Radiocarbon, Vol 59, Nr 5, 2017, p 1399–1413 DOI:10.1017/RDC.2017.74
Selected Papers from the 8th Radiocarbon & Archaeology Symposium, Edinburgh, UK, 27 June–1 July 2016

THE CHRONOLOGY OF SITE 3 IN ULÓW (TOMASZÓW LUBELSKI DISTRICT, EAST POLAND): THE RELEVANCE OF ANTHRACOLOGICAL ANALYSIS FOR RADIOCARBON DATING AT A MULTICULTURAL SITE

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ABSTRACT. Archaeological site 3 in Ulów is in an area previously thought not to have been settled before historical times. Systematic excavation work that began there in 2002 revealed long-term occupation from the Late Palaeolithic to the Middle Ages. The majority of archaeological features represent a cemetery belonging to the Late Roman and Early Migration periods (III–V c. AD, Wielbark culture). The site's relative chronology was determined from analyses of archaeological artifacts. To complete the chronological framework required for a proper interpretation of cultural processes, a group of charcoal fragments was selected for radiocarbon (^{14}C) dating. These charcoals were first taxonomically identified and weighed, and then designated for accelerator mass spectrometry (AMS) and conventional ^{14}C analyses. The datings (n = 43) indicated three main chronological horizons. Some of the graves from the Wielbark culture contained charcoals of younger or older age, posing problems in interpreting taphonomic processes at this multicultural site. In the light of the ^{14}C dating results, the chronology of several features previously attributed to the Wielbark culture was re-interpreted.

KEYWORDS: anthracology, funerary rites, radiocarbon dating, Ulów (Poland), Wielbark culture.

INTRODUCTION

The discovery of a complex of archaeological sites in Ulów has revealed a long history of human settlement in a region previously thought to have been uninhabited in prehistory and especially during the Roman period. The sites are near the village of Ulów in the Middle Roztocze region (Tomaszów Lubelski municipality, Tomaszów County, Lublin Province), part of the Central Polish uplands in southeastern Poland (Figure 1). Archaeological site 3 in Ulów (50°28'9.98"N; 23°18'26.49"E; 342 m asl) is in sandy terrain covered by forest. Rescue excavations at this site started in 2001 in order to prevent its destruction by continuous illegal excavations (Niezabitowska 2005; Niezabitowska-Wiśniewska 2009). Vestiges of different cultural units were identified at this site. The oldest material was dated to the Late Palaeolithic. Other objects represented different cultures from the Mesolithic and Neolithic to the Middle Ages.

Archaeological Investigations

The excavated area of site 3 in Ulów covers 2236.70 m^2. The archaeological features can be grouped into four main types based on their function and cultural units (Figure 2, Table 1). Type 1 includes features related to the graves of barrows of the Corded Ware culture, a Late Neolithic culture that developed in the 3rd millennium BC (Figure 2) (Włodarczak 2009; Niezabitowska-Wiśniewska and Wiśniewski 2011). Within this type, Type 1A is distinguished, describing pits dug into the barrow mounds, which are signs of subsequent looting.

Type 2 includes features associated with the Wielbark culture. This culture is traditionally related to the Goths, who during the Late Roman and the Early Migration periods (3rd–5th c. AD) inhabited southeastern Poland. This type is represented mainly by cremation graves, which usually contained rich offerings including metal, pottery, and glass artifacts. We dated most of these objects to phase

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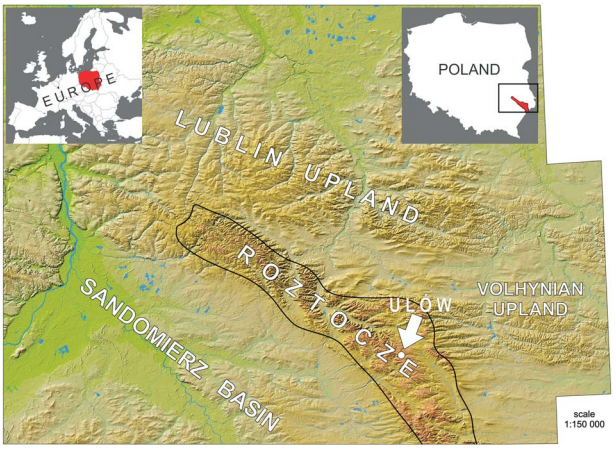

Figure 1 Location of archaeological site 3 in Ulów in the Roztocze region, southeastern Poland.

