

Fedderingen Wurth, an Ertebølle site at the North Sea coast

Fedderingen Wurth, ein Ertebøllefundplatz an der Nordseeküste

Marcel BRADTMÖLLER*

Neanderthal Museum, Talstr. 300, D-40822 Mettmann

ABSTRACT - The site of Fedderingen Wurth LA 51 has been excavated between 1989 and 1990 by the 'Museum für Dithmarscher Vorgeschichte'. It is still the only excavated Ertebølle site on the German North Sea coast. The paper focuses on two aspects. First of all the results of the attribute analysis conducted on flint artefacts is crucial. As there are no absolute dates available, emphasis is placed on a techno-typological comparison of the material with other contemporaneous sites. The sites chosen for comparison are the well studied settlements Rosenhof and Timmendorf-Nordmole, both located at the Bay of Mecklenburg (Schleswig-Holstein). The affiliation of Fedderingen Wurth to the Ertebølle, postulated already by typological features at an early stage of investigation, was confirmed. Strong parallels, in blank and tool production and in the use of the settlement area compared to other Ertebølle sites are obvious. On the other hand, a convincing line of communication linking Fedderingen Wurth with the remains of the Swifterbant culture at Hüde I, Lower Saxony could not be detected. The second aspect of the paper deals with spatial analysis of the human activities. The interpolation of the artefact distribution features both the first undisturbed knapping spot on a German Ertebølle site and a picture of the destructive influence of the sea. Comparison to the Danish site Sindholt Nord suggests an interpretation as so called 'activity spot' or 'dinnertime camp'. The surf-model could prove that Section II, located further down slope, had been disturbed on one or several occasions by marine flood (possibly the 'Calais IV Transgression').

ZUSAMMENFASSUNG - Das Ziel der Untersuchung war die merkmalsanalytische Bearbeitung und Auswertung der Artefakte des Fundplatzes Fedderingen Wurth LA 51. Obwohl schon in den Jahren 1989 und 1990 durch Mitarbeiter des Museums für Dithmarscher Vorgeschichte untersucht, handelt es sich immer noch um den einzigen gegrabenen Platz der Ertebølle Kultur an der Nordseeküste. Untersucht wurden zwei Teilflächen von zusammen 46 m², bei insgesamt 116 m² ausgegrabener Fläche. Durch die Analyse der Verteilung der Artefakte (vor allem der Abschläge) kann in Fläche I zum ersten Mal für einen nord-deutschen Küstenplatz ein ungestörter Schlagplatz der Ertebølle Kultur nachgewiesen werden. Die Vergleichbarkeit mit dem dänischen Fundplatz Sindholt Nord legt eine Interpretation als sog. "activity spot" oder "dinnertime camp" nahe. Hierbei konnte auch zum ersten Mal eine Sequenz der Scheibenbeilherstellung und das Zielprodukt aneinandergesetzt werden. Eine gleichartige Untersuchung der zweiten Fläche ergab, dass hier die Fundschicht durch einmaliges oder mehrfaches Eindringen des Meeres (möglicherweise in Verbindung mit der 'Calais IV Transgression') gestört ist. Diese zeigt sich auch in den betreffenden Profilen. Auf Grund der Ergebnisse der Untersuchung verbrannter Artefakte können drei spätneolithisch datierende Holzkohleproben einem thermischen Ereignis zugerechnet werden, das erst nach der/den Überflutung/en stattfand. Um die schon früh erkannte typologische Zuordnung des Materials zur Ertebølle Kultur zu überprüfen bzw. zu erweitern, liegt ein Schwerpunkt des Artikels im Vergleich mit anderen, zeitgleichen Fundplätzen an der Ostseeküste. Besonders im Bereich der Grundformproduktion und der Nutzung der Siedlungsareale zeichnen sich deutliche Parallelen ab. Dagegen konnte ein möglicher Kontakt mit der Swifterbant Kultur nicht überzeugend nachgewiesen werden.

KEYWORDS - Ertebølle, North Sea coast, lithic analysis system, axe-blade production, refitting, GIS, Kriging
Ertebølle Kultur, Nord See Küste, Scheibenbeilproduktion, GIS, Kriging

Introduction

Shore lines of the North Sea have been subject of constant change during the Holocene. Due to the complexity of isostatic movements in the northern area, only the southern part of the region appears to remain isostatically stable during the Holocene (Behre

2003). Although short-term hydrological rates are mostly affected by the tides, storms can also shift the shoreline. Medium- and long-dated changes in sea level recorded in this area can be ascribed to climatic changes. These fluctuations, intensified by the shallowness of the southern North Sea basin as well as the gently inclined coast, have had significant effects on the human settlement.

Fundamental changes from the geomorphological point of view during the Holocene were the breakthrough of the English Channel (Behre 2003) and the

*bradtmoeller@neanderthal.de

flooding of a huge part of the North European plain, the so-called 'Doggerland' around 7 000 BC. The coast line shifted some 600 km further south and Doggerland became an island. Although no demographic data exist it can be assumed that the Dogger Bank was quite populated at that time (cf. Andersen 2005). Shortly after 6 000 calBC - as shown by sea-level reconstructions (Behre et al. 2002; Shennan 2000) - the area was finally lost to the sea. Recent studies (Weninger et al. in prep) indicate the possibility that Doggerland was catastrophically flooded by the largest tsunami known for the entire Holocene in the region, the sub-marine Storegga landslide (Bondevik 2005).

