

Contact in stone: adzes, *Keile* and *Spitzhauen* in the Lower Rhine Basin¹

Neolithic stone tools and the transition from Mesolithic to Neolithic in Belgium and the Netherlands, 5300-4000 cal BC

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Abstract

This article concerns the distribution of LBK adzes and post LBK Rössen Keile in the Lower Rhine Basin. In the Rössen stage contacts are more intensive and Keile are distributed over a wide area. Two distinct spheres of influence can be distinguished. In the south of the Lower Rhine Basin no Keile are found, indicating no eastern contact with the Rössen communities in the Rhineland. In the middle and north there is an eastern, Rössen sphere of influence, visible by the distribution of Keile north of the line Amsterdam-Liège.

The function of Keile in Mesolithic territory is hard to specify. Based on wear traces an identical use as in Rössen territory can be proposed in which working wood was the main activity. They may have had a complementary role as club heads for hunting and warfare or as prestigious symbols. Repairs of shaft holes in a Mesolithic pecking technique and the presence of possible imitations in the form of Spitzhauen are indications that contacts between the hunter-gatherers and agrarian communities were limited and not direct.

Keywords: Mesolithic, Neolithic, Bandkeramik, Rössen culture, neolithisation, adzes, *hohe durchlochte Schuhleistenkeil*, *Breitkeil*, *Keile*, *Spitzhaue*, Lower Rhine Basin

1 Introduction

An intriguing aspect of the neolithisation process of Mesolithic communities north of the loess is their contact with Bandkeramik farmers and their successors. The distribution of the polished stone implements of these last communities all over the north-western European Plain can be regarded as one of the most prominent expressions of contact between these communities. This renewed overview of the 'danubian' stone implements in the Lower Rhine Area concentrates on their dimensions and repairs in relation to the distribution. It aims to specify in more detail

the role these implements have played in the interaction between the last hunter-gatherers and early farmers and their contribution to our understanding of the neolithisation process. I proposed that interaction between (ethnographic-historical) societies with a different social, cultural and economic background could provide valuable information for understanding different stages of contacts between farmers and hunter-gatherers (Verhart 2000). Some of the observed phenomena will be tested with archaeological information.

This inventory of adzes, *hohe durchlochte Schuhleistenkeile* and *Breitkeile* in the Lower Rhine Basin is based on publications and national databases: the *Centrale Archeologische Inventarisatie (CAI)* for Belgian Flanders and *Archis* for the Netherlands. The German territory is outside the scope of this inventory. The artefacts have been studied and described using publications and the data available in the central databases. Only a small number of unpublished items have been seen and studied in person, mainly for practical reasons.

While finishing this article a study of *Breitkeile* was published by Raemaekers (Raemaekers *et al.* 2011). Apparently contact between modern archaeological researchers in the Lower Rhine Basin seems to be less than between farmers and hunter-gatherer 7500 years ago. Several topics, which I wanted to present in this article are now available in print. I decided to reduce the documentary character of the duplicated topics, add remarks if necessary and concentrate on subjects not treated by Raemaekers.

2 Adzes

The hafted polished stone adze was introduced in the Lower Rhine Basin by the Bandkeramik farmers, who around 5300 cal BC settled the loess zone of the German Rhineland, southern Limburg and the Belgian Haspengouw. Stone adzes were not known in the preceding Late Mesolithic, in which period all heavy chopping equipment was made of bone and antler, as attested by the assemblage from Hardinxveld-Polderweg, phase 1 (Louwe Kooijmans 2001a). Preserved massive wooden planks, as those of the Kückhoven well, show that the LBK adzes were used to finish off the products of cleaving oak trees (Weiner 1998). The trees themselves must have been chopped down with these adzes as well, in view of the absence of stone axe blades. This option has been proven by experiments (Weiner 1986). So, adzes will have been essential tools in LBK society for chopping trees, woodland reclamation, building the large houses and modelling wood.

LBK adzes are the first implements, which found their way to the non-agrarian communities in the north, and which can be identified now as final or 'terminal' Mesolithic, and initial Swifterbant in the Lower Rhine Basin, Ertebølle in southern Scandinavia, as pointed out among others by Lomborg (1962) for Scandinavia and Brandt (1967) for Lower Saxony. The process behind their distribution in the Lower Rhine Basin and the meaning to be attached to it has however received limited attention, and mostly in not widely accessible publications (Brounen & de Jong 1988; Van der Graaf 1987; Louwe Kooijmans 1993b). It is this aspect this section will concentrate on.

2.1 LBK adzes in general

Typology and chronology

The adzes have been subject to several typological and typo-chronological studies. Initially two types were distinguished (fig. 1). When width exceeds thickness they were named flat adzes (*Flachhacke*), when thickness exceeds width shoe-last adzes (*Schuhleistenkeile*), or high adzes. Within the latter group a distinction is sometimes made between intermediate Flomborn adzes



Figure 1 Adzes can be divided in two main groups: when width exceeds thickness they are named flat adzes (*Flachhacke*) (left); when thickness exceeds width they are called shoe-last adzes (*Schuhleistenkeile*), or high adzes (right). Scale 1:1 (after Bakels 1987, Figure 1. Photo Faculty of Archaeology, Leiden).

and the higher Hinkelstein adzes (Buttler 1938; Bakels 1987; Merkel 1999). Later, subdivisions were made on the basis of metric characteristics into two groups (Schietzel 1965), six groups (Modderman 1970, 184) and finally two groups again (Dohrn-Ihmig 1983). All typologies were based on the width-height ratio, while Modderman added the absolute dimension. The wide variation, from small to large and from flat to high adzes, certainly reflects a functional differentiation, but the various types do not appear to be of chronological significance. All types occur in all phases, but it is suggested that thick adzes became more popular in the final stage of the LBK (Bakels 1987, 60; Merkel 1999).² For this reason all adzes have been treated in this study as one group.

The earliest stone shaft hole implements³

The technique of drilling stone to make a shaft hole was already known as early as in the *älteste Bandkeramik*, as demonstrated by a broken *Scheibenkeule* out of serpentinite at the settlement of Schwanfeld (Hessen; Gronenborn 1997, *Tafel* 5.9) and a single small fragment in Langweiler 8,⁴ dated to the beginning of the Rhineland LBK (Bakels 1987, 62). It however appears that the technique was only rarely applied on adzes, an early example being known from Langweiler 8 as well.⁵ In this way the perforated flat adze – in German formerly named *Plättbolzen* – was created, with a shaft hole at right angles to the edge. The perforated flat adzes became more common in the post-LBK culture groups, Rössen included (Raetzl-Fabian 1986). So their occurrence in the north will be dealt with in the next section.

Raw materials

The study of the LBK adzes has especially focussed on the origins of the exotic raw materials used for these implements (Bakels 1987; Jadin & Hauzeur 2003). These are amphibolite, basalt and fine, high-silica rocks: quartzite and lydite. The amphibolite used is a dark greenish metamorphic rock with foliated structure, a stone type, which is very resistant to blows and as such very suited for wood cutting implements. No local source could be identified for it and a provenance of these adzes to the east of the Lower Rhine Basin seems the most likely (Bakels 1987, 67). Petrographical analysis of adzes from the German Harz area proved most of these factually to have been made from actinolite-hornblende schist, which is a more precise term than the more general 'amphibolite' (Schwartz-Mackensen & Schneider 1983, 174-175; 1986). The source of this raw material should be found in the western Carpathians (Slovakia) and/or the High Balkan (Bulgaria). Quite recently mining areas and workshops have been discovered more to the west at Jistebsko in the Jizera Mountains, Bohemia, northeast of Prague (Prostředník *et al.* 2005; Christensen *et al.* 2006).

In Bavaria local sources for the appropriate rocks have been demonstrated, such as river deposits (Endlicher 1995). Altogether the amphibolite adzes originate from outside the Lower Rhine Area, with at the moment a most likely source in the Carpathians.

The other raw materials mentioned will have been quarried in or close to the region itself. The basalt adzes were made of rock from the Siebengebirge and/or Eifel. Quite a number of adzes, particularly from the later LBK stage, are made of phtanite and lydite, both black silicious quartzites. The phtanite comes from Horion-Hozémont, to the southwest of Liege, the lydite from Céroux-Mousty, south of Brussels (Caspar 1984; Bakels 1987, 68). Blanks for adzes and production debris of Céroux-Mousty lydite in the LBK settlement of Wange prove their production close to the source (Lodewijckx 1984). These adzes found their way to the east as well, as to the settlement of Darion in Hesbaye, to the South Limburg Graetheide cluster and are rare on the Aldenhovener Platte.

The contribution of non-amphibolites as raw material increases in the later stage of the LBK, especially at sites in the periphery of the LBK distribution (Bakels 1987, 63; Ramminger 2009, fig. 8).

To the north, where adzes are rare, none of the raw materials mentioned above, like actinolite-hornblende schist and lydite, are found (Beuker *et al.* 1992).

Meaning

Being an essential implement in the male domain and being made of selected and exotic stone, adzes will have been highly prized artefacts, the possession of which added prestige to their owners. So they are not only found as fragments in settlements, in the final stage of their 'biography', but in larger numbers as grave gift and in hoards.

Burial gifts in south German and Slovakian cemeteries, in which skeletal remains had been preserved, demonstrate that adzes in general were associated with men (Kahlke 1954; Müller *et al.* 1996; Richter 1968-69; Pavúk 1972; Reinecke 1978). But skeletal remains have decomposed in the Lower Rhine Basin and so analysis has to be based solely on the gift associations. Dohrn-Ihmig (1983) came, however, to the same conclusion in her analysis of the Niedermerz cemetery. Van de Velde (1979) assumed, in contrast, that high adzes in the Elsloo cemetery are male grave gifts indeed, and an indicator for prestige and status, while women received adzes as well, but especially flat ones.

Use and secondary working

Adzes have been used, worn and repaired like many other prehistoric artefacts. There are, however, not many traces of secondary working, except for sharpening of the edge by grinding and polishing. This usually resulted in a shorter length and different lengthwise section, while the cross-section presumably remained unchanged (*cf.* Bakels 1987, 70).

Some quite rare broken specimens from settlement contexts show, apart from traces of re-hafting, the scars of working in a flaking technique in an attempt to obtain a functional edge again. To that purpose the fragment was treated like flint. Judging from the unfinished pieces this flaking was not always successful (*fig. 2*).



Figure 2 LBK adzes with traces of secondary working and repair. Scale 1:1 (*after* Bakels 1987, *Figure 21, 22*, photo Faculty of Archaeology, Leiden). *left*) rehafted broken adze, Elsoo. *right*) two broken adzes with traces of flaking, Rosmeer.

2.2 Adzes outside the LBK culture area

Typical LBK adzes occur as stray finds all over the sandy plain to the north of the LBK settlement clusters of the loess belt (Brandt 1967, *Karte 1, 3, 4*). In the Netherlands 40 and Belgium 77 adzes are found outside the loess belt (*fig. 3*). Two zones can be made out in the distribution of these adzes and other typical LBK artefacts: a narrow *c.* 25 km wide inner zone, adjacent to the northern loess border, and a wide outer zone beyond up to 100 km (Van der Graaf 1987; De Grooth & Van der Velde 2005, *fig. 11.3*; Louwe Kooijmans 1993b; Verhart 2000, *fig. 1.15*). This bipartition is most obvious in the west.

Inner zone

The adzes from this zone are exclusively surface finds, without any archaeological context, but they have been found in the vicinity of mixed flint scatters from various periods at some locations in the inner zone.