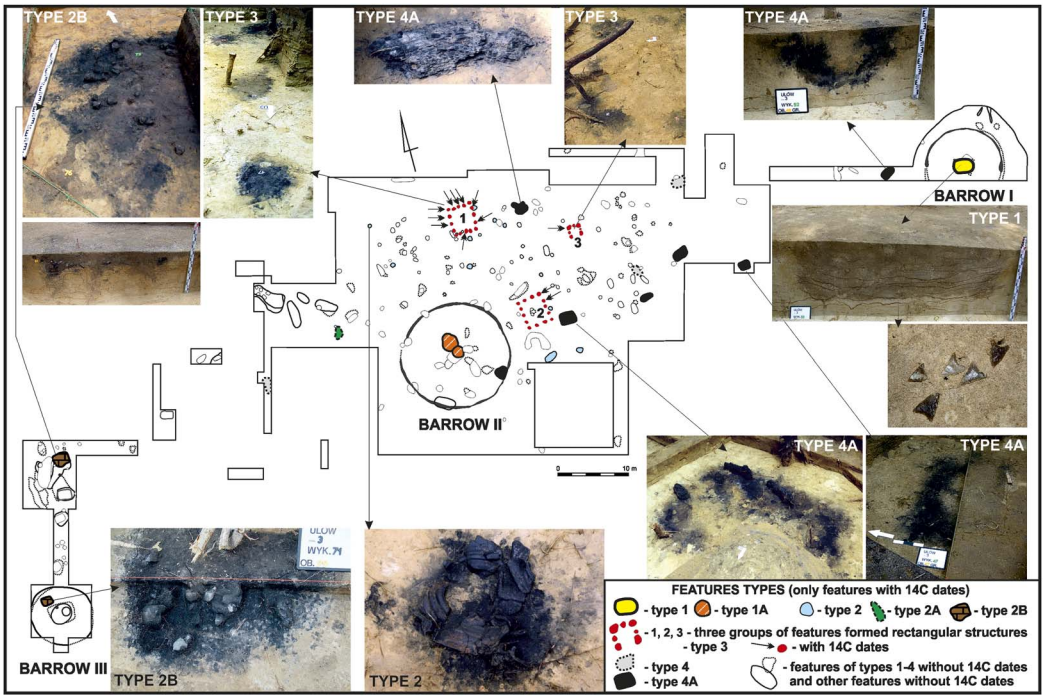

Figure 2 Distribution of anthropogenic features in excavation units at site 3 in Ulów, with photos of examples of different types of archaeological features.

C3/D1 of the Roman period, corresponding to ages between 360/370 and 430 AD (Tejral 1988; Godłowski 1992). The graves were scattered in the northern part of the site and were not associated with Late Neolithic barrows (Figure 2). The function of other archaeological features (Type 2A) in which material of the Wielbark culture occurred is more difficult to interpret. Hearth remains with pavement were also found (Type 2B).

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Table 1 Radiocarbon dating of charcoal samples from site 3 in Ulów.

No.	Taxon (charcoals)	Sample name	Type of archaeological feature	Lab nr	Age ^{14}C	Cal age BC/AD (68.2%)	Cal age BC/AD (95.4%)	Chronological horizon
1	*Pinus sylvestris*	Grave 74	2	Poz-76346	9510 ± 50 BP	9118BC (15.3%) 9068BC 9060BC (14.3%) 9009BC 8914BC (2.6%) 8902BC 8848BC (35.9%) 8746BC	9137BC (37.2%) 8972BC 8941BC (56.5%) 8703BC 8674BC (1.7%) 8652BC	0A
2	*Pinus sylvestris*	Grave 66	2	MKL-2728	7610 ± 70 BP	6562BC (4.6%) 6548BC 6526BC (2.1%) 6520BC 6511BC (61.5%) 6407BC	6612BC (94.1%) 6356BC 6291BC (1.3%) 6269BC	0B
3	*Quercus* sp.	Feature 41	4A	MKL-2735	4340 ± 40 BP	3011BC (24.5%) 2976BC 2971BC (13.2%) 2949BC 2944BC (30.5%) 2905BC	3086BC (5.5%) 3061BC 3030BC (89.9%) 2890BC	I
4	*Quercus* sp.	Feature 40	4A	MKL-2736	4320 ± 40 BP	3010BC (19.8%) 2979BC 2959BC (2.8%) 2953BC 2942BC (45.6%) 2892BC	3081BC (1.8%) 3070BC 3026BC (93.6%) 2883BC	I
5	*Quercus* sp.	Feature 41A	4A	MKL-3015	4300 ± 40 BP	3007BC (8.6%) 2989BC 2931BC (59.6%) 2883BC	3023BC (95.4%) 2876BC	I
6	*Quercus* sp.	Grave 40	2	MKL-2727	4260 ± 40 BP	2918BC (65.9%) 2872BC 2798BC (1.3%) 2795BC 2783BC (1.1%) 2781BC	3010BC (2.0%) 2980BC 2940BC (71.9%) 2855BC 2812BC (17.7%) 2746BC 2726BC (3.8%) 2697BC	I
7	*Quercus* sp.	Feature 12	4A	MKL-2731	4250 ± 40 BP	2911BC (55.7%) 2870BC 2802BC (12.5%) 2779BC	2926BC (63.4%) 2850BC 2814BC (25.4%) 2740BC 2730BC (6.2%) 2693BC 2686BC (0.3%) 2680BC	I
8	*Quercus* sp.	Feature 49	4A	MKL-2847	4180 ± 40 BP	2881BC (14.6%) 2851BC 2813BC (37.4%) 2742BC 2729BC (16.3%) 2695BC	2891BC (22.1%) 2831BC 2821BC (73.3%) 2631BC	I
9	*Quercus* sp.	Feature 47	4A	MKL-2739	4120 ± 70 BP	2863BC (17.3%) 2807BC 2759BC (12.3%) 2717BC 2710BC (38.6%) 2581BC	2886BC (89.7%) 2561BC 2536BC (5.7%) 2492BC	I

Table 1 (*Continued*)

