab. 2).

### House- and post-structures

In total, five house- or post structures were recorded within the sequence (Fig. 3). House 1, stratigraphically dated to phase 1, was almost completely preserved and about 9.8 m long and 3.8 m wide. The post construction is oriented north-northeast to south-southwest and had a two-aisled interior construction with central ridge posts. The houses gable ends had an apsis-like-form, whereby the northern part was much better preserved. In the filling of a post a piece of tooth-stamped decorated pottery was found. It was most likely not accidentally inserted but intentionally deposited (Lehmphul 2012 b, fig. 5.3). Such deposits are usually interpreted as foundation deposits and have been frequently documented in other sites (Beran/Hensel 2013, 56 – 57; Spatzier 2017, 151 – 180).

Previously house structure 2 had been interpreted as incompletely excavated house or floor plan (Lehmphul 2013, 24 – 25 fig. 4). However, the preservation of the posts, their symmetric relation to each other, as well as the new study of their stratigraphic relation, have shown that it is highly probable that the structure can be
reconstructed completely. The total length was 9.6 m with a maximum preserved width of 5.5 m in the central section and 4.5 m in the area of its western narrow side. The ground plan is oriented to the east-northeast and west-southwest with a more oval shape. It had a two-aisled inner structure, partly supported by individual additional internal posts. Similar to house 1, it dates to phase 1. Analogously a piece of a single rim with a fine cord decoration was recovered from a post hole in the north-eastern part – apparently another foundation deposit. In the southeastern part of the house a 0.4 m deep pit was found. It was filled with a dark grey sediment, a granite hammerstone and two flint artifacts were recovered from the filling. The feature belongs to the house and is interpreted as working pit or the remains of a buried fireplace.

The dating of house 3 is completely based on its stratigraphic relations. However, the majority of this relations cannot be assigned to a single phase (1 or 2a). Only two posts clearly belong to phase 2a, resulting in the stratigraphic dating to phase 2a. The ground plan has a two-aisled layout, is approximately rectangular and about 4.3 to 4.6 m wide and 12.4 m long. The east-northeast to west-southwest orientation corresponds with the post structure 2. In the center is a shallow, circular hollow still 10 centimeters deep. This suggests either a working pit or the rest of a fireplace located in the house center.

House 4 is 14.2 m long, has a two-aisled subdivision principle and is oriented north-northeast to south-southwest. It varies slightly in width from 5.1 m in the south, 5.4 m in the center, and about 5.2 m in the north, leading to a rectangular shape with slightly concave long sides. As north end of the house is not completely secured, the maximum length of the ground plan could not be determined with certainty. Due to the stratigraphic relations of its post-pits with different layers, the house is dated to phase 1.
Post structure 5 is composed of stake-holes with a diameter of 3.15 m to 3.20 m. They are arranged in an almost ideal circle with one single central post. This structure is the only one of the post structures that had been identified during both excavations. Therefore profile sections were made specifically in direction through the center of the circle. Most profiles indicated a vertical position, however few were actually oriented oblique to the center of the circle. One possible interpretation of this structure would be as a small roofed hut. In this case the central post would have had a function as a support for the huts roof.

Ten more stake-holes with a diameter of approximately 0.1 m were recorded on a length of approximately 5.80 m. They were positioned with irregular intervals and usually arranged in pairs. The distance between the double stack-holes was about five centimeters. This configuration is interpreted as the remains of a fence. The distance between the pairs would allow the stacking of thin brushwood between them, resulting in an effective fence. This feature is remarkable, as it occurs in combination with up to 10 m long parallel plough marks, clearly related to the fence thus indicating their contemporary existence. Additionally the small distance between the plough marks and the fence allows the assumption that the plough was laterally attached to a single draft animal, most likely cattle, and had not been centrally positioned between two animals.

Based on the features, and their stratigraphic and scientific dating and relations, the following aspects can be deduced: The development
of small oval houses to rectangular ground plans can be observed in the sequence. This early evidence of a fence at a field’s border clearly indicates the fencing of fields. It was proven further that the rebuilding of the various houses resulted in a clear settlement structure. The accumulation of selected domestic waste in specific areas like middens reflects a tendency towards an aboveground waste disposal behaviour. This practice is probably connected to a specific kind of arable agriculture: The midden cultivation “(...) a crossover between gardens and arable fields” (Guttmann 2005, 235). Furthermore, it could be shown that these purposefully created disposal areas also acted as activity zones for flint-tool-production. The entire chaînes opératoires of typical artifacts’ primary production sequence could be found in the midden heap of phase 2b and also in the areas of former midden heaps dating to the older phases (Lehmphul in press).