The Middle Limburg Roer micro region stands out in the inner zone thanks to intensive surveys by an active amateur group. So far 13 adzes have been collected there, some have been

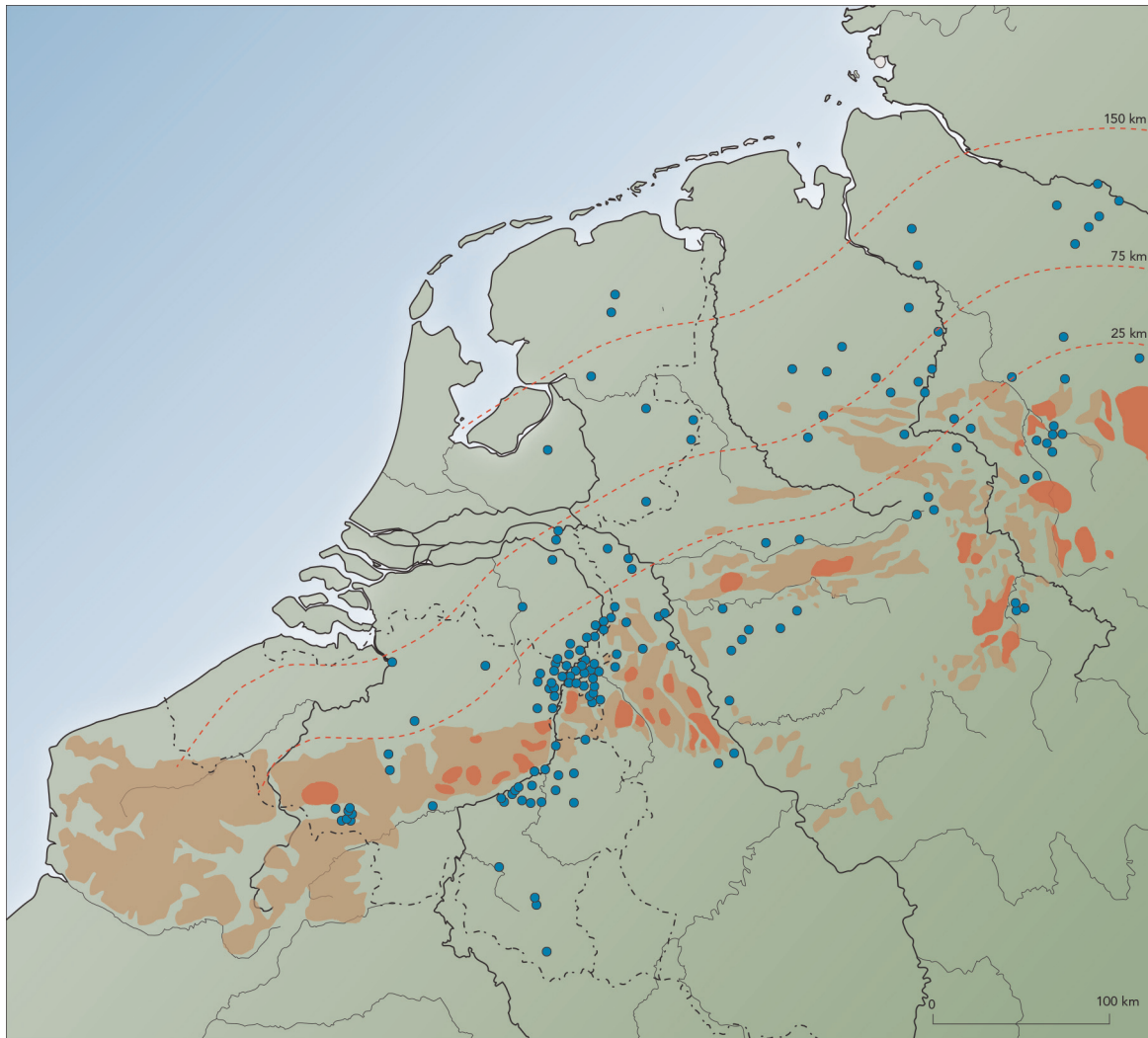


Figure 3 The distribution of adzes in the Lower Rhine Basin outside the loess and LBK settlement zone. German data after Brandt 1967; Belgian data after Jadin & Hauzeur 2003, with additions. Legend: Yellow: loess; red: LBK settlement areas; blue dots: adzes; dotted lines: distance to LBK settlement zone.

found at sites where Late Mesolithic flint has been collected, be it always together with artefacts from other periods (Verhart in prep.) There are also surface associations of LBK and Limburg pottery sherds and characteristic LBK flint artefacts in different combinations documented in this region as well. Montfort I and II, well-known alleged key sites in this region, with a complete LBK flint inventory, pottery sherds and several small adzes must however be considered as unreliable (Newell 1970, figs 14, 15).⁶

One of the most informative sites, be it not associated with adze finds, is Echt-Annendaal, overlooking a wide brook valley and partly excavated in 1984 (Brounen 1985). No recognisable soil traces have been preserved due to soil processes, but the documented small-scale find scatters have been interpreted as resulting from a sequence of various short-term activities during the LBK and Rössen stages.

Outer zone

In the Netherlands adzes have been found all along the river Meuse as far north as Nijmegen (Bakels 1987, 78). The northernmost are two (not fully reliable) adzes from the Veluwe district, c. 150 km from the loess (Schut 1991, 59). No LBK adzes are known from the well-documented province of Drenthe farther north (Beuker *et al.* 1992).⁷ In Belgium only a single specimen has

been reported at a comparable distance (75 km), found in the 19th century during construction work at Antwerp-Fort St. Marie (Jadin & Hauzeur 2003, 88-89, locus 6).

One adze provides a little more information. A sand dredging location near the village of Gassel yielded a flat adze and some Early Neolithic sherds (so-called *Begleitkeramik*) among tens of thousands of pieces of flint, ranging in age from Early Mesolithic through to Late Neolithic (Brounen & De Jong 1988; Verhart 2000, 33). Artefacts considered characteristic for LBK are, however, completely absent and it must be questioned whether adze and sherds relate to a single activity, as is suggested.

The only other LBK artefacts in this outer zone are some 30 flint arrow-heads, all isolated surface finds, in distribution overlapping with the adzes (De Graaf 1987; Louwe Kooijmans 1993b, fig. 11). An exceptional find is a typical LBK arrow-head of Rijckholt type flint excavated from the oldest level of Hardinxveld-Giessendam Polderweg, dated to 5500-5300 cal. BC. The contact must have occurred at an extremely early moment in time, since this arrow-head found its way to the west almost immediately after LBK colonists had settled in South-Limburg in 5300 cal. BC.

Outside the study area

A small number of adzes has been found in northern Germany, but it is hard to ascertain whether all these adzes are actually of LBK origin (Klassen 2004; Terberger *et al.* 2009). They date probably from the late LBK period, but some adzes may be dated to the Rössen period (Klassen 2004, 56).

It is however obvious that there have been contacts between the western part of the Baltic and the LBK, judging from the pottery. In the LBK period this concerns some small sherds that might originate from the more southerly LBK settlement centres, such as the upper reaches of the Elbe in the Altmark, at a distance of c. 150 km (Klassen 2004).⁸ There may also have been contacts over a similar distance with the LBK in the Uckermark region in the Oder estuary, also at a distance of c. 150 km (Klassen 2004, 72). These relations become stronger in the Rössen period, as can be deduced from the larger number of sites with imported pottery (Klassen 2004, 75-83).

The finds of Bandkeramik material in the western Baltic span a slightly larger distance to the LBK settlement areas than in the Lower Rhine Basin. Pottery and adzes are distributed almost equally in the western Baltic, whereas adzes are found over larger distances than pottery in the Lower Rhine Basin.

Interpretation

Several options have been considered as an explanation for the finds in both these zones: exchange with or theft by Mesolithic groups, expeditions or wanderings of LBK people to the north (for hunting, prospecting, cattle herding) or even an extension of formal LBK settlement area (Amkreutz 2010; Louwe Kooijmans 1993b, 125; Verhart 2000, 37). A more precise attribution of these options to sites and artefacts is not possible. The wider zone reflects at any rate a more extensive relation to the LBK settlements.

The sites and their find composition in the inner zone seem to be explained best as the reflection of small-scale camps of the people from the Bandkeramik settlements themselves in combination of course with exchange, theft and scavenging of left camping areas. For the first interpretation a study of the settlement pattern and land use in the LBK settlement cluster of the Graetheide plateau has made it likely that there was a shortage of pasture in the LBK habitation area on the loess (Bakels 1978, 1982), especially in the later stages when population had grown. A solution may have been the exploitation of the adjacent sand region in a form of transhumant cattle herding. Especially the site Echt-Annendaal, mentioned above, would fit this model, but

not in connection with the Graetheide LBK cluster. The pattern and composition in the Roer region continue into the Rössen stage, while there is no succession of occupation at the Graetheide plateau (Zimmermann 2009). Some rough-outs of lydite adzes found in the Roer area and in the vicinity of Neer, northwest of Roermond, support this option of small-scale camps of the LBK people (Brounen & Peeters 2009).

3 Perforated Rössen Keile

3.1 Introduction: heavy duty implements

The successors of the Bandkeramik people extended the already known but not widely practised technique of stone perforation to high adzes of large dimensions and so developed the heavy 'perforated high shoe last adze' and the slightly less sophisticated *durchlochte Breitkeil* or 'perforated broad wedge'. These implements have a wide distribution over the Dutch and North German plain, outside the known distribution area of the Rössen culture.

It is first of all remarkable that the receiving Swifterbant and Ertebølle communities managed to obtain these implements, which were highly valued by their producers, and that in considerable numbers, and not only the 'left-overs', but also first rate quality implements. However the extreme long ones, in the Rössen area probably used in a more social/ceremonial manner, are totally absent. The producers derived prestige from the exotic material and for the receivers the new forms and technology may in this perspective be added, apart from utilitarian use. How were they obtained? What may have been given as counter value? To what extent may we consider the transaction as a reciprocal exchange relation? To what counter values? May the wider distribution indeed be viewed as a down-the-line exchange or should we consider alternatives? A major drawback in answering such questions is the lack of find contexts. Most information has to be distracted from the artefacts themselves, from their dimensions, traces of use, secondary working, find locations and distribution patterns.

3.2 The Keile in general

Typology

Generally in the Hinkelstein-Großgartach-Rössen complex two main types of heavy perforated implements are distinguished: the *hohe durchlochte Schuhleistenkeil* or 'perforated high shoe last adze' and the *durchlochte Breitkeil* or 'perforated broad wedge' (Brandt 1967; Klassen 2004; Raemaekers *et al.* 2011; Van der Waals 1972). (fig. 4). Both are characterized by a conical shaft hole near the butt end and parallel to the cutting edge. The butt varies in shape and may display modest to severe use damage.

The *hohe durchlochte Schuhleistenkeil* has a D-shaped cross-section and one symmetry axis at a right angle to the cutting edge and the shaft hole. The thickness/width ratio exceeds 1:1. 'Width' is defined at right angles to the axis; 'thickness' or 'height' is parallel to it, as with LBK adzes.

The *Breitkeil* has a more or less rectangular cross-section and a symmetry axis parallel to the shaft hole and the cutting edge. The width – in this case defined as the dimension at a right angle to the axis (!) – exceeds thickness. The symmetry is, however, rarely perfect, probably as a result of use wear, damage and repair.