No.	Taxon (charcoals)	Sample name	Type of archaeological feature	Lab nr	Age ^{14}C	Cal age BC/AD (68.2%)	Cal age BC/AD (95.4%)	Chronological horizon
10	*Fraxinus excelsior*	Barrow 1, central grave	1	Poz-73135	4045 ± 35 BP	2621BC (36.8%) 2559BC 2536BC (31.4%) 2491BC	2836BC (4.4%) 2816BC 2670BC (91.0%) 2473BC	I
11	*Quercus* sp.	Feature 60/2	4A	MKL-2846	3980 ± 40 BP	2569BC (40.3%) 2517BC 2500BC (27.9%) 2467BC	2618BC (0.6%) 2610BC 2582BC (90.4%) 2399BC 2383BC (4.4%) 2347BC	I
12	*Betula* sp.	Feature 32K	3	MKL-2726	1850 ± 60 BP	86AD (68.2%) 235AD	27AD (1.2%) 40AD 48AD (86.2%) 264AD 274AD (8.0%) 330AD	IIA
13	*Pinus sylvestris*	Grave 14	2	Poz-76343	1840 ± 30 BP	133AD (68.2%) 216AD	86AD (95.4%) 242AD	IIA
14	*Betula* sp.	Feature 9K	3	Poz-79535	1770 ± 30 BP	230AD (25.9%) 264AD 275AD (42.3%) 330AD	138AD (95.4%) 345AD	IIA
15	*Betula* sp.	Grave 17	2	Poz-76344	1765 ± 30 BP	236AD (22.8%) 264AD 275AD (45.4%) 330AD	142AD (2.0%) 160AD 165AD (4.1%) 196AD 209AD (87.9%) 354AD 367AD (1.5%) 379AD	IIA
16	*Betula* sp.	Feature 9AK	3	Poz-79534	1750 ± 30 BP	245AD (16.4%) 265AD 271AD (51.8%) 332AD	222AD (95.4%) 385AD	IIA
17	*Quercus* sp.	Feature 99	2B	MKL-2730	1750 ± 40 BP	239AD (68.2%) 340AD	144AD (1.1%) 154AD 168AD (3.2%) 195AD 210AD (91.0%) 392AD	IIA
18	*Corylus avellana*	Feature 5K	3	Poz-79533	1730 ± 30 BP	254AD (41.0%) 303AD 315AD (25.0%) 346AD 373AD (2.2%) 376AD	243AD (95.4%) 386AD	IIA
19	*Betula* sp.	Grave 12	2	Poz-76342	1715 ± 30 BP	259AD (18.9%) 282AD 324AD (49.3%) 384AD	249AD (95.4%) 394AD	IIA
20	*Betula* sp.	Feature 4K	3	Poz-79532	1715 ± 30 BP	259AD (18.9%) 282AD 324AD (49.3%) 384AD	249AD (95.4%) 394AD	IIA

21	*Betula* sp.	Grave 3	2	Poz-79531	1700 ± 30 BP	264AD (8.4%) 275AD 330AD (59.8%) 391AD	253AD (23.6%) 304AD 313AD (71.8%) 406AD	IIA
22	*Pinus sylvestris*	Grave 84	2	Poz-76349	1685 ± 30 BP	335AD (68.2%) 400AD	257AD (13.4%) 297AD 320AD (82.0%) 419AD	IIA
23	*Quercus* sp.	Feature 72	2B	MKL-3008	1650 ± 50 BP	334AD (56.2%) 430AD 492AD (12.0%) 530AD	257AD (7.7%) 298AD 319AD (87.7%) 539AD	IIB
24	*Betula* sp.	Feature 20K	3	MKL-3012	1640 ± 70 BP	336AD (41.7%) 438AD 443AD (8.9%) 473AD 486AD (17.6%) 535AD	244AD (95.4%) 565AD	IIB
25	*Betula* sp.	Grave 42A	2	MKL-3011	1620 ± 70 BP	356AD (2.7%) 365AD 381AD (65.5%) 539AD	254AD (6.0%) 302AD 315AD (89.4%) 588AD	IIB
26	*Pinus sylvestris*	Feature 46	4	Poz-79562	1565 ± 30 BP	429AD (50.5%) 495AD 508AD (8.5%) 520AD 527AD (9.2%) 539AD	419AD (95.4%) 560AD	IIC
27	*Betula* sp.	Feature 47K	3	MKL-3009	1550 ± 50 BP	429AD (40.1%) 497AD 505AD (28.1%) 557AD	405AD (95.4%) 605AD	IIC
28	*Betula* sp.	Feature 23K	3	MKL-3010	1540 ± 50 BP	429AD (37.4%) 495AD 508AD (6.0%) 520AD 527AD (24.8%) 571AD	410AD (95.4%) 615AD	IIC
29	*Pinus sylvestris*	Feature 3K	3	Poz-79530	1525 ± 30 BP	434AD (10.8%) 453AD 470AD (11.0%) 487AD 534AD (46.4%) 585AD	428AD (35.1%) 499AD 504AD (60.3%) 604AD	IIC
30	*Carpinus betulus*	Barrow 2, feature 68/10	1A	Poz-76338	1515 ± 30 BP	474AD (5.6%) 485AD 536AD (62.6%) 600AD	428AD (24.6%) 495AD 507AD (2.1%) 520AD 527AD (68.6%) 615AD	IIC
31	*Alnus* sp.	Feature 6K	3	MKL-2724	1480 ± 50 BP	545AD (68.2%) 636AD	430AD (14.2%) 494AD 510AD (1.1%) 518AD 529AD (80.1%) 654AD	IIC
32	*Corylus avellana*	Feature 6K	3	MKL-2740	1480 ± 40 BP	549AD (68.2%) 623AD	433AD (3.6%) 457AD 468AD (3.4%) 488AD 533AD (88.4%) 651AD	IIC
33	*Pinus sylvestris*	Feature 10K	3	Poz-79561	1415 ± 30 BP	614AD (68.2%) 653AD	585AD (95.4%) 663AD	IIC
34	*Pinus sylvestris*	Feature 37	4	MKL-2844	1300 ± 35 BP	668AD (46.6%) 713AD 745AD (21.6%) 765AD	658AD (95.4%) 770AD	IID

