7 Flint, procurement and use

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The flint from Schipluiden consists of a small amount of high-quality imported material, including some typical Michelsberg tool types, and a large component of rolled pebbles. The source of these pebbles is unknown, but must have been relatively well accessible. The tools formed part of various tool kits geared to such activities as hide scraping, the manufacture of ornaments, cereal harvesting and fire making. The range of activities suggests that complete households once occupied the dune.

7.1 Introduction

Flint artefacts constitute one of the largest find categories at Schipluiden. No flint is to be found in the dune's surroundings, which means that all the material had to be imported. Identifying the flint sources was therefore an important aspect of the study whose results are reported here. Knowledge of the flint-procurement sites tells us whether the Schipluiden people maintained exchange contacts or whether they obtained their flint in the context of their mobility patterns.

A second objective of this study was to gain insight into the activities carried out at the site by doing a wear-trace analysis of a selection of the material. Such a functional analysis can provide additional information regarding subsistence activities and craft activities such as woodworking, bead production and tasks like basketry or rope-making, whose products are often not preserved. The range of activities, combined with other information such as that obtained in palaeobotanical and archaeozoological analyses, gives an indication of the character of the site, for example whether it was a permanent settlement or a special activity site. It may also tell us something about the composition of the social group residing at or using the site.

Finally, a technological and morphological study of the flint assemblage enables comparison with other sites of the Hazendonk group, especially the nearby sites of Wateringen 4 and Ypenburg (within the micro-region). Such a study also provides insight into diachronic developments in flint use by the region's Neolithic wetland communities.

7.2 The material

Schipluiden has yielded a total of over 15,000 flint artefacts, mostly small fragments. The majority of the objects were collected by hand as part of the standard excavation strategy, and consist of artefacts measuring 2 cm and more (chapter 4). The small fraction was recovered mainly from the 4-mm sieve.

As a pilot, all the flint from trench 10 was described, including all the fragments from the sieve (N=1182). This was repeated for the flint from trench 18 (N=1615). The results of these two trenches were used to assess the representativeness of the sample studied. It was decided to analyse all the retouched implements, even those bearing only the slightest signs of retouch (commonly known as 'use retouch'), as well as all the blades, cores, core-preparation and core-rejuvenation pieces. In total, 5106 pieces were described, 1123 of which were modified artefacts. However, in order to obtain a homogeneous sample in terms of selection strategies, all the flint from the sieve – except 14 special pieces – and all the unmodified flint from trenches 10 and 18 were removed from the final operating file used for the calculations, resulting in a total of 2666 manually collected modified or technologically significant implements (table 7.1).

In order to check whether this procedure was justified, the frequencies of raw material and type were compared for the total number of artefacts described (N=5106), the total of trenches 10 and 18 (N=2797) and the total of our operating file (N=2666). As far as the raw material used for the implements' manufacture is concerned, the frequency of rolled pebbles, and especially unidentified material, is much higher amongst the sieved material (table 7.1). This is to be expected, as the sieved flint contains large quantities of splinters, whose raw material is almost impossible to identify. Apart from the larger amount of unidentified raw material, the manually collected flint is therefore representative. The same holds for the operating file from which all flint from the sieve was removed. The relative percentages of the various tool types show no differences that could be attributable to differences in the collection strategy. The same holds for the degree of burning. The operating file of 2666 artefacts can therefore be considered representative for answering most questions.

The flint artefacts comprise a number of tool types typical of this period such as triangular bifacially retouched points

%	all coded artefacts (N=5106)			trenches 10 and 18 (N=2797)			operating file (N=2666)		
	hand-collected		4 mm	hand-collected		4 mm	hand-collected		4 mm
flint variety	Units	pit fills	Units	Units	pit fills	Units	Units	pit fills	Units
rolled pebbles	57.6	53.9	12.9	55.9	49.2	11.3	58.1	55.6	7.1
Cap Blanc Nez	1.8	2.4	–	1.2	1.5	–	2.3	2.6	–
Obourg	1.2	3.6	0.1	0.6	3.1	0.1	1.6	5.1	–
black, homogeneous	0.4	1.2	0.2	0.3	1.5	–	0.6	1.7	–
light grey Belgian	0.5	0.6	–	0.8	–	–	0.6	0.9	–
various Belgian	1.6	1.8	0.3	0.3	–	0.2	2.2	2.6	7.1
Spiennes/Rijckholt	0.2	–	–	0.1	–	–	0.2	–	–
northern flint	0.2	0.6	–	0.5	1.5	–	0.1	–	–
indet.	36.3	35.8	86.5	40.3	43.1	88.5	34.2	31.6	85.7
Totals	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
N=	3668	165	1273	1535	65	1197	2535	117	14

Table 7.1 Composition of various flint sub-assemblages per flint variety, recovery technique and context (features or units).

and some pointed blades. Additionally, a surprising number of strike-a-lights were found, a tool type that is not commonly encountered in contemporary assemblages. The raw materials used are similar to those employed at Wateringen 4. Rolled pebbles, possibly from the chalk deposits of northern France, predominate, supplemented by a few types of Belgian flint, including Obourg flint.

7.3 Methodology

7.3.1 Morphological study

All the implements were described in terms of their metrical attributes, the raw material they are made of, tool typology, primary classification (*i.e.* flake, core, blade, *etc.*), kind and extent of cortex, patination, degree of burning, fragmentation and modification (*e.g.* axe flakes). They were described according to the database of the Laboratory for Artefact Studies at Leiden University.[1]

7.3.2 Technological study

During the analysis, artefacts displaying technological indications were kept aside for the technological study. The selection thus obtained included cores, core-preparation and rejuvenation pieces, flakes and blades. This selection was made randomly across the trenches, by taking some pieces from each bag of finds. We continued to describe artefacts until the relative percentages of the attributes remained constant. This resulted in a total of 432 artefacts that were described in terms of their technological features. Those features include such variables as the type and length of the platform, dorsal face preparation, striking angle, type of impact point, the pronouncement of the bulb of percussion and the state of the distal end. The study of these technological characteristics provides evidence of the reduction strategies, the way cores were prepared prior to flaking (planning) and possibly also the level of expertise of the flint knappers.

7.3.3 Functional analysis

The selection for use-wear analysis was made on the basis of typology. We took a comparative proportion from the various typological categories. An exception was made for blades made of imported flint, which were all included in the analysis. In total, 373 implements were studied for traces of use. In order to assess the validity of our selection, we examined all the implements from trench 10 for 'possibly used edges' (PUAs), they are edges with (use-) retouch, a point or a straight edge of more than 1 cm viewed in cross-section (Van Gijn 1990). This resulted in a total of 351 PUAs on 204 artefacts, all of which were examined by microscope (reported in Wentink 2004). The relative percentages of the represented tool types and the inferred activities of this sample correspond to the results of the total analysis, indicating that the selection provided a representative view.

The use-wear analysis was performed using an incident light microscope with magnifications in the range of 10-560 × (equipped with DIC) and a stereoscopic microscope (10-160 ×). The latter was used to locate possible residue and to obtain a general survey of the tool. Some types of wear traces, such as those formed in striking pyrite, are better studied by stereomicroscope, as the traces are macro-scopic rather than microscopic. Photographs were taken with a Nikon DXM1200 digital camera. Some of the tools were cleaned in distilled water in an ultrasonic cleaning tank in order to remove adhering dirt, but the majority of the tools were just wiped clean with alcohol to remove finger grease. Chemical cleaning was not necessary.

7.4 Taphonomy

Many artefacts seem to have been found in a secondary position, having been discarded in the dump zones along the southeastern edge of the dune (fig. 7.1). However, unlike bone, antler and to a lesser extent ceramics, flint had also survived on top of the dune. Some of the flint artefacts found on top of the dune may have been in a primary position, but it is impossible to distinguish them from the rest of the scatter (chapter 3). Only three tools were found in a primary context: the strike-a-lights were found in the hand of the skeleton of grave 2, held against the deceased's mouth (fig. 5.3).

The number of burned pieces is high: 731 of the 2666 implements (27.4%) show signs of burning. This is however a much smaller number than at Wateringen 4, where 39% of the implements were burned to various degrees. No figures have yet been published for Ypenburg. It is unlikely that flint was intentionally burned. There is no evidence of heat treatment (such treatment has indeed never been demonstrated for comparable assemblages), so the signs of burning cannot be attributed to accidents during heat treatment. It is more likely that the burning is due to intensive human occupation of the dune, causing previously abandoned flint to be accidentally burned.