There have been several attempts to create finer subdivisions. The *Keile* have been subdivided into triangular and *bügeleisenförmige* (flat-iron) specimens (Brandt 1967, 1995; Lönne

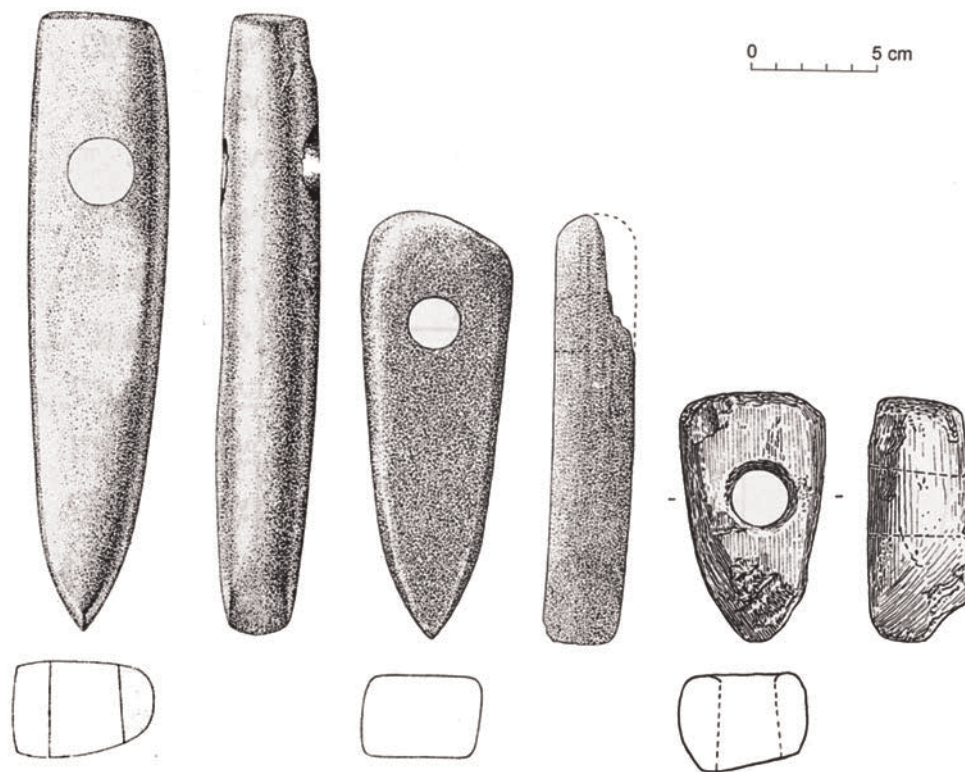


Figure 4 From left to right: *hohe durchlochte Schuhleistenkeil* from Emmen-Bargererscheidenveen and *Breitkeile* from Oud-Schoonebeek and Spijk. Scale 1:3 (after Van der Waals 1972, Tafel 42, 43).

2003). The latest contributions in this field are the studies by Merkel (Merkel 1999) with 6 types and Klassen with 15 types (Klassen 2004). Major drawbacks of these detailed typologies are the low numbers per type and the fact that the present shape of the artefact is the end of its 'biography'. Most of them have been used, reworked and finally discarded as worn implements. Especially the *hohe durchlochte Schuhleistenkeile* changed in appearance by these processes. Often it is not possible to secure whether the implement originally was a *hohe durchlochte Schuhleistenkeil*. The longer the *Breitkeil* has been used, the shorter it will be and the more the length:width ratio will increase.⁹ The cross-section is, however, much less affected by use, and so the distinction between the 'perforated high shoe-last adze' and the 'broad wedge' certainly has sense (Raemaekers *et al.* 2011, 3-5).

In this paper both main types have been taken together under the collective term *Rössen Keile* or '*Keile*' for short, and are considered to represent the period between the LBK and the Michelsberg culture, 4950-4300 cal BC.

Dating

The *hohe durchlochte Schuhleistenkeile* are well dated to the post-Bandkeramik period from c. 4950 onward, since they are regularly found as grave gifts in Hinkelstein and Grossgartach cemeteries and are fully absent in LBK contexts (Farrugia 1992; Goller 1972; Lichardus-Itten 1980; Lönne 2003; Meier-Arendt 1975; Spatz 1999). The same applies to the *durchlochte Breitkeile*. This type gradually replaced the earlier one, but both seem to have been in use side by side for a long period and are generally considered to get out of use before the development of the Michelsberg culture (Lönne 2003; Raetzl-Fabian 1986). *Keile* seem however to continue for

some centuries in the northern Swifterbant communities, as for instance demonstrated by fragments originating from one *Keil* at Swifterbant S3, dated c. 4300-4000 cal BC (Raemaekers 1999, 27).¹⁰ Also in northern Germany and southern Scandinavia the use of *Keile* continues until ca. 4000 cal BC (Klassen 2004, Abb. 32). In eastern Holstein they were deposited in a restricted time span at the end of the fifth millennium BC (Hartz *et al.* 2011).

Raw material

The majority of *Keile* is made out of the same actinolite-hornblende schist as the LBK adzes, with possible primary sources in the western Carpathians (Slovakia) and the High Balkan (Bulgaria), as revealed in the research by Schwartz-Mackensen and Schneider (1986, 29, 33; 1983, 174-175) mentioned earlier. The workshops, as mentioned before in the section on raw materials for the LBK adzes, have been discovered more to the west at Jistebsko in the Jizera Mountains, Bohemia, northeast of Prague (Prostředník *et al.* 2005; Christensen *et al.* 2006).

Besides these imports more local rocks were used as well. The majority of *Breitkeile* in south-eastern Lower Saxony are made of amphibolite, but greywacke, diabase, granite and basalt occur as well (Lönne 2003, 166, 173).¹¹ In the Dutch province of Drenthe 2 out of 15 of the *Keile* found had been made from gneiss, possibly derived from the local boulder clay deposits, all others are made of amphibolite and amphibolite-like rocks (Beuker *et al.* 1992).

Production and acquisition

Hoardings are wide-spread over Central Europe and may comprise various implements in different stages of working, from roughly worked blocks with and without shaft hole to completely finished specimens. Well-known examples are the Čištěves hoard in Bohemia (Venčl 1975) and the Schladen hoard in Lower Saxony (Lönne 2003, Abb. 80). They demonstrate that the *Keile* have not been distributed ready-made, but as raw material and rough-outs, at least into Central Europe. The rough-outs usually received further working in the settlements. An exceptional find in the Lower Rhine Basin is a fully pecked rough-out with traces of sawing in a Rössen settlement at Maastricht-Randwijck. It is a clear indication of in situ working, but similar examples from abroad are not known or have not been published (Louwe Kooijmans 1988, 2005, fig. 12.7). On the other hand part of the *Keile* could have been made out of already shaped and finished artefacts to adapt to local traditions. The basic form was obtained by occasional sawing, by pecking and grinding, but the final finish quite often was incomplete. Traces of the original pecked surface and traces of working, such as saw cuts, are either only partially ground off or still clearly visible.

At last the conical shaft hole was made with the aid of a hollow drill. A hollow was made first by pecking, where the wood or bone drill head was placed. This preliminary treatment can be deduced from the pecked surface at the rounded edge of the shaft hole that is still visible on some specimens. Experiments, too, have demonstrated the importance of this preliminary treatment (Lessig 1999; Vosgerau 1983-84). Subsequently the drilling was executed, probably with the aid of a drill bow in order to obtain a high speed. By adding water and sand a shaft hole was drilled. Experiments have demonstrated that in a hard type of rock like diabase a drill depth of 8 mm could be reached in 80 minutes. A shaft hole in a *Breitkeil* with a depth of 40 mm could be made in a single day (Vosgerau 1983-84). Drilling with a hollow bone drill on location is illustrated by the large numbers of drill cores in the settlement waste at the Rössen settlement sites (Lönne 2000). The perforation was, however, not always successful to judge from the number of discontinued perforations.

Hafting

The dimensions of the conical shaft holes range from 11-15 mm to a maximum (and quite normal) of 32-35 mm (Lönne 2000; Merkel 1999).

Recovered remnants of handles provide information about the hafting technique. A *Breitkeil* with a wooden handle is known from the excavations at Hüde I (Deichmüller 1965). The handle was made of hazelwood. The renewed investigation in 2000 and 2001 at Rosenhof site LA 58 yielded a *Breitkeil* with a remnant of the handle in the shaft hole, made of rosewood (Hartz 2004, 70, *Abb.* 4).

A striking aspect is the relatively narrow shaft hole in relation to the weight of a *Breitkeil*. The types of wood recovered (hazel and rose) are not particularly known for their application in handles. Usually a type of wood is selected for its particular favourable qualities. Hence (Neolithic) axe handles have preferably been made of ash (Louwe Kooijmans & Kooistra 2006, 234). The handles of *Keile* differ in this respect.

Function and use

Many functions for the *Breitkeile* have been suggested in the course of time, ranging from plough coulter or ard share, to battle axe, hack, axe and wedge (*e.g.* Buttler 1937, Mariën 1948, Raemaekers *et al.* 2011; Van der Waals 1972). Most have been refuted and need no further discussion. As the main options the various forms of woodworking are left. Being the successors of the LBK adzes, in stone type used, in morphology and in social prestige one is inclined to consider a similar function, but then in a different execution.

A major condition for the effectiveness of an artefact as a cutting or chopping tool is symmetry. In general this condition is fulfilled, be it that both types have a different symmetry: that of adze and axe. The shaft hole is, however, rather narrow and so the haft not suited to swing the hafted *Keil* as a normal axe or adze. This has been demonstrated by experiments, in which *Breitkeile* were used as a wedge to cleave wood and as an axe. In most instances the tools turned out to be quite ineffective (Lessig 1999; Meier 1990; Raemaekers *et al.* 2011; Vosgerau 1983-84). It was demonstrated that a 260 mm long *Breitkeil* could be used for cutting into a chopped down tree, but precision proved to be quite low (Meier 1990). This was attributed to the large weight of the axe blade. Additional problems were swinging the blade and securing the handle in the shaft hole and consequently chopping down a tree was almost impossible. It is perfectly clear that these experiments did not copy the real use. In the experiments undertaken by Raemaekers two *Breitkeile* were broken while felling a tree (Raemaekers *et al.* 2011, 9).

This brings us finally by a frequently suggested interpretation that *Breitkeile* have been used as wedges for cleaving wood. There are however not so many experiments carried out to test several options (Böhm & Pleyer 1990; Meier 1990; Raemaekers *et al.* 2011), but the damage, especially at the butt end, may be a clue for its utilitarian function, but as far as known, no (microscopic) use wear study has been executed. The wedge could be placed and held in the proper position by means of the handle.

The length of *Breitkeile* will have decreased due to use. Most damage has been found at the cutting edge and butt (Raemaekers *et al.* 2011, 9-10; Van der Waals 1972, 159-160). The damage, especially of the cutting edge, has mostly been counteracted by grinding. The butt however very often has not been reworked, as a consequence of which damage caused by heavy strokes has remained visible. This implies that the location of the shaft hole in relation to the butt, and the distance between shaft hole and butt, are original and not changed by later repair activities.

Traces on the butts show that a large number of the *Breitkeile* are used. These wear traces varies from incidental impacts to severe ones caused by hammering. The last are however rare. This implies that cutting and cleaving wood seems to be the main activities employed with

these implements. The stone wedge could in this last option be placed in the proper position by means of the handle.

Within the group of *Keile* some perforated axes are standing out because of their exceptional length, often in combination with a rather narrow shaft hole. Some are over 40 cm long. They are only found in the Rössen occupation area, mainly in hoards (Raemaekers *et al.* 2011, 18, fig. 8 and 9). This raises the question whether *Keile* had also a non-utilitarian function. In other words did they play a role in the social domain as ceremonial axes? A clay figurine from Szegvár-Tüzköves, Hungary (Tisza Culture) of a man with a large perforated axe over the right shoulder may be a illustration of this (Trogmayer 1990).

In the Rössen culture area *Keile* are also found in graves. They are frequently recovered from male graves which indicate that they can be regarded as personal items of the deceased (Raemaekers *et al.* 2011, 16). In that respect a social connotation can also play a role.

3.3 *The Keile outside the Rössen culture area*

Distribution

Van der Waals (1972) was the first to make an overview of the finds in the Lower Rhine Basin, inspired by the publications on southern Scandinavia (Lomborg 1962) and Lower Saxony (Brandt 1967) and by the discovery of the first Swifterbant sites in the Dutch central polder district. The rather dense distribution offered for the first time a view on the widespread occupation by communities now known as 'Swifterbant', at that time only known from the site Hüde I at the Dümmer and the Swifterbant discoveries themselves. Van der Waals observed that 22 out of 28 specimens with reliable find circumstances had been found in or close to low-lying areas or rivers.¹² He saw this correlation as reflecting a preference for the occupation of these zones, which could be understood in view of the supposed coverage of the upland with a dense forest in these times.

