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TOWARDS A BETTER UNDERSTANDING OF THE ECONOMY AND CULTURE OF THE LATE BRONZE AGE IN THE SOUTHEASTERN BALTIC: TARBIŠKĖS SETTLEMENTS

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Keywords

Rescue excavation, southeastern Baltic, Late Bronze Age, farming, pottery, stone axe manufacturing

Abstract

In 2020, rescue excavations due to construction of a pipeline connecting Poland and Lithuania took place at the Bronze Age sites Tarbiškės 1 and Tarbiškės 2, eastern Lithuania, both dated to 1050–900 cal BC. They revealed a rather homogeneous archaeological assemblage which fills a gap in the development of the Bronze Age culture and economy in the southeastern Baltic. Tarbiškės Ware, from a typological as well as chronological point of view, stands in an intermediate position linking Trzciniec culture pottery with Žalioji and Early Striated Wares. Macrobotanical analysis of charred plant remains revealed that Bronze Age people at Tarbiškės cultivated *Panicum miliaceum*, *Hordeum vulgare* and *Triticum* sp. The Tarbiškės sites demonstrate that early farmers used to settle areas at higher elevations with sandy soils, further from large bodies of water. They used flint and other stone tools widely and lacked bronze. Tarbiškės is the first and only ancient settlement discovered in Lithuania with a workshop for on-site manufacturing of polished stone axes with drilled holes.

Introduction

Late Bronze Age (1100–500 cal BC) hill-top settlements and lake dwellings have recently attracted a lot of attention from archaeologists in Lithuania (Pranckėnaitė 2014; Minkevičius et al. 2019; Podėnas 2020). These investigations have been carried out within the framework of targeted scientific projects, and the excavated settlements have mainly been dated to the Hallstatt radiocarbon calibration plateau (ca. 750–400 cal BC). Rescue excavations, as part of large infrastructure development projects, have also contributed significantly to the knowledge of the culture and economy of the Bronze Age population. In 2015, a new gas pipeline was built which passed through the ancient settlement of Kvietiniai in the valley of the Minija River in western Lithuania, and rescue excavations allowed the identification of a new type of pottery named as Kvietiniai-Tojāti Ware, the detection of aquatic biomarkers in the ceramic vessels of this pottery type, and the dating of charred barley grains to ca. 1300–1250 cal BC (Robson et al. 2019; Vengalis et al. 2020; Piličiauskas et al. 2021). In 2020, the construction of another gas pipeline connecting Lithuania and Poland began, which provided the opportunity to locate and investigate archaeological sites of different periods and functions in this region. An archaeological expedition of the Lithuanian Institute of History succeeded in discovering two adjacent Late Bronze Age settlements in Tarbiškės in eastern Lithuania. Unlike at Kvietiniai, the archaeological material at

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Tarbiškės was homogeneous, with hardly any finds from earlier or later than the Bronze Age, and therefore offered much better potential for archaeological material analysis and laboratory research. This article is devoted to presenting the results of the field and laboratory investigations of the Tarbiškės sites. It fills one of the many remaining gaps in the development of the culture and economy of the Bronze Age.

1. Location and landscape

Tarbiškės (N 54.82°; E 24.77°) is located in the Elektrėnai municipality, in the Vievis undulating glaciolacustrine plain formed during the last glaciation according to the geomorphological map of Lithuania (https://www.lgt.lt/epaslaugos/elpaslauga.xhtml). The subsoil consists of sand, sandy loam and gravel. The sites Tarbiškės 1 and 2 are situated 0.4–0.5 km to the south and west of the small Lake Lapoja (3.3 ha), which has boggy shores (Fig. 1). It must have been considerably larger during the Bronze Age (Fig. 2). The lake shore may have been situated much closer to Tarbiškės 1 (ca. 0.3 km) and 2 (ca. 0.1 km). Another lake, now completely overgrown and filled in, was located about 200 m to the south of Tarbiškės 2. However, this lake was even smaller than Lapoja and may have already been overgrown before the Bronze Age. A shallow gully about 30 m wide separates Tarbiškės 1 and 2, and forms a spring. It is likely that the Bronze Age inhabitants of the Tarbiškės sites used water from this spring instead of the more distant Lake Lapoja or the Lapoja stream.

The sites Tarbiškės 1 and 2 are located on high, flat areas (122–123 m and 117–119 m a.s.l. respectively) covered by light sandy soils and well drained by the valleys of the adjacent streams and lakes. The area has been ploughed for a very long time. Old maps indicate that at the end of the 19th century, the fields of the Tarbiškės farm, which was located among forests and bogs, were here. In the interwar period, 300–500 m to the west of the Bronze Age sites, on the left bank of the Lapoja stream, there was the large village of Tarbiškės, which was demolished and ploughed during the Soviet era. The village site and the surrounding fields have been intensively used for agriculture from the end of World War II until the present day, with underground drainage and irrigation systems installed. Two very wide (2–2.8 m) ditches belonging to those systems were uncovered during archaeological excavations.

Figure 1. Drone photo of Tarbiškės 1 and 2 sites.

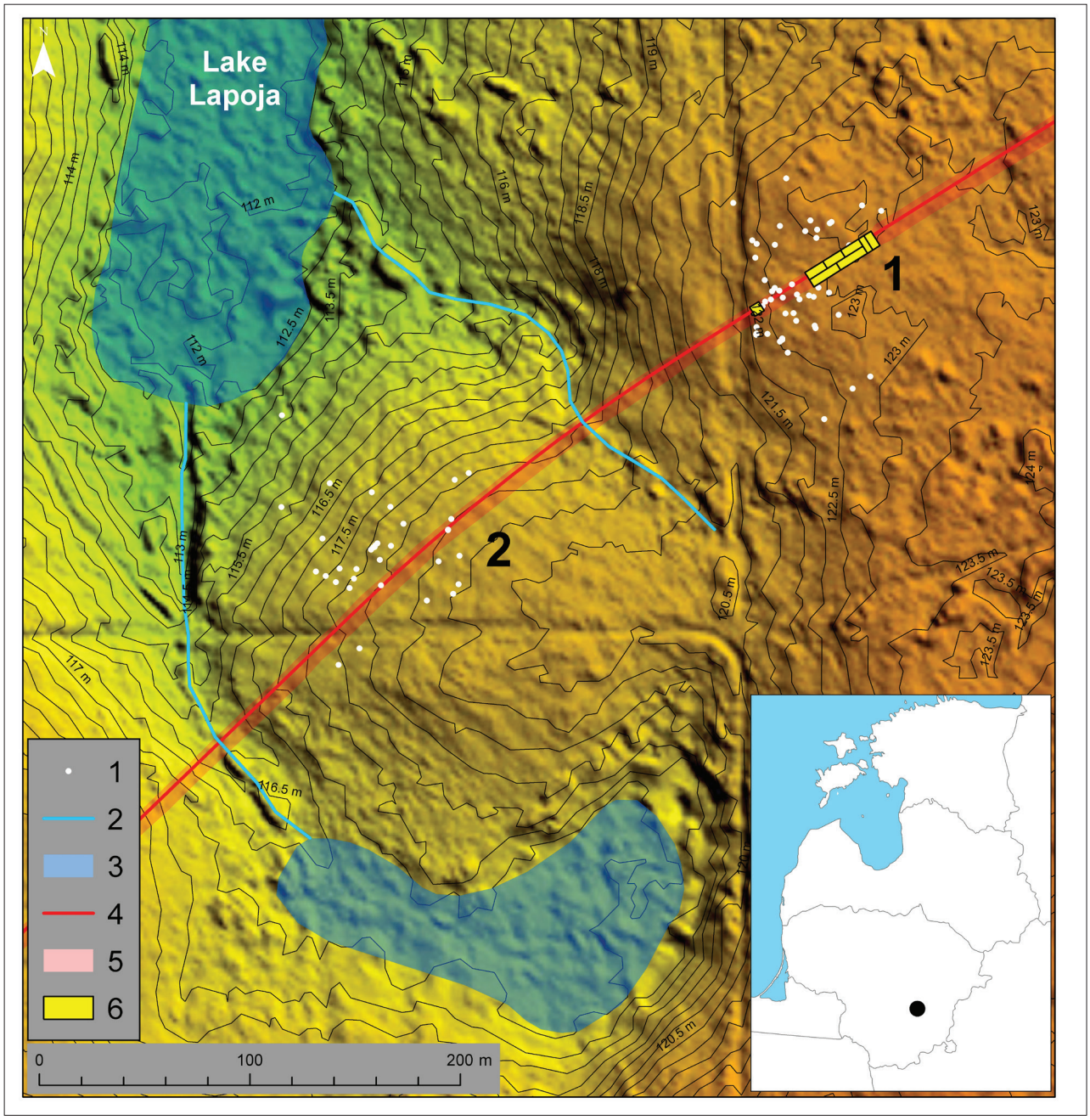

Figure 2. Location and elevation map of Tarbiškės 1 and 2 sites based on LiDAR data. Surface finds (1), streams and springs (2), former lakes (3), pipeline (4), construction zone (5), archaeological trenches (6).

2. Field research

In 2015, archaeologists Rokas Vengalis and Gytis Piličiauskas of the Lithuanian Institute of History, on their own initiative and at their own expense, carried out an archaeological survey of the then planned gas pipeline connection between Lithuania and Poland. The aim of these investigations was to draw attention to the fact that archaeological surveys incorporated into large infrastructure development projects are often carried out improperly, i.e. without a systematic visual survey of the ploughed areas. In selected sections of the planned pipeline, totalling 53 km in length, 15 new archaeological sites from different periods were found. Among them was Tarbiškės, where Bronze Age archaeological finds were attested on the surface of the ploughed field, such as sherds of handmade pottery with a striated surface and flint flakes (Vengalis et al. 2016).

In 2020, when the construction of the pipeline started, the archaeological investigations were resumed and were funded by the pipeline builder. At Tarbiškės, more extensive field investigations were carried out, including visual survey of ploughed fields, metal detector survey, boreholes by hand auger, test pitting, excavation of archaeological trenches, monitoring of mechanised removal of the topsoil layer and investigation of the features discovered.