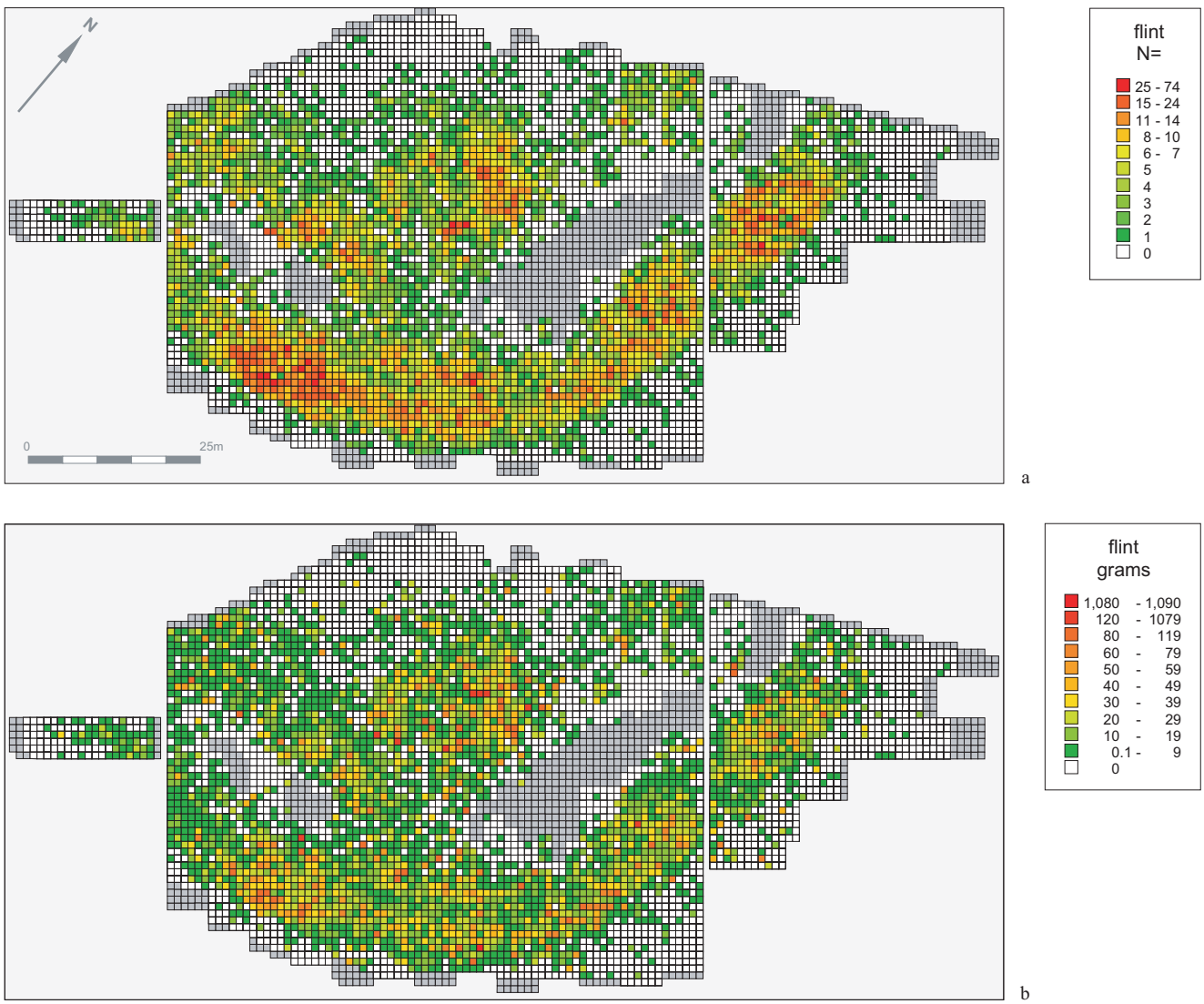


Figure 7.1 Distribution patterns of all manually collected flint artefacts per square metre; number of finds (a) and total weight (b).

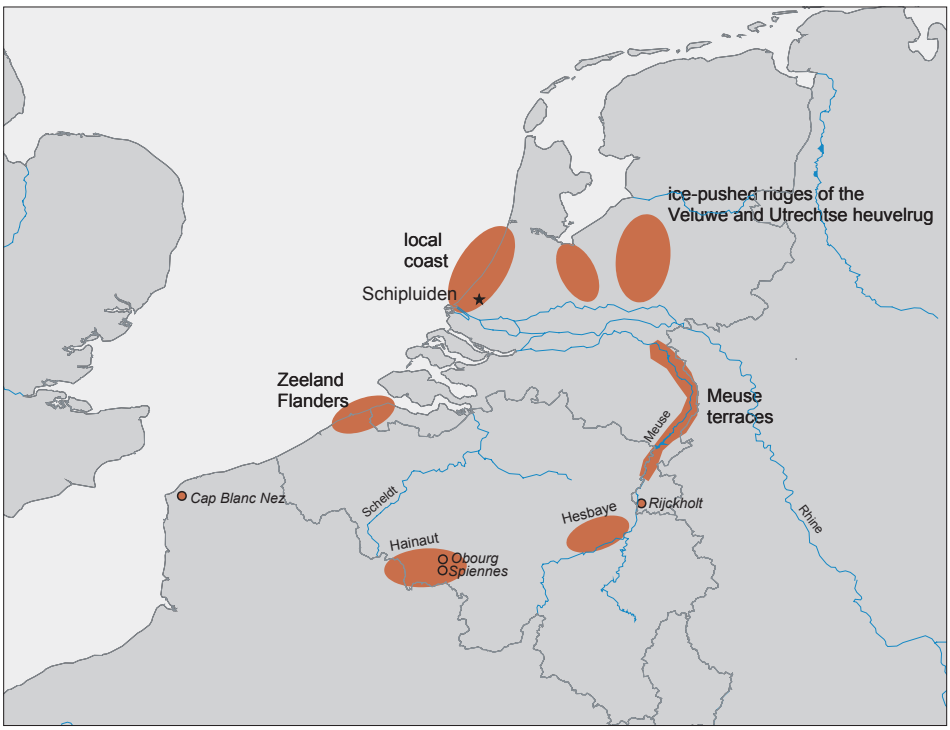


Figure 7.2 Possible sources of the flint used at Schipluiden.

Fragmentation is not frequent: 79.2% of the artefacts are complete. The number of proximal, medial and distal fragments is relatively small (5.8% in total). Fragmentation could not be established for some of the modified implements due to extensive (bifacial) retouch. The absence of fragmentation can be attributed to the fact that the employed technology was predominantly a flake technology, involving only a small number of blades. Intentional fragmentation is usually linked with a blade technology. At first sight the artefacts seem to be in mint condition, and 97% of the implements were described as not patinated. However, the black colour of most artefacts seems to be at least partially due to patination in the humic deposits in which the artefacts were buried. Other forms of patina were observed on very few tools: colour patina was noted on only four implements and gloss patina on 17 artefacts, while 38 artefacts display white patination to various degrees. Some of these implements are probably fairly old implements that were scavenged elsewhere and re-used.

Although the artefacts were somewhat reflective when examined under the microscope, the use polishes were still clearly visible and interpretable. The edges and ridges were not affected by gloss patina and were still sharp.

7.5 Raw materials

Flint was brought to the site in different forms: as nodules, axes and macrolithic blades. All flint must have been brought to the site (fig. 7.2). The nodules, most of which were rolled pebbles, were flaked locally. The axes are made of a variety of southern types of imported flint. After they had been broken they were considered a source of good-quality flint and were used as cores for the production of flakes. The blades were brought to the site as blanks or as finished tools, a distinction that could not be made without refitting the small debitage.

7.5.1 Rolled pebbles

The greater part of the flint consists of a specific type of rolled pebbles (table 7.2). The pebbles are very rounded and generally ovoid in form. The outer surface shows a lighter, bluish or greyish rough texture, probably caused by rolling in an intertidal zone (fig. 7.3a). The flint itself has a blackish to dark grey colour, frequently somewhat mottled with lighter inclusions. It is fine-grained, in some cases even translucent at the edges. The source of this type of flint is difficult to trace. The flint bears some similarity to the material found at Cap Blanc Nez near Calais, northern France, where flint nodules are still eroded from the chalk cliffs by the sea today. The cortex on these nodules is rough due to frequent rolling in the waves, and is composed of a multitude of pounding marks. It lacks the characteristic 'hard' cortex indicative of river-rolled pebbles. Some of the raw material of the rolled pebbles from Schipluiden

N=											%									
flint variety	rolled pebbles	Cap Blanc Nez	Obourg	black, homogeneous	light grey Begian	various Belgian	Spiennes / Rijckholt	northern flint	indet.	totals	rolled pebbles	Cap Blanc Nez	Obourg	black, homogeneous	light grey Begian	various Belgian	Spiennes / Rijckholt	northern flint	indet.	totals
primary classification																				
flake	748	32	17	5	10	38	–	1	552	1403	49	53	37	29	59	62	–	33	60	53
blade	35	7	9	5	2	4	3	–	35	100	2	12	20	29	12	7	60	–	4	4
core	433	10	3	1	3	6	–	2	67	525	28	16	7	6	18	10	–	67	7	20
waste	96	6	15	5	1	12	2	–	165	304	6	10	33	29	6	20	40	–	18	12
splinter	2	–	–	–	–	–	–	–	1	3	+	–	–	–	–	–	–	–	+	+
core fragment	6	1	1	–	–	–	–	–	5	13	+	2	2	–	–	–	–	–	1	1
block	36	1	–	–	–	–	–	–	9	46	2	2	–	–	–	–	–	–	1	2
rejuv. platf. tabul., facet.	3	–	–	–	–	–	–	–	3	6	+	–	–	–	–	–	–	–	+	+
idem, not facetted	2	1	–	1	–	–	–	–	3	7	+	2	–	6	–	–	–	–	+	+
rejuv. core face, parallel	20	–	–	–	–	–	–	–	4	24	1	–	–	–	–	–	–	–	+	1
idem, perpendicular	20	–	–	–	–	–	–	–	3	23	1	–	–	–	–	–	–	–	+	1
core prep., crested blade	2	–	–	–	–	–	–	–	–	2	+	–	–	–	–	–	–	–	–	+
idem, decort. flake	112	2	–	–	–	–	–	–	13	127	7	3	–	–	–	–	–	–	1	5
idem, decort. blade	2	–	–	–	–	–	–	–	1	3	+	–	–	–	–	–	–	–	+	+
pebble	1	–	–	–	–	–	–	–	–	1	+	–	–	–	–	–	–	–	–	+
indet.	19	1	1	–	1	1	–	–	56	79	1	2	2	–	6	2	–	–	6	3
Totals	*1537*	*61*	*46*	*17*	*17*	*61*	*5*	*3*	*917*	*2666*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*

Table 7.2 Flint, primary classification versus flint variety.

indeed bears sufficient similarity to our reference material from Cap Blanc Nez to be identified as such (fig. 7.3b), so the material classified as rolled pebbles may as a whole originally also have come from this source. The strong northbound currents in the North Sea may have carried flint nodules from Cap Blanc Nez in a northerly direction. Such nodules may have been deposited as far north as the Belgian province of Zeeland (P. Cleveringa, pers. comm.). Similar flint has been found at Neolithic sites around Antwerp, for example at Doel (Crombé *et al*. 2000). It has not been found further inland in Belgium and seems to be confined to coastal sites in that country (P. Crombé, pers. comm.). The inhabitants of Schipluiden may have travelled to the Belgian province of Zeeland to collect flint. The problem is that there are no data on the presence of flint in the western part of the Dutch province of Noord-Brabant. Detailed research is evidently needed before we can identify the source of this characteristic dark, fine-grained 'sea flint'.

