From Lithics to Spatial and Social Organization: Interpreting the Lithic Distribution and Raw Material Composition at the Final Palaeolithic Site of Kettig (Central Rhineland, Germany)

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During the Final Palaeolithic Federmessergruppen period, a wide range of siliceous raw materials was used in the Central Rhineland (Germany). Beside materials from the immediate region, exogenous resources such as flint from up to 100 km away in the Meuse drainage area and the moraines of the Saalian glaciation were exploited. At Kettig, the spatial distribution of different lithic raw materials and analysis of several categories of burnt finds allow the characterization of the settled area in space and time. While adequate, good-quality raw material was available in the Central Rhineland, the regular use of exogenous raw materials at Central Rhineland sites also demonstrates the necessity of maintaining regular social contacts with other groups in neighbouring regions.

Keywords: FINAL PALAEOLITHIC, FEDERMESERGGRUPPEN, SPATIAL ANALYSIS, RAW MATERIAL ECONOMY, SOCIAL CONTACTS, WESTERN GERMANY.

Introduction

At Kettig, in the Neuwied Basin (Central Rhineland, Western Germany), it was possible to investigate a Final Palaeolithic Federmessergruppen site which is of importance for two major reasons. One of these is given by artefacts of red deer antler of types previously unknown for the Federmessergruppen; the other is the possibility of a detailed spatial analysis of the site, which gives new insights into the internal organization and division of a relatively large habitation area of the period some 13.2 ky cal-BP.

Furthermore, the overall spectrum of lithic raw material observed at Federmessergruppen sites in the Central Rhineland permits a final statement of general importance for human behaviour. While materials suitable for producing lithic tools were available in the region, an important amount of material was brought to the sites from exogenous sources up to 100 km and more distant. This is interpreted as reflecting regular social contacts with people in neighbouring regions, which were of great importance for small hunter-gatherer groups in a largely uninhabited landscape.

During the Pleistocene, the Central Rhineland and, in particular, the Neuwied Basin to the northwest of Koblenz, was repeatedly the scene of major volcanic eruptions. The most recent eruption occurred towards the end of the late glacial Allerød interstadial c. 12.9 ky cal-BP in what is today the Laacher See caldera (Street et al., 1994; Jöris & Weninger, 2000). The massive Plinian eruption covered the late glacial Central Rhineland landscape (Ikinger, 1996) with layers of ash and pumice (Laacher See tephra=LST), often several metres thick (van den Bogaard & Schmincke, 1985), and so protected archaeological sites from erosion and destruction. Pumice quarrying, which began in the middle of the 19th century and has been carried out on an industrial scale since the Second World War, has repeatedly uncovered well-preserved sites, especially of Allerød age.

The conserving effect of the volcanic sediments has protected not only sites of human settlement but also numerous botanical localities with preserved trees, imprints of leaves in ash layers of the LST, etc. All this allows us to draw a very detailed picture of the vegetation and environment of the final Allerød (Baales & Street, 1996; Baales et al., 1998a; Street & Baales, 1997). Generally, the Central Rhineland was a lightly forested region with aspen, birch, willow near the rivers and some pine on higher, drier grounds. The regular presence of horse at Allerød sites may also indicate more open areas, perhaps at higher elevations surrounding the Neuwied Basin.

The first archaeological investigation beneath the LST was carried out in 1883 by Hermann Schaaffhausen at the Martinsberg in Andernach. More recent excavations have been carried out there in the...
The Kettig Site

During the Allerød, the Kettig site occupied a promontory of land (the Rhine middle terrace) raised somewhat above the banks of the Rhine. A channel at the foot of the promontory was either permanently water-filled or at least occasionally flooded. A west-east oriented trial trench established that archaeological material was located not only on the promontory itself, but also extended downslope into the Rhine valley-bottom (see Figure 4). There is one conventional \(^{14}\)C-date for the site of 11,314 ± 50 yr BP (Hd-18123; B. Kromer, pers. comm., Heidelberg), carried out on bulked bones of red deer size. The data was calibrated (“converted” following Jöris & Weninger, 2000) to c. 13.2 ky cal-BP.