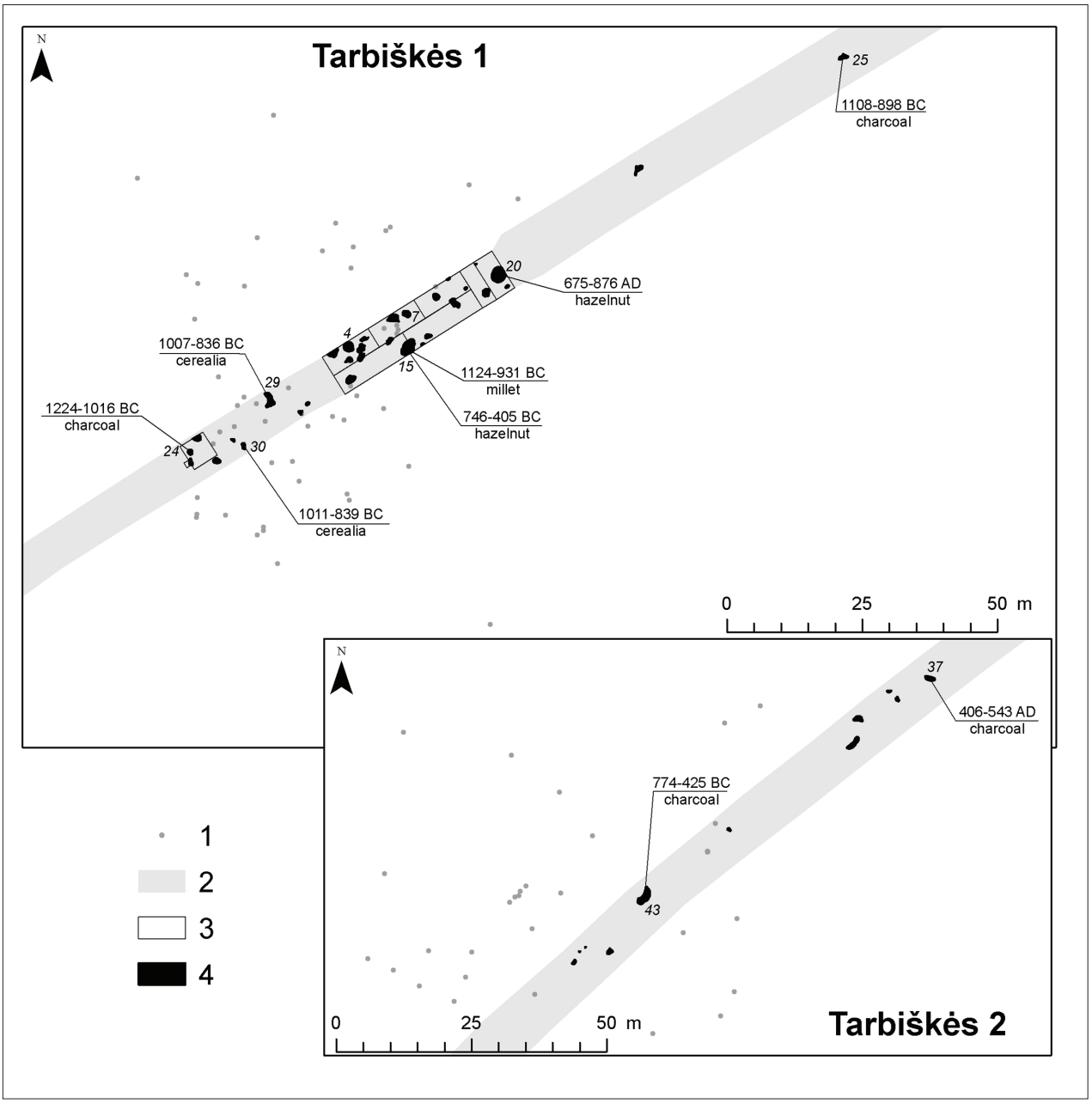

Figure 3. A situation plan of research at Tarbiškės with surface finds (1), construction zone (2), archaeological trenches (3), and features (4) marked.

The visual survey, including metal detectors, covered an area of ca. 7 ha, including some fields outside the pipeline construction zone. The surface visibility in ploughed fields varied from 50% to 100%. There were two distinct concentrations of surface finds of approximately 70–80 m each, containing 86 finds – mostly bipolar flint flakes (Fig. 2). Shallow boreholes up to 1 metre in depth were drilled with a hand auger at surface find concentrations to determine whether there was an unploughed archaeological layer preserved. The boreholes were spaced along the axial line of the pipeline at 10 m intervals. A total of 49 boreholes were drilled along a 480 m long section. If a borehole encountered an unploughed humous or fossil layer, a test pit of 0.5 x 0.5 m was made in its place. All excavated soil in the test pits was sieved through 0.5 m mesh sieves. Two test pits at Tarbiškės 1 yielded archaeological finds below the ploughed layer. Here, larger trenches were excavated, starting from the very surface of the ploughed layer. At Tarbiškės 2, no unploughed archaeological layer was observed, so here only monitoring of mechanised topsoil removal was planned with a subsequent investigation of any uncovered features (Fig. 3).

First, trenches 1–3, comprising a total area of 4 x 30 m, were investigated (Fig. 4). These trenches were excavated prior to the mechanised stripping of the topsoil, and finds were collected both from the ploughed horizon and from the underlying archaeological layer. As in the test pits, all

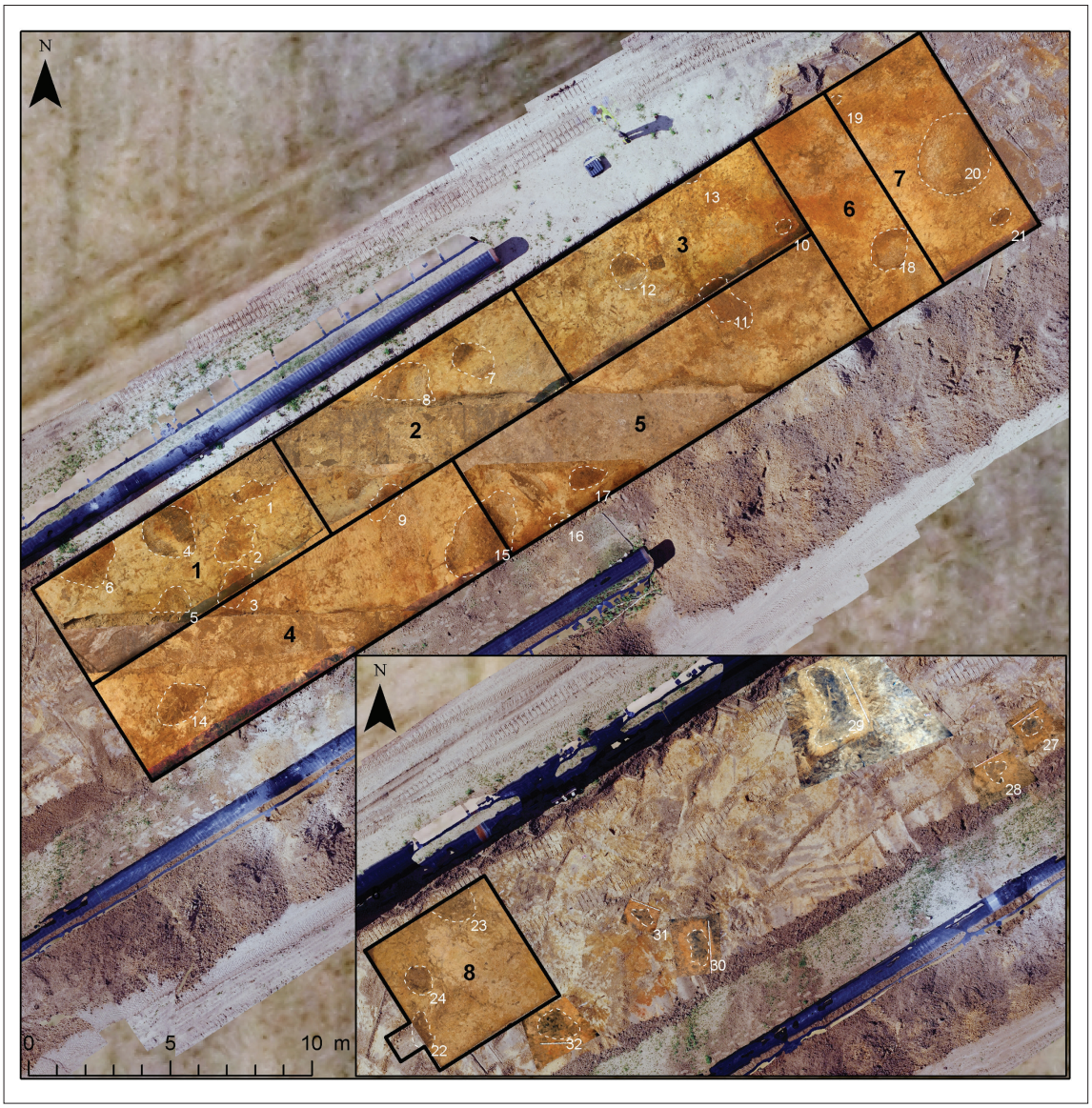

Figure 4. Orthophoto with trench (in black) and feature (in white) numbers indicated.

excavated soil was sieved through 5 mm mesh sieves. From the surface finds, it was hypothesised that the ploughed soil might contain numerous artefacts. However, finds in the topsoil turned out to be very scarce, with an average density of only 1.5/1 m^2 in trenches 1–3, while the pottery in the ploughed soil was almost entirely decayed. The other trenches (nos. 4–8) were investigated only after the ploughed soil was removed mechanically. The archaeological layer was investigated in mechanical levels of 10–20 cm thickness, each level being followed by documentation of the exposed surface relief (Fig. 5).

