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Re-evaluation of the site Hohen Viecheln 1

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Abstract
Hohen Viecheln is one of the key sites for Early Mesolithic research in Northern Europe. Due to a large number of osseous tools the site became a reference site already shortly after excavation. However, because of a difficult stratigraphy the chronological depths of the site and its inventory have been discussed ever since. Due to the importance of the material for comparison, a re-evaluation of the chronology of the site and typology of the bone points was conducted through directly dating several artefacts. The results of these analyses show the possibility to metrically differentiate between different bone point types and the inherent potential for formalising the description of such tool types beyond morphologic features.
With the support of radiocarbon dating it was shown that bone points of the Duvensee-type were longer in use at the site than points of the more regionally distributed Pritzerbe-type. It is also shown that the stratigraphy clearly shows phases of erosion that caused a re-deposition of older material on top of the find layers. As a consequence, the direct dating of finds improved the understanding of the geological processes at the site as well as the chronology and archaeo-cultural developments in the Early Mesolithic. With respect to the artefacts the site is integrated into a wider perspective, and it can be demonstrated that the assemblage from Hohen Viecheln shows several northern connections to the Danish island of Zealand.

1 Introduction

Hohen Viecheln (official site name: Hohen Viecheln 1; 53.779567 N; 11.494762 E; WGS84) is one of the archaeologically most valuable Mesolithic lakeshore sites from Northern Germany. With more than 300 bone points (and fragments) the assemblage has become one of the reference points for early Holocene archaeology on the North European Plain. In the final publication of the site (Schuldt 1961a), the excavator Ewald Schuldt described two Mesolithic find layers and a Neolithic one and discussed if they show a continued occupation of the site over centuries, but he also stressed the potential for erosion processes (Schuldt 1961b, 78–89). His interpretation has been subject to criticism since shortly after publication due to the complex stratigraphy and discrepancies with the dating of the layers. Already the first reviewers described the monograph as a 'problematic publication' (Schüle 1962, 238, authors' translation). One of the most profound critiques is found in the review by Bernhard Gramsch (1964, 188) who stated that the differentiation of two separate Mesolithic find layers should be rejected due to the visible overgrowing sequences in the profiles. Finally, Stefan Pratsch concluded that the significance of the excavation at Hohen Viecheln is severely limited due to a much too coarse excavation methodology and the sometimes contradictory results from scientific studies (Pratsch 2006, 30–31).

In fact, the excavation strategy of Ewald Schuldt was not adequate by modern standards for a Mesolithic littoral zone. Furthermore, his excavation team had previously worked on a Slavic castle wall and was not experienced with excavating Mesolithic shore zones. 'There [at the Slavic castle] shovels and spades had been the common working tools, here [in Hohen Viecheln] spatula and brush appeared in their place. [...] I had to warn again and again about caution, since they [the team] felt that this procedure appeared like a gimmick' (Schuldt 2005, 54, authors' translation). In addition, Schuldt decided 'to treat all finds as one complex' in the monograph (Schuldt 1961b, 90, authors' translation). Only in more detailed studies of specific finds he indicates exactly from which stratigraphic position and which of the three find layers these artefacts come from.

Particularly the well over 300 bone points and fragments of such from Hohen Viecheln are nonetheless still used in studies and considered relevant for modern research as reference material for the chronology of this important artefact group. Thanks to recent research, especially by Erwin Cziesla (1999a; 1999b; 2002; 2006; Cziesla/Pettitt 2003), Bernhard Gramsch (1987a; 1990; 2000; 2003; 2009/2010; 2011) as well as Søren H. Andersen and Peter Vang Petersen (2005), it is possible to better classify the longevity of certain bone point types in Northern Europe both in relative and absolute chronology. In recent decades, against this backdrop archaeologists have independently arrived at the question of whether essential parts of the find material from Hohen Viecheln are significantly older than previously thought (Cziesla 2002, 59–61; Gramsch 1987b, 98; Pratsch 2011, 80; Terberger/Piek 1997, 15). Although two radiocarbon samples date finds to the Boreal (Gramsch 1973, 50), their association with the find layers is unclear. In the context of supra-regional faunal historical studies two single AMS radiocarbon samples of animal bones from the site were dated to 8392±62 cal. BC (KIA-35740: 9180±40 uncal. BP, *Equus ferus*; Sommer et al. 2011, table 1) and 8276–7970 cal. BC (KIA-30246: 8955±40 uncal. BP, *Emys orbicularis*; Sommer et al. 2007), respectively. However due to lacking context information of the samples it is not possible to contextualise these dates as well. Hence, the overall chronology of Hohen Viecheln had to be re-visited, and an extended dating program was undertaken to clarify the chronology of the stratigraphy as well as the artefacts.

The chronology of the site and the artefacts has been one of the main topics discussed. Therefore it was necessary to re-analyse the profiles to get indications for the chronological development of the stratigraphy. Unfortunately, one of the major drawbacks of Schuldt's excavations is the fact that only two profiles were documented. Therefore it is difficult to reconstruct and understand the local palaeotopography in detail, which complicates the understanding of the overgrowing sequence at the site. Since Hohen Viecheln is well-suited for understanding technological and typological developments in the Early Mesolithic, this analysis focusses on three major aspects:

1. The dating and re-interpretation of the stratigraphic sequence at the site. We use extensive radiocarbon dating of spatially located bone/antler tools to date the sediments by contextualisation. Thus we are able to date the overgrowing process in its different stages and simultaneously date important tool types.
2. Framing the typological sequence of harpoons and bone points in Northern Germany and its vicinities on the basis of the material from Hohen Viecheln. Furthermore we provide a formal definition of the different bone point types.
3. By directly dating distinct tools we provide the first extensive assemblage of radiocarbon-dated tools from an excavated Early Mesolithic site in Northern Germany.

1.1 Location of the Site

The site Hohen Viecheln is situated at the northern shore of Lake Schwerin in Mecklenburg-Western Pomerania in northeastern Germany (Fig. 1). Situated between the town Bad Kleinen to the west and the village Hohen Viecheln to the east, the site lies on the banks of the Dömitz-Wismar channel ('Wallen-

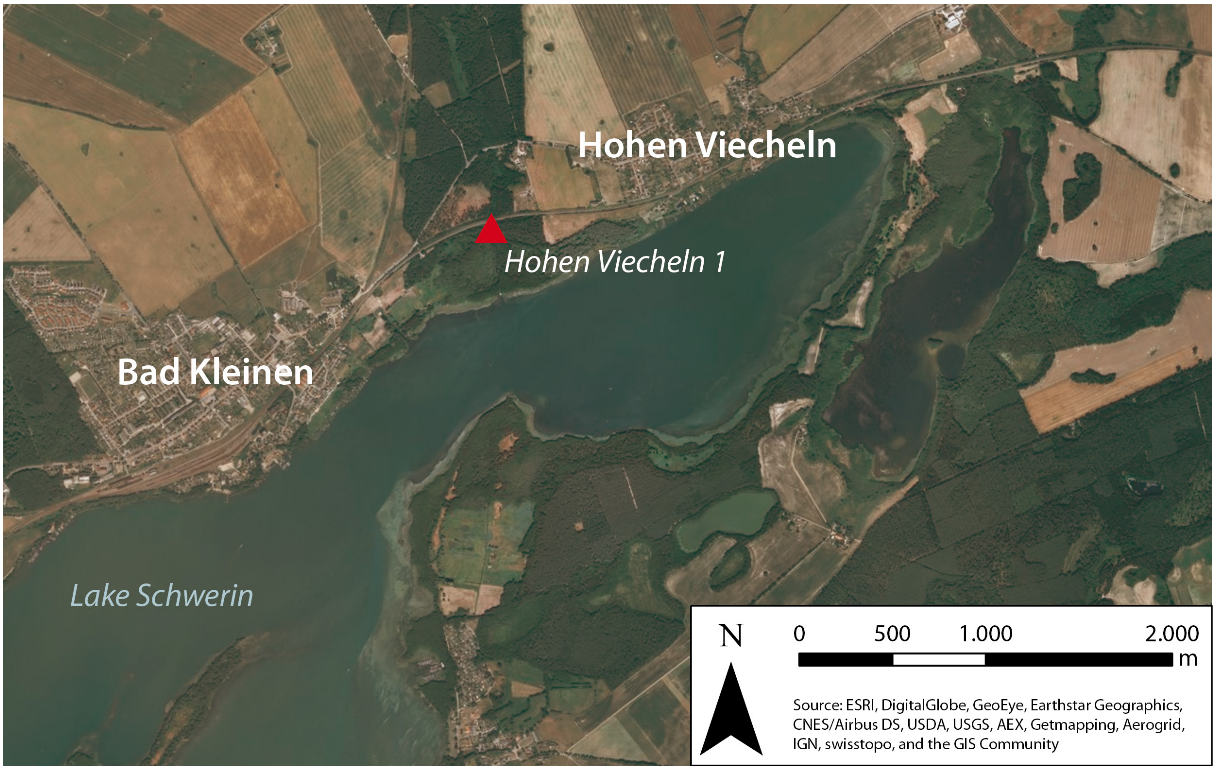

Fig. 1. The site Hohen Viecheln 1 is located between the town Bad Kleinen and the village Hohen Viecheln at the northern shore of Lake Schwerin.

steingraben'). This channel was originally intended as 'Viechelnsche Fahrt' to serve the salt trade between the Hanseatic cities Lüneburg and Wismar and was planned in the 15th/16th century as a competing project to the western 'Stecknitzfahrt', today's 'Elbe-Lübeck Canal', which was controlled by the Hanseatic city of Lübeck (Stuhr 1899).

The channel section at the position of the Mesolithic site was built about AD 1531 as a last segment of the new connection between Lüneburg and Wismar (Eckoldt 1975, 16; Goldammer 1997, 74–75; von Carmer 2006, 31). But due to several interruptions and problems during the channel construction work, its final part between Lake Schwerin and Wismar was finished only in AD 1582 (Eckoldt 1975, 16). At Hohen Viecheln the channel had to be dug down c. 10 m into the terminal moraine. By this, it cut through the watershed between Baltic Sea and North Sea so that Lake Schwerin was from then on draining towards the Baltic Sea as well. Before the construction of the Wallensteingraben the lake's only outflow was via the River Stör towards the River Elbe in its southern part. The height difference between Lake Schwerin and Wismar is more than 38 m (von Carmer 2006, 29–31), so that several locks were needed to establish a navigable water level. Due to insufficient bank stabilisations sediments slid steadily into the channel and finally made it impossible to continue shipping on the Wallensteingraben; the last recorded passage dates to AD 1597 (Eckoldt 1975, 16). During the Thirty Years War (1618–1648) it finally became unnavigable (von Carmer 2006, 31). Even though Wallenstein renovated some parts of the channel during his time as Duke of Mecklenburg (1628–1631), it has never been re-established as a trading connection between Lake Schwerin and Wismar. Nonetheless it was named after him because he was mistakenly seen as the builder of the channel (Eckoldt 1975, 16).

The building of the Wallensteingraben destroyed large parts of the Mesolithic settlement. Additionally, the area was affected in the 19th century by the construction of the railway line between Rostock and Schwerin which now covers large areas in close vicinity to the site. For this line a railway dam was erected directly north of the site which might still cover parts of the prehistoric settlement.

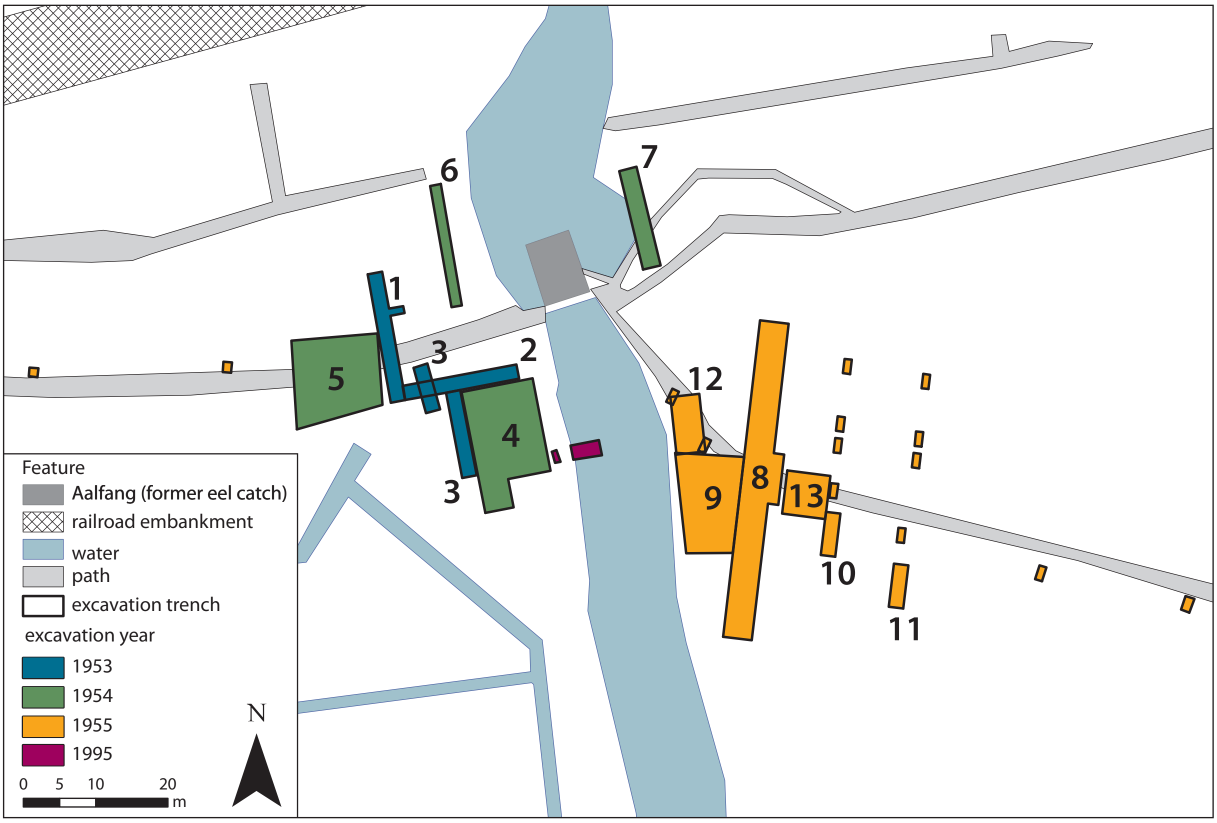

Fig. 2. Location and excavation year of the different trenches (after Gehl 1961, fig. 2). It can be seen how the Wallensteingraben parts the excavation trenches.

Other disturbances have resulted from the construction of a tank blockade at the end of World War II and an (unfinished) fish pond as well as several drainages along the shore of Lake Schwerin (Schuldt 1961b, 76). Therefore, it is unclear today to which extend the site has been affected and possibly destroyed in recent history and where the prehistoric settlement was actually located, since the excavations by Schuldt almost exclusively targeted the shore zone. However, it can be assumed that the settlement was quite large due to several stray finds. For instance, Schuldt (1961b, 76) mentions an oral report of citizens from Hohen Viecheln about remains of a dugout canoe in a drainage channel in the vicinity of the site but these were neither documented nor preserved. It is highly likely that these finds were made in the foreland of the site which is characterised by extensive fenlands and swamps that cover a stripe of approximately 800 m between the present lake shore and the excavation area. Nowadays the site is crossed by a hiking and bicycle path which passes the Wallensteingraben over a bridge.

1.2 Research history

In 1952 the site Hohen Viecheln was discovered by two children who found a finely barbed bone point at the outlet of Lake Schwerin into the Wallensteingraben (Schuldt 1953, 9). Due to a broken drainage pipe a layer of peat had been uncovered where the point was found (Schuldt 1953, 9–10). A hint by the finders made it possible to collect six other bone points which had been uncovered before by different children from the village in the same area. As a result of this, on September 26th 1952 a 2 m² wide test trench was opened, in which a compact peat layer was discovered that contained several fragments of bone, burned wood, and lithic artefacts. Underneath this layer, three additional bone points as well as several lithic artefacts were found in a dark sand. All in all 320 finds were recorded in this trench (Schuldt 1953, 10).

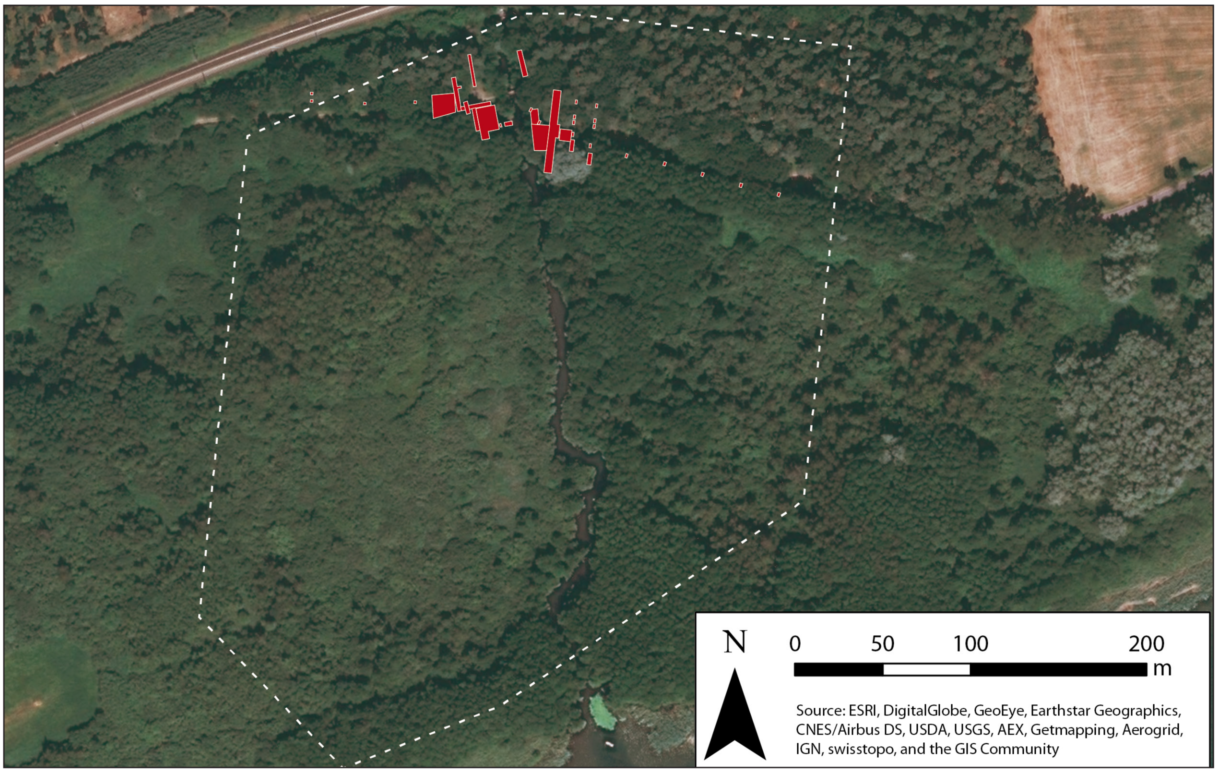

Fig. 3. Excavation trenches of E. Schuldt shown as red polygons; together with the area that was investigated by an extensive coring campaign (dashed white line).

Consequently, a larger excavation was planned; it started on September 10th 1953 (Schuldt 1953, 13). Head of the excavation was the director of the German Academy of Sciences, Berlin, at that time Wilhelm Unverzagt; Ewald Schuldt took the local direction (Schuldt 1954, 9–11). To understand the geological situation the excavators first opened a 30 m long and 2 m wide trench in north-south direction (trench 1, Fig. 2), in order to cut through the ancient shore zone and parts of the former settlement area. Another trench from east to west was consecutively opened, meeting trench 1 at its southern end (Schuldt 1953, 13). Due to disturbances, trench 1 was not excavated in its southern part, but a third trench was placed at right angles to trench 2 (Schuldt 1961b, 78). The excavations were stopped at a depth of four metres below surface level or 2 m below the synchronous lake level, respectively, due to groundwater pressure (Schuldt 1953, 14). It became obvious that following excavations would have to install efficient pumping systems and use wooden slabs to protect the profiles. 16,000 finds were recorded in this campaign (Schuldt 1953, 14). Among them, there is the remarkable amount of 119 bone points, including plain points as well as notched and barbed types (Schuldt 1953, 17–19). Most of the bone points from this campaign were found underneath the peat layer (down to 20 cm below), mainly in a perpendicular position (Schuldt 1953, 19). Some ceramic fragments were discovered as well but all of them were located above the peat layer (Schuldt 1953, 23).

The second campaign started on April 1st in 1954 and focused on excavating larger areas with the support of a motor pump (Schuldt 1954, 11). Trench 4 was opened but had to be divided into an eastern and a western part due to a pipe that drained the fen and therefore must not be destroyed. The find-bearing peat layer was found but due to its sloping down to 5 m below surface level in the southern part of the trench, Schuldt (1954, 11) reports that a proper find recovery was not possible at all times. Furthermore, he mentions that the amount of finds decreased to the south. The last trench from this campaign, trench 5, yielded distinctly less finds in its western part than trench 4 (Schuldt 1954, 14).

During this campaign the foreland of the site, which was still open meadow at that time, was investigated by corings to map the Pleistocene surface under the fen. Today it is overgrown by a dense fen woodland. By using a grid of 20 x 20 m an 800 m wide area between the excavation trenches and Lake Schwerin was investigated (Schuldt 1954, 13; Fig. 3). Additionally, the area between the railway dam and the street between Hohen Viecheln and Bad Kleinen was cored; there peat layers with a thickness of around 5 m were documented.

The last extensive campaign for the time being was conducted in 1955. Focus of this excavation was the area east of the Wallensteingraben (Schuldt 1955, 7–8). Even though further trenches (10–11 and 13) yielded finds, their number decreased with greater distance to the Wallensteingraben (Schuldt 1955, 9–10). Generally, the main concentration of finds was located between trenches 5 and 13 (Schuldt 1955, 11–12). Therefore Schuldt understandably concluded that the actual settlement site was destroyed by the different construction works in the area.

Two further small excavations were conducted on three days in December 1960 with 266 finds and in 1979, as can be seen from inventory lists. But it is unclear where these trenches were located.

The last excavation campaign at Hohen Viecheln was conducted during summer 1995. Renaturation works in a part of the Wallensteingraben required archaeological actions which resulted in a small trench within the channel. The 8 m² excavated were recorded in more detail than before so that four Early Mesolithic layers could be identified as well as a Late Mesolithic/Early Neolithic layer (Schacht 1995).

In 2016 seven sediment cores were taken within the project described here. Apart from retrieving the layers excavated in the 1950s further information could be gained for the geological development of the northern shore of Lake Schwerin.

1.3 Geological situation

1.3.1 Pleistocene landscape development

The site is located in the southern part of the terminal moraine deposits of the main ice marginal position (qW2o) of the Pomeranian phase of the Weichselian Glaciation (Litt et al. 2007, 57–58) which during its maximum ice marginal position (qW2max) also formed the depression that is nowadays filled with Lake Schwerin (Gehl 1961; LUNG 2000). The Pomeranian phase is traditionally dated to c. 18,000–15,000 cal. BC but its correct age is currently under scientific discussion (e.g. Hardt/Böse 2018).

Under the pressure of the ice shield meltwater flowed upwards to the north and led to the formation of a valley that sloped towards the glacier. This valley was filled with dead ice blocks which were subsequently covered by meltwater sands in later stages. A repetition of the process formed also a smaller valley which was sloping northwards on a higher elevation level. Nowadays this depression contains Lake Losten (Lostener See) and the Wallensteingraben. The basin of a now silted up small lake immediately north of the railway dam and south of Lake Losten, which is about 1,000 m to the north from the site, also owes its existence to this process. At the beginning of the Holocene and thus during the Early Mesolithic there was probably no running water in this northwards sloping valley, and Lake Schwerin drained south-wards to the River Elbe. Thus, the archaeological site is probably located at an important intersection of Mesolithic exchange routes between regions: close to a lake with connection to the Elbe system and within a valley that served as a vector to the predecessors of the Baltic Sea.

1.3.2 Holocene landscape dynamics at the site

To re-evaluate the results of the preceding excavations and coring campaigns and to complete the description of the sediments deposited during the Holocene, a new coring campaign was conducted in

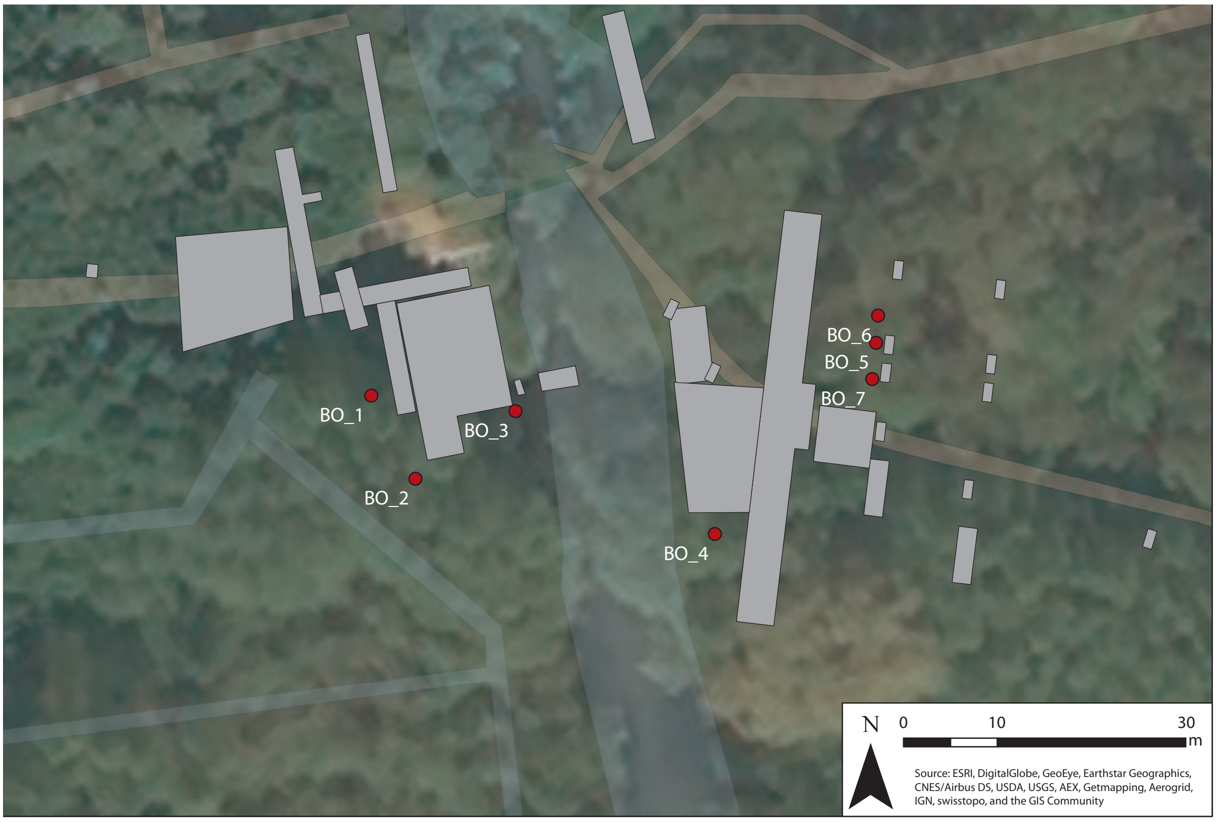

Fig. 4. Locations of the corings (April 2016).

April 2016. For this, corings were carried out at seven points at Hohen Viecheln (Fig. 4), and four sediment cores were recovered close to the old excavation trenches in the vicinity of the lake shore (BO_1–BO_4), while three further cores were taken from the adjacent slope (BO_5–BO_7). In total a length of almost 30 m of sediments and soils were recovered.

Terrestrial sediments were drilled with a percussion-vibracore system using plastic liners with a diameter of c. 48 mm. Lake and telmatic sediments were cored with a Livingstone piston corer modified by H. Usinger (Mingram et al. 2007), using cores of 80 mm or 55 mm in diameter. In each case the base of the Holocene sediment was reached. The position of all drilling points was documented with a total station.

After opening the cores the characteristics of the sequences of sediments and soils were documented using the following field methods: Grain size, density and content in carbonates were determined according to instructions for German soil surveys (Boden AG 2005). Colours of sediments and soils were determined using the Munsell Soil Colour-scale (Munsell Soil Color charts 1990). All cores were documented in digital photographs and drawings to scale.

The character of the site at the northeastern bay of Lake Schwerin has changed throughout the Holocene due to natural processes (aggradation of organic sediment) influenced by lake level fluctuations, and by anthropogenic activities (perhaps medieval water mills and the construction of the Wallensteingraben). This is well reflected by the results of the excavations and the drilling campaign of April 2016 (Figs. 5–6).

The base of the Holocene section is formed by well-sorted Pleistocene sands deposited at the end of the formation of the tunnel valley (S1) (Fig. 6). These sands contain no visible organic inclusion, and their grain size distribution is mostly fine sands with some medium sized sand. The deposition of these sands occurred in slowly running water.

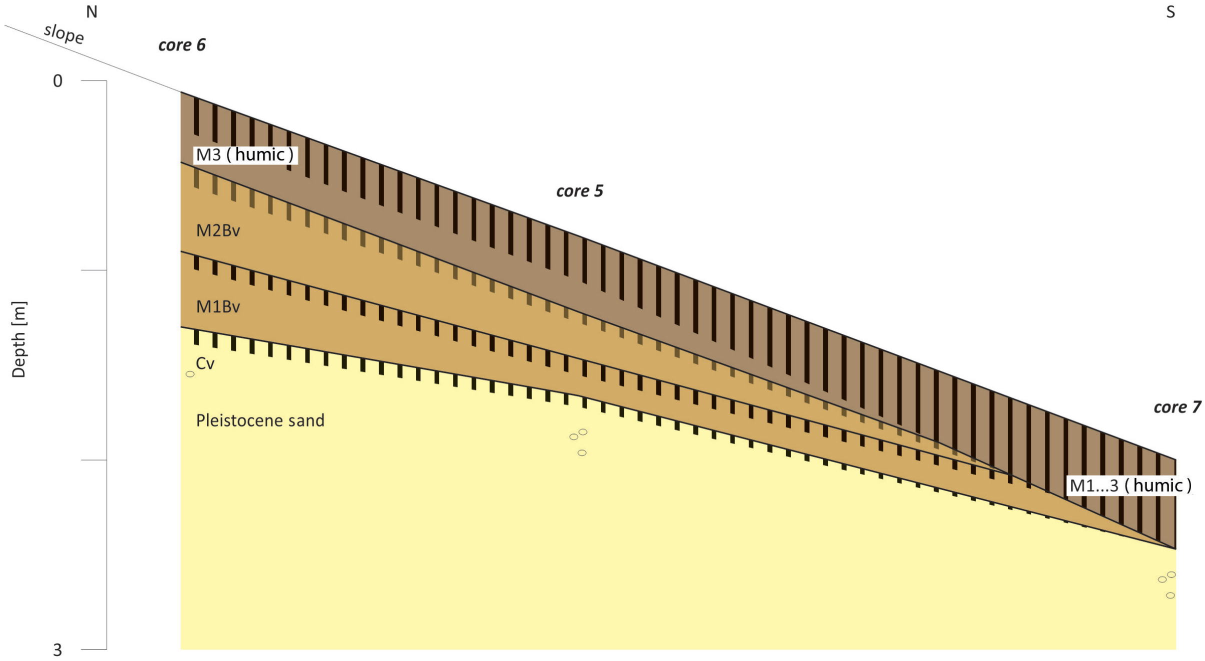

Fig. 5. Transect of the corings BO5–BO6.

Above, an intersecting layering of sands, alternatingly poorer and richer in organic matter, including charcoal or wood, was deposited (S2). These sands additionally contain a slightly higher amount of medium sand. The deposition of these sediments occurred during an initial phase of the lake formation. Whether they are slope deposits or littoral sands is not completely clear. Their composition points to a more turbulent pattern of erosion and deposition. Since we only have later dates from the overlying sediments, the interlayered sandy-humic sandy sediments have been deposited before c. 8,000 cal. BC. Thus, a deposition during the Late Glacial (YD) is not excluded.

Above the interlayered sandy-humic sandy deposits a much finer (silty to clayey), dark grayish sediment was deposited at the site. Since the sediment properties change gradually, the deposition of this organic detritus gyttja probably indicates the process of a stepwise lake level increase (G1). Relatively fast, the composition of this gyttja then changes into a more organic rich detritus gyttja (G2).

A further increase in lake level occurred subsequently, testified by a fine-grained light ochre calcareous gyttja (G3). The lack of any coarse particles and the fact that there are almost no non-calcareous components indicate an Early Holocene lake level peak.

This phase of lake status ended abruptly. A hiatus divides the calcareous gyttja in all cores from an overlaying peat deposit (P1). Thus, a clear and considerable lake level drop had occurred. According to the available radiocarbon results this drop dates between c. 8,000 and 6,300 cal. BC.

The early Holocene sequence described so far (peat-covered gyttja) is recorded in one profile and inclines in some other profiles relatively steep (15–30°) with a depth gradient of c. 3 m. This is also clearly visible in the transect profile constructed from the drilling results (Fig. 5). This situation is considered to reflect

1) a Holocene melt-out of dead ice in the deepest part of the lake basin, resulting in a tilting of earlier deposits, or
2) a compaction of earlier deposited peat and weak gyttja by the weight of burying sandy sediment (Gehl 1961; Kaiser 2003).

Later on, a mid- to late Holocene re-rise of the lake level is indicated by the deposition of middle sand on top of the peat (hS1). These sands (partly interlayered humic sand/peat fragments – pure sands) are re-deposited sandur deposits that are a result of shore erosion. They gradually filled the small adjacent basin.