During this time period, sometimes referred to as the Calais I transgression (6 600-5 400 calBC), the sea level rose around 125 cm per 100 years reaching the modern coast line for the first time. Until ca. 5 000 calBC the rise of the sea level slowed down, followed again by a major terrestrial flooding, known as the Calais II transgression (Behre 2003). Sea-level rise had slowed down to ca. 14 cm per 100 yrs now. First deposits of what is known as waterlogged peat are recognised between 4 150 and 3 900 calBC (Menke 1988). During Calais III, marine and brackish sediments were deposited over wide areas of the northwestern

German coast and the Mean High Tide (MHT) appears to have reached heights of about 2 m below the actual sea level (b.s.l.). Around 3 000 calBC the first clearly verified sinking of the sea level took place. This phenomenon, known as Regression I (Behre 2003), ends with the Calais IV Transgression around 2 400 calBC. A second downshift followed, displaced by another Transgression (Dunkirk) at about the beginning of the Common Era, continuing until today.

The local environment of Fedderingen Wurth

The site of Fedderingen Wurth (lat. 54,2833333/long. 9,1333333) is located 2 km west of the village Fedderingen, in the region of Dithmarschen, close to the west coast of Schleswig-Holstein. The archaeological remains are situated on a geest ridge, formed of glacial deposits, of which the western end rises like an island in the surrounding lowland. This natural formation is commonly mistaken for a human-made dwelling mound (in German: Wurth). It is important to remember that, even though the site of Fedderingen Wurth lies more than 18 km from the coast today, for the Ertebølle people the environment was different

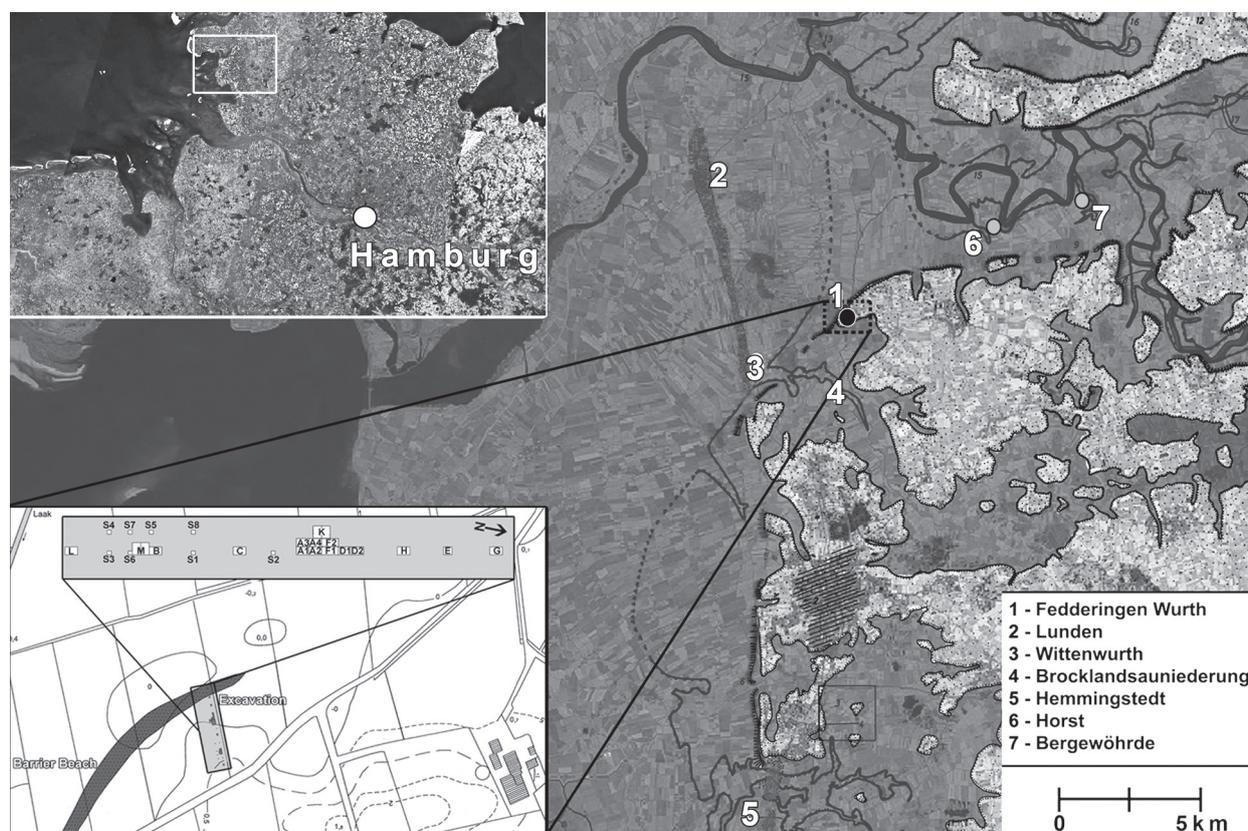


Fig. 1. Projection of a satellite image (Landsat 7) on the topographical map of the region (after Menke 1984). The gray-transparent area shows the supposed sea level around 5000 calBC. In the left corner the map of the site with an overview of the excavation sections.

Abb. 1. Projektion von Satellitenkarte (Landsat 7) auf die topographische Karte der Region (nach Menke 1984). Die halbtransparente Fläche zeigt den hypothetischen Meeresstand um 5000 v.Chr. Links unten ist eine Übersicht über die Grabungsfläche zu sehen.