Table 1 (*Continued*)

No.	Taxon (charcoals)	Sample name	Type of archaeological feature	Lab nr	Age ^{14}C	Cal age BC/AD (68.2%)	Cal age BC/AD (95.4%)	Chronological horizon
35	*Fagus sylvatica*	Feature 76K	3	Poz-76348	1215 ± 30 BP	769AD (7.6%) 780AD 788AD (60.6%) 874AD	694AD (16.0%) 746AD 763AD (79.4%) 889AD	IID
36	*Pinus sylvestris*	Feature 70	4	MKL-2845	1210 ± 35 BP	770AD (68.2%) 878AD	689AD (16.0%) 750AD 760AD (78.6%) 894AD 931AD (0.8%) 938AD	IID
37	*Fagus sylvatica*	Barrow 2, feature 68A/11	1A	Poz-76337	595 ± 30 BP	1310AD (53.7%) 1360AD 1387AD (14.5%) 1401AD	1298AD (69.7%) 1371AD 1379AD (25.7%) 1410AD	III
38	*Abies alba*	Grave 25	2	MKL-2725	570 ± 40 BP	1315AD (41.6%) 1356AD 1389AD (26.6%) 1414AD	1299AD (57.6%) 1370AD 1380AD (37.8%) 1428AD	III
39	*Pinus sylvestris*	Grave 25	2	MKL-2737	530 ± 30 BP	1399AD (68.2%) 1432AD	1320AD (19.5%) 1350AD 1391AD (75.9%) 1440AD	III
40	*Fagus sylvatica*	Feature 69	2A	MKL-2729	530 ± 40 BP	1328AD (12.3%) 1341AD 1395AD (55.9%) 1435AD	1310AD (29.4%) 1360AD 1386AD (66.0%) 1445AD	III
41	*Fagus sylvatica*	Feature 69	2A	MKL-2738	530 ± 50 BP	1325AD (17.7%) 1345AD 1394AD (50.5%) 1437AD	1301AD (35.9%) 1368AD 1382AD (59.5%) 1449AD	III
42	*Fagus sylvatica*	Grave 68	2	Poz-76345	565 ± 30 BP	1320AD (37.7%) 1350AD 1391AD (30.5%) 1414AD	1306AD (54.2%) 1364AD 1385AD (41.2%) 1426AD	III
43	*Pinus sylvestris*	Grave 2	2	Poz-76339	455 ± 30 BP	1427AD (68.2%) 1451AD	1413AD (95.4%) 1473AD	III

The remaining archaeological features usually did not contain any material usable for age estimation by relative chronology, or else their material was of mixed chronology. Type 3 includes three groups of post-holes forming rectangular structures (4.0 × 3.5 m, 4.4 × 3.8 m, 1.8 × 1.7–1.8 m). Type 4 includes large fragments of burnt wood (Figure 2). Type 4A consists of conspicuously large, deep, rectangular structures.

The aim of this study was to establish the absolute chronology of the graves of the Corded Ware and Wielbark cultures (Types 1 and 2), and the absolute chronology of the features that lacked well-dated archaeological material (Types 3 and 4).

MATERIALS AND METHODS

Wood charcoal fragments were the only botanical material found at site 3 in Ulów. Anthracological analysis can help identify the different uses of wood during funeral ceremonies (Moskal-del Hoyo 2012). The charcoals came from hand-picked samples recovered during excavation work in 2001-2010. A given grave or feature yielded 1–9 samples. There were only a few charcoals in Corded Ware culture graves (Type 1). More than 1150 charcoal fragments were taxonomically identified to 14 taxa. For radiocarbon (^{14}C) dating, 43 charcoal fragments (Table 2) from different types of features were chosen: 1 from Type 1, 2 from Type 1A, 13 from Type 2, 2 from Type 2A, 2 from Type 2B, 13 from Type 3, and 10 from Type 4.

Charcoal fragments were identified taxonomically by standard methods used in anthracology (e.g. Moskal-del Hoyo 2012). Branches or twigs were selected, based on ring curvature (Marguerie and Hunot 2007). This material, young wood, is better suited for ^{14}C dating (Moskal-del Hoyo and Kozłowski 2009).

The taxonomically identified charcoal fragments were selected for ^{14}C dating. Since many samples contained large fragments of burnt wood, they were first sorted for liquid scintillation counting (LSC). This conventional ^{14}C analysis was performed in the Laboratory of Absolute Dating in Kraków (Poland). Samples were chemically pretreated with AAA (acid-alkali-acid). The procedure included standard synthesis of benzene from the samples (Skripkin and Kovalyukh 1994). ^{14}C measurements were carried out using a HIDEX 300SL triple photomultiplier liquid spectrometer (Krąpiec and Walanus 2011). AMS ^{14}C measurements were performed in the Radiocarbon Laboratory in Poznań (see Goslar et al. 2004 for details). Calibrated ^{14}C ages (cal AD/BC) were obtained based on the IntCal13 ^{14}C calibration dataset (Reimer et al. 2013) and OxCal 4.2 calibration software (Bronk Ramsey 2009).

RESULTS AND DISCUSSION

Based on the ^{14}C dating results, three main chronological horizons were distinguished (Figures 3–5) and divided into subgroups (Table 1).