Similar stratigraphy has been recorded in all eight trenches investigated in Tarbiškės 1. The ploughed topsoil was made up of 0.2–0.3 m thick dark grey-brown humous sand. Under it, 0.1–0.3 m thick grey or light grey-brown fine sand was exposed. Deeper down was a fine yellowish sand with inclusions of gravel (Fig. 6). Within the trenches, 23 structures were documented and excavated (Fig. 4). Archaeological finds were found in the humous layer, grey or brown sand, and features.

After the excavation of the trenches, mechanised removal of topsoil began and was monitored by archaeologists. The width of the stripping zone varied from 8 to 10 m. A layer of yellowish fine sand was exposed beneath a 0.2–0.3 m thick humous topsoil. On its surface, isolated archaeological finds were found, which, due to bioturbation, had been deposited downwards. In addition, 28 features (12 at Tarbiškės 1 and 16 at Tarbiškės 2) were recorded in a stretch of ca. 430 m (Fig. 3). Their fills were sieved, charcoals were collected for ^{14}C dating and soil samples (1.55 l in total) were taken from seven features for macrobotanical analysis.

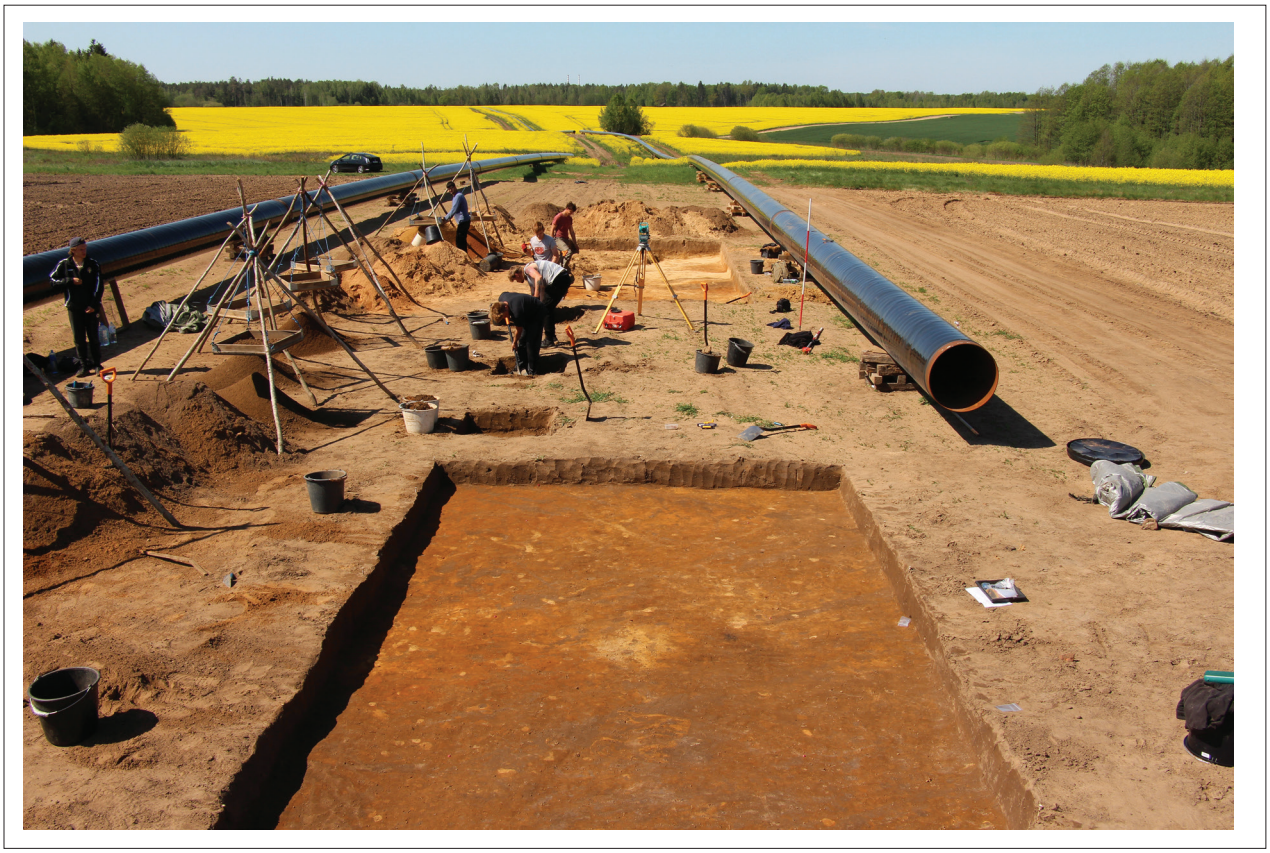

Figure 5. A view of excavations of Tarbiškės sites with archaeological layer dry sieved.

3. Features

Fifty-two features were studied at Tarbiškės. There were 36 features at Tarbiškės 1 and 16 at Tarbiškės 2 (Fig. 3). Most of them, however, despite the archaeological finds, are of natural origin. This is evidenced by the irregular or specific shapes, as well as by the content of the fills, which are not common to features found in other archaeological settlements. There were no pits with fire-cracked stones, no charcoal concentrations, and no confirmed postholes. Among those features found, a group of round pits 1–3 m in diameter can be distinguished, one side of which is filled with dark-grey sand and the other with gravel (nos. 4, 7, 8, 12, 20; Fig. 7.20). These are tree throws with gravel brought to the surface by uprooting trees. Another type of tree throw is represented by crescent-shaped features with an asymmetrical section (nos. 26, 29, 41, 43; Fig. 7.29, 43). Archaeological finds including Bronze Age pottery from the fills indicate that at the time of the formation of the tree throws there was still a well-preserved archaeological layer, which has now been severely destroyed by ploughing. Only four pits found in and adjacent to trench 8 (nos. 22, 24, 30, 32; Fig. 7.24, 30) are likely to be anthropogenic, while five further smaller pits resemble postholes (nos. 10, 19, 21 and 45–46).

Archaeological finds were found in 31 of the 52 features. The most frequent finds were flint flakes and unornamented small sherds of Bronze Age pottery. Feature 25 with 0.32 kg of very fragile potsherds in its fill stands out. Here, the lower part of a large vessel was crumbled and the fill of the feature was black and humous (Fig. 7.25). This is probably also a tree throw, but much later than the others, which had less organic residue in their fills.

4. Pottery

Almost all of the prehistoric pottery at Tarbiškės (305/331 potsherds) was found in a brown sand cultural layer and in features under the plough zone, with only a few potsherds found in the ploughed layer. It is clear that the fragile hand-made pottery was destroyed by sustained ploughing. The highest density of potsherds was found in trench 1 (Fig. 8).

There were several types of pottery, although their proportions varied greatly, with one type clearly predominating (Table 1). Two small sherds, both decorated, belonged to a thin-walled (5–6 mm) beaker. Its clay mass was tempered with grog and the exterior was decorated with incised horizontal lines and a herringbone motif (Fig. 9.1–2). It is a typical vessel of the Neolithic Corded Ware culture (2800–2400 cal BC), many of which have been found in other

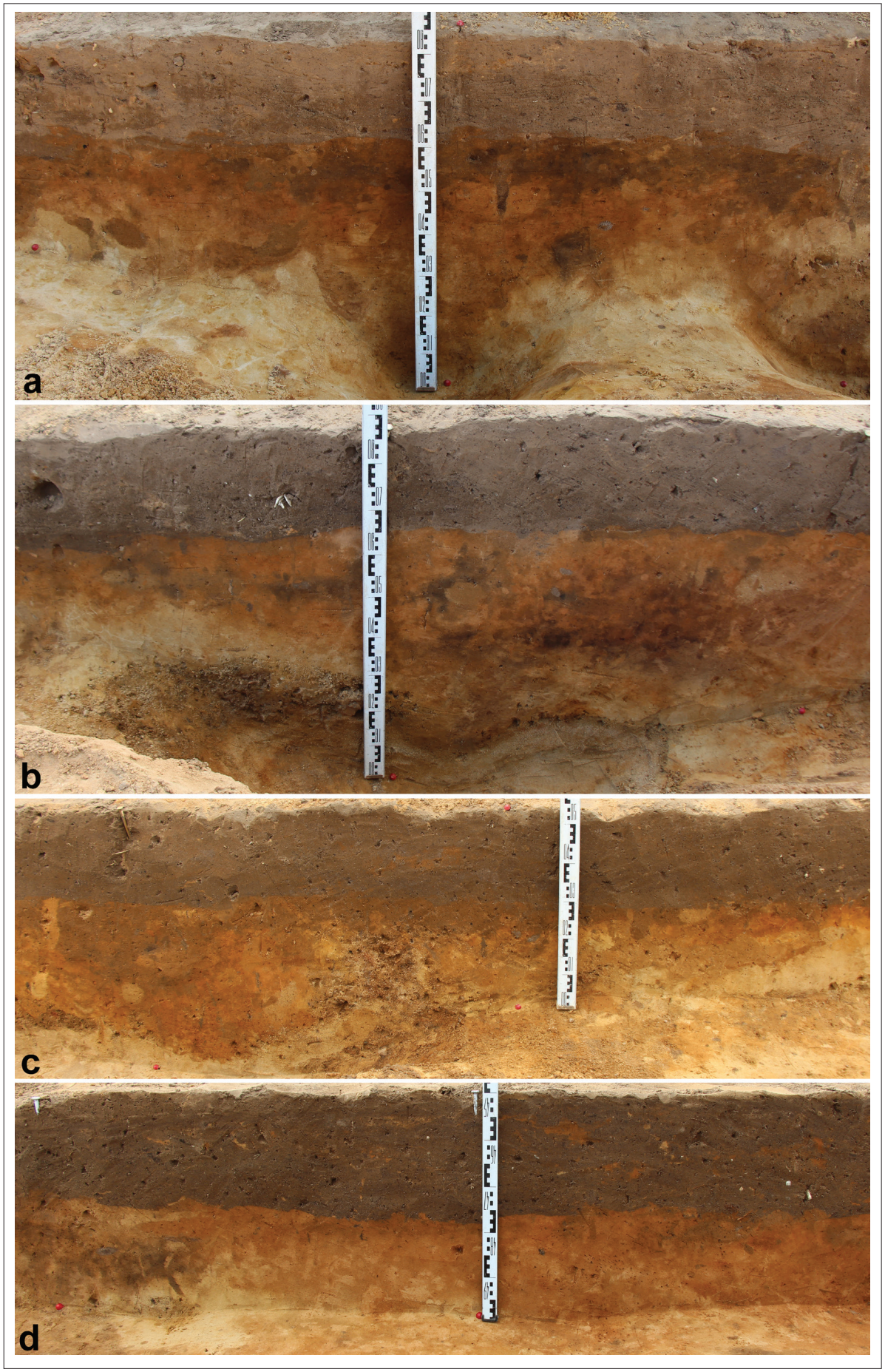

Figure 6. Examples of stratigraphy at trench 1(a), 2(b), 3(c), and 5(d) with features 3, 9, 11, and 16 correspondingly.