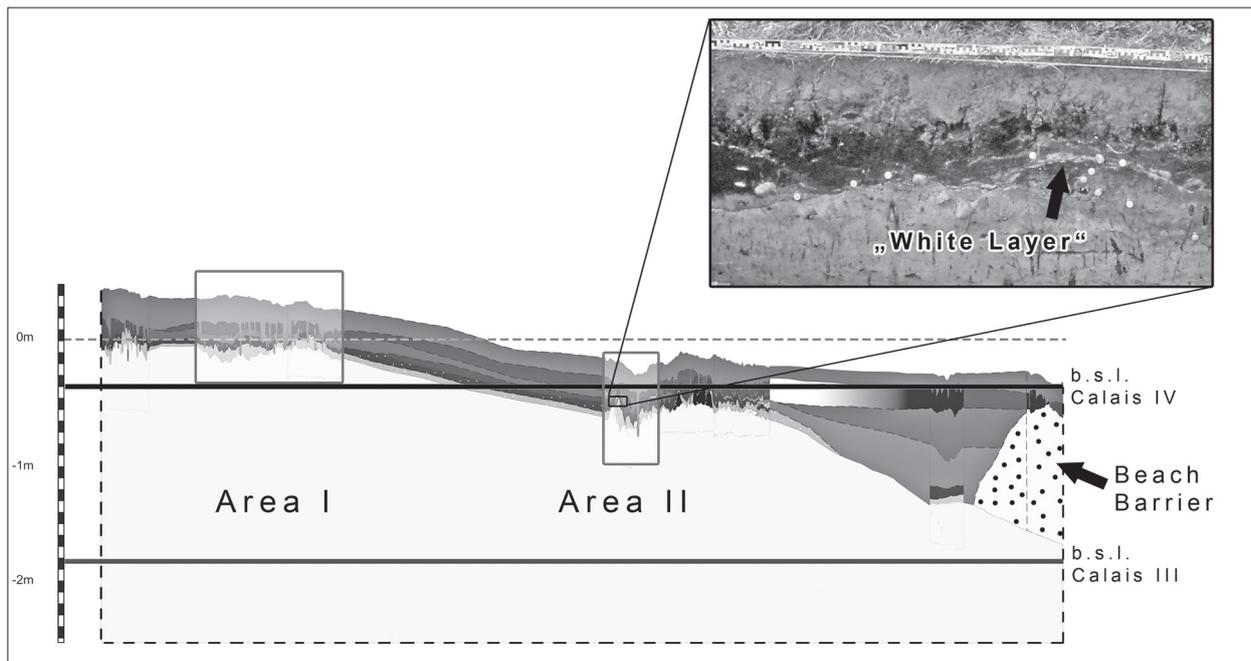


Fig. 2. Geological profile with close-up of the profile in Area II. The lower line marks the b.s.l. for the Calais III Transgression, the upper line for the Calais IV Transgression. View from East.

Abb. 2. Geologisches Profil mit Nahaufnahme des Profils aus Area II. Die untere Linie markiert die durchschnittliche Meeresspiegelhöhe der Calais III Transgression, die obere Linie die der Calais IV Transgression. Blick von Osten.

(Fig. 1). The surrounding inner *Brocklandsau*-depression, created a Fjord-like water body that reached far inland (Lübke 1991). In front of the local beach at Fedderingen Wurth stretched a several hundred meter wide area of flat water (Menke 1988).

The excavation

The site Fedderingen Wurth LA51 was discovered by Ulf Köberich during construction work on the local drainage system in 1983. Stone artefacts collected during a subsequent systematic survey of the site were identified as belonging to the Ertebølle culture (Harald Lübke, pers. comm.). Up to this time, the existence of Mesolithic sites on the German North Sea coast had only been known by isolated surface finds. The only "excavated" assemblage was recovered in 1900 by dredging work at the Watergate in Husum buried by four meters of sediment (Bantelmann et al. 1995).

As it appears from the survey data, the area covered at Fedderingen Wurth by artefacts is 200x150 m, giving a total area in the range of 3 ha (Volker Arnold, pers. comm.). It was decided to dig, under the guidance of Harald Lübke, 11 sections in the course of the eight months fieldwork. These resulted in a long profile from the bottom of the depression up to the top of the geest, with a total area of 116 m² (Fig. 2). The excavation was organized in artificial spits of 5 cm thickness. From 1990 only tools were still measured in three dimensions due to the large amount of material, everything else was recorded by units of ¼ m² per layer.

Profiles and stratigraphy

A layer of clay, peat and sand deposits of between 0,3 m to 1,8 m in depth is interstratified between the modern grey topsoil and the glacial sandridge at the bottom (Fig. 2). These are the remains of marine flooding and terrestrial bog growth from the Atlantic period. Although the difference in altitude is under two meters, the sections of the depression display a highly complex stratigraphy. Modern anthropogenic disturbances occurred only twice: a modern pit in section C, which destroyed much of the ancient stratigraphy and a 10 cm thick drainage-pipe, which is affects section A.

In section G a beach barrier was cut (Fig. 2). It consists of 80 % of flint; the interstice was filled with gravel and solid rock. A clue for the dating of this formation is provided by the artefacts below the beach barrier. They do not show any edge rounding, so it appears that the barrier was formed contemporaneously or at least proximately after the Mesolithic activities (cf. Arnold 2000).

The glacial geest ridge is sterile except for a few artefacts. Where it is not covered by the beach barrier, it is overlaid by two layers of less humous sand, altogether with a thickness of 5 cm. Most of the artefacts discovered at Fedderingen Wurth originate from these two layers and suggest, that they document the archaeological horizon (AH).