Horizon I is represented by Late Neolithic features of the Corded Ware culture (Figure 3) and archaeological features of Types 1 and 4A. Only one barrow grave (Type 1) contained charcoals, from which one fragment of ash *Fraxinus excelsior* was dated. The result (ca. 2620–2490 BC, 68.2% probability, Table 1, no. 10) was in accordance with the relative chronology of the Ulów barrows, which were initially interpreted to be of the younger phase of the Corded Ware culture (Niezabitowska-Wiśniewska and Wiśniewski 2011). All of the Type 4A (Table 1, no. 3–5, 7–9, 11) features also proved to be Late Neolithic. Taxonomical analysis of charcoal fragments from those features showed that only oak *Quercus* sp. wood was used. Such features, which are situated between barrows, have no exact analogues in other Corded Ware sites in Poland, but we should

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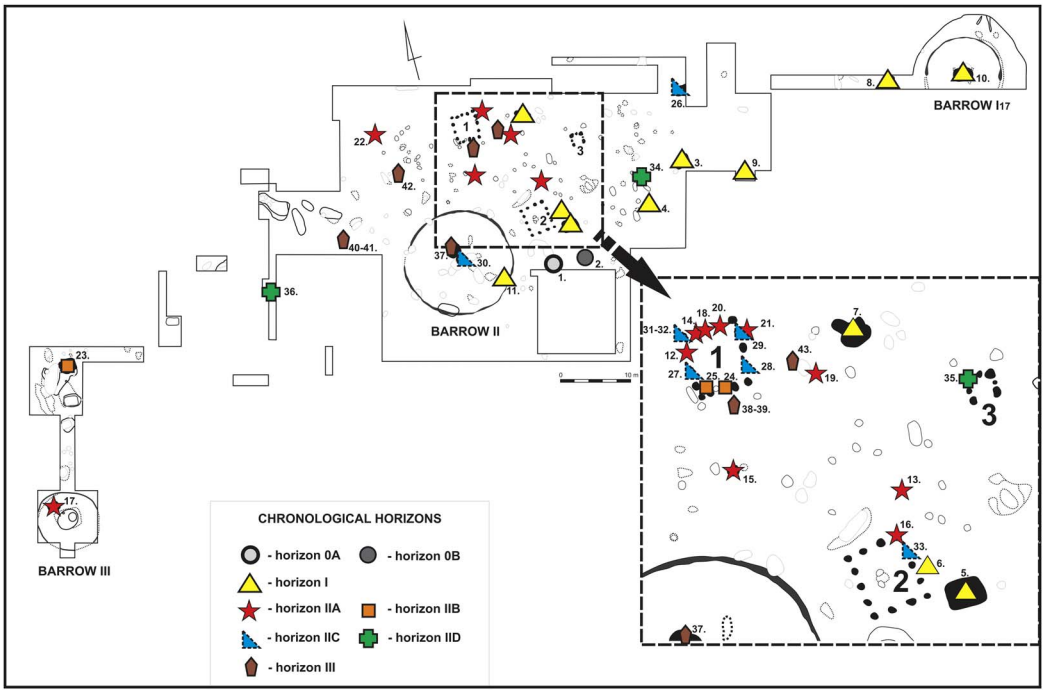

Figure 3 Distribution of ^{14}C dating results of samples (numbers as in Table 1) in excavation units at site 3 in Ulów. Horizons 0–III.

point out that only areas adjacent to barrows have usually been excavated; vast areas rather farther from the barrows generally are not investigated. In the light of these results, the presence of Corded Ware pottery scattered in the vicinity of the remains of those wooden structures may indicate the past practice of unknown, more complicated rites associated with the Late Neolithic cemetery. Occasionally, features with remains of burnt and cremated bones have also been found under and outside barrows (Machnik 1966; Włodarczak 2006).

The time interval represented by the Late Neolithic features of the Corded Ware culture was established from a model enabling calculation of the probability distribution for the beginning, end, and possible time span of the phase in calendar age (Figure 4). The model indicates that the analyzed objects may represent a broad chronological range from the beginning of the fourth millennium until the middle of the third millennium (Figure 4).

The relationship between the barrows (Type 1) and the wooden structures (Type 4A) requires more study. Although the ^{14}C dating from barrow I indicates a period later than that of the wooden structures, other barrows from the nearest area, such as barrow II of site 4 in Ulów, showed a chronology of around 3000–2800 BC (Niezabitowska-Wiśniewska, unpublished). The differences in chronology may also be related to the use of wood obtained from oak, which is a genus of long-lived trees that may give a date older than the moment of its use by humans (the "old wood" problem; Schiffer 1986). This applies especially to timber remains.

In southeastern Poland, the development of the Corded Ware culture began between 2800 and 2700 BC, and the final stage occurred around 2300 BC (Jarosz and Włodarczak 2007). Its age estimation may be more complicated, however, as for this period two plateaus of the calibration

