PETER VAN DEN BROEKE · LIESBETH VAN BEURDEN
KIRSTI HÄNNINEN · CAROLINE VERMEEREN

A BRONZE AGE SAUNA IN NIJMEGEN (PROV. GELDERLAND / NL): AN EXCEPTIONAL SITE IN MAINLAND EUROPE

In 2001 and 2003 an unusual site was investigated in the expansion area of the municipality of Nijmegen north of the river Waal (**fig. 1**). In this archaeologically very rich part of the river plain (Betuwe region), filled with sand, silt and clay between two branches of the Rhine (Nederrijn and Waal), extensive archaeological research is still being carried out by the archaeological service of the municipality of Nijmegen in conjunction with the development of the Nijmegen-Noord district[1]. Because at the time only the fieldwork of the development-led research was funded, it was only recently that the results could be analysed and a site report drawn up[2]. The excavation area, named »Rust Wat« – »take a rest« – after a former nearby tavern, encompassed features from several periods, the earliest dating from the Neolithic. Those from the Middle Bronze Age (1800–1100 BC) were concentrated in the northern part of the area covered, and had only been disturbed by some post-medieval ditches and a shallow pit dug during a recent professional search for ammunition from WW II. The next paragraphs will focus on this part of Nijmegen-Rust Wat.

What was initially presented as a small Middle Bronze Age cult site[3], based on votive deposits found in and near an adjacent residual river channel, in recent years actually appeared to be a complex that can best be described as a sauna site associated with ritual activities. Most of the features were covered with a dark layer

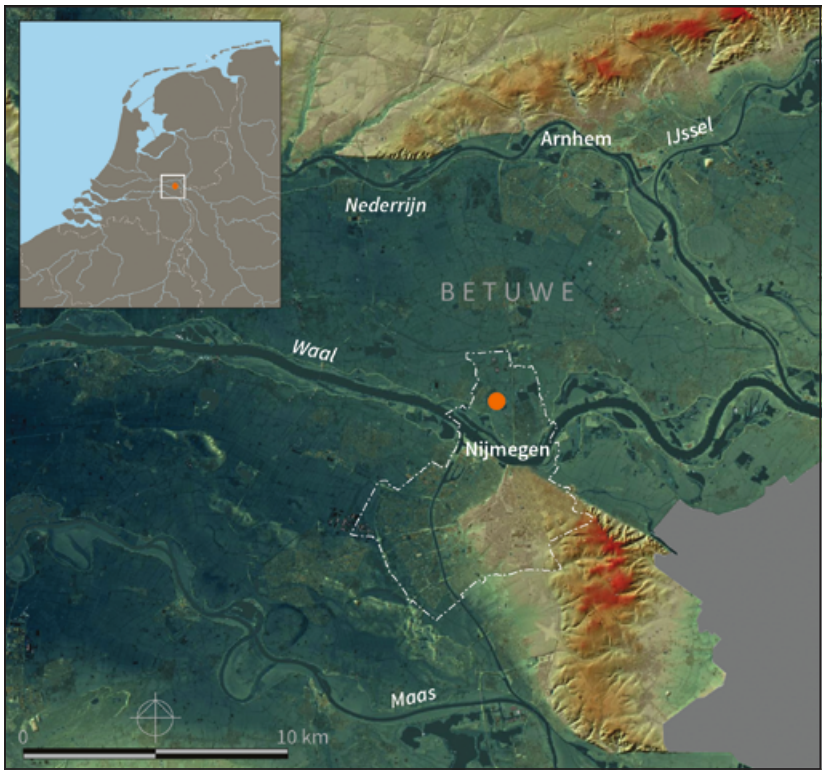

Fig. 1 The site's location (●) within Northwest Europe and within the Betuwe region, a river plain situated partly among the remains of ice-pushed ridges from the Saale glaciation (relative elevation map). – (Map Actueel Hoogtebestand Nederland; edited by R. Mols, Bureau Archeologie en Bodemkwaliteit municipality of Nijmegen [BABN] / N. W. Willemse, RAAP Archaeological Consultancy).

DOI: https://doi.org/10.11588/ak.2023.3.101724

Fig. 2 High on the bank of the residual channel the cultural layer had its maximum thickness of more than 20 cm. It wedged out on the channel bank, which was sectioned at right angles to the channel. – (Photos BABN).

Fig. 3 Fired chunks of clay in the cultural layer, just above the burnt clay floor at the entrance to the western structure. View to the northeast. – (Photo BABN).

of clay containing mainly charcoal, fire-cracked stones and pieces of fired clay, in short: a burnt mound or burnt spread[4]. This is a type of site that is well known from the British Isles, but is highly exceptional on the European mainland. After a concise description of the features and finds, the site's function and the identity of its users will be discussed.

Fig. 4 Beneath the cultural layer were two distinct trench features, here viewed obliquely from the northeast. Noteworthy is the burnt clay floor at the wide entrance to the structure on the right. On top of it lay a concentration of chunks of fired clay (**fig. 3**). In the foreground is a post-medieval ditch. – (Photo BABN).

HUT FEATURES UNDER A DARK BLANKET

In the Bronze Age, the aforementioned dark layer lay next to a residual river channel with a width of at most 50 m (cf. **fig. 16**). To the west, the upper part of this cultural layer had been removed in recent ploughing. Further east it was more than 20 cm thick and wedged onto the channel bank (**fig. 2**). Observed as fills in several pits, the layer was found to have an overall area of about 200 m². Two concentrations of remains were recorded: a »pavement« of chunks of fired clay (**fig. 3**) and a less distinctive concentration of burnt stone fragments.

Surprisingly, the features of two hut-like structures came to light underneath the dark layer (**figs 4–5**). They were both characterised by a narrow foundation trench enclosing an interior space with a maximum diameter of about 3 m. A third configuration of small trenches could not be positively identified as representing a structure because of the trenches' shallow depth and the impression that the configuration also included narrow burrows.

The wide entrance to the western structure (STR 1) contained a burnt clay floor (**figs 4–5**) just underneath the aforementioned concentration of chunks of fired clay. The two post-holes on either side of it are the only post-holes that can be ascribed to the structure with certainty, except for a few specimens in the foundation trench, which had a maximum depth of 25 cm. The fact that the width of the trench did not exceed 15 cm suggests that it contained a wicker wall that was here and there interrupted or supported by posts. Although it may have been nothing more than a simple wicker fence, it is more likely that this was the substructure of a hut with, for example, a superstructure of curved branches (**fig. 6**).