Figure 7. AMS ^{14}C dated features 15, 20, 24, 25, 29, 30, 37 and 43.

settlements of this culture in Lithuania (Piličiauskas 2018). One further potsherd was exceptional — it was a rim of a coarse vessel, tempered with admixtures of crushed stone, with only slightly profiled walls, a thinned edge, and a fine-rusticated outer surface (Fig. 9.13). This sherd is of the so-called Fine-Rusticated Ware in Lithuania and is dated to the end of the Late Bronze Age or as early as the Early Iron Age (ca. 700–200 cal BC) (Vengalis et al. 2020; Vengalis et al. forthcoming). Another exceptional sherd is the bottom of a small vessel just 4 cm in diameter found in

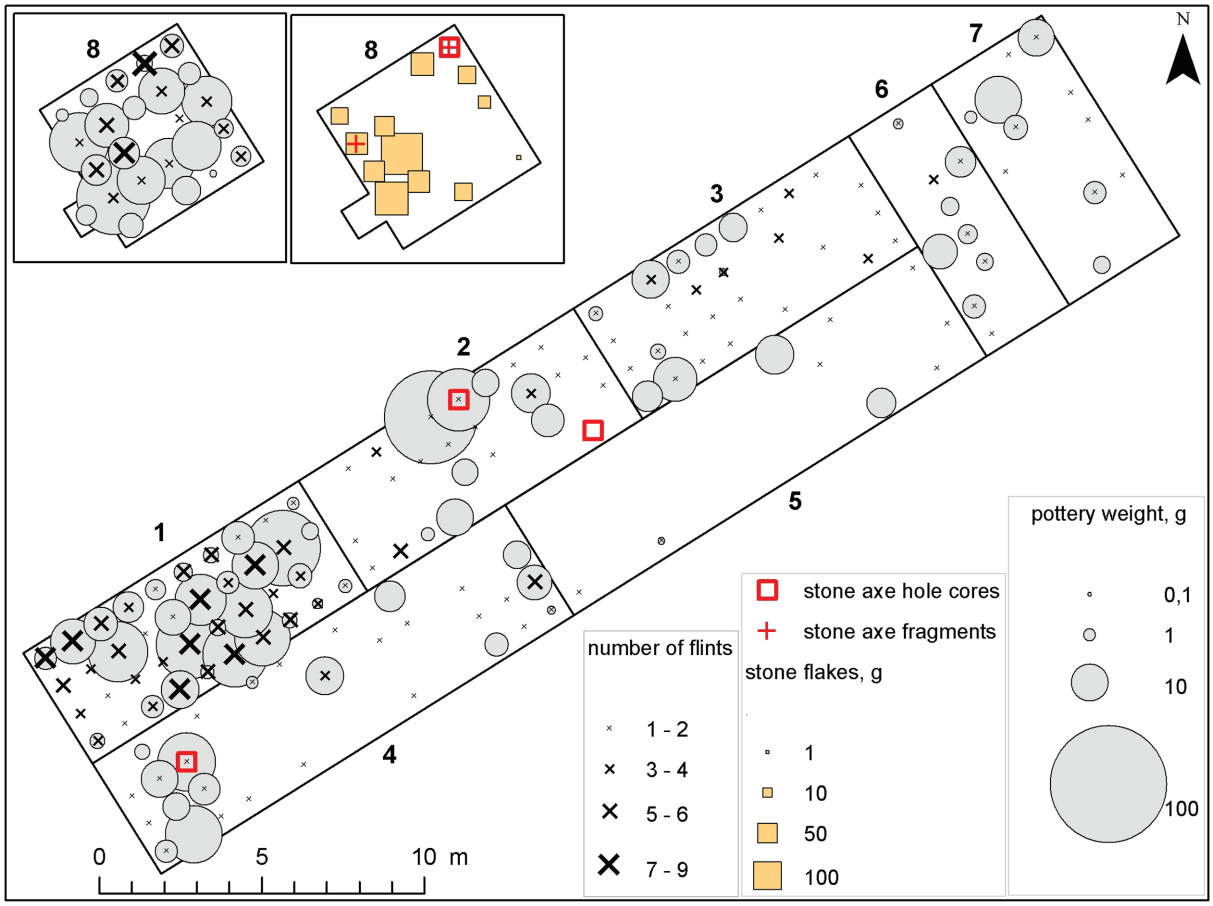

Figure 8. Distribution map of ceramics, flints and other rock finds.

trench 8 (Fig. 9.30). Unlike the other vessels, its clay mass contained sand and organics.

The rest of the vessels were made of clay with medium coarse (201 sherds), coarse (108 sherds) or fine (4 sherds) granite temper. Their texture varied from smooth to strongly striated. However, these differences do not seem to be due to different chronologies, but due to the size, ornamentation and possible function of the vessel. This clearly predominant group of pottery will be referred to as Tarbiškės Ware, as it has no direct analogues in previously studied sites. Almost all of the Tarbiškės Ware potsherds were found at Tarbiškės 1, and only two sherds were found at Tarbiškės 2 (Fig. 9.31).

Potsherds of thick-walled (9–14 mm) vessels predominated (75 sherds) among Tarbiškės Ware. Most of them were from undecorated vessels with coarse temper, with slightly, chaotically or more vertically striated exteriors and more deeply and horizontally striated interiors, with unprofiled or weakly profiled walls, with rounded edges, and with mouths of ca. 20 cm in diameter (Fig. 9.14, 11–12, 14–18, 27, 29). Very rarely, thick-walled pottery has a smoothed and decorated exterior (Fig. 9.19, 22, 24). For decoration only a single tool was used, perhaps a narrow-edged object wound with string or rope, with which, depending on the density of the winding, either sparser impressions, called barbed wire (Fig. 9.22–24), or denser ones, resembling a maggot (Fig. 9.19), were made. Thin-walled (5–6 mm, 12 potsherds) and medium-thick (7–8 mm, 40 potsherds) ceramics have smooth surfaces and are more frequently decorated compared to thick-walled, but only with the same barbed wire motif (Fig. 9.20–21, 23, 25–26, 28). The rims of these vessels, like those of the thick-walled ones, are straight or slightly S-profiled, with rounded edges (Fig. 9.3, 5, 7–10).

Barbed wire and maggot-like ornaments appear in Lithuania at the end of the Neolithic, ca. 1800 cal BC, in the pottery of Šventoji 9 (Rimantienė 2005, Fig. 31) and of the upper archaeological layer of Daktariškė 5 (Piličiauskas 2018, Figs. 25–26). They are also frequently found in Early Bronze Age ceramics of the Trzciniec culture, the

Table 1. Pottery classification and characteristics Tarbiškės settlements. Note that 2 Tarbiškės Ware potsherds were found at Tarbiškės 2 while all other at Tarbiškės 1

Type	Numbers of pot-sherds	Temper						Exterior surface					Wall thickness		
		grog	sand and	coarse granite	medium granite	fine granite	undetermined	fine-rusticated	smoothed	striated	ornamented	undetermined	9-14 mm	7-8 mm	5-6 mm
Tarbiškės Ware	326			108	201	4	13		118	79	11	118	75	40	12
Corded Ware	2	2									2				2
Fine-rusticated Ware	1							1							1
Unknown	2		2							2					2

richest and purest assemblage of which was collected at Visėtiškės in northeastern Lithuania (Piličiauskas 2018, Fig. 99). However, unlike Visėtiškės, at Tarbiškės there are no thickened and moulded rims or corded and incised ornaments. Here, striated surfaces predominate in the assemblage and there are fewer ornamented vessels than at Visėtiškės. These differences outweigh the similarities and do not allow the Tarbiškės sites to be attributed to the Trzciniec culture. The pottery from Tarbiškės is perhaps of a later chronology, as shown by the AMS ^{14}C dates (see chronology section). However, it is important to note that the Visėtiškės settlement was never AMS ^{14}C dated and its attribution to the Early Bronze Age (1800–1100 cal BC) is very rough and based on pottery typology only.

Barbed wire and maggot-like ornaments are still found on the ceramics of some eastern Baltic fortified sites dating to the Late Bronze Age (Graudonis 1989; Sperling 2014). However, they are completely absent from the Late Bronze Age pottery called Žalioji Ware (Piličiauskas et al. 2011; Piličiauskas 2012; Pranckėnaitė 2014), although the clay mass, the striations and the weakly profiled walls are similar to the Tarbiškės Ware. Therefore, Tarbiškės Ware, from a typological as well as chronological point of view, stands in an intermediate position linking Trzciniec culture pottery with Žalioji and Early Striated Wares. As shown by the AMS ^{14}C dates, this pottery was produced ca. 1050–900 cal BC (see the section on chronology).