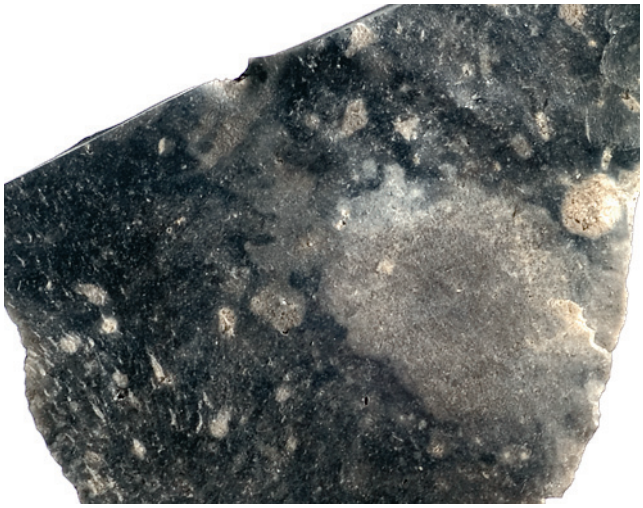
Another possibility is that the rolled pebbles were collected further north, closer to the Schipluiden site. Van der Valk (in prep.) notes that gravel, including small flint nodules, may have been obtained at the coast close to Schipluiden. According to Van der Valk, there are three possibilities. In the first place, estuarine gullies may have cut into the Pleistocene gravel deposits at the base of the river Oude Rijn. Other gravel deposits that may have been eroded by the sea are those of the ice-pushed ridge of Rhine-Meuse deposits in the subsoil of Haarlem-Vogelenzang. Another possibility, finally, is that the Oude Rijn carried gravel from the hinterland. If so, those gravel deposits must also have contained small nodules of flint, because the rivers transported Tertiary flint from the uplands of Noord-Brabant (Van der Valk in prep.).

The possibility of rolled pebbles of flint having been obtained close by on the beach is in agreement with the observation that flint was brought into the site in considerable quantities. The entire reduction sequence is represented at the site, from unmodified rolled pebbles via core-preparation and rejuvenation pieces to finished tools (see below). Flint was evidently not in short supply. The rolled pebbles are therefore considered to be local flint, and will be referred to as such below.

7.5.2 Imported flint: blades and axes

There is also a small quantity (5.2%) of non-local, 'exotic' flint types, deriving directly from the south Belgian

a 10775



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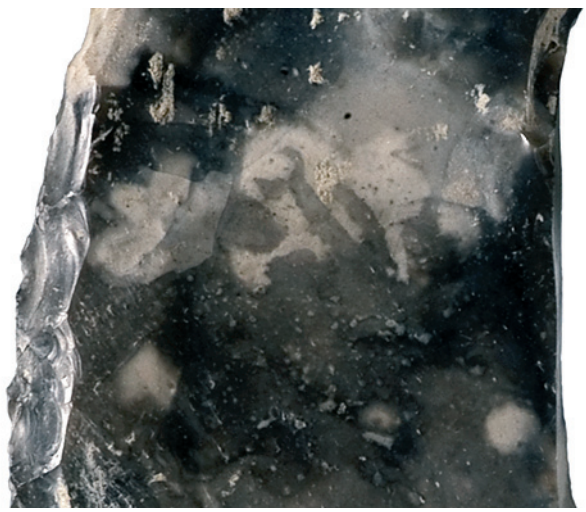

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Cretaceous zone. The artefacts concerned are predominantly finished products of a size larger than the rolled pebbles (fig. 7.4), and include no cores, core-preparation or rejuvenation pieces (table 7.2). Some of this material may have been imported in the form of polished axes. Several varieties of Belgian flint could be distinguished:

1) first of all there is the well-known light-grey flint from central Belgium, more specifically perhaps Hesbaye. This is a light grey, mottled, fine-grained flint;
2) a larger group consists of a fine-grained, mottled flint of darker shades of grey, probably from the same general region (fig. 7.3c). One of the axes from Schipluiden, a burned fragment of a large Buren axe, is made of this type of flint. It may actually be a variety of the same light grey Belgian flint;
3) a third variety of greyish flint also has a medium grey colour, but, instead of being mottled, it has very well defined inclusions of lighter flint against a darker background (fig. 7.3d). It is translucent and has a waxy feel to it;
4) there are also two varieties of homogeneous black flint: an almost translucent, very fine-grained variety and a somewhat coarser one. The translucent variety bears a close resemblance to the material found at Obourg in the Belgian province of Hainaut. It sometimes has a faint reddish colour when viewed through thin edges, a feature deemed highly characteristic of Obourg flint. Smaller nodules of a similar black flint are sometimes classified as Zevenwegen flint. A few artefacts found at the contemporary site of Wateringen 4 were indeed classified as such (Van Gijn 1997). The slightly coarser grained black variety of flint shows very fine light coloured specks (fig. 7.3e). It is sometimes found in coastal assemblages in the region of Antwerp, for example at Doel (P. Crombé, pers. comm.), but no source is known for this type of flint.

A last type of southern flint is represented by a group of five artefacts of a mottled dark grey, almost black flint of a fine-grained, but not translucent variety. This material bears resemblances to both Rijckholt and Spiennes flint, but is not entirely characteristic of either (fig. 7.3f).[2] It is not so strange that the Rijckholt and Spiennes flints should look so very alike, because they both come from the same chalk layer of Lanaye. It was indeed long believed that the two types could not be distinguished (M.E.Th. de Grooth, pers. comm.). It can be argued that Spiennes is most likely to have been the source of the Schipluiden flint, considering that very few flint artefacts point to a source near the Meuse. On the other hand, however, the hard stone found at the site, most notably the quartz, does derive from Meuse deposits (chapter 8), and the small amount of Rijckholt/Spiennes-like material may have been collected in the context of search parties or exchange relationships whose primary aim was the procurement of hard stone.

Finally, a few pieces (N=3) with a possible northern origin were encountered. They have characteristic glossy, patinated surfaces typical of flint from boulder clay deposits. No flint with Bryozoa inclusions, characteristic of erratic sources, was however identified.

Flint procurement

Unfortunately, the greater part of the flint cannot be sourced. The flint concerned consists of smallish flakes without cortex or distinctive features. Obviously the percentage of unidentifiable flint among the flint from the 4-mm sieve is much higher than that among the manually collected material because the former consists of splinters that are too small to show distinctive features such as cortex, mottling and the like.

To conclude, even though it has not been possible to determine the origin of the raw material, the general area from which the inhabitants of Schipluiden procured their raw material is evident: a source at the coast near Schipluiden or further south towards the Belgian province of Zeeland for the dark rolled pebbles, and the south Belgian Cretaceous zone, from Hainaut to (possibly) Hesbaye, for the imported material. This implies contacts in a direction different from that inferred for the hard stone, namely south instead of east or southeast.

7.6 Technology and typology

7.6.1 Technology

The predominant type of raw material consists of rolled pebbles of small dimensions (3.5-6 cm in diameter). These pebbles were brought to the site and worked locally, as

◀ Figure. 7.3 The most important flint varieties represented in the assemblage (magnification 2×).
a rolled pebble
b Cap Blanc Nez
c Belgian flint probably from the Hesbaye
d mottled greyish flint, probably Belgian, with waxy texture
e relatively coarse-grained black flint
f grey flint from Spiennes or possibly Rijckholt

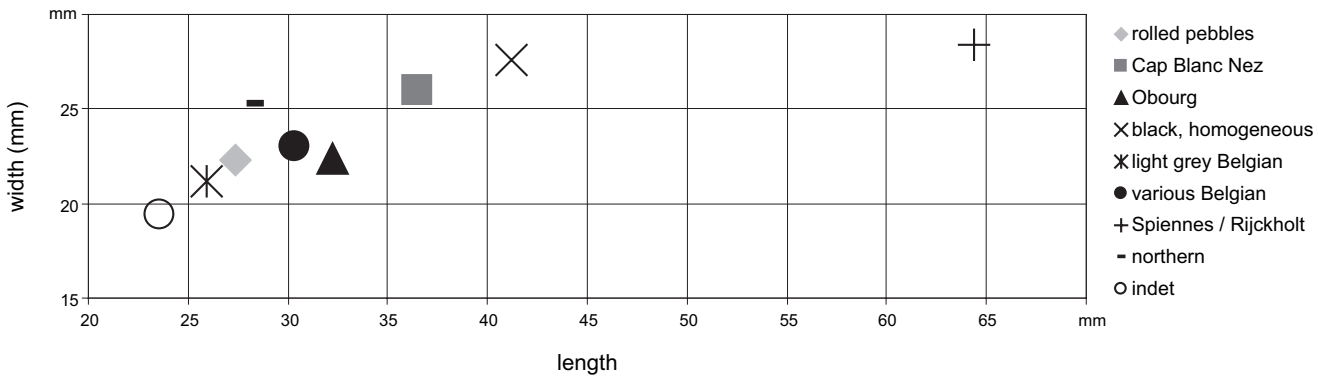


Figure. 7.4 Mean dimensions of the various flint varieties. The relatively small number of larger blade implements has only a modest effect on the mean values, with the exception of the Spiennes/Rijckholt material.

demonstrated by the presence of decortification flakes, core-preparation and core-rejuvenation pieces (table 7.2, fig. 7.5). The small amount of debitage of other types of flint is probably attributable to the import of polished axes that were secondarily used as cores after breaking. This would explain the incidental presence of cores of Belgian, Obourg and homogeneous black flint. Cores of Spiennes/Rijckholt-like flint are however absent. The secondary use of broken axes as cores also explains the low frequency of cortical pieces of Belgian flint. The larger blades of Belgian flint were most likely imported as finished products, since no debitage associated with their production has been found.