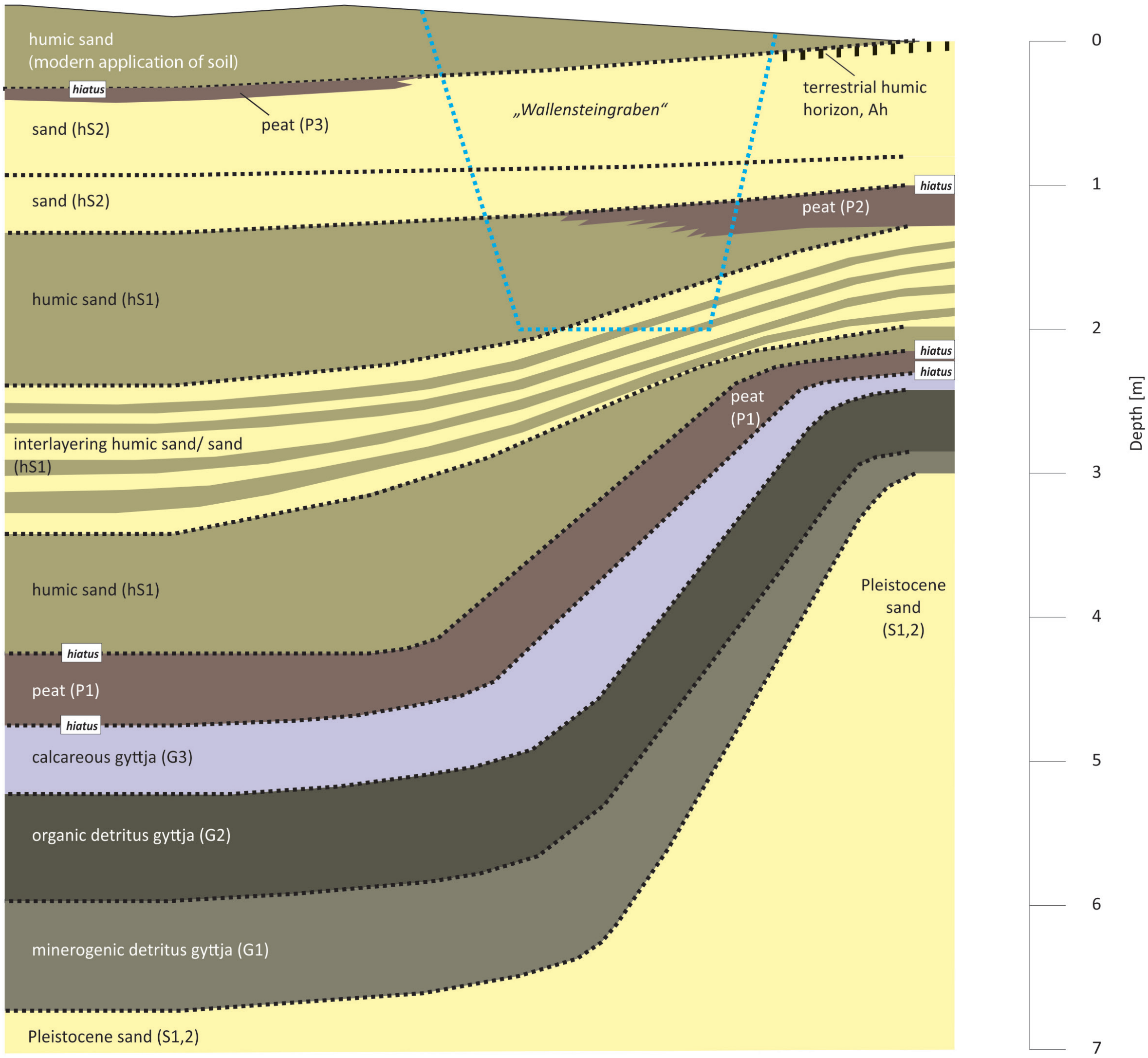

Fig. 6. Transect of the corings BO1–BO4.

When this rise in lake level reached an equilibrium status a new peat layer started to form at the lake shore (P2). This is indicated by the peat layer in 1–1.3 m depth in core 4 (Fig. 6).

A last lake level rise buried the peat sequence under another stack of littoral sand (hS2). Whether this lake level rise is related to the construction of a water mill during medieval times is still under consideration.

The construction of the Wallensteingraben in the early modern period resulted in a last slight decrease in lake level. This led to the formation of another peat layer (P3) – seen in core 2, closest to the lake shore – and an associated development of a terrestrial humus horizon in core 4. The peat layer of core 2 was buried by the previous archaeological excavations and modern construction activities, for instance, the unpaved road that crosses the site nowadays.

The evaluation of the second drilling transect shows the internal composition of the adjacent steep slope, considered as a 'palaeo-cliff' that formed largely during lake level high stands (Fig. 5). In general the drillings show sequences of buried soils and Holocene colluvial layers. The texture of the substrate is middle sand to fine sand. At the base a weakly developed soil (Regosol?, or just accumulated organic matter) formed in the periglacial perstructure layer (that contains some stones, occasionally). Above this, a sequence of three colluvial layers was deposited where Cambisols formed. Thus, the formation of these forest soils is clearly of Holocene age. The thickness of the colluvial layers decreases towards the lower part of the slope which might indicate shore erosion after the deposition of the colluvial layers. At the foot of the slope, a disturbance of the sequence by modern activities (construction of the pathway that crosses the site nowadays) is possible, additional to lake shore erosion.

Summing up the results of the geomorphological and sedimentological analyses of the new cores and including the background information from the excavation documentation, the Holocene site history can be outlined: After the formation of the depression during the Late Glacial, the basin of Lake Schwerin was quickly filled with water. A high lake level was reached between 8,000 and 6,300 cal. BC. Then, a dramatic drop of the lake level occurred before a certain re-rise took place in the subsequent Holocene. The last phases of slight water level changes (between 1–2 m) were probably a result of anthropogenic activities (medieval water mill, Wallensteingraben).

2 Method

This study uses an attribute-based recording of artefacts for the typological analysis as well as radiocarbon samples for the chronological evaluation of the stratigraphy and different tool types. For this, direct samples of characteristic bone artefacts were taken and analysed. Since no sediment samples from the excavations were preserved it was not possible to obtain a direct dating of layers associated with artefacts so that the stratigraphy had to be dated by contextualised finds. Furthermore, the specific situation of an overgrown littoral zone made it necessary to be able to determine the position of samples as exactly as possible, because finds from the same layer and vertical position cannot be considered contemporaneous due to the sequential deposition of sediments in the overgrowing sequence of the former bay at Hohen Viecheln (cf. Bokelmann 1971, 8–10).

With 313 recorded specimens the bone points are the most numerous group of tools that has been included in the analyses. Hence, a major aspect of this study is focussed on improving the typo-chronology of early Holocene bone points, but a focus is also laid upon the morphology of these tools.

2.1 Artefact recording

The artefacts were recorded attribute-related and typologically. Each find was assigned a unique ID that is a combination of a code for the excavation campaign and the find number. The excavations from 1954 and 1955 are labelled with the campaign number '1', the trial excavation from 1953 with '2', the 1960s excavation with '3', stray finds and the campaign from 1979 with "5?". Finally, the 1995 excavation has been ascribed the campaign code '95'. Each respective code is followed by the find number so that, for instance, find number 914 from the 1955 excavation would be labelled '1914'. Only bone artefacts were added to the database.

The artefacts were recorded with respect to whether they show thermal influence, which tool types they represent, if working traces are macroscopically visible, and if decoration could be seen. Metric data (length, width, thickness, weight) were also recorded. The recording scheme and recorded data can be found in the appendix. With respect to bone points it was noted if and how many barbs or notches[1] were present, their form, the length of the barb-row and its distance from the tip of the point. Moreover, the maximum widths and depths of barbs were distinguished, if possible. For further comparison of the technology the shape of the points' proximal ends was recorded (cf. Appendix).

1 In the following the terms 'barb' and 'notch' are used similarly for reasons of simplification. For a clear definition of barbs and notches see chapter 3.1.1.3.

An artefact was recorded as 'complete' if all attributes and the basic form were visible. This is also given if e.g. small pieces of the tip of a bone point were splintered off but these traces did not resemble impact scars. The recording of working traces has always been referred to at the existing or remaining parts of the artefact.

2.2 Radiocarbon sampling

The radiocarbon samples were taken at the Landesamt für Kultur und Denkmalpflege Mecklenburg-Western Pomerania, using a dental drill to abrade the surface layer of each bone/antler artefact, before cutting or drilling the samples. To limit damage to the collection, 200–300 mg dating samples were taken, and sampling locations were carefully chosen to avoid damaging worked surfaces and to minimise visual impact. Each object was photographed immediately before and after sampling.
A few mg of powder from the abraded surface and from the dating sample of each artefact were tested by FTIR spectroscopy to detect potential contamination from consolidates. Most artefacts appeared to have been consolidated, with products which had penetrated some way into the bone/antler (cf. Meadows et al. in prep.).

2.2.1 Sample treatment

The samples were demineralised in HCl (c. 1 %) at room temperature. To remove mobile humic acids, the demineralised material was treated with 1 % NaOH (20 °C, 1h) and again with 1 % HCl (20 °C, 1h). The preferred dating extract, collagen, was dissolved overnight as gelatin in H_2O_{dem} at 85 °C and pH=2.7. Insoluble particles were removed by filtration through a 0.45µm pore silver filter. The gelatin solution was freeze-dried, and then weighed to measure the collagen yield as a percentage of the starting weight.

An aliquot of collagen from each sample was combusted to CO_2 in a closed quartz tube together with CuO and silver wool at 900 °C. Carbon contents, estimated from the CO_2 pressure after combustion, were normal for collagen. The sample CO_2 was reduced with H_2 over about 2 mg of Fe powder as catalyst, and the resulting carbon/iron mixture was pressed into a pellet in the target holder. All targets produced sufficient ion beam during AMS measurement. ^{14}C concentrations were measured by comparing the simultaneously collected ^{14}C, ^{13}C, and ^{12}C beams of each target to those of Oxalic Acid standard CO_2 and background material. Conventional ^{14}C ages were calculated according to Stuiver/Polach (1977, 355–363) with $\delta^{13}C$ correction for isotopic fractionation based on the $^{13}C/^{12}C$ ratio measured by AMS simultaneously with the $^{14}C/^{12}C$ ratio.

The AMS $\delta^{13}C$ values, although not suitable for dietary reconstruction, are in the normal range for early Holocene herbivore collagen. For the determination of our measuring uncertainty we observe both the counting statistics of the ^{14}C measurement and the variability of the interval results that, together, make up one measurement. The larger of the two is adopted as measuring uncertainty. To this we add the uncertainty connected with the subtraction of our 'blank'. The quoted 1σ uncertainty is thus our best estimate for the full measurement and not just based on counting statistics.

For quality-control purposes, bone samples of known ^{14}C age were processed and measured concurrently with these samples, with satisfactory results. One other quality-control measure, the atomic C:N ratio, will be reported when we receive the results of EA-IRMS measurements at another laboratory on aliquots of the dated collagen from KIA-51086, 51087 and 51094. Insufficient collagen was recovered from the other samples for EA-IRMS measurement in addition to AMS dating.

2.2.2 Sampling strategy

The samples were taken in two different sessions with respect to specific questions for each one. To avoid reservoir effects only herbivorous mammals were dated. The first round was meant to date the different layers by sampling embedded objects. Only objects were chosen which are found in one of the two trenches that provide detailed profile drawings (i.e. trenches 4 and 8). Thus it was possible to determine the position of a find with respect to the overall stratigraphy. The second criterion for regarding a find as a sample was based on the information if they were attributed to a distinctive layer or an absolute depth (e.g. 'gyttja' or '1.4 m'). Finally, we ranked the bones based on their distance from the profile so that those specimens which were found closer to the drawn profiles were considered more reliable for dating the recorded profiles.

The second round of samples was taken after evaluating the results from the first round. Hence, it was possible to regard the insights gained from indirectly dating the layers. In this round further 20 samples were taken, and almost exclusively bone points were sampled to understand their typo-chronology. In total 21 points were sampled so that each of the three preliminary classified types at Hohen Viecheln (Duvensee-type, Pritzerbe-type, and rib-harpoon; Schuldt 1961b) was reflected in the samples; simple points without barbs were mainly excluded due to their chronological insignificance. Additionally, we chose to date a *baton de commandement*, two antler axes, and two tool sockets.

Especially for the bone points the damage applied was minimised by preferably sampling incomplete specimens – as long as they could be attributed to a specific type. Pieces with less than 5 g were not considered suitable due to the risk of not gaining large enough samples. Again the spatial position was considered so that the samples can be used for evaluating the duration of types as well as the stratigraphic sequence. Moreover, pieces were preferred which provided clear information on their archaeological layer and were associated with trenches 4 or 8. Consequently, the possible samples were ranked from high to low suitability depending on the aspects

1. if the horizontal position and stratigraphic layer is known precisely and the bone point well represents a determinable type,
2. if their stratigraphic layer is known and the absolute horizontal position ± 2 m,
3. if the layer or the vertical position is known.

Depending on this scheme the higher-ranking bone points were preferred for sampling. The other tools were mainly chosen based on the same criteria with the difference that the exact localisation was rated highest.

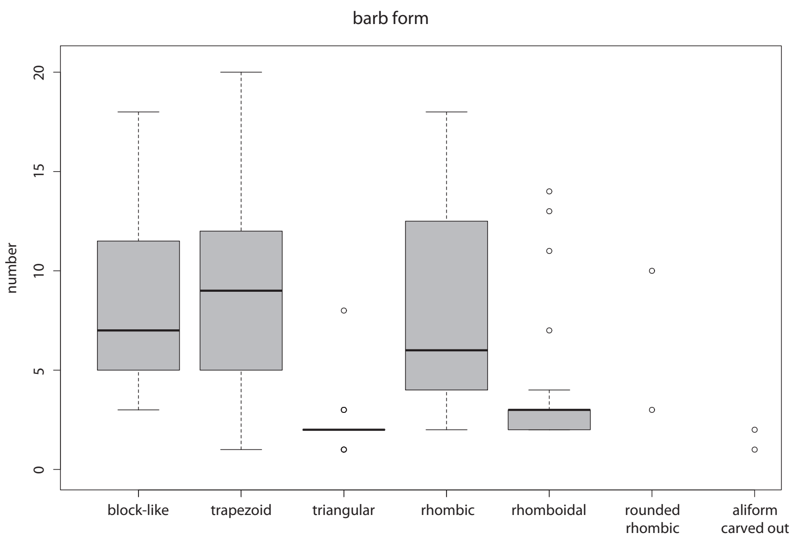

Fig. 7. Boxplot of the different barb forms and the number of barbs.

2.3 Statistical analysis

For comparing metrics common statistical tests were used (e.g. t-test, ANOVA) depending on the distribution of the data; the respective test used is mentioned. Normality was tested with the Shapiro-Wilk's test and equality of variances with the Levene's test. For the decision of the right method for clustering O. Nakoinz 's (2013, 251) decision tree for clustering methods was considered as a guideline. The null hypothesis was regularly rejected for p-values ≤ 0.05, p-values ≤ 0.01 are considered as highly significant. The radiocarbon dates are calibrated with OxCal 4.2.4 (Bronk Ramsey/Lee 2013) using the IntCal 13 radiocarbon calibration curve (Reimer et al. 2013). For chronological analysis the samples are compared by Bayesian models (Bronk Ramsey 2009).

3 Results

The material from Hohen Viecheln provides the possibility for a detailed attribute-related analysis of Mesolithic bone points, so that, based on the large number of specimens, a statistical evaluation of the data and a resulting formal description are possible. Additionally, the large number of radiocarbon dates provides a solid ground for discussing typo-chronological developments. Before presenting the chronological aspects of this study, we will therefore focus on the osseous artefacts themselves.

3.1 Typology

Typological classifications are a standard tool set in archaeology. Especially when radiocarbon dates are not possible or affordable they remain one of the go-to methods for artefact classification. As a consequence the formal description of tool-types is mandatory to guarantee comparable recordings of data.

3.1.1 Bone points

All in all 312 specimen were classified as complete or fragmented bone points in the assemblage. Not all of the artefacts originally classified as a point were confirmed as such. Four specimens were re-classified as other objects but no bone points.

For the purpose of a formalised classification all recorded finds were analysed focussed on correlations of specific attributes. This was done to evaluate which criteria are useful for the definition of types. An attribute-related analysis was chosen to detect which types are morphologically closer related. Furthermore, it was tested which attributes are relevant to be used in cluster analyses so that definitions for each type could be obtained. Basically, it is a positivistic model of an attribute-related analysis, since the recorded attributes are deductively determined by the questions formulated above (Hill/Evans 1972). Hence, the variables were preselected from a much larger number of possible attributes of the artefacts.

3.1.1.1 Defining for inherent types

For describing the different bone point types it is important to qualify criteria that are useful as differentiators. Therefore, the different qualitative and quantitative aspects are compared in the following. This provides a basis for the formal description of the different types.

There is a high correlation between the number of barbs and their form (Kruskal-Wallis chi-squared = 76.039, df = 5, p-value < 0,001). Block-like, trapezoid, and rhombic forms show regularly more barbs than triangular or rhomboidal forms. Consequently, triangular and rhomboidal forms can be seen as related forms that are chosen for bone points with a limited number of barbs whereas block-like, trapezoid, and rhombic forms show a much larger variance and generally have been used for specimens with more incisions (Fig. 7).

The respective form of the barbs is highly correlating with the depths of the incisions (Kruskal-Wallis chi-squared = 90.333, df = 6, p-value < 0.001) such as the widths of the barbs

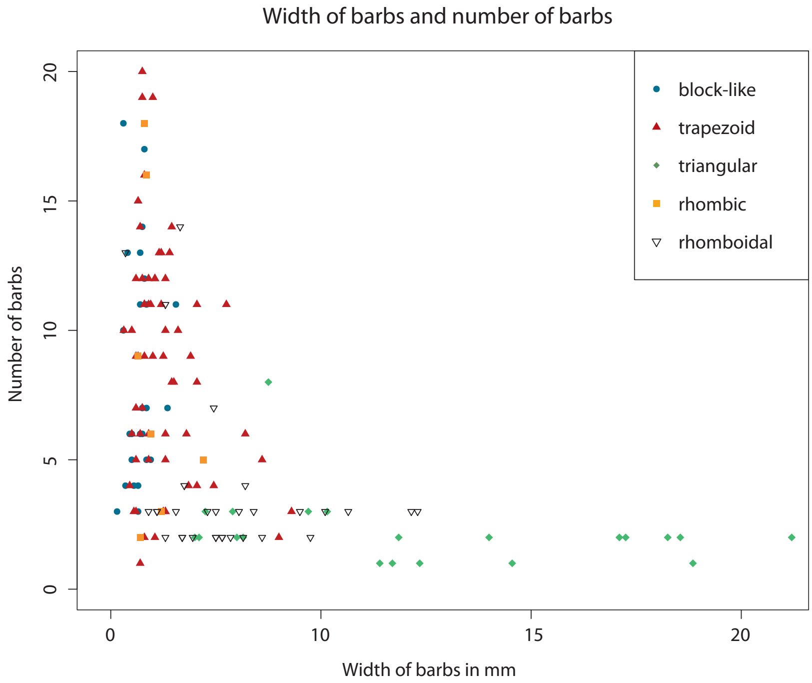

Fig. 8. Scatterplot of the width of the barbs and the number of barbs with the prevailing barb form.

(Kruskal-Wallis chi-squared = 45.352, df = 6, p-value < 0.001). As can be seen from Fig. 8 the block-like, trapezoid, and rhombic barbs have a very limited range of barb widths whereas the triangular and rhomboidal barbs scatter more widely and provide higher values for this attribute. It also becomes obvious that the number of barbs and their width are highly correlating (Kruskal-Wallis chi-squared = 60.843, df = 20, p-value < 0.001). Rhomboidal and triangular barbs show predominantly lower barb numbers than the other forms.

To determine inherent types within the dataset and differentiate types based on metric grounds a Principal Component Analysis (PCA) was applied. This analysis provides the opportunity to include several of the recorded features into one analysis so that their interference can be investigated. The following attributes were regarded:

- number of barbs (NB)
- length of barb-row (LBR)
- distance of barb-row from tip (DBR)
- width of barbs (WB)
- depth of barbs/notch (DB)
- length (L)

The width, thickness, and weight of the bone-points were excluded because these have minor effects on the results and correlate positively with length. Only complete specimens were taken into account.

The first three principal components explain 90.3 % of the data scatter while the first and second principal represent 54.2 % and 27.1 %, respectively (Fig. 9). The first principal component is mainly loaded on the distance and length of the barb-row as well as the number of barbs. Consequently artefacts with longer and further proximally located barbs are more distant to the point of origin on the horizontal axis. The same applies for the number of barbs. The artefact which is furthest away from the point of origin is ID 951995/1212/65/3 which shows 37 notches in total with 20 and 17 notches on two sides, respectively, and hence represents an exception in the assemblage (cf. Gramsch 1973, fig. 17.1).

The second component axis is mainly loading on the width and depth of barbs and the overall length of the point. The wider and deeper the barbs the higher a data point is located on the second component axis. The length is mainly loading on the third component.

Fig. 9 shows that the differentiation into different clusters can well be done with regard to the above mentioned attributes: group 1 comprises all artefacts without barbs. Therefore they do not contribute relevantly to the differentiation as all the other attributes under consideration are exclusively focussed on barbed bone points. Group 2 is mainly characterised by wider and deeper barbs whereas the distance

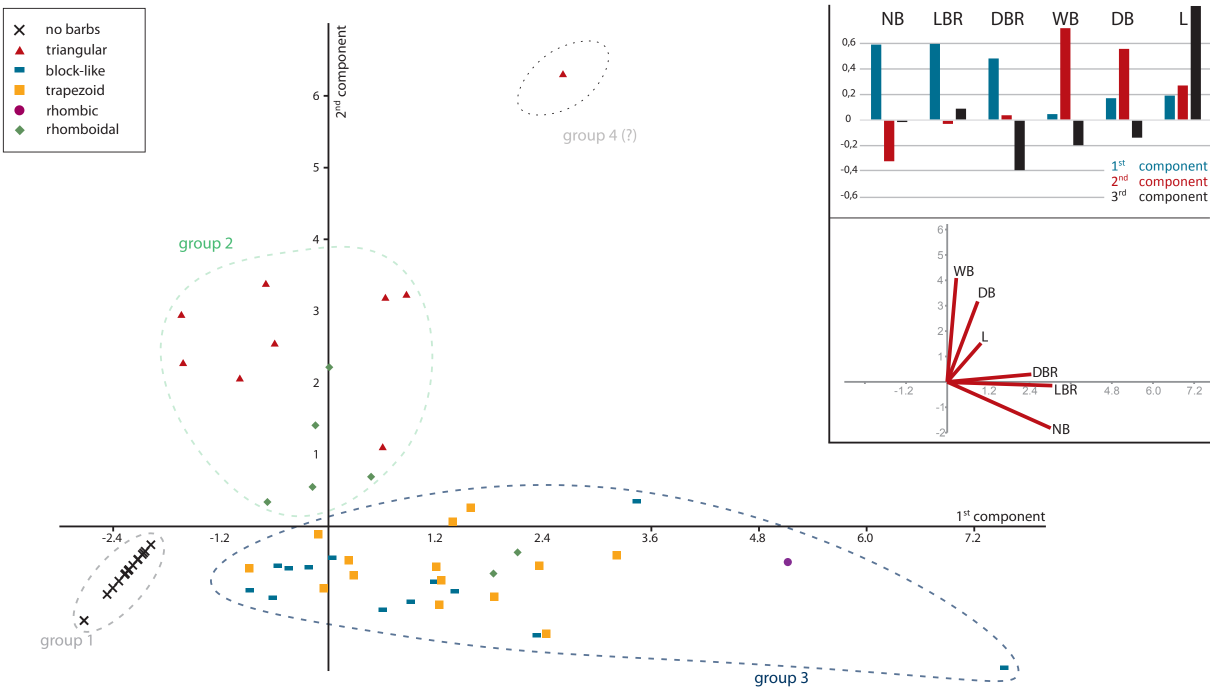

Fig. 9. PCA of all complete bone points. The first and secondary component axis represent 90.3 % of the data scatter.

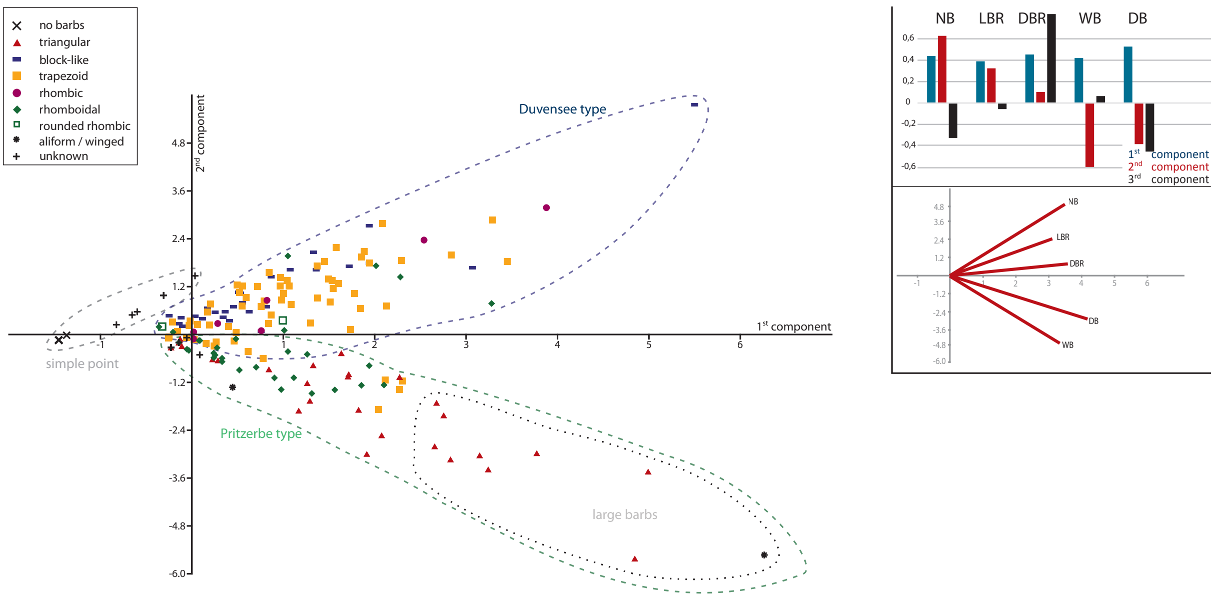

Fig. 10. Discriminant analysis based on the groupings from the PCA (1st principal: 55.01 %, 2nd 29.31 %). The different bone point types were assigned according to Table 1.

from the distal end as well as the length and number of barbs is lower than in group 3. Additionally, group 2 points exclusively have triangular or rhomboidal barbs which is contrasted by mainly trapezoid and block-like barbs in group 3. Group 4 is so far only represented by one specimen thus it is highly questionable if it should be separated from the other clusters at all. However, this is the only complete point made of a rib bone, which might be the reason for a metric difference of this type.

For the typological and formal description of the different groups, the fragmented bone points were classified by using a Discriminant Analysis. As has been shown by the foregoing analysis, the differentiation in different groups was well possible so that the groups of the complete bone points were used as a training dataset for this analysis. Here, the factor 'length' was not regarded as it is highly dependent on the fragmentation. All the broken fragments were initially marked as 'not classified'.

The result of the discriminant analysis is shown in Fig. 10. The high similarity with the PCA-result underlines the suitability of the material and the training dataset for classifying broken or incomplete specimen. Furthermore, this shows metric and typological differences. The calculated clusters can for comparative reasons be ascribed to different bone point types following Schwantes's (1928, 218–219) and Clark's (1936, 116–117) typologies. However, as the analysis shows, several details of their typologies cannot be reliably ruled out based on the analysed material and available data. Further refinements of the typologies were done by Gramsch (1973; 1990; 2009/2010) and Galiński (2013) based on technological and finer morphological differentiation. Also simplifications of the system were suggested by Cziesla (1999b, 490).

Several fragments are difficult to classify because of their fragmentation but overall it becomes clear that trapezoid and block-like barbs are a typical attribute for the Duvensee-type points whereas the Pritzerbe-type points show mainly rhomboidal and triangular barbs. The latter group is furthermore providing higher values for the width and depth of their barbs. The Duvensee type points show rather small values for this attribute but generally longer barb rows and a higher number of barbs.

One subtype can be derived from the scatter of the Pritzerbe-type points which was previously (in the analysis of all complete specimens) considered as a cluster of points made of ribs. This analysis shows that it is mainly reflected by specimens with larger barbs and barb widths, but it is not yet clearly distinguishable whether they form a subgroup of the Pritzerbe-type points or another type group, that would correspond to the Mullerup-type. Until further data is provided, they are therefore considered as belonging to the Pritzerbe-type.

Special attention was paid to two groups of bone points which form minor clusters or linear distributions, respectively. One of these subgroups is located in the Duvensee type cluster and characterised by their rhomboidal barbs. These four specimens show an uncommon barb form, only present in this subgroup. As can be seen in Fig. 11 they span over the scatter and show clearly how the length of the barb-row and their position in the plot are connected: While specimens with a barb-row that covers all of the point's length are spread more to the upper border of the cluster, points with a barb-row that is located more medio-proximally are closer to the first component axis.

The other group is comprised of four points in the Pritzerbe-type cluster. These specimens are characterised by deep and large notches of trapezoid shape that are located in the distal part of the bone point. By visual investigation, this group has to include another point with rather triangular than trapezoid notches which nevertheless obviously follow the same *schème opératoire* (cf. Plate 7; ID 15605). While the outline of these points resembles that of the Duvensee-type ones, the metric analysis places them into the Pritzerbe-type cluster. The most relevant attributes for this assignation are the depth and width of the barbs. From a taxonomic perspective, this group is probably closer to the Duvensee-type than the Pritzerbe-type due to their general shape, number of barbs, their position and form. Since no complete specimen of this type is preserved, it is difficult to gain a formal description for this group. However, according to Schwantes (1928, 211) and Clark (1936, 116–117) the type can be called Dobbertin-type point (Table 1).

Additionally, five points can visually be attributed to Clark's (1936, 116–117) Kunda type (IDs 252 [Plate 2]; 298 [Plate 3]; 13845; 14358 [Plate 6]; 14933 [Plate 7]), however the metric analysis of the Hohen Viecheln finds does not clearly separate them from the Duvensee-type points and they do not cluster comparable to the Dobbertin-type points (Fig. 11). Consequently, they are not considered as another type in this analysis.

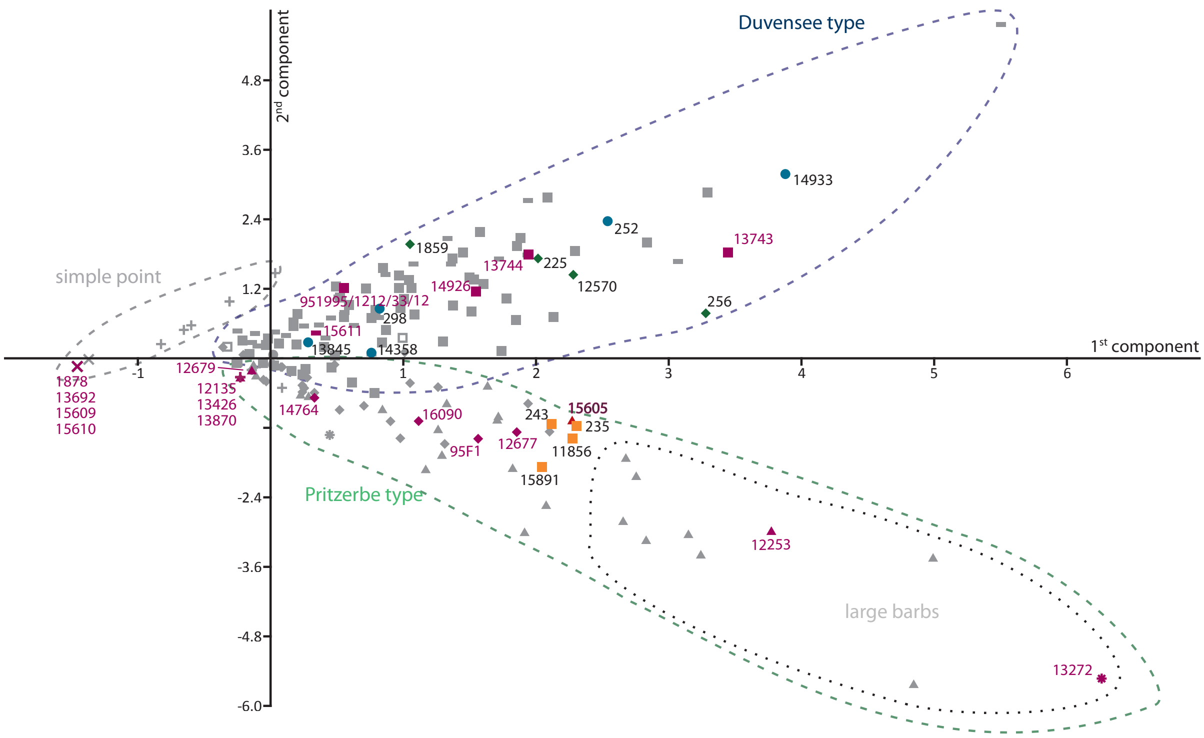

Fig. 11. The same result as in Fig. 10 with special highlighting: pink: all radiocarbon dated bone points. Orange: Dobbertin-type points. Blue: Kunda-type points.

Table 1. Comparison of different type definitions for bone points.