5. Igneous rock processing

All stone artefacts (n = 31, excluding flint) were described and identified by the naked eye or by magnification of 410x. Chemical analysis has not been performed. Three stone axe hole cores made of igneous rocks were found in trenches 1–7 (Fig. 10.4–6). These finds confirm that polished stone axes were manufactured by the Bronze Age people living at Tarbiškės. The absence of other processing waste in trenches 1–7 may not necessarily indicate that the initial stages of axe manufacturing took place somewhere outside of the settlements. However, the examination of trench 8 (Fig. 8) indicated that the processing of stone tools may have indeed taken place at Bronze Age Tarbiškės, where in addition to one more axe hole core (Fig. 10.3), the trench yielded small fragments of two polished tools, possibly axes (Fig. 10.1–2), and 24 flakes of various rocks weighing 6.7 kg (Fig. 10.8–17). Stone axes at Tarbiškės were made of igneous rocks such as diabase (3), porphyry (2), and basalt (1) (Table 2). Flaked waste materials collected at trench 8 were of porphyry (19) and diabase (3), quartz (1) and quartzite (1) (Table 2). Most of the flakes (Fig. 10.9–17) were from the same rock as the adjacent hole core (Fig. 10.3), i.e. a greenish grey white-spotted basalt-porphyry (Table 2). It seems that both flakes and hole cores are waste products of the manufacturing of a single polished axe. Despite numerous attempts, it was not possible to refit basalt-porphyry flakes. Some of them may have been thrown away and were not collected, and the rather small size of trench 8, which was only 4 x 4 metres should be borne in mind. Furthermore, some of the stone axe production waste could have entered the ploughed layer that was mechanically removed and thus was not studied. In addition to basalt-porphyry, some flakes were attributed to andesite-porphyry and diabase. These may have been discarded during the production of two other stone axes (Fig. 10.1–2, 5). This finding may imply that most, or even all, stone axes found at the various trenches at Tarbiškės could have been produced at a single workshop situated near to trench 8. In addition to fragments of axes and their production waste, a fragment of a sandstone grinder was found in trench 8 (Fig. 10.7).

Although cores drilled from polished axe holes as well as fragments of already finished stone axes have been found in many Bronze Age settlements in Lithuania, rock waste from their production has not been mentioned in the literature until now. It is possible that those flakes simply

Figure 9. Neolithic Corded Ware culture (1–2) and Bronze Age pottery (3–30). Field numbers: 1(74), 2(81), 3(686), 4(659), 5(386), 6(420), 7(164), 8(710), 9(300), 10(523), 11(437), 12(380), 13(422), 14(577), 15(692), 16(282), 17(42), 18(564), 19(319), 20(324), 21(321), 22(305), 23(614), 24(323), 25(308), 26(657), 27(135), 28(655), 29(136), 30(516+527).

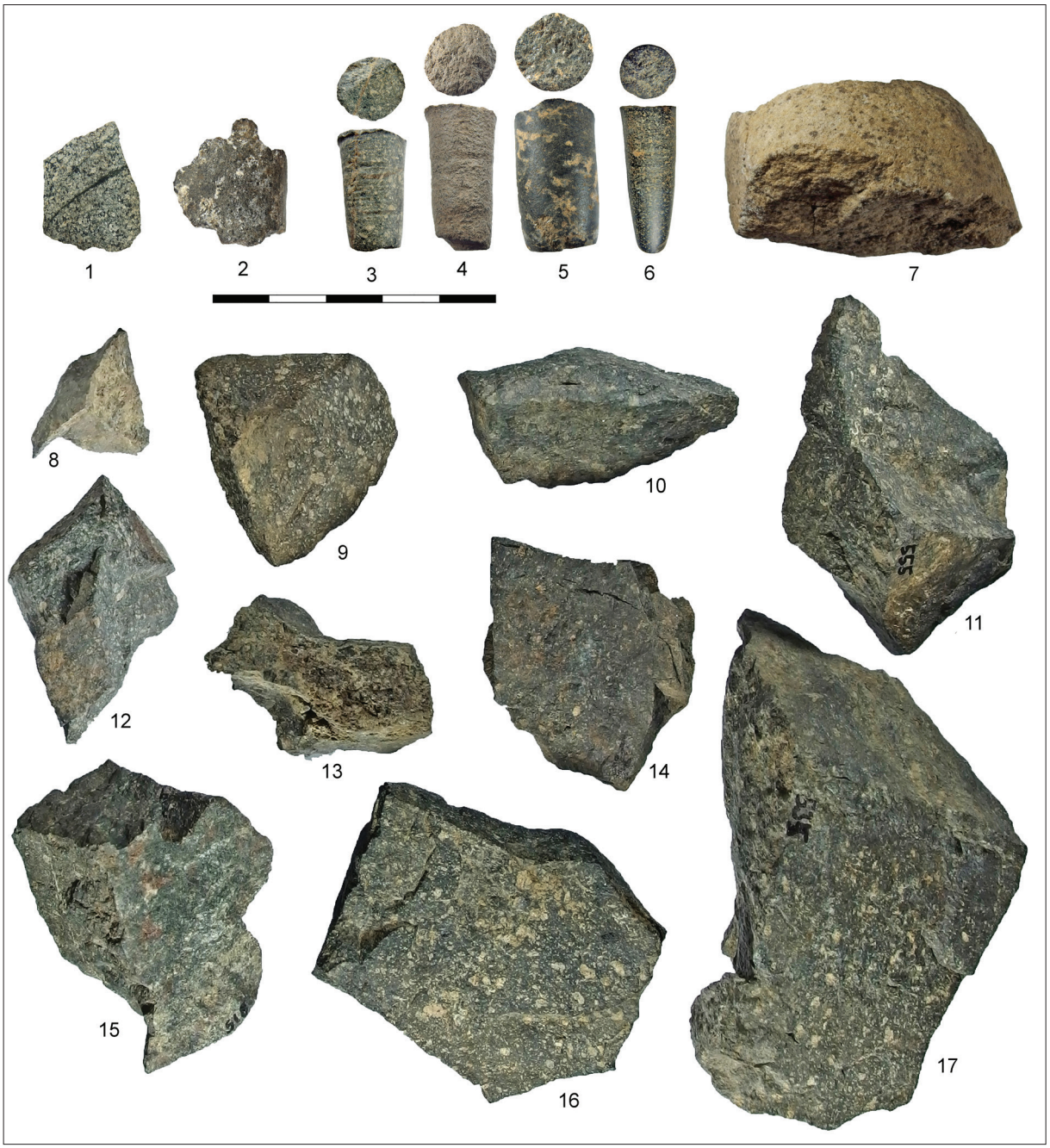

Figure 10. Fragments of stone axes (1–2), hole cores (3–6) and other manufacturing waste (8–17), and sandstone grinder (7). Field numbers: 1(519), 2(616), 3(617), 4(288), 5(307), 6(400), 7(503), 8 (499), 9 (505), 10 (504), 11 (555), 12 (611), 13 (530), 14 (520), 15(518), 16(638), 17(535).

had not been identified and collected during previous excavations. On the other hand, it might be assumed that, in many cases, the heavy boulders chosen for axe manufacturing were not transported into the habitation zones and were flaked at the raw material extraction sites, somewhere near river beds or outcrops rich in boulders. However, the case of Tarbiškės suggests otherwise, as attested in the site's assemblage.

6. Flint processing

A total of 426 (620 g) flint finds were collected at Tarbiškės – 395 at Tarbiškės 1 and 31 at Tarbiškės 2 (Table 3). At Tarbiškės 2, flints were found only in ploughed topsoil while at Tarbiškės 1, 202 (51.1%) were found in ploughed topsoil and 193 (48.9%) in the underlying archaeological layer or features. The high number of flints found in the topsoil indicates that a large part of the archaeological layer was destroyed by ploughing. The highest density of flint finds, as well as ceramics, was in

Table 2. Tarbiškės stone artefacts excluding flint

No.	Artefact No.	Trench	Description	Rock	Weight, g
1	288	2	Axe hole core	Basalt	5.9
2	307	2	Axe hole core	Diabase (uralite porphyry)	12.9
3	400	4	Axe hole core	Dolerite (diabase)	5.1
4	519	8	Axe (?) fragment	Andesite-porphyry	2.8
5	616	8	Axe (?) fragment	Diabase	12
6	617	8	Axe hole core	Basalt-porphyry	5.8
7	503	8	Grinder	Sandstone	136.1
8	499	8	Production waste	Basalt-porphyry	5.3
9	500	8	Production waste	Andesite-porphyry (?)	1.9
10	501	8	Production waste	Andesite-porphyry	2.5
11	502	8	Production waste	Quartz	3
12	504	8	Production waste	Basalt-porphyry	31.3
13	505	8	Production waste	Basalt-porphyry	24.6
14	518	8	Production waste	Basalt-porphyry	61
15	520	8	Production waste	Basalt-porphyry	37.5
16	529	8	Production waste	Basalt-porphyry	6.4
17	530	8	Production waste	Basalt-porphyry	25.4
18	531	8	Production waste	Diabase	5.4
19	533	8	Production waste	Basalt-porphyry (?)	6.1
20	534	8	Production waste	Basalt-porphyry	12.4
21	535	8	Production waste	Basalt-porphyry	209.4
22	536	8	Production waste	Diabase	5.9
23	537	8	Production waste	Quartzite	9.8
24	555	8	Production waste	Basalt-porphyry	49
25	563	8	Production waste	Basalt-porphyry	40.2
26	598	8	Production waste	Andesite-porphyry	2.5
27	609	8	Production waste	Basalt-porphyry	15.2
28	610	8	Production waste	Basalt-porphyry	4.4
29	611	8	Production waste	Basalt-porphyry	25.7
30	612	8	Production waste	Dolerite (diabase)	13.1
31	638	8	Production waste	Basalt-porphyry	70.4

trench 1 (Fig. 8). Only 47 flints (11%) yielded traces of fire or heat.