Unique to Kettig are two artefacts of red deer antler. One of these is a barbed point which morphologically and technologically resembles Magdalenian specimens but is defined by J. Tinnes (in Baales, in press) as an independent “Kettig type”. The other artefact is an antler hammer (percuteur), a form of tool otherwise unknown from a Federmessergruppen context. Despite the protective covering of LST, Final Palaeolithic artefacts of organic materials have only been rarely found in the Central Rhineland (Baales, 1994, 1997, 1999; Bolus, 1992; Baales & Street, 1996). This is a striking difference to the preceding Upper Magdalenian dated at Gönnersdorf and Andernach to around 15-5 ky cal-BP.

The list of large mammal species is dominated by red deer (Cervus elaphus), which is represented by a minimum of eight individuals. The remains of other large mammal species are much less common and represent fewer individuals (Table 1).

A number of remains of red and roe deer, especially teeth (particularly the analysis of the cement structure of a red deer tooth by Kierdorf [in Baales, in press]) allowed the identification of the season of occupation of the site as late summer or early autumn. The Kettig lithic assemblage is typical of the Rhineland Allerød sites. It is dominated by more than 100 short end scrapers, followed by projectile points (including both classic Federmesser points, other types of backed pieces and simple microliths), burins, truncated and laterally retouched pieces, borers and splintered pieces (pièces esquilléées). The spectrum of raw materials is generally similar to that of other Central Rhineland sites and is particularly close to that from Andernach-Martinsberg (Figure 3; see Floss, 1994). The assemblage is made not only of regionally available materials, such as Tertiary limno-quartzite and

### Table 1. The Allerød fauna from Kettig (without molluscs identified by Mania)

<table>
<thead>
<tr>
<th>Species</th>
<th>NISP</th>
<th>MNI</th>
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<tr>
<td>Perissodactyla</td>
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<td>Large bovid (aurochs?)</td>
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<td>Chamois?</td>
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<td>Red deer</td>
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<td>Roe deer</td>
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<td>Carnivora</td>
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<td>Bear</td>
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<td>Red fox</td>
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<td>Marten</td>
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<td>Rodentia</td>
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<td>Voles</td>
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<td>Insectivora</td>
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<td>Common shrew</td>
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<td>Pygmy shrew</td>
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<td>Water shrew</td>
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<td>Chiroptera</td>
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<td>Noctule</td>
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<td>Pisces</td>
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<td>Cyprinids</td>
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Identifications: Baales (1998) and Kalthoff (1998) and Krey (in Baales, in press). NISP: Number of identified specimen; MNI: Minimum number of individuals. The animals certainly exploited by man are red and roe deer, horse, a large bovid (aurochs?), a caprid (identification is correct) and beaver. Possibly exploited were brown bears, wolf, red fox, weasel, marten and the fishes, which are only represented by pharyngeal teeth.

1980s and from 1994 to 1996 (Baales & Street, 1998). Further important late glacial sites have been discovered since, especially during the second half of the 20th century, among them the well-known Late Upper Palaeolithic Magdalenian site (c. 15-5 ky cal-BP) of Gönnersdorf (see Bosinski et al., 1995). Particularly important are four major (late) Allerød settlements of the Final Palaeolithic Federmessergruppen (Schwabedissen, 1954) (Figure 1). Urban, discovered in 1966, lies to the northeast of Koblenz (Baales et al., 1998b). At Andernach-Martinsberg, an extensive Federmessergruppen horizon (Veil, 1982; Stapert & Street, 1997) overlies a Magdalenian settlement equivalent to Gönnersdorf. Niederbieber, a suburb of Neuwied, covers an area of some 10,000 m\(^2\) and is the largest site known from this period in the Central Rhineland (Bolus, 1992; Baales, 1998; Baales & Street, 1998). Kettig (District Mayen-Koblenz), which is the subject of this paper, lies south of the Rhine and was investigated over an area of 242 m\(^2\) during 6 months following its discovery in April 1993 (Figure 2).
Figure 1. Location of Central Rhineland (Neuwied Basin) Federmessergruppen sites. Settlement (large ▲): 1—Kettig; 2—Andernach-Martinsberg; 3—Niederbieber; 4—Urbar. Isolated hearth (only two were associated with artefacts, ▲): 5—Bassenheim; 6—Kobern; 7—Polch; 8—Ochtendung; 9—Meisenheim 3; 10—Nickenich. Single finds (●): 11—Meisenheim 2; 12—Thür. Human skeleton (×): 13—Weissenthurm (see Baales & Street, 1996).