Around 2 400 calBC, contemporaneously with the Calais IV Transgression, there came a rapid rise in sea level, probably higher than the former beach barrier.

A strong disturbance of the continuous soil accumulation is indicated by a line of grey-white sand. This emerges first in the profile of section A and can be pursued up to the beginning of the shallow water zone on average D. The event that led to the deposit of this thin, partly banded, white layer of 1-2 cm disturbed all previous soil formations. As already assumed during the excavation (Harald Lübke, pers. comm.), it is probably the result of one or several storm tide events. These had impacts on the stratigraphy as well as on the distribution of the artefacts. It was the formation of the Ludener Spit after 2 400 calBC (Behre et al. 2002; Wells 1995) that prevented complete destruction of the site by further maritime influences.

The ¹⁴C dates allow a further temporal adjustment and fit well into the phase of the Calais IV Transgression. In total four samples of charcoal were dated by the radiocarbon method. Two samples were taken from the top of the humous sand (AH), which is equated with the former topsoil. Both dates gave surprisingly recent ages of 2 330 ± 95 calBC and 2 465 ± 90 calBC. Two further samples 2 055 ± 65 calBC and 3 100 ± 150 calBC from deeper layers also provided a Neolithic age. The dated material was probably discarded into the deposit later, as the abandoned site lay open for a long-time after the last human occupation.

The assemblage

The total number of artefacts is estimated to be between 16 000-18 000 items. Two areas with

different conditions of preservation were selected for analysis. Area I, with an area of 18 m², lies in the upper, supposedly undisturbed zone (sections M and B, see Fig. 4). Area II comprises 24 m² (section A). Altogether 9 876 artefacts have been analysed during this work. Flint artefacts form the largest part of it (n=9 753). Besides these finds eight other examined could be identified as hammer stones. Because of the unfavourable conditions of preservation on the sandy geest ridge, organic material is not preserved. This is the reason, why the 115 pieces of pottery are also very badly preserved.

The beginning of pottery production within the hunter gatherer societies of the Baltic region between 5 500 and 5 000 calBC is still not a clearly understood process (cf. Halgreen 2005, Hartz & Lübke 2005). The pot sherds from Fedderingen Wurth are tiny fragments. Typically for the Ertebølle culture, all are roughly tempered with quartz and fired at not very high temperatures (cf. Hallgren 2005; Hartz & Lübke 2005). The wall thickness could be measured on only 36 pieces. These range between 0,5 and 1,7 cm. Due to the small size of the pieces it was not possible to assign them to a certain type of vessel. Only one finely tempered, lightly curved piece can be identified clearly as a lamp fragment (cf. Lübke 1991).

The total number of analysed flint artefacts amounts to 9 753 pieces (Fig. 3). They were analysed by a special system (Bradtmöller et al. in prep.). The most frequent artefact forms are flakes and chips (8592). This figure includes trimming blades/flakes (175) from axe-blade production and core prepa-

	Area I	Area II	Museum DM	Analysed	Complete assemblage
Flakes (without diagnostic pieces)	3285	5132	0	8417	unknown
Core tablets	0	4	0	4	unknown
Partial Core tablets	7	22	0	29	unknown
Crested flakes (striking platform)	2	26	0	28	unknown
Crested flakes (reduction surface)	0	4	0	4	unknown
Crested blades (striking platform)	4	14	0	18	unknown
Crested blades (reduction surface)	1	1	0	2	unknown
Waste flakes axe-blade production	77	13	0	90	unknown
Blades	150	365	0	515	unknown
Cores	7	72	0	79	unknown
Art. shatter (incl. Core shatter)	68	343	0	411	unknown
Hammerstones	0	8	0	8	unknown
Tools (without axes)	22	107	25	129	ca. 350
Flake core-blade	1		0	20	20
Core axe-blade	1	2	0	7	7
Pottery sherds	3	4	0	115	115
Sum	3628	6117	25	9876	ca. 15.000-16.000

Fig. 3. Fedderingen Wurth. The assemblage (for estimation of the tools see Hartz 1999, 147).

Abb. 3. Fedderingen Wurth. Das Fundinventar (Zur Schätzung der Geräte siehe Hartz 1999, 147).