Local Baltic erratic small-sized flint dominates the assemblage at Tarbiškės. Flakes were removed by bipolar percussion, as is evidenced by numerous bipolar cores and flakes (Table 4; Fig. 11.6–7, 16–17, 19). Bipolar flakes were very rarely retouched –– they were used without curation or not at all. The bipolar cores may actually have been the desired tools, although use-wear studies at other settlements have not yet been able to determine their function (Piličiauskas and Osipowicz 2010). Four flakes had remnants of polished surfaces, which indicates that they were removed from bifacial and square polished axes (Fig. 11.1, 3, 13). The end of production of bifacial flint axes is not well dated in Lithuania, it may have already occurred during the Late Bronze Age, but the use of square flint axes is clearly associated only with Neolithic contexts (Brazaitis and Piličiauskas 2005). These finds at Tarbiškės do not prove that polished flint axes continued to be produced and used as wood-cutting tools during the Bronze Age. They might have been manufactured by Neolithic people at Tarbiškės or other adjacent sites, and later brought to the Bronze Age settlement and reused as flint raw material, which can be attested in some of the remains. One of the flakes had a brown bog patina on its old surface while

Table 3. Distribution of flint finds at Tarbiškės

Site	Trench/ surface	Quantity	Weight, g	Area, sq. m	Density per sq. m
Tarbiškės 1	Trench 1	164	167.5	40	4.1
	Trench 2	33	49.3	40	0.8
	Trench 3	46	44.4	40	1.2
	Trench 4	33	42.1	60	0.6
	Trench 5	7	4	60	0.1
	Trench 6	11	88	24	0.5
	Trench 7	8	10.2	32	0.3
	Trench 8	46	80.1	25	1.8
	Surface	47	79.9		
Tarbiškės 2	Surface	31	48.8		
In total:		425	608.8		

Table 4. Classification of flint finds at Tarbiškės

		Quantity	%
Blades	irregular	**1**	**0.2**
Retouched	arrowhead	1	2.3
	retouched blade	2	
	retouched flake	3	
	perforators	2	
	side-scrapers	2	
Cores	bipolar	11	2.8
	irregular for flakes	1	
Flakes	with attributes of bipolar percussion	84	88.5
	other	293	
Shatter		21	4.9
Flaked raw material		1	0.2
In total:		426	100
Total weight:		535.1 g	

fresh scars were free of it. This suggests that the axe was originally lying in a low and wet location and was only later brought to Tarbiškės and knapped into flakes. The Bronze Age people may have reused Neolithic axes as cores, not only because of the lack of raw materials in the area, but also because there may have been an important symbolic aspect here, as they are of distinctive shapes and have obvious functions and may also be linked to ancestors (Brazaitis and Piličiauskas 2005).

Ten retouched tools identified made up 2.4% of the whole flint assemblage (Table 4). Two of them we classified as side-scrapers (Fig. 11.9, 18), one as an arrowhead (Fig. 11.15), two as perforators (Fig. 11.8, 14), three as retouched flakes (Fig. 11.10–12), and two as retouched blades (Fig. 11.4–5). A rhomboidal arrowhead was made out of a thin flake without much reshaping. Only edges were bifacially retouched. Its atypical form was made in an opportunistic way, which is not common for the Stone Age and is therefore most likely related to Bronze Age settlements at Tarbiškės. The same cannot be said about two massive retouched blades made of good quality flint which was likely imported from the Upper or Middle Nemunas basin (Fig. 11.4–5). These finds, as distinct from other flints, may belong to a Neolithic Corded Ware culture settlement or short-lived camp.

To conclude, in the Tarbiškės flint assemblage, as in the case of the ceramic assemblage, Neolithic and Bronze Age finds can be distinguished according to their raw materials, technological and typological features. Only two massive retouched blades and perhaps flakes of polished flint axes are Neolithic. The Bronze Age flint assemblage is clearly predominant, characterised by small-sized local raw materials, bipolar percussion and a very small number of formal tools. Unfortunately, the Tarbiškės flint assemblage cannot be compared to those at other Bronze Age sites because there have been few flint finds dated to the Bronze Age or they were found in contexts that were from mixed periods (Grigalavičienė 1995).

7. Other finds

During excavations only two fragments of iron objects were found and both were probably from the modern village. No bronze objects were detected in the trenches despite extensive sieving. The only bronze artefact, which might be related to the Bronze Age settlement, was found during surface survey with a metal detector at Tarbiškės 2. It is most likely a kind of ornament or its preform consisting of a bronze stick flattened at both ends (Fig. 11.20). Unfortunately, we were not able to find any analogies for this find at other prehistoric settlements or graves.

Only eight small fragments of clay daub were collected at trenches 1, 4 and 8, as well as within the fill of features 29, 32 and 43 outside the trenches. This implies either that clay was not widely used for building house walls, floor and hearths or that the excavations did not cover the dwelling zones of Bronze Age settlements. Alternatively, unburned clay daub may have not have survived.

Unburnt animal bones were not preserved at Tarbiškės, while burnt ones were very few. Only eight fragments were found in trench 8. Seven of them were too small for species identification, while one was identified as fragmented cattle tooth.

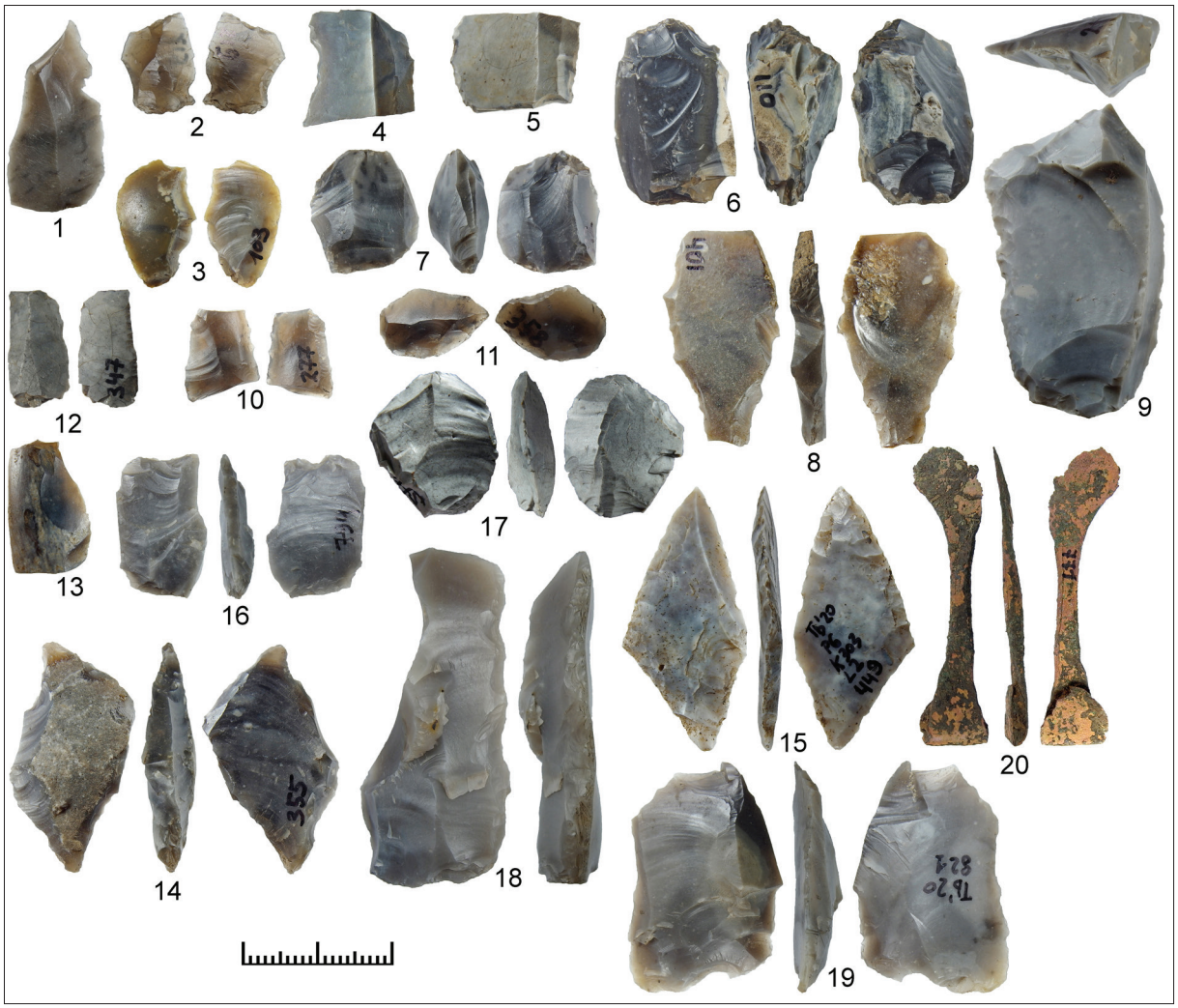

Figure 11. Flint artefacts and debitage (1–19) and bronze article (20). Field numbers: 1(41), 2(249), 3(103), 4(231), 5(149), 6(112), 7(110), 8(401), 9(26), 10(277), 11(358), 12(347), 13(384), 14(355), 15(449), 16(794), 17(775), 18(817), 19(821), 20(771).

8. Chronology

The sites of Tarbiškės 1 and 2 were relatively dated to the Bronze Age, according to the typology of pottery, stone and flint tools. Well-dated Bronze Age site assemblages, with the assistance of radiocarbon dating, however, are still very scarce in Lithuania, so the typological sequences of the various artefacts are not yet well developed. For this study, AMS radiocarbon (^{14}C) dating was undertaken at the Mass Spectrometry Laboratory, Centre for Physical Sciences and Technology in Vilnius (Lithuania). The standard acid-alkali-acid (AAA) pre-treatment was used for the charred plant remains. In this study, all radiocarbon ages were calibrated using the OxCal v4.4.4 software and IntCal20 atmospheric curve (Bronk Ramsey 2009; Reimer et al. 2020). Calibrated dates are presented at 95.4% probability.