Figure 2. Kettig. View of the site from the south. In the background, the Mülheim-Kärlich nuclear power plant (some 1.6 km distant) marks the south bank of the Rhine at the present day.
siliceous slate (Kievelschiefer or lydite), but also includes chaledony from Bonn-Muffendorf, some 40 km to the north (Floss, 1992), and large quantities of several types of Cretaceous flint, particularly from the Meuse region. c. 100 km to the northwest of the site (see Baales & Street, 1996). Spatial plotting of the different raw material clusters provides a range of information on the occupation history of the settlement.

### Joining the Dots? Site Formation at Kettig Shown by the Lithic Artefacts

Plotting lithic artefacts at a Stone Age site commonly reveals horizontal clusters, generally interpreted as material left over by the settlement process (mainly in the form of waste products or débitage). At Kettig, the conserving effect of pumice of the LST resting above the find horizon has preserved such evidence for the activities of the Federmessergruppen inhabitants in a more or less undisturbed condition. Although mapping lithic artefacts is one of the basic methods used in the reconstruction of occupational histories of Palaeolithic and Mesolithic sites, there is almost no consensus as to how to do this or of how to represent them on a map, a problem discussed in detail by Cziesla (1990). Here I follow Cziesla’s proposal in using an “equidistance” level for interpreting artefact distributions, and the following maps are based on this procedure.

A “equidistance” plot of the distribution of the entire flaked stone assemblage (Figure 4(a)) shows a major dense concentration of artefacts at the southwest of the site. Further concentrations with fewer artefacts can be recognized at the northeast, and a still smaller accumulation is also visible to the northwest. In contrast, the rest of the site presents an undifferentiated picture. This is due to the fact that any smaller concentrations present are “swallowed up” by the disproportionally large number of artefacts of the southwestern concentration.

In order to obtain a better resolution for potentially smaller lithic concentrations, a second plot was produced (Figure 4(b)) by dividing the site into several independent sectors (areas A–F) and using the “equidistance method” independently for each of these. The densest concentration to the southwest (area E) and the northeastern part of the site characterized by three distinct concentrations (area B) are again clearly visible. In contrast with Figure 4(a), several previously invisible concentrations of artefacts now appear. To the south (area D), a smaller concentration is visible, which “fades out” to the northeast and was unfortunately partially destroyed by LST quarrying. A further loose scatter of finds to the west (area F) shows no clear structuring and is recognizable by only a restricted number of artefacts. It is noticeable that the densest concentration of this area lies at the boundary to area E. This is an unusual distribution which is repeated by other categories of material (e.g. burins, burned artefacts). Another small concentration with a few retouched forms is found down the eastern slope of the promontory (area C), a situation hard to interpret due to limited excavation in this area. The interpretation of the northernmost part of the site (area A) is now particularly clear and a major concentration of artefacts can be recognized. Unfortunately, the southern margin of this area was truncated by quarrying.

Figure 4(b) characterizes Kettig as a site comprising various small concentrations of greatly varying density.
Plotting the artefacts by different size groups (e.g. <1 cm or 1–4 cm) merely mirrors the results for the overall distributions and will not be presented here. In contrast, plotting the different raw materials produces more interesting results and allows an interpretation of the development of individual artefact accumulations.

Figure 4. Kettig. Distribution of all lithic artefacts for (a) the entire site with an “equidistance” of $N=73$ and for (b) the artificial sub-areas (A–F) with variable “equidistances”.
A plot of the artefacts of Tertiary quartzite (Figure 5(a)) shows that the densest concentration is at the southwest of the excavation (cf. the densest concentration of all artefacts, Figure 4(b), area E). The majority of the Tertiary quartzite comprises very small chips (<1 cm). In contrast with this situation, the pronounced concentration at the northeast of the site shown by the plot of all materials (area A in Figure 4(b)) disappears completely in Figure 5(a), since this concentration consists mainly of artefacts of siliceous slate (Figure 5(b)). Further artefacts of siliceous slate are found particularly to the northeast (area B) and, much less commonly, at the southwest (area E) of the site. Siliceous slate occurs only rarely in the eastern test trench, where Tertiary quartzite dominates again.