The distribution map of Van der Waals was supplemented by Raemaekers (1999, 104, App. 4) and expanded with the Lower Saxony and Rhineland data (Louwe Kooijmans 1993b; Verhart 2000). The most recent detailed distribution map is provided by Raemaekers *et al.*, but with the exception for the Netherlands of the province of Limburg (Raemaekers *et al.* 2011, fig. 10). The number of *Keile* in Netherlands is much higher than in Belgium and the complete implements dominate (Table 1).

Belgium	Netherlands	total	
Fragments	0	20	20
Complete (no dimensions)	6	10	16
Complete	10	83	93
Total	16	113	129

Table 1 The number of *Breitkeile* by country divided in fragments and complete artefacts with and without known dimensions

Two patterns can be made out in the overall distribution of the *Keile* (fig. 5). First there is a rather even spread all over the northern part of the Lower Rhine Basin, continuing in western part of northern Germany (Brandt 1967, *Karte* 2, 6; Klassen 2004, *Abb.* 31). In the central part of northern Germany, Denmark and southern Sweden the find density also decreases to the north, but more zones with concentrations are visible in contrast to areas with hardly any finds (Klassen 2004, *Abb.* 31). Exceptional is the concentration around Hamburg, which is probably the result of purchasing from antique dealers who claimed that the finds were originating from

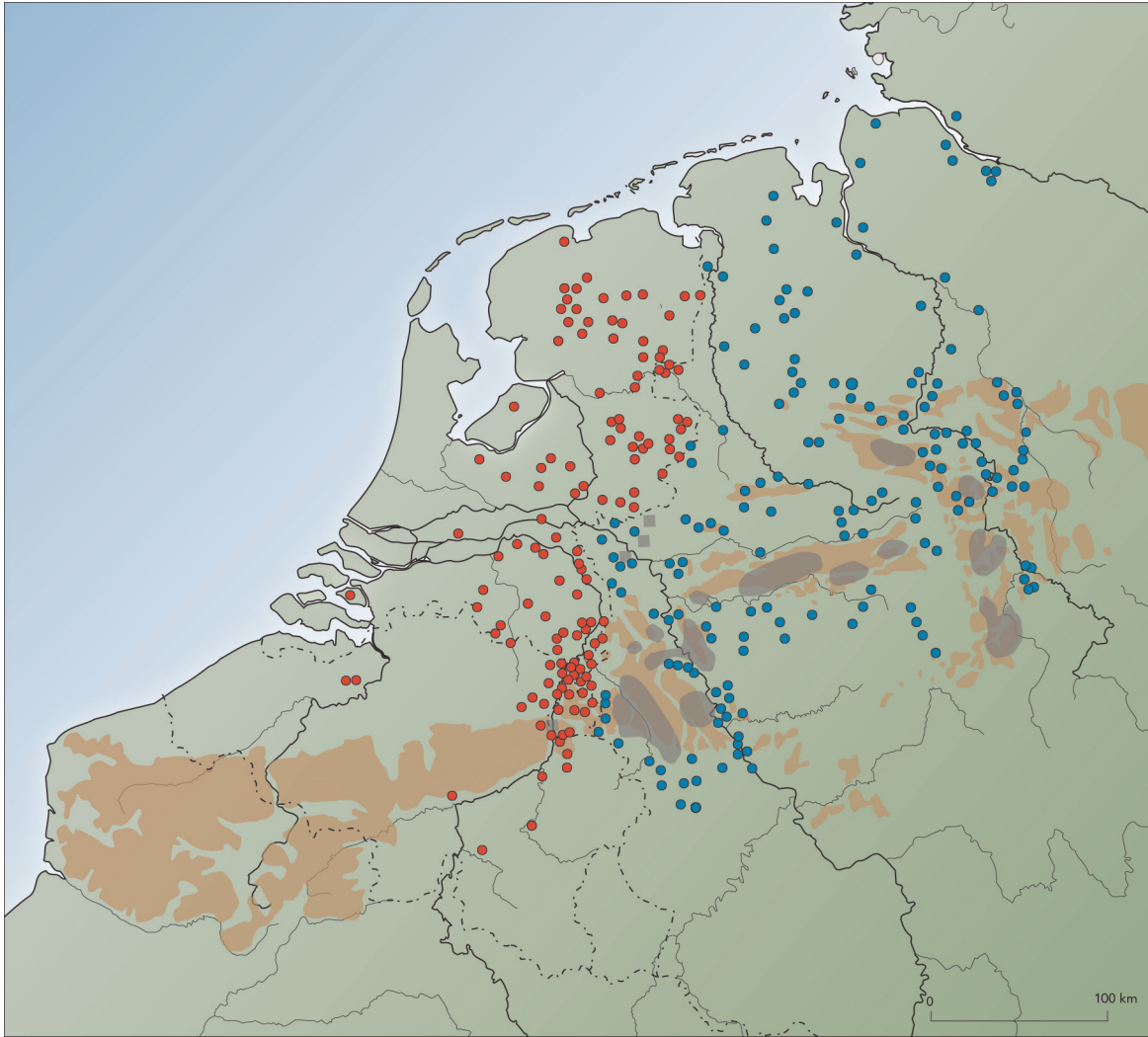


Figure 5 Distribution of Rössen Keile in the Lower Rhine Basin. German data (blue) after Brandt 1967. Dutch data and Belgian (red) after Van der Waals 1972, Raemaekers 1999, Verhart 2000, with additions. Legend: Yellow: loess, Red: Rössen Culture settlement areas.

the river Elbe. The concentration in the province of Limburg may relate to the short distance to the Rössen settlement zone.

The distribution shows secondly a sharp boundary to the west, with only a few finds west of an imaginary line Amsterdam-Liège. The unfavourable recovery conditions for stray axes in the Holocene wetlands of the western Netherlands will play a part in the north. The quasi absence all over Belgium to the west of the Limburg Meuse zone may relate to the different culture sphere: Blicquy in the west and Rössen in the east, each with northern contact spheres of their own. Long lasting north-south relations have been demonstrated in the western (Blicquy and its successors) sphere for the period 5500-3500 cal BC for settlement sites in the Rhine/Meuse delta, in the form of raw material acquisition and artefact typology (Louwe Kooijmans 1993a). They cannot be visualized on the map, since no implements comparable to the *Keile* had been involved. But it remains intriguing that (prestigious?) implements, which found their way so far north in the eastern sphere, were apparently not appreciated as such at a relative short distance to the west.

Find conditions, context

The divergent ratios between complete and fragmented *Keile* in different regions are to some extent determined by settlement research, but seem to reflect for a great deal different ways of use and handling *Keile*.

In the Lower Rhine Basin *Keile* have been found almost exclusively isolated and as surface finds (Raemaekers *et al.* 2011). Fragments are relatively rare, partly because these are less easily recognized by a layman. In contrast to the other areas considered, hardly any evidence for their use has come to light in the large-scale excavation of Late Mesolithic/Early Neolithic sites conducted in recent years. Both in Hardinxveld-Giessendam-De Bruin and Hoge Vaart these artefacts have not been found (Louwe Kooijmans 2001a, 2001b; Hogestijn & Peeters 2001). Of course the low number of excavated sites in the Lower Rhine Basin compared to the higher number in Scandinavia can also be of relevance in this conclusion. There is only one distinct fragment from Swifterbant-S3¹³ and two complete specimens have been recovered earlier at Hüde (Deichmüller 1965, 10). The quasi absence of fragments in the Dutch sites may be related to their marginal western position in the Rössen sphere, mentioned above. We may, however, conclude that *Keile* were treated in a different way than in the other regions, and perhaps were used more off site.

In Denmark many more settlements have been excavated and almost half of all broken specimens derive from these sites (Klassen 2004, *Fundliste* 1). The fragments are relatively large pieces (>5.5 cm).

The find conditions in the Rössen culture area itself are quite different, as has been well documented for the south-eastern part of Lower Saxony by Lönne (2003). *Keile* are found in settlements in worn condition and as fragments, demonstrating their intensive use at the settlement location itself. They are found off-site mainly as stray finds in Lower Saxony. Others have been grave gifts or were found in hoards. These last categories reflect, apart from their utilitarian function, also their symbolic importance.

Dimensions

Judging from hoard finds and seemingly unused specimens pristine *Keile* may have reached a length of 350-400 mm, but a length of *c.* 300 mm seems more normal practice.¹⁴ However the width of *Keile* in the Lower Rhine Basin shows quite some variation (fig. 9). There is tendency of increasing width in relation to the length, but the variation in width suggests that the original length could vary also.

In the hoard of Schladen (Landkreis Wolfenbüttel) a semi-manufactured *Breitkeil* has been found with a length of 370 mm (Schwarz-Mackensen & Schneider 1983). In the Möckern hoard the longest item is 345 mm (Hoffmann 1955). An extremely long specimen from Euskirchen, without any additional find data, has a length of 421 mm.¹⁵ Their length, heavy weight and pristine condition raise the question whether these long *Keile* were still utilitarian tools.

In the course of their use *Breitkeile* were worn, damaged, broken and repaired, resulting in ever shorter specimens and a wide range in length, as reflected in the metric diagrams. The shortest, in the final stage of a long process of use, appear to consist in some cases almost entirely of a shaft hole surrounded by a tiny bit of stone, as exemplified by a specimen from Spijk (Van der Waals 1972, G.8).¹⁶

The complete *Keile* found in the Netherlands and Belgium – all isolated finds – range from 90 to 327 mm, for specimens from Gennep and Echt respectively, with an average of 154 mm. Their dimensions have been displayed in a series of graphs (figs 6-9). The largest number lies in the length category 120-140 mm. The values of width are close together and do not show any extremes (fig. 7). The width of the axes (30-90 mm) could be the result of the original length or prolonged use and wear. Especially the wider variation of the smaller implements seems to be

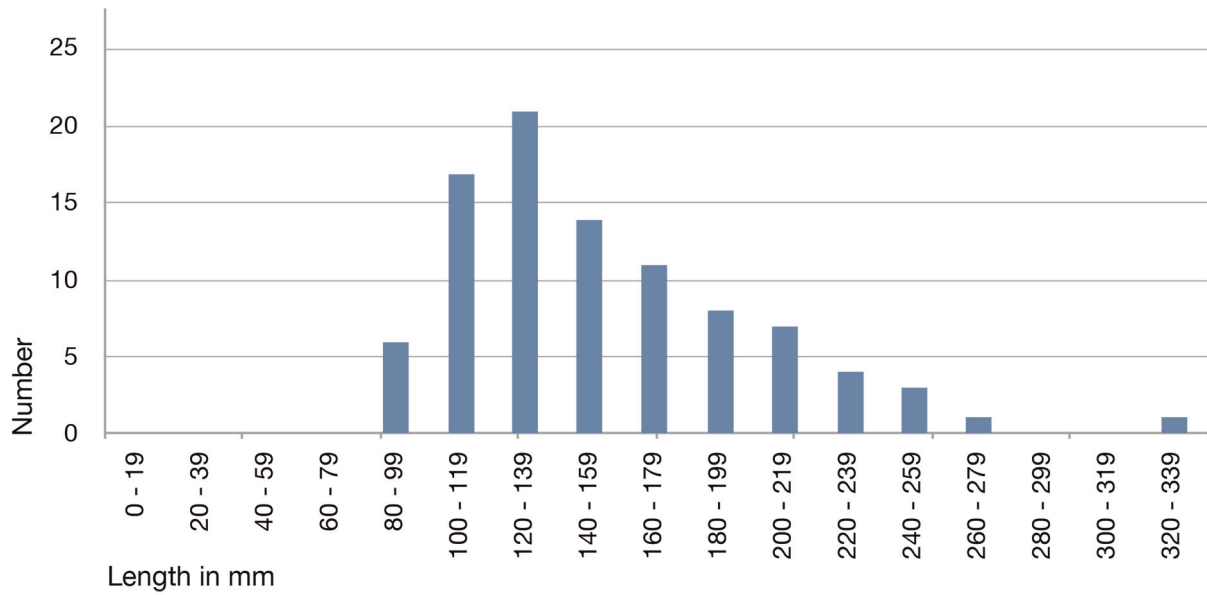


Figure 6 Length of Rössen Keile in the Lower Rhine Basin.