Schwantes 1928	Clark 1936	Gramsch 1973; 1990; 2009/2010	Cziesla 1999b	Galinski 2013	this study
Einfache Knochenspitze	Plain point	Einfache Knochenspitze	Einfache Spitze	Bonin type Międzychód type Nowe Juchy type Gumbinnen type Jaskinia Maszycka type Obrowo type	Simple point
Einseitig fein-gezähnte Spitzen	Duvensee type Istabi type	Spitzen mit flachen Kerben	Typ 2 (Duvensee)	Duvensee type	Duvensee-type
Knochenspitzen mit einseitig ge-kerbtem Rand	Dobbertin type	Spitzen mit tiefen Kerben	Typ 2 (Duvensee)	Dobbertin type	Dobbertin-type
Einseitig fein-gezähnte Spitzen	Kunda type	Spitzen mit tiefen Schrägkerben	Typ 2 (Duvensee)	Kunda type	Duvensee-type
Pritzerber Typ	Mullerup type	Spitzen mit einem kleinen Widerhaken	Typ 8 (Pritzerbe)	Mullerup type	Pritzerbe-type
Pritzerber Typ	Pritzerber type	Spitzen mit mehreren kleinen Widerhaken	Typ 8 (Pritzerbe)	Pritzerbe points	Pritzerbe-type

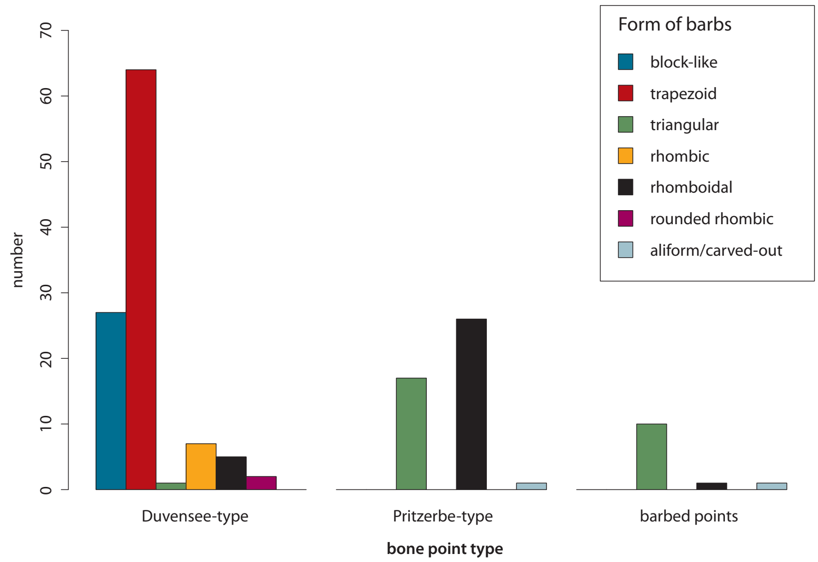

Fig. 12. The bone point types show clearly different types of barbs.

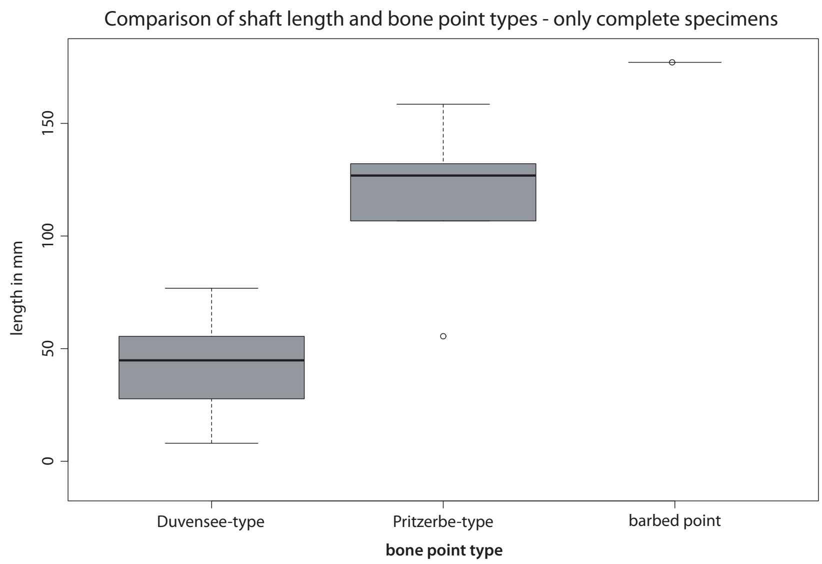

Fig. 13. There is a clear difference between the shaft lengths of Duvensee- and Pritzerbe-type bone points.

Yet, only one complete specimen (Plate 7; ID 14933) and four fragments were analysed and hence the available data from Hohen Viecheln are too few for clear divisions. It is likely that future studies on a supra-regional level will be able to separate this type from the Duvensee-type on a formal basis.

3.1.1.2 Differences between the bone point types

The average number of barbs differs between Duvensee-type points and Pritzerbe-type points in a highly significant way. If only complete specimens are compared it becomes obvious that Duvensee-type points show a lot more barbs ($\bar{x}$= 11.4) than Pritzerbe-type points ($\bar{x}$ = 2.3) (Welch's Two Sample t-test t = 7.0625, df = 30.533, p-value ≤ 0,001). Since no complete specimens are preserved of the other types, it is not possible to see whether they show statistically significant differences.

The barb-form shows distinct differences between the two main types as well (Fisher's test with simulated p-value; X^2 = 171.52, df = 21, p-value < 0.001): The Duvensee-type points show regularly a trapezoid barb form which forms rather notches than barbs. Contrary to this, the Pritzerbe-type points' barbs are shaped in triangular or rhomboidal forms which terminate in a pointy end and thus form distinct barbs (Fig. 12; Table 2; chapter 3.1.1.3).

The length of the shaft can provide information on how the points were hafted. It is calculated by summarising the distance of the barbs from the tip and the length of the barb-row and then subtracting it from the total length of the bone point. By this, the maximum shaft length, i.e. the potential area used for hafting, is estimated. However, this does not mean that the point must have been hafted along the whole length. Generally, the Pritzerbe-type points have distinctively longer shafts then the Duvensee-type points (Welch's two sample t-test = -7.802, df = 31, p-value < 0.001; x : Duvensee: 43.0 mm, Pritzerbe: 117.8 mm; Fig. 13).

Table 2. Barb form differentiated by bone point type.

notch/barb form	Duvensee-type	Dobbertin-type	Pritzerbe-type	barbed point	Σ
block-like	27	0	0	0	27
trapezoid	60	4	0	0	64
triangular	0	1	17	10	28
rhombic	7	0	0	0	7
rhomboidal	5	0	26	1	32
rounded rhombic	2	0	0	0	2
aliform/carved out	0	0	1	1	2
indet.	0	0	1	0	1
Σ	**101**	**5**	**45**	**12**	**163**

When comparing the proximal ends of the points no general tendency could be observed regarding the form or preparation of this part (Fisher's exact test p-value = 0.427; Fig. 14). 60 specimen could be integrated into this analysis but all bone point types showed comparable numbers of different shapes for their proximal end. Worth mentioning is the fact that twelve out of 29 Duvensee-type points have a rectangular end, which is the prevailing form within this group. Furthermore, several bone points seem to have been broken out of the bone after forming a splinter and thus were not extensively worked over (cf. David this volume).

The lengths of the different bone point types differ highly significantly (Kruskal-Wallis chi-squared = 15.503, df = 3, p = 0.001; Fig. 15). Only complete specimens were regarded to obtain a proper sample population. It can clearly be seen that the Duvensee-type points are smaller than the Pritzerbe-type points. The one complete barbed point made of a rib is the largest bone point in the

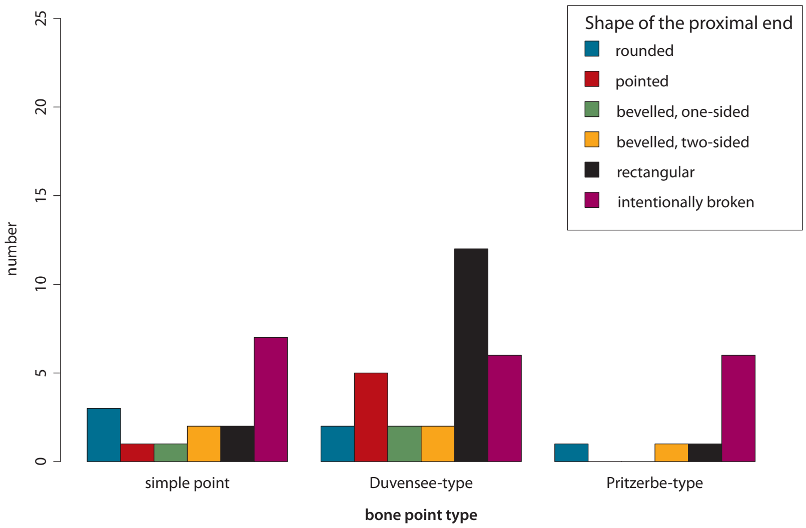

Fig. 14. Clear differences in the shape of the proximal end cannot be determined.

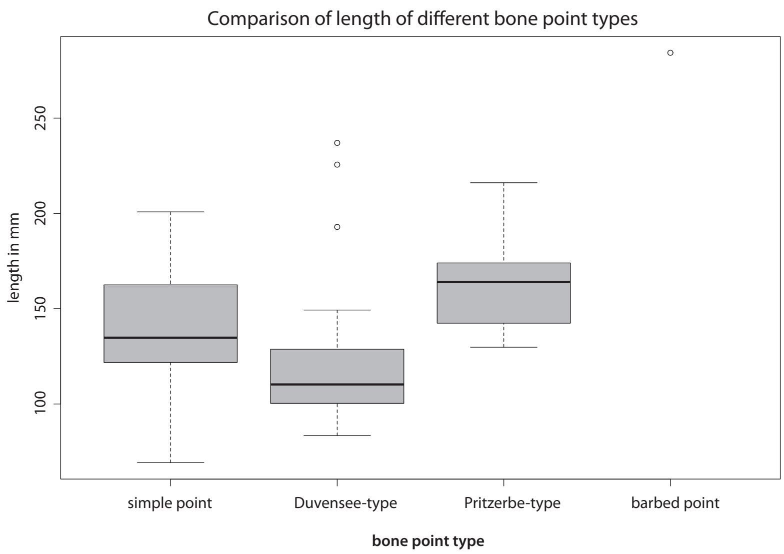

Fig. 15. Lengths of the different bone point types.

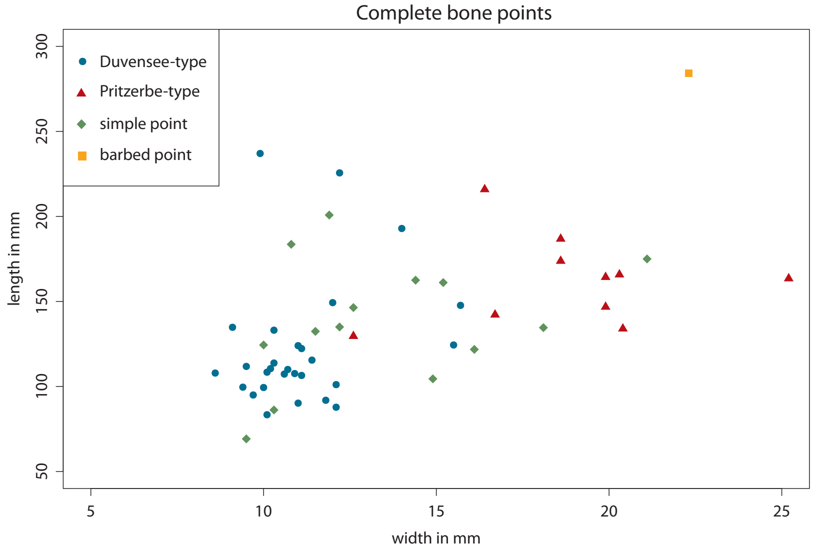

Fig. 16. Scatterplot of the widths and lengths of the different complete bone points.

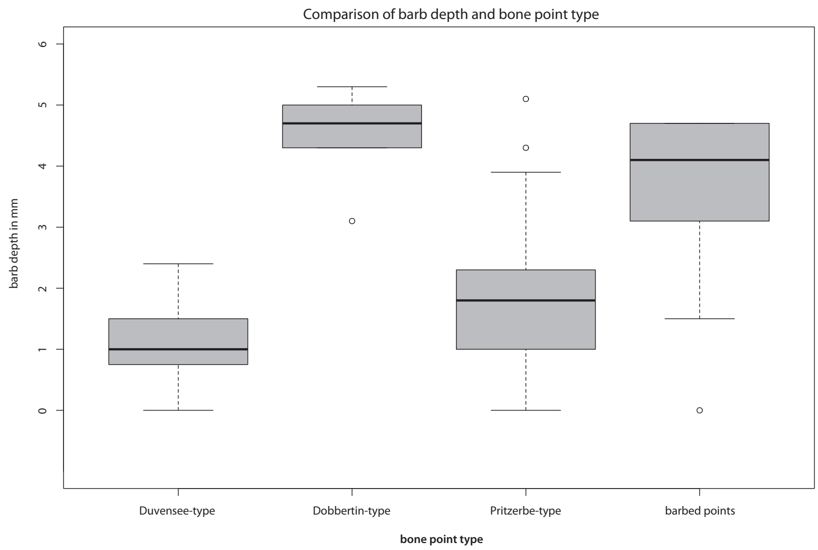

Fig. 17. Differences in barb depths by bone point type.

assemblage (ID 15349; Plate 8). It can be discussed if the three Duvensee-type points which are outliers from the length spectrum represent a longer subtype. Yet no definite conclusions should be drawn as three specimens are quite a low sample number. The simple points' length range covers almost the whole range of the Duvensee and Pritzerbe-type points. Thus it cannot be excluded that some of the bone points might have been pre-forms for the other types.

When integrating the widths of the points, it becomes clear that Duvensee-type points are generally smaller than Pritzerbe-type points which form a clear cluster with only one outlier to the lower and one to the upper width-range of this type. The width difference between both types seems to be a characteristic (Kruskal-Wallis chi-squared = 24.384, df = 2, p-value < 0.001).The simple points scatter without any clear centre (Fig. 16).

The depth of the barbs and notches shows distinct differences between the groups (Kruskal-Wallis chi-squared = 45.274, df = 3, p-value < 0.001; Fig. 17). The notches of the Duvensee-type points provide the lowest value whereas the Dobbertin-type points clearly have the deepest notches. The Pritzerbe-type points provide a wide range of barb depth, and the barbed points show a tendency towards deeper barbs with a median value of more than 4 mm. In this analysis all barbed points made of ribs ("barbed points") are summarised as a group of their own, showing that they differ slightly from the Pritzerbe type points.

3.1.1.3 Formal description of the different types

One of the most representative classification of Mesolithic bone points on morphological grounds has been published by Clark (1936, 116; for a discussion see Verhart 1988, 175–176). His scheme, however, lacks a formal description, which complicates reliably assigning finds and classifying in-between types. Furthermore, the scheme mainly focuses on the barb form and pays less attention to other morphological or metric features. Since the assemblage from Hohen Viecheln grants the opportunity to gain statistically determined differences, the present types will be formally described here.

The bone points can be divided into two main groups: plain points on the one hand and, on the other hand, those which show a lateral modification. The latter can further be differentiated into notched and barbed point types. Barbs and notches are differentiated by their form: barbs are incised into the lateral side of the point, often close to its distal end. They show an outer incision angle (α) > 90°(KF_Schema, type 3-7) so that they create a gap and a spike which function as an element to prevent the point from slipping out of its target. Notches are generally incised with ≤ 90° into the lateral side (see Figs. 18–19, type 1 and 2). The group of the notched points mainly comprises the Duvensee-type and Dobbertin-type points, whereas the Pritzerbe type points are characterised by distinct barbs.

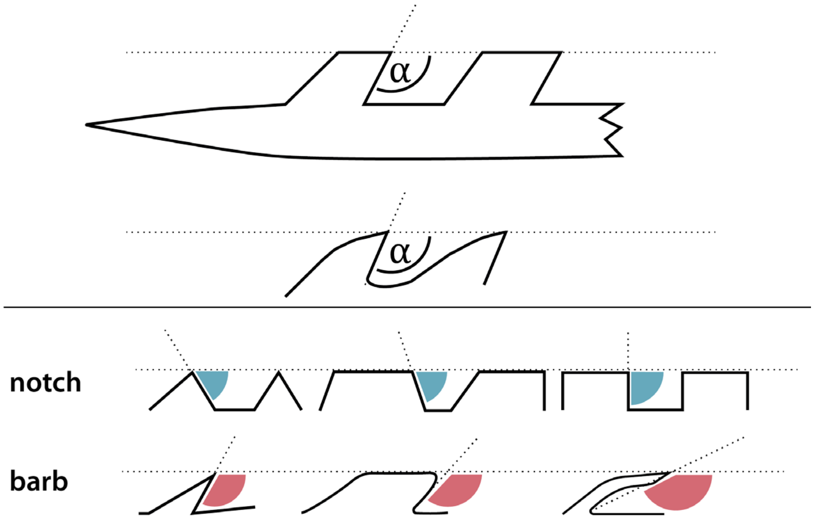

Fig. 19. The outer incision angle (α) describes the angle between the incision and the lateral side of a bone point. Notches are characterised by α ≤ 90° (blue), barbs are formed when α > 90° (red).

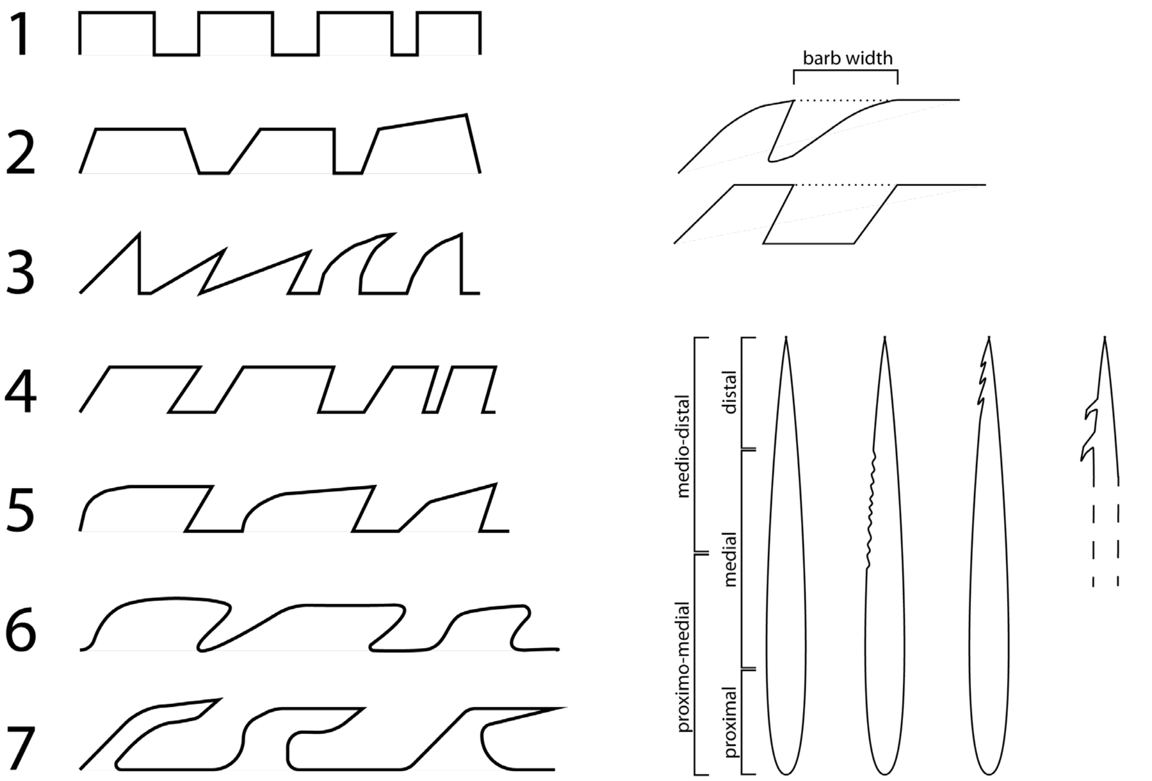

Fig. 18. Different notch and barb form as well as the description of the parts of a bone point. 1: block-like, 2: trapezoid, 3: triangular, 4: rhombic, 5: rhomboidal, 6: rounded rhombic, 7: aliform/carved out.

Table 4. Qualitative and quantitative characteristics of the analysed bone points. * indicates values that are based on small sample sizes and must therefore not be understood as representative.

attribute	**Duvensee-type points**	**Dobbertin-type points**	**Pritzerbe-type points**
number of notches/barbs	3–37 $\bar{x}$ = 9.0	3– >8* $\bar{x}$ = 4.8	1–4 $\bar{x}$= 2.0
prevailing barb form	block-like, rhombic or trapezoid	trapezoid or triangular	triangular or rhomboidal
length of barb row	11.4– ≥ 125.5 $\bar{x}$ = 50.6	indet. (no complete specimen)	24.6–48.4 $\bar{x}$ = 31.7
barb width	0.3–5.5 $\bar{x}$ = 2.0	6.4–8.6 $\bar{x}$= 7.5	1.8–27.7 $\bar{x}$ = 7.6
barb depth	0.2–2.4 $\bar{x}$ = 1.2	3.1–5.3 $\bar{x}$= 4.5	0.4–5.1 $\bar{x}$ = 2
distance of barbs from tip	8.1–76.9 $\bar{x}$ = 29.7	29.3–48.4* $\bar{x}$ = 38.9 (only 2 measurements)	7.8–46 $\bar{x}$ = 21.4

While most of the differing aspects are already presented in the chapters above, a summary will be provided here for the main types (Table 4). The Dobbertin-type is included into the list, even though only five fragments of these points have been found. As a consequence, not all metric values can be provided. Nonetheless, it is obvious that the type is metrically different from the other two.

The Duvensee-type with rhombic or trapezoid barb forms has an average barb width of 2.0 mm and an average barb depth of 1.2 mm. Contrary to this, Dobbertin-type points show much larger values in every parameter. Due to a similar *schème opératoire* both bone point types can probably be connected from a taxonomic point of view.

The formal description of the present types in Hohen Viecheln can be done as follows:

1) simple bone points: The simple bone points in the Hohen Viecheln assemblage are made of sections or splinters that were usually cut from metapodial bones. They are pointed towards their distal end and show different proximal terminations. Generally, there is a large variety in forms and sizes.

2) Duvensee-type points: The Duvensee-type points are characterised by notches or barbs at (usually) one lateral side. The barbs are located in the proximal-medial, medial lateral area or on the complete lateral side. Since no clear difference between bone points with rhombic or rhomboidal barbs (Kunda-type points) and trapezoid or block-like notches could be obtained from the analysis of the Hohen Viecheln finds we understand them for now as subgroups of Duvensee-type points that are not defined further.

3) Dobbertin-type points: The Dobbertin-type point is characterised by triangular or trapezoid notches on one lateral side. These notches are located only on the medial and distal part of the point and have a very pronounced depth and width in comparison with Duvensee-type points.

4) Pritzerbe-type points: The Pritzerbe-type points are characterised by barbs which are located at the distal end of the bone point. The barbs are of triangular or rhomboidal shape and rarely exceed a number of 3. This type seems to include two subgroups: 'Pritzerbe-type with large barbs' are points which are made of ribs not metapodial bones. Since only two specimens of this subgroup are completely preserved, a reliable metric data base for it is lacking. However, they seem to show a tendency towards deeper and wider barbs.

A second subgroup which is not present in the Hohen Viecheln material are Pritzerbe-type points which have barbs on either end. Cziesla (2006) discussed whether these points have to be seen as a sub-type or, likewise Clark (1936, 116–117), as an independent type. Regarding Friesack 4 (e.g. Gramsch 2009/2010, fig. 16.64) where these bone points have been found together with remains of a former hafting it seems more likely that they represent more elaborate, perhaps even multi-use or -purpose tools (cf. Cziesla 2006). Until further evidence is provided, we understand them as a more elaborate form of the 'classic' Pritzerbe-type with only one barbed end.

Fig. 20. Distal parts of unique or rare bone point types from the Hohen Viecheln material (from left to right: IDs 12253; 13272; 1919; 15277; 11677).

5) Other barbed points: Some bone point fragments from Hohen Viecheln are not well-preserved. So their types are either hard to determine or a clear differentiation is not possible due to their low number. Thus they lack a metric analysis even though they often seem to represent other types, based on barb forms or arrangement of barbs. Short descriptions and probable typological assignments are possible though.Two specimens show an aliform barb (IDs 1680 & 13272), and while the first can clearly be assigned to the Pritzerbe-type, the second has to be regarded as a singular type that resembles best Clark's type 9 (Törning type). Some other finds are further noticeable due to their shape, but are even more difficult to assign to a specific type. As can be seen in Fig. 20 all fragments are distal parts of bone points. They show similarities to Pritzerbe-type points because of the triangular shape of their barbs, but their general form seems to be more elongated and more slender. According to Clark's (1936, 116–117) typology most parallels can be drawn to the Gohra-Worle-type (No. 10) or the Sorbehnen-type (No. 11). One of the specimens (ID 11678 [Plate 4]) shows incisions on both lateral sides but it seems as if this might have been a production mistake as the single incision is not fully shaped out as a barb; nonetheless it cannot be ruled out that it might have been a functional feature.

3.1.1.4 Stratigraphic positions of the bone points

145 specimen can be attributed to a specific layer and most of them to a trench (Table 5). All trenches produced at least one specimen, except for trench 6. This can be explained by preservation conditions as this test trench was located on the dryland area. Generally, it becomes evident that the trenches described by Schuldt (1961b, 85–86) with the most finds also provide the best preservation conditions for osseous tools.

Table 5. Different bone point types per trench.

trench	simple point	Duvensee	Dobbertin	Pritzerbe	others	indet.	Σ
1	6	5	-	2	-	-	13
2	24	15	-	6	-	1	46
3	2	2	1	1	-	-	6
4	26	31	1	13	9	2	82
5	14	15	-	11	1	1	42
7	1	-	-	-	-	-	1
8	11	11	-	8	-	2	31
9	12	7	1	7	2	4	33
10	1	-	-	-	-	-	1
12	1	1	1	-	1	-	3
13	1	4	-	2	-	1	8
northern profile	-	-	-	-	1	-	1
surface	3	9	1	2	-	2	16
unknown	4	8	-	9	-	7	28
Σ	**106**	**110**	**5**	**59**	**13**	**20**	**312**

Table 6. Different bone point types per layer.

layer	simple point	Duvensee	Dobbertin	Pritzerbe	others	indet.	Σ	summed layers
surface layers	8	4	0	4	2	1	19	surface // spoil // above upper peat // sand above peat
upper peat	11	9	0	5	3	0	28	above and below upper peat // upper peat // below upper peat
sand	2	10	0	2	0	0	14	sand below peat // below peat/sand
sand/peat	19	9	0	13	1	1	43	sand/peat // peat
lower peat	3	8	0	2	2	0	15	lower peat // below lower peat
gyttja	1	2	1	3	1	1	9	peat/gyttja // gyttja
brushwood layer	1	12	1	1	1	2	18	brushwood layer
Σ	**45**	**54**	**2**	**30**	**10**	**5**	**146**	
indetermined	59	52	3	31	4	15	164	
disturbed	2	0	0	0	0	0	2	
total Σ	**106**	**106**	**5**	**61**	**14**	**20**	**312**	

Due to different names in the original recording, some layers were summarised into groups (cf. Table 6) to enable comparisons with the monograph. Schuldt (1961b, 86–90) proposed that the different bone point types reflect chronological entities represented by the respective layer of origin. Comparing their numbers and ratios (Table 6 and Fig. 21) no clear differences in the vertical distribution of bone point types could be reproduced. Nevertheless – under the precondition that finds from non-attributable layers (i.e. 'sand', see Fig. 21) are not regarded – obvious changes in point type ratios can be seen as a constant increase in simple bone points towards the upper layers (Fisher's exact test: $p < 0.004$ by exclusion of undetermined types). But a proposed change from Duvensee-type points over Pritzerbe-types to rib and other types (cf. Schuldt 1961b, Abb. 1) is not visible even though differences between the layers and ratio of types are present (Fisher's exact test: $p < 0.009$). However, as the layers provide no reliable information as to the ages of the artefacts (see 3.3), these tendencies do not tell anything about the chronological sequence of types.

Table 7. Different skeletal elements used for heavy duty tools.

	made of antler	made of bone	Σ
axe without shaft hole	31	3	34
axe with shaft hole	12	-	12
socketed axe	-	2	2
axe indet.	1	-	1
mattock	-	3	3
chisel	1	4	5
not recorded	10	1	11
Σ	**55**	**13**	**68**

3.2 Other tools

3.2.1 Axes, mattocks and chisels

Another quite numerous tool type in the Hohen Viecheln material are heavy duty tools (Orłowska/Osipowicz 2018). From 54 of such tools, 43 could be analysed and seven specimens were dated. The majority of these artefacts are represented by axe-heads with and without shaft hole. The diameter of the shaft holes ranges from 15.5–35.7 mm with a mean value of 27.0 mm. Three specimens are decorated by engravings (IDs 12137 [Plate 11]; 15606; 2609/3263; see 4.3).

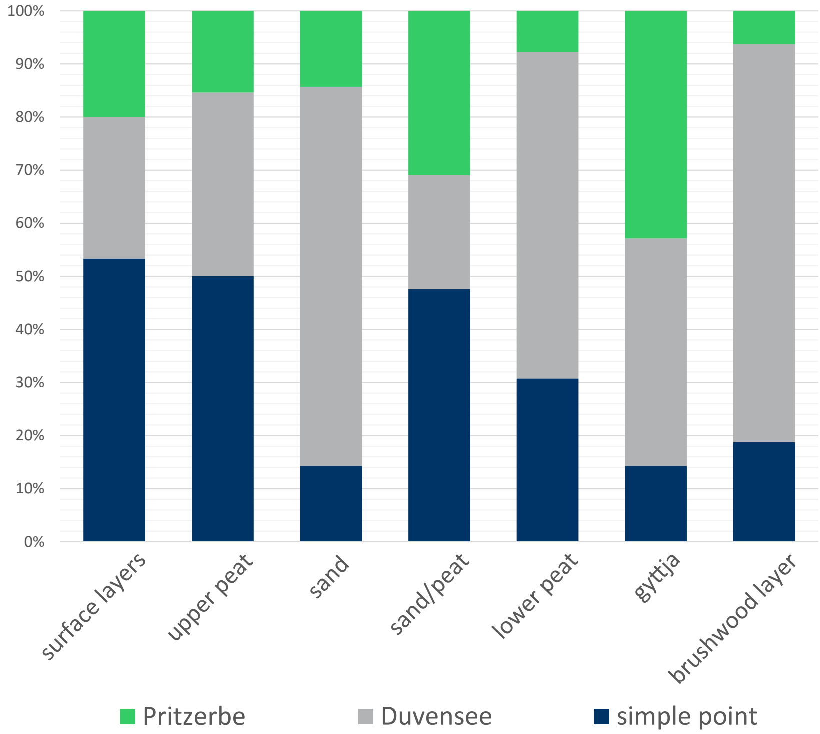

Fig. 21. Main bone point types per layer.

Very typical antler tools from the Hohen Viecheln excavations are axe-heads without shaft holes (Table 7). Schuldt (1961b, 132–134) lists 16 specimens, 13 of which could be analysed. Three artefacts (cf. 3.3.2) classified as common Mesolithic tool types (Pratsch 2011, 84–89) were radiocarbon dated. While the finds from Hohen Viecheln were originally determined as red deer antler (Schuldt 1961b, 132), Pratsch (2001, 33–34; 2011, 80–81) re-analysed the material and reports two of them to be made of elk antler.

3.2.2 Baton de commandement

One of the finds from Hohen Viecheln is interpreted as a Lochstab or *baton de commandement* (ID 1610). The piece has an overall length of c. 40 cm and shows a round perforation at one end. Schuldt (1961b, 136–137) reports that the decoration which is covering the whole piece was filled with dark material, probably birch pitch. Due to its deposition in a rather shallow peat layer close to the ancient shore it is not well-preserved. A broken off piece was sampled for radiocarbon dating but unfortunately did not provide a result due to a too low collagen content. Two other artefacts were recently attributed to this group by B. Gramsch (2018, 23): one of them is a decorated antler socket (ID 12137 [Plate 11]), the other an antler mattock (ID 13843) which has a short line with cross-hatches engraved. As both pieces are only fragmentarily preserved, it cannot be reliably determined if they represent fragments of a *baton de commandement*.

3.2.3 Tool sockets

Several artefacts from Hohen Viecheln are sockets for tools, presumably flint axes. These sockets are made of antler beams which were cut at both ends so that a short and straight piece was obtained. At one end the spongy material was removed and the artefact was perforated for a shaft. In addition to five specimens listed in Schuldt (1961b, 139) two more were identified and one was dated (ID 1914). Four specimens are unperforated and two are sockets with shaft holes. One of them was recovered with a core axe still inserted (Fig. 22). One find from the 1960's excavation could not be re-analysed (ID 3116). The perforated sockets are 112.0 and 116.3 mm in length, respectively, while the unperforated ones range from 51.6 to 192.5 mm. It is probable that all the unperforated sockets represent half-products, as they have untrimmed edges and partly unremoved spongy bone.

Fig. 22. Socketed core axe (ID 15268).

Another artefact is a decorated wild boar tibia (ID 15367; Plate 13) that Płonka (2003, 51–52) interprets as a sleeve for hafting. He suggests that its perforated distal end served for mounting a tool. It is important to notice that the proximal end was perforated as well which transformed the bone to a pipe-like artefact. Yet, it remains unclear whether this artefact really served as a sleeve or socket, especially in comparison to all the other sockets from the site which are exclusively made of antler, or if the artefact might have served a completely different purpose like e.g. a trumpet or an adapter of any kind.

3.2.4 Antler frontlet

Antler frontlets are a type fossil for the Early Mesolithic. While two artefacts have already been assigned to this find category in the monograph about the site (Schuldt 1961b, 130–131), three further finds are discussed (see Wild this volume). Unfortunately, the exact position of most of these extraordinary artefacts is not known which complicates a spatial analysis. But it seems that all of them were found close to the ancient shore. The finds are described in a specific chapter (see Wild this volume).