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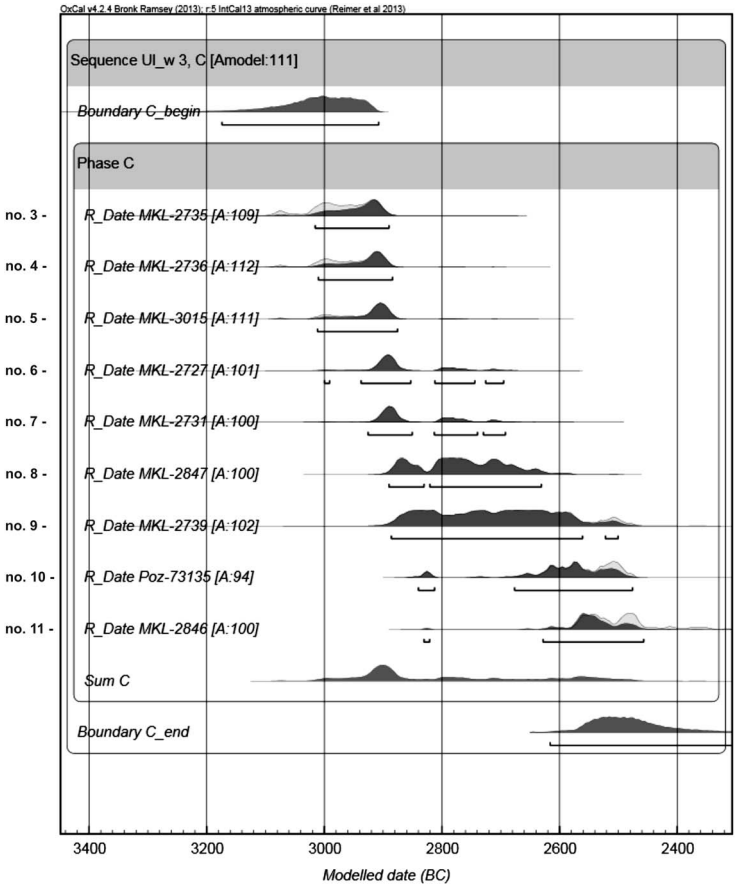

Figure 4 ^{14}C dating results of samples from Late Neolithic archaeological features (Horizon I). The model applied yields a calculation of the probability distribution pattern for the calendar-age beginning, end, and possible time span of the phase.

curve appear, at 2880–2580 and 2470–2200 BC (Włodarczak 2009). In this context and in the light of new ^{14}C dates from the Lublin Upland (Włodarczak 2016), it might be also assumed that the dating results of oak timber might reflect the "old wood" problem.

One dating result came from a typical cremation grave of the Wielbark culture (Type 2) with cremated bones and rich offerings (grave 40, Table 1, no. 6). The presence of charcoal dated to the Late Neolithic suggests that post-depositional processes were responsible for the admixture of anthracological material, attributable to the location of this grave in an area of Late Neolithic features with a great amount of burnt wood (Type 4A) (Figure 3).

Horizon II (Types 2–4) is associated with cultures that developed during the first millennium AD. It can be divided into four subgroups (Table 1, IIA–IID). Horizons IIA and IIB correspond to the Wielbark culture. Five graves (Type 2), one feature with pavement (Type 2B) and five features of Type 3 belong to Horizon IIA (Table 1, no. 12–22). According to the relative chronology they represent the Late Roman period, falling between the 3rd and 4th centuries AD. Figure 5 presents the probability distribution pattern produced from a model taking into account all dating results. Feature 32K (Table 1, no. 12) and grave 14 (Table 1, no. 13) gave the oldest dating results,

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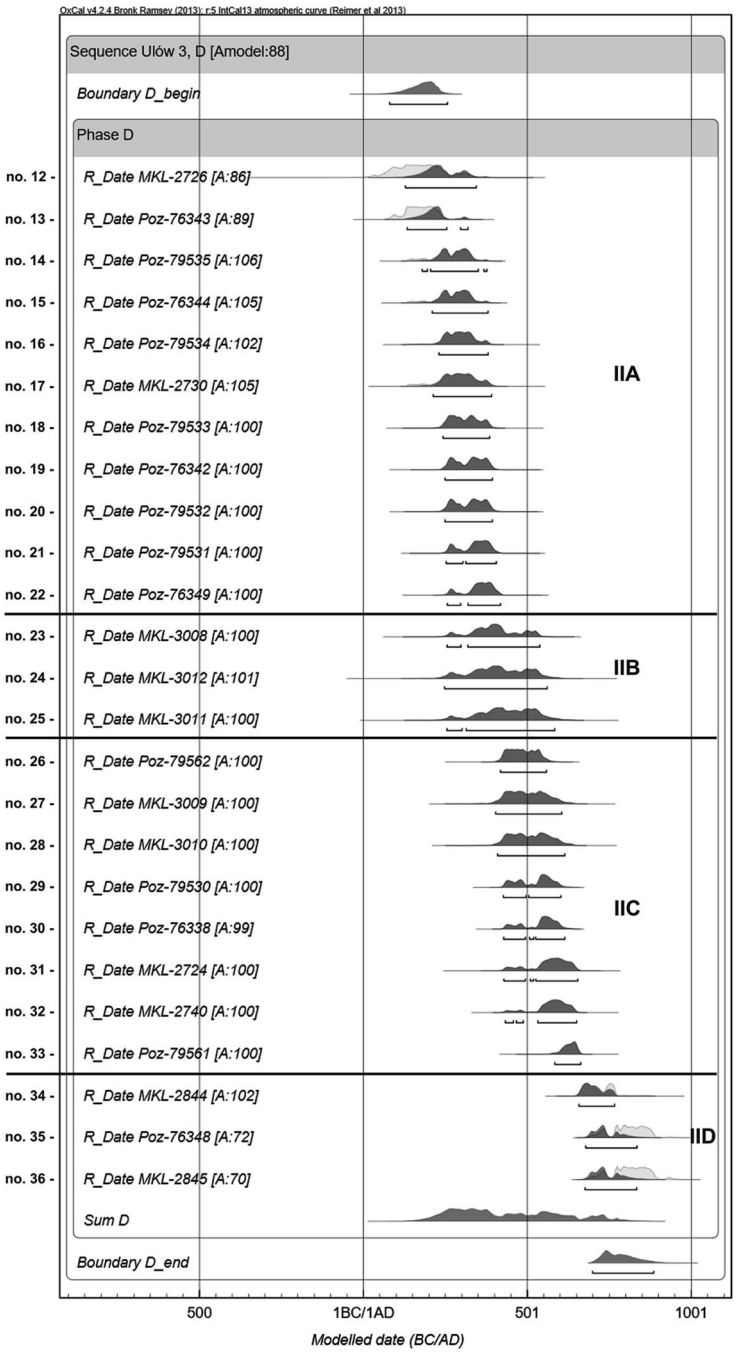