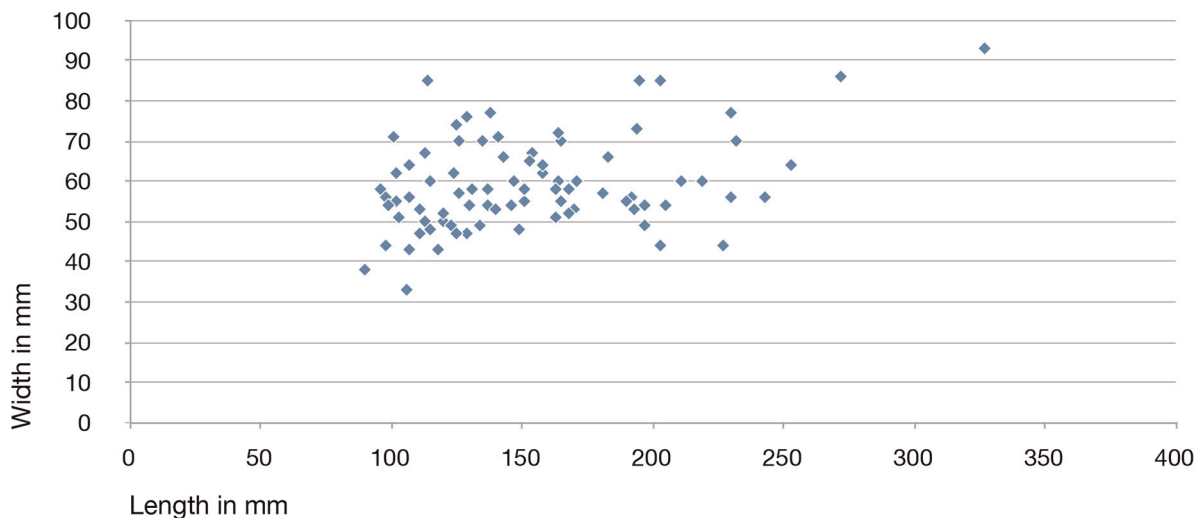


Figure 7 Length/width ratio of Rössen Keile in the Lower Rhine Basin.

the result of prolonged use, with retouching, pecking and grinding, hardly affecting the cross section.

Interregional comparison of these data may inform us on the eventual selection of axes distributed to the north and so on the processes of their distribution.

The detailed study by Lönne (2003) in the Göttingen region (south-eastern part of Lower Saxony) provides information on the dimensions of *Breitkeile* within a Rössen territory and its immediate vicinity. All *Breitkeile* have been described, both isolated finds and those from settlement context. The length of the complete implements – in different stages of use – ranges from to 80 to 315 mm with an average of 145 mm, very similar to the Lower Rhine Basin data. (fig. 8) There is hardly any difference in dimensions between *Breitkeile* recovered as isolated finds and those from settlements.

A statistical analysis of the data with a kernel density method, displayed in smoothed histograms, visualizes the slight difference between both regions (fig. 9).¹⁷ Both graphs display single-peak distributions that differ at most four centimetres. The length of Lower Saxony *Breitkeile* displays a normal distribution with a peak between 135-175 mm; for Dutch specimens this

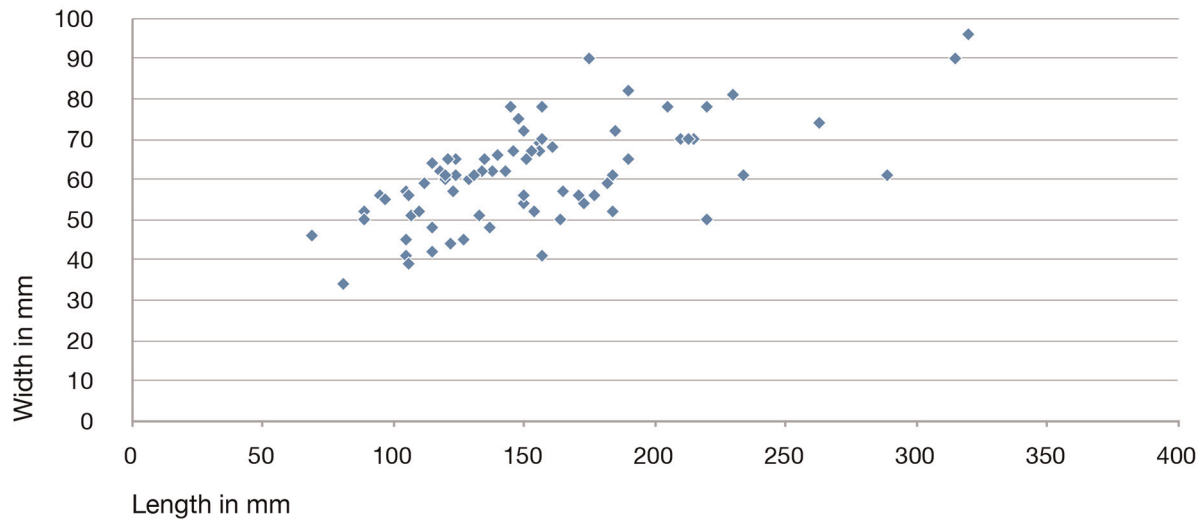


Figure 8 Length/width ratio of Rössen Keile in Lower Saxony.

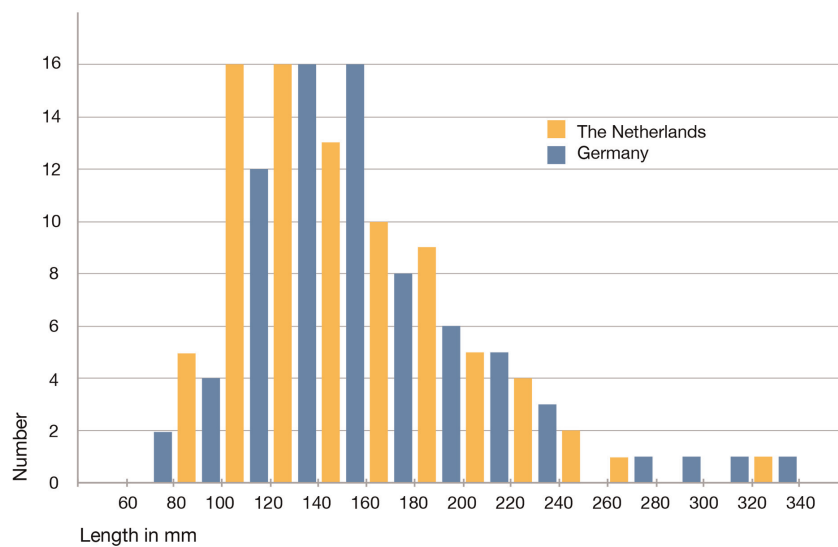


Figure 9 Smoothed histograms of the length/width ratio of Rössen Keile in the Lower Rhine Basin (yellow) and south-eastern Lower Saxony (blue) showing that the Dutch *Breitkeile* are on average slightly shorter than those from Lower Saxony.

is 95-135 mm. So the Dutch *Breitkeile* are on average slightly shorter than those from Lower Saxony, most probably slightly more worn out.

The 30 complete *Breitkeile* found in Denmark and southern Sweden vary in length between 115 and 219 mm, with an average of 161 mm (Klassen 2004, *Fundliste 1*). In this case south-eastern Lower Saxony is a very plausible source. From northern Germany 70 *Keile* are known, 93 to 385 mm in length, with an average of 167 mm (Klassen 2004, *Fundliste 1*).¹⁸ The North German implements show rather identical ratios as those in Lower Rhine Basin area with a large variation in length and some small worn-out *Keile*. In Denmark and southern Sweden there is less variation in length. The large *Keile* apparently did not reach these regions. Very small and worn ones are missing as well.

The comparison of two districts within the research area of the Lower Rhine Basin at increasing distance to the Rössen culture area may inform us on eventual down-the-line distribution. So two southern provinces, Belgian and Dutch Limburg (at 20-75 km) are compared to the northern provinces of Friesland and Drenthe (at 150-200 km). The *Keile* have nearly identical dimensions in both regions. Their lengths range between 100 and 250 mm, but in Limburg there is one longer specimen (fig. 10). Shorter specimens have been found in both regions. So

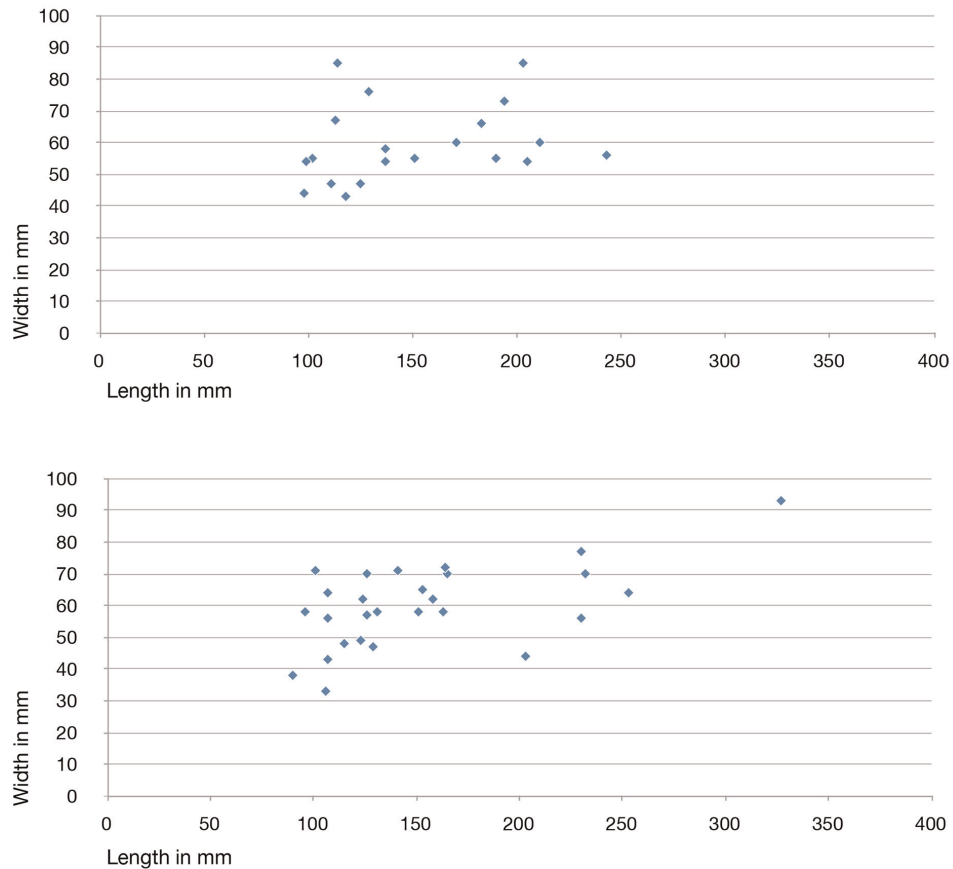


Figure 10 Length/width ratio of Rössen Keile in the Lower Rhine Basin.
 above: in the northern provinces of Friesland and Drenthe,
 below: in the southern provinces of Belgian and Dutch Limburg.

there appears to be no loss in quality with increasing distance on this scale and no indications for down-the-line exchange in the Lower Rhine Basin.