The more or less complete absence of cortex on the imported material is another indication that this flint was only incidentally flaked at Schipluiden. None of the artefacts made of the light grey Belgian material shows cortex. Implements of Belgian flint, Obourg and black homogeneous flint have cortex in only 10-25% of the cases. This contrasts with the rolled pebbles and the Cap Blanc Nez material, 65-70% of which shows a weathered outer surface.

As already mentioned above, broken polished flint axes were also employed as cores (fig. 7.6). When an axe breaks in half (for example as a result of a shock fracture from impact), two perfectly prepared platforms result. A considerable number of polished axe flakes were found (N=548), most of which are of unknown flint (N=514), but Belgian (N=18), light grey Belgian (N=12), Obourg (N=3) and Cap Blanc Nez (N=2) flint were also identified. Their average size is relatively small (average length is 2.2 cm), but they do show well-developed bulbs of percussion indicating that they were struck purposefully. These polished axe flakes can be considered decortification flakes, removed in order to prepare a proper core. The great majority of the polished flakes in the assemblage (71.6%) are unmodified flakes, but some flakes were modified into tools or used without further modification (fig. 7.7). The small number of cores of imported material may therefore actually be the exhausted remnants of polished axes, granted a second life as a core. In fact, 45 flake cores display a polished facet. Some of the tools of unknown or imported flint must have been made from such 'axe cores'. Those cores cannot have been very large, as most of the recovered axes are of small dimensions**.** Attempts to refit the polished axe fragments were not successful (Wentink 2004).

As the reduction sequence was basically directed at the production of flakes, blades are a rare occurrence. Most blades were made from rolled pebbles and are of small dimensions. They are probably not intentional products of the reduction sequence. The larger blades are invariably made on imported, Belgian flint. They must have been brought to the site as finished products, as no evidence of large blade cores or flaking waste from imported flint has been found. Something similar was also observed at for instance Kraaienberg (Louwe Kooijmans/Verhart 1990), and is in agreement with the evidence obtained at other Middle Neolithic sites.

Evidence of both hard and soft hammer percussion has been found. Platform preparation was not evident in the case of more than half of the examined pieces. Incidentally, the platform was abraded or displayed micro-retouch. The type of platform varied. The largest category was formed by platforms with cortex, which is not surprising considering the fact that most of the flaked material consisted of rolled pebbles. Other platforms include facetted, pointed and linear shapes. The platforms of a number of tools, made of exotic materials had disappeared through retouch, so nothing remained to indicate the shape of the original platform. The widths of the platforms are 3-5 mm, with only a few

larger specimens. The angle of percussion varied between 90 and 130 degrees, with an average at 110-120 degrees (189 implements). The impact point usually displays a cone of percussion, sometimes the cone extends into the platform.

As stated above, rolled pebbles of small dimensions constitute the largest category of locally knapped flint. They measured on average 3.5 by 6.0 cm. Some of the pebbles display one or two flake negatives, suggesting that they were only tested. It is likely that a bipolar technique was used to open the pebbles, for, being small and rounded, they afforded no primary striking points. Flakes with evidence of bipolar flaking were found (N=71). Several hammer stones were found, some of which may have been used for hard hammer percussion, but only one anvil was encountered (chapter 8). Once the pebbles had been opened up, normal hard hammer percussion seems to have been practised. Well-developed bulbs of percussion prevail, but evidence of soft hammer percussion was also found. Broken axes were secondarily deployed as cores, using the same technology. The tools made on the imported flint were frequently retouched, indeed to such an extent as to result in the removal of technological features. The absence of a pronounced bulb of percussion on many of these tools points to removal by soft hammer percussion.

The flint technology shows close similarities to that practised at neighbouring sites. At Wateringen 4 rolled pebbles were likewise knapped locally, while imported flint rarely displays cortex and must therefore have been brought to the site in the form of finished products. There, too, a considerable number of axe flakes were encountered (Van Gijn 1997). Bipolar reduction was observed at Ypenburg (Koot/Van der Have 2001, 111). At all three sites flake technology predominated and the average size of the artefacts is small. The dichotomy between the rather wasteful reduction strategies of local flint and the import of small amounts of high-quality implements observed at Schipluiden is also in agreement with the evidence provided by contemporary Michelsberg sites further east and in Belgium (*e.g.* Kraaienberg, Louwe Kooijmans/Verhart 1990) and the site of Spiere in the Scheldt basin (Vanmontfoort *et al.* 2001/2002).

7.6.2 Tool typology

The range of tool types represented at Schipluiden agrees with that encountered at Hazendonk sites (table 7.3). The triangular point is the most noteworthy, being a typical Michelsberg type of point. This artefact was found in substantial numbers. Most had a straight, slightly convex or concave base and an asymetrical cross-section (fig.7.8). They show surface retouch, which does not always cover the entire ventral surface. Interestingly, unfinished points are relatively numerous, suggesting that this tool type was also manufactured locally. This is corroborated by the fact that quite a few of them are made on local flint. A few were produced on Belgian and Obourg flint (table 7.3). Other point types such as geometric points and leaf-shaped points were encountered in small numbers.

Another tool type typical of the Hazendonk period is the pointed blade. Only a relatively small number of pointed blades 'proper' were found at the site (fig. 7.9). The other blades that were classified as such are less typical.

A small number of point-butted axes were found, all of them with an oval cross section and usually of quite small dimensions, approx. 5 cm in length (fig. 7.6). One axe is made of local flint, the others are of unknown flint types. The flint of most of these axes resembles the (light grey) Belgian flint. Only three axes are complete; the other

Legende of codes in figures of chapters 7 and 10

contact material/activity

BR	burning
CE	cereals
HA	hafting
HI	hide
HI/SIPL	hide/silicious plants
JE	jet
MI	mineral
PL	(soft) plant
PO	pottery
SH	shooting
SIPL	silicious plants
SOMA	soft material
ST	stone
UN	unknown
WO	wood

motion


drilling/boring


'impact'


cutting/sawing


transverse/scraping


hafting

degree of use

•	heavily developed traces
•	medium developed traces
·	lightly developed traces
x x x	traces of tar from hafting
+ + +	friction glass from hafting
* * *	handling traces

technical information


bulb of percussion present


bulb of percussion absent but direction of percussion clear

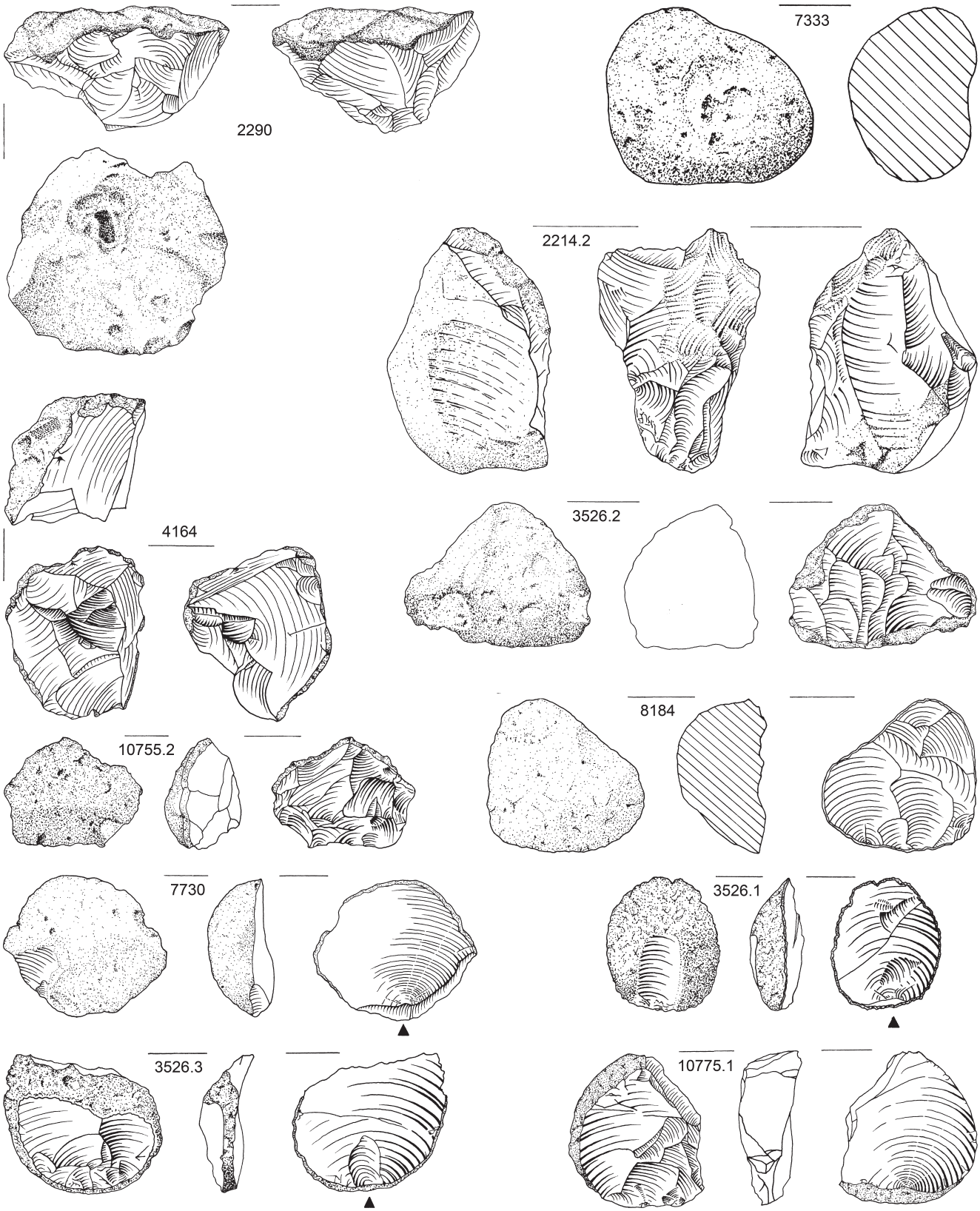


Figure 7.5 Cores and core-preparation flakes (scale 1:1).