Figure 5 Model showing the probability distribution pattern for samples of Horizon II, originating during the first millennium AD.

correlated with the period between the end of the 1st century AD and the beginning of the 3rd century AD. This seems slightly too early for the presence of the Goth culture in southeastern Poland, as Goths appeared in the Lublin Upland no earlier than at the end of the 2nd century AD

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(Kokowski 1991, 2010, 2013). However, these two dating results are in accord with the relative chronology, as the main and highest peak falls at the beginning of the 3rd century AD (Figure 5), which corresponds to the presence of the Wielbark culture in the Lublin region. The majority of the dating results from other graves and features can be placed in the second half of the 3rd century and the 4th century AD. The result from grave 84 (Table 1, no. 22), which gave the youngest date of this horizon, correlates well with the relative chronology, as this grave was initially dated to the C3/D1 phase and the dating result points to 335–400 AD (68.2% probability).

Horizon IIB is represented by three dating results, which indicate the Late Roman and Migration periods (4th–5th c. AD) (Table 1, Figure 5). The data from feature 20K (Table 1, no. 24, Type 3) and grave 42A (Table 1, no. 25, Type 2), which are near each other (Figure 3), are similar. It is important to note that feature 72 with stone pavement (Table 1, no. 23, Type 2B) is similar to feature 99 (Table 1, no. 17, Type 2B) of Horizon IIA, which was used by people of the Wielbark culture. These kinds of features are known from other cemeteries of the Wielbark culture and can be interpreted as fireplaces related to funeral rites (Chowaniec 2005; Gałęzowska 2007).

Horizon IIC represents the Migration period and the Early Middle Ages according to the relative chronology, corresponding to the 5th and 6th centuries and the beginning of the 7th century AD (Table 1, Figure 5). All of the ^{14}C measurements come from features (Table 1, no. 26–33, Types 3 and 4). ^{14}C dating of feature 68/10 dug into barrow II (Table 1, no. 30, Type 1A) confirmed that this feature is evidence of later looting of the Neolithic graves in the barrow. From this feature a charcoal of hornbeam *Carpinus betulus* was selected for dating, because this tree is late arrival in the region (Bałaga 1998; Korzeń et al. 2015) and its presence in a late Neolithic grave was doubtful. The function of features of Type 4 with a large accumulation of pine wood (Table 1, no. 26, Type 4) is still difficult to interpret.

Six dating results came from features of Type 3 (Figure 3, Table 1, no. 27–29, 31–33) which suggest that at least two rectangular structures were built during this period, evidenced by groups of post-holes. As described previously, six charcoal samples from features of Type 3 were also dated to Horizons IIA and IIB (Table 1, no. 12, 14, 16, 18, 20, 24). Based on the dating results as well as the dominance of objects belonging to the Wielbark culture mixed with a few small cremated bones and charcoals, it is likely that the "older" charcoals represent burial remains and a cremation layer from the surface of the cemetery of the Wielbark culture, on which a structure with post-built walls was built later. During this construction work, charcoals from different chronological and cultural units would have been mixed together. If so, it has implications for our interpretation of cultural processes in the late stage of the Migration period and Early Middle Ages: it was thought that these lands had been uninhabited, and this leaves an open question. Who settled there between the end of the 5th century and the beginning of the 7th century AD? Did Goths of the Wielbark culture remain in this area? Did a new unknown tribe of Late Germanic people appear? Infrequent material typical of the latter group was found at the site. It is unlikely that these buildings were made by the first Slavic people, who usually did not build such things (Parczewski 1988, 1993; Godłowski 2000; Bemmann and Parczewski 2005). In addition, the palynological analyses performed so far near the Ulów site 3 (Pidek, unpublished) have not helped in detecting the existence of the inhabitance during the Migration Period due to the lack of pollen zones dated to this period.

Horizon IID corresponds to the Early Middle Ages (7th–8th c. AD, Figure 5). This horizon was represented by charcoals found in three features of Types 3 and 4 (Table 1, no. 34–36). Since they did not belong to the Corded Ware culture or to the Wielbark culture, it is very difficult to interpret their function and to connect them to a particular culture, but from this period some single finds of Slavic tribes were found at Ulów.