3.4 Changing patterns in distribution and contact

The distribution of LBK adzes and *Keile* illustrate the contacts between farmers and hunter/gatherers. The find of an amber pendant in the well of Kückhoven is an illustration of connections with the Baltic region (Gronenborn 2005, 2010). The wider distribution of *Keile* as compared to that of the adzes is an indicator for a wider range of these contacts. The higher intensity is the result of a longer time span presumably in combination with increasing contact. There are however additional other contact indicators as well.

Long lasting relations between south and north can be deduced from the distribution of Wommersom quartzite, originating from an outcrop between Tienen and Sint Truiden in Belgium, and exploited from the early Mesolithic onward, especially in the middle and late Mesolithic. Its most northern expansion was just to the north of the rivers Meuse and Rhine (Arora 1979; Van Oorsouw 1993).

We owe other indicators to the closed stratigraphical context and the conditions at the earliest sites in the wetlands of the Rhine/Meuse delta. Long-term relations with the south from the late Mesolithic onwards are revealed there in the acquisition of raw materials, like flint, pyrite, haematite and rock from distant regions far to the south (Louwe Kooijmans 2005, 2006).

Other evidence from the same contexts is, first, a LBK arrow-head at the river dune Polderweg in Hardinxveld-Giessendam, already mentioned in the former paragraph, indicating an

very early contact shortly after LBK colonists had settled in South-Limburg in 5300 cal. BC. A second southern link is documented by a relative small number of bone-tempered pottery sherds in phase 2 at the river dune De Bruin in Hardinxveld-Giessendam, dated to the early 5th millennium (Raemaekers 2001). Of these sherds 27 are decorated in techniques and motives characteristic for Blicquy pottery of southern Belgium. They probably belong to a restricted number of vessels. One, undecorated pot with double perforated lugs has no Blicquy but Grossgartach affinities.

The lack of evidence of north-south contacts in the intermediate space will be strictly due to bad preservation.

Rössen Pottery

Pottery has also been retrieved outside the Rössen culture area, but only in small numbers and its distribution is very limited. Some isolated Rössen pottery finds have been published from Middle Limburg (Bloemers 1972, Brounen 1985), and documentation of amateur collections resulted in more sites, but their number is still very low.¹⁹ Some alleged Rössen pottery sherds found at Aalten, north of the river Rhine, c. 50 km to the west of the Rössen habitation near Duisburg (Schut 1987), appear factually to be Late Bronze Age.²⁰

Farther east some imported Rössen vessels have been retrieved at Hüde (Germany), at a distance of c. 40 km to the north of another Rössen habitation centre (Kampffmeyer 1983).

In view of the scarcity of pottery outside Rössen territory we have no alternative than to evaluate the distribution of *Keile* to find out more about the nature of the contacts between hunter-gatherer communities and early farmers in the Lower Rhine Basin.

Distribution analysis

The occurrence over a wide area of *Keile* and the distribution pattern indicate that theft and scavenging at abandoned Rössen sites can be excluded as the major process behind the distribution of these artefacts. This leads to the conclusion that farmers must have exchanged their *Keile* with local groups around the agrarian settlements. We can think of 'forest products', raw materials, labour and women as valuable commodities in return. From these groups in close contact with the Rössen farmers the *Keile* found their way to their hinterland.

The spatial distribution and characteristics of the *Keile* in the Lower Rhine Basin have been opposed to the model of down-the-line-exchange. In that case there should be an absence of production debris, artefacts should decrease in number and size with distance from the source, the objects should be more fragmented and could have gained a different meaning (Appadurai 1986; Renfrew 1982; Verhart 2000, 2009). The distribution of *Keile* in the Lower Rhine Basin however, shows none of these aspects. The only trend to be observed is that the *Keile* outside the Rössen occupation area are a little smaller and more worn.

There is another aspect, which informs us about the background of acquisition. The *Keile* with secondary hour-glass shaped shaft hole, found outside the Rössen habitation area, in the territory of the hunter-gatherers, show that the Mesolithic hunter-gatherers, who had acquired a *Keil* (or fragment), were not acquainted with the way the primary shaft holes had been made, or maintained their traditional practise of making shaft hole by pecking. This last option is plausible explanation for secondary hourglass-shaped shaft holes made by people living close to the Rössen habitation centres, as demonstrated by the Colmont specimen in southern Limburg (Brounen 1997). They could have had direct access to the farming communities living at a distance of 25 km and could have observed the Rössen technique of drilling with a hollow drill.

The majority of the Mesolithic hunter-gatherers were not in immediate direct contact with the producers of the *Keile*. These artefacts were distributed from hand to hand over the area

occupied by them. Important information how *Keile* were made was not transferred by the Rössen communities or by groups living close in their neighbourhood.

It is not possible to determine whether the breakage of the artefacts had taken place originally in the Rössen area or at the location where the *Keile* were found. The new shaft holes were not made in the Rössen technique, with a hollow drill, but with the traditional Mesolithic pecking technique. This implies that Mesolithic hunter-gatherers, who had a *Keil* in their possession, and were living more to the north, were unaware of how shaft holes had to be made.

3.5 Use and meaning of *Keile* in hunter-gatherer territory

Keile are quite rare regarding the total number and time span in which they were used, so these artefacts do not belong to the standard tool range of Mesolithic hunter-gatherers. The Mesolithic tool range comprises moreover good functional equivalents in bone and antler. Wear traces on

Keile in the Lower Rhine Basin are identical with the ones, which can be seen on *Keile* found in the Rössen occupation area. It is not possible to determine if these wear traces originate from the Rössen region itself or are the result of activities exploited in the Lower Rhine Basin.

These artefacts could have a similar function in both regions: cutting and cleaving wood. The *Keile* in the Lower Rhine Basin however, are with one exception not recovered in settlements and are also not known from graves or hoards. Most specimens are stray finds and often found in the low lying - wet - areas of the landscape suggesting deliberate deposition. Raemaekers *et al.* (2010, 21-24) made clear that complete *Keile* were often deposited in the low lying areas of the landscape, despite the low number of finds with detailed information about find circumstances in their study area. A quarter of all *Keile* was found in low lying locations, while c. 30% was found on higher land, the supposed area for settlements (Raemaekers *et al.* 2011, table 7).

This raises the question whether these artefacts, apart from being utilitarian implements, played also a role in the social domain. Exotic objects and materials have always exerted a major attraction, often also associated with a higher appreciation (Taffinder 1998). As such the possession of exotic objects, or control over their distribution, may cause an increase in prestige. *Keile* belong in this category because of their appearance and raw material, despite the fact that they are worn. In this respect *Keile* may have been given an additional meaning in hunter-gatherer society, as compared to the Rössen culture, especially in graves and hoards.

Secondary shaft holes

It appears that *Keile*, robust as they may be, were rather frequently broken across the shaft hole. In those cases a new shaft hole may have been made. Within the Rössen culture area the new shaft hole was executed in the traditional way with a hollow drill, in no respect different from primary shaft holes (see Lichardus 1976, *Taf.* 10c). Parts of the original shaft hole remained still visible at the (new) butt in some cases. That such items, 'in their second life', found their way to the west/north is demonstrated by specimens from Helmond-Stiphoutsbroek (Arts 1994, fig. 11), Montfort and Elsloo (Brounen 1997).

In the northern regions, outside the Rössen zone, in contrast, hourglass-shaped shaft holes were (attempted to be) made by means of a pecking technique in a number of cases. This practice is unknown in the area investigated by Lönne in Lower Saxony (Lönne 2003). Examples of hourglass-shaped shaft holes have been published from Denmark, among others from Skalagerbanke and Gåbense-Faergegård (Fischer 2002, fig. 22.17). In the Netherlands a specimen was found at Colmont, southern Limburg (Brounen 1997). A remarkable large fragment of a high bandkeramik adze from Voerendaal-Vrakelberg, showing an attempt to make an hourglass-shaped shaft hole by means of pecking, may be interpreted as a reworked scavenged



Figure 11 Examples of Rössen Keile with secondary shaft holes. From left to right: Stiphoutsbroek, with conical shaft hole (after Arts 1994); Elsloo, with conical shaft hole (after Brounen 1997); Colmont, with hourglass-shaped shaft hole from Colmont (after Brounen 1997).

artefact (Brounen 1997). Both sites are at a distance of only 30 km from the Rössen settlement cluster at the Aldenhovener Platte.

Meaning, alternatives and ritual deposition

Assuming that the *Keile* in the Rhineland loess zone (the main source area for the Lower Rhine Basin), have similar specifications as those in south-eastern Lower Saxony then it is apparent that no positive or negative selection had taken place and that the indigenous people had a regular access to these highly valued tools. Three options for the background of this exchange can be distinguished. However, a preference for one of these options cannot be given.

The first option is that the axes were exchanged in a better condition, that part of the wear and damage results from use after exchange, and that the axes were valued for their functional qualities as well. Indications for their use are the secondary hourglass-shaped perforations and the recovery of – be it scarce – fragments. Apparently such shaft holes had a purpose and did suffice, as they did for the *Geröllkeulen* and *Spitzhauen* (see below). As such they are an indication for a prolonged use. But in order to use *Keile* for wood working, they should be fixed firmly to the handle and that seems hardly feasible in the case of *Keile* with this type of perforation. The second option is that the axe spectrum as available in Rössen settlements, from pristine to heavily worn, was exchanged, that they were not or hardly used by the indigenous recipients, and deposited in the same condition as received. This implies that the axes had first and for all a symbolic and no functional value for the new owners and could play a role as prestige object, as can be supported by ethnographic analogies (Appadurai 1986; Renfrew 1982; Taffinder 1998; Verhart 2000), parallel and in accordance to the ideas developed in southern Scandinavia and adjacent Germany (Lomborg 1962; Berlekamp 1969; Gramsch 1973; Fischer 1982, 2002; Merkel 1999; Lübke *et al.* 2000; Klassen 2002, 2004). The exotic character of the items, alternatives in the Mesolithic tool kit, the restricted numbers in hunter-gatherer territory and the long distance of exchange, are in favour for this option. The third option is an alternative functional explanation that the *Keile* were used as the head of a clubs. As such they