pebble	7333	core caps	8184, 7730 and 3526.1
cores	2290, 2214.2, 4164, 3526.2 and 10755.2	core preparation flakes	3526.3 and 10775.1

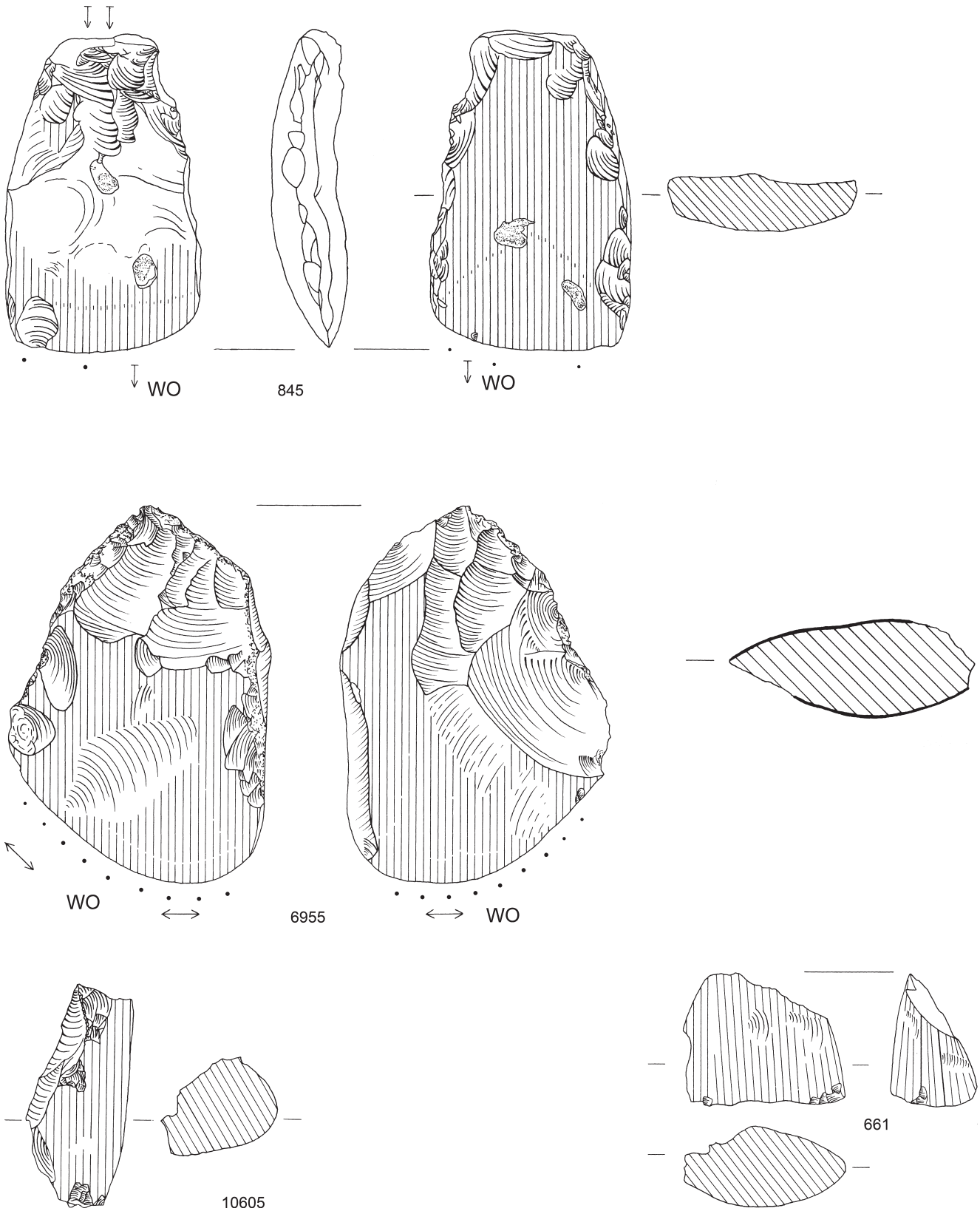
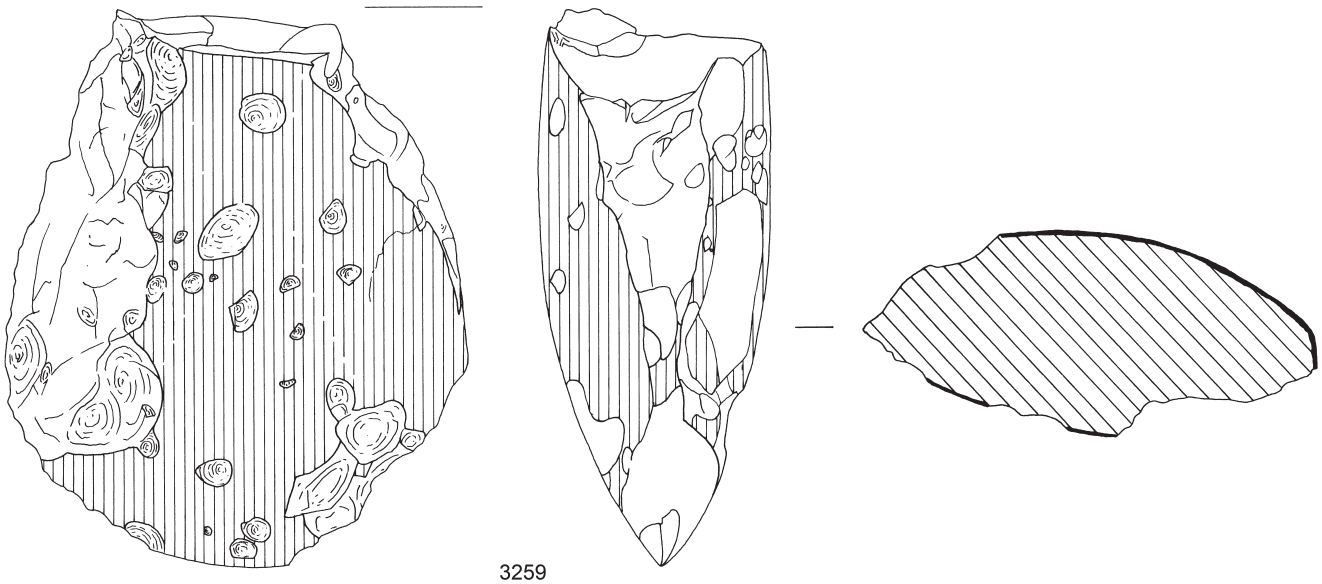
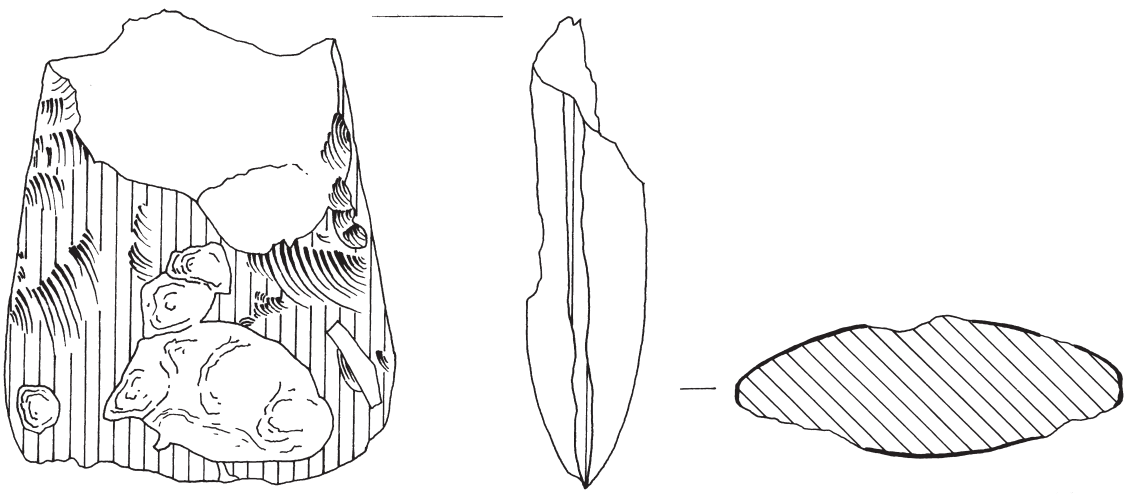


Figure 7.6 Axes and axe fragments (scale 1:1).