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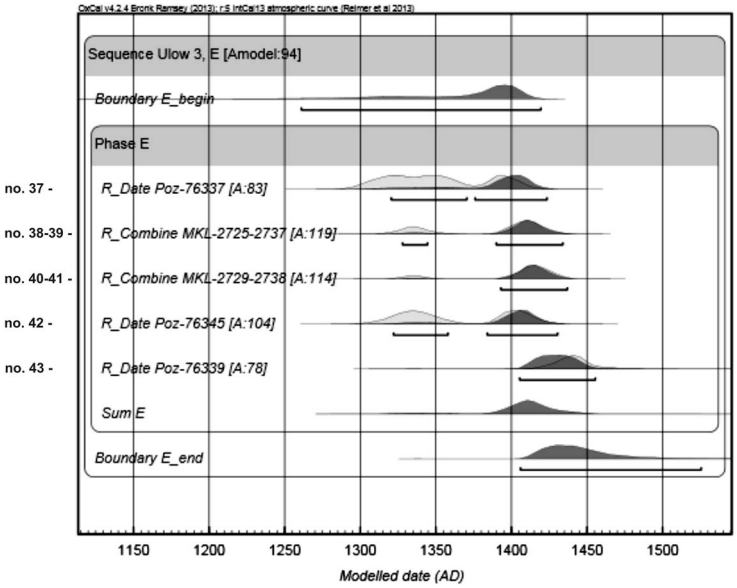

Figure 6 Model showing the probability distribution pattern of samples from the Middle Ages.

Seven charcoals were dated to Horizon III of the Middle Ages (second half of 14th c. to first half of 15th c. AD) (Table 1, Figures 3 and 6). Feature 68A/11 (Table 1, no. 37, Type 1A) again apparently comes from a looting pit. Two dated charcoals from different areas of feature 69 (Table 1, no. 40–41) gave very similar results placing them in the first half of the 15th century AD. This feature contained artifacts characteristic of the Wielbark culture, including a wheel-made vessel, so the charcoal remains likely indicate later disturbance of feature 69. The situation is similar for graves 2, 25, and 68 (Table 1, no. 38–39, 42–43). They most likely were Wielbark culture burials, as many remains of cremated bones and rich offerings typical for this cultural unit were documented. The presence of charcoals dated to the Middle Ages shows that post-depositional processes caused the admixture of anthracological material. The existence of a settlement at Ulów during the Middle Ages was not confirmed, but the sporadic presence of humans is inferred from single archaeological findings.

Finally, two charcoals of Scots pine *Pinus sylvestris* from two Wielbark culture graves (Type 2) turned out to be of early Holocene origin (Horizon 0A and 0B). These results are not surprising, as both graves had an admixture of lithic material dated by typological analysis to the Late Palaeolithic and Mesolithic. The manner in which the graves were made could not be determined; probably they were dug into older cultural layers. These graves are on the southern edge of the Wielbark culture cemetery, away from the main concentration of graves. Their material may have moved from the original burials or from the cremation layer (Figure 3).

In view of these results, we can suggest some general trends in the use of wood, probably related to its availability in different periods of local development of the vegetation cover in the Holocene (Bałaga 1998; Korzeń et al. 2015). For example, only oak wood was used in the Neolithic structures that left remains of large beams (Type 4A), indicating a preference for oak timber. Its mechanical properties make oak an excellent construction material, as previously confirmed in work on numerous archaeological sites (Zielski and Krąpiec 2004). Different kinds of wood were found in Wielbark culture graves from Horizons I and II, but birch *Betula* sp. and pine *Pinus sylvestris* were ubiquitous

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and most frequent. These trees have shown frequent occurrence in other incineration cemeteries of the Roman period (Sławiński et al. 1958; Czeczuga and Kłyszejko 1974; Moskal-del Hoyo 2012). Birch in particular could have been chosen due to the ignition properties of its bark, which contains betulin, a chemical compound which rapidly ignites even fresh and wet wood; it also allows birch wood to reach higher temperatures during burning (Lityńska-Zając et al. 2014). In two hearths with pavement, from the same culture, only oak wood was documented. Among the features dated to Horizon III late-arriving trees such as fir *Abies alba* and beech *Fagus sylvatica* prevailed. These findings have implications for selection of charcoals for ^{14}C dating. Anthracological analysis may prove helpful in choosing the best charcoal samples to use for ^{14}C dating of particular cultural units, and it may also help in elucidating problems of taphonomy when a given taxon does not fit the taxonomic list of the whole charcoal assemblage characteristic for a specific culture. At a multicultural site such as the one reported here, which shows clear evidence of mixing of material, only charcoal fragments analyzed by ^{14}C unquestionably belong to particular archaeological features.

CONCLUSIONS

Radiocarbon dating of charcoals sampled from different types of archaeological features confirmed and clarified the chronology of cemeteries that originated during the periods of the Corded Ware and Wielbark cultures at site 3 in Ulów. A group of features with burnt wooden structures and with a small amount of archaeological material (Type 4A) were demonstrated to be of Late Neolithic origin. The ^{14}C datings confirmed the occurrence of multiple post-depositional processes leading to the formation of disturbed layers of archaeological features. For example, there was a discrepancy between the chronology of archaeologically well-dated artifacts from grave contexts (Type 2) and the ^{14}C dates of charcoal samples. The results also indicated that the barrow dated to the Corded Ware culture was looted in later periods. ^{14}C dating also revealed much greater intensity of settlement during the early and late stages of the Middle Ages, previously not inferred from a few earlier findings. These dating results also suggest that there probably was no hiatus in this area between the late Wielbark culture and the first Slavic groups; this is unusual in Polish prehistory.

For multicultural sites like site 3 in Ulów, a large sequence of ^{14}C datings is essential for proper determination of the age of different archaeological features. A full archaeological reconstruction of the different phases of multicultural settlements requires the use of complementary methods in the framework of an interdisciplinary research program.

ACKNOWLEDGMENTS

This research was supported by the National Science Centre in Poland (DEC–2013/09/B/HS3/03352) and by statutory funds of the W. Szafer Institute of Botany, Polish Academy of Sciences. Michael Jacobs line-edited the text.

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