We dated eight samples of charred plant remains –– wood charcoal, cereal grains, and hazelnut shells. All samples were collected in features (Table 5). Six of them were from Tarbiškės 1, and two of them were from Tarbiškės 2. The dated structures were distributed along the 340 m long section of the pipeline construction (Fig. 3). The medians of obtained dates cover a very broad period of 1150 cal BC–750 cal AD, while the dates cluster into three phases: ca. 1150–900 cal BC, ca. 650–500 cal BC and ca. 450–750 cal AD (Fig. 12). As the archaeological material from Tarbiškės is quite homogeneous, there is no doubt that some of the three periods are not associated with it, and some of the AMS dates are not from the settlement period. The oldest group of dates undoubtedly corresponds to the Tarbiškės sites, as three out of five of the dates were obtained from charred cereal grains, such as cereals and millet (Table 5). Therefore, the settlements were definitely inhabited between ca. 1050 and 900 cal BC. One more date from the same oldest date group belongs to deciduous charcoal from feature 25. The result (2821 ± 32 BP; 1108–898 cal BC) is in the midst of the crop dates from features 15, 29 and 30 and therefore is probably also related to the human activity phase (Fig. 12). Finally, the

Table 5. AMS ^{14}C dates obtained from the sites Tarbiškės 1 and 2

No.	Feature	Site	Sample description	Lab. code	^{14}C date (BP) ± error	cal BC/AD (95.4%)
1	15	Tarbiškės 1	charred *Panicum* miliaceum 3 grains	FTMC-UU26-10-1	2868 ± 26	1124-931 BC
2	15	Tarbiškės 1	charred hazelnut shell	FTMC-UU26-10-2	2427 ± 26	746-405 BC
3	20	Tarbiškės 1	charred hazelnut shell	FTMC-UU26-11-2	1250 ± 26	675-876 AD
4	24	Tarbiškės 1	*Fraxinus* sp. charcoal	FTMC-UU26-45	2932 ± 32	1224-1016 BC
5	25	Tarbiškės 1	deciduous (?) charcoal	FTMC-UU26-42	2821 ± 32	1108-898 BC
6	29	Tarbiškės 1	charred *Cerealia* grain	FTMC-UU26-16	2781 ± 26	1007-836 BC
7	30	Tarbiškės 1	charred *Cerealia* grain	FTMC-UU26-17	2789±27	1011-839 BC
8	37	Tarbiškės 2	*Salix* sp. charcoal	FTMC-UU26-43	1620 ± 30	406-543 AD
9	43	Tarbiškės 2	*Fraxinus* sp. charcoal	FTMC-UU26-44	2484 ± 35	774-425 BC

oldest date is from ash charcoal in feature 24 — 2932 ± 32 (1224–1016 cal BC). This date is statistically not significantly different from the date for millet –– 2868 ± 26 BP (T = 2.4, T'(5%) = 3.8, ν = 1) — so this sample is also likely related to the same settlement. Features dated to ca. 1150–900 cal BC are spread across the entirety of site 1 within the 140 m long pipeline construction section (Fig. 3). The relationship of the second group of dates (ca. 650–500 cal BC) to the archaeological finds is highly questionable. At first glance, the two dates from features 15 and 43 would seem to indicate a second, later phase of the settlement's existence. Slightly profiled, thick-walled vessels with irregularly or horizontally striated walls (Fig. 9.14, 16–17, 27–29) are found not only in Early Bronze Age settlements, such as in the upper archaeological layer at Daktariškė 5 (Piličiauskas 2018, Figs. 25–26), but also in Late Bronze Age settlements, such as at Žalioji (Piličiauskas 2012) or Luokesa 1 (Pranckėnaitė 2014). More important, however, is that one of these dates was obtained from a hazelnut shell, which was found in the same feature (15) as the dated millet grains. Thus the hazelnut shell date (2427 ± 26 BP) turned out to be more than 400 years later than the millet date (2868 ± 26 BP). Feature 15 was oval, 2.3 x 3.4 m in size and 0.47 m deep, and filled with dark-grey fine sand and gravel (Figs. 4 and 7.15). Its structure most closely resembles that of a tree throw, which brought the natural soil (gravel) to the surface and which was partially filled with the humous archaeological layer as well as with charcoals from forest fires. A second AMS date from this group of dates was obtained for an ash charcoal from feature 43 at Tarbiškės 2. This is also a large, crescent-shaped tree throw (Fig. 7.43), 1.3 x 3.6 m in size and 0.55 m deep, probably much later than the settlement. This interpretation is further strengthened by the dates of the third and latest group (450–750 cal AD). A dated hazelnut shell (1250 ± 26 BP) and a willow charcoal (1620 ± 30 BP) were collected from features 20 and 37, both of which were also considered to be tree throws (Fig. 7.20, 37). These dates fall within the Middle Iron Age (400–800 cal AD) according to the periodisation accepted in Lithuanian archaeology. Many settlements dating from this period have been excavated in Lithuania; the archaeological material of that age is well known and it is certainly not present among the Tarbiškės finds. Therefore, four out of nine AMS ^{14}C dates at Tarbiškės are not related to Bronze Age settlements, but most likely indicate forest fires from later periods. Meanwhile, Tarbiškės 1 is dated by charred cultural plants to ca. 1050–900 cal BC. Similar finds suggest the same or a comparable chronology for Tarbiškės 2, which has been much less studied, and which has not yet been sampled for macrobotanical analysis and therefore has not yielded the remains of cultivated plants necessary for reliable dating.

9. Plant remains and evidence for farming

During fieldwork, seven soil samples were taken for archaeobotanical analysis. A total of 155 litres of sediment were collected from archaeological features following a protocol described as 'probabilistic sampling' (d'Alpoim Guedes and Spengler 2014). Samples were processed using a machine-assisted flotation tank powered by the municipal water supply. The floating fraction was collected using steel sieves with a mesh size of 300 μm. The heavy fraction and small artefacts were retrieved using a glass-fibre net with a 1.4 mm aperture. Dried material was sorted and examined with a binocular microscope with x10 to x70 magnification. Plant remains were identified based on morphological identification and using identification

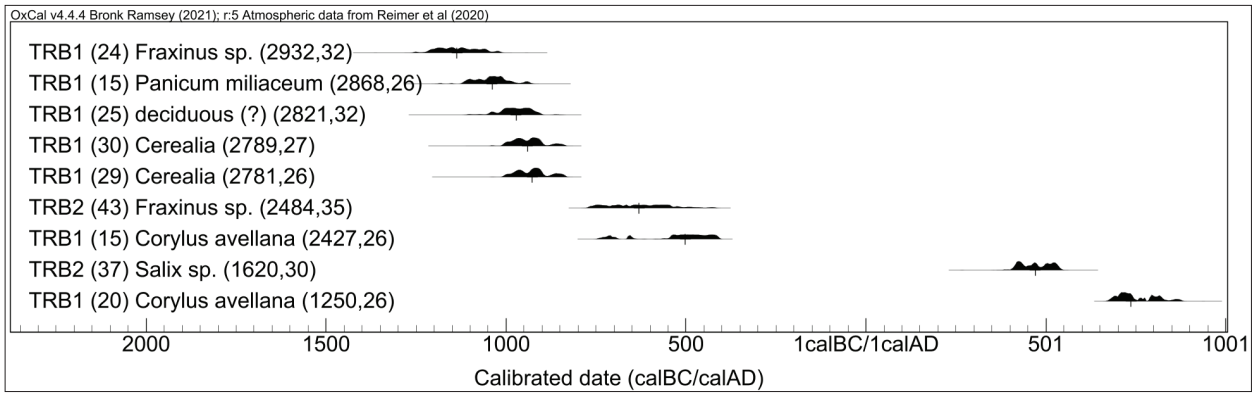

Figure 12. A calibration plot of ^{14}C dates obtained for charred plant remains from Tarbiškės 1 (TRB1) and 2 (TRB2) sites. Feature numbers are given in brackets.

atlases (Cappers et al. 2012; Jacquat 1988; Latałowa 1999; Neef et al. 2012), and seed reference collections of modern and archaeological plant remains. Plant nomenclature follows Mirek et al. (2002) and Zohary et al. (2012).

The majority of the analysed samples contained charred macrofossils of cultural plants (Table 6). A total of 13 cereal grains were discovered in samples from features nos. 1 and 3–6. Broomcorn millet (*Panicum miliaceum*) constituted a major component (n=8) among the identified crops (Fig. 13). Two other grain fragments possibly belong to an unidentified wheat (cf. *Triticum* sp.). Another fragment likely belongs to barley (cf. *Hordeum vulgare*).

Archaeobotanical analysis also provided some information on wild plants. Twenty-six charred macroremains of wild taxa were recorded. These included remains of fruits of weedy/ruderal species — stickwilly (*Galium spurium*) and pale persicaria (*Persicaria lapathifolia*). In addition, several plant remains could be linked to forest habitats, namely hazelnut (*Corylus avellana*) shells, raspberry (*Rubus idaeus*) fruitlet, red campion (*Silene dioica*) seed, and pine (*Picea* sp.) needle fragments. However, the natural origin of most archaeological features must be taken into consideration. This, coupled with the radiocarbon dates of hazelnut shells, suggests that some of the wild plant remains could be later additions to the archaeological contexts resulting from physiogenic and biogenic post-depositional processes.

Despite the total number of finds being relatively low, the archaeobotanical data presents an essential piece of evidence for the history of farming in the southeastern Baltic. These are the first finds of crops from Late Bronze Age settlements. All previous Late Bronze Age assemblages were associated with wetland deposition sites (Antanaitis-Jacobs et al. 2002), hill-top settlements (Minkevičius et al. 2019) and pile-dwellings (Pollmann 2014). Therefore, this data not only bridges the gap between the Early and Late Bronze Age but also provides information on the subsistence strategies at different types of settlements. The fact that the find of broomcorn millet is the earliest reported in the region is also significant. It indicates the gradual expansion of the local crop with the inclusion of a new cereal and brings the chronology of local *P. miliaceum* cultivation closer to the spread of millets in northern Europe in ca. 1250–1150 cal BC (Filipović et al. 2020). Prior to this find, the only known crop taxon from the 2nd millennium BC sites was barley (*Hordeum vulgare*) from the Kvietiniai settlement dated to 1409–1219 cal BC (Piličiauskas et al. 2021). The preference for these particular cereals is not surprising. Barley is well suited for cultivation in the northern latitudes due to its tolerance of colder temperatures (Weisskopf and Fuller 2014) and harsh environments (Vanhanen et al. 2019). By comparison, broomcorn millet is characterised by a relatively short life cycle, which makes it suitable as an emergency crop (Cappers and Neef 2012).