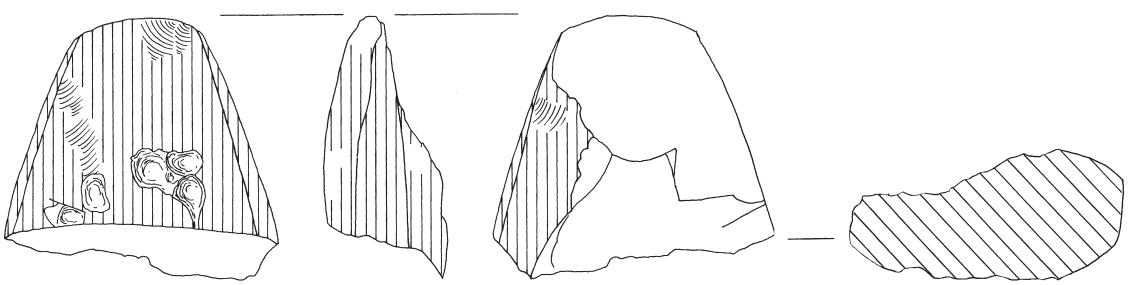


Figure 7.6 *(cont.)* Axes and axe fragments (scale 1:1).

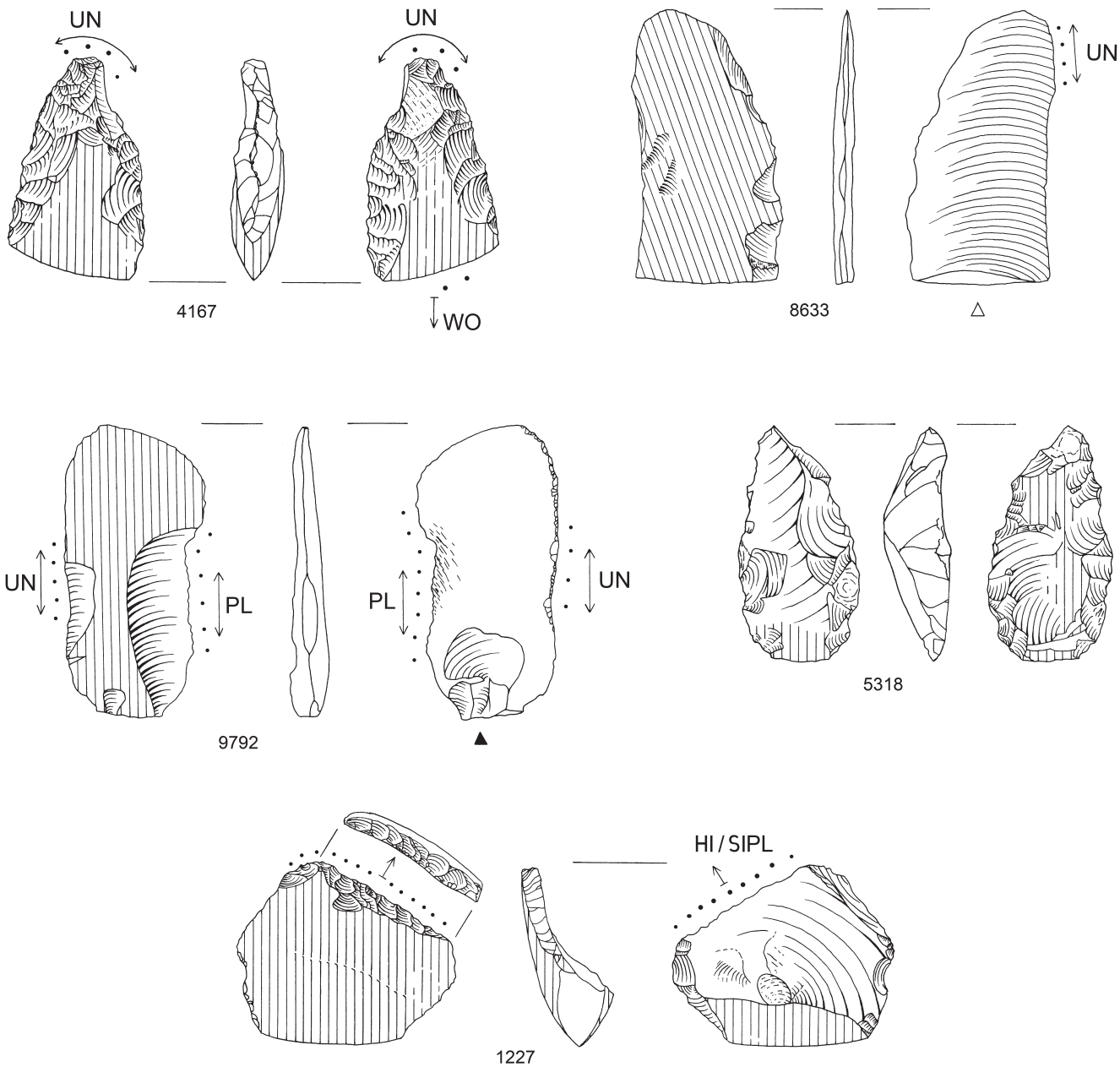


Figure 7.7 Retouched or used axe flakes and fragments (scale 1:1).

artefacts are large parts of axes. One burnt distal end, still displaying part of the cutting edge can probably considered part of a Buren axe (fig. 7.6, no. 3259).[3] The axes have a highly polished cutting edge, the remaining surface being only (partially) ground. This may be because the removal of the deep depressions of the flake negatives was very time-consuming, but it may also be indicative of recycling and rejuvenating damaged axes. Complete axes are indeed also rare in the assemblages of the neighbouring Michelsberg sites. No complete axes were found at Wateringen 4 (Raemaekers *et al*. 1997), nor at Gassel (Verhart/Louwe Kooijmans 1989), while only one was encountered at Kraaienberg (Louwe Kooijmans/Verhart 1990). Only one atypical specimen was found at Maastricht Klinkers

flint variety / artefact type	rolled pebbles	Cap Blanc Nez	Obourg	black, homogenous	light grey Belgian	various Belgian	Rijckholt / Spiennes	northern flint	indet.	totals
geometric microlithic point	3	1	–	–	–	–	–	–	2	6
triangular point	37	2	10	3	–	9	1	–	26	88
leaf-shaped point	3	–	–	–	–	–	–	–	2	5
halfproduct point	24	4	2	–	–	1	–	–	10	41
point indetermined	3	–	–	1	–	1	–	–	9	14
borer	12	3	1	–	–	5	–	–	4	25
burin	2	–	–	–	–	2	–	–	–	4
scraper	21	4	3	2	1	2	2	–	17	52
combination tool	–	1	–	–	–	2	–	–	–	3
axe	1	–	–	–	–	–	–	–	13	14
pointed blade	12	2	2	2	–	3	1	–	9	31
strike a light	10	2	5	3	–	1	–	–	13	34
retouched blade	14	2	1	1	2	3	1	–	10	34
retouched flake	438	23	15	4	2	20	–	–	213	715
retouched core	9	3	2	–	1	–	–	–	2	17
retouched block	1	1	–	–	–	–	–	–	–	2
retouched type unknown	12	2	1	–	–	1	–	–	21	37
notched flake	1	–	–	–	–	–	–	–	–	1
not modified	936	11	4	1	11	11	–	3	566	1543
Totals	*1539*	*61*	*46*	*17*	*17*	*61*	*5*	*3*	*917*	*2666*

Table 7.3 Flint, artefact type versus flint variety.

(Schreurs 1992, 139). Complete axes were also relatively rare at Spiere in the Scheldt basin (Vanmontfort *et al*. 2001/2002). Wateringen 4 yielded only four fairly large parts of axes, but many polished axe fragments (7.3%, Van Gijn 1997, 173). Flake axes were absent at Schipluiden.

Other tool types are less specific of the Hazendonk flint repertoire. Scrapers constitute an important tool type. Their sizes and exact shapes vary, many being somewhat irregularly shaped (fig. 7.10). Most of the scrapers were classified as short end scrapers with a single scraping head. They were predominantly made on rolled pebble flakes and were produced locally as the need arose. Three very finely shaped scrapers were classified as tanged scrapers (fig. 7.11, nos.1255, 9381, 815). The almost lamellar retouch must have been applied by either soft percussion or, more likely, pressure flaking, as it covers a large part of the tool's surface. Two were made on Spiennes/ Rijckholt flint, one on homogeneous black flint; they were probably imported as finished tools. Scrapers of this kind were not found at Wateringen 4, nor at other Hazendonk sites.

Quite a few borers were found, ranging from a very heavy reamer made of mottled Belgian flint to a tiny awl with a long, finely retouched tip (fig. 7.11). Although some borers were clearly imported, such as the large reamer (no. 8345), the majority are much smaller and were made locally on flakes of rolled pebbles.

Strike-a-lights form an interesting category. They are characterised by an elongated shape and a rounded point at one or both ends (fig. 7.12). Their general shape may vary somewhat, so tools vaguely resembling a scraper may initially have been classified as such, and have been identified as strike-alights only after microscopic examination. No tools have previously been identified as strike-a-lights in Hazendonk assemblages. Those assemblages may however have included strike-a-lights that were classified as reamers (*e.g*. Louwe Kooijmans/Verhart 1990, fig. 30, tool N26). Three strike-a-lights were found in grave 2, in or close by the hand of the buried man (fig. 5.4).