**Pottery and vessel forms**

Approximately 3600 fragments of pottery with a total weight of 78.5 kg were recovered. The accumulation of the pottery finds is linked to the different usage of the excavated settlement area in the phases. The relation of pottery between the phases was: phase 1 = 5.1 kg, phase 2a = 25.3 kg, phase 2b = 21.1 kg, phase 3 = 13.3 kg and phase 4 = about 7 kg. The remaining pottery finds are distributed among finds that cannot be clearly assigned to one phase and stray finds. Based on the good conservation conditions, it was assumed that the majority of the fragments could also be grouped into vessel units. A disadvantage for the reconstruction was the only slightly varying vessel spectrum consisting of mostly undecorated forms, especially within the group of weakly S-shaped vessels. In total, the pottery could be divided into 1431 individual units which exhibit different degrees of fragmentation. A vessel unit can be represented either by a single body sherd or by a completely preserved or almost completely reconstructed vessel. From a formal-typological point of view, a total of 84 vessels could be distinguished on the basis of their one-, two- or three-part profile. A selection of partially or almost completely reconstructed vessels is illustrated in Figure 4 (Fig. 4).

Only 2% of the pottery is decorated and belongs to the category of fine ware. Decorations include fine cord markings, toothed-stamps, and deep circular impressions below the rim (cf. Lehmphul 2012b, fig. 5). The most distinctive ornamental element consists of a raised horizontal cordon. The cordons encircle the vessel and are mostly located on the upper part of the vessel neck, close to the rim. They generally occur solitary, although there are some examples with two or three parallel cordons. Their appearance varies greatly: They can be well-formed and distinct, but also poorly-formed and indistinct. During the formation of the stratigraphic sequence different preferences are observable: In the older phases is the cordon thick and distinct, within the later phases poorly-formed and indistinct, disappearing during the final phase 4. Less pronounced is the positional variation of the horizontal cordon. In younger phases it is closer to the bend of the neck while in later phases it is close to the rim (Lehmphul 2013 in press).

Another temporal sensitive feature is the position of the vessels belly or rather maximal diameter: In phase 2a and 2b the maximal diameter is close to the bottom of the vessel, during the later phase 3 and 4 the maximal width moves closer to the rim. This tendency is not related to the size of the vessel. Furthermore the shape and size of the vessels neck changes: While it is wide and high or kind of funnel-shaped during the older phases it becomes shorter and
steep within phase 4 (Lehmphul in press). Especially in those cases where two or three indistinct cordons occur, the decoration appears very similar to broad, shallow grooves. Such decoration is known for example from the sites at Bejsebakken (Sarauw 2008, fig. 15.2) and Mortens Sande (Liversage 1987, fig. 10.3) in Denmark.

Parallels to the cordon decoration at Altgaul have been found on a large number of sites dating to the Final Neolithic and Early Bronze Age. For example Lanz 14, a settlement site in Mecklenburg-Vorpommern, consisted of a succession of occupation layers with aeolian deposits similar to those in Altgaul. Sherds with raised cordon decoration were found on the whole site in a particularly large number.

<table>
<thead>
<tr>
<th>Phase 4</th>
<th>Phase 3</th>
<th>Phase 2/3</th>
</tr>
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<tbody>
<tr>
<td>bowls</td>
<td>beakers</td>
<td>flint daggers</td>
</tr>
<tr>
<td>cups</td>
<td>giant-beaker-like vessels</td>
<td>rock stone tools: Zapfenkeile (adze, chisel)</td>
</tr>
<tr>
<td>steep walled vessels</td>
<td>pots</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 4. Altgaul 2, Lkr. Märkisch-Oderland. Reconstructed vessel-shapes and stone tools (flint daggers of type I, Zapfenkeile) in relation to the stratigraphic phases.
These sherds were found together with tooth-stamped pottery, and G. Wetzel suggests that this indicates a later date for the artifacts. He assigns it to the Single Grave culture, with a strong Bell Beaker influence (Wetzel 1969, 160–161). On the site Parchim 113, also in Mecklenburg-Vorpommern, sherds with raised cordon decoration and fragments of tooth-stamped pottery were recovered from occupation layers and pits. The typological analysis also indicates a Single Grave culture context with Bell Beaker influence (see Wietrzichowski 2008, 60–61 fig. 4.1–2). Pottery with raised cordons was recovered from a circular ditched enclosure near Pömmelte-Zackmünde in Saxony-Anhalt. Here the typological analysis showed that the decoration on the pottery was influenced mainly by Bell Beaker and early Unetice culture (Spatzier 2017).