Finally, it is important to address the low count of plant remains recovered from the soil samples. It is possible that the low density of macrofossils could be a result of the unfavourable local taphonomic conditions. This might be illustrated by the poor state of preservation of both plant and other organic remains. However, it could also be explained by the distance from dwelling and/or food-processing areas. This is supported by the general lack of clay daub fragments and absence of archaeological features typically associated with these activities, such as postholes, hearths and pits with fire cracked stones.

Conclusions

Rescue excavations due to the construction of the pipeline connecting Lithuania and Poland revealed the Bronze Age sites of Tarbiškės 1 and Tarbiškės 2 in eastern Lithuania, both dated to 1050–900 cal BC. These sites are very

Table 6. Charred plant remains from Tarbiškės. Frag. = fragment. Indet. = indeterminate.

Context no.	**Identified remains**	4	7	15	20	29	30	35
Volume floated (L)		20	20	40	20	20	20	15
Taxon								
Cultivated plants								
Cerealia	caryopsis frag.	-	-	1	-	-	-	-
cf. *Cerealia* indet.	caryopsis frag.	1	-	-	-	-	-	-
cf. *Hordeum vulgare*	caryopsis	-	-	-	-	1	-	-
Panicum miliaceum	caryopsis	-	-	4	1	3	-	-
cf. *Triticum* sp.	caryopsis	-	-	-	-	-	2	-
Wild plants								
Clinopodium sp.	seed frag.	-	1	-	-	-	-	-
Corylus avellana	endocarp frag.	-	-	1	3	-	-	-
Galium spurium	fruit	-	2	-	-	-	2	-
cf. Lamiaceae	fruit	-	1	-	-	-	-	-
Persicaria lapathifolia	fruit	-	-	-	-	-	1	-
Picea sp.	needle frag.	-	1	-	-	4	-	-
Pinaceae	cone frag.	-	1	-	-	-	-	-
Rubus idaeus	fruit	-	1	-	-	-	-	-
Silene dioica	seed	-	-	-	-	-	-	1
Indet. frag.		-	3	2	1	1	-	-

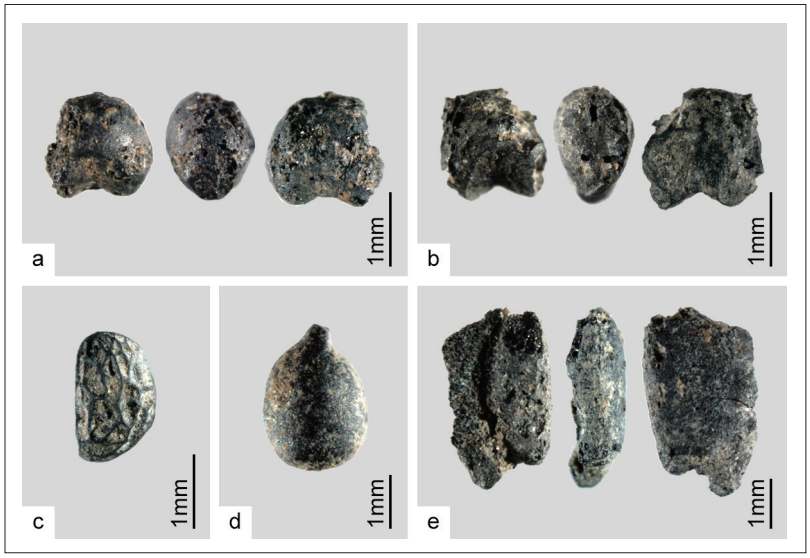

Figure 13. Charred plant remains from Tarbiškės. (a–b) *Panicum miliaceum* (broomcorn millet) caryopses; (c) *Rubus idaeus* (raspberry) fruitlet; (d) *Persicaria lapathifolia* (pale persicaria) fruit; (e) *Cerealia* (cereal) caryopsis fragment.

important for Lithuanian archaeology, as their excavations provided a find assemblage that was almost exclusively confined to a short period, which partially fills the gap in the cultural sequence between the Early Bronze Age Trzciniec culture and the Late Bronze Age hill-top and lake settlements with Early Striated and Žalioji Wares. Moreover, macrobotanical analysis of charred plant remains from archaeological features revealed that Bronze Age people at Tarbiškės engaged in farming. The local population cultivated several cereal taxa, which included broomcorn millet, and possibly barley and wheat. This not only expands our knowledge of the local 2nd millennium BC crop regime but also presents evidence for the gradual intensification of local agricultural activity starting before the emergence of the hill-top settlements. Despite the ca. 1,000-year-long circulation of metal artefacts in the eastern Baltic, the people of Tarbiškės lived on the periphery of the main trading routes and they lacked bronze re-

sources. They flaked local flint and were manufacturing polished stone axes from igneous rocks directly on site.

The sites at Tarbiškės demonstrate that early farmers settled in higher areas with sandy soils that were situated further from larger bodies of water. This choice of settlement pattern might be the main reason why so few sites dated to the Early Bronze Age have been discovered in Lithuania so far, since rivers and lake shores have been the main targets for most academic archaeological surveys. Similarly, rescue excavations due to the construction of roads, railways, and pipelines were also mainly conducted near waterways. In general, the systematic archaeological monitoring of mechanical topsoil removal including in high-lying areas far from large bodies of water was only initiated in 2020. Should this practice be continued and routinely incorporated into rescue excavations in addition to adequate macrobotanical sampling and analysis, as is hoped by the authors, more early farming settlements may be identified, perhaps even including Neolithic ones. Neolithic sites with indisputable evidence of plant cultivation in particular would be of interest for the settlement history of this region, as they have not yet been discovered for the eastern Baltic.

Acknowledgements

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Abbreviations

Archaeol. Baltica – Archaeologia Baltica

ATL – Archeologiniai tyrinėjimai Lietuvoje …. metais / Archaeological Investigations in Lithuania in …, Vilnius

Lietuvos Arch. – Lietuvos archeologija

Veget Hist Archaeobot - Vegetation History and Archaeobotany

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BRONZOS AMŽIAUS PIETRYČIŲ BALTIJOS REGIONO EKONOMIKOS IR KULTŪROS GERESNIO PAŽINIMO LINK. TARBIŠKIŲ GYVENVIETĖ

GYTIS PILIČIAUSKAS, ROKAS VENGALIS, KAROLIS MINKEVIČIUS, GRAŽINA SKRIDLAITĖ, GIEDRĖ PILIČIAUSKIENĖ

Santrauka

2020 m. tiesiant dujotiekio jungtį tarp Lietuvos ir Lenkijos buvo atlikti gelbėjamieji archeologiniai tyrimai Tarbiškių 1 ir 2 vėlyvojo bronzos amžiaus gyvenvietėse Rytų Lietuvoje (1, 2 pav.). Gyvenvietės aptiktos paviršinių žvalgymų metu, o 0,1–0,3 m storio nesuartas archeologinis sluoksnis lokalizuotas gręžiant gręžinius ir kasant kasinius. Tuomet perkasomis ištirtas 322 m^2 plotas (4, 8 pav.). Mechanizuotų žvalgymų metu, nukasus paviršinį humusingą sluoksnį, archeologinių radinių ir įgilintų objektų rasta 430 m ilgio dujotiekio atkarpoje dviejuose atskiruose arealuose (3–5 pav.). Iš viso ištirti 52 įgilinti objektai, iš kurių dauguma – natūralios kilmės (6, 7 pav.). Iš jų paimti septyni grunto mėginiai (155 l) archeobotaninei sudegusių augalų liekanų analizei.

Tarbiškių gyvenvietėse aptikta gana vienalytė archeologinė medžiaga iš dalies užpildo bronzos amžiaus kultūros ir ūkio raidos pažinimo Pietryčių Baltijos regione spragą. Tik pavieniai titnago ir keramikos radiniai skirti neolitui – virvelinės keramikos kultūrai. Tarbiškių keramika tipologine ir chronologine prasme užima tarpinę padėtį tarp ankstyvojo bronzos amžiaus Tšcineco kultūros ir vėlyvojo bronzos amžiaus ankstyvosios brūkšniuotosios ir Žaliosios tipo keramikos. Vienintelis jos ornamentas – spygliuotos vielos arba vikšro pavidalo įspaudai (9 pav.). Gyvenvietėje plačiai naudoti titnago ir kitų uolienų įrankiai, galbūt dėl to, kad trūko bronzos. Tarbiškės 1 Lietuvoje yra pirmoji ir kol kas vienintelė senovės gyvenvietė, kurioje rasta akmeninių kirvių su išgręžtomis skylėmis gamybos vieta. Ji identifikuota pagal magminių uolienų nuoskalas, kurių rūšys (diabazas, porfyritas, bazaltas) sutapo su kirvių išgrąžų uolienomis (10 pav.). Apdirbant bronzos amžiaus gyvenviečių titnagą, vyravo dvipolė technika, kuria skaldyti vietiniai mažų gabaritų žaliavos gabalai, taip pat iš senesnių gyvenviečių atsinešti gludinti kirviai (11 pav.). Pagal sudegusių grūdų AMS ^{14}C datas, Tarbiškių 1 gyvenvietės bronzos amžiaus radinių kompleksas datuotas 1050–900 cal BC (12 pav.). Sudegusių augalų liekanų makrobotaninė analizė atskleidė, kad bronzos amžiaus žmonės Tarbiškėse augino soras (Panicum miliaceum), miežius (Hordeum vulgare) ir kviečius (Triticum sp) (13 pav.). Tarbiškių gyvenviečių padėtis rodo, kad ankstyvieji žemdirbiai įsikurdavo aukštesnėse vietovėse su smėlingais dirvožemiais, toliau nuo didelių vandens telkinių.

Sistemingi mechanizuoti archeologiniai žvalgymai didelių infrastruktūros plėtros projektų vietose Lietuvoje pradėti tik 2020 m. Jei ši praktika bus tęsiama, o makrobotaniniai tyrimai taps įprasta gelbėjamosios archeologijos dalimi, netrukus gali būti aptikta daugiau ankstyvųjų žemdirbių gyvenviečių, galbūt net ir neolitinių, kurių iki šiol nėra žinoma visame Rytų Baltijos regione.