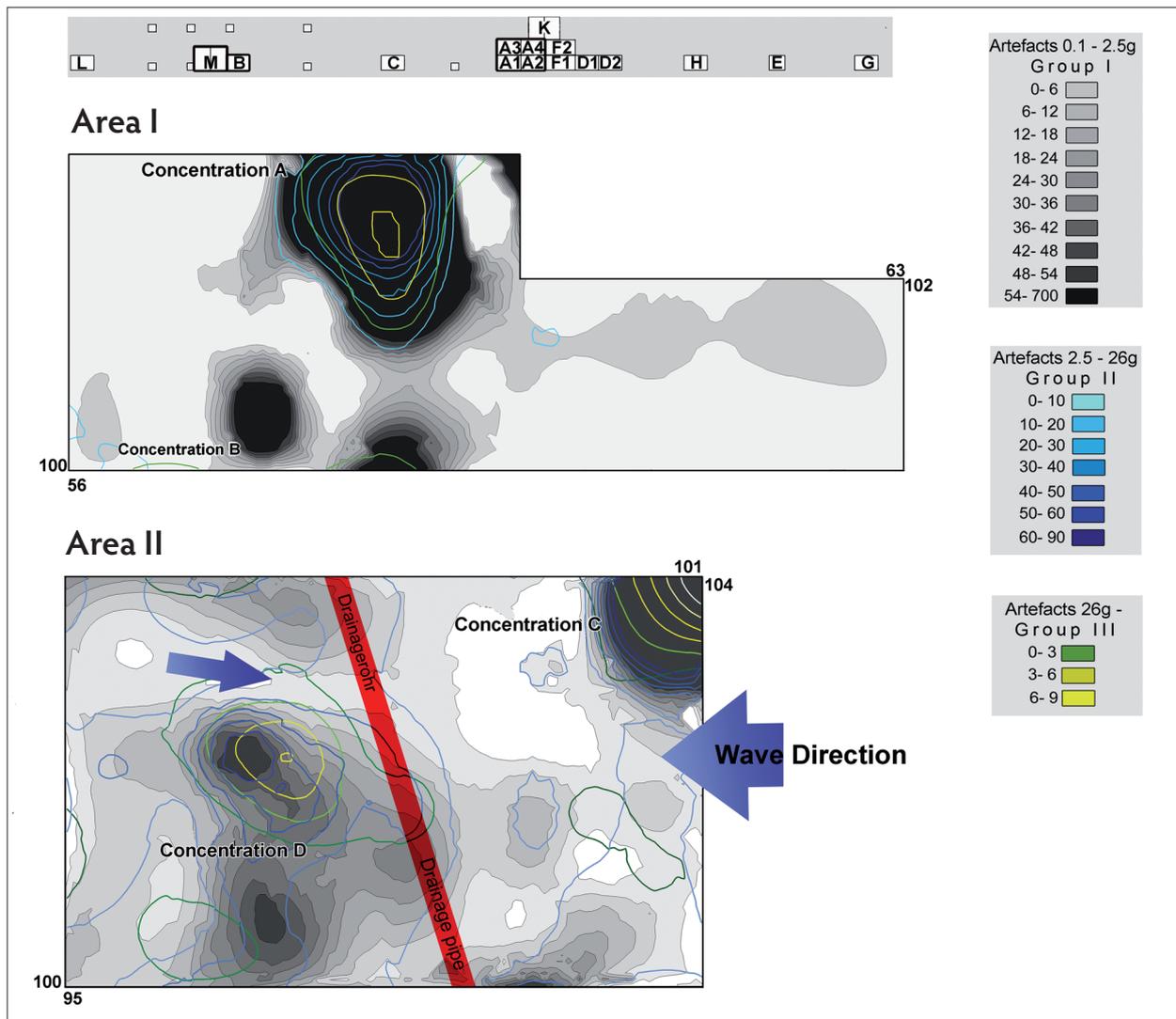


Fig. 4. Interpolation of the find scattering of all flakes, separated in three different size groups.

Abb. 4. Interpolation der Fundverteilung der Abschläge in drei unterschiedlichen Größenklassen.

ration. The second important group is formed by 515 blades. Within the tools (156), transverse arrowheads (35) and their preliminary products (36) dominate. Pieces with truncations, lateral retouch and burins/burin waste are present with 29 pieces. The flake axe-blades and core axe-blades amount to 27 pieces. Other tools are only rarely represented in the assemblage of Fedderingen Wurth.

Stone artefact technology

The reduction face of the cores and the dorsal negatives of the blades result from a unipolar technique. A bipolar technique is not recorded.

To prepare for blade production the cores were initially decorticated. The striking platform was abraded on two thirds of the blades. In later phases of the sequence many cores were turned in such a way that the old reduction face could serve as new striking platform. The cores are quite intensively exploited despite the probably good supply of raw material in

nearby Kleve. As a result of this exploitation only a few cores with blade negatives are represented. A need for simple flakes probably existed, but their use is verifiable macroscopically only for the retouched pieces. Analysis of butts, impact rings, bulbs and striking lips shows that only a small part of the blade assemblage was struck by hard-hammer percussion. Instead Fedderingen Wurth has, in contrast to other Ertebølle sites, a particular high use of indirect soft-hammer technology. The good quality of blades was verified by the analysis of the edge parallelism and the quality index (cf. Bauche 1987; Kannegard-Nielson 1985). Thus the majority of blades could be used for tool production, especially for transverse arrowheads.

Postsedimentary processes –the surf model

To analyse the artefact distribution all 8 441 unmodified flakes and chips were interpolated with the kriging method (cf. Nipper 1980). Their dimensions

were measured with a size class model (GK, cf. Arnold 1979) which was simplified into three groups (cf. Johansen & Stapert 1998): GK VII and GK VIII = group 1, GK VI and GV = group 2, GKIV to GK I = group 3. In Area I two concentrations (A and B) could be distinguished (Fig. 4). While concentration B consists of small flakes and chips only, concentration A contains all size groups and their density allocations show the same shape. Supported by an undisturbed profile an in situ situation could be postulated for this area.

In contrast to this, distribution in Area II shows some clustering too, but the boundaries are more diffuse. Completely mapped is concentration D. Only group 3 shows a clearly defined longish boundary with a strong north-south orientation. Group 1 and 2 show on the other hand a strong east-west orientation.

This can be explained by the supposed effect of the surf. The wave motion probably dispersed the smaller artefacts over the entire area. In this case, the north-south orientation resulted from the direct influence of the wave energy. The drift line of the surf, where the waves gently coasted, led to a west-east geared zone of accumulation. On larger artefacts the influence of the sea was limited and led only to a parallel small-scale wash-out in the direction of the surf (cf. Wells 1995). This difference is supported by artefact counts. In Area I the groups have values of similarity for the interpolations between 0,894 and 0,796, very close to each other. Group 1 and group 2 show the maximum similarity. For Area II the value of similarity is still very high, with a minimum of 0,685. However, this value follows the trend that already became visible in conjunction with interpolation; the groups are more dissimilar, whereby the largest difference lies between group 3 and group 1.