Retouched blades are relatively rare (fig. 7.13). A few were made from rolled pebbles and have small dimensions. They are probably not the result of intentional blade production. Other blades, like no. 10,419 (fig. 7.13), are much larger, regularly shaped, made of imported or unknown materials

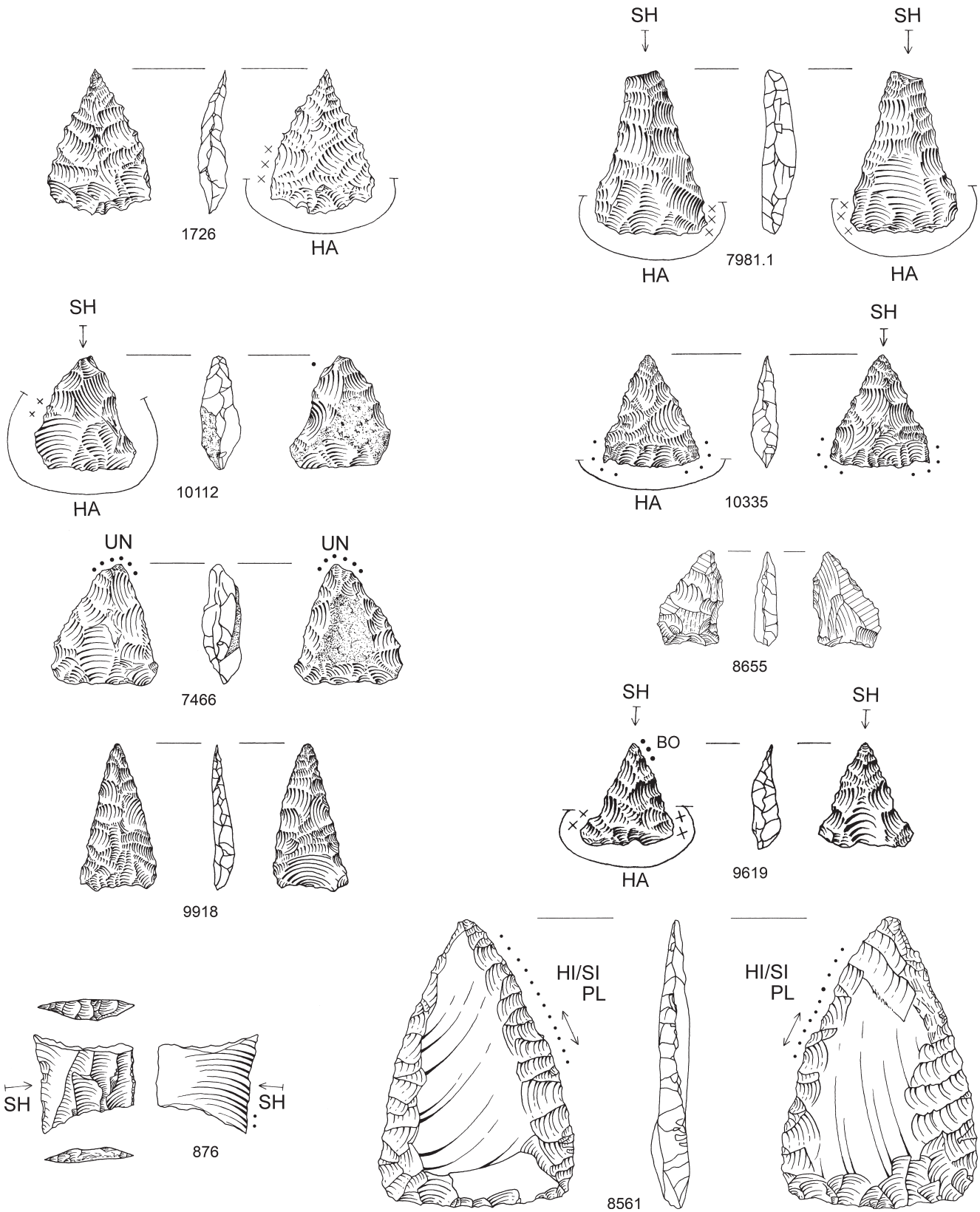


Figure 7.8 Triangular and leaf-shaped points and a geometric point (876), (scale 1:1).

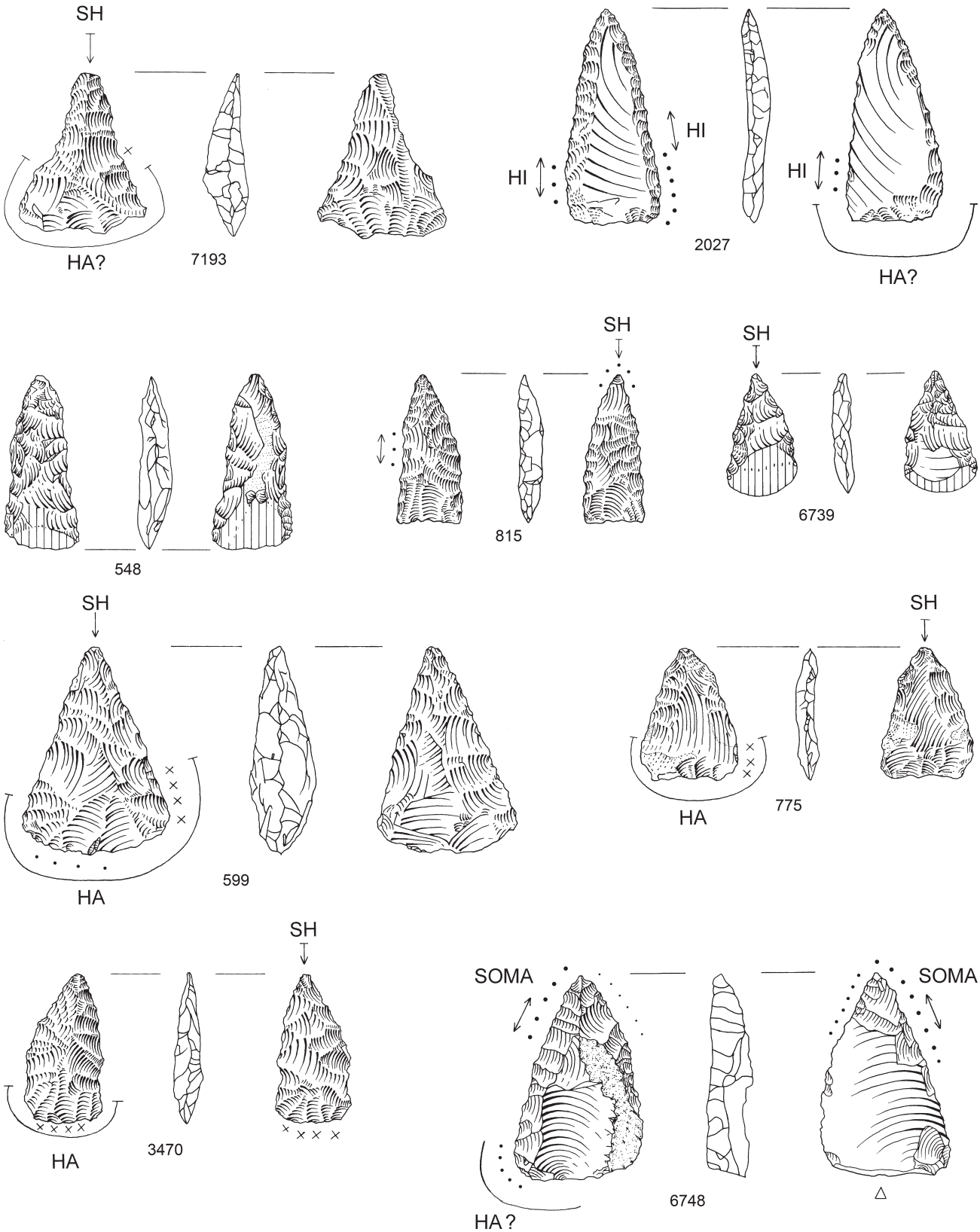


Figure 7.8 *(cont.)* Triangular and leaf-shaped points (scale 1:1).