A remarkably good parallel to one of the vessels from Altgaul (Lehmphul 2012b, fig.6.3) comes from the Alle-Noir Bois site in Switzerland (Othenin-Girard 1997, plate 8, 10–11). The vessels found there were part of a domestic assemblage of Bell Beaker material. The layer delivered 193 vessel fragments, 20% of which had raised horizontal cordons. The 14C-data showed dating ranges between 2400–2140 cal BC (Othenin-Girard 1998, 58 and fig. 3, 10).

Deep impressions below the rim and cordons on the upper part of the neck (Fig. 4, Phase 2a) are characteristic decorations found on the pottery from a number of Bell Beaker domestic sites in France (Besse 1996, plate 11). The frequent occurrence of cordons on the upper part of the neck in combination with S-profile vessels and perforated rims also suggests a Bell Beaker influenced domestic pottery (cf. Heyd 2004, 189–190). Other Examples include material from radiocarbon-dated pit clusters, in the Kuyavian region of Poland (sites Toruń 243 and Żegotki 3), that can be assigned to phase III of the Iwno culture.
or to the transitional phase between the Iwno culture and Trzciniec culture (Makarowicz 2001, figs. 19; 21). In contrast to the stylistic evolution traceable for the coarse ware in Altgaul, no change in technology could be observed. The majority of the pottery assemblage is connected to the group of Giant Beakers with and without horizontal cordons (Moser 1994) and smaller Giant Beaker-like vessels with cordons (cf. the discussion of the terms: Schunke 2009; Lehmphul 2012b; Lehmphul 2013; Spatzier 2017).

The vessel spectrum in Altgaul is not particularly variable and more or less constant over time. In addition to large vessels such as the Giant Beaker and the smaller Giant Beaker-like vessels, cups, bowls, undecorated beakers and steep-walled vessels in different sizes appear. This highlights the continuation and stability of technological parameters throughout the whole sequence, providing a further line of evidence for a continuous inhabitation of the site.

Lithic

The lithic spectrum is characteristic for the Final Neolithic debitage and flake industry (Fig. 5), containing a few blades, some borers, flint daggers of type I, and a high percentage of scrapers. Statistically significant is a difference in size and weight of scrapers and debitage from the older phases under the drift-sand-formation to the later phases above it. The difference in size of the stone tools is remarkable. During the older phases (1, 2a 2b), the scrapers are smaller and flatter, resembling small thumbnail scrapers, typical for bell beaker complexes, for example in Southern France (Furestier 2008). While the scrapers of the later phases (3 and 4) are thicker and significantly larger thus resembling tools used in Denmark’s older Bronze Age (Eriksen 2010, 85–86, table 1). This shift is not connected to technical aspects of the chaînes opératoires and correlates with the gradual development of the pottery.

A total of 116 flint tools were recorded. They belong to a secondary production sequence. The spectrum of modifications is dominated by different types of scrapers (74), followed by lateral retouched flakes and blades (14). The remaining 23% consist of borers (5), flint daggers and dagger fragments of type I (5), as well as axe fragments (5), arrowheads (3), and a larger number of debitage pieces, including cores and core debitage used as hammerstones (10). The latter are usually characterized by larger areas with splintered surfaces.