Therefore the value of similarity is also evidence for an impact of the sea. Because of the lack of edge rounding and the good preservation, we are dealing here in all probability with one or a few short-term events.

This surf-model is underpinned by the distribution of the refitted artefacts. In the assumed undisturbed Area I the maximum distance between two refitted artefacts is less than two meters, while the maximum gap in Area II reaches more than seven meters.

Human activity in Area I and II

Acquisition of raw material was quite easy. In most parts of the geest raw material is abundant. Less than 5 km away eroded flint nodules can be picked up from the geest cliff at Kleve. Probably the nodules were tested directly on the spot and partly decorticated. This activity is poorly documented in the excavated and analysed areas of the site.

Eight hammer stones of dense rock are documented as tools for flint knapping. Features on the blanks (bulb, butt, impact ring, etc.) prove that this technology, the direct hard percussion technique, was used during the reduction sequence in Fedderingen Wurth. As a result of poor preservation, tools for indirect soft hammer percussion (antlers), are missing (cf. Dibble & Whittaker 1981; Mateiciucova 2003). The hammer stones are roundish or oval in shape and made of quartzitic sandstone. They are found exclusively in Area II. Because of their weight it is unlikely that these artefacts were shifted over larger distance. The high numbers of cores (72 of 79), core rubble (39 of 45) and a disproportionate number of trimming flakes (70 of 84) suggest intensive core reduction in Area II.

Blade and blade fragments could be documented in Area I 150 times (altogether 515). But out of ten identified blade cores only one example originates from Area I. The fact that the average weight of the six flake cores in Area I (218 g) is 60 g higher than in Area II (159 g) and the large portion of natural surface on them makes it implausible that they are unidentified blade cores.

Another notable characteristic of Area I is the production of flake axe-blades. 77 of altogether 90 waste flakes of their production were documented in Area I. The refitted sequences show the production of at least three axe-blades. One of these sequences contains both the waste material and the axe-blade itself (Fig. 5). This is so far a singular situation in the archaeological record of northern Germany. Altogether 14 flakes could be refitted to the axe-blade. They are waste material from the trimming of the surface as well as from the lateral edges of the axe-blade.

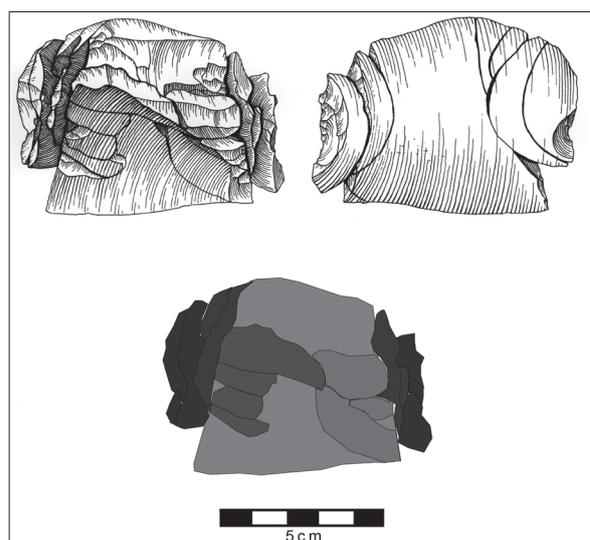


Fig. 5. Refitting flake axe-blade. Reduction sequence runs from light to dark. Illustrator A. Hebel.

Abb. 5. Zusammensetzung des Scheibenbeils. Abbaurichtung von hellgrau zu dunkelgrau. Zeichner A. Hebel.

The replacement of a broken neck fragment is documented once. Resharpener of the blade of a flake axe by a trimming flake failed and it was rejected. Apart from the flake axe-blade, only large numbers of arrowheads are also found in this concentration. This indicates a spatial separation in different zones of activities. That a part of the transverse arrowheads was probably produced in Area I is suggested by three preliminary work products and by the high ratio of broken blanks. One of the blades has a concave truncation, was intentionally broken, and has a width of 2,5 cm. This fits perfectly to a work in progress. Blades from another refit show comparable fractures at the same position. The limited extension of concentration A and the high refitting ratio suggest a short time span for these activities.

On this evidence, concentration A is interpreted as a short-term stay to complement the equipment by new tools (arrowheads and flake axe-blades) and to replace or repair old ones (core axe-blade fragment, broken arrowheads). Why a part of the produced projectiles as well as the flake axe-blade was left on the spot remains unclear.

In other parts of Area I human activities are only poorly documented. Other tools (two burins, one scraper, one laterally retouched flake) were found outside concentration A.

An Ertebølle site with a quite similar situation is Sindholt Nord at the Mariager fjord (Andersen 2004) dated to the Atlantic period. The archaeological horizon has been destroyed completely by ploughing. Although scattered in all directions, artefacts still formed a concentration of some 10x7 m (Andersen 2004, 42) with similarities to concentration A. Blade production is recorded. At Sindholt Nord, a few laterally retouched flakes also were found with the transverse arrowheads. Broken projectiles were replaced by new, locally made pieces. Further parallels are two flake axe-blade fragments. Because of its short-term character (118 artefacts), Andersen calls this site an "activity spot" or dinner time camp" (Andersen 2004, 43). In Fedderingen Wurth 20 times more artefacts were found, but this may be due the state of excavation on the one hand, and the large amount of waste from flake axe-blade production on the other hand. It seems that the prehistoric "dinner" lasted here probably a little bit longer.