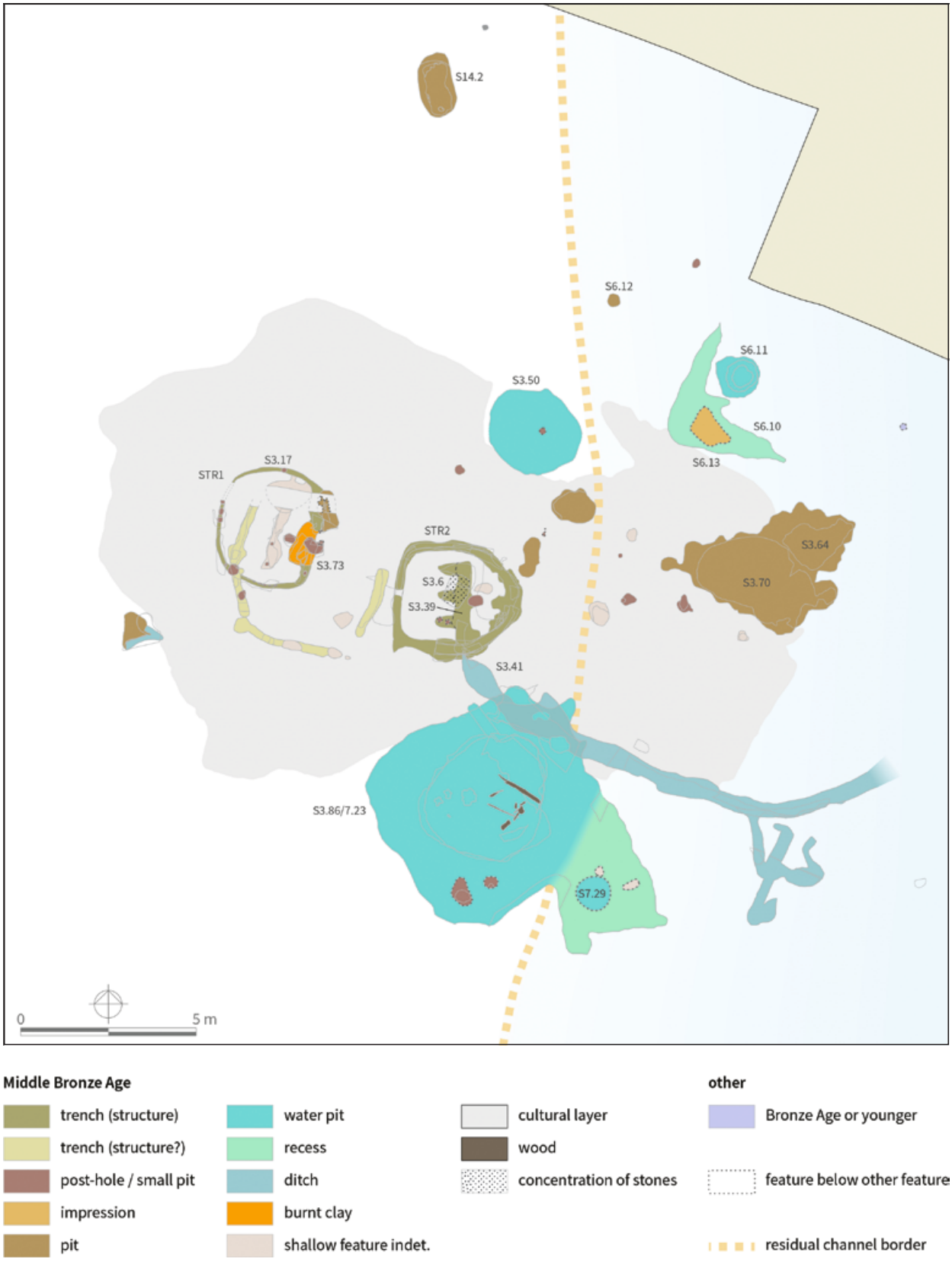

Fig. 5 Overview of the Middle Bronze Age features of Nijmegen-Rust Wat. The cultural layer covered all the features within its distribution area. Older and younger features have been omitted. See **fig. 11** for (sub)recent features. – (Drawing L. Scheffer / R. Mols, BABN).

Fig. 6 Hut structure of the kind that may have been used at Nijmegen-Rust Wat: a spherical skeleton of branches on top of a vertical wicker substructure. – (After de Raaff 2018, fig. 3).

The wall trench of the more D-shaped eastern structure (STR 2) varied in depth to at most 0.5 m, but showed no traces of any posts, suggesting that this trench likewise contained a wicker wall, which, along the straight west side, may have represented a complete wicker façade with a narrow entrance in the middle. The shape of the eastern sections of the wall trench and the greater concentration of stones in this part suggest that the assumed wickerwork was at some stage replaced here (**fig. 7**).

The aforementioned concentration of fire-cracked stone fragments (S3.6) came to light in the cultural layer at the centre of the eastern structure. Directly under this concentration was a peculiar element: a ditch in the shape of an (inverted) E (S3.39). The north-south oriented branch, which extended into the wall trench to the south, was found to be at most 19 cm deep, with a slightly bowl-shaped cross-section. It cut through the shallower protrusions and may have been dug at the time of the assumed replacement of the wicker wall.

This north-south branch was surprisingly found to continue beyond the wall as a deep ditch (S3.41). Pointed outlines suggest a passageway from the interior through the wall in the form of, for example, a wooden tube or gutter. Via a few bends – and a puzzling system of shallow side branches – the ditch extended to the lowest part of the residual channel. In the Middle Bronze Age this channel was not much deeper than 1 m, and it was dry in summer.

Fig. 7 The rather wide top fill of the foundation trench in the northeastern part of structure 2 seems to have been reshaped to create a much deeper, narrower trench. – (Photo BABN).

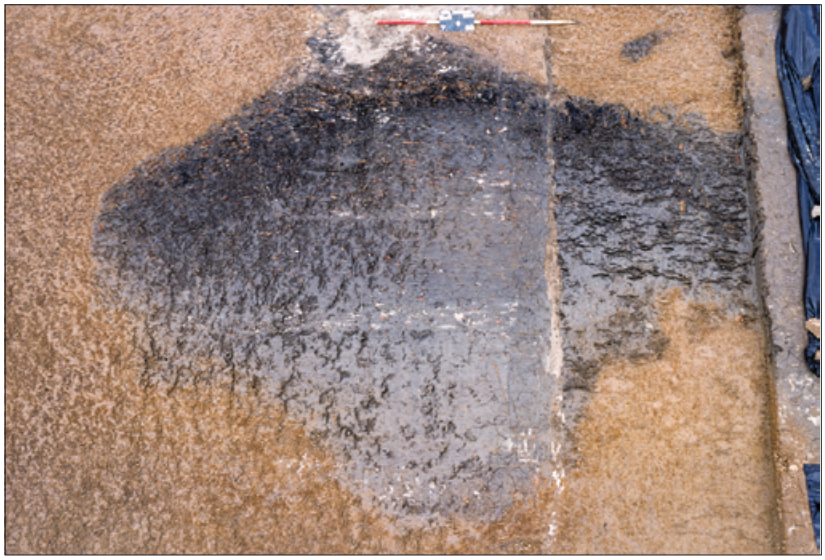

Fig. 8 The large square water pit S3.86/7.23 was clearly visible because the dark layer also extended into the northern part of the pit at a late stage. On the right is the beginning of a niche in the water pit, a recess containing the narrow water pit S7.29. – (Photo BABN).

WATER PITS

The described drainage ditch was at some stage moved and then ran through the first fill of a huge water pit (S3.86/7.23) that had been created by digging out some 30 m² of clay. The top part was square (**fig. 8**). Lower down it was round with some loose wood at the bottom. In the southeast was a recess containing a much narrower water pit (S7.29).

Another eye-catching feature at this site was a third water pit (S3.50), more cylindrical in shape and less voluminous than water pit S3.86/7.23. A large irregularly shaped pit along the bank of the residual channel (S3.64/3.70) was probably a quarry pit that supplied the fat clay used to coat the sandy bases of the water pits. Such an insulating clay layer at the transition to the underlying and surrounding sand will have prevented the risk of the water in the pit disappearing into the sandy subsoil, and also that of sand being washed away, causing the steep sides to collapse.