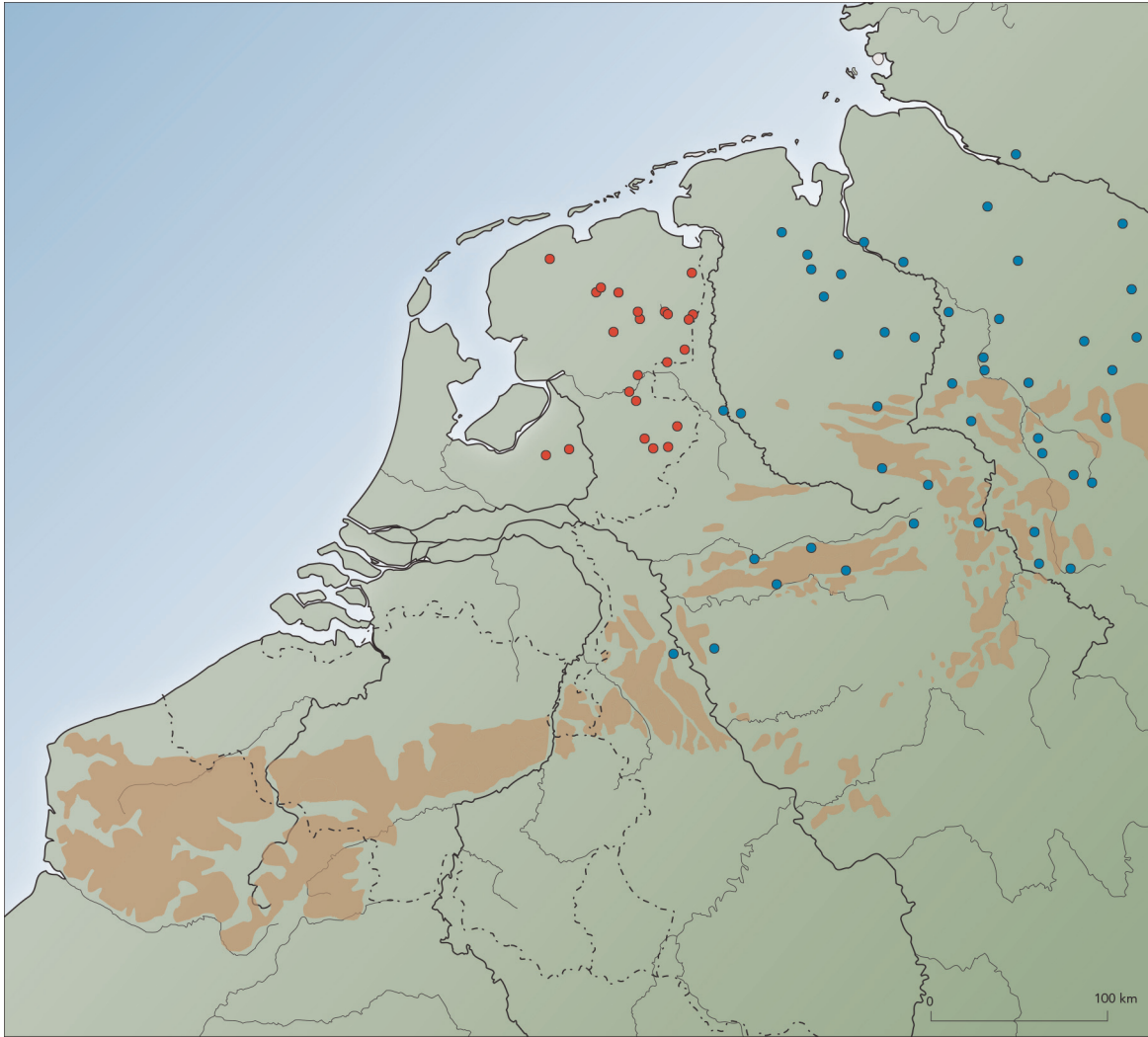


Figure 12 Distribution of *Spitzhauen* in the Lower Rhine Basin. German data (blue) after Brandt 1976; Dutch data (red) after Hulst & Verlinde 1979, with additions.

could have been objects with a symbolic value or used in warfare. Violence is a well-documented element of Mesolithic society, but evidence that club heads were involved in these activities is lacking up till now. Only in hunting activities the use of clubs is well documented (Noe-Nygaard 1974).

4 *Spitzhauen*

4.1 Introduction

In the Lower Rhine Basin artefacts have been found, which show some resemblance in outline with the *Breitkeile*, the so-called *Spitzhauen* (Brandt 1976; Hulst & Verlinde 1979). Their distribution is in the Lower Rhine Basin restricted to the northern regions, where as now 32 specimens are known. They do not occur in the south (fig. 12). It is a typical North European implement, found all over the North German plain and southern Scandinavia, the Dutch examples representing the westernmost extension. The northwestern group of *Spitzhauen* represents a less slender group of artefacts. The slender type with a widening of the width at the location of the shaft hole is nearly absent in this region (Brandt 1976, *Abb. 1*, Form B.)

Detailed studies of Dutch *Spitzhauen* have been presented by Hulst & Verlinde (1979) and by Drenth & Niekus (2008; 2010).²¹

4.2 Description

A *Spitzhaue* is an axe-like artefact with a stocky oval shape, an hourglass-shaped shaft hole, located towards the butt, and a blunt pointed tip. (fig. 13).²² They are made of natural pebbles that have been pecked into the right shape, particularly at the edge. Many specimens still display (parts of) the original pebble surface. In some instances traces of grinding have been found as well. The characteristic double-conical shaft hole has also been made by pecking, in the same technique as the identical perforations of the so-called *Geröllkeulen*. Rock types selected are predominantly quartzite and (quartzitic) sandstone, with a significant shift towards the softer sandstones in comparison to the raw material of *Geröllkeulen* (Hulst & Verlinde 1979, 200). In the province of Drenthe five out of eight specimens had been made of quartzitic sandstone (Beuker *et al.*, 1992).²³ These stone types were commonly available in pebble deposits.

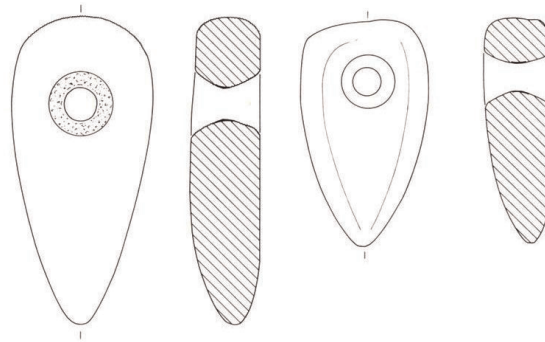


Figure 13 Two examples of Dutch *Spitzhauen*. Left: Deldenerbroek, Ambt Delden; right: Boekelo, Enschede. Scale 1: 2 (after Hulst & Verlinde 1979, Abb. 5, 6).

The 16 Dutch *Spitzhauen* listed by Hulst & Verlinde (1979) range in length from 100 to 202 mm. The majority however have a length around 130-140 mm. The width ranges from 50 to 92 mm; the thickness from 30 to 55 mm (fig. 14-15).

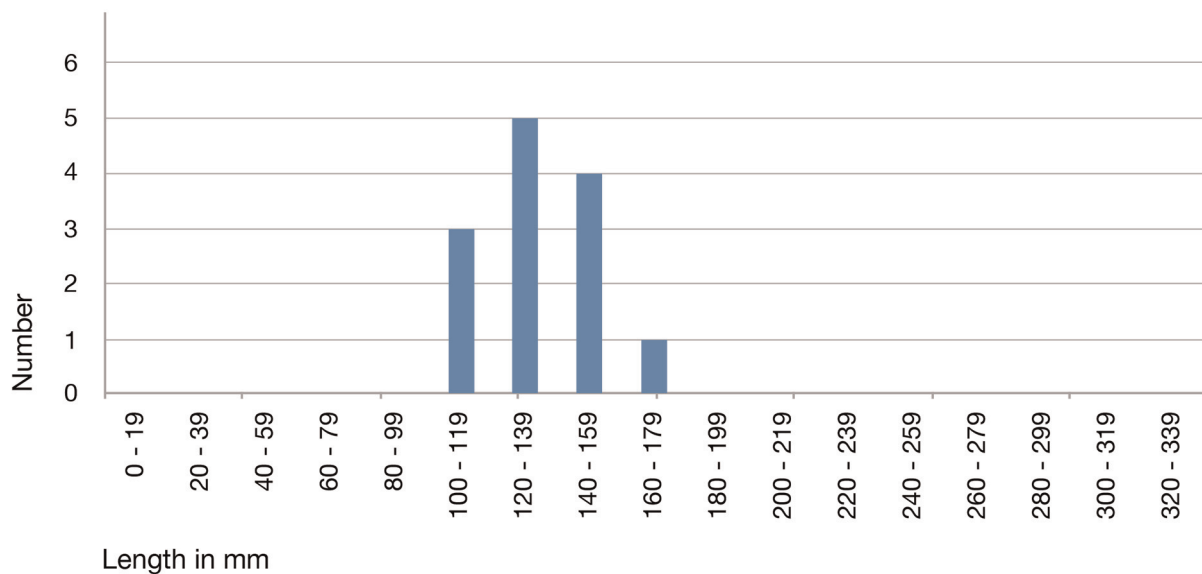


Figure 14 Length of *Spitzhauen* in the Lower Rhine Basin.

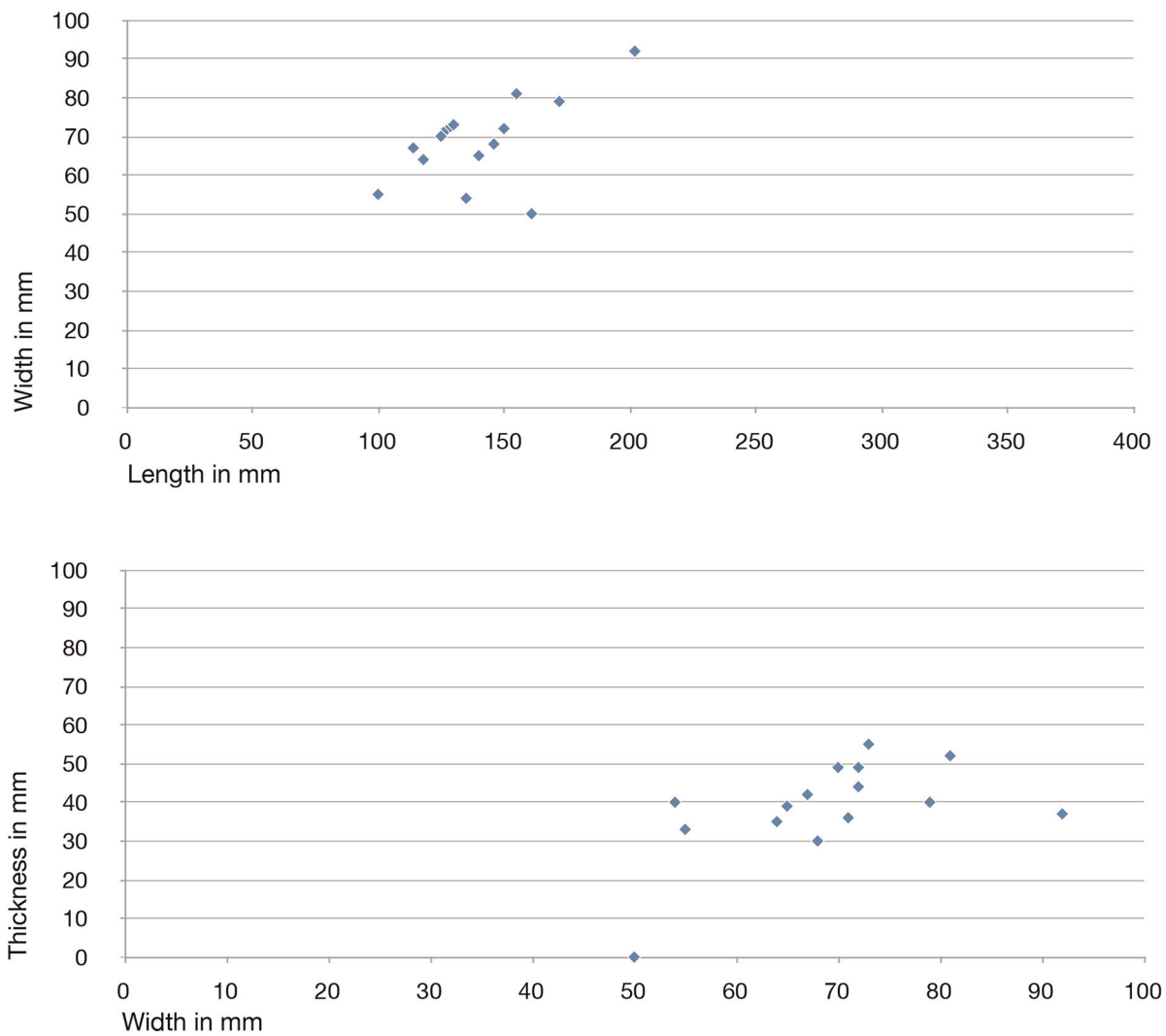


Figure 15 Length/width ratio (above) and width/height ratio (below) of *Spitzhauen* in the Lower Rhine Basin.