Bell Beaker common ware and Giant Beakers

The basis for the empirical comparison with other sites is created on the base of the pottery. The vessels are linked within the stratigraphy of the site Altgaul, and therefore are dated relative and absolute. The raised horizontal cordon underneath the rim is the most distinctive element of the vessels from the sequence and similar vessel forms from other sites as well as the decoration have a wide geographical distribution. For the comparison of geographical aspects, such as the topographical features of a site, it must be noted that only few settlements of this period have been examined. However, even if only individual pottery fragments and settlement finds that are relatively dated were collected from the surface, the sites are still reference value to the local chronology. They can be used as an indication of a comparable and contemporaneous site. Both, the few 14C-dates as well as the frequent lack of other diagnostic finds have hindered a precise contextual or chronological object classification. In most of the
studies, this led to a variable, usually typological or cultural based dating. Most finds were attributed to an archaeological culture by means of cultural or chronological diagnostic pottery or were dated to the respective period on the basis of this cultural assignment.

For the inter-site comparison only flat horizontal cordons on smoothed vessel surfaces were recorded, resulting in 160 comparable sites covering large parts of Central and Northern Europe and include the countries of Great Britain, Ireland, France, Switzerland, Italy, Germany, the Netherlands, the Czech Republic, Poland, Denmark and Sweden. Over 90% of these sites are located on shorelines, big river valleys or smaller rivers close to the former (Fig. 6). The range of variation and preservation is variable, both on a quantitative and qualitative level. Due to the preservation conditions of the sites most vessels are highly fragmented. Only rarely the complete profiles of the vessels could be reconstructed or material for radiocarbon dates had been recovered.

There are two chrono- and chorologically cornerstones to this distribution. One is the research of Marie Besse (Besse 1996; 2003 and 2004) and Oliver Lemercier (Lemercier 2004) on western Bell Beaker common ware and the other the research of Aleksander Gardawski (Gardawski 1959), Primislav Makarowicz, and Janusz Czebreszuk (Czebreszuk 1998; Kosko/ Czebreszuk 1998) on the Trzciniec culture or the Trzciniec circle in Poland. But Trzciniec – interestingly a phenomenon similar to the Bell Beaker phenomenon – is younger and dates to the Early Bronze Age, approximately after 1950 BC (Makarowicz 2001).

The majority of the radiocarbon-dated sites can be limited to a period between approximately 2450 and 2000 cal BC within the
two-sigma range. The quality of the data varies greatly depending
on the sample material. While the Danish sites studied in the 1980s
and the southern Swedish settlement of Fosie IV are associated with
a high degree of uncertainty due to conventional dating almost ex-
clusively derived from charcoal, the more recent and modern com-
plexes from central Germany are comparatively precise, most analy-
ses were conducted on the basis of bones and macro remains (Lehm-
phul 2017, fig. 3). For the Danish settlement of Bejsebakken, a total
of 22 radiocarbon dates have been recorded. The high number of
$^{14}$C-dates improves statistical significance, indicating dates between
2350 and 2000 BC (Sarauw 2008).

For certain regions, such as Italy, individual inventories from Central
Germany, and the Swiss settlements Alle Noir Bois (Othenin-Girard
1998) and Cortaillod/Sur les Rochettes Est (Burg 2002), dates at the be-
ginning of the 2nd half of the 3rd millennium BC points towards an ear-
ly phase between 2400 and 2200 BC. Very early data between 2550
and 2200 BC was collected for the Marktbergeler Doline (Nadler 1998).

Longer, continuous settlement and occupation phases are high-
ly probable for some sites. These include the already mentioned
settlement of Bejsebakken, as well as the sequence of Altgaul, the
circular enclosure of Pömmelte-Zackmünde (Spatzier 2017, 245–254)
and probably also the recently presented Bell Beaker settlement
from Klobikau in Saxony-Anhalt (Balfanz/Fröhlich/Schunke 2015).

Relatively late, if compared to the majority of the data, are the
Polish complexes of the Trzciniec culture starting already in the first
half of the 2nd millennium BC and dating back to the transitional
horizon Iwino-Trzciniec at the beginning of the development. Usu-
ally Trzciniec culture are the most recent sites. Nevertheless, there are
– albeit only sporadic so far – late dating inventories in the West-
ern distribution area of the facies, such as for the inventory of Trombs,
Rheinland-Pfalz (Sensburg 2004) or a complex from the Rhône valley
in Southern France (Lemercier 2004, fig. 100).