Area II shows a completely different situation. Regarding 13 recorded trimming flakes the production rate of flake axe-blades seems to have been much lower than in Area I. In contrast, the high quantity of tools is suggestive of more intensive settlement activity. The distribution shows the same mixed scattering as the blanks, since these artefacts were also exposed to the surf. Five burin spalls and 30 preliminary products of arrowhead production possibly indicate that a part of the tools were manufactured in Area II.

The site of Rønbjerg Strandvolde in the Limfjord is taken for comparison (Skousen 1998). This contemporaneous site was studied both by survey and by excavations. Two concentrations were identified with dimensions of 8x10 m and 6x6 m. In both concentrations individual clusters appear. As in Area II, blade and flake production is confirmed. Numerous tools are represented and the arrowheads were made in this area. Skousen interprets the site within a supra-regional settlement pattern as regularly visited site for seal hunting (Skousen 1998, 75).

While Area I might be interpreted as the waste of maybe only one flint knapper, Area II shows more intensive settlement activity. However, the time span of activities in Area II, the number of occupations as well as the relationship between Area I und II remain unresolved.

Fedderingen Wurth in the framework of the final Mesolithic of the North European plain.

Northern Germany is a key area for attempts to understand the Neolithisation of Scandinavia (Hartz et al. 2000, 129). Whereas along the Baltic coast of Schleswig-Holstein various studies prove intensive networking with Scandinavia (Hartz et al. 2000, 148), our understanding of the same period along the North Sea littoral is still basic. As suggested by antler axes recovered from the Husumer Schleuse, and finds of Danubian axes in Dithmarschen and Nordfriesland (cf. Hartz 1999, 59) connections to the Baltic coast and the Linearbandkeramik already existed. Considering its geographical configuration, the North Sea littoral of North Germany is the perfect region to expect influence from the Swifterbant culture. However, for the site closest to Fedderingen Wurth, Hüde I (Lower Saxony), only the tool component has been studied (Stapel 1991) and a comparison of blanks and blank production with Fedderingen Wurth has not been possible until now. The data from Fedderingen Wurth show a clear affiliation to the ceramic phase of the Ertebølle culture and the stone tools and their technology support this connection. On the other hand, there is insufficient typological evidence of relations to the Swifterbant culture. The most obvious difference is displayed by projectile points. While the trapezoid forms are favoured by the Swifterbant culture (Stapel 1991, 158; Raemakers 1999, 129) they are not recorded at Fedderingen Wurth. More research on the blank production of the Swifterbant culture could help to solve this problem.

ACKNOWLEDGEMENTS: The author would gratefully acknowledge the following persons for help and assistance on the long way to the thesis and/or for short-term paper editing: A. Zimmermann, G.-C. Weniger, H. Lübke, S. Hartz, B. Weninger, V. Arnold, J. Meurers-Balke, I. Ulbricht, A. Drafehm M.A., S. Rathje M.A.,

A. Hebel, I. Schmidt, L. Clare M.A., G. Roth M.A., F. Kenkel M.A., H. Paulsen M.A., W. Lage M.A., M. Weber M.A., E. Norkus, L. Lorenz, my family and many others.