Two clear concentrations of West European flint (Figure 5(c)) are present at the northeast of the site (area B). The most extensive of these overlaps with that of the siliceous slate at this position. Two smaller concentrations are visible to the south, one in the area of the overall densest concentration of artefacts (area E) and another to the west of this in area F. The majority of finds in the latter concentration are small, normally fire-cracked chips. They probably represent the remains of only a limited number of artefacts which were burnt elsewhere and dumped at this location where no other traces of fire were found.

A translucent type of flint can only be described as either of Baltic or Tétange type. Both materials appear very similar, although their respective source would be c. 100 km to the north in Saalian moraines or at a lesser distance in the region west of Kettig. This flint shows a very specific distribution pattern (Figure 6(a)), with two clear scatters at the northeast (area B), well outside the concentration of West European flint (see Figure 5(c)).

The distribution of chalcedony artefacts (Figure 6(c)) is also very distinct and reveals a dense accumulation again at the northeast of the site (area B), unfortunately partially disturbed by quarrying activities before the discovery of the site. Further single artefacts of chalcedony are scattered to the west and south, but the bulk of the chalcedony lies at the same location as the small northeastern concentration of West European flint (see Figure 5(c)) and peripheral to the accumulation of Baltic/Tétange flint to the north (Figure 6(a)).

In summary, several, mostly distinct concentrations of different lithic raw materials could be observed at Kettig. Such dense scatterings of débitage at Stone Age settlements are generally attributed to two primary types of activities. Firstly, they can mark the actual sites of knapping activities, i.e. the locations at which nodules were worked. A second possibility is that they represent sites ("dumps") at which material worked elsewhere was discarded or deposited.

Knapping locations are suggested as the explanation for the concentrations of artefacts in the north and northeastern parts of the site (areas A to D). These locations are mostly represented by single raw materials (especially areas A, C, D and some spots in B) and, furthermore, are situated in area B close to the hearth(s) discussed below.

The very dense concentration of lithics in area E is clearly separated from the hearth(s) in area B. Following Behm (1983), the pronounced concentration of this material and the close spatial clustering speak clearly for an interpretation as a “secondary dump”. Although a hypothetical knapping episode at this location cannot be ruled out (or recognized), the subsequent use of area E as a “dump” where lithic waste was discarded can be definitely recognized. This interpretation is supported by subsequent, more detailed spatial analyses of individual nodules of the raw materials.

The variable characteristics of the broad raw material types allow the identification of specific units ("nODULES") which can be subjected to a further stage of analysis. Three examples are given here for Tertiary quartzite. The main occurrence of a dense—in structure and colour—homogeneous, grey quartzite (Figure 7(a)) is in area B and the dense, southwestern concentration (area E). A few crested blades in area B identify the knapping area of this material, although a core of this "nodule" was not found. The presence of this distinct Tertiary quartzite in the dense concentration of area E shows that some waste, particularly flakes and chips, produced at the knapping spot near a hearth at the northeast of the site (area B) was subsequently dumped several metres away to the southwest.

A yellow–grey Tertiary quartzite with large yellow inclusions and a coarse, off-white weathered cortex shows a totally different situation (Figure 7(b)). The material is concentrated at the south of the site (area D) and practically absent from the adjacent dump (area E). The presence of two cores allows the location to be interpreted as a small knapping area at which low intensity, primary flaking activities took place. This area lies some distance away from the main, northeastern occupied area with the hearth(s) (area B) and it was therefore not "cleaned up" or significantly disturbed by subsequent human activities.

A third situation is represented by a variety of brown quartzite with yellow flecks and water-rolled cortex. This material is concentrated at the very east of the site (Figure 7(c)) and the artefacts include a roughly prepared and still viable core with a refitting flake, which was nevertheless discarded. It is believed that the knapping of the brown quartzite was one of the last activities carried out at Kettig, and artefacts were found clustered tightly together, rather than dispersed, since the site was deserted shortly afterwards. Only a single scraper of this material was found in the eastern trench some distance from the concentration. This distribution parallels that of the chalcedony (Figure 6(b)), which is therefore also associated with the last phase of site activity, an interpretation further
Figure 5. Kettig. Distribution of all lithic artefacts of Tertiary quartzite, siliceous slate and West European (“Meuse”) flint.
supported by the concentrated accumulation of this material.

**Refitting**

Although only a small amount of lithic material could be refitted, analysis of the conjoining lines provides some further interesting information on the settlement history and activities which took place at Kettig.