3.3 Chronology

The chronological analysis is aiming at three different subjects: First, it is to be clarified if the given stratigraphy can be used to differentiate between different occupations at the site. Second, the prevailing organic tool type, the bone points, are analysed from a chronological perspective to estimate how long the different types have been in use. Finally, it is discussed how the Mesolithic occupation in Hohen Viecheln dates.

36 artefacts were sampled as well as the consolidant. Including double-checks 41 samples were submitted in total. Eight samples failed due to low collagen content or gave disputable results. The samples are presented in Table 8. All in all, four simple bone points were sampled as well as five Duvensee-type points, one Dobbertin-type point, eight Pritzerbe-type points, two other barbed points, seven mattocks or axe-heads, the *baton de commandement*, one socket, one antler frontlet, and six bones with working traces or cut marks.

3.3.1 Chronology of the stratigraphy

Already in the monograph by Schuldt (1961a) indications can be found that illustrate how difficult the stratigraphical situation at the site is. Given that the artefacts are associated with the stratigraphical layers correctly, two artefacts demand special interest as they are reported by Schuldt (1961b, 127) to have been found in different layers. The bone mattock (ID 2609) was found in two pieces in trenches 3 and 4. While one piece was recovered from the lower part of the peat layer in trench 4, almost 4 metres further south, the other one was found embedded in the gyttja in trench 3. Another decorated mattock was found in trenches 8 and 9, broken into five pieces. Even though the whole artefact could not be reassembled, it was possible to reconstruct its general form (ID 14760). The fragments were found in the lower part of the peat, the gyttja and sandy layers. This indicates that the stratigraphic association alone is not reliable and that relocation processes are to be expected at the site. To understand the embedding processes and thus the chronological sequences it was therefore necessary to develop a reliable chronological model. Some preconditions applied to our model were:

1. Peat growth starts at the shore and continues successively towards the lake area.

2. A layer which is described in the inventory lists as 'Schwemmschicht' (fluvial layer) is most likely similar to that layer Schuldt described as brushwood layer ('Schwemmholzschicht' = fluvial brushwood layer/brushwood layer). Even though the covering erosion layer is called 'Schwemmsandschicht' (fluvial sand layer) and therefore might also have been meant with the term, two samples from the 'Schwemmschicht' layer date in comparison approximately as old as finds that are reliably attributed to the brushwood layer. Results from the erosion layer (Schwemmsandschicht/fluvial sand layer) are younger, thus the two samples located in the 'Schwemmschicht' can almost certainly be attributed to the brushwood layer.

3. It is possible that the erosion of the cliff on the shore deposited older material above younger sediments, so that an inverted stratigraphy can occur.

4. With respect to the organogenic sediments the obtained ages do not give the point in time when the overgrowing process reached a certain extension. They just show that the process had already happened at that point when the artefact was deposited.

Table 8. List of ^{14}C-datings.

find ID	lab. number	uncal. BP	± 1 σ	cal. BC	NS-coordiantes
1878	RICH-22174	8631	41	7732–7583	6-8
12135	RICH-	failed			7-8,50
12137	KIA-51092 / RICH-22177	failed / 7516	41	outlier	7-8,50
12253	RICH-22668	8445	43	7585–7385	8,50-12
12677	RICH-22645	8728	42	7938–7606	0-6
12679	RICH-	failed			0-6
13272	RICH-22178	8822	45	8204–7745	9,10
13273	RICH-22169	8941	44	8261–7965	0,10
13426	RICH-22641	8906	49	8251–7846	0-3
13692	KIA-51090	9043	42	8306–8218	19-21
13743	RICH-22640	9109	49	8457–8247	22-23
13744	RICH-22637	8740	44	7941–7611	22-23
13828	KIA-51085 / RICH-22171	failed / 10427	52	outlier	24-26
13843	KIA-51093	9349	35	8731–8491	24-26
13858	KIA-50663	2710	30	910–809	19,5
13870	KIA-51288	failed			2,50
14764	RICH-22642	8663	44	7783–7588	0-1
14770	KIA-51088	8850	41	8210–7795	2,50
14926	RICH-22650	9278	44	8629–8345	25
15271	KIA-51091	failed			31-33
15314	RICH-22176	9608	44	9212–8822	31-33
15315	KIA-51094	8748	39	7949–7615	31-3
15324	KIA-51086	9309	51	8712–8349	29,5
15325	RICH-22175	9064	43	8332–8226	29,5
15605	RICH-22643	8303	47	7491–7188	30-31
15609	KIA-51089	8973	46	8285–7970	21,50
15610	KIA-51087 / RICH-22172	9205 / 9055	43 / 44	8441–8278	28,70
15611	RICH-22649	8829	44	8204–7752	21,40
15863	KIA-51074	9518	46	9136–8711	
16090	RICH-22646	9015	43	8301–7996	4,0
1914	RICH-22170	8772	43	8166–7615	6-8
1915	RICH-22173	8630	42	7735–7582	6-8
2609	KIA-51290 / RICH-22644	8728 / 8741	42 / 43	7937–7610	1,80
2610	KIA-51289 / RICH-	failed/failed			
951995/1212/33/12	KIA-51286	failed			
95F1	KIA-51287	8908	42	8244–7954	
unknown	KIA-35740	9180	40	8537–8292	15,3
unknown	KIA-30246	8955	40	8276–7970	

Table 8. Continued

EW-coordinates	trench	layer	artefact type	reference
0-5	4	lower peat	simple bone point	this study
6-10	4/4	brushwood layer	Pritzerbe-type point	this study
6-10	4	brushwood layer	axe-head	this study
6-10	4	lower peat	barbed point	this study
0-2	5	peat	Pritzerbe-type point	this study
0-2	5	peat	Pritzerbe-type point	this study
0,10	4	indet	barbed point	this study
8,50	4	indet	cut marks/work traces	this study
0,00-0,40	4	below peat	Pritzerbe-type point	this study
2-4	8	below upper peat	simple bone point	this study
2-4	8	peat	Duvensee-type point	this study
2-4	8	peat	Duvensee-type point	this study
0-4	8	brushwood layer	mattock/axe-head	this study
0-4	8	brushwood layer	antler-axe	this study
2,8	8	indet	consolidant	this study
1,40	9	indet	Pritzerbe-type point	this study
0,5	9a	peat	Pritzerbe-type point	this study
3,8	8	peat	cut marks/work traces	this study
1	8	peat	Duvensee-type point	this study
0-4	8	gyttja	axe-head	this study
0-4	8	gyttja	cut marks/work traces	this study
0-4	8	gyttja	cut marks/work traces	this study
3,5	8	above gyttja	axe-head	this study
3,5	8	above gyttja	cut marks/work traces	this study
2-3	9c	gyttja	Dobbertin-type point	this study
0,50	8	basal sand	simple bone point	this study
0,70	8	peat	simple bone point	this study
4,30	8	peat	Duvensee-type point	this study
	12	basal sand	antler frontlet	Wild this volume
1,50	13	sand	Pritzerbe-type point	this study
0-5	4	brushwood layer	socket	this study
0-5	4	brushwood layer	axe-head	this study
2,10	3	peat and gyttja	mattock	this study
	3	indet	*baton de commandement*	this study
	1995	indet.	Duvensee-type point	this study
	1995	peat	Pritzerbe-type point	this study
1	2	layer a	bone, wild horse (*Equus ferus*)	Sommer et al. 2011
			bone, pond turtle (*Emys orbicularis*)	Sommer et al. 2007

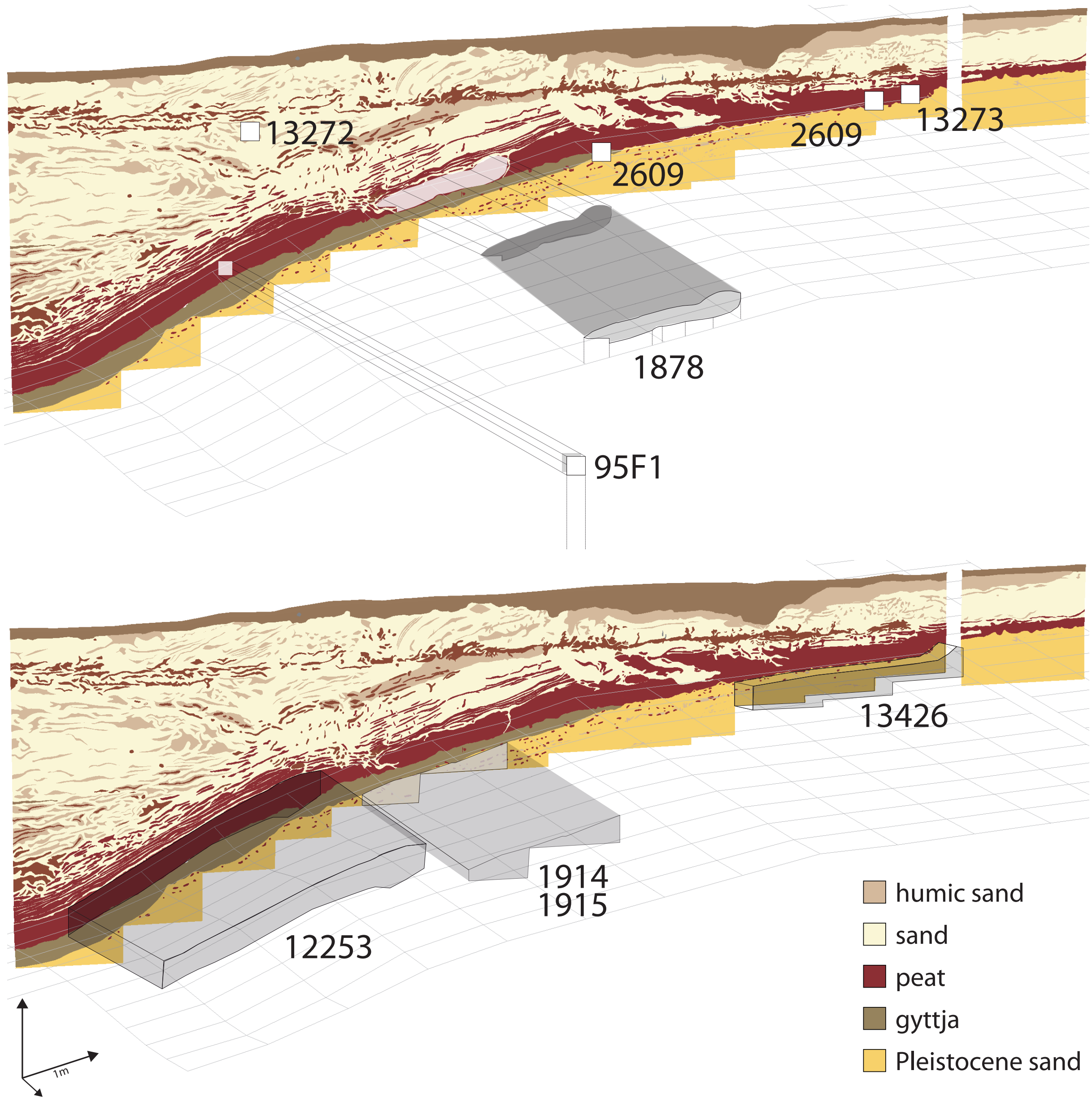

Fig. 23. Areas or location of sampled find IDs projected on the profile of trench 4.

3.3.1.1 The stratigraphic sequence in trench 4

The first indications that the basal sand/brushwood layer was overgrown by peat are present for 8261–7965 cal. BC[2] (ID 13273; RICH-22169) with a sample from the lower peat layer. One sample from the 1995 excavation dates to a comparable age of 8244–7954 cal. BC (ID 95F1; KIA-22641) and shows that the peat was covering some larger area around that time. Around 7938–7606 cal. BC (ID 2609; RICH-22645) the border of the peat is located between metres 1 and 4, as documented by the antler mattock (ID 2609) which was found broken into two pieces. This artefact was deposited in gyttja and peat, whith the latter closer to the ancient shore. Two other samples give slightly younger ages with 7732–7583 cal. BC (ID 1878; RICH-22174) and 7585–7385 cal. BC (ID 12253; RICH-22668). These are located further away

2 All radiocarbon dates are given with a standard deviation of 2 σ.

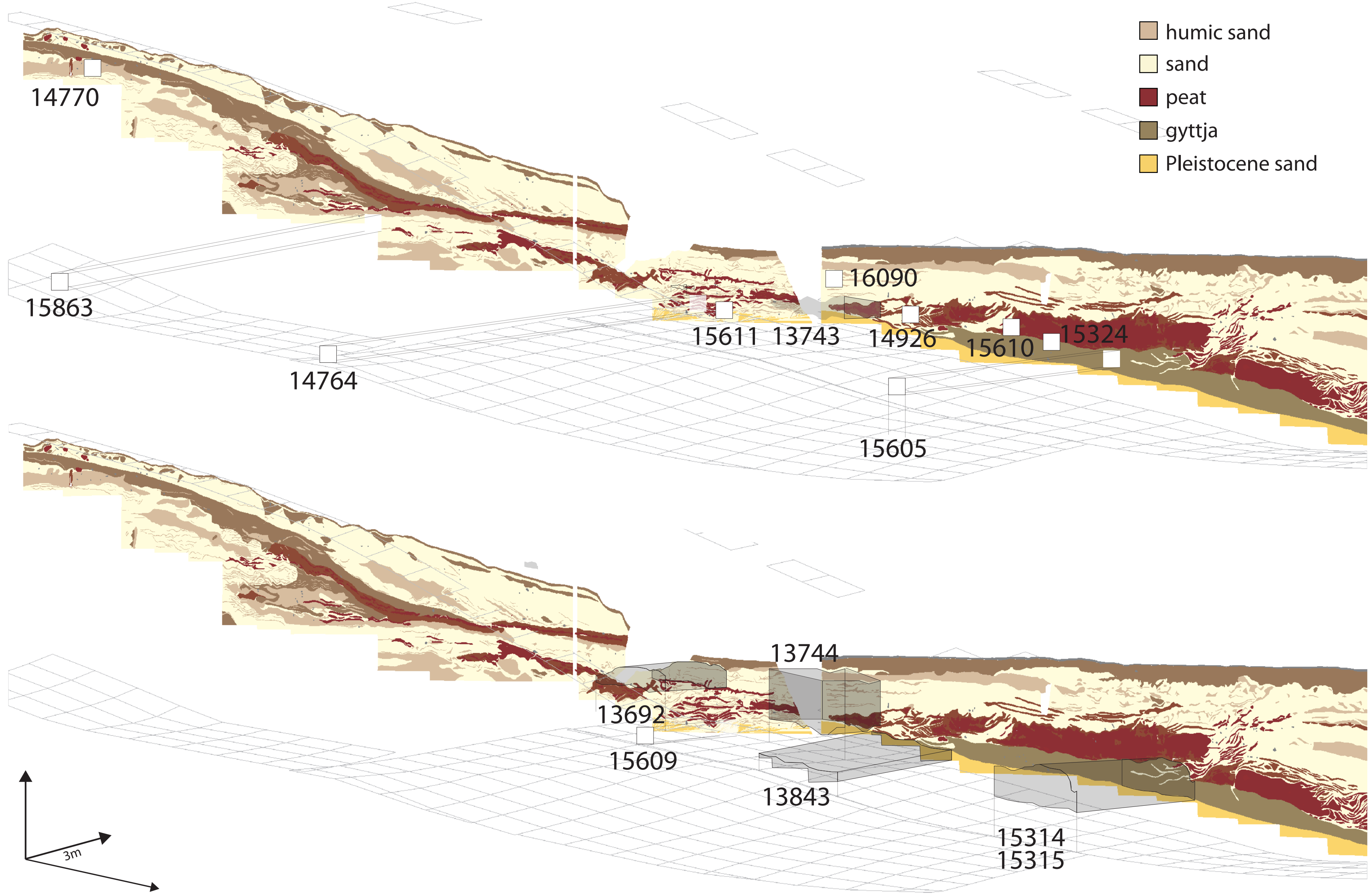

Fig. 24. Areas or location of sampled find IDs projected on the profile of trench 8.

from the shore the younger they are. Remarkably, two samples from the brushwood layer underneath the peat gave almost similar ages with 8166–7615 cal. BC (ID 1914; RICH-22170) and 7735–7582 cal. BC (ID 1915; RICH-22173) showing that the overgrowing might have happened rather quickly. The process follows the reconstructed palaeo-surface quite well, indicating a natural succession.

After the peat had been deposited some erosion took place which relocated material from the cliff at the shore and deposited it on top of it. This is demonstrated in the profile drawing by sand layers on top of peat, while intersected peaty bands might indicate several shorter overgrowing phases (Fig. 23). Sample ID 13272 with an age of 8204–7745 cal. BC (RICH-22178) is an indicator for this, as it must have been re-deposited so that it was found between the lower peat and the upper peat layer. This also indicates that the upper peat must have been deposited after this erosional event.

3.3.1.2 The stratigraphic sequence in trenches 8, 9, and 13

The basal sand/brushwood layer in the trenches under discussion here is dated by an antler frontlet (see Wild this volume) from trench 13. This artefact was found in the northern area of the site and gave an age of 9136–8711 cal. BC (ID 15863; KIA-51074), therefore indicating that the peat growth had not progressed so far into the lake at that point in time. A more detailed picture can be drawn in trenches 8 and 9 where most of the samples come from. Around metre 21.5 of trench 8 two samples show ages of 8285–7970 cal. BC (ID 15609; KIA-51089) and 8204–7752 cal. BC (ID 15611; RICH-22649) and have been found in the basal sand/brushwood layer and in a re-located peat within the brushwood layer, respectively. Anyway, this shows that the deposition of both samples must have happened before the lower peat layer was formed. Another sample which comes from a position between 3–5 m more southwards is dated to 8731–8461 cal. BC (ID 13843; KIA-51093). But since this sample comes from the 'Schwemmschicht' its position is not entirely certain, but likely to be within the basal sand. However, a small probability remains that it is some eroded material found in the overlying sand layer ('Schwemmsandschicht').

The lower peat layer was formed around 7783–7588 cal. BC (ID 14764; RICH-22642) as an incorporated artefact in trench 9 shows. Two other samples next to that one produced older ages with 8457–8247 cal. BC (ID 13743; RICH-22640) and 7941–7611 cal. BC (ID 13744; RICH-22637) but their stratigraphic positions are unclear because they are described as belonging to the lower peat and/or the erosional sand layer. Still, they were found below the upper peat layer so that it is possible that these artefacts had been re-deposited by erosion before the upper peat was formed. It is furthermore very likely that the older sample was not found *in situ* due to the younger dates below the lower peat layer mentioned above. A simple bone point found – according to the inventory list – in the peat layer was probably re-deposited as well, since this artefact must have been found above or on top of the lower peat when comparing its recorded vertical position to the profile drawing. This artefact was dated to 8441–8278 cal. BC (ID 15610; RICH-22172; KIA-51087) which makes it an outlier anyway.

A sample from below the peat and thus from the upper part of the gyttja is dated to 8712–8349 cal. BC (ID 15324; KIA-51086). Other samples from this layer date to 9212–8822 cal. BC (ID 15314; RICH-22176), 7949–7615 cal. BC (ID 15315; KIA-51094), and 7491–7188 cal. BC (ID 15605; RICH-22643) showing a long deposition phase or intrusions of younger materials. This also indicates that the southern area in trench 9 and probably 8 had not yet been overgrown by peat around 7200 cal. BC.

Two samples found between the lower and the upper peat layer have ages of 8306–8218 cal. BC (ID 13692; KIA_51090) and 8301–7996 cal. BC (ID 16090; RICH-22646) and represent most likely re-deposited artefacts. In connection with the dates from the lower peat layer these finds indicate that the erosion in this area happened after or around c. 8600 cal. BC. Furthermore, all the potentially eroded artefacts date around 9100 cal. BC and thus indicate the re-location of material from an older occupation phase.

While the stratigraphical sequence in the western trenches is quite easily explained, the eastern trenches show a more complex depositional history. On the basis of the obtained radiocarbon samples and the stratigraphical analysis the following processes can be reconstructed:

The artefacts in the basal sand show two deposition phases. The first one is placed between 9136–8711 cal. BC (ID 15863; KIA-51074) and 8731–8491 cal. BC (ID 13843; KIA-51093). The second phase is probably connected to erosion processes because in this phase some disturbances and a re-deposition of peat are recorded; it dates between 8285–7970 cal. BC (ID 5609; KIA-51089) and 8204–7752 cal. BC (ID 15611; RICH-22649). These dates also fall in between the ages obtained for the covering erosion layer: 8306–8218 cal. BC (ID 13692; KIA-51090) to 7941–7611 cal. BC (ID 13744; RICH-22637). Therefore, erosion is recorded in this trench for the time after 8600 cal. BC but before the formation of the upper peat band.

The artefacts from the basal sand date between 9136–8711 cal. BC (ID 15863, KIA-51074) and 8204–7752 cal. BC (ID 15611; RICH-22649). Since the obtained samples provide a rather long timespan for this as well as for the gyttja layer it is difficult to pinpoint the formation of the different layers. The artefacts from the lower peat provide a *terminus ante quem* for its formation of 9088–8395 cal. BC and a duration of this process until 7823–7113 cal. BC. The samples from the eroded material date between 8306–8218 and 8166–6552 cal. BC and hence predate the erosion.

3.3.2 Chronology of the bone tools

To gain information on the duration of the use of different bone tools several samples were dated directly. The chronological analysis of the bone points will be analysed first, in the later part of this chapter the other sampled tools will be discussed. Regarding the chronological timespan of the different bone artefact types it has to be kept in mind that the dates presented in this chapter only represent the ages of the specimens. This is especially relevant when conclusions are made about the time spans certain types were in use for because this is not inherent to the ages presented here. The samples rather give indications when these types were prevailing, not when they were not in use.

3.3.2.1 Bone points

The Duvensee-type points gave the oldest age for the bone points, with a sample dating to 8692–8345 cal. BC (ID 14926; RICH-22650). The youngest sample was dated to 7941–7611 cal. BC (ID 13744; RICH-22637). Therefore this type was present in Hohen Viecheln during most parts of the Boreal. The presence of the simple bone points is dated to start a bit later but generally shows a comparable duration. The dates of this type spread between 8441–8278 cal. BC (ID 15610; KIA-51087 & RICH-22172) and 7732–7583 cal. BC (ID 1878; RICH-22174).

As far as the samples from Hohen Viecheln are concerned, the Pritzerbe-type points seem to have been in use in a distinct and shorter period (Fig. 25). Their ages range between 8301–7996 cal. BC (ID 16090; RICH-22646) and 7783–7588 cal. BC (ID 14764; RICH-22642) and therefore might show that this type became common slightly later. But the youngest samples are still contemporaneous with most other types. The other point types were not so numerously sampled, hence indications for the time spans of their use are not possible. Nonetheless, it is striking that the sampled Dobbertin-type point clearly gave a younger age with 7491–7188 cal. BC (ID 15605; RICH-22643) than the Pritzerbe- or Duvensee-type and simple bone points.

With respect to the overall chronology, already Cziesla (1999b, 492–493) suggested that the Duvensee-type points date to the Preboreal and older Boreal while the Pritzerbe-type points seem to date to the younger Boreal, but both types occurred contemporaneously in the Late Preboreal/Early Boreal – at least in Hohen Viecheln.

Table 9. Bone point numbers from Friesack 4 (after Gramsch 1990; 2009/2010).

occupation layer	**simple points**	**Duvensee-type points**	**Pritzerbe-type points**	**Dobbertin-type points**	**no clear attribution**	**indet.**	**Σ**
1 Late Preboreal	15 (16.3 %)	50 (54.3 %)	0 (0 %)	1 (1.1 %)	1 (1.1 %)	25 (27.2 %)	92
2 Late Preboreal/Early Boreal	9 (10.0 %)	24 (30.0 %)	15 (18.8 %)	2 (2.5 %)	4 (5.0 %)	26 (32.5 %)	80
3 Early Boreal	17 (15.2 %)	7 (6.3 %)	38 (33.9 %)	0 (0 %)	9 (8.0 %)	41 (36.6 %)	112
4 Late Boreal/Early Atlantic	69 (64.5 %)	4 (3.7 %)	3 (2.8 %)	0 (0 %)	1 (0.9 %)	30 (28.0 %)	107

Relevant for the typo-chronology of bone points in northeastern Germany were the excavations at Friesack 4 where large amounts of bone points and fragments (n = 391) were found (Gramsch 1999; 2009/2010). Even though Gramsch uses a different classification system that concentrates on the barb form, it is possible to compare the points due to their thoroughly published drawings (Table 9).

The ratio of Duvensee-type and Pritzerbe-type points shifts from a predominance of the first type in the Preboreal to a prevailing of the latter type during the Boreal. Due to the difficulties connected to the stratigraphy at Hohen Viecheln it is not possible to assign undated points to a chronozone, but our results suggest a chronological placement of Pritzerbe-type points in the Middle to Late Boreal as well (Fig. 25). This fits with the ages published for two finds from Bützsee (Czielsa/Pettit 2003, 26) and underlines the rather narrow timespan this type seems to have been in use for. Contrary to our results, the (re-classified) Dobbertin-type points from Friesack are indicated to be older than the sample from Hohen Viecheln. Anyway, the available number of dated artefacts of this type is far too small to draw definite conclusions about the period of their duration yet. For the Duvensee-type on the other hand plenty of data are available. Though their number decreases in the younger layers in Friesack, they are documented from the Middle Preboreal to the Late Boreal/Early Atlantic and therefore provide an even longer timespan than estimated from the Hohen Viecheln samples. Yet another age for this point type was derived from a stray find from Bützsee (Cziesla/Pettit 2003, 23–26) that dates to 10,068–9826 cal. BC (10,185 ± 65 uncal. BP; OxA-8743) and thus indicates that this type was in use even before the Mesolithic.

3.3.2.2 Other tools and artefacts

Three antler axes were dated and indicate two different settlement phases. Two specimens have ages between 8731–8491 cal. BC (ID 13843; KIA-51093) and 8712–8349 cal. BC (ID 15324; KIA-51086). The third artefact was dated to 7735–7582 cal. BC (ID 1915; RICH-22173) and could be contemporaneous to a mattock (ID 2609) and a socket made of an antler beam (ID 1914; RICH-22170) which date to 7937–7610 cal. BC (KIA-51290 & RICH-22644) and 8166–7615 cal. BC, respectively. The axes and mattocks with shaft holes are usually assigned to the Early Mesolithic but show quite a long range of use when directly dated (Crombé et al. 1999; Dellbrügge 2002, 69–71; Gross/Lübke 2019).

Most of the bones with working traces fall into the same phase that is mainly reflected by the various bone points. Surprisingly one find, a detached epiphysis, which probably represents debitage from bone point production, dates significantly older than most of the other artefacts, with an age of 9212–8822 cal. BC (ID 15314; RICH-22176). This artefact is one of only two samples which date to the Preboreal. The other one is the antler frontlet (ID 15863; KIA-51094) with an age of 9136–8711 cal. BC (see Wild this volume).

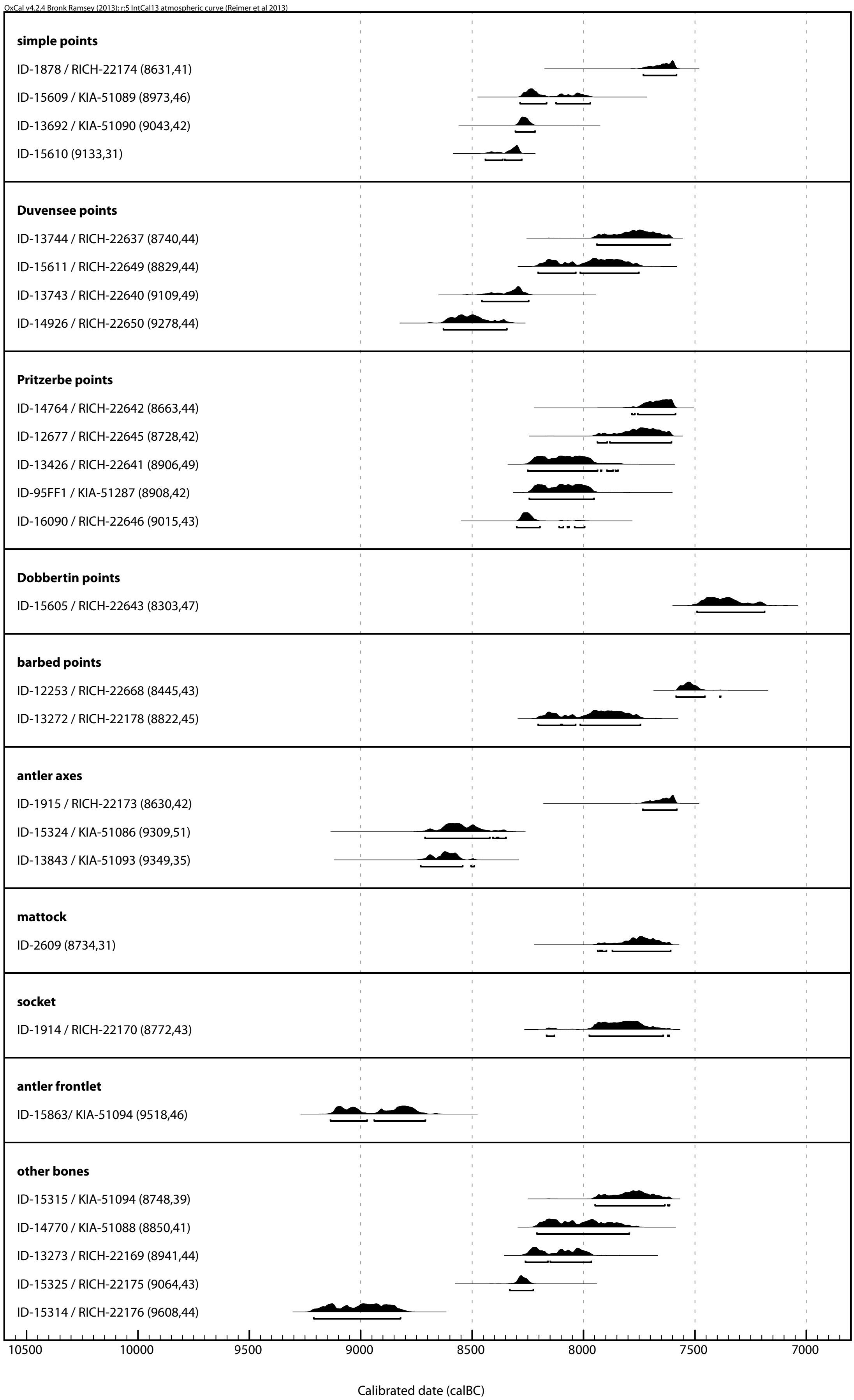

Fig. 25. Calibration diagram of all dated tools from Hohen Viecheln.

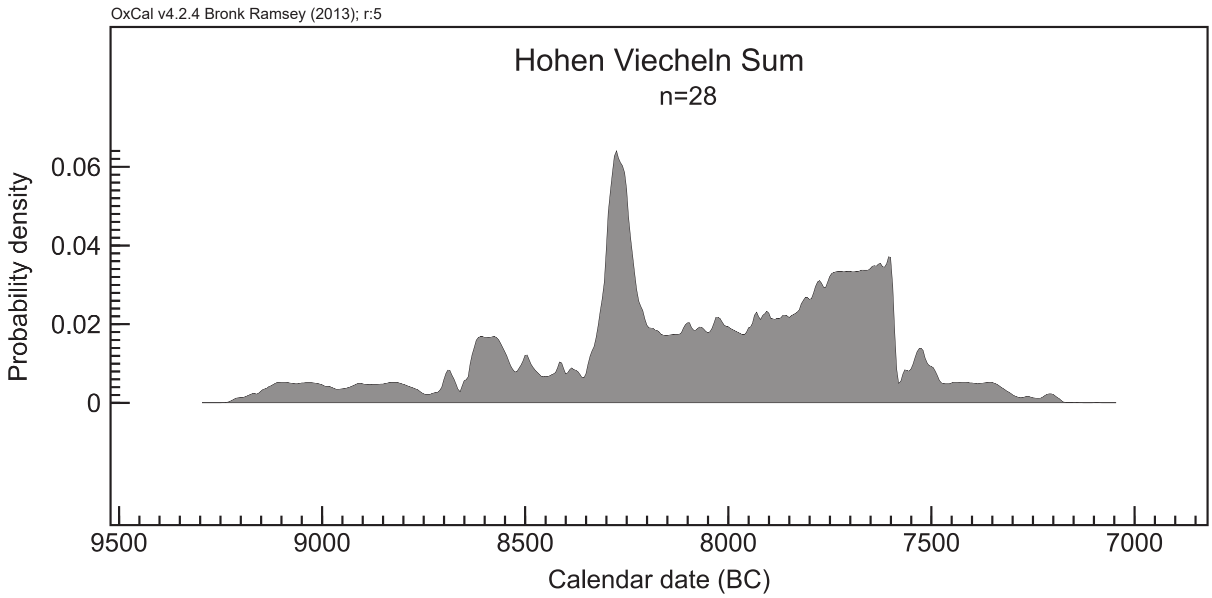

Fig. 26. Sum calibration of all radiocarbon samples from Hohen Viecheln.

3.3.3 Chronology of the occupation

Most of the artefacts are dated between 8332–8226 and 7735–7582 cal. BC and thus in accordance to classic typology. Therefore it can reliably be concluded that a relevant period of occupation at Hohen Viecheln dates to the Boreal (Fig. 26). Quite likely, this phase does represent the main or most extensive occupation even though the number of obtained samples is not necessarily reflecting the settlement intensity. However, through our sampling strategy, it can be assumed that we chose a representative selection of the artefacts so that the general tendency is given. A younger, Late Boreal phase is indicated by the sample of a Dobbertin-type point and possibly one of the barbed points (ID 12253), but it remains unclear if both samples belong to the same occupation phase. While these specimens post-date the bulk of the radiocarbon samples, some artefacts date slightly older and thus hint to another, prior occupation of the bay. Two antler axes and a Duvensee-type point date to the Preboreal/Boreal transition and are therefore older than most of the samples. The oldest activity phase in Hohen Viecheln dates to the Late Preboreal, shortly after the Preboreal Oscillation. The dated antler frontlet is among the artefacts from this phase and can be considered contemporaneous to other finds of this kind from Northern Europe (e.g. Elliot et al. 2018; Wild this volume). It might therefore indicate the initial Early Holocene Mesolithic and moreover a distinct techno-complex or archaeo-cultural unit.