4.3 Dating

There is no reliable dating evidence for the *Spitzhauen* in the Lower Rhine Basin. Most artefacts are isolated finds without any context (Hulst & Verlinde 1979). The few alleged associations are unreliable. There is for instance a specimen from Deldenerbroek, reported to have been found with an unspecified axe, but unfortunately the axe has been lost. Two specimens, supposed to have been found beneath a thick layer of peat, lack exact find locations.

Half a *Spitzhaue* from Den Ham (Hulst & Verlinde 1979, O₁), with an exceptional broadening at the shaft hole, is a type known from Sweden and Germany and is supposed to have been used there from the Early Mesolithic onward (Degn Johansson 2000; Gramsch 1973). The date is based on a find in Sandarna, which however appears not to originate from the Early Mesolithic level, but from a younger, Late Mesolithic layer containing Neolithic admixture as well (Alin & Niklasson 1934; Nordqvist 2000). Some German specimens too appear to have a younger (Late Mesolithic) date (Gramsch 1973, 28). The number of finds in Denmark is restricted.²⁴

Special attention has to be given to the alleged *Spitzhauen* from Hohe Viecheln, Germany (Schuldt 1961, 103, Taf. 39, 40a, 99b-c). These implements have been found in a peat layer dated

to the Late Boreal (c. 7200 cal BC), which mean that they would be the oldest known. It concerns however merely two natural pieces of rock, showing unfinished hourglass-shaped perforations, and both lacking traces of pecking. The third fragment shows a complete hourglass-shaped perforation, but has an irregular pointed outline without traces of pecking. These fragments are regarded as rough outs, broken during production. It is however questionable whether these fragment are rough outs.²⁵ Any fragments of *Spitzhauen* with pecking traces are lacking at other Boreal sites. The occurrence of stones with an irregular outline and hourglass-shaped perforation at other Mesolithic sites, like St. Oedenrode (Heesters 1971), are in favour to classify the Hohen Viecheln finds into this category.

The technique of making an hourglass-shaped hole in a natural pebble by means of pecking has been developed in early stage of the Mesolithic. Early, well-dated examples are three fragments of *Geröllkeule* ('mace heads') from Friesack, one of a finished and two of unfinished specimens, from early Boreal layers, c. 8000 cal BC. From a younger layer, dating from the Early Atlantic, c. 7000 cal BC, comes a complete one with preserved wooden haft (Gramsch 1987, 85; 2000). The lower limit for this technique seems therefore to be near this time. There are some open Mesolithic associations in the Netherlands, and recently a specimen has been found in a pit with human cremation remains on the submerged dune of Beverwaard-Tramremise near Rotterdam, well dated to c. 7100 cal BC (Zijl *et al.* 2010, 24, 32). An upper limit is given by several fragments from Swifterbant site S3 (c. 4000 cal BC).²⁶

The south-eastern part of the province of Groningen consists of large scale peat bog reclamation. The area had been covered with peat from the Middle Atlantic onward. On the now recovered old coversand surface a large number of Early and Middle Mesolithic sites have been traced and excavated. The period of human activity has reliably been dated to the period 7500-6300 cal BC on the basis of 34 ¹⁴C dates. Four *Geröllkeulen* have been found in this district, but no *Spitzhauen* at all (Groenendijk 1993, 47). Their absence may be viewed as significant in spite of the low numbers and to imply an origin of the specific artefact type after 6300 cal BC.²⁷

The development of the *Spitzhaue* seems altogether to be rather late in the development of stone artefacts with hourglass-shaped shaft holes, probably to be dated after the Middle Atlantic, *i.e.* after c. 6000 cal BC.

4.4 Function

The question concerning the function of *Spitzhauen* is equally hard to answer. The tip is so blunt as to preclude the use as a working wood implement. The double-conical shaft hole, which hardly allows a firm fixation of a handle, contradicts a function as an axe. The choice of raw material is an argument against the use on hard material. There are however macroscopic traces of wear in some shaft holes, showing that they have been hafted. Many of the *Spitzhauen* display traces of use, in the form of battered parts of the surface. These occur in particular at the butt and, to a lesser extent, at the tip. Only three specimens show use damage at both ends. They are, however, absent at almost half of all artefacts (Hulst & Verlinde 1979, 195). Microscopic use wear study has not been performed on either *Spitzhauen* or *Geröllkeulen* up till now.²⁸

It is, however, beyond discussion that the *Spitzhaue* was an implement used on a relatively soft material, modestly damaged and worn, and occasionally broken (see also Drenth & Niekus 2010). It was left or deposited in the field, rarely at a settlement site. It could even have been used as weapon. So a functional interpretation is difficult, due to lacking evidence in relation to find circumstances and absence of wear studies.

4.5 *An alternative perspective*

Based on the available data, especially the scarce dating evidence, the introduction of *Spitzhauen* has to be regarded as an indigenous development in Late Mesolithic society. The distribution of these rather rare implements covers the northern part of the northwest European plain and southern Scandinavia, with the exclusion of Denmark.

I would like to give some arguments in favour of the development of *Spitzhauen* as possible imitations of Rössener *Keile* in Mesolithic territory, especially in the northern part of the Lower Rhine Basin. These are the morphological similarity to Rössener *Keile*, the restricted distribution in the northern part of the Lower Rhine Basin and the similarities in the execution of the shaft holes of the *Spitzhauen* itself and the locally, in Mesolithic territory, repaired broken *Keile*. The occurrence of *Spitzhauen* particularly in the northern part of the Lower Rhine Basin, their form and dimensions opens the possibility that *Keile* in circulation there may have been the source of inspiration. A drawback for this option is of course the impossibility to secure their introduction after c. 5000 cal BC, the supposed start of the arrival of *Keile* in Mesolithic territory.

5 Concluding remarks

The possible imitation of *Keile* and the locally made shaft holes in broken ones provide clues for the type of contact. The term contact is widely used in archaeology, but the actual meaning, tenor and implications are rarely pursued in any depth. How often have *Breitkeile* not been considered expressions of contact reflecting the adoption of cultural elements and transmission of information which would result in the shift to a new, read agrarian, economy? The distribution of *Keile* and a number of connected observations demonstrate that this needs some elucidation.

The use of a new and foreign artefact does not necessarily imply that in cases of direct or indirect contact there is also a flow of information allowing transfer of knowledge in other domains. Several ethnographical examples are known that demonstrate the exact opposite (Verhart 2000). Repair of shaft holes in broken *Keile* in a Mesolithic technology is an archaeological example.

Keile with secondary hourglass-shaped shaft holes found close the Rössen habitation area could be the result of maintenance of traditional practises by local groups of hunter-gatherers, which indicates a rather closed and restricted attitude towards new ideas and developments.

The *Keile* with secondary hourglass-shaped shaft holes found farther away can be the result of limited and indirect contact between hunter-gatherers and farmers of the Rössen culture.

In both cases this has implications for the conceptualisation of the transition from hunting and gathering to an agrarian lifestyle. Hunter-gatherers may have been familiar with agrarian communities in the direct or more distant vicinity. This does however not mean that they adopted and familiarised themselves immediately with the knowledge on agriculture and animal husbandry. Growing new and unknown crops requires knowledge and experience, even at a small scale. The soil used for crops needs to be suitable, the sowing seeds need to be planted at the right time and in the right way, the growing crop needs care and attention and needs to be harvested at the right moment. Livestock, too, needs to be handled with knowledge and experience, albeit probably to a somewhat lesser degree. Familiarising that knowledge in the beginning assumes a very direct contact in order to gain experience.

Gender aspects will be an issue here as well. Whereas in the first contact situations the men will play a prominent part, women will be increasingly integrated in a continuation of those contacts (Louwe Kooijmans 2010; Price & Brown 1985; Price & Gebauer 1995; Verhart 2000). In general they will be the ones mastering pottery production and crop cultivation. The experience in gathering wild edible plants and roots they have gained in their traditional hunter-

gatherer society will have been a major advantage in obtaining that new knowledge and transfer to regions farther away.

The acquisition of LBK adzes and Rössen *Keile* is only the beginning of a lengthy transformation process from hunter-gatherer to farmer, being step by step documented in the Holocene sedimentation districts in the west and north of the Netherlands.

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Notes

1. This research forms part of the project "From Hardinxveld to Noordhorn - from forager to farmer" within the framework of the 'Malta Harvest Programme' financed by the Netherlands Organisation for Scientific Research.
2. Adzes were also in use in the earlier stages of the Rössen Culture (Raetzel-Fabian 1986).
3. I owe Marjorie de Grooth the detailed references to the Langweiler 8 finds.
4. No. 5033, related to house 101, 'house generation' IV, meaning Modderman's stage 1c.
5. No. 3021, related to house 52, 'house generation' VI, meaning Modderman's stage 1d or late Flomborn.
6. These sites have been discovered by the amateur archaeologist A.M. Wouters. Many of his sites and site reports are considered unreliable.
7. However, no research has been done into the origin of the flat adzes found more to the north. High adzes do not occur in the north.
8. Klassen presumes for the Parow sherd (Klassen 2004, Abb. 53:A) an origin in the Rhineland. This would mean a contact distance of approx. 600 km. However, the type of decoration referred to by him as characteristic for this region also occurs, albeit rarely, in the more northern LBK habitation areas in the vicinity of Wolfsburg, in which case a distance of 150 km appears more likely. The Parow find is problematic in more respects, as the authenticity of the find site is in doubt. The sherd was found when dredging a yacht basin without archaeological supervision (Terberger & Seiler 2004).
9. For similar, but Late Neolithic issues, see Lekberg 2004.
10. Pers. comm. Izabel Devriendt.
11. It is however unclear whether this is also true for the group of Breitkeile as Lönne's study involves other tools as well, such as adzes and axes and she did not published a table of the relation between tool type and raw material.
12. Some caution is needed with alleged river finds, if purchased from antique dealers. This regards for instance finds from the Elbe at Hamburg (Klassen 2004, *Fundliste 1*; Laux 1993), from the Waal near Nijmegen and from the Scheldt near Ghent. (Van der Waals 1972, G.4 and O.1).
13. Pers. comm. Izabel Devriendt.
14. See also Raemaekers *et al.* 2001, 18, Fig. 8 and 9.
15. Collection Rijksmuseum van Oudheden, inv. nr. M 1892/11.22.
16. Collection Rijksmuseum van Oudheden, inv. nr. e 1970/2.1.
17. This statistical analysis was performed by Milco Wansleben.
18. These results are in sharp contrast with measurements published by M. Merkel (1999) for the region northern Germany and southern Scandinavia. For the *hohe durchlochete Schuhleistenkeile* (type E) the lengths varies between 15,3 and 37 cm and most artefacts measures 25-30 cm. For the Breitkeile of

- type F the lengths are 32-49 cm, an average of 30 cm for type G and type H has lengths between 10 and 30 cm.
19. The total will not exceed 20 sites, the published sites included.
 20. Personal information prof. dr. D.C.M. Raemaekers.
 21. The northwestern group of *Spitzhauen* represents a less slender group of artefacts. The slender type with a widening of the width at the location of the shaft hole is nearly absent in this region (Brandt 1976, Abb. 1, Form B.)
 22. A Mesolithic grave in Nadelwitz (Germany) has yielded a pebble hammer with a straight conical perforation, however, comparable to that of the *Breitkeil* (Geupel 1988). This is however rare.
 23. In the older study by Hulst & Verlinde (1979) sandstone is also mentioned as a major source.
 24. Approximately five examples are known, all unpublished single finds (Pers.comm.. Lutz Klassen).
 25. See also Brandt 1976, 273-274.
 26. Pers.comm. Izabel Devriendt.
 27. *Geröllkeule* occur twice as frequent as *Spitzhauen* in the provinces of Overijssel and Gelderland (Hulst & Verlinde 1976, 1979).
 28. A use wear study of a *Geröllkeule* from Hattermerbroek is in progress (Drenth & Niekus 2010, 755).

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