One hundred and twenty-two of the total of 24,098 artefacts (3,834 artefacts >1 cm) were refitted, a proportion of only 0.5% (3.18%). They form 55 refitting complexes and provide a total of 67 conjoining lines which were plotted following the system of Cziesla (1986, 1990). This gives a total of 40 sequential refits (Aufeinanderpassungen), 21 breakage refits (Aneinanderpassungen), five modification refits (Anpassungen) and one thermal refit (Einpassung eines Hitzeaussprungen). The sequential refits thus dominate. (This applies to all raw materials.)

The 65 plotted conjoining lines are mainly concentrated in two areas (Figure 8). The majority (37 lines) lies to the northeast (area B), while 18 are found to the southwest, mainly linked to the dump (area E). The two areas are connected by a c. 7.5 m long sequential refit of Tertiary quartzite, conjoining a small bladelet fragment at the southwest with a long and thick blade at the northeast (Figure 8(a)). This is representative for the transportation of material knapped at the

![Diagram of Kettig](image-url)
Figure 7. Kettig. Distribution of the larger artefacts of three raw material units ("nodules") of Tertiary quartzite. C: core; Ct: core tablet; Cb: crested blade; S: end scraper.
northeast to the dump at the southwest of the site. A conjoining line from the southwest dump extends some 8·25 m to the northwest, an area in which only a few long conjoins were recognized, and is difficult to interpret.

The northeast of the site (area B) is interpreted as the main area of site activity (as shown in more detail in the following chapter), not least due to the types of conjoins found here. While 20 of the 37 lines (54·05%) represent sequential refits (knapping), a further 17 (45·95%) are due to breaks, which suggests that subsequent human settlement activities at area B, especially “trampling”, also influenced the artefacts by breaking lithics lying on the surface.

The situation at the southwestern part of the site (area E) is different. The 12 (66·66%) sequential refits represent the disposal of series of knapped waste at the dump. Only two of the 18 conjoining lines (11·11%) are due to breaks, suggesting that, once deposited at this part of the site, the artefacts were not subsequently greatly modified as a result of human activities such as trampling.

The Question of Hearths

Unlike at the Federmessergruppen site of Niederbieber (Bolus, 1992), it was not possible to identify hearths at Kettig as small areas of recognizably burned sediment. Nevertheless, it was already possible during excavation to observe two concentrations with numerous burnt bone splinters and lithic artefacts at the northeast of the site (area B). The plot of white, calcined bone splinters (representing the burning of bones at high temperatures: Figure 9) shows that most of this material lies at the northeast of the site, with its major distribution in square 47/42. Most burnt fragments of mammal teeth as fire-cracked artefacts lie in the same area. Plotting the centres of distribution of the burnt bone, tooth and artefacts, and also of thermally altered porphyry, quartz and quartzite confirms the location of a hearth at this part of the site (Figure 10).

A few metres to the southwest of this heart is a second, less clearly defined accumulation of burnt material (Figure 10). Although many calcined bone fragments are present (Figure 9), they are here less concentrated than in the hearth and form a more diffuse scatter. The same is true for burnt tooth fragments, while burnt artefacts were very uncommon. This situation might have two different explanations:

(1) It is possible that a fire burned here (not necessarily for long time) at the beginning of the occupation of the Kettig site, before the hearth in square 47/42 was in use and the remains of the earlier hearth were dispersed and distorted by later activities on the site. In this hypothesis, the unburned material found at this part of the site (especially lithic artefacts) would have been subsequently deposited when the older hearth was no longer in use.

Figure 8. Kettig. Refitting lines of conjoining lithic artefacts. □, m² find; →, sequential refit; –·–, breakage refit; –→, modification refit; –→–→, thermal refit.
(2) Alternatively, this area contains only material intentionally cleared out (cleaning, maintenance) from the hearth in square 47/42, only a few metres to the northeast, which would have been in use during the entire settlement process at Kettig.

It is difficult to decide which hypothesis is correct, but to the author, the first one appears more plausible.

Another category of burnt material is provided by numerous fragments of quartz cobbles shattered by their repeated use as pot-boilers (Batchelor, 1979; Dittmann, 1990). Thermally altered quartz is particularly common in the same area as the majority of the burnt lithic artefacts. At the northeast of the site, they can be interpreted as the waste from the final episodes of water-heating activity around the hearth in
square 47/42 (see Figure 10). Other, more restricted concentrations of burnt quartz fragments to the south (e.g. in area E, which is otherwise characterized as a dump for lithic artefacts) can be interpreted as due to similarly discarding “exhausted” quartz fragments left over from earlier episodes of boiling using the hearth(s) at the northeast of the site.