The latter effect was actually observed in a narrow, deep fourth water pit along the bank of the residual channel (S6.11). This shaft was the deepest feature at the site, with a depth of almost 1 m below the floor of the residual channel. It may well be associated with the (cattle) hoofprints that came to light in this part of the site. The pit was probably intended to provide drinking water for one or more animals when the residual channel was dry. As horned animals will not have been able to stick their heads into a narrow pit to drink water from the bottom of a pit that was more than 1 m deep, we may assume a link with the trapezoidal feature observed immediately next to it (S6.13), whose flat base lay only 3 cm below the excavation level. It looks like the imprint of a massive object in the soft clay where the bank of the channel was levelled in a rough sickle shape (S6.10). This recess will have contained a wooden trough for water drawn from the adjacent pit.

A BURNT MOUND IN AN OAK FOREST

During the fieldwork many twigs, acorns and acorn cupules were found on the floor of the last water pit (S6.11), implying that one or more oak trees stood nearby. The results of the palaeobotanical analyses of pollen, botanical macroremains, wood and charcoal from the site reveal a landscape rich in trees and

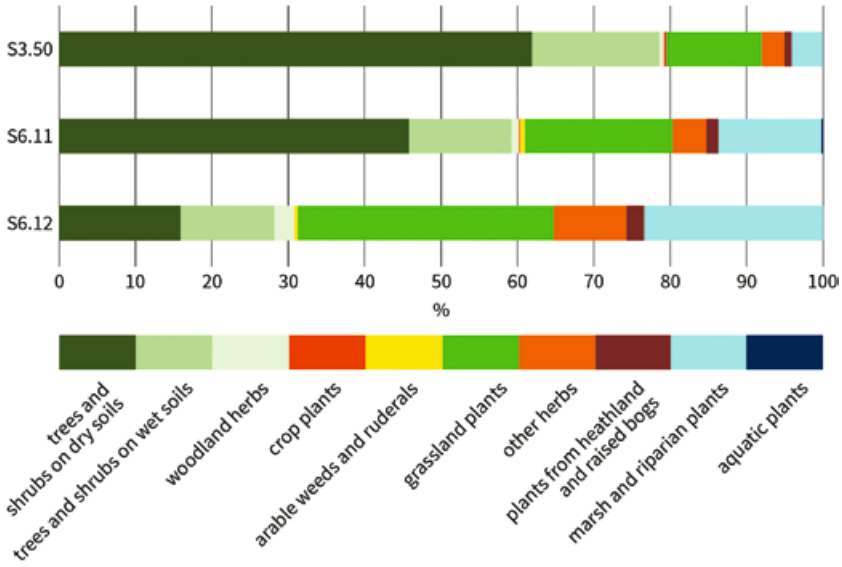

Fig. 9 Pollen ratios in different vegetation categories from two water pits (S3.50, S6.11) and a shaft (S6.12). The top diagram probably (primarily) represents the original vegetation at the site. The other two diagrams seem to reflect the local vegetation and forest clearing at the time of the site's use. – (Illustration BIAX Consult / R. Mols, BABN).

shrubs[5]. The site itself consisted of a clearing with a herbaceous vegetation. It was surrounded by a softwood riparian forest in the lower parts along the residual channel and a hardwood riparian forest dominated by oak in the higher parts (**fig. 9**)[6]. Oak also prevails in the site's charcoal samples (**tab. 1**).

This image contrasts strongly with that of the wider environment in roughly the same phase. Illustrative is a site only 1.5 km north, where the proportion of tree pollen from a water pit was less than 6 %, implying extensively managed grasslands that were regularly grazed and/or used for haymaking[7]. The nearest known contemporary farms were 2 km west of this pit and 3 km northwest of the Rust Wat site[8].

The users of the Rust Wat site along the residual channel apparently deliberately sought out or created a clearing in a wooded part of the landscape, far from the farms and fields. This is evident from the scarcity of cereals and other cultivated crops in the pollen diagrams. They are even completely absent from the twelve studied samples of macroremains.

We are here obviously dealing not with a settlement, or part of one, but a site for special activities. The combination of large quantities of charcoal and stone means that we may identify it as a »burnt mound«, although the term »burnt spread« is at least as appropriate for the relatively flat refuse dump of this site[9]. Such mounds and spreads are best known from Ireland, Great Britain and Scandinavia, where the majority date from the Bronze Age[10]. The Scandinavian burnt mounds are assumed to more closely resemble the burnt offering places known mostly from Central Europe[11]. The scarce Bronze Age examples known elsewhere in Europe do not show the characteristics of the Rust Wat site, so only the British and Irish examples will be considered here.

A basic activity attested at such burnt mound sites was heating stones in or near a fire. Massive piles of fire-cracked stones indicate the use of stones that did not survive a thermal shock. Irish sites in particular have shown that water was often heated with stones in wooden containers, in some cases even discarded canoes[12]. By analogy this suggests that the concentration of 294 pieces of fire-cracked stone found at the centre of the eastern structure at Rust Wat represents the contents of a decayed wooden tub. This is further supported by the fact that the stones came to light at a higher level than the hut features. The only difference between the burnt mounds known from the British Isles and Rust Wat is the large amount of pieces of fired clay that were found at the latter site.

taxa	(native) species/ genera	scientific names	macro-remains	pollen	wood	char-coal
oak	oak	*Quercus*	××	××	××	××
willow	willow	*Salix*	×	×	××	××
hazel	hazel	*Corylus*	×	×	×	×
field maple	field maple	*Acer campestre*	×	-	-	-
field maple type	field maple, sycamore	*A. campestre, A. pseudoplatanus*	-	-	-	×
maple	field maple, sycamore	*A. campestre, A. pseudoplatanus*	-	×	-	-
alder	alder	*Alnus*	-	×	×	×
ash	ash	*Fraxinus*	-	×	-	×
hawthorn	hawthorn	*Crataegus*	×	-	-	-
Pomoideae	crab apple, wild pear, hawthorn, rowan	*Malus sylvestris, Pyrus pyraster, Crataegus, Sorbus*	-	-	×	×
bramble	bramble	*Rubus fruticosus*	×	-	-	-
cherry type	wild cherry, bird cherry	*Prunus avium, Prunus padus*	-	-	-	××
plum type	blackthorn	*Prunus spinosa*	-	-	-	×
rowan group	crab apple, wild pear, rowan, hawthorn, wild cherry, bird cherry, blackthorn, bramble, dewberry, raspberry	*Malus sylvestris, Pyrus pyraster Sorbus, Crataegus Prunus avium, P. padus, P. spinosa, Rubus fruticosus, Rubus caesius, Rubus idaeus*	-	×	-	-
dogwood	dogwood	*Cornus sanguinea*	×	-	-	-
wayfaring tree	Guelder rose, wayfaring tree	*Viburnum opulus, Viburnum lantana*	-	-	-	×
birch	birch	*Betula*	-	×	-	-
beech	beech	*Fagus*	-	×	-	-
pine	pine	*Pinus*	-	×	-	-
elm	elm	*Ulmus*	-	×	-	-
lime (linden)	lime (linden)	*Tilia*	-	×	-	-
poplar	poplar	*Populus*	-	-	?	-

Tab. 1 Presence/absence of the find categories by taxon and the native species they entail. Legend: × = present, ×× = numerous, ? = identification uncertain.