Fig. 27. Ahrensburgian point(?).

Several finds have to be attributed to a younger occupation represented by ceramic fragments and polished flint axes from the Early and Middle Neolithic. A ceramic rim fragment is from trench 4 from 25 cm below surface and therefore still above the upper peat layer. The other ceramics are from trench 5 from the sand layer. The Neolithic finds are stratigraphically distinguishable from the older finds (Schuldt 1961b, 78). Another artefact might be a semi-finished Late Palaeolithic Ahrensburgian tanged point (Fig. 27) from re-deposited material that is probably connected to the building of the Wallensteingraben.

4 Regional and supra-regional contacts

The analysis of contacts in prehistory is the more difficult the more detailed it is supposed to be. While general trends are easily traceable on a broad chronological perspective, it becomes more difficult when contacts and exchange are supposed to be retraced on an individual basis. Due to the character of archaeological samples, as just an excerpt of real life and the complete existing tool set, it becomes hardly possible to trace contacts between single sites or individuals. Refittings of artefacts can give detailed insights into transport or contacts, but they also demand time consuming analyses and the prerequisite that relevant parts of the same artefact are discovered. In this chapter probable contacts of the people settling in Hohen Viecheln are analysed from a typological point of view which enables a more general and archaeo-cultural analysis. From this perspective the site is assigned to a techno-complex, and more detailed perspectives will render it possible to assign the site to a more regional subgroup.

4.1 Typology

Several finds from Hohen Viecheln show similarities to other sites and regions. Generally, the site can be integrated into the Maglemose techno-complex (Sørensen et al. 2018). Furthermore the bone points, the mattocks and antler axes from Hohen Viecheln find good parallels at Danish and northern German sites that are attributed to this techno-complex (e.g. Clark 1936, Fig. 40). Relevant for comparison are in this respect Friesack 4 (Gramsch 2011; 2018), the sites at ancient Lake Duvensee (Gross et al. 2018; Hartz et al. this volume), and sites from the Danish Maglemosen, Køng Sværdborg bog and Åmosen (e.g. Andersen 1982; Brøndsted 1960, 59–103; Henriksen 1980; Sarauw 1911). Further comparable finds are known from the Netherlands and the North Sea where similar finds of socketed axes were made (Louwe Kooijmans 1970, 36–49; Verhart 1995, 296–298) such as axe sockets with a shaft hole like the one found in Hohen Viecheln (ID 15268). At the site Bad Dürrenberg, Germany, such a socket was found in the grave of a female dating to the Late Mesolithic (Geupel 1980, 109). But similar finds were also presented by Zagorska (1980, 77) from the Early Holocene site Zvejnieki II, Latvia, and Henriksen (1980, fig. 61:1) from Lundby II, Denmark, showing thereby that such sockets were widely common throughout the Mesolithic. The same is true for antler axe blades without shaft holes which are found from Denmark (e.g. Broholm et al. 1924, 59) to Latvia (Loze 1980, Abb. 2). Since these date from the Mesolithic to the Neolithic their chronological information is rather limited as well. The same is true for socketed axes, as an example from Hardinxveld, Netherlands, shows. These tools were still in use during the Late Mesolithic and therefore cannot be seen as chronological markers for Early Mesolithic assemblages (Louwe Kooijmans 2003, Fig. 77.15). However, recently it has been demonstrated for southeastern Schleswig-Holstein, Germany, that the blade orientation can be used as a chronological marker for burr axes (Gross/Lübke 2019).

Already indicated by the osseous mattocks and axes, the cultural context is further illustrated by the different bone point types from Hohen Viecheln. A first summary of their distribution is given by Clark (1936, fig. 47), which was later regionally refined (e.g. Cziesla 1999b; 2006; Gramsch 1973, Karte 4; Verhart 1990). A discussion of the distributions, mainly of the Duvensee- and Pritzerbe-type, is done by Cziesla (1999b; 2004, 176). As his analysis shows, the Pritzerbe-type points might represent a rather delimited distribution, which is interpreted as a 'social territory-marker' (Cziesla 2006).

One bone point fragment found in Hohen Viecheln (ID 13272) resembles large-barbed harpoons but cannot be reliably classified as a harpoon due to its missing proximal end. Though scarce in Germany, such harpoons are a well-represented type in Denmark (e.g. Brøndsted 1960, 52–54). The Hohen Viecheln specimen is made of the lateral side of a metapodial bone and thus was not produced in the more common method by shaping it from the back (volar/plantar) side. A comparable artefact was found in

Simmerbølle on Langeland (Andersen/Petersen 2005, 10; 24). Though it is just a single find, it hints at connections to Zealand (cf. Andersen/Petersen 2005, 8). This is underlined by a barbed point from Lundby 1, Zealand (Henriksen 1980, fig. 21:456) that is very similar to another find from Hohen Viecheln (ID 12253). It is worth mentioning that this artefact might as well be parallelised with a bone point from Bergkamen-Oberaden which is dated to 10,095–11,105 cal. BC (11,107 ± 42 BP; MAMS 11813; Baales et al. 2013, 25–26) and therefore indicates a long prevalence of this type. Furthermore, specimens comparable to the Pritzerbe-type points from Lundby 1 show no or just a slight reworking of the proximal end of the artefact, just like in Hohen Viecheln (Henriksen 1980, 39–40).

Different construction works and renaturations in the Europoort harbour in Rotterdam provided the most extensive bone point assemblages for the Netherlands (see Amkreutz/Spithoven this volume). Even though the axes, sockets and sleeves show some similarities with the material from Hohen Viecheln (cf. Louwe Kooijmans 1970), the bone points – the number of which exceeds 750 specimens from the wider area (Spithoven 2016, tab. 1) – show specific differences to those found in Hohen Viecheln, or more broadly, the core area of the Maglemose techno-complex. Thus it becomes obvious that tools which are subject to several limitations, like the diameter of antler beams, feature a very uniform shape in a regional and diachronic sense. Other tools which allow a larger variety due to smaller end products and/or more possibilities for their outer form, are more useful for differentiations of regional distributions. Apart from the outer form, i.e. the typology, especially the methods of production, i.e. technology, help to culturally assign the assemblage.

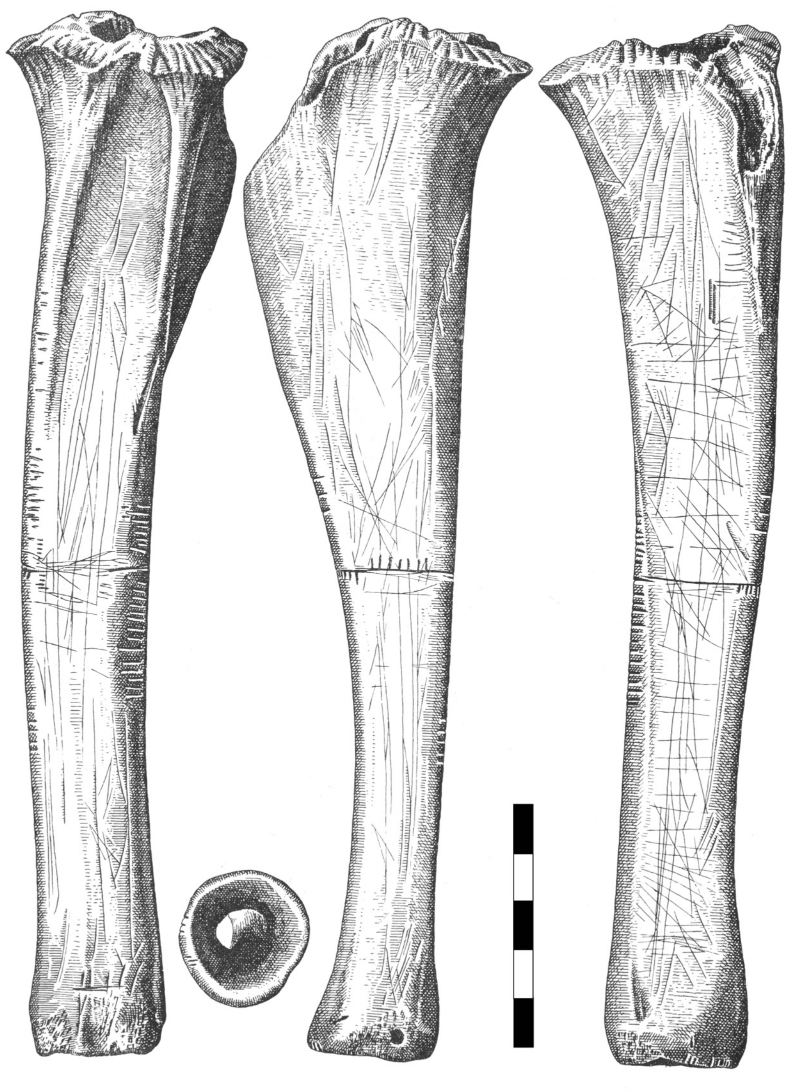

Fig. 28. Decorated wild boar tibia (ID 15367; after Schuldt 1961a, Taf. 55).

4.2 Technology

David (2006, 96–97; 2007; this volume) analysed the *chaîne opératoire* for bone artefacts from several Early Mesolithic sites from southern Scandinavia and continental Europe. For the borders of the modern North Sea area she defined a 'Northern techno-complex' which she described as 'Early Maglemose territory'. Hohen Viecheln is included in the southern part of this area. Consequently, not only the typological analysis integrates Hohen Viecheln into the Maglemosian techno-complex but technological hints are given as well.

Nonetheless, specific differences can be ruled out when Hohen Viecheln is compared with more eastern sites like Friesack. Being part of the same techno-complex the general technology for producing bone and antler tools at these sites is comparable, but specific differences are obvious as well. Especially in the manufacturing of the Pritzerbe-type points there is a striking difference between both sites. In Friesack the proximal end was usually completely worked and polished while the points from Hohen Viecheln show no or just a rough reworking of this part resulting in parts of the epiphysis being usually still preserved. This more 'rough' manufacturing practise is also seen at finds from Dummersdorf near Rostock (Gramsch 1973, fig. 20.1) or Lundby (e.g. Henriksen 1980, fig. 22). This points to another similarity between Zealand and Hohen Viecheln as well as a local manufacturing trait.

4.3 Decorated pieces

Other indications for connection between Hohen Viecheln and other regions can be deducted from decorated pieces. Widespread analyses of Mesolithic decoration patterns were done by Nash (1998) and Płonka (2003) who tried to rule out general characteristics and differences of decorations and imbedded representations of social aspects. Still, it has to be noticed that decorations are potentially bearing personal or ethno-cultural meanings and thus could reflect underlying traits and associations as well as no specific meaning at all (cf. Płonka 2003, 146–147). Hence, deducting contacts from ornamentation alone is just as questionable as it is for every other aspect of prehistoric life. Due to the fact that decorated artefacts from the Early Holocene are generally rare and show a great variability, it is insufficient to compare the patterns and draw conclusions, especially when trying to fathom meanings of the applied patterns (Gramsch 1973, 78; Jestrzemski 1987, 59–69). Thus it is inappropriate to interpret the decoration of those artefacts like decorated pottery from younger epochs, for instance, which is available in abundance and providing standardised decorating patterns.

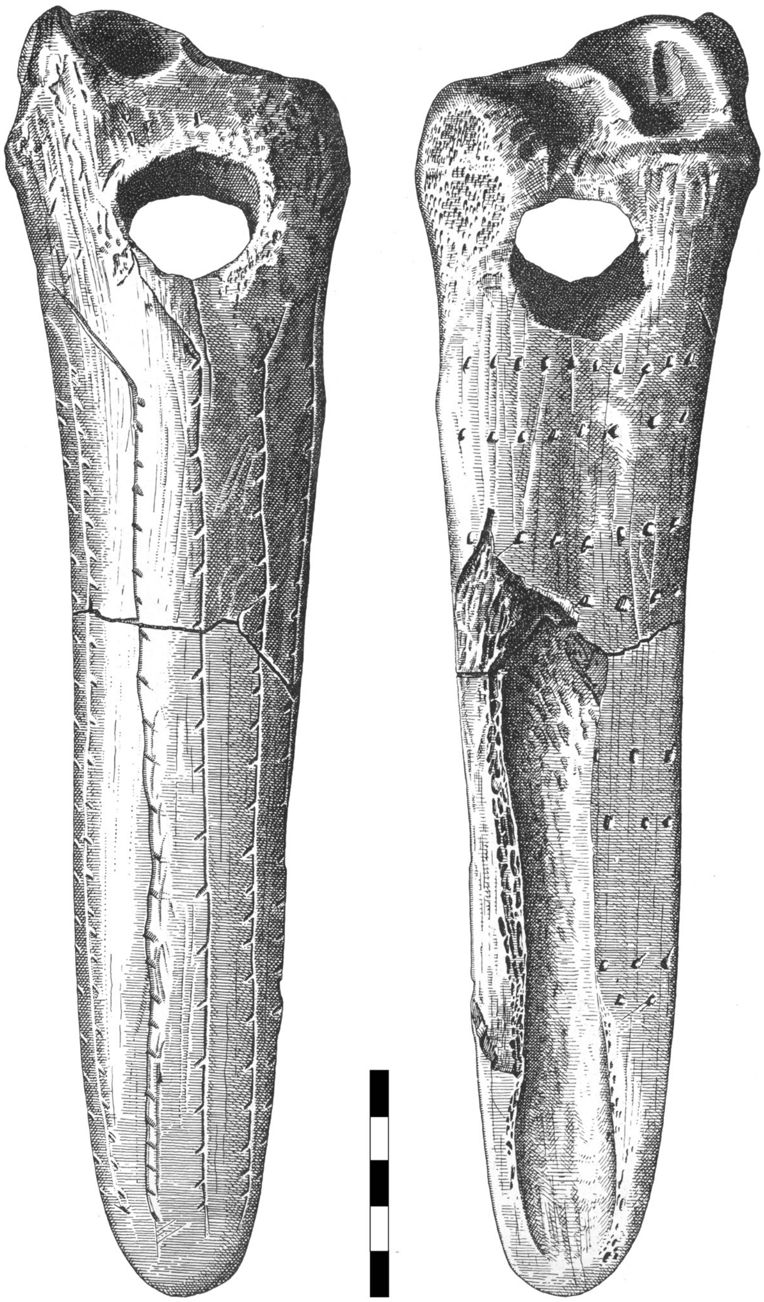

Fig. 29. Decorated bone mattock (ID 2609 & 13263; after Schuldt 1961a, Taf. 51).

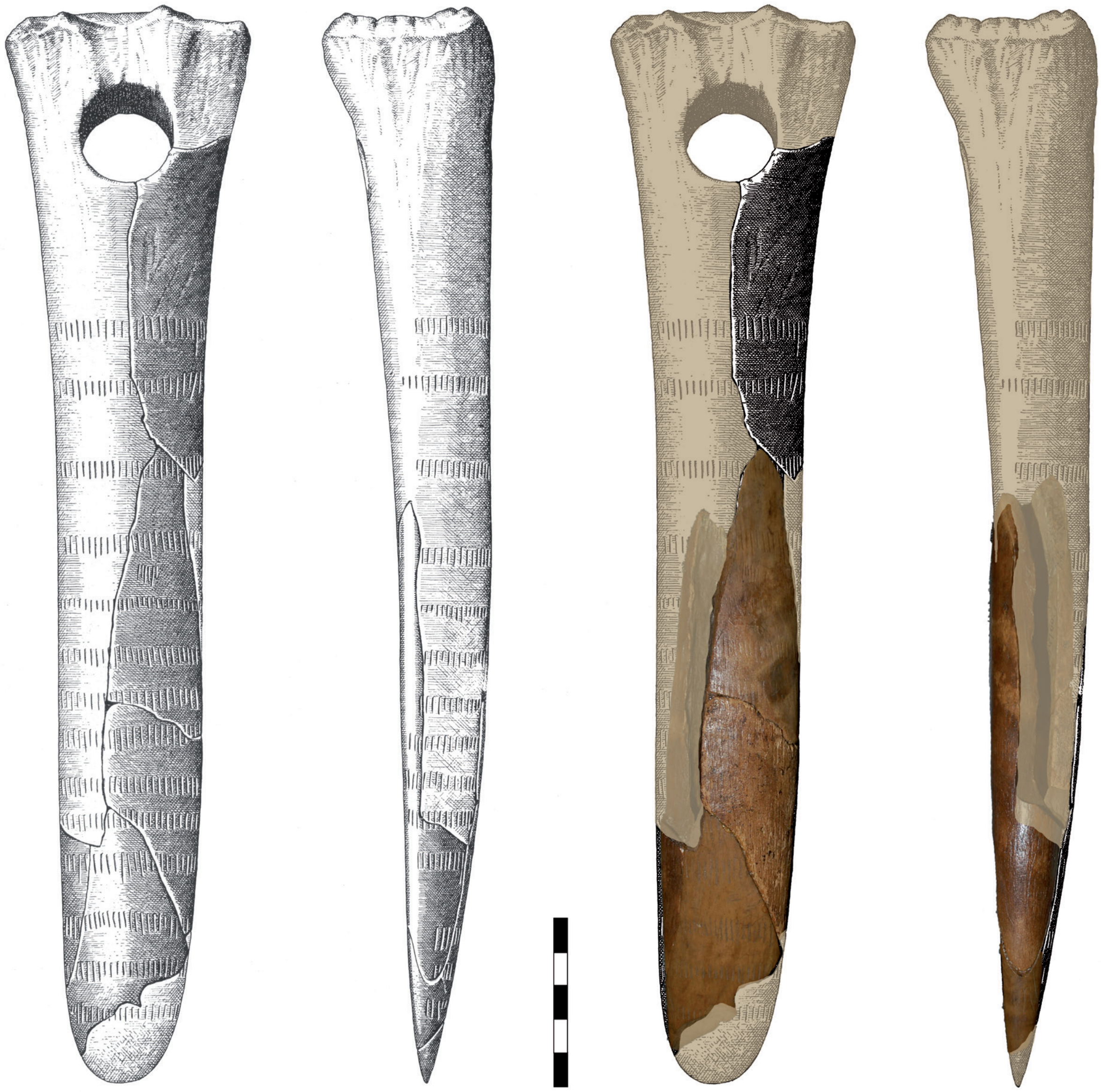

Fig. 30. Decorated bone mattock (ID 14760; after SCHULDT 1961a, Taf. 52). To the right: Photograph of recovered pieces projected on the reconstruction drawing.

Ornamented pieces from Hohen Viecheln nevertheless hint at general ideas of Early Holocene people and their ways of expression. Among the decorated artefacts are one tibia of a wild boar (ID 15367; Fig. 28; Plate 13), two mattocks[3] from aurochs radii (ID 2609+13263; ID 14760; Figs. 29–30), one antler axe with shaft hole (ID 12137; Fig. 31; Plate 9), the *baton de commandement* (ID 2610; Fig. 32) made of red deer antler, and a decorated shed antler beam (ID 2136; Fig. 33). One of the mattocks was successfully dated (cf. 3.3.2).

The wild boar tibia shows cut marks all over its shaft and is perforated on its proximal and distal end. Most cut marks are either longitudinal or transverse to the length of the bone, so that they hardly form a distinct pattern. However, on one lateral side the bone is cut perpendicular to the length in rather regular distances, showing a purposely made decoration. Another feature on the bone is a deeper groove

3 SCHULDT (1961b, 127) mentions three mattocks with decoration, but one of these artefacts, a broken tip, did not show any decoration. He just argues that this piece is thoroughly polished and therefore it can be assumed that it was decorated. Since no ornamentation is visible, this find is not classified as decorated in this study.

Fig. 31. Decorated antler axe with a shaft hole (ID 12137; after Schuldt 1961a, Taf. 60).

running around most of the medial part, as if it was meant to cut the bone in half. In this groove some short cuts are placed perpendicular to it (Fig. 28). While it is clear that the cut marks are not solely due to butchering processes, it remains unclear which purpose this potential tool had (see 3.2.2).

The two mattocks show three different decoration patterns. The almost complete specimen (Fig. 29) is decorated on its upper part with lines at which several small diagonal lines are attached (design 'e' after Clark 1975, fig. 37). Its underside is decorated by regular borings (design 'a' after Clark 1975, fig. 37).

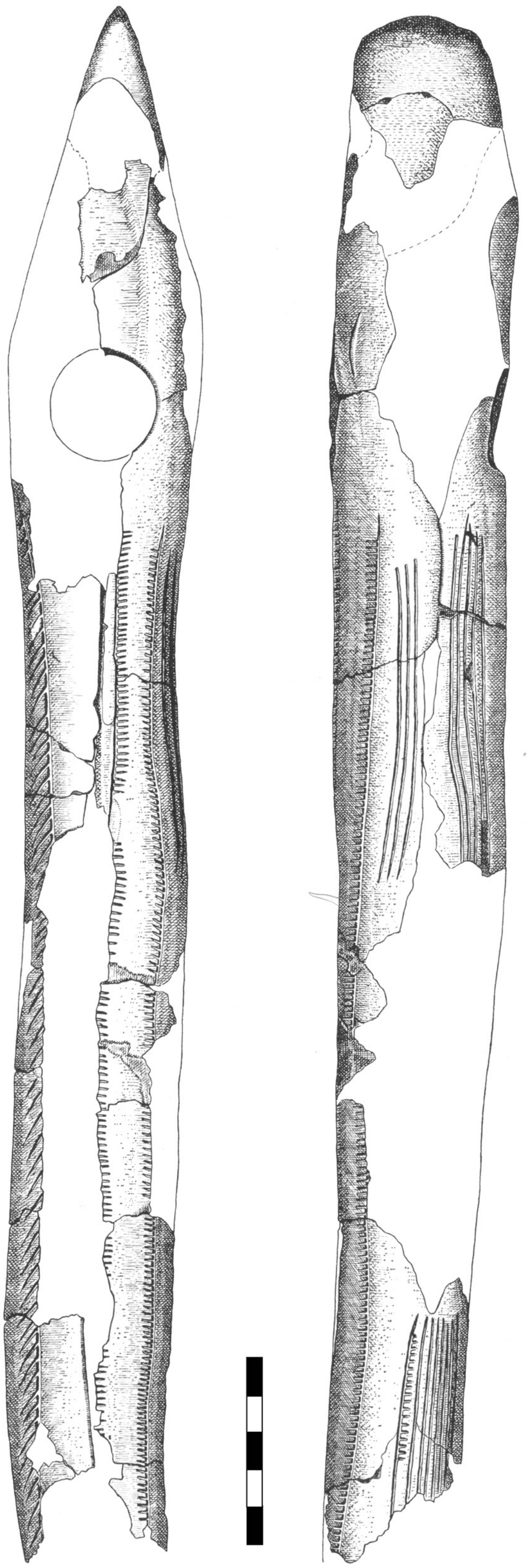

Fig. 32. The *baton de commandement* (ID 2610; after Schuldt 1961a, Taf. 61).

Comparable patterns are found on amber pendants from Hinge Au and Ulkestrup Lyng, respectively (see Petersen this volume). The second decorated mattock (Fig. 30) displays a lower variability as it is only decorated by 14 bands of vertical short incisions (design 'b1' after Clark 1975, fig. 37).

Yet another design is present on the antler axe with shaft hole. Clark (1975, 252) differentiated three different patterns on this artefact (q1, x1, y1). Especially the zig-zag lines with filling short lines on this piece are of interest because a comparable pattern is found on an artefact from Sværdborg (Broholm et al. 1924, 113). Below this zig-zag line is a band of rhombi (Fig. 31).

The *baton de commandement* (Fig. 32) represents a single find from Hohen Viecheln. This piece was found only 40 cm below the surface in a peaty band which was not constantly below the water level so that it is very badly preserved. Schuldt (1961b, 137) even describes that is was highly damaged which made the recovery rather difficult; he instructed the excavators to fix the remains on an artificial core. Even though the artefact is highly fragmented it is still possible to differentiate three different ornamentations. The first are two parallel but mirrored lines with diagonal incisions attached to it (design 'e' after Clark 1975, fig. 37), the pattern is comparable to that on one of the mattocks, but the diagonal incisions are longer here. This decoration was applied to one side of the artefact. A second ornament, on the other side and slightly on the upper side, is represented by two parallel but mirrored lines with perpendicular short incisions (design 'g' after Clark 1975, fig. 37). On the same side of the artefact a similar decoration is incised at its lower, broken part which is grouped with six straight lines. Two other groups of straight lines are found further up on the artefact with three and five lines, respectively. Comparable decorations are known from Late Boreal/Early Atlantic finds from Friesack 4 (Gramsch 2000, fig. 21; 2018). However, the purpose of such tools is yet unclear, as recently discussed by Gramsch (2018, 32–36).

A very different ornament is found on a shed antler beam on which several minor decoration fields are showing fence-like lines (design 'j1' after Clark 1975, fig. 37) of more or less rectangular or

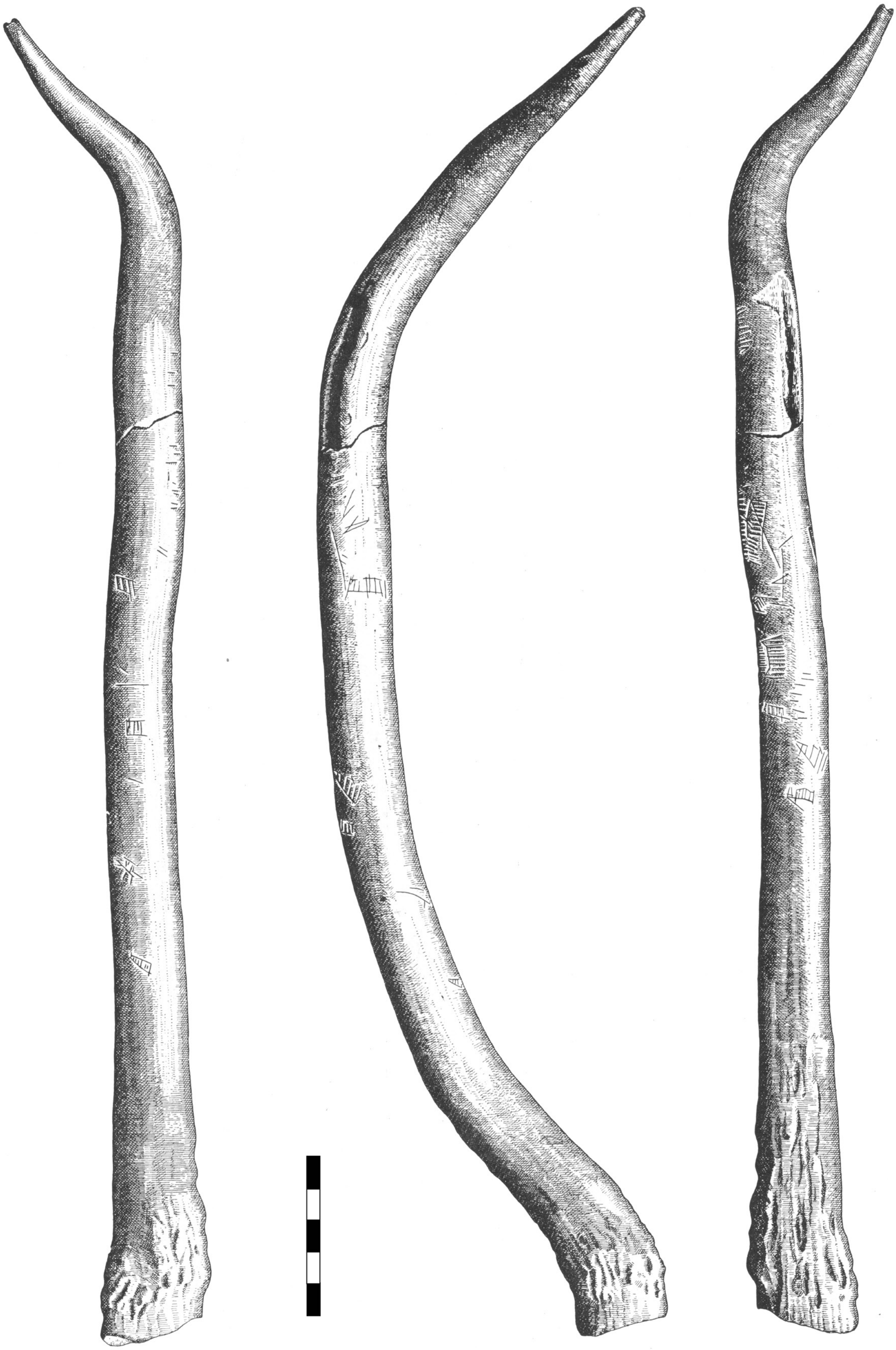

Fig. 33. Decorated antler beam (ID 2136; after Schuldt 1961a, Taf. 62).

triangular shape. This piece also shows some single short lines (Fig. 33). Similar, but more regularly placed, patterns are found on a red deer antler beam from Friesack 4 dated to the Late Preboreal (Gramsch 2000, Taf. 3: 12; 2019, 14–16). This might indicate that this artefact from Hohen Viecheln dates to the Preboreal as well.

Terberger (2003) discusses decorated artefacts from the Mesolithic of Northern Germany and Poland. He points out, based on the work by Clark (1936, 1975) and Gramsch (1989), that the barbed line motif which is also found in Hohen Viecheln (ID 2609) is a very popular one found in the eastern part of the Northern European Lowlands and on the eastern Danish Islands (e.g. Langeland, Zealand) as well as in middle Sweden (Terberger 2003, 552–554). The analysis of different decoration styles and ornaments enabled Toft (2006, 112–115) to conclude that subgroups of the Maglemose techno-complex had far-reaching contacts, but different ornamentation styles may be seen as cultural or social subdivisions. He also points out that a polythetic approach which combines results from *chaîne opératoire* (e.g. David 2009), typology (e.g. Cziesla 1999b; 2006) and decoration analyses (e.g. Newell et al. 1990; Płonka 2003) can provide a better understanding of boundaries in prehistory.

4.4 Contacts

A site with a comparable assemblage of osseous tools is Friesack 4. For both sites it is proven that they were occupied during the Early Holocene and that they show different settlement phases. While several of the decorated pieces show similarities, local differences are obvious as well. For instance, socketed axes ("Tüllenhacken") as well as radius mattocks[4] (Gramsch 2011, 49–52) are not known from Friesack. Furthermore, there are differences in the proximal shaping of the Pritzerbe-type points which are usually more thoroughly shaped in Friesack while the Hohen Viecheln specimens are only roughly shaped.

Louwe Kooijmans (1970, 62–66) argues that the Early Mesolithic bone and antler artefacts from the Netherlands belong to the Maglemose techno-complex, but it has to be noted that the barbed bone point types differ significantly from the types found in Hohen Viecheln.

Generally, it seems as if some forms rather represent a regional distribution while others, especially the Duvensee-type points, might represent widespread types that can be seen as typical for the Early Mesolithic and widespread on the North European Plain (e.g. Clark 1936, 126; Cziesla 1999a; 1999b; Dellbrügge 2002, 63–64; Fischer 1996, 162; Galiński 2013; Gramsch 1973, 31–32; 1990, 24–25; 2009/2010, 67–75). Cziesla (2006) argued for a very limited distribution of the Pritzerbe-type points in a limited north-south oriented strip from the Danish island Zealand to the Havelland in Brandenburg, Germany. However, this was recently rejected by Petersen (this volume; cf. Gramsch 2009/2010, 75).

Likewise, Schilling (2003, fig. 47.10) suggests a cultural connection between southern Zealand and Northern Germany in form of a hypothetical social group he calls 'Ancylus lake group'. Even though this is yet hypothetical, the area he delimits for this group or lineage coincides fairly well with the connections shown above. Therefore it seems well arguable that a regional variation of the Maglemosian techno-complex may be reflected by the finds. Gałinski (2013) further shows that several bone point types are as well found in modern Poland, among which are Pritzerbe-, Duvensee-, Dobbertin- and Kunda-types. Hence it becomes apparent that the site Hohen Viecheln was embedded into different techno-complexes with blurry borders. While we cannot rule out different groups coming together there or using the site at different times, the technological and typological studies clearly show the attribution to local and supra-regional archaeological entities.

4 One fragment of a aurochs radius mattock was dredged out of the channel next to the site but due to the missing age determination Gramsch (2011, 49) does not assign it to any distinct occupation layer. Even if the find was connected with the Boreal (?) occupation it remains the only specimen from the site and shows that this type was not common in Friesack.

5 Conclusion

The project was able to provide absolute chronological data for individual artefacts and thus indirectly for the strata of Hohen Viecheln. By directly dating the finds not only their age could be reconstructed, but also phases of erosion. The first occupation at Hohen Viecheln dates to the late Preboreal, as the dates of two artefacts, including one antler frontlet, show. Apparently, peat growth started around the Preboreal/Boreal transition, and the littoral zone slowly silted up. Due to the location of some artefacts below the peat in the gyttja and the 'driftwood layer', it has to be assumed that different settlement phases were present during the Boreal.

Various finds from the sand layer above the peat date earlier than the latest finds from the organogenic layers. This is explained by the fact that the peat covering sand layers have been deposited due to erosion of the former lake shore. The erosions re-deposited older finds and left them in a stratigraphically higher position than younger artefacts. The beginning of the erosion and a presumably connected lake level change can be dated later than 7600 cal. BC. Isolated humus bands in the sand, as well as a horizontal peat band located about 60–80 cm below surface, document phases with peat growth and less erosion.