Interlude—Locating the Tent? The “Ring and Sector” Method at Kettig

The question whether the hearth identified in square 47/42 was within or outside a dwelling structure can be investigated by application of the “ring and sector” method developed by Stapert (1992). This analysis was performed earlier in Central Rhineland Federmessergruppen contexts at Niederbieber (Bolus, 1992; Stapert, 1992), with negative results, and for two hearths at Andernach-Martinsberg (Stapert & Street, 1997), where, as at Kettig, no evident tent structures could be recognized. The analysis at Andernach showed that one hearth was inside a tent of some 4 m in diameter.

At Kettig the “ring and sector” analysis of the cores and retouched artefacts (tools), with the centre of the hearth in square 47/42 and using distance increments of 0.5 m, shows that it is not possible to recognize a “wall effect”, showing that this hearth was not located inside a tent.

Furthermore, the analysis did demonstrate that various categories of tools behave in different ways. End scrapers tend to be found closer to the hearth than projectile points, a feature already described for Niederbieber Area I by Stapert (1992: 83). As an explanation, Stapert suggests that, unlike the scrapers at the somewhat older Upper Palaeolithic sites, their location at Federmessergruppen sites does not reflect the spot of their use. Rather, the end scrapers were removed from their hafts (“hafting and re-tooling”) by softening their adhesive in a fire and discarded in the “drop zone” close to the hearth. They would also be relatively frequently burned, a situation clearly substantiated at Kettig around the hearth at square 47/42.

While the interpretation seems plausible for hearth 47/42, the absence of adhesives on a sample of five scrapers from Kettig investigated microscopically (although traces of adhesive were found on all five investigated projectile points; see Pawlik [in Baales, in press; Baales, 1999]) and the overall diffuse distribution of scrapers, in more or less similar frequencies across the entire site, might speak against its general applicability.

Occupation Division at Kettig

On the evidence of the flaked stone artefacts and, to a limited extent, on the basis of the other discussed materials, at least two phases can be identified during the occupation of the Kettig site:

1. In the area of the hearth in square 47/42, certain raw materials used for stone tool production are found in relatively discrete concentrations. Among these are a small but dense concentration of Tertiary quartzite artefacts directly to the southeast of the hearth and the vast majority of the artefacts of Baltic/Têtange flint. These artefacts are demonstrably the result of tool production around the hearth. Since the material is still very clearly concentrated (i.e. has not been dispersed by a long subsequent period of human activity) and contains numerous fire-cracked specimens, it is suggested that it represents a younger phase of the occupation of the site while this hearth was in use.

Although concentrations of artefacts of chalcedony and a particular type of brown Tertiary quartzite somewhat to the southeast are located close to the area of greatest human activity around the hearth, they are not dispersed, and it is believed that these raw materials also belong to the younger phase of settlement.

2. Concentrations of artefacts of West European flint and siliceous slate cover a larger, diffuse area to the south of the hearth in square 47/42 (Figure 5(b)). They are believed to derive primarily from an older phase of settlement, possibly centred around an associated hearth, and to have been dispersed by “trampling”, etc. during the entire succeeding phase of occupation.

The absence of artefacts of Baltic/Tétange flint, brown Tertiary quartzite and chalcedony (assigned to the younger occupation phase) in area E suggests that the dump site reconstructed here should be associated with earlier settlement activities. Burnt quartz fragments found at the dump can most probably be attributed to early stone boiling events. The knapping areas of siliceous slate, and those of Tertiary quartzite on the periphery of the site (e.g. Figure 7(b), (c)), probably also represent the older phase of occupation.