Many of the burnt mounds known from Ireland and Great Britain are characterised by the virtual absence of other categories of finds. The same holds for Rust Wat. As far as animal remains are concerned, half a cattle metatarsal accounts for more than half of the total bone weight found here[13], and only 15 g of this total was recovered from the cultural layer. The site moreover yielded only 41 sherds of Middle Bronze Age pottery (**fig. 10**), in spite of the fact that it must have been used for several decades, if not on a daily basis. No sherds whatsoever came to light inside the foundation trenches, and no distinct concentrations were found within the enclosures either. A remarkable find is a fragment of a scoop that was recovered from the dark layer 5 m southeast of the eastern hut (**fig. 10, 6**). Unlike ladles, all the scoops so far known in the Lower Rhine area date from the Late Bronze Age (1100–800 BC)[14]. This is also one of the few sherds showing no clear signs of secondary burning and containing no mineral temper. The only other ceramic find is a fragment of what may have been a spherical loom weight.

The proportion of worked flint is negligible, comprising only eight insignificant pieces (28 g). The only other stone artifacts are one fragment of a truncated conical sandstone artifact and a rectangular polished piece of lydite, only 3.4 cm long, showing extra lustre along its narrow long sides. The function of neither artifact is known.

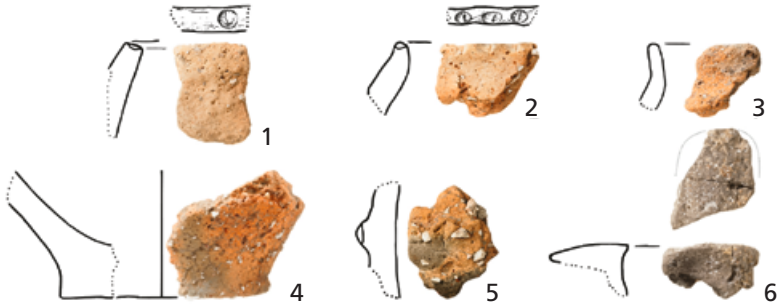

Fig. 10 Handmade Middle Bronze Age pottery: **1–3. 6** all the retrieved rim sherds. – **4** a bottom sherd. – **5** a cordoned wall sherd. – **1–2. 5** are decorated with fingertip impressions. – (Photos R. Mols, BABN; drawings M. Verhoeven, BABN). – Scale 1:3.

This is in marked contrast to the yield of unworked stone from the cultural layer and the features – mainly fragments of sandstone and quartzite cobbles, together amounting to more than 41 kg – and the more than 119 kg of fired clay. Extrapolation from the contents of the sieved squares (10 %) of the cultural layer (**fig. 11**)[15] with the inclusion of the remains from the features leads to the conclusion that there were originally at least 200 kg of stone and 1000 kg of fired clay at the site.

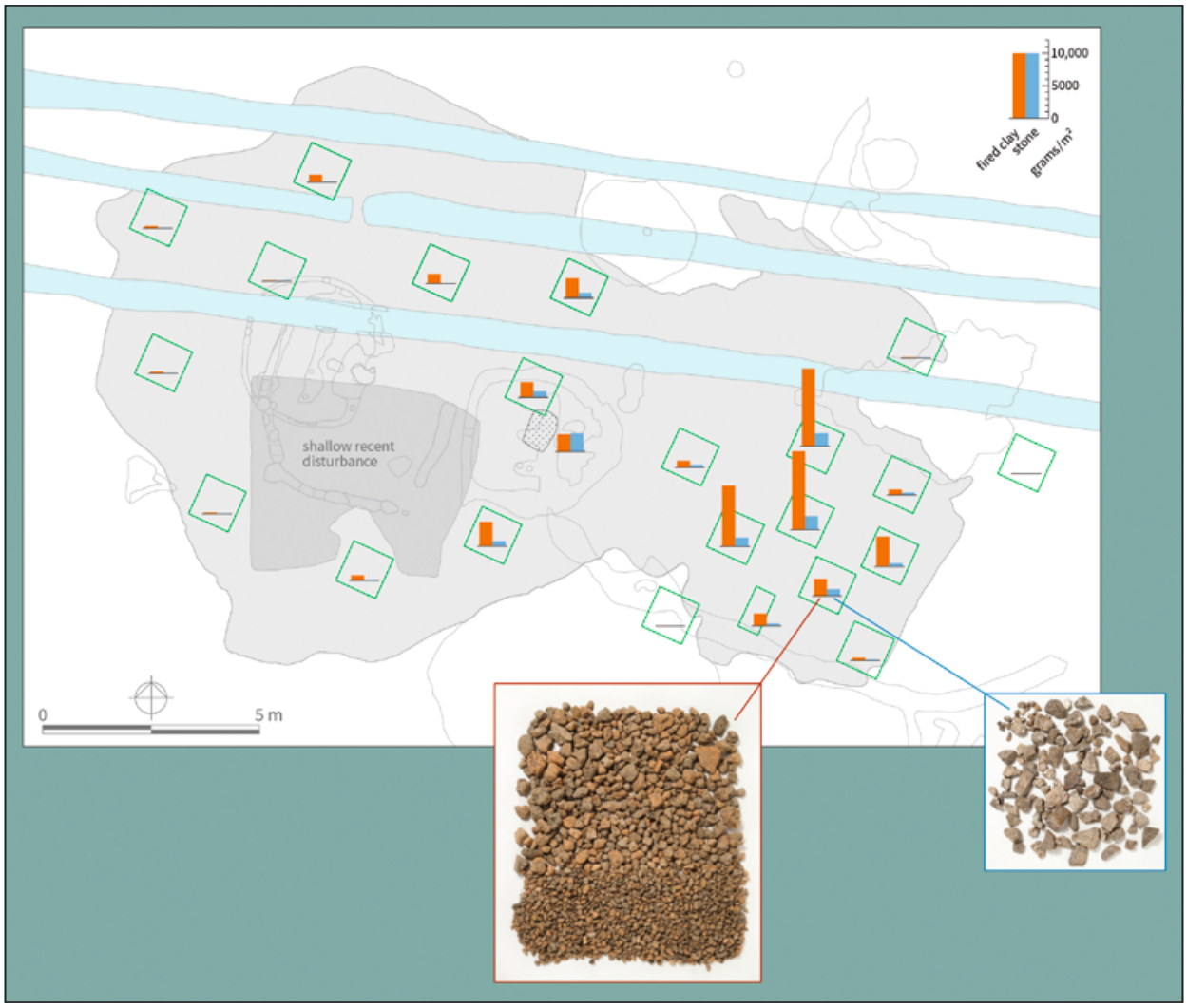

Fig. 11 Graphical presentation of the yields of fired clay and stone from the 22 sieved squares of the cultural layer and from the concentration of stones within structure 2 (S3.6). Inserted are pictures of fired clay and stone from one of the squares with a small yield. – (Drawing and photos R. Mols, BABN).