In terms of bone point typo-chronology, it was possible to formally describe the various artefacts and assign fragmented specimens. As a conclusion, a subdivision of the notched bone points in Duvensee- and Dobbertin-type is recommended. Accordingly, the detailed but not formally described typology of Clark (1936, 116–117) has been found applicable for the material. The metric recording and statistical evaluation emphasised typological differences between the finds. The analyses further showed that metric attribute-based recording can overcome differences in regional or national typologies, thus increasing the scientific utility of the data.

The age determinations show chronological differences for the different bone point types. In Hohen Viecheln the Duvensee-type points are present from the early Boreal, whereas the Pritzerbe-type seems to appear in the middle to late Boreal (see Cziesla 1999b, 492). Comparable sites show that the Duvensee-type points already appear in the Preboreal or even the late Younger Dryas (Cziesla/Pettit 2003; Gramsch 1990; 2010). Dobbertin-type bone points appear to be later than the two types mentioned, but only five fragments were found at the site of which only one was dated. This vaguely points to a younger age of this type with a late Boreal to early Atlantic age, but this needs to be verified in further studies.

Most of the other dated bone and antler artefacts date to the Boreal, culminating in the early and middle part of this chronozone. Based on the sampling strategy, it can be assumed that the dated samples represent the time span of the artefacts well and in a relatively representative way. As a conclusion, the main occupation phase dates to the Boreal. Additionally, an older occupation during the Preboreal as well as a younger one at the Boreal/Atlantic border is attested. Further single finds from the excavation indicate uses of the area at other times, too, demonstrated for instance by a possible pre-form for an Ahrensburgian tanged point and ceramic fragments from the Neolithic.

Particularly, the well over 300 bone points (and fragments) from Hohen Viecheln are a relevant reference material for the chronology of this important artefact group. The radiometric ages obtained in the project show that the chronological range of the find material is greater than previously assumed. At the same time, however, it became clear that the main find layers date to the Boreal, and thus the original dating by the pollen analyst Schmitz (1961, 36) for the main find layer, i.e. the Boreal/Atlantic transition, has to be considered a little too young. Nonetheless, he certainly recognised the earliest Mesolithic settlement in the late Preboreal/early Boreal. Ultimately, the chronological classification by the excavator Schuldt (1961b, 89) was quite correct, although he greatly simplified the chronological range.

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Appendix

Recording scheme for the bone artefacts from Hohen Viecheln and a list of all recorded finds.

feature	description/numeric coding	characteristic
NS	north-south coordinate in trench	
EW	east-west coordinate in trench	
TYP	condition of the artefact	
	0.	not modified
	1.	ready-made artefact
	2.	un-ready artefact(roughout/preform)
	3.	production waste
	4.	butchering waste
	99.	not determinable
EHG	preservation of the artefact	
	1.	complete
	2.	proximal
	3.	medial
	4.	distal
	5.	proximal & medial
	6.	medial & distal
	7.	incomplete
	8.	thermal chippings
	99.	not determinable
GER	tool type	
	000.	no modification
	100.	simple bone point
	121.	bone point Duvensee-type
	122.	bone point Dobbertin-type
	131.	bone point Pritzerbe-type
	136.	bone point with aliform barbs
	199.	bone point, not further classified
	310.	bone knife
	320.	awl
	340.	'scapula scraper'
	400.	mattocks/axes
	412.	… with diagonal convex blade
	422.	… with vertical convex blade
	429.	… with vertical indeterminable blade
	430.	… with horizontal blade
	432.	… with horizontal convex blade
	439.	… with horizontal indeterminable blade
	440.	… socketed mattock/axe

feature	description/numeric coding		characteristic
		441.	… … with concave blade
		450.	antler axe blade
		452.	… with convex blade
		480.	bone/antler chisel
		490.	mattock/axe with unclear blade orientation
		499.	mattock/axe not further classified
		500.	*baton de commandement*
		510.	tool socket
		520.	antler tine (no tool!)
		521.	… used as retoucher
		522.	… used as punch
		530.	antler frontlet
		800.	pendant
		994.	production waste of a bone point (debitage)
		995.	perforated phalange
		997.	chopped off epiphysis
		998.	bone splinter
KA	number of notches/barbs		
KF	form of the notches/barbs (cf. Gramsch 2011)		
		0.	none
		1.	block-like
		2.	trapezoid
		3.	triangular
		4.	rhombic
		5.	rhomboidic
		6.	rounded rhombic
		7.	aliform/winged
		99.	not determinable
LKR	length of notch/barb row in mm		measured from the outer edge of the first notch/barb to the outer edge of the last notch/barb
		999.	not determinable
EKR	distance of barb row from the tip (only possible if EHG 1, 2 or 5)		
		999.	not determinable
BK	max. width of notches/barbs in mm		
		0.	no notch/barb
		999.	not determinable
TK	max. depth of notches/barbs in mm		
		0.	no notch/barb
		99.	not determinable
KNOSPD	Preservation of distal/terminal part of the bone point		
		0.	not preserved
		1.	preserved
		2.	overworked (e.g. thinned)
		99.	not determinable

feature	description/numeric coding	characteristic
KNOSPP	preservation of proximal/basal part of the bone point	
	0.	not preserved
	1.	rounded
	2.	pointy
	3.	thinned basis on one side
	4.	thinned basis on both sides
	5.	angular
	6.	broken out of raw material block
	99.	not determinable
DMSL	axes: shaft hole diameter in mm	
	0.	no shaft hole
	99.	not determinable
LS	axes: width of the blade in mm	
	0.	no blade preserved
	999.	not determinable
ARS1	working traces 1	
	0.	none
	10.	polishing
	20.	cut marks
	21.	cut marks (ventrally)
	25.	burin marks
	30.	pick / chipping marks
	40.	shattered/smashed (open)
	45.	longitudinal splitting
	50.	bite marks
	70.	intentionally modified
	71.	perforated
	99.	not determinable
ARS2		working traces 2 (see ARS1)
LARS		location of working traces (use location of EHG)
VERZ	ornamentation	
	0.	none
	1.	present
	24.	proximal & distal
	99.	not determinable
L	length in mm	
B	width in mm	
D	thickness in mm	
G	weight 0,1 g	

ID	trench	NS	EW	layer	TYP	EHG	GER	KA	KF	LKR	EKR	BK	TK	KNOSPD	KNOSPP
?(5)	indet.			indet.	1	1	131	3	3	38	36.3	9.4	1.5	1	6
?2678	indet			indet.	1	6	131	4	5	43.2	15.2	6.4	3.7	1	0
11	surface			surface layers	1	6	100	0				0	0	0	6
11000	4	8-9.50	0-5	lower peat	3	6	994	0				0	0		
11001	4	8-9.50	0-5	lower peat	3	0	994	0				0	0		
11045	4	9.50-13	0-3	gyttja	2	1	995	0				0	0		
11056	4	6-8.50	0-5	brushwood layer		0	999	0				0	0		
11057	4	6-8.50	0-5	brushwood layer		0	999	0				0	0		
11071	4	6-8.50	0-5	brushwood layer		0	997	0				0	0		
11072	4	6-8.50	0-5	brushwood layer		0	997	0				0	0		
1110	8			indet.	1	5	131	2	5	999	999	3.4	1.8	0	1
11118	4	9.50-13	0-3	lower peat		0	997	0				0	0		
11134	4	6-9.5	0-5	lower peat		0	997	0				0	0		
11141	4	6-9.5	0-5	lower peat		0	995	0				0	0		
11154	4	9.50-13	0-3	lower peat	3	0	0	0				0	0		
11168	4	9.5-13	3.5	gyttja	1	3	452	0				0	0		
1118	4	9.50-13	0-3	lower peat		0	997	0				0	0		
11188	4	9.5-13	0-5	lower peat		0	997	0				0	0		
11191	4	5-6	0-5	upper peat	999	1	995	0				0	0		
11192	4	5-6	0-5	upper peat	1	7	400	0				0	0		
11193	4	5-6	0-5	upper peat	1	3	121	13	2	999	999	2.4	1.5	0	0
11194	4	5-6	0-5	upper peat	1	6	136	2	3	999	33	999	4	1	0
11195	4	5-6	0-5	upper peat	999	0	490	0				0	0		
11196	4	5-6	0-5	upper peat		0	520	0				0	0		
11197	4	5-6	0-5	upper peat		0	520	0				0	0		
11201	4	5-6	0-5	upper peat	4	0	520	0				0	0		
11202	4	5-6	0-5	upper peat	1	1	422	0				0	0		
11203	4	5-6	0-5	upper peat		0	995	0				0	0		
11204	4	5-6	0-5	upper peat	1	6	440	0				0	0		
11205	4	5-6	0-5	upper peat	1	6	100	0				0	0	1	0
11206	4	5-6	0-5	upper peat	0	0	520	0				0	0		
11208	4	5-6	0-5	upper peat	1	1	452	0				0	0		
11209	4	5-6	0-5	upper peat	1	5	131	1	999		999	999	999	0	4
11210	4	5-6	0-5	upper peat		0	0	0				0	0		
11230	4	5-6	0-5	upper peat	0	0	520	0				0	0		
11341	4	5-6	0-5	upper peat	3	0	997	0				0	0		
11494	4	5-6	0-5	upper peat		0	999	0				0	0		
11495	4	5-6	0-5	upper peat	3	0	997	0				0	0		
11496	4	5-6	0-5	upper peat		0	999	0				0	0		
1165	4	9.5-13	3-5	indet.		0	0	0	0	0	0	0	0	0	0
11677	4	5-6	6-10	upper peat	1	4	136	2	3	999	23.21	24.2	4.7	1	0
11678	4	5-6	6-10	upper peat	1	4	136	2	3	999	38.6	26.5	3.1	1	0
11685	4	5-6	6-10	upper peat	3	3	994	0				0	0		
11730	4	5-6	6-10	brushwood layer	2	3	452	0				0	0		
11731	4	5-6	6-10	brushwood layer		0	400	0				0	0		
11732	4	5-6	6-10	brushwood layer		0	400	0				0	0		
11733	4	5-6	6-10	brushwood layer		0	400	0				0	0		
11734	4	5-6	6-10	brushwood layer		0	400	0				0	0		
11735	4	5-6	6-10	brushwood layer		0	400	0				0	0		
11736	4	5-6	6-10	brushwood layer		0	400	0				0	0		

DMSL	LS	ARS1	ARS2	LARS	VERZ	L	B	D	G	comment
0	0	20	0	1	0	129.8	12.6	6.7	10.9	
0	0	0	0	0	0	112.4	12	9.1	9.2	
0	0	25	0	1	0	135	18.3	10.3	15.6	
0	0	25	30	1	0	166.5	43.8	31.2	72.7	
0	0	25	30	1	0	136.1	37.3	40.7	99.3	
0	0	40	0	2	0	29.8	22.8	29.6	187.8	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	151.8	22	13.3	28.4	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	30	1	0	0	0	0	0	
0	37.9	30	0	4	0	156.8	43.9	49	169.3	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	30	40	24	0	272.9	36.76	36.7	240.7	
26.8	999	0	0		0	178.7	72.3	42	133.2	
0	0	0	0		0	91.3	10.8	6.3	7.2	
0	0	0	0		0	80.1	30.7	3.7	2.3	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	0	4	0	0	0	0	0	
0	31.9	20	0	4	0	236.6	34.6	29.2	126.6	
0	0	0	0		0	0	0	0	0	
28.5	999	20	0	2	0	180.1	69.5	60.2	285	
0	0	0	0		0	101.2	14.6	6.7	6.2	
0	0	30	0	4	0	0	0	0	0	
0	38	30	0	4	0	26.4	47.4	31.8	164	
0	0	0	0		0	121.9	21.2	6.6	13	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	20	0	4	0	50.5	10.7	3.9	1.9	
0	0	0	0		0	64.7	11.6	3.4	2.3	
0	0	0	0		0	133.3	21.3	5.6	12.9	
0	0	30	0	24	0	134.7	33.8	36.7	109.2	
0	0	0	0		0	0	0	0	0	not found
0	0	0	0		0	0	0	0	0	not found
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	not found
0	0	0	0		0	0	0	0	0	not found
0	0	0	0		0	0	0	0	0	not found

ID	trench	NS	EW	layer	TYP	EHG	GER	KA	KF	LKR	EKR	BK	TK	KNOSPD	KNOSPP
11856	4	5-6	6-10	brushwood layer	1	5	122	6	2	999	999	6.4	5.3	0	4
11857	4	5-6	6-10	brushwood layer	1	3	121	3	4	999	999	2.4	1.2	0	0
11858	4	5-6	6-10	brushwood layer	1	4	100	0				0	0	1	0
11859	4	5-6	6-10	brushwood layer		1	199	0							
11862	4	5-6	6-10	brushwood layer	1	1	121	13	2	85.4	18.4	2.8	1.6	1	1
11863	4	5-6	6-10	brushwood layer	3	0	997	0				0	0		
1188	4	9.5-13	0-5	lower peat		0	997	0				0	0		
1195	4	5-6	0-5	upper peat		0	400	0				0	0		
1196	4	5-6	0-5	upper peat		0	520	0				0	0		
1197	4	5-6	0-5	upper peat		0	520	0				0	0		
12	1			disturbed	1	3	100	0				0	0	0	0
12069	4	7-8.50	6-10	gyttja	3	0	0	0				0	0		
12070	4	7-8.5	6-10	gyttja	2	1	994	0				0	0		
12134	4	7-8.50	6-10	brushwood layer	1	1	121	11	2	37.3	31.9	1.6	1.4	1	3
12135	4	7-8.50	6-10	brushwood layer	1	5	131	1	999		999	999	999	0	6
12136	4	7-8.50	6-10	brushwood layer		0	995	0				0	0		
12137	4	7-8.50	6-10	brushwood layer	1	7	400	0				0	0		
12169	4	7--8.50	6-10	brushwood layer		0	520	0				0	0		
12253	4	8.50-12	6-10	lower peat	1	6	136	2	3	999	54.5	24.5	3.9	1	0
1230	4	0-2.5	0-5	upper peat	1	4	400	0				0	0		
1231	4	0-2.5	0-5	upper peat	1	6	121	10	2	999	39.4	2.6	1.5	1	0
1232	4	0-2.5	0-5	upper peat	1	3	121	12	2	86.1	999	2.1	1.5	0	0
1233	4	0-2.5	0-5	upper peat	1	3	121	6	2	999	999	1.8	1.6	0	0
12338	4	8.50-12	6-10	brushwood layer		0	0	0				0	0		
1234	4	6-13	0-5	upper peat	1	5	100	0				0	0	0	5
1236	4	0-2.5	0-5	upper peat	3	0	997	0				0	0		
1237	4	0-2.5	0-5	upper peat	3	0	997	0				0	0		
12434	4	3-5	6-10	sand		0	999	0				0	0		
12471	4	8-9	6-10	brushwood layer	3	0	0	0				0	0		
12473	4	8-9	6-10	brushwood layer		0	0	0				0	0		
12474	4	8-9	6-10	brushwood layer		0	0	0				0	0		
12520	4	10-11	6-10	brushwood layer	1	1	121	3	1	16.4	22.2	0.3	0.2	1	4
12556	4	10-11	6-10	brushwood layer		0	996	0				0	0		
12570	4	10.50-11	6-10	brushwood layer	1	1	121	11	5	46.5	50.8	2.6	1.3	1	5
12571	4	10.50-11	6-10	brushwood layer		0	997	0				0	0		
12607	4	8-9	6-10	gyttja	1	0	0	0				0	0		
12627	4	8-9	6-10	gyttja	3	0	520	0				0	0		
12639	5	6-11.50	11-12	indet.	1	5	131	1	999		999	999	999	0	4
12640	4	0	8.50	gyttja		0	999	0				0	0		
12676	4	1	10	surface layers	1	4	121	12	2	999	16.6	1.8	0.8	1	0
12677	5	0-6	0-2	sand/peat	1	6	131	3	5	32.8	17.3	10.2	3.3	1	0
12679	5	0-6	0-2	sand/peat	1	5	131	2	3	999	999	999	999	0	4
12680	5	0-6	0-2	sand/peat	1	5	100	0				0	0	0	4
12681	5	0-6	0-2	sand/peat	1	5	100	0				0	0	0	0
12682	5	0-6	0-2	sand/peat		0	0	2				0	0		
12683	5	0-6	0-2	sand/peat	3	2	136	0				0	0		
12684	5	0-6	0-2	sand/peat	1	3	131	3	5	999	999	6.8	2.1	0	0
12685	5	0-6	0-2	sand/peat	1	4	100	0				0	0	0	0
12686	5	0-6	0-2	sand/peat	1	3	131	2	5	999	999	999	999	0	0
12687	5	0-6	0-2	sand/peat		3	131	3				0	0		

DMSL	LS	ARS1	ARS2	LARS	VERZ	L	B	D	G	comment
0	0	20	0	1	0	165.7	19.1	10.3	35.3	
0	0	0	0		0	45.7	11.1	4.9	2.2	
0	0	0	0		0	49.8	8	3.1	1	
0	0	0	0		0		0	0	0	not found
0	0	20	0	3	0	111.8	9.5	5.3	6	
0	0	20	0	4	0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	25	1	0	112.2	15.7	8.7	11.9	
0	0	30	0	24	0	0	0	0	0	discarded (no tool)
0	0	30	40	24	0	254.3	21.7	33.3	150.5	
0	0	0	0		0	108.4	10.1	5.9	6.3	
0	0	20	25	1	0	157	17.4	10.3	23.1	
0	0	0	0		0	0	0	0	0	
15.5	0	20	0	1	1	180.9	36.3	31	80	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	98.8	6.3	6.6	5.8	
30	0	0	0		0	108.1	87.4	73.6	285.4	
0	0	0	0		0	84.1	11.3	4.9	4.4	
0	0	0	0		0	103.3	9.3	5.5	2.5	
0	0	0	0		0	52.4	12.9	7	4.1	
0	0	0	0		0	0	0	0	0	
0	0	20	25	3	0	73.9	13.9	8.2	6.9	
0	0	0	0		0	0	0	0	0	
0	0	20	0	2	0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	30	0	4	0	0	0	0	0	discarded (no tool)
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	0	2	0	83.4	10.1	5.6	6.1	
0	0	0	0		0	0	0	0	0	
0	0	20	25	3	0	122.3	11.1	4.4	7.3	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	81.8	29.9	8.8	14.4	
0	0	30	50	2	0	0	0	0	0	discarded (no tool)
0	0	0	0		0	114.9	21.9	14.1	15.3	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	60	8.8	5.1	3.7	two-sided notching 5/7; EKR measured on shorter side (33mm)
0	0	25	0	5	0	132.5	12.7	6.4	11.2	
0	0	25	0	3	0	150.2	17	9.8	17.9	
0	0	0	0		0	101.8	13.3	10.8	11	
0	0	0	0		0	100.6	18.9	9.8	15.6	
0	0	0	0		0	0	0	0	0	refit with ID 12679. recorded there
0	0	0	0		0	67.7	18.6	5.7	6.1	
0	0	0	0		0	51.7	12.1	6.7	2.6	
0	0	0	0		0	57.6	10.6	5.1	2.7	
0	0	0	0		0	33.8	11.7	6.5	1.8	
0	0	0	0		0	123	18.3	11.5	19.8	

ID	trench	NS	EW	layer	TYP	EHG	GER	KA	KF	LKR	EKR	BK	TK	KNOSPD	KNOSPP
12688	5	0-6	0-2	sand/peat	1	3	131	1	999		999	999	999	0	0
12689	5	0-6	0-2	sand/peat	1	1	100	0				0	0	1	6
12690	5	0-6	0-2	sand/peat	1	3	100	0				0	0	0	0
12691	5	0-6	0-2	sand/peat	1	5	100	0				0	0	0	4
12692	5	0-6	0-2	sand/peat		0	520	0				0	0		
12693	5	0-6	0-2	sand/peat	1	6	450	0				0	0		
12694	5	0-6	0-2	sand/peat	1	1	999	0				0	0		
12695	5	0-6	0-2	sand/peat		0	510	0				0	0		
12696	5	0-6	0-2	sand/peat	999	0	999	0				0	0		
12697	5	0-6	0-2	sand/peat	1	3	100	0				0	0	0	0
12850	5	0-3	10-12	sand/peat	1	3	121	4	1	999	999	1.3	0.9	0	0
12861	4			upper peat	1	1	131	1	3		21.3	19.1	3.1	1	4
12864	4			upper peat	3	2	131	0				0	0		
12875	4			surface layers	1	3	100	0	0	0	0	0	0	0	0
12896	5	0-11.50	2-3	sand/peat	1	3	100	0				0	0	0	0
12897	5	0-11.50	2-3	sand/peat	1	2	100	0				0	0	0	1
12898	5	0-11.50	2-3	sand/peat	1	3	121	11	1	999	999	1.4	0.9	0	0
12899	5	0-11.50	2-3	sand/peat	1	3	121	5	2	20.7	999	2.6	1	0	0
12900	5	0-11.50	2-3	sand/peat	1	3	121	2	2	999	999	2.1	0.8	0	0
12901	5	0-11.50	2-3	sand/peat	1	4	121	2	4	999	23.6	1.4	0.8	1	0
12905	5	0-11.50	2-3	sand/peat	3	1	994	0				0	0		
12906	5	0-11.50	2-3	sand/peat	1	3	100	0				0	0	0	0
12915	5	0-11.50	2-3	sand/peat	1	1	480	0				0	0		
12916	5	0-11.50	2-3	sand/peat		0	480	0				0	0		
12951	5	5-6	3-4	sand/peat	1	1	131	1	3		21	12.8	2.3	1	6
12952	5	5-6	3-4	sand/peat	3	999	0	0				0	0		
13019	5	0-5	9-10	sand/peat		0	520	0				0	0		
13020	5	0-5	9-10	sand/peat		0	520	0				0	0		
13023	5	0-5	9-10	sand/peat	1	3	100	0				0	0		
13059	4	10.5-13.5		indet.		0	520	0				0	0		
13129	5	0-12	5-6	sand/peat	1	1	100	0				0	0	0	4
13142	5	0-4	8-9	sand/peat		0	520	0				0	0		
13143	5	0-4	8-9	sand/peat		0	520	0				0	0		
13144	5	0-4	8-9	sand/peat		0	520	0				0	0		
13164	5	0-4	8-9	sand/peat	1	1	121	5	1	27.1	22.3	1.9	0.6	1	2
13165	5	0-4	8-9	sand/peat	1	3	121	14	2	999	999	1.4	1.6	0	0
13166	5	0-4	8-9	sand/peat	1	5	121	11	2	999	999	5.5	2.1	0	6
13167	5	0-4	8-9	sand/peat	1	3	121	7	1	30.9	999	1.7	1	0	0
13168	5	0-4	8-9	sand/peat		0	520	0				0	0		
13170	5	10-11	5-6	sand/peat		0	997	0				0	0		
13173	5	10-11	5-6	sand/peat		0	999	0				0	0		
13174a	5	10-11	10-11	sand/peat	9	1	998	0				0	0		
13174b	5	10-11	10-11	sand/peat	1	1	412	0	0	0	0	0	0	0	0
13175	5	10-11	10-11	sand/peat		0	520	0				0	0		
13177	5	0-6	7-8	sand/peat	1	5	131	1	999		999	999	999	0	6
13178	5	7-8	4-5	sand/peat	1	1	131	3	5	24.6	7.8	4.6	0.9	1	6
13179	5	7-8	4-5	sand/peat	1	6	131	3	5	999	999	1.8	0.4	0	6
13180	5	3-4	9-10	sand/peat	1	3	121	13	1	67.9	999	0.8	0.7	0	0
13181	5	3-4	9-10	sand/peat	1	3	121	9	2	31.5	999	1.3	0.8	0	0
13182	4			surface layers	1	3	121	4	1	999	999	0.7	0.9	0	0

DMSL	LS	ARS1	ARS2	LARS	VERZ	L	B	D	G	comment
0	0	0	0		0	51	15.1	6.9	4.6	
0	0	0	0		0	161.1	15.2	7.6	16.8	
0	0	0	0		0	34	9.3	5.4	1.4	
0	0	0	0		0	175.8	16	10.5	24.3	
0	0	0	0		0	0	0	0	0	
0	0	30	0	4	0	142.9	26.4	29.5	57.8	
0	0	20	0	4	0	233.8	25.3	30.8	150.4	
0	0	0	0		0	0	0	0	0	
0	0	999	0	3	0	0	0	0	0	
0	0	0	0		0	146.5	13.2	10.9	17.2	
0	0	0	0		0	37.7	8	4.8	1.3	
0	0	0	0		0	163.7	25.2	13.2	38.8	
0	0	0	0		0	71.3	17.5	6	5	
0	0	0	0	0	0	53.4	14	10.3	5.9	
0	0	0	0		0	78.1	13.3	6.6	4.8	
0	0	0	0		0	59	15	7	5	
0	0	0	0		0	43.9	11.1	5.1	2.1	
0	0	0	0		0	71.8	9.6	5.4	3.3	
0	0	0	0		0	40.9	10.8	5	1.5	
0	0	0	0		0	31.8	9.6	5.9	1.5	
0	0	20	25	1	0	144.8	20.5	8.5	23.87	discarded (no tool)
0	0	0	0		0	106.8	16	11.1	15.1	
0	14.3	25	0	3	0	26.7	35.8	17.9	48.7	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	134.2	20.4	4.4	12.3	
0	0	0	0		0	0	0	0	11.7	discarded (no tool); 4 fragments
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	102.2	14.5	7.6	10.3	
0	0	0	0		0	0	0	0	0	
0	0	25	0	1	0	134.6	18.1	5.6	12.3	
0	0	0	0		0	0	0	0	0	refit with 13144
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	refit with 13144
0	0	20	0	2	0	99.4	10	5	5	
0	0	0	0		0	88.6	13.4	6.5	8.8	
0	0	0	0		0	205	14	7.9	11.6	
0	0	0	0		0	60.3	9.3	6.3	2.7	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	25	0	1	0	165.9	17.1	12.5	24.8	discarded (no tool); find no. double: differentiated in a and b
35.7	41.3	30	0	4	0	151.8	93.1	46.6	418	
0	0	0	0		0	196	63.6	25.5	110	
0	0	25	0	1	0	173	17	9.5	16.75	
0	0	25	0	5	0	164.5	19.9	9.2	17.5	
0	0	0	0		0	179.2	16.6	10.9	18.3	
0	0	0	0		0	157	11.9	5.5	8.2	
0	0	0	0		0	67.2	9.3	5.3	2.8	
0	0	0	0		0	33.3	11.7	5.9	2.3	

ID	trench	NS	EW	layer	TYP	EHG	GER	KA	KF	LKR	EKR	BK	TK	KNOSPD	KNOSPP
13183	4			indet.	1	6	121	12	2	999	23.5	1.5	1	1	0
13184	4			indet.	1	5	998	0				0	0		
13185	4	8		indet.	1	3	136	2	3	999	999	999	4.3	0	0
13203	5	6-11	9-10	sand/peat		0	520	0				0	0		
13210	5	12-12	0-3	gyttja	1	3	199	0				0	0	0	0
13263	4			gyttja		0	400	0				0	0		
13265	4	7-9	6-10	sand	1	5	121	12	2	999	999	2.1	1.7	0	5
13269	5		4-6	sand/peat	1	6	121	6	1	999	41.4	1	0.8	1	0
13270	5		4-6	sand/peat	1	3	121	6	1	999	999	1.9	0.9	0	0
13271	4			surface layers	1	3	100	0				0	0	0	0
13272	4	9.10	0.10	indet.	1	6	136	2	7	999	53.4	39.5	7.4	1	0
13273	4	0.10	8.50	indet.	1	1	998	0				0	0		
13274	4	0.10	8.50	indet.	1	5	121	19	2	999	999	2	1.4	0	4
13275	4	0.10	8.50	indet.	1	3	121	2	2	999	999	1.6	0.9	0	0
13278	4	0-1	5-6	sand	1	1	100	0				0	0	1	2
13279	4	0-1	5-6	sand	1	5	100	0				0	0	0	0
13280	4	0-1	5-6	sand		0	520	0				0	0		
13307	4	0-1	9-10	upper peat	1	3	131	2	3	999	999	999	999	0	0
13308	4	0-1	9-10	upper peat	1	4	136	2	3	999	17.62	18	4.7	1	0
13309	4	0-1	9-10	upper peat		0	0	0				0	0		
13310	4	0-1	9-10	upper peat		0	520	0				0	0		
13323	4	0.20	6-10	sand		0	520	0				0	0		
13373	4			indet.		0	0	0				0	0		
13374	4			indet.		0	0	0				0	0		
1341	4	5-6	0-5	upper peat		0	997	0				0	0		
13424	4	0-3	0.0-0.4	sand		0	520	0				0	0		
13425	4	0-3	0.0-0.4	sand	1	6	121	3	2	12.9	23.6	1.2	0.6	1	0
13426	4	0-3	0.0-0.4	sand	1	3	131	1	999		999	999	999	0	0
13619	8	17-18		sand/peat	1	1	100	0				0	0	1	1
13620	8	16-17	0-2	indet.		0	995	0				0	0		
13621	8	16-17	0-2	indet.		0	995	0				0	0		
13630	8	20-22	2-4	indet.	1	1	100	0				0	0	1	5
13691	8	19-21	2-4	indet.	9	1	998	0				0	0		
13692	8	19-21	2-4	indet.	1	3	100	0				0	0	0	0
13693	8	19-21	2-4	indet.	2	3	131	0	0	0	0	0	0	0	0
13714	8	18-20	2-4	indet.		0	131	1				0	0		
13720	8	18-20	2-4	indet.		0	520	0				0	0		
13743	8	22-23	2-4	upper peat	1	6	121	9	2	125.5	44.5	3.8	1.9	1	0
13744	8	22-23	2-4	upper peat	1	6	121	17	1	999	37	1.6	1.4	1	0
13757	8	22-23	2-4	upper peat	3	0	997	0				0	0		
13771	8	23-25	2-4	upper peat	1	6	121	8	2	999	36.3	4.1	2.4	1	0
13781	8	23-25	2-4	upper peat	3	0	997	0				0	0		
13782	8	23-25	2-4	upper peat	3	7	997	0				0	0		
13791	8	19-21	0-2	sand	3	0	0	0				0	0		
13795	8	18-20	2-4	indet.		0	995	0				0	0		
13810	8	23-24	0-2	indet.	3	0	997	0				0	0		
13828	8	24-26	0-4	brushwood layer	1	0	499	0				0	0		
13829	8	24-26	0-4	brushwood layer		0	995	0				0	0		
13831	8	24-26	0-4	brushwood layer		0	520	0				0	0		
13843	8	24-26	0-4	brushwood layer	1	7	400	0				0	0		

DMSL	LS	ARS1	ARS2	LARS	VERZ	L	B	D	G	comment
0	0	0	0		0	69.7	11.5	5.6	3	
0	0	0	0		0	135.3	17.1	7.6	15.5	discarded (no tool)
0	0	0	0		0	68.7	18.1	4.1	3.6	
0	0	0	0		0	0	0	0	0	
0	0	0	0		9	38.7	10.7	4.7	2.1	
0	0	0	0		1	15.1	0	0	0	refit with ID 2609
0	0	20		2	0	86.5	12.6	4.8	5.6	
0	0	0	0		0	86	9	7.1	3.4	
0	0	0	0		0	52.7	10.6	4.6	2.6	
0	0	20	0	5	0	90.8	11.7	8.8	11.1	
0	0	0	0		0	92	20.9	7.1	7	
0	0	25	0	1	0	127.6	13.2	9.8	11.7	discarded (no tool)
0	0	25	0	6	0	114.7	11.1	6.7	5.9	
0	0	0	0		0	34.9	8.8	6.3	1.7	
0	0	20	0	1	0	132.4	11.5	6.3	8.9	
0	0	25	30	1	0	81.1	17.5	10	8.2	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	112.4	24.5	4.1	8.1	refit with ID 13309
0	0	0	0		0	58.2	14.2	3.1	2.2	
0	0	0	0		0	0	0	0	0	refit with ID 13307; recorded there
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	76.9	25.2	9.3	11.7	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	78	8.6	4.6	2.5	
0	0	25	0	1	0	99.9	13	7.6	7.4	
0	0	0	0		0	162.5	14.4	9.5	16.4	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	24.8	20.7	0	0	not found
0	0	25	0	1	0	179.5	15.1	11.3	18.2	discarded (no tool)
0	0	20	25	1	0	73.5	13.9	5.9	5.6	
0	0	25	0	1	0	109.2	16.9	14.1	19.6	
0	0	0	0		0	165	0	0	0	not found
0	0	0	0		0	0	0	0	0	
0	0	20	0	2	0	192.1	15.6	7.7	15.1	
0	0	20	0	5	0	187	11.7	7.8	18	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	164.9	16.3	7.5	19.8	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	30	0	4	0	0	0	0	0	discarded (no tool)
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	74.6	50.2	9.5	20.7	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
24.2	40	0	0		0	138.7	95	29.3	173.2	