Summary of the Spatial Analysis and some General Remarks on the Raw Material Economy

This paper could only give a brief summary of certain aspects of the Federmessergruppen site of Kettig, the full analysis of which will be presented in the final publication (Baales, in press). The main emphasis was laid on the possibilities of using lithic artefact distributions for the recognition of internal site spatial organization and fine chronological division of occupation phases. It was possible to differentiate several discrete knapping areas of lithic artefacts, some of which clearly relate to a hearth, and a “dump” where numerous lithic artefacts knapped elsewhere on the site were discarded.
Site history at Kettig can be divided into two successive phases of occupation (which are, however, closely linked), the younger of which is represented by series of Federmessergruppen sites in the Central Rhineland show a striking use of exogenous raw materials (cretaceous flint obtained from sources some 80 km (and more) distant, especially those located in the Meuse drainage area (Belgium and The Netherlands) to the northwest. Although no Central Rhineland raw materials found either more diffusely across the site due to their dispersal by subsequent human activity or in a secondary dump. Apart from these insights into the spatial organization of a large Final Palaeolithic settlement in the Central Rhineland, analysis of the different lithic raw materials at Kettig allows some conclusions of a more general nature.

Final Palaeolithic Federmessergruppen sites in the Central Rhineland show a striking use of exogenous raw materials (Figure 11) for manufacturing all kinds of tools, even though good quality raw material was present locally. "Exogenous", as used here, means raw materials (cretaceous flint) obtained from sources some 80 km (and more) distant, especially those located in the Meuse drainage area (Belgium and The Netherlands) to the northwest, or from moraines of the Saalian glaciation to the north. The introduction of flint into the Central Rhineland can be observed from the early Middle Palaeolithic onwards and is particularly pronounced for the Upper Palaeolithic Magdalenian and for the Final Palaeolithic Federmessergruppen (Floss, 1994; Baales & Street, 1996).

Seasonal information for both the Magdalenian and the Federmessergruppen sites in the Central Rhineland shows the availability of large game animals as a food resource on a year-round basis. This implies that hunter-gatherers at both periods (separated by some 2 ky) were potentially able to remain all year round in the Neuwied Basin and its vicinity (Baales & Street, 1996, 1998). In this case, we need to ask why did people change location and transport exogenous materials?

It is very probable that the reason for this mobility was the necessity of maintaining regular social contacts with other hunter-gatherers in neighbouring regions. The need for such social interaction is made clear by a recent study of European population density during different pre- and protohistoric periods (Zimmermann, 1996). Data presented by Vencl (1991), based on Federmessergruppen site density in Eastern Central Europe, suggest that the population of Central Europe comprised some 0·02–0·03 individuals/km² (Zimmermann, 1996: 58), only a tenth of a thousand of the recent value. This is, of course, only an estimate, but seems to be supported by data from sub-recent hunter-gatherer societies. Even without a detailed study, one can find in Pfizenmayer (1926: 248) a notice that North Siberian reindeer hunters at the beginning of the 20th century showed a population density of some 0·04 individuals/km² (close to the data discussed here for the Federmessergruppen), although even smaller values are known (cf. Weniger, 1982: 153, 207).

In order to survive in such a sparsely inhabited Late Glacial landscape, the small hunter-gatherer groups needed regular contact with other groups. These social networks allowed hunter-gatherers to interact with other similar, local hunter-gatherer units, creating a form of higher-level “group identity”. Knowledge of and intermarriage between different local groups would in turn have provided a form of “insurance” in times of local subsistence crisis by temporarily making available regions occupied by other (now “related”) people, and also made it possible to avoid inbreeding of the “own” local group. Although established for social reasons, once in existence, the networks also enabled the exchange and diffusion of knowledge of new technological innovations and thus incidentally led to the development of archaeologically recognizable inter-regional technocomplexes (e.g. the Federmessergruppen).

In this model, lithic raw material curation and transportation was simply a by-product of the movements initiated by highly necessary regular social contacts between the Central Rhineland Federmessergruppen groups with others in neighbouring regions of Northwestern Europe. All Federmessergruppen sites in the Neuwied Basin have produced artefacts of cretaceous flint from the Meuse catchment area to the northwest. Although no Central Rhineland raw materials have yet been found on contemporary sites in Belgium or The Netherlands, a few Dutch sites of the preceding Magdalenian have produced small numbers of Tertiary quartzite artefacts (often backed bladelets) presumed to have a Central Rhineland origin (Arts & Deeben, 1987: 55 f) and brought in by people from the south.

Whereas the Federmessergruppen contacts between the Central Rhineland and the northwest have long been known, the recent recognition of Niederbieber of several nodules of Muschelkalkhornstein (Triassic chert; H. Löhr, pers. comm.) provides new evidence.
for contact on a similar scale to the region around Saarbrücken, almost 200 km to the southwest.

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