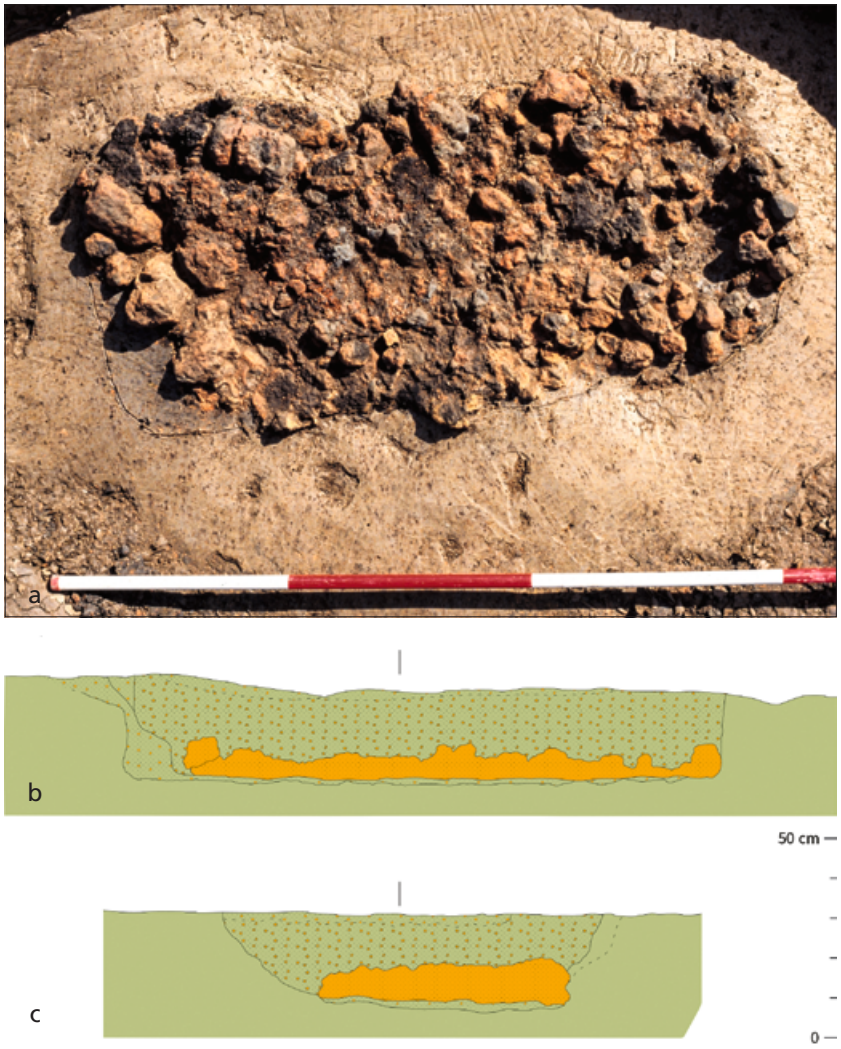

Fig. 12 Pit S14.2 in various aspects: **a** top view of the lumps and chunks of fired clay at the bottom of the pit. – **b** longitudinal section. – **c** cross-section. The clay matrix of the higher fill layers contained crumbs of fired clay. – (a photo BABN; b–c drawings K. Kruithof / R. Mols, BABN).

CERAMIC HEATING »STONES«

The dominance of pieces of fired clay at the site was initially a mystery. Impressions, of for instance wickerwork, were extremely rare. But then the contents of a peripheral pit in the north (S14.2) proved to be an eye-opener. The entire floor of this pit was covered with balls, or rather irregularly shaped lumps of fired clay, weighing up to 1.4 kg each (**fig. 12**). This discovery was the key to understanding that we were here dealing with substitutes for cobbles.

The smaller pieces of fired clay that make up the bulk of the finds from this site are probably fragments of clay lumps of the kind found in the aforementioned pit, fragmented by repeated use and subsequently trampled. The use of ceramic heating »stones« is not surprising in this part of the river plain, considering that cobbles were only to be found a few kilometres further south, for example on the Kops Plateau, a site with fluvioglacial deposits south of the river Waal, in the higher part of Nijmegen.

Similar artifacts of fired clay have come to light during excavations in other parts of the world, but they are usually assumed to have been used for culinary purposes, in particular cooking food[16]. Some basic experiments were carried out to test the hypothesis that these lumps of silty clay may have served as sources

of heat in sweat lodges, primarily to answer the question whether heated clay balls can withstand exposure to cold water, in either sprinkling or immersion[17]. The manufactured clay balls were left to dry for four to five weeks and then placed around a wood fire in a shallow pit. After at least three hours, specimens with a temperature of around 200 °C were sprinkled with cold water. This caused no fractures, only steam (**fig. 13**). In a second test, a series of five balls heated to approximately 350 °C were immersed in a bucket containing 10 ℓ of lukewarm water (13–18 °C). This was repeated twice, each time after drying the balls by the fire and reheating them to 350 °C. The damage was limited to a few cracks in one of the five balls. The first impression of these experiments is that the porosity of clay balls actually makes them more resistant to temperature shocks than many types of stone.

Fig. 13 The effect of pouring half a glass of water over a recent clay ball with a temperature of about 200 °C. – (Photo E. Mols).

A PLACE OF ABSTINENCE

A whole range of activities may conceivably be associated with such a burnt mound site. Studies have so far focused on, for instance, beer brewing and skin processing[18]. But food preparation, including cooking meat, is most often mentioned. Another frequently mentioned function is that of a steam bath. R. Bradley agreed with the proposition previously put forward by L. Barfield and M. Hodder[19], in particular in cases in which the heaps of stones were accompanied by a small structure: »It seems more likely that the main objective was to create large amounts of steam, so that they may have been used like North American sweat lodges«[20].

In his impressive recent study of 1165 Irish burnt mound sites, A. Hawkes was of a different opinion, namely that the sites in question were used primarily for food preparation[21]. The one other plausible function, that of a sauna, could in his opinion apply only to a small number of such sites – those associated with remains of structures, and a possible plunge pool just outside[22]: precisely the most similar counterparts of the Rust Wat site (**fig. 14**).

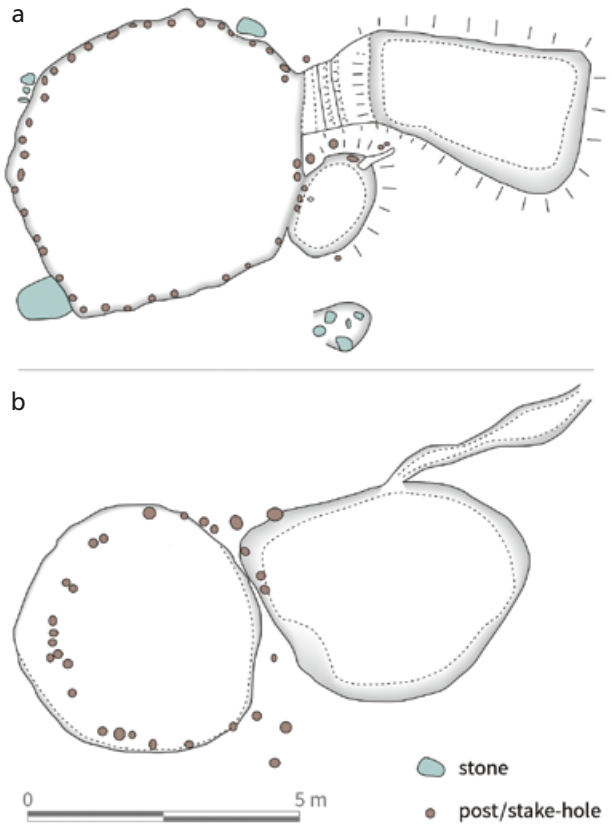

Fig. 14 Most similar late prehistoric sites in Ireland: **a** Rathpatrick (Kilkenny/IE). – **b** Burrow or Glennanummer (Offaly/IE). – Except for a burnt mound they include a sunken circular structure and an adjacent trough (plunge pool?). Rathpatrick also comprises a small pit, a hearth with stones and earth-cut steps between the stake circle and the water pit. – (Drawings R. Mols, BABN, after Hawkes 2018, fig. 4.59).