Literature cited

- Andersen, S. (2004).** Aktivitetspladser fra Ertebølletid – Dyngby III og Sindholt Nord. *Kuml* 2004: 9-43.
- Andersen, S. (2005).** En glittestok fra Dogger Banke i Nordsoen, *Kuml* 2005: 9-16.
- Arnold, V. (1979).** Tegelborg - Eine spätneolithische Ostseeküstenstation und ihre Flinttechnik. Doktorarbeit, Universität Köln.
- Arnold, V. (1990).** Die vorchristliche Westküste-Besiedlung und Nutzung. In: V. Arnold, D. Drenkhahn & D. Meier (Eds.) *Frühe Siedler an der Küste*, Dithmarschen, 47-67.
- Bantelmann, A., Oanten, A., Kuschert, R. & Steensen, Th. (1995).** Geschichte Nordfrieslands, Heide.
- Bauche, R.D. (1987).** Untersuchung zur Steingerät-Grundformproduktion der Kulturschichtenfolge vom Zigeunerfels und der Jägerhaus-Höhle. Magisterarbeit, Universität Köln.
- Behre, K.E., Kliewe, H. & Schwarzer, K. (2002).** Die Küsten Deutschlands. In: H. Liedtke & J. Marcinek (Eds.) *Physische Geographie Deutschlands*. Gotha, 323-384.
- Behre, K.E. (2003).** Eine neue Meeresspiegelkurve für die südliche Nordsee. *Probleme der Küstenforschung im südlichen Nordseegebiet*. Band 26: 9-63.
- Bondevik, S., Finn L., Harbitz, C., Mangerud, J., Dawson, A., Svendsen, J. (2005).** The Storegga Slide tsunami - comparing field observations with numerical observations. *Marine and Petroleum Geology* 22: 195-208.
- Bradtmöller, M., Drafeh, A. & Mischka, D. (in prep).** „SDS-Spagat der Steine“ - Ein allgemeingültiges Aufnahmesystem für mikrolithische und nichtmikrolithische Steinartefakte verschiedener Zeitstellungen.
- Clausen, I. (1994).** Hemmingstedt, Kr. Dithmarschen, *Offa* 51: 221-228.
- Dibble, H.L. & Whittaker, J. (1981).** New experimental evidence on the relation between percussion flaking variation. *Journal of Archaeology Science* 6: 283-296.
- Gietzelt, M. (2000).** Geschichte Dithmarschens, Heide.
- Hallgren, F. (2006).** *The Introduction of ceramic technology around the Baltic Sea in the 6th Millennium*. Internet publication, www.arkeologi.uu.se/presentation/HallgrenCTCArrival.pdf (20.11.2007).
- Hartz, S. (1991).** Hochatlantische Besiedlung in Schleswig Holstein. Ein Beispiel. *Offa* 48: 115-132.
- Hartz, S. (1997).** Frühbäuerliche Küstenbesiedlung im westlichen Teil der Oldenburger Grabenniederung (Wangels LA505). Ein Vorbericht. *Offa* 54/55: 19-41.
- Hartz, S. (1999).** *Die Steinartefakte des Fundplatzes Grube-Rosenhof, Schleswig*.
- Hartz, S., Heinrich, D. & Lübke, H. (2000).** Frühe Bauern an der Küste. Neue C¹⁴-Daten und aktuelle Aspekte zum Neolithisierungsprozess im Norddeutschen Ostseeküstengebiet. *Prähistorische Zeitschrift* 75: 129-152.
- Hartz, S. (2005).** Aktuelle Forschungen zur Chronologie und Siedlungsweise der Ertebølle- und frühesten Trichterbecherkultur in Schleswig-Holstein. *Bodendenkmalpflege in Mecklenburg-Vorpommern* 52 : 61-81.
- Hartz, S. & Lübke, H. (2005).** Zur chronostratigraphischen Gliederung der Ertebølle-Kultur und frühesten Trichterbecherkultur in der südlichen Mecklenburger Bucht. *Bodendenkmalpflege in Mecklenburg-Vorpommern* 52: 119-142.
- Hinz, H. (1954).** Vorgeschichte des nordfriesischen Festlandes, Neumünster 1954.
- Johansen, L. & Stapert, D. (1998).** Dense flint scatters: knapping or dumping? *Urgeschichtliche Materialhefte* 12: 29-41.
- Kannegaard-Nielson, E. (1985).** *Senmesolitisk Flæketeknik*. Magister thesis, University of Aarhus.
- Lübke, H. (1991).** Fedderingen Wurth. Ein Fundplatz der Ertebølle/ Ellerbeck-Kultur. In: V. Arnold, D. Drenkhahn & D. Meier (Eds.) *Frühe Siedler an der Küste*, Dithmarschen, 38-46.
- Mateiciucova, I. (2003).** Mesolithische Traditionen und der Ursprung der Linearbandkeramik. *Archäologische Informationen* 26/2: 299-320.
- Meier, D. (2001).** *Landschaftsentwicklung und Siedlungsgeschichte des Eiderstedter und Dithmarscher Küstengebietes als Teilregion des Nordseeküstenraumes – Teil 1 Die Siedlungen*. Bonn.
- Menke, B. (1976).** Befunde und Überlegungen zum nacheiszeitlichen Meeresspiegelanstieg (Dithmarschen und Eiderstedt, Schleswig-Holstein). *Probleme der Küstenforschung* 11: 145-161.
- Menke, B. (1988).** Die holozäne Nordseetransgression im Küstenbereich der südöstlichen Deutschen Bucht. *Offa-Bücher* 66: 117-137.
- Nipper, J. (1981).** Autoregressiv & Kriging-Modelle. Zwei Ansätze zur Erfassung raumvarianter Strukturen. In: M. Ostheider & D. Steiner (Eds.) *Theorien und Quantitative Methodik in der Geographie*. Symposium Zürich 26.-28.März 1980, Zürich, 31-46.
- Raemaekers, D. C. M. (1999).** The articulation of a "New Neolithic" - the meaning of the Swifterband Culture for the process of neolithisation in the western part of the North European Plain. Leiden.
- Rathje, S. (2004).** Die Steinartefakte des submarinen Küstensiedlungsplatzes Timmendorf-Nordmole, Wismarbuch, Magisterarbeit, Universität Kiel.
- Shannon, I., Lambeck, K., Flather, R., Horton, B., McArthur, Innes, J., Lloyd, J., Rutherford, M. & Wingfield, R. (2000).** Modelling western North Sea palaeogeographies and tidal changes during the Holocene. In: I. Shennan & J. Andrews (Eds.) *Holocene land-ocean interaction and environmental change around the North Sea*. Geological Society, London, Special Publications 166: 299-319.
- Skousen, H. (1998).** Rønbjerg Strandvolde – kystboplads ved Limfjord. *Kuml* 1998/1999: 29-73.
- Stapel, B. (1991).** *Die geschlagenen Steingeräte der Siedlung Hüde I am Dümmer*. Hannover.
- Vang Petersen, P. (1993).** Chronological and regional variation in the late Mesolithic of eastern Denmark. *Journal of Danish Archaeology* 3: 7-18.
- Well, J.T. (1995).** Effects of Sea Level Rise on Coastal Sedimentation and Erosion. In: D. Eisma (Ed.) *Climate change – impact on coastal habitation*. Lewis Publishers, London.
- Weninger, B., Edinborough, K., Bradtmöller, M., Danzeglocke, U., Holst, D., Jöris, O., Niekus, M. & Wagner B. (in prep.).** The Flooding of Doggerland by the Storegga Slide Tsunami.