ID	trench	NS	EW	layer	TYP	EHG	GER	KA	KF	LKR	EKR	BK	TK	KNOSPD	KNOSPP
13844	8	24-25	2-4	indet.	1	5	121	13	2	82	999	2.3	1.2	0	2
13845	8	23-25	2-4	upper peat	1	5	121	3	5	999	999	3.1	1.7	0	5
13847	8	26-27	0-2	indet.		0	995	0				0	0		
13848	8	23.70	1.60	indet.		1	131	1	3		14.7	27.7	1.7	1	5
13849	8	24.0	1.30	indet.	1	5	100	0				0	0	0	6
13850	8	23.50		indet.	1	5	100	0				0	0	0	6
13851	8			indet.	1	5	100	0				0	0	0	4
13852	8			indet.	1	5	100	0				0	0	0	4
13853	8			indet.	1	5	199	999	999	999	999	999	999	0	1
13854	8			indet.	1	3	131	2	5	999	999	5	1.5	0	6
13855	8			indet.		5	121	23	2	88.7	999	3.1	2.2	999	0
13856	8	19.5	2.8	indet.		0	0	0				0	0		
13857	8	19.5	2.8	indet.		0	995	0				0	0		
13858	8	19.5	2.8	indet.		0	995	0				0	0		
13859	8	19.5	2.8	indet.		0	995	0				0	0		
13860	8	19.5	2.8	indet.		0	995	0				0	0		
13866	9	2.8	0.80	indet.	1	5	998	0				0	0		
13867	9	2.0	5.2	indet.	1	1	320	0				0	0		
13868	9	2.50	4.50	indet.	1	5	100	0				0	0	0	6
13869	9	1.40	6.20	indet.	1	5	100	1	999		999	999	999	0	6
13870	9	2.50	1.40	indet.	1	6	131	1	999		999	999	999	0	4
13871	9	2.10	1.50	indet.		0	199	0				0	0		
13872	9	2.10	1.50	indet.	1	3	199	0				0	0	0	0
13873	9	1.10	3.0	indet.	1	3	100	0				0	0	0	0
13874	9	1.60	3.20	indet.	1	3	131	2	999	999	999	999	999	0	0
13875	9	1.60	3.20	indet.	1	5	100	0				0	0	0	1
13876	9	1.0	5.60	indet.	1	1	998	0				0	0		
13877	9	1.0	5.60	indet.	1	3	199	0				0	0	0	0
13878	9	0.0	3.50	indet.	1	2	430	0				0	0		
13879	9	0.50	1.50	indet.		0	999	0				0	0		
13890	8	22-23	0-2	sand/peat		0	520	0				0	0		
13898	8	23-25	2-4	upper peat	4	0	520	0				0	0		
13899	8	23-25	2-4	upper peat	0	0	520	0				0	0		
140	5			indet.	1	1	100	0	0	0	0	0	0	1	3
14007	8	19.21	0-2	indet.	1	6	480	0	0	0	0	0	0	0	0
14059	9	0-3	4-5	indet.		0	520	0				0	0		
14068	9	0-3	0-2	upper peat	3	0	997	0				0	0		
1410	4	0-2.5	0-5	upper peat		0	520	0				0	0		
14118	9	0-3	0-2	upper peat	1	1	521	0				0	0		
14202	9	0-3	3-5	indet.	4	0	520	0				0	0		
14230	9	0-3	3-5	indet.	3	3	994	0				0	0		
14279	9	0-3	5-7	upper peat	4	0	0	0				0	0		
14297	9	0-3	7-9	sand/peat	3	0	520	0				0	0		
14322	9	0-3	7-9	sand/peat		0	520	0				0	0		
14331	9	0-3	7-9	surface layers	1	5	100	0				0	0	0	1
14332	9	0-3	7-9	surface layers		0	999	0				0	0		
14358	9	0-3	7-9	sand/peat	1	5	121	5	4	36.1	999	4.4	1.5	0	6
14383	9	0-3	7-9	sand/peat	1	5	998	0				0	0		
14384	9	0-3	7-9	sand/peat	999	0	999	0				0	0		
14385	9	0-3	7-9	sand/peat	1	1	131	2	3	26.8	32.5	13.7	4.3	1	5

DMSL	LS	ARS1	ARS2	LARS	VERZ	L	B	D	G	comment
0	0	0	0		0	111.1	11.2	0	0	not found
0	0	20	25	5	0	121.8	12.7	7.1	11.6	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	162.5	23.6	0	0	not found
0	0	25	0	5	0	151.3	18.2	9.1	22	
0	0	25	30	1	0	152.2	18.5	7	22.1	
0	0	25	0	1	0	94.6	20.8	11.6	15	
0	0	25	0	1	0	137.1	18.8	11.1	15.1	
0	0	25	0	3	0	140.9	21.6	8.8	13.9	
0	0	25	0	5	0	96.6	13.2	7.5	7.9	
0	0	0	0		0	107	9.4	0	0	not found
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	25	0	1	0	128.5	20.8	9.3	10.6	discarded (no tool)
0	0	0	0		0	122.3	105.7	10.1	9.3	
0	0	25	0	5	0	141.9	14.4	9.3	13.8	
0	0	0	0		0	172.8	11.7	3.4	13.9	
0	0	25	0	1	0	157	25.6	10.5	21.9	
0	0	0	0		0	0	0	0	0	not found
0	0	0	0		0	95.2	15.3	8.6	6.5	
0	0	0	0		0	58.2	14.9	6.2	6.1	
0	0	20	0	1	0	38.8	13.2	5.8	2.2	
0	0	20	25	1	0	109.3	15.9	9.1	13.1	
0	0	25	0	1	0	149.2	11.4	10.6	14.5	discarded (no tool)
0	0	20	25	1	0	74.3	16.3	6.4	5.8	
0	0	0	0		0	99.9	30.8	13.9	29.7	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	30	0	2	0	0	0	0	0	discarded (no tool)
0	0	0	0		0	0	0	0	0	discarded (no tool)
0	0	0	0	0	0	69.2	9.5	5.1	2.9	
0	999	0	0	0	0	178.4	48.8	30.7	87.6	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	294.2	35.6	25.7	132	
0	0	30	0	4	0	0	0	0	0	
0	0	0	0		0	109.2	12.5	7.1	6.6	discarded (no tool)
0	0	40	0	4	0	0	0	0	0	discarded (no tool)
0	0	30	0	4	0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	189.6	13	8.3	16.4	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	160.3	15.2	8.1	16.9	
0	0	25	0	1	0	16.8	19.2	9.5	23.2	discarded (no tool)
0	0	0	0		0	0	0	0	0	
0	0	20	25	4	0	166	20.3	14.7	35.9	

ID	trench	NS	EW	layer	TYP	EHG	GER	KA	KF	LKR	EKR	BK	TK	KNOSPD	KNOSPP
144	5			indet.	0	0	520	0				0	0		
14429	9	0-3	6-8	sand/peat	1	1	100	0				0	0	1	1
14436	9	0	0-1	sand/peat	2	1	422	0				0	0		
14445	9	2.0	0	indet.	1	3	100	0				0	0	0	0
14447	9	0-3	6-8	indet.		0	995	0				0	0		
14448	9	1-3	4-6	indet.	3	0	996	0				0	0		
14449	9	0-3	6-8	indet.		0	995	0				0	0		
14450	9	0-1	2-4	indet.	1	1	432	0				0	0		
14451	9	0-3	4-6	indet.		0	520	0				0	0		
14452	9	0-3	4-5	indet.	2	0	510	0				0	0		
14453	9	2-3	4-6	indet.	1	3	199	0				0	0	0	0
14454	9	1-2	2-4	indet.	1	1	100	0				0	0	1	6
14469	9	0-3	6-8	brushwood layer	3	0	0	0	0	0	0	0	0	0	0
145	5			indet.	1	5	100	0				0	0	0	2
1450	9	0-1.60	5-6	indet.		0	520	0				0	0		
14523	9	1-2	2-4	indet.		0	995	0				0	0		
14536	9	2-3	4-6	sand/peat		0	999	0				0	0		
14546	9	0-3	4-6	sand/peat		0	996	0				0	0		
14547	9	0-3	4-6	sand/peat		0	520	0				0	0		
146	5			indet.	4	999	121	0				0	0		
1461	4	2.5-5	0-5	surface layers		1	432	0				0	0		
1462	4	2.5-5	0-5	upper peat		0	520	0				0	0		
1463	4	2.5-5	0-5	upper peat	1	5	131	2	3	999	999	6	1.3	0	4
14634	9	0-3	0-3	indet.		0	995	0				0	0		
14639	9	0-3	1-2.5	indet.	3	0	0	0				0	0		
1464	4	2.5-5	0-5	upper peat	1	4	131	1	3		999	999	999	0	0
14647	9	0-1	5-6	indet.		0	520	0				0	0		
1465	4	2.5-5	0-5	upper peat	1	6	100	0				0	0	1	0
1466	4	2.5-5	0-5	upper peat	1	5	100	0				0	0	0	6
1467	4	2.5-5	0-5	upper peat	1	3	100	0				0	0	0	0
1468	4	2.5-5	0-5	upper peat	3	3	994	0				0	0		
1469	4			upper peat	1	2	100	0	0	0	0	0	0	0	4
1470	4	2.5-5	0-5	upper peat	1	3	100	0				0	0	0	0
1471	4	2.5-5	0-5	upper peat	1	3	100	0				0	0	0	0
14711	9	0-3	0-1	indet.	1	1	452	0	0	0	0	0	0	0	0
14723	9	1-3	5-6	sand/peat	3	0	997	0				0	0		
14739	9	0-3	1-2.5	sand/peat	3	0	0	0				0	0		
14754	9	1.5	6.5	brushwood layer	521	1	520	0				0	0		
14756	9	1-2	2-4	indet.	3	0	997	0				0	0		
14757	9	1-2	2-4	indet.	3	0	997	0				0	0		
14760	9	3.0	1.0	sand/peat		0	999	0				0	0		
14761	9	0-3	1-1.25	sand/peat		0	999	0				0	0		
14762	8	25.5	0.9	indet.	3	0	0	0				0	0		
14763	9	1.60	8.50	sand/peat		0	0	0				0	0		
14764	9	0-1	0.5	sand/peat	1	5	131	2	5	999	999	5.7	1.6	0	4
14765	9	3.5	2.0	sand/peat	1	1	100	0				0	0	1	6
14766	9	1.5	3-4	sand/peat	1	1	121	19	2	68.2	18.4	1.5	0.7	1	2
14767	9	1.5	7.5	surface layers	1	6	121	6	1	30.3	25.5	1.5	0.6	1	0
14768	9	0.5	7.5	brushwood layer	1	1	121	6	2	28	17.4	2.6	1.7	1	5
14769	9	4-5	3.0	brushwood layer	1	1	121	5	1	30.5	26.1	1.7	0.9	1	2

DMSL	LS	ARS1	ARS2	LARS	VERZ	L	B	D	G	comment
0	0	0	0		0	0	0	0	0	discarded (no tool)
0	0	0	0		0	124.4	10	8.4	11.1	
0	39.4	0	0		0	291.6	80.5	33.8	429.3	
0	0	0	0		0	86.9	16.8	6.4	7.6	
0	0	0	0		0	0	0	0	0	
0	0	25	0	1	0	109	34.3	22.2	45.8	
0	0	0	0		0	0	0	0	0	
18	26.9	20	0	1	0	212.4	55.2	25	177.8	
0	0	0	0		0	0	0	0	0	
0	0	30	0	24	0	192.5	44.9	37.7	132.2	
0	0	20	0	6	0	111.6	25.4	3.6	10.2	
0	0	0	0		0	146.4	12.6	8.2	13.5	
0	0	30	0	4	0	164.6	36.5	23	42.5	discarded (no tool)
0	0	25	0	1	0	130	14.4	5.8	11.2	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	40.1	16	5.4	1.7	
34.9	44.5	0	0		0	110	85	41.5	320	
0	0	0	0		0	0	0	0	0	
0	0	25	0	1	0	150.1	22	14.7	26	
0	0	0	0		0	0	0	0	0	
0	0	30	0	4	0	0	0	0	0	discarded (no tool)
0	0	0	0		0	51.4	11.6	7.2	2.4	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	91.3	13.8	6.6	8	
0	0	25	40	3	0	88.7	14	8	8.1	
0	0	0	0		0	106.6	15.8	8.6	10.6	
0	0	25	30	1	0	51.3	16.3	8.2	5.6	discarded (no tool)
0	0	20	0	1	0	71.4	20.6	6.8	7.4	
0	0	0	0		0	63.7	12.8	5.8	4.5	
0	0	25	0	1	0	83.4	17.3	9.5	10.5	
0	12.4	30	0	4	0	109.4	23.1	21.8	51.3	
0	0	0	0		0	0	0	0	0	
0	0	20	0	3	0	0	0	0	0	
0	0	30	4		0	230	38	30.5	162.6	
0	0	0	0		0	0	0	0	0	
0	0	30	0	3	0	0	0	0	0	
0	0	0	0		0	0	0	0	0	refit with IDs 14761, 15229, 15606; recorded at 5606
0	0	0	0		0	0	0	0	0	refit with IDs 15229, 14760, 15606; recorded at 5606
0	0	0	0		0	0	0	0	0	discarded (no tool)
0	0	0	0		0	0	0	0	0	
0	0	25	0	5	0	195.8	17.7	9.6	23.9	
0	0	20	25	2	1	135	12.2	10	14.7	
0	0	0	0		0	110.5	10.2	6.3	7.7	
0	0	20	0	2	0	93.7	9.4	5.9	5	
0	0	0	0		0	90.2	11	5	4.2	
0	0	20	0	3	0	101.1	12.1	5.4	7.7	

ID	trench	NS	EW	layer	TYP	EHG	GER	KA	KF	LKR	EKR	BK	TK	KNOSPD	KNOSPP
14770	8	2.50	3.8	sand/peat	999	0	995	0				0	0		
14771	9	3-4	3	sand/peat		0	520	0				0	0		
14772	9	0-7	6-7	indet.	3	0	0	0				0	0		
14775	9	0-3	7-9	brushwood layer		0	995	0				0	0		
14783	9	0-3	5-6	indet.		0	0	0				0	0		
14869	9	0-3	7-9	brushwood layer	2	1	994	0	0	0	0	0	0	0	0
14925	9	24-25	0-1	sand	2	0	510	0				0	0		
14926	8	25	1	sand/peat	1	6	121	9	2	999	58.4	1.2	0.8	1	0
14928	8	28-30	0-2	gyttja	4	0	520	0				0	0		
14932	8	29-30	3.50	brushwood layer		1	121	3	1	11.4	42.2	1.3	0.5	1	6
14933	8	27-28	2-3	brushwood layer	1	1	121	18	4	102.5	61	1.6	1.2	1	5
1494	4	5-6	0-5	upper peat		0	999	0				0	0		
1496	4	5-6	0-5	upper peat		0	999	0				0	0		
15078	8		21.50	indet.		0	0	0				0	0		
1514	4	2.5-5	0-5	upper peat	2	6	998	0				0	0		
15176	9	0-3	4-5	Sand	3	0	997	0				0	0		
15223	9	0-3	0-2	gyttja		1	131	3	5	33	14	5	1.1	1	5
15224	9	0-3	0-2	gyttja		0	995	0				0	0		
15225	9	0-3	0-2	gyttja		0	996	0				0	0		
15226	9	0-3	0-2	gyttja	1	1	521	0				0	0		
15229	9	0-3	0-2	gyttja		0	999	0				0	0		
15230	9	0-3	5-7	gyttja	1	5	131	2	3	999	999	4.2	0.8	0	4
15241	9	0-3	4-5.5	gyttja	1	5	131	3	3	999	999	4.5	0.5	0	4
15242	9	0-3	4-5.5	gyttja	1	1	320	0				0	0		
15246	13			brushwood layer		0	0	0				0	0		
15257	9	0-3	2-4	gyttja	4	0	520	0				0	0		
15260	9	26	7	gyttja	1	1	121	11	1	98.7	36.1	3.1	2.2	1	2
15268	9	0.5	5.5	gyttja	1	1	510	0				0	0		
15270	N-profile			indet.	1	3	136	1	999		999	999	999	0	0
15271	8	31-33	0-4	gyttja	1	1	412	0				0	0		
15272	N-profile			indet.	1	1	441	0				0	0		
15277	9	8-9	?	surface layers	1	6	136	2	3	999	26.8	27.1	3	1	0
15279	O-profile			indet.		0	996	0				0	0		
15280	9	0-3	5-7	gyttja	3	0	997	0				0	0		
15281	9	0-3	2-4	sand/peat		0	0	0				0	0		
15282	9	0-3	2-4	sand/peat		0	0	0				0	0		
15310	8	34-35	0-4	gyttja	3	0	520	0				0	0		
15314	8	31-33	0-4	gyttja	3	0	997	0				0	0		
15315	8	31-3	0-4	gyttja	3	0	994	0				0	0		
15324	8	29.5	3.5	gyttja	1	1	412	0				0	0		
15325	8	29.5	3.5	gyttja	1	5	999	0				0	0		
15326	9	0-3	2-4	gyttja	3	0	997	0				0	0		
15327	N-profile			indet.	3	0	0	0				0	0		
15328	8	33-35	2-4	gyttja	1	6	100	0				0	0	1	0
15349	9	0-3	6-7	gyttja	1	1	136	2	3	70.65	36.45	32.4	4.7	1	6
15350	9	0-3	6-7	gyttja	2	3	452	0				0	0		
15351	9	0-3	6-7	gyttja	999	999	999	0				0	0		
15366	9		1.5-2.5	gyttja	1	1	121	6	2	37.4	24.2	1	0.6	0	1
15367	9		1.5-2.5	gyttja	1	1	999	0				0	0		
15374	9		1.5-2.5	gyttja		0	998	0				0	0		

DMSL	LS	ARS1	ARS2	LARS	VERZ	L	B	D	G	comment
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	30	0	2	0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	30	0	3	0	0	0	0	0	
0	0	30	0	4	0	246.4	32.7	40.6	203.1	
0	0	30	0	24	0	132.7	42	36.7	155	
0	0	20	0	1	0	89	10.2	6.5	5.1	
0	0	30	0	24	0	0	0	0	0	discarded (no tool)
0	0	0	0		0	134.8	9	0	0	not found
0	0	20	0	1	0	225.6	12.2	7.1	20.9	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	refit with ID 15608; recorded there
0	0	0	0		0	130.2	29.7	10.2	20.6	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	176.1	23.9	13.2	34.4	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	30	24	0	162.5	27	25.2	60.8	
0	0	0	0		1	0	0	0	0	refit with IDs 14761, 14760, 15606; recorded at 5606
0	0	20	25	1	0	168	20.1	17.4	21.1	
0	0	20	25	1	0	187.8	18.4	16.8	25.6	
0	0	0	0		0	118.6	41.2	29.9	60.1	
0	0	0	0		0	0	0	0	0	
0	0	30	0	1	0	0	0	0	0	discarded (no tool)
0	0	20	0	1	0	192.9	14	9.1	24.8	
17.5	0	20	30	1	0	116.3	35.8	34.3	82.9	
0	0	0	0		0	159.1	22.5	6.7	18.5	
0	27.9	20	30	4	0	153.2	28.6	23.2	77.5	
26.6	42.9	30	0	1	0	162.6	64.6	58.9	255.8	
0	0	0	0		0	65.7	10.7	5.3	3.4	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	30	0	4	0	0	0	0	0	
0	0	25	0	1	0	0	0	0	0	
0	0	20	30	3	0	0	0	0	0	
0	43.8	30	0	24	0	217.6	44.6	34.1	222.5	
0	0	20	0	1	0	318.7	17.6	18	92.4	
0	0	0	0		0	0	0	0	0	
0	0	30	0	2	0	0	0	0	0	
0	0	0	0		0	107.5	10.1	5.6	4.7	
0	0	0	0		0	284.2	22.3	4.4	27.9	
0	36	25	30	1	0	131.5	34.5	35.6	100.8	
0	0	20	30	999	1	124.5	59.3	18.7	74.9	
0	0	20	0	2	0	113.8	10.3	6.7	7.1	
0	0	20	0	1	1	25	51.1	48.7	140.9	
0	0	0	0		0	0	0	0	0	

ID	trench	NS	EW	layer	TYP	EHG	GER	KA	KF	LKR	EKR	BK	TK	KNOSPD	KNOSPP
15379	8	29-31	0-4	brushwood layer		0	998	0				0	0		
15390	8	29-31	0-4	brushwood layer		0	999	0				0	0		
15392	8	29-31	0-4	brushwood layer	3	0	997	0				0	0		
15401	9		4.5-6.5	gyttja	3	0	520	0				0	0		
15416	9		4-6	gyttja	3	0	0	0				0	0		
15429	9		3-4	gyttja	1	7	999	0				0	0		
15430	9		3-4	gyttja		0	520	0				0	0		
15431	9		3-4	gyttja	4	0	520	0				0	0		
15447	9		2.50	upper peat	1	1	100	0				0	0	1	6
15448	9		2.5	upper peat	1	1	100	0				0	0	1	1
15449	surface			surface layers	1	3	199	0				0	0	0	0
1545	4	2.5-5	0-5	upper peat	1	5	100	0				0	0	0	4
15450	surface			surface layers	1	5	131	1	999		999	999	999	0	6
15451	9	29-33	1-3	indet.	1	6	100	0				0	0	0	0
15452	9	29-33	4-6	indet.		0	0	0				0	0		
15457	9	29-33	4-6	indet.		0	999	0				0	0		
15459	9	29-33	4-5	gyttja		0	995	0				0	0		
1546	4	2.5-5	0-5	upper peat	1	3	121	4	2	999	999	4.9	2.4	0	0
15485	9	29.5-33	0-3	gyttja	1	1	480	0				0	0		
15486	9	29.5-33	0-3	gyttja		0	520	0				0	0		
15500	9	29-33	1-3	sand/peat		0	995	0				0	0		
15526	9	29.5-33	0-3	gyttja	3	3	999	0				0	0		
15548	4			brushwood layer	1	5	121	11	2	999	999	1.8	1.5	4	0
15549	4			brushwood layer	1	1	522	0				0	0		
15604	9	29-33	4-5	gyttja		0	995	0				0	0		
15605	9	30-31	2-3	gyttja	1	5	122	8	3	999	999	7.5	4.7	0	6
15606	8	24.30	0	indet.	1	7	400	0				0	0		
15607	8	21.50		upper peat		1	131	3	5	38.7	17	9	3.9	1	6
15608	8	21.50		upper peat	1	1	131	3	3	44.5	13.1	10.3	5.1	1	6
15609	8	21.50	0.50	indet.	1	5	100	0				0	0	0	4
15610	8	28.70	0.70	sand/peat	1	5	100	0				0	0	0	1
15611	8	21.40	4.30	brushwood layer	1	3	121	7	1	999	999	1.5	1.3	0	0
15612	8	21.40	4.30	brushwood layer	1	1	998					0	0		
15613	8	18.5	4.30	brushwood layer	1	3	199	0				0	0	0	0
15614	8	18.5	4.30	brushwood layer	1	3	121	3	2	999	999	2.5	1.2	0	0
15691	surface			indet.	1	5	199	0				0	0	0	5
15695	8	20-24	4-5	sand/peat	3	0	520	0				0	0		
15696	8	20-24	4-5	sand/peat	3	0	520	0				0	0		
15717	8	25-28	4-5	sand/peat		0	999	0				0	0		
15722	8	25-27	0-1	sand/peat		0	0	0				0	0		
15730	8	25-27	0-1	sand/peat	1	2	100	0				0	0	0	4
15751	8	25-27	0-1	sand/peat	3	0	997	0				0	0		
15752	8	25-27	0-1	sand/peat	3	0	997	0				0	0		
15762	8	25-27	0-1	sand/peat		0	0	0				0	0		
15773	8			indet.	3	0	0	0				0	0		
15774	8			indet.		0	530	0				0	0		
15775	8			indet.	3	0	0	0				0	0		
15776	8	25-28	profile	sand/peat		0	998	0				0	0		
15830	9			indet.		0	995	0				0	0		
15831	9			indet.	3	0	520	0				0	0		

DMSL	LS	ARS1	ARS2	LARS	VERZ	L	B	D	G	comment
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	30	0	2	0	0	0	0	0	
0	0	30	0	2	0	0	0	0	0	discarded (no tool)
0	0	20	0	1	1	102.5	36.2	36.9	57.1	
0	0	0	0		0	0	0	0	0	
0	0	30	0	24	0	0	0	0	0	discarded (no tool)
0	0	20	0	3	0	200.8	11.9	9.1	22.1	
0	0	0	0		0	183.6	10.8	5.2	4.6	
0	0	0	0		0	27.5	11.3	5	1.7	
0	0	0	0		0	146.9	19.9	10.9	25.71	
0	0	25	30	5	0	152.6	16.5	10.3	21.9	
0	0	0	0		0	103.2	11.2	7.8	9.8	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	67.3	11.5	9.2	3.9	
0	23.3	20	0	2	1	217	31.4	17.4	95.8	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	0	1	1	143.2	21.5	5.5	14.4	
0	0	25	0	1	0	89.3	12.5	8.3	8.3	
0	0	30	0	2	0	148.9	40.2	22	53.5	
0	0	0	0		0	0	0	0	0	
0	0	20	25	1	0	154.8	16.5	9.7	24.2	
0	0	0	0		1	184.8	40.1	26.2	87.3	refit with IDs 14761, 14760, 15229; recorded at 5606
0	0	0	0		0	189.8	19.5	0	0	not found
0	0	25	0	5	0	216.1	16.4	10.5	27.8	refit with ID 15078
0	0	25	0	1	0	100.4	18.2	9.5	11.1	
0	0	0	0		0	74	16.9	7.9	10.4	
0	0	20	0	1	0	81.9	18.5	8.2	5.5	
0	0	25	0	1	0	157.3	11.6	12.6	18.6	discarded (no tool)
0	0	0	0		0	128.4	18	10.2	16.3	
0	0	0	0		0	45	11.4	5.6	1.9	
0	0	25	0	1	0	194.5	20.6	14.1	35.9	
0	0	30	0	2	0	0	0	0	0	
0	0	30	0	4	0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	25	30	1	0	50.8	16.9	7.7	5.1	
0	0	30	0	2	0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	30	24	0	0	0	0	0	discarded (no tool)
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	discarded (no tool)
0	0	40	20	3	0	148.6	70.1	62.9	325	
0	0	0	0		0	0	0	0	0	
0	0	30	50	24	0	0	0	0	0	

ID	trench	NS	EW	layer	TYP	EHG	GER	KA	KF	LKR	EKR	BK	TK	KNOSPD	KNOSPP
15838	9			indet.		0	0	0				0	0		
15862	9			indet.	1	1	320	0				0	0		
15863	12			sand/peat		0	530	0				0	0		
15871	9			indet.		0	0	0				0	0		
15872	9			gyttja		0	999	0				0	0		
15889	12			indet.	1	3	136	3	5	999	999	14.3	1.5	0	0
15890	12			sand/peat	3	3	994	0				0	0		
15891	12			indet.	1	3	122	3	2	999	999	8.6	5	0	0
15892	12			indet.	1	3	100	0				0	0	0	0
15893	12			sand/peat	3	7	994	0				0	0		
15894	12			indet.		0	999	0				0	0		
15895	12			indet.	0	0	520	0				0	0		
15896	12			indet.	0	0	520	0				0	0		
15952	12			indet.	3	3	994	0				0	0		
16030	12			indet.		0	0	0				0	0		
16031	10			sand/peat	1	5	100	0				0	0	0	6
16032	10			sand/peat	3	0	520	0				0	0		
16084	10			sand/peat	0	0	520	0				0	0		
16090	13	4.0	1.50	Sand	1	5	131	3	5	999	999	6.1	3.2	0	4
16091	13	6.0	2.75	indet.		0	121	7				0	0		
16092	13	6.0	0.70	indet.	1	6	121	6	1	17.5	19.9	0.9	0.6	1	0
16093	13	3.50-7	0-3	indet.	999	0	520	0				0	0		
16157	13	0-2.5	3-6	Sand	1	5	121	3	2	999	999	2.6	1.5	5	0
16158	13	2.50-5	3-6	sand/peat	1	5	100	0				0	0	0	4
1616	4	0-5	6-10	surface layers	1	6	100	0				0	0	1	0
16160	13	0-2.50	0-3	indet.	1	1	121	11	2	55	15.9	4.1	1.8	1	5
16245	13			sand/peat		5	199	3	999	999	999	999	999	999	0
16247	13		west	indet.		0	995	0				0	0		
16249	13		west	indet.		0	995	0				0	0		
16250	13		west	indet.	1	1	510	0				0	0		
16251	13		west	indet.	3	0	0	0				0	0		
16252	13		west	indet.	3	5	994	0				0	0		
16253	13		east	indet.	1	3	131	2	999	999	999	5.8	1	0	0
1654	4	1-5	6-8	sand/peat		0	520	0				0	0		
1677	4	1-5	6-8	lower peat	3	0	520	0				0	0		
1678	4	1-5	6-8	lower peat	1	1	121	8	2	39.2	47	3	2	1	1
1679	4	1-5	6-8	lower peat	999	0	999	0				0	0		
1680	4	1-5	6-8	lower peat		0	131	1	7	0	18	9.4	1.6	1	5
1681	4	1-5	6-8	lower peat	1	1	121	12	1	42.8	18.5	1.6	0.6	1	6
1682	4	1-5	6-8	lower peat	1	6	121	11	2	42.3	14.6	1.6	1	1	0
1683	4	1-5	6-8	lower peat	1	5	100	0				0	0	0	4
1684	4	1-5	6-8	lower peat	999	0	0	0				0	0		
1730	4	5-6	6-10	brushwood layer		0	400	0				0	0		
1731	4	5-6	6-10	brushwood layer		0	400	0				0	0		
1732	4	5-6	6-10	brushwood layer		0	400	0				0	0		
1733	4	5-6	6-10	brushwood layer		0	400	0				0	0		
1734	4	5-6	6-10	brushwood layer		0	400	0				0	0		
1735	4	5-6	6-10	brushwood layer		0	400	0				0	0		
1736	4	5-6	6-10	brushwood layer		0	400	0				0	0		
1756	4	1-5	6-8	lower peat	1	6	136	3	3	999	23.3	999	4.4	1	0

DMSL	LS	ARS1	ARS2	LARS	VERZ	L	B	D	G	comment
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	150.2	17.7	10.6	15.2	discarded (no tool)
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	46	17.3	3.8	2.4	
0	0	20	40	1	0	90.9	20.6	4.3	9.5	discarded (no tool)
0	0	25	0	1	0	77.4	14.8	8.6	9.7	
0	0	0	0		0	75.8	10.2	5.4	4.5	
0	0	25	30	1	0	67.1	14.5	5.4	4.9	discarded (no tool)
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	0	1	0	62.2	15.5	4.8	4.1	discarded (no tool)
0	0	0	0		0	0	0	0	0	
0	0	20	25	1	0	174.3	17.7	6.6	22.3	
0	0	30	0	4	0	0	0	0	0	
0	0	0	0		0	0	0	0	0	discarded (no tool)
0	0	25	0	5	0	172	23.7	13.1	34.8	
0	0	0	0		0	156	0	0	0	not found
0	0	0	0		0	59.6	11.2	5.4	3.2	
0	0	20	0	2	0	0	0	0	0	
0	0	0	0		0	99.5	10.8	6.5	6.7	
0	0	25	30	5	0	165.8	20.6	8.2	187	
0	0	0	0		0	89.4	9.7	7.2	6.8	
0	0	0	0		0	147.7	15.7	7	14.6	
0	0	0	0		0	175	0	0	0	not found
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
16.7	0	30	0	24	0	112	49.6	45.9	108.1	
0	0	30	0	24	0	0	0	0	0	discarded (no tool)
0	0	0	0		0	129.6	39.6	16.1	24.6	discarded (no tool)
0	0	25	0	3	0	159.4	14.6	6.7	13.1	
0	0	0	0		0	0	0	0	0	
0	0	25	0	4	0	0	0	0	0	
0	0	20	0	2	0	133.1	10.3	6.3	6.1	
0	0	0	0		0	116.2	14.2	20.3	56.1	
0	0	0	0		0	191	23.3	0	0	not found
0	0	20	0	2	0	107.9	8.6	7.5	6.2	
0	0	20	0	3	0	87.4	9.3	5.5	3.7	
0	0	20	25	1	0	74.4	10.9	5.6	4	
0	0	0	0		0	36.4	16.2	9.9	2.8	discarded (no tool)
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	not found
0	0	0	0		0	0	0	0	0	not found
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	not found
0	0	0	0		0	0	0	0	0	not found
0	0	0	0		0	0	0	0	0	not found
0	0	0	0		0	85.2	13.9	5.4	3.8	

ID	trench	NS	EW	layer	TYP	EHG	GER	KA	KF	LKR	EKR	BK	TK	KNOSPD	KNOSPP
1759	4	1-5	6-8	lower peat	3	0	997	0				0	0		
1857	4	1-5	6-8	lower peat	1	1	121	6	2	26.5	30.7	1.4	0.9	1	4
1858	4	1-5	6-8	lower peat	1	5	121	5	2	999	999	1.2	0.9	0	4
1859	4	1-5	6-8	lower peat	1	6	121	13	5	49.4	16.2	0.7	0.4	1	0
1860	4	1-5	6-8	lower peat	1	5	131	1	999		999	999	999	0	6
1861	indet.	1-5	6-8	lower peat	1	6	121	9	2	999	14.8	2	1.1	1	0
1862	4	1-5	6-8	lower peat	1	4	100	0				0	0	1	0
1864	4	1-5	6-8	lower peat	1	5	121	7	2	999	999	1.5	0.9	0	1
1878	4	6-8	0-5	lower peat	1	5	100	0				0	0	0	5
188	7			indet.	1	5	100	0				0	0	0	4
1914	4	6-8	0-5	brushwood layer	2	1	510	0				0	0		
1915	4	6-8	0-5	brushwood layer	1	6	429	0				0	0		
1916	4	6-8	0-5	brushwood layer	4	0	520	0				0	0		
1917	4	6-8	0-5	brushwood layer	3	0	520	0				0	0		
1918	4	6-8	0-5	brushwood layer	2	4	510	0				0	0		
1919	4	6-8	0-5	brushwood layer	1	6	136	2	3	999	27.8	48.9	4.1	1	0
1923	4	6-8	0-5	brushwood layer	3	0	997	0				0	0		
1zu1	surface			indet.	1	2	121	3	2	999	999	1.1	1	0	5
21	3		0.90	indet.	1	6	121	20	2	999	20.6	1.5	1	1	0
210	2	15.80		indet.	1	5	121	4	2	999	999	0.9	0.7	0	5
2100	2	9.0	0.6	indet.	1	4	131	2	5	999	999	7.2	1.8	0	0
2101	4		1.3	indet.	1	3	121	3	2	999	999	999	999	0	0
2102	4		1.4	indet.	1	2	100	0				0	0	0	0
2103	4		0.4	indet.	1	3	100	0				0	0	0	0
2104	4		1.4	indet.	1	4	121	5	1	999	999	1	0.7	0	0
2105	2	3	1.10	indet.	1	1	100	0				0	0	1	4
2106	surface			indet.	1	3	100	0				0	0	0	0
2107	4		0.3	indet.	1	6	100	0				0	0	0	0
2108	4		0.3	indet.	1	5	100	0				0	0	0	4
2109	2	13		surface layers	1	6	100	999	999	999	999	999	999	1	0
211	2	15.80	0.70	indet.	1	3	131	2	5	999	999	5.3	0.8	0	0
2110	2	13		surface layers	1	3	100	0				0	0	0	0
2111	2	13		surface layers	1	3	100	0				0	0	0	0
2112	2	13.5	0.5	indet.	1	6	430	0				0	0		
2113	2	16	0.35	indet.	1	6	439	0				0	0		
2114	2	15.50	0.40	indet.		9	400	0				0	0		
2115	2	14.60		surface layers	3	0	0	0				0	0		
2116	2	8.10	0.70	indet.		0	0	0				0	0		
2117	indet.	1	1	indet.	3	0	0	0				0	0		
2118	1		1	indet.	3	0	0	0				0	0		
2119	2	14.90	0.8	indet.	3	0	997	0				0	0		
212	2	17.90	0.80	indet.	1	6	100	0				0	0	1	6
2123	3	1.80	1.80	indet.	3	0	997	0				0	0		
2126	2	15	0.4	indet.	4	0	0	0				0	0		
2127	2			indet.		4	340	0				0	0		
2128	2			indet.		0	340	0				0	0		
2129	2	5.50	1.70	indet.		1	340	0				0	0		
213	indet.	1	9.50	indet.	1	5	131	2	5	17.9	17	9.5	1.9	2	0
2130	indet.	15	1	indet.	0	0	520	0				0	0		
2131	2	15.40	1.10	indet.	1	1	480	0				0	0		