But Rust Wat cannot be unambiguously interpreted either. Food preparation and beer brewing may be ruled out as activities at a site where not a single cereal grain was found and finds of bones and pottery were extremely rare. On the contrary, these absences conjure up an image of a »place of abstinence«, while the specific location – a clearing in an oak forest far from the place of residence – even suggests a sacred atmosphere[23].

SWEATING AND BATHING

The features and finds are most in accordance with a sauna site[24]. The eastern structure seems to have been a sweat lodge or a bathing room. Crucial for this interpretation are the fire-cracked stones that were found at the centre of the structure mixed with a greater than average amount of chunks of fired clay. They may have been used in combination with water, or without water (dry sauna). The north-south oriented branch of the E-shaped ditch may be assumed to have held an elongated wooden tub, probably a hollowed-out part of a tree trunk. The drainage ditch that came to light in line with this elongated cavity strongly suggests that substantial amounts of water were (also) used in this structure (wet sauna or hot bath). The narrow entrance is in accordance with a room that needed to be kept warm. This will have worked better with a hut covering of sewn-together animal skins than with some kind of vegetable covering such as reeds, which will moreover have been flammable.

This hypothesis also leads to a specific interpretation of the two large water pits. The southern one is particularly noteworthy, as it was flanked by a niche containing a narrow water pit. The large water pit may very well have been a plunge pool, to which water could have been added from the adjacent narrow pit. Bathers could also be doused with fresh water if so desired.

It has already been mentioned above that the stones and fired clay balls could have created a steam room and also a warm bath in the eastern structure. However, the latter function seems to be more in accordance with the northern elongated pit S14.2 containing lumps of fired clay (**fig. 12**). The bowl-shaped cross-section of this pit combined with a straight longitudinal section may indicate that part of a hollowed-out tree trunk was used as a bathtub here.

The western structure is a little harder to interpret. There was no clearly recognisable evidence for the use of heated water, only a remarkable patch of burnt clay at the wide entrance. The chunks of clay overlying this patch will be the remains of complete lumps of clay that were disturbed by the hydraulic excavator. Extending across the entire entrance, this patch brings to mind a ritual transition of the kind known from all over the world, involving jumping or even walking over sources of heat[25]. It is even conceivable that the hot clay balls were sprinkled with water to create a steam curtain through which the participants in a session had to pass – a rite of passage in a most literal sense! And it is only a small leap of thought to associate the eastern structure with the kind of ceremonies, restrictions and spirituality known from sweat lodges in more recent times. More physical aspects, such as cleansing, relief from ailments, and physical well-being will also have been important. The range of possibilities may indeed be even greater, as suggested by an early written source. In the 5th century BC the Greek historian Herodotus wrote that the Scythians liked to place hemp seeds on the hot stones in their sweat lodges[26].

From the fact that Herodotus also referred to Greek steam baths it may be inferred that saunas were already common at that time, at least in parts of the European continent. Nijmegen-Rust Wat, an apparent source of an archaeological nature, predates this early written source by a thousand years: the eight obtained ^{14}C dates, ranging from 3460 ± 50 BP (charcoal) to 3268 ± 17 BP (wood), together yield dates of 1650–1500 BC (**fig. 15; tab. 2**). The limited lifespan of the presumed wicker walls of the two structures

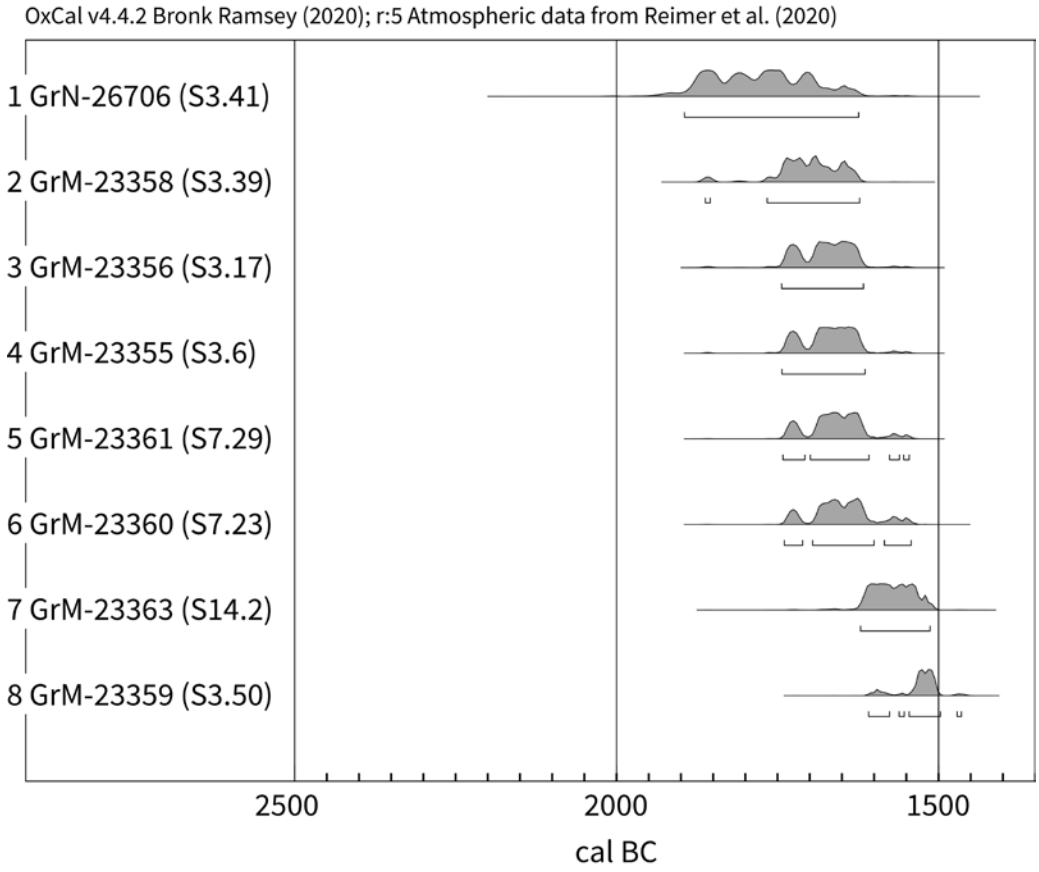

Fig. 15 Calibrated ^{14}C dates with 2× standard deviations indicated (probability range 95.4 %). Calibrated using OxCal v4.4.2. – (Plot edited by R. Mols, BABN).

no.	lab. code	feature no.	feature type	material	result BP	result cal BC (2 σ)
1	GrN-26706	S3.41	drainage ditch	charcoal	3460 ± 50	1895–1625
2	GrM-23358	S3.39	N-S ditch within structure 2	charcoal	3410 ± 24	1863–1623
3	GrM-23356	S3.17	foundation trench of structure 1	charcoal	3388 ± 24	1744–1617
4	GrM-23355	S3.6	stone concentration in structure 2	charcoal	3383 ± 24	1744–1615
5	GrM-23361	S7.29	narrow water pit	wood	3372 ± 24	1742–1546
6	GrM-23360	S7.23	large water pit	wood	3365 ± 24	1740–1543
7	GrM-23363	S14.2	pit	charcoal	3308 ± 24	1622–1514
8	GrM-23359	S3.50	water pit	wood	3268 ± 17	1609–1465

Tab. 2 Overview of the ^{14}C samples relating to the Bronze Age site, in order of ^{14}C result BP.

that must have been crucial elements in the site's use suggests that it was in use for at most a few decades. The ^{14}C results in particular point to around 1600–1550 BC.