Therefore the phenomenon that can be dated from the second
half of the 3rd century BC to the beginning of the 2nd millennium BC
and spreads throughout Northern, Central, and above all Western
Europe (Fig. 7; Table 3). Depending on the region, state of research
and sources, but primarily due to the prevailing cultural-historical
view, this temporal depth has led to different interpretations and in
the absence of radiocarbon dating, to very variable relative dating
approaches, which were usually linked to an archaeological culture
until the mid-1990s.

![Fig. 7. Sum calibration of vessels with horizontal cordon sum of different sites, contexts and sample materials (Table 3; see also Lehmphul 2017, fig. 3).](image-url)
The main problem is the lack of associated finds or other accompanying diagnostic vessels and finds. Specifically Giant Beakers are often single finds (Mertens 1998, 197). Almost 80% of the here presented sites are linked to settlements. This is a clear indication that the presented pottery is closer related to settlements than to cemeteries. The assignment to a “culture” is more often a result of the application of a typo-chronological concept (Fig. 8). It illustrates the widespread, but locally strong Bell Beaker influence in Final Neolithic and Early Bronze Age assemblages. Almost 15% of the sites are based on decorated sherds associated with more than one cultural assignment. They fall into the category Mixed cultures (e.g. Single Grave culture, Bell Beaker and Únětice culture). For example the sites Altgaul, the Danish settlement of Bejsebakken or the circular enclosure of Pömmelte-Zackmünde fall into this category and all exhibit clear

<table>
<thead>
<tr>
<th>Sitename/region</th>
<th>Country</th>
<th>Sitecategory/context</th>
<th>¹⁴C-Date (BP)</th>
<th>2-sigma-range cal BC</th>
<th>Reference (Illustration of pottery and ¹⁴C-date)</th>
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<tr>
<td>Zwenkau, Saxony</td>
<td>Germany</td>
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<td>2436–2140</td>
<td>Schunke 2009, 291 fig. 3–5</td>
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<td>2432–2142</td>
<td>Schunke 2017, 67 fig. 14,3,5 footnote 3.</td>
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<td>Grave</td>
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<td>2472–2146</td>
<td>Leinthaler/Bogen/Döhle 2006, fig. 41 footnote 3.</td>
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<td>2205–1981</td>
<td>Balfanz/Frohlich/Schunke 2015, 756 fig. 6, 7,</td>
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<td>Wietzchowski 2008, 57 fig. 3,17–18 and 4,1–2 footnote 9</td>
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<td>Ullrich 2008, 173 table 1; plate 7, 13, 14</td>
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<td>2346–2036</td>
<td>Wiermann 2004, 331–332 plate 42.8</td>
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<td>2570–2061</td>
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<td>Landolt/Gersende/Putelat 2010, 86 fig. 9, 7</td>
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<td>Erstein</td>
<td>France</td>
<td>settlement/shallow pit</td>
<td>3835 ± 35</td>
<td>2458–2154</td>
<td>Croutsch/Tegel/Pascutto 2010, 53 fig. 6, 12</td>
</tr>
<tr>
<td>Olmi 1 und 2</td>
<td>Italy</td>
<td>settlement/shallow pit</td>
<td>3890 ± 30</td>
<td>2468–2291</td>
<td>Sarti et.al. 2008, 29, Leonini/Sarti 2008 fig. 5.9.</td>
</tr>
<tr>
<td>Zegotki 3</td>
<td>Poland</td>
<td>settlement/pit</td>
<td>3580 ± 30</td>
<td>2028–1828</td>
<td>Makarowicz 2001, 218 table 1 fig. 21.</td>
</tr>
</tbody>
</table>
indications for constant inhabitation or usage over a long period of time (Sarauw 2008; Spatzier 2017, 245–254).

In relation to the diffusion of the different cultures the chronologi cal pattern points towards a strong Bell Beaker influence. It is also connected to the late Single Grave culture or rather the Late Neolithic Dagger Period, the Proto-Únětice culture, and the late Iwno and early Trzciniec phenomenon in Poland.

Discussion

The analyses of the site Altgaul have shown that most finds were deposited near the surface in midden heaps or in layers. Without extraordinary conservation conditions, such as the extensive covering of large areas by drift sand layers or colluvial layers, the evidence would be drastically reduced, mainly to stone artifacts and some highly fragmented pottery sherds. This specific aboveground waste disposal behaviour of the 2nd half of the 3rd millennium BC is apparently the main problem leading up to the difficulties in identifying settlements.