DMSL	LS	ARS1	ARS2	LARS	VERZ	L	B	D	G	comment
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	110	10.7	6.4	8.3	
0	0	0	0		0	59.6	10.2	5.8	4.2	
0	0	0	0		0	73.3	9.6	5.7	3.6	
0	0	20	25	1	0	155.9	14.2	9.4	14.7	
0	0	0	0		0	51.2	9.5	4.9	2.3	
0	0	0	0		0	43.8	10.1	5.3	2.3	
0	0	0	0		0	79	9.8	6.8	4.2	
0	0	0	0		0	183.9	15.7	10.5	29.7	
0	0	25	0	2	0	79.2	14.4	10.1	6.5	
0	0	30	0	24	0	72.7	36.5	34.6	64.1	
0	0	20	0	24	0	154.9	40.8	39.2	130.6	
0	0	30	0	2	0	0	0	0	0	
0	0	30	0	4	0	0	0	0	0	
0	0	30	0	4	0	51.6	31.5	37.6	21.9	
0	0	0	0		0	76.9	12.3	4.7	4	
0	0	20	2		0	0	0	0	0	
0	0	0	0	0	0	25.8	10.5	6	1.9	
0	0	0	0		0	90.5	11.3	5.6	5.9	
0	0	0	0		0	68.5	10.8	6.9	5.5	
0	0	0	0		0	32.5	12.2	6	1.4	
0	0	0	0		0	28.4	12.3	6	1.2	
0	0	0	0		0	22.9	9	4.1	0.5	
0	0	0	0		0	46	10.3	6	2	
0	0	0	0		0	31.6	8.4	5.5	1.3	
0	0	0	0		0	104.5	14.9	5.3	4.2	
0	0	0	0		0	101.3	9.2	5.2	3.4	
0	0	20	0	4	0	74.5	16.5	11.3	10.7	
0	0	25	0	1	0	117.4	21.9	7.8	9.2	
0	0	0	0		0	107.1	19.6	6	10.3	
0	0	0	0		0	74.3	10.9	8.8	7	
0	0	25	0	1	0	143.9	17.7	9.6	10.3	
0	0	0	0		0	93.3	13.7	8.3	8.9	
28	999	0	0		0	233.8	72.2	39.1	389.9	
32	49.6	20	0	3	0	157.2	73.2	58.5	418.8	
29	3.9	0	0		0	18.5	0	0	0	
0	0	30	0	2	0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	0	2	0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	0	5	0	0	0	0	0	
0	0	0	0		0	82.3	12.4	6.1	6.2	
0	0	30	0	3	0	0	0	0	0	
0	0	20	0	1	0	27	0	0	0	
0	0	0	0		0	14.45	0	0	0	
0	0	0	0		0	15.05	0	0	0	
0	0	0	0		0	12.8	0	0	0	
0	0	0	0		0	69	13.3	6.6	5.3	
0	0	0	0		0	12.9	0	0	0	
0	20.8	0	0		0	174.3	32.3	26.4	86.5	

ID	trench	NS	EW	layer	TYP	EHG	GER	KA	KF	LKR	EKR	BK	TK	KNOSPD	KNOSPP
2132	2	15.4	0.40	indet.	4	0	520	0				0	0		
2133	2	14	0.4	indet.	999	0	520	0				0	0		
2134	2	12		surface layers		0	996	0				0	0		
2135	3	16	2	indet.	1	1	432	0				0	0		
2136	2	14.20	0.90	indet.	999	1	999	0				0	0		
2137	2	5.50	1.65	indet.		0	310	0				0	0		
2138	indet.	5.50	1.70	indet.		0	310	0				0	0		
2139	indet.	5.50	1.70	indet.		0	310	0				0	0		
214	2	5	1	indet.	1	5	100	0				0	0	0	6
2140	indet.	5.50	1.70	indet.		0	0	0				0	0		
2141	2	5	0.70	indet.		0	0	0				0	0		
2142	2	16.50	0.70	indet.		0	0	0				0	0		
2143	2	16.50	0.70	indet.		0	0	0				0	0		
2144	2	14.50	0.60	indet.		0	0	0				0	0		
2145	2	14.80	0.70	indet.		0	0	0				0	0		
215	2	15.20	0.60	indet.	999	3	100	0				0	0	0	0
216	2	5	1	indet.	1	6	131	2	3	12.2	999	4	1.9	0	6
217	4		0.60	indet.	1	1	131	1	3		999	14.7	2.3	0	5
2173	2	15	0.70	indet.		0	310	0				0	0		
2174	2	15	0.70	indet.		0	0	0				0	0		
218	2		0.70	indet.	1	5	100	0				0	0	0	5
2180	2	15.80	0.70	indet.		0	310	0				0	0		
2181	2	15.80	0.70	indet.		0	0	0				0	0		
219	3		0.80	indet.	1	1	131	4	5	48.4	13.4	3.5	1.9	1	6
2196	indet.	9.50	1.20	indet.		0	0	0				0	0		
2197	2	15.40	0.70	indet.		0	0	0				0	0		
2198	2	13.20	1.20	indet.		0	0	0				0	0		
2199	2	13.20	1.20	indet.		0	0	0				0	0		
22	3	3	6.80	indet.	999	3	999	0				0	0		
220	3		0.80	indet.	2	1	994	1				0	0		
22023	2	13.20	1.20	indet.		0	0	0				0	0		
2208	2	15	0.70	indet.		0	340	0				0	0		
2209	4	14.40	0.90	indet.		0	340	0				0	0		
221	3		0.80	indet.	1	5	100	0				0	0	0	5
2211	2		0.60	indet.		0	520	0				0	0		
2212	2		0.60	indet.		0	0	0				0	0		
2215	2	16	0.70	indet.		0	0	0				0	0		
2216	2	15.40	0.70	indet.		0	0	0				0	0		
222	indet.	15	1	indet.	1	1	100	0				0	0	1	5
2225	2	14.50	0.80	indet.		0	340	0				0	0		
2228	2	0.90	15	indet.		0	0	0				0	0		
2229	2	14.60	0.70	indet.		0	0	0				0	0		
223	2	5		indet.	1	1	121	10	2	38.5	38.25	1	1	1	5
2232	2	15	0.70	indet.		0	0	0				0	0		
2235	2	15	0.70	indet.		0	0	0				0	0		
2236	2	15	0.70	indet.		0	0	0				0	0		
224	4		0.60	indet.	1	3	121	11	1	999	999	1.7	0.9	0	0
225	indet.	1953	1	indet.	1	1	121	14	5	59.4	22.5	3.3	1.3	1	6
2254	2	14.80	0.60	indet.		0	0	0				0	0		
226	1	4	2	indet.	1	1	121	6	1	23.9	13.4	1.4	0.9	1	6

DMSL	LS	ARS1	ARS2	LARS	VERZ	L	B	D	G	comment
0	0	25	0	2	0	0	0	0	0	
0	0	20	0	4	0	0	0	0	0	
0	0	25	0		0	17.1	0	0	0	
0	39.1	20	0	2	0	151.8	40.4	42.9	178.2	
0	0	30	0	3	1	404	33.4	29.4	140	
0	0	0	0		0	37.5	0	0	0	
0	0	0	0		0	30.5	0	0	0	
0	0	0	0		0	37	0	0	0	
0	0	20	25	1	0	134.7	10.8	6.8	9.4	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	25	0	1	0	82.6	9	7.4	5.7	
0	0	20	0	1	0	143.6	17	10.4	16.3	
0	0	20	30	2	0	142.4	16.7	9	19.2	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	25	1	0	134.6	19.8	6.7	9.9	
0	0	0	0		0	17.26	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	30	0	4	0	187	18.6	10.7	23.5	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	50.6	12.6	6.5	3.2	discarded (no tool)
0	0	20	25	1	0	170	18.4	11.7	16.3	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	19.55	0	0	0	
0	0	0	0		0	15.5	0	0	0	
0	0	25	0	5	0	191.5	19.4	12.6	35.1	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	25	0	2	0	175	21.1	9.9	29.9	
0	0	0	0		0	10.14	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	0		0	0	0	0	0	
0	0	0	0		0	106.5	11.1	6.5	5.6	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	88.1	9.4	6.2	5.4	
0	0	0	0		0	107.6	10.9	5.5	4.7	
0	0	0	0		0	0	0	0	0	
0	0	20	0	1	0	99.6	9.4	4.6	4.8	

ID	trench	NS	EW	layer	TYP	EHG	GER	KA	KF	LKR	EKR	BK	TK	KNOSPD	KNOSPP
227	1	1	9.75	indet.	1	6	121	9	2	999	15.9	2.5	1.7	1	0
228	1	1	9.50	indet.	1	3	121	15	2	999	999	1.3	0.9	0	0
2285	2	13	0.80	indet.		0	0	0				0	0		
2289	2	13	0.80	indet.		0	0	0				0	0		
229	5	15	0.90	indet.	1	1	121	4	1	28.3	13.1	1.1	0.7	1	5
2290	2	13	0.80	indet.		0	0	0				0	0		
2291	2	13	0.8	indet.		0	0	0				0	0		
23	4		0.80	indet.	1	6	100	0				0	0	0	6
230	2	14.60	0.80	indet.	1	1	121	18	1	56.8	27.8	0.6	0.5	1	2
2306	2	15.40	10.70	indet.		0	0	0				0	0		
2307	2	15.60	0.60	indet.		0	0	0				0	0		
2308	2	15.60	0.60	indet.		0	0	0				0	0		
2309	2	13.30	0.40	indet.		0	0	0				0	0		
231	4		0.50	indet.	1	3	121	6	2	999	999	3.6	1.5	0	0
2310	2	13.60	0.80	indet.		0	0	0				0	0		
2313	2	11.80	0.80	indet.		0	0	0				0	0		
2314	2	11.80	0.80	indet.		0	0	0				0	0		
232	3	0.9	5	indet.	1	3	100	0				0	0	0	0
2321	2	13.60	0.60	indet.		0	0	0				0	0		
233	2	15	60	indet.	1	6	121	9	4	999	26.6	1.3	1.1	1	0
234	2	1.20	1.60	indet.	1	3	121	14	2	999	999	2.9	2.1	0	0
2347	2	11.80	0.80	indet.		0	0	0				0	0		
2348	2	12	0.80	indet.		0	0	0				0	0		
235	3		0.70	indet.	1	6	122	5	2	999	29.3	7.2	4.3	1	0
2353	2		0.30	indet.		0	0	0				0	0		
236	3		0.95	indet.	1	1	121	12	2	44.9	27.7	1.2	0.7	1	5
2363	2	13.50	0.60	indet.		0	340	0				0	0		
237	2	15	0.80	indet.	1	6	121	10	2	999	44.1	3.2	1.9	1	0
2370	indet.			indet.		0	0	0				0	0		
238	2	4.20	0.40	indet.	2	1	994	0				0	0		
2386	2	13.50	0.70	indet.		0	0	0				0	0		
2389	2	16	1	indet.	0	0	0	0				0	0		
239	2	14.90	0.60	indet.	1	1	100	0				0	0	1	6
2390	2	16	1	indet.		0	520	0				0	0		
2391	2	16	1	indet.		0	0	0				0	0		
24	indet.	9.50	1.20	indet.	1	5	131	2	5	999	999	3.4	1.8	0	5
240	2	5	1	indet.	2	1	994								
241	2	11	0.70	indet.	1	6	100	0				0	0	2	6
242	2	15.5	0.5	indet.	1	5	121	4	2	999	999	3.7	2.2	0	6
243	surface			indet.	1	2	122	2	2	999	48.4	8	3.1	2	0
244	surface			indet.	1	4	131	2	3	37.3	17.9	6.3	2.7	1	0
245	indet.			indet.	1	2	131	2	5	999	46	6.3	1.5	1	0
246	surface			indet.	1	3	121	11	2	47	999	1.9	0.8	0	0
247	surface			indet.	1	1	121	16	2	57.9	16.5	1.6	1.3	1	6
248	2	5	1	indet.	1	6	121	8	2	47.7	999	2.9	1.5	2	5
249	2	14.80	0.6	indet.	1	1	121	14	1	52	17.3	1.5	1.5	2	5
2498	2	6	1.65	indet.		0	0	0				0	0		
25	2	18.80	0.70	indet.	1	5	131	2	5	999	999	5	0.8	0	6
250	surface			indet.	1	1	121	10	1	29.2	30.3	0.6	0.4	1	5
2509	2	6	1.70	indet.		0	340	0				0	0		

DMSL	LS	ARS1	ARS2	LARS	VERZ	L	B	D	G	comment
0	0	0	0		0	75	13.2	6.2	4.8	
0	0	0	0		0	63.2	12.6	5.8	3.5	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	107.3	10.6	5	6.4	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	30	1	0	152	24.2	9.5	20.4	
0	0	0	0		0	124	11	6.4	9.9	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	0	1	0	94.8	13.4	7.5	8.6	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	0	1	1	76.7	11.8	5.3	5	
0	0	0	0		0	0	0	0	0	
0	0	20	0	1	0	62.7	10.2	5.7	4.2	
0	0	0	0		0	108.7	10.8	5.7	6.9	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	0	2	0	93.1	18.5	8.9	7.1	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	95	9.7	5.6	3.8	
0	0	0	0		0	14.15	0	0	0	
0	0	20	0	2	0	104.7	13.2	5	5.5	
0	0	0	0		0	0	0	0	0	
0	0	20	25	1	0	145.6	17.5	7.8	10.8	
0	0	0	0		0	0	0	0	0	
0	0	50	0	2	0	0	0	0	0	discarded (no tool)
0	0	40	0	2	0	121.8	16.1	9.4	8.1	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	20	0	5	0	154.4	18.4	8.3	23	
0	0	20	25	1	0	150.9	17.4	11	20.6	
0	0	20	0	1	0	170	16.3	11.4	16.3	
0	0	0	0		0	161	15.7	9.6	22.7	
0	0	0	0		0	61.4	14.7	6.8	3.4	
0	0	20	0	3	0	73.7	13.2	5.7	2.8	
0	0	0	0		0	59.3	11.7	4.7	2.3	
0	0	0	0		0	97.6	9.3	6.1	4.4	
0	0	20	25	1	9	115.5	11.4	5.9	8.2	
0	0	20	0	2	0	100	11.1	6.4	8.1	
0	0	0	0		0	87.8	12.1	4.9	5.7	
0	0	0	0		0	0	0	0	0	
0	0	20	0	1	0	167	13.8	9.2	17	
0	0	0	0		0	91.9	11.8	5.7	5.2	
0	0	0	0		0	0	0	0	0	

ID	trench	NS	EW	layer	TYP	EHG	GER	KA	KF	LKR	EKR	BK	TK	KNOSPD	KNOSPP
251	2	10.5	0.8	indet.	1	3	100	0				0	0	0	0
252	2	15.5	0.35	indet.	1	6	121	10	6	999	8.1	3.1	2.2	1	0
253	2	15	0.35	indet.	1	6	100	0				0	0	0	5
254	1	9.5	1	indet.	1	5	131	3	5	999	999	11.3	2.8	0	5
2544	2	16	0.80	indet.		0	0	0				0	0		
255	indet.			indet.	1	1	121	1	2	0	48.6	1.4	1	2	5
256	1	10.5	1.10	indet.	1	5	121	7	5	71.5	63.7	4.9	2.4	1	0
257	surface			indet.	1	1	121	12	2	74.4	55.9	2.6	1.1	1	5
258	2	5	1.20	indet.	1	1	121	13	1	52.3	10.2	1.4	1.3	1	6
259	surface			indet.	1	1	121	9	2	39.2	999	1.6	0.4	0	5
26	2	16	0.60	indet.	1	1	131	1	3		28.3	13.4	3	1	6
260	2	12	0.75	indet.	3	1	994	0				0	0		
2607	3	17	2.10	indet.		0	0	0				0	0		
2608	3	17	2.20	indet.		0	0	0				0	0		
2609	3	1.80	2.10	indet.		0	400	0				0	0		
261	surface			indet.	1	5	121	11	2	62.8	999	2.4	1.5	2	6
2610	3			indet.		0	500	0				0	0		
2611	1	2	1.8	indet.		0	999	0				0	0		
2612	4		0.40	indet.	999	999	0	0				0	0		
2613	4		0.40	indet.	999	999	199	0				0	0		
262	2	12.5	0.5	indet.		5	121	11				0	0		
263	2	7.5	0.6	indet.	999	3	994	0				0	0		
264	2	0.7	9	indet.	1	5	100	0				0	0	0	6
265	4		0.5	indet.	1	3	100	0				0	0	0	0
266	2	9	0.8	indet.		3	199	0				0	0		
267	2	6	1	indet.	1	3	998	0				0	0		
268	2	15.80	0.80	indet.	1	5	121	4	2	999	999	4.1	1.3	0	1
269	2	15.50	0.70	indet.	1	5	100	0				0	0	0	4
27	2	15.90	0.60	indet.	3	4	994	0				0	0		
270	4		0.60	indet.	1	5	998	0				0	0		
2705	2	16	1	indet.		0	0	0				0	0		
2706	2	16	1	indet.		0	520	0				0	0		
2707	2	16	1	indet.		0	0	0				0	0		
2708	2	15.80	1.10	indet.	1	5	121	1	999		999	999	999	0	1
2709	2	15.80	1.10	indet.	1	5	432	0				0	0		
271	1	9	1.25	indet.	1	3	100	0				0	0	0	0
2710	2	13	0.90	indet.		7	400	0				0	0		
2711	2	15.5	0.80	indet.		7	400	0				0	0		
272	1	9	1.20	indet.	1	3	100	0				0	0	0	0
273	2	15.70	0.60	indet.	1	3	121	5	2	999	999	1.8	1	0	0
274	2	15.50	0.60	indet.	999	3	100	0				0	0	0	0
275	1	9	1.20	indet.	1	4	131	3	5	999	999	2.2	0.7	0	0
276	2	15.40	0.60	indet.	1	9	800	0				0	0		
277	4		0.30	indet.	1	9	100	0				0	0	0	0
2770	2	10.60	0.80	indet.		0	997	0				0	0		
2776	surface			indet.		0	0	0				0	0		
278	1	12	1.10	indet.	1	3	121	3	2	999	999	2.6	1.7	0	0
279	2	15	0.60	indet.	1	2	100	0				0	0	0	0
28	4	0.65		indet.	1	2	131	2	5	16	40.6	5.3	1.5	1	0
280	2	15	0.60	indet.	1	3	100	0				0	0	0	0

DMSL	LS	ARS1	ARS2	LARS	VERZ	L	B	D	G	comment
0	0	0	0		0	89.4	10.4	7.3	6.4	
0	0	0	0		0	68.7	9.1	5.9	2.3	
0	0	25	0	1	0	144.5	11.6	6.3	8.5	
0	0	20	25	2	0	193.6	19.4	9.4	27.5	
0	0	0	0		0	0	0	0	0	
0	0	30	0	2	0	151.5	12.5	0	0	
0	0	20	0	1	0	152.7	15.2	8.1	13.2	
0	0	20	0	2	0	149.3	12	5.6	11.3	
0	0	20	0	1	0	124.4	15.5	8.2	10.2	
0	0	0	0		0	134.8	9.1	6.9	9	
0	0	20	0	4	0	147	19.9	6.42	17	
0	0	20	25	1	9	124.3	10.5	6.5	9.6	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		1	15.1	0	0	0	refit with ID 13263
0	0	0	0		0	125.5	9.7	5.6	7.8	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0.23	0	
0	0	0	0		0	0	0	0	0	discarded (no tool)
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	98	0	0	0	not found
0	0	25	0	1	0	160	12.7	8.2	17.8	
0	0	0	0		0	134.2	12.7	10.1	11.8	
0	0	0	0		0	64.9	11.2	4.7	3.1	
0	0	0	0		0	85	0	0	0	
0	0	25	0	1	0	67.8	10.4	6.4	2.7	
0	0	0	0		0	105.7	10.7	5.3	5.6	
0	0	20	30	1	0	96	13.9	6.5	10.4	
0	0	0	0		0	82.5	20.6	9.5	16.2	
0	0	25	0	1	0	101.6	11.7	7.2	5.6	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	65.6	11.7	5.6	3.1	
25	42.1	0	0		0	257.7	63.1	41.7	285.3	
0	0	0	0		0	48	8.7	7.8	2.5	
0	3.8	0	0		0	13.05	0	0	0	
	0	0	0		0	10.5	0	0	0	
0	0	0	0		0	41.1	12.8	4.3	2.6	
0	0	0	0		0	41.5	13.4	7.8	3.9	
0	0	0	0		0	69.8	14.7	10.5	11.9	
0	0	0	0		0	36.1	10.1	4.4	1.5	
0	0	20	71	2	9	48.1	10.1	4.1	1.7	discarded (no tool)
0	0	0	0		0	39.4	8.3	6.1	2.2	
0	0	0	0		0	0	0	0	0	
0	0	20	0		0	0	0	0	0	
0	0	0	0		0	53.2	12.6	5.3	3.2	
0	0	0	0		0	63.9	13.9	5.7	5.5	
0	0	0	0		0	80.1	11	5.2	5.1	
0	0	0	0		0	58.4	10	5.6	3.2	

ID	trench	NS	EW	layer	TYP	EHG	GER	KA	KF	LKR	EKR	BK	TK	KNOSPD	KNOSPP
2801	2	7	0.90	indet.	3	7	994	0				0	0		
281	1	1	9.50	indet.	1	3	100	0				0	0	0	0
282	4		0.60	indet.	3	3	999					0	0		
283	2	5.20	0.70	indet.	1	3	131	1	999		999	999	999	0	0
284	2	15	0.60	indet.	1	5	100	0				0	0	0	1
285	4		0.60	indet.	1	3	131	2	5	999	999	3.9	1.9	0	0
286	indet.			indet.	1	3	131	2	999	999	999	999	999	0	0
287	surface			indet.	1	6	121	7	2	999	19.7	1.2	0.5	1	0
287a	surface			disturbed	1	5	100	0	0	0	0	0	0	0	4
288	2	11.5	0.4	indet.	1	5	100	0				0	0	0	5
289	2	15	0.3	indet.	1	5	100	0				0	0	0	5
29	2	4.50	0.90	indet.	1	5	100	0				0	0	1	0
290	2	10.0	0.70	indet.	1	3	998	0				0	0		
291	3	3	1.60	indet.	4	1	998	0				0	0		
292	2	13	0.6	indet.	1	3	100	0				0	0	0	0
293	2	4.5	0.7	indet.	1	3	100	0				0	0	0	0
294	4	8	1.4	indet.	1	3	100	0				0	0	0	0
295	2			indet.	1	3	100	0				0	0	0	0
296	1	11.5	1.30	indet.	1	3	100	0				0	0	0	0
297	4		1.4	indet.		2	121	7				0	0		
298	4		1.4	indet.	1	3	121	6	4	999	999	1.9	1.3	0	0
299	1	10.5	1.10	indet.	1	3	100	0				0	0		
3109	indet.	1	2.30	indet.		0	0	0				0	0		
3110	indet.	2	0.65	indet.	3	0	0	0	0	0	0	0	0	0	0
3116	indet.	0.30	1.80	indet.		0	510	0				0	0		
314	indet.	3.30	0.40	indet.		999	199	0				0	0		
3141	indet.	1.90	3.35	indet.		0	0	0				0	0		
3142	indet.	2.10	3.30	indet.		0	0	0				0	0		
3143	indet.	2.25	3.55	indet.		0	0	0				0	0		
3166	indet.	0.85	2.60	indet.		0	400	0				0	0		
3199	indet.	0.50	0.15	indet.		0	400	0				0	0		
3205	indet.	0.70	0	indet.		0	0	0				0	0		
3212	indet.	1.60	0.10	indet.		4	199	0				0	0		
323	indet.	2.10	1.75	indet.		0	0	0				0	0		
3246	indet.	2.85	0.20	indet.		0	199	999				0	0		
3254	indet.	2.60	1.10	indet.		0	521	0				0	0		
3256	indet.	2.70	0.90	indet.		4	199	0				0	0		
3258	indet.	2.70	1.80	indet.		0	999	0				0	0		
3266	indet.	0	0	indet.		0	996	0				0	0		
345	indet.	0.40	1.20	indet.		0	0	0				0	0		
362	indet.	0.90	0.65	indet.		999	199	0				0	0		
367	indet.	1.05	0.55	indet.		3	199	0				0	0		
5?1960 HV144	indet.	2.20	3.40	indet.	1	1	100	0	0	0	0	0	0	1	4
5?1960 HV149	indet.			indet.	1	3	121	7	1	999	999	2.7	2.1	0	0
5?1960 HV161	indet.			indet.	1	6	121	16	4	74.5	31.4	1.7	1.3	1	0
5?1960 HV212	indet.			indet.	3	3	998	0	0	0	0	0	0	0	0

DMSL	LS	ARS1	ARS2	LARS	VERZ	L	B	D	G	comment
0	0	0	0		0	55	21.6	5.3	3.3	discarded (no tool)
0	0	0	0		0	38.7	10.7	3.8	1.3	
0	0	0	0		0	103.2	17	12.5	16.3	discarded (no tool)
0	0	0	0		0	78.3	11.1	5.3	3	
0	0	0	0		0	96.9	10.5	8.2	8.4	
0	0	20	0	4	0	102.7	13.9	13.2	15.3	
0	0	25	0	1	0	165	28.2	20	15.4	
0	0	0	0		0	70	9.4	6.3	3.4	
0	0	25	0	2	0	82.7	23	13.7	15	
0	0	0	0		0	92.2	16.8	8.3	7.5	
0	0	0	0		0	99.2	11.4	11.1	9.8	
0	0	25	0	1	0	107.4	7.8	6.4	4.1	
0	0	0	0		0	89.7	10.5	5.5	4.9	
0	0	0	0		0	109.5	13	7.3	4.1	discarded (no tool)
0	0	25	0	4	0	81	10.9	8.7	6	
0	0	20	0	1	0	72.2	10.4	5.5	3.4	
0	0	0	0		0	57.8	9	6.6	2.3	
0	0	0	0		0	53.2	11.5	9.5	4.5	
0	0	0	0		0	53.4	11.4	7	4.5	
0	0	0	0		0	69.5	0	0	0	
0	0	0	0		0	46.8	8.1	4.8	1.5	
0	0	0	0		0	38.5	9.6	3.4	1	
0	0	0	0		0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	not found
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	not found
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	not found
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	not found
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	
0	0	0	0		0	0	0	0	0	not found
0	0	0	0		0	0	0	0	0	not found
0	0	25	0	3	0	86.2	10.3	6.5	5.7	
0	0	0	0	0	0	54.5	11.8	5.9	4.7	
0	0	0	0	0	0	120.1	11.3	6.6	8.8	
0	0	0	0	0	0	119.9	16.7	8.6	11.9	discarded (no tool)

ID	trench	NS	EW	layer	TYP	EHG	GER	KA	KF	LKR	EKR	BK	TK	KNOSPD	KNOSPP
5?1960 HV256	indet.			indet.	3	3	998	0	0	0	0	0	0	0	0
5?1960 HV62	indet.			indet.	1	5	121	3	6	999	999	1.1	0.6	0	2
5?1960 HV67	indet.			indet.	999	999	998	0	0	0	0	0	0	0	0
5?78/33	indet.			indet.	1	2	199	0	0	0	0	0	0	2	0
5?79/ 205.I	indet.			indet.	2	1	100	0	0	0	0	0	0	0	5
5?79/ 205.Ib	indet.			indet.	1	1	412	0	0	0	0	0	0	0	0
5?79/ 205.Ic	indet.			indet.	0	0	995	0	0	0	0	0	0	0	0
5?79/ 205.II	indet.			indet.	0	0	0	0	0	0	0	0	0	0	0
5?79/ 205I	indet.			indet.	1	3	131	3	3	999	999	5.8	2.6	0	0
5?94/871	indet.			indet.	1	5	131	3	5	999	999	2.2	1.4	0	6
5?94/971	indet.			indet.	1	3	131	2	5	999	999	2.6	1.9	0	6
951995/ 1212/17/23	indet.			indet.	1	2	100	0	0	0	0	0	0	0	0
951995/ 1212/33/12	indet.			indet.	1	5	121	10	2	999	24.6	0.62	0.5	0	1
951995/ 1212/65/3	indet.			upper peat	1	1	121	37	1	93.6	76.9	0.8	0.6	1	3
95F1	8			sand/peat	1	1	131	3	5	30.5	15	14.6	2.1	1	1

DMSL	LS	ARS1	ARS2	LARS	VERZ	L	B	D	G	comment
0	0	25	0	1	0	76.4	10.9	9.2	9.1	discarded (no tool)
0	0	0	0	0	0	69.3	9.7	7.3	5	
0	0	0	0	0	0	117.7	12.1	5.3	6.8	discarded (no tool)
0	0	0	0	0	0	41.6	12.5	5.5	2.5	
0	0	0	0	0	0	179.2	21.3	11.1	26.4	
24	47.7	0	0	0	0	206.7	55.4	81.2	386.3	multiple similar find numbers; recorded as 79/205.Ib
0	0	40	0	3	0	0	0	0	0	multiple similar find numbers; recorded as 79/205.Ic
0	0	0	0	0	0	0	0	0	0	discarded (no tool)
0	0	0	0	0	0	126.9	17	8.9	19.8	
0	0	0	0	0	0	112.7	17.6	7.4	12.8	
0	0	0	0	0	0	112.8	17.9	7.6	12.8	
0	0	0	0	0	0	40.4	10.2	4.7	1.8	
0	0	0	0	0	0	118.8	11.9	6.9	7.8	
0	0	20	0	1	0	237	9.9	7.3	20	
0	0	20	25	1	0	174	18.6	10.3	33.3	

Plate 1


ID 11
ID 21
ID 23
ID 24
ID 25
ID 26
ID 27
ID 28
ID 29
ID 210
ID 211
ID 213
ID 216
ID 220
ID 217
ID 219
ID 223
ID 224
5 cm


ID 221
ID 225
ID 226
ID 227
ID 228
ID 229
ID 230
ID 231
ID 233
ID 234
ID 235
ID 236
ID 237
ID 239
ID 243
ID 244
ID 241
ID 242
ID 245
ID 246
ID 247
ID 248
ID 249
ID 250
ID 252
5 cm

PLATE 3

ID 254 · ID 255 · ID 256 · ID 257 · ID 258 · ID 259 · ID 260 · ID 261 · ID 275 · ID 298 · ID 1110 · ID 1231 · ID 1232 · ID 268 · ID 276 · ID 285 · ID 297 · ID 1233 · ID 2100 · ID 1464 · ID 1861 · ID 2101 · ID 1858 · ID 2104 · ID 1546 · ID 1859

5 cm


ID 1463
ID 1678
ID 1681
ID 1682
ID 1756
ID 1857
ID 1864
ID 1919
ID 11193
ID 11678
ID 11677
ID 11862
ID 2110
ID 12134
ID 12135
ID 12253
ID 11857
ID 12520
ID 12570
ID 12676
ID 12684
ID 12686
5 cm

PLATE 5

ID 12677
ID 12689
ID 12861
ID 12850
ID 12951
ID 12898
ID 13164
ID 12899
ID 13165
ID 12900
ID 13166
ID 12901
ID 13167
ID 13270
ID 12688
ID 13182
ID 13183
ID 13184
ID 13185
ID 13265
ID 13272
ID 13173
ID 13178
ID 13179
ID 13180
5 cm


ID 13274
ID 13275
ID 13307
& ID 15277
ID 13308
ID 13743
ID 13744
ID 13771
ID 13845
ID 13854
ID 13870
ID 13874
ID 14358
ID 14766
ID 14385
ID 14764
ID 14429
ID 14769
ID 14768
ID 14926
5 cm

Plate 7


ID 14933
ID 15230
ID 15241
ID 15260
ID 15270
ID 15447
ID 15448
ID 11856
ID 15366
ID 16160
ID 15948
ID 15277
ID 16090
ID 16092
ID 15605
5 cm

ID 15349

ID 15608

ID 1461

5 cm

ID 13174

ID 2113

5 cm

ID 2112

5 cm

Plate 11

ID 12137

ID 15268

5 cm

ID 2135

ID 15324

ID 11208

5 cm

ID 15367

5 cm

ID 14436

5 cm