Younger archaeological remains of what may plausibly be interpreted as sweat lodges postdating Nijmegen-Rust Wat on the European continent seem to date from the end of the Iron Age. They are partitioned stone structures on the Iberian Peninsula[27].

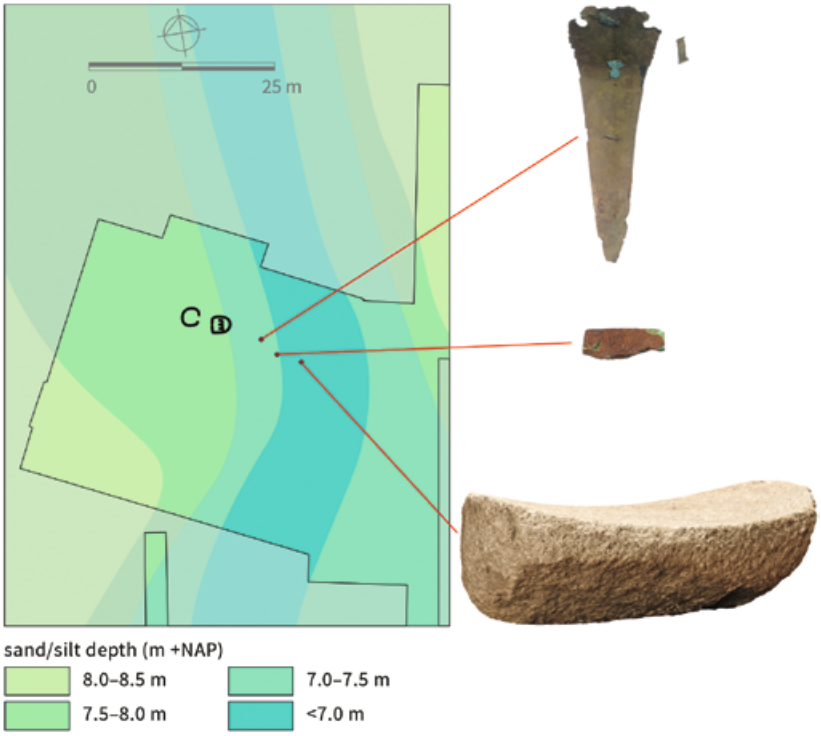

Fig. 16 Three suspected votive gifts: a bronze dagger blade (max. 9.5 cm) with the only remaining rivet, the top of a bronze low-flanged axe or stopridge axe (max. 2.7 cm) and a saddle quern of quartzitic sandstone (max. 37 cm). The findspots are indicated together with the two hut plans on a physiographic substrate established by coring, also outside the limits of the excavation trenches. – (Drawing RAAP / R. Mols, BABN; photos R. Mols, BABN).

CLOSING DEPOSITS?

The charcoal, fired clay and stone fragments will initially have been lying around the site as refuse dumps. But it would seem that they later became scattered across the entire site, because they also ended up in all the pits that were found beneath the cultural layer. The fact that these remains also covered the interiors of the huts suggests that these structures had by that point already decayed, been demolished or burnt down. However, this scattering of the sauna remains will not have been the very last activity at this site, as can be inferred from the stratigraphic position of one of the special objects reflecting ritual depositions (**fig. 16**): a bronze dagger blade, clearly detached from the handle, that was found on the bank of the residual channel, at a high level inside or on top of the cultural layer. This position may indicate that it dates from the time of the site's abandonment, as closing deposits are regionally well known from the Bronze and Iron Ages[28].

It is not possible to provide a relative date for the still usable saddle quern that was found lying upside down in the bed of the residual channel. However, in view of their respective male and female connotations[29], the dagger and this saddle quern may well have both been deposited here around the same time.

The find of this saddle quern is in marked contrast to the absence of remains of cultivated crops and food residues at the site. Grinding acorns for consumption is known to have been customary in the Late Neolithic[30] and, in theory, it could indeed well have been practised at this specific wooded location. However, the quern is more likely to be viewed in the context of objects that were ritually deposited in wet environments without having been used on the spot, for example to beg for fertility. In the Netherlands, the stream valleys and bogs in the northern province of Drenthe are best known for such votive deposits of various kinds of objects, including saddle querns[31]. Similar gifts are also known from the prominent British Bronze Age ritual Flag Fen site (Cambridgeshire/GB)[32].

The dagger blade that came to light on the channel bank will have had a different meaning[33]. And in view of the scarcity of other artifacts, the single bronze axe fragment that came to light at this site may also be regarded as a ritual deposit, even though it appears to have been moved from the centre of the site by subrecent ploughing[34].

THE IDENTITY OF THE VISITORS

A pressing question concerns the identity of the people who occasionally visited the clearing in the oak forest. The site's small size suggests that it was used by at most a few families, or a select group of their members. Or did a select group of people from a larger area gather here, for example religious specialists? No counterparts of this site are known in mainland Northwest Europe, or seemingly in a much wider area, making it tempting to look westwards for an interpretation, to the burnt mounds of the British Isles, also in view of our knowledge of overseas contacts in the context of the bronze trade in the Middle Bronze Age. And with the current emergence of so many indications of Bronze Age long-range migration involving both individuals and large groups[35], this raises the question whether we may be dealing with one or more migrants here. Be that as it may, the pottery found at the site can be attributed to the regionally well-known Hilversum Culture[36].

Another possibility is that *regional* inhabitants copied the use of the pyrolithic technique in a hut after a trip overseas. This is actually supported by the outcome of a study that has not yet been mentioned. Analysis of the excavation results showed that stones had been used only in an advanced phase of the site's use, whereas the chunks of fired clay were represented in all layers of the stratigraphy, leading to the conclusion that the burnt mound was initially created by heating lumps of clay instead of stones. If this had been a case of an overseas tradition being continued by migrants, we would expect stones to have been used for heating from the very start. The impression that only heated lumps of clay were used at first suggests the activity of regional inhabitants, even though virtually no similar finds are known from other prehistoric contexts in the Lower Rhine area[37].

EPILOGUE

Although the small dimensions make the discovery of similar sites rather difficult, it is highly noteworthy that no counterparts are known from an archaeologically well-covered area such as Northwest Europe. However, given its assumed useful life of a few decades, it is unlikely to have been nothing more than a local experiment. The above description may be helpful in identifying other cases[38].

Notes

1) See van den Broeke/Ball 2012 for a provisional overview.

2) van den Broeke 2023. This article is essentially a summary of the site report. The analysis and reporting could be realised thanks to a substantial additional budget from the municipal Ontwikkelingsbedrijf, as part of the »Uitwerking oud onderzoek Waalsprong« programme.

3) van den Broeke 2003.

4) Cf. Ó Néill 2009. – Gardner 2018. – Hawkes 2018.

5) See van Beurden et al. 2023 for a detailed report.

6) The top diagram in **fig. 9** probably reflects the situation before the start of the intensive use of the site, as the pollen sample was taken from the insulating clay layer at the bottom of the northern large round water pit (S3.50), which may have been dug from the channel bank (S3.64/3.70).