The most distinctive decorative elements of the pottery assemblage are raised horizontal cordons, a smooth vessel surface, and S-shaped bodies of vessels varying size. The equal distribution of various vessel-forms within the stratified phases of Altgaul indicates no typo-chronological difference associated with vessels sizes (like Giant Beakers and Giant Beaker-like vessels) (Schunke 2017). Moreover it seems that there is a similar empirically comprehensive package in terms of a longue durée (Fig. 4).

Individual regional and transregional studies have shown that this decoration, which is applied to various vessel shapes, such as bowls, cups and storage vessels, is primarily connected to Final Neolithic and Early Bronze Age cultures or phenomena. These include the settlement and Bell Beaker common ware in central and southern France (Besse 1996; Lemercier 2004), a few tomb and some settlement finds from the Bell Beaker culture in central Germany (Hille 2012, 22; Wiermann 2004; Spatzier 2017; Schunke 2017), the (late) Single Grave culture with Bell Beaker influences in northern Germany (Jacobs 1991; Wetzel 1969) and the closely associated Early Bronze Age Giant Beakers (Moser 1994) as well as the smaller Giant Beaker-like vessels. The latter were defined and named by T. Schunke in reference to the Giant Beakers and were first linked with cultural influences from the northern Late Neolithic Dagger period and the late Single Grave culture and finally also to the Únětice culture (Schunke 2009). A few years later and due to stratigraphic evidence and in the light of a pit-inventory with a bell beaker with metope ornamentation, the Giant Beaker-like vessels were then linked to the Bell Beaker culture (cf. Schunke 2017). Even within the younger Early Bronze Age Trzciniec culture, raised horizontal cordons are an essential characteristic of the pottery decoration on vessels from settlement as well as from grave contexts (Gardawski 1959).

The connection between the various types of Bell Beaker Common Ware and the Giant Beakers are evidenced by the sequence of vessel forms from Altgaul: In the older phases 2a and 2b there are more similarities with Bell Beaker forms linked to the common ware, while in the younger phases 3 and 4 forms of Únětice culture dominate. There are also differences in the flint artifacts for certain types (scrapers), while other tools, such as type-I flint daggers or Zapfenkeile (Danish: Tapkiler, English: tanged wedges), are present during all phases. However, the transitions within the pottery are fluent and, together with the proven, consistent pottery technology, are an indicator for the continuity of the settlement.
Conclusion

The classical cultural concepts, some of which were developed a hundred years ago to aid the chronological and spatial allocation of the artifacts, make a comparative study difficult. Considering difficulties in the identification of these mostly river bound settlements and the high mobility during these times one question remains: What linked the Bell Beaker common ware and the Early Bronze Age Giant Beaker horizon? A few well preserved settlements such as Altgaul, Bejsebakken in Denmark or the monument of Pömmelte-Zackmünde, which have been studied using modern approaches, provide evidence for a long continuity of these sites. Apparently there was a stable but difficult to detect settlement system oriented towards large communication paths – the great river valleys. We should ask ourselves what held this settlement system together over long distances and long periods of time. In the second half of the 3rd millennium BC the picture is dominated by grave complexes. As a result, the relationship of these cultures or phenomena becomes less comprehensible on the basis of complex settlement remains, but mostly on the level of the grave complexes and thus in the sphere of beliefs and mortuary praxis – a basically ritualized and conservative level. Perhaps the location close to the big rivers was not only strategically important for communication, but was further caused by certain subsistence strategies. The prerequisite for maintaining the interaction space and overcoming a distance, ranging from southern France, through central Germany to southern Scandinavia and even the British Isles is not only due to a network of settlements existing over a prolonged period of time, but, in my opinion, a previously underestimated form of subsistence, which requires a high degree of mobility. It is a semi-settled form of transhumance that combines both the aspect of sedentariness and increased mobility and therefore sustains these extensive areas of communication and interaction. This network of settlements is based on the diffusion of people. Through interactions between groups and individuals, ideas and technologies started to spread at the dawn of Early Bronze Age. Finally while the phenomenon of these specific settlement pottery is diminishing in the West due to the formation of Early Bronze Age cultures, the tradition continues to exist within the eastern Trzciniec culture leading to strong arguments for a European wide network based on and stable, long existing settlement systems.

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