7) van Haaster 2012. A ^{14}C date of 3250 ± 35 BP was obtained for uncharred seeds from the water pit.

8) van der Linde/Ball 2022.

9) Hawkes 2018, 3.

10) Hawkes 2018, 119–120. 153.

11) Ó Néill 2009, esp. 22–24. 161–163. – Hawkes 2018, 46–50.

12) Hawkes 2018, 77–79.

13) Zeiler 2023.

14) Cf. Hermsen/Scholte Lubberink 2019, figs 21, 21–22. 26; 22, 52.

15) A slice of 5 cm or two slices of 5 cm thick were sieved per square, depending on the thickness of the culture layer on the spot. The dimensions of the sieved squares were basically 100 cm × 100 cm.

16) E. g. Bennison-Chapman 2021. – Simms et al. 2013.

17) Experiments conducted with E. J. P. J. Mols, Diever/NL.

18) Cf. Ó Néill 2009, 71–79. 193–195. – Gardner 2018, 21–31. – Hawkes 2018, 155–179.

19) Barfield/Hodder 1987.

20) Bradley 2007, 214–215.

21) Hawkes 2018, 186.

22) Hawkes 2018, 100–104. 113 (type 7). 170. 172–174 fig. 4.59.

23) This supposition is partly motivated by the later descriptions of sanctuaries in Gallia and Germania by classical authors, as summarised by Roymans 1990, 63.

24) See van den Broeke 2023, 163 fig. 8.117 for a lively artist impression by Kelvin Wilson.

25) E. g. de Vries 1970, 461.

26) Hdt. 4, 73. 75. The palaeobotanical research focused on the possibility of the site containing concentrations of special plant species associated with a potential function as a sauna, but no specific results can be reported in this respect.

27) García Quintela/Santos Estévez 2015.

28) Habermehl 2022, esp. 33–38.

29) Cf. the symbolic male/female opposition perceived in the ritually deposited stone axes and querns in the Late Neolithic/Early Bronze Age ring sanctuary of Pömmelte (Salzlandkreis/DE) (Spatzier/Bertemes 2018, 666–668).

30) Kubiak-Martens 2014.

31) van der Sanden 1998.

32) Buckley/Ingle 2001.

33) Recent research into organic residues on bronze daggers found in Italy show that they were used to process animal carcasses (Caricola et al. 2022). In the case of Rust Wat it could be suggested that both the dagger and the unexpected hoofprints on the bank of the residual channel are associated with animal sacrifice. No sacrificial remains were found here, but it is quite conceivable that a sacrificial animal was deposited in the water after having its throat slit (with a bronze dagger).

34) Cf. Fontijn 2003, appendices, for fragments of bronze objects interpreted as ritual deposits. The results of XRF analyses suggest that both the axe fragment and the dagger blade are made of copper from the Great Orme mine in Wales (van Os 2023).

35) E. g. Harding 2018, with references. Small-scale migration from the Middle Rhine area and from Northern France to the Betuwe region may be assumed for the Early and Middle Iron Ages at least. This apparently led to the reintroduction of inhumation alongside the prevailing cremation ritual (van den Broeke 2014; Kootker et al. 2017).

36) As recently summarised by Drenth 2018. However, as the production of this handmade pottery ostensibly took place on a domestic level, it may be assumed that the pottery was manufactured by women (e. g. Hodder 1981). This does, theoretically, not rule out the possibility of the arrival of one or several males.

37) Which is not surprising, considering its vulnerable nature. See, however, the recently published burnt clay finds from Medel-De Roeskamp, lying in the same river plain as Nijmegen-Rust Wat (Hermsen 2023, esp. fig. 50.33, Early Bronze Age).

38) Susan Mellor corrected the English text.

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Zusammenfassung / Summary / Résumé

Eine bronzezeitliche Sauna in Nimwegen (prov. Gelderland/NL): eine außergewöhnliche Fundstelle auf dem europäischen Festland

In diesem Artikel wird eine bronzezeitliche Fundstelle in den Niederlanden vorgestellt, die den *burnt mounds* der Britischen Inseln ähnelt. *Burnt mounds* sind jedoch auf dem europäischen Festland sehr ungewöhnlich, besonders in Kombination mit tiefen Wassergruben. Die in Nimwegen gefundene Anlage datiert um das 16. Jahrhundert v. Chr. und scheint mindestens eine Schwitzhütte und zwei Tauchbecken zu umfassen, die sich in einem von Eichen dominierten Wald befinden. Als Wärmequelle wurden nicht nur Steine, sondern vor allem Tonkugeln verwendet. Einige Votivgaben, die im und in der Nähe des angrenzenden Altarms gefunden wurden, unterstreichen den rituellen Charakter des Ortes. Die lange Nutzungsdauer in Verbindung mit dem Fehlen von Gegenstücken in der weiteren Umgebung wirft die Frage auf, ob die Nutzerinnen und Nutzer der Anlage möglicherweise von der anderen Seite der Nordsee eingewandert sein könnten.

A Bronze Age Sauna in Nijmegen (prov. Gelderland/NL): an Exceptional Site in Mainland Europe

This article presents a Bronze Age site in the Netherlands similar to the burnt mounds of the British Isles. Burnt mounds are, however, very exceptional on the European mainland, especially in combination with deep water pits. The site found in Nijmegen, dating from around the 16th century BC, seems to have comprised at least one sweat lodge and two plunge pools in an oak-dominated wood. Stones, but above all clay balls were used as sources of heat. Some votive deposits found in and near the adjacent residual channel emphasise the site's ritual character. The long period of use combined with the absence of counterparts in the wider area raises the question whether the site's users may have been migrants from across the North Sea. Translation: S. Mellor

Un sauna de l'Âge du Bronze de Nimègue (prov. Gueldre/NL): un site exceptionnel pour l'Europe continentale

Cet article présente un site de l'Âge du Bronze aux Pays-Bas similaire aux *burnt mounds* des îles Britanniques. Un *burnt mound* est toutefois un phénomène très exceptionnel sur le continent européen, en particulier en combinaison avec de profondes fosses à eau. L'exemple de Nimègue, datant d'environ le 16e siècle av. J.-C., semble contenir au moins une hutte de sudation et deux bassins profonds, situés dans un bois dominé par les chênes. Comme source de chaleur, non seulement des pierres, mais surtout des boules d'argile ont été utilisées. Quelques dépôts votifs dans et près d'un bras mort adjacent soulignent le caractère rituel du site. L'utilisation à long terme et l'absence d'homologues dans la zone plus large soulève la question si des migrants de l'autre côté de la mer du Nord seraient être impliqués ici.

Traduction: J. Bourgeois

Schlüsselwörter / Keywords / Mots-clés

Nimwegen / Bronzezeit / *burnt mound* / Schwitzhütte / Votivgaben
Nijmegen / Bronze Age / burnt mound / sweat lodge / votive deposits
Nimègue / Âge du Bronze / *burnt mound* / hutte à sudation / dépôts votifs

Peter van den Broeke
Gemeente Nijmegen
Bureau Archeologie en Bodemkwaliteit
Postbus 9105
NL - 6500 HG Nijmegen
p.van.den.broeke@nijmegen.nl

Liesbeth van Beurden
Kirsti Hänninen
Caroline Vermeeren
BIAX Consult
Symon Spiersweg 7 D2
NL - 1506 RZ Zaandam
beurden@biax.nl
hanninen@biax.nl
vermeeren@biax.nl