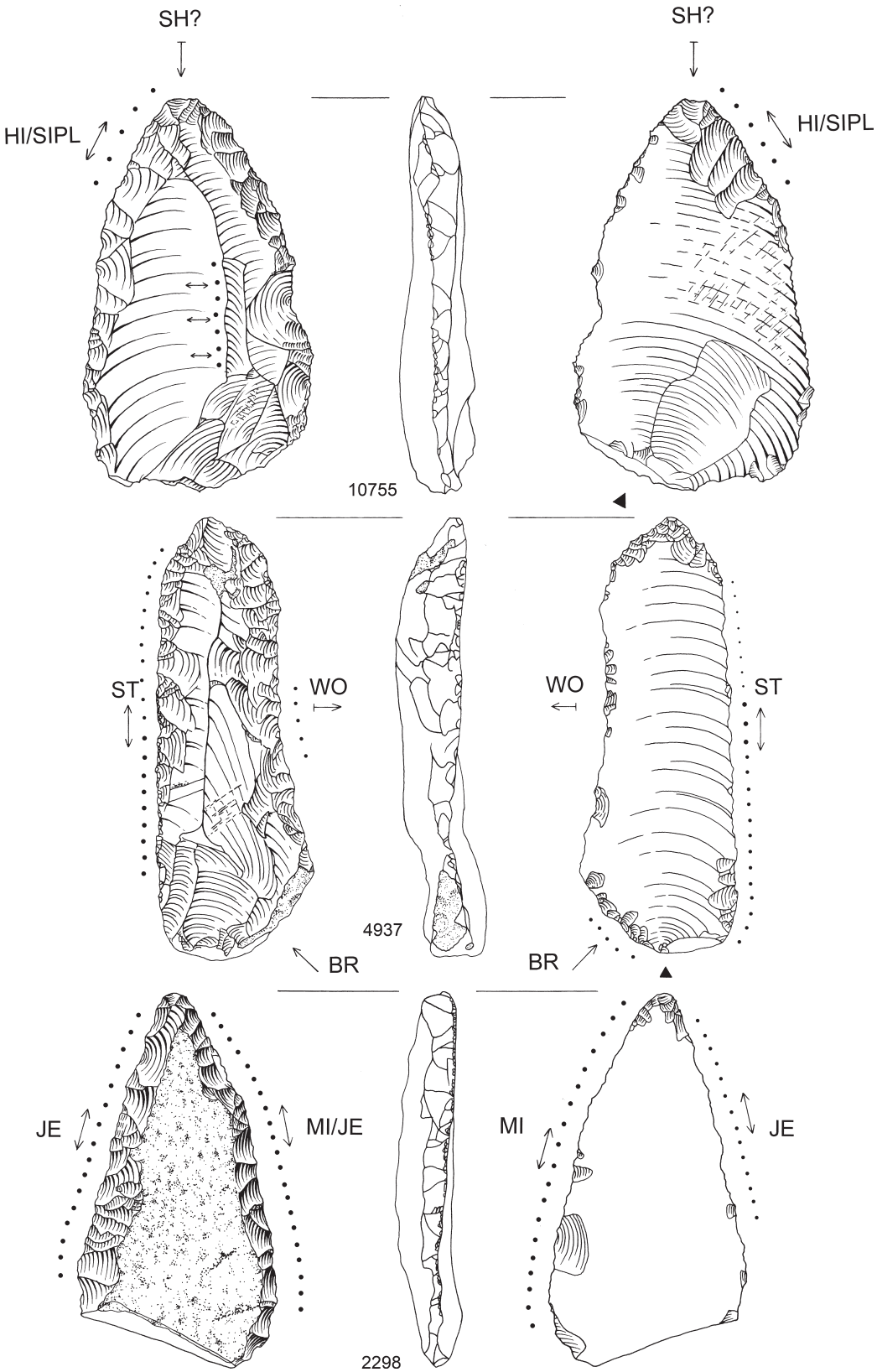


Figure 7.9 Pointed blades of imported flint (scale 1:1).

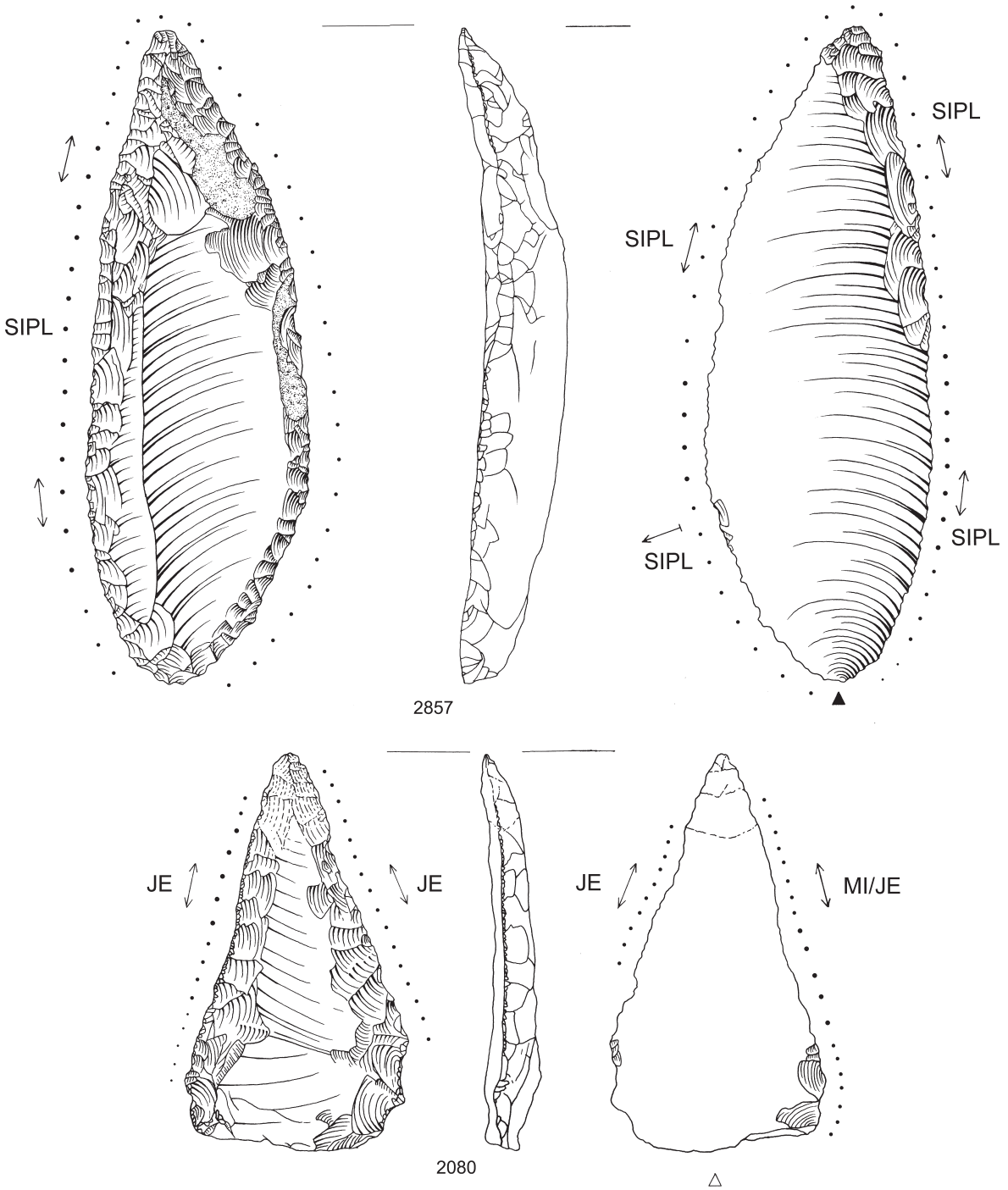


Figure 7.9 *(cont.)* Pointed blades of imported flint (scale 1:1).

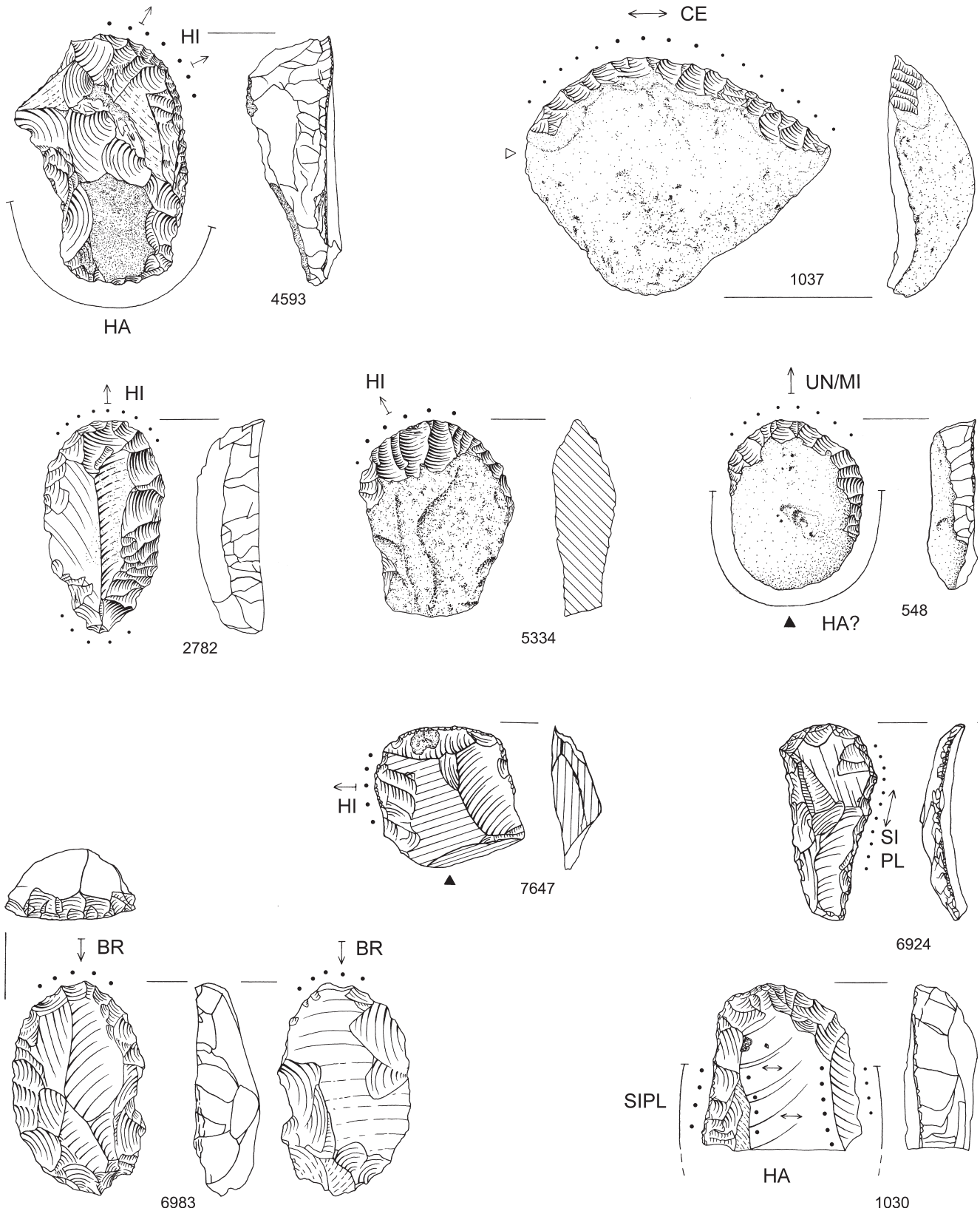


Figure 7.10 Various end and side scrapers (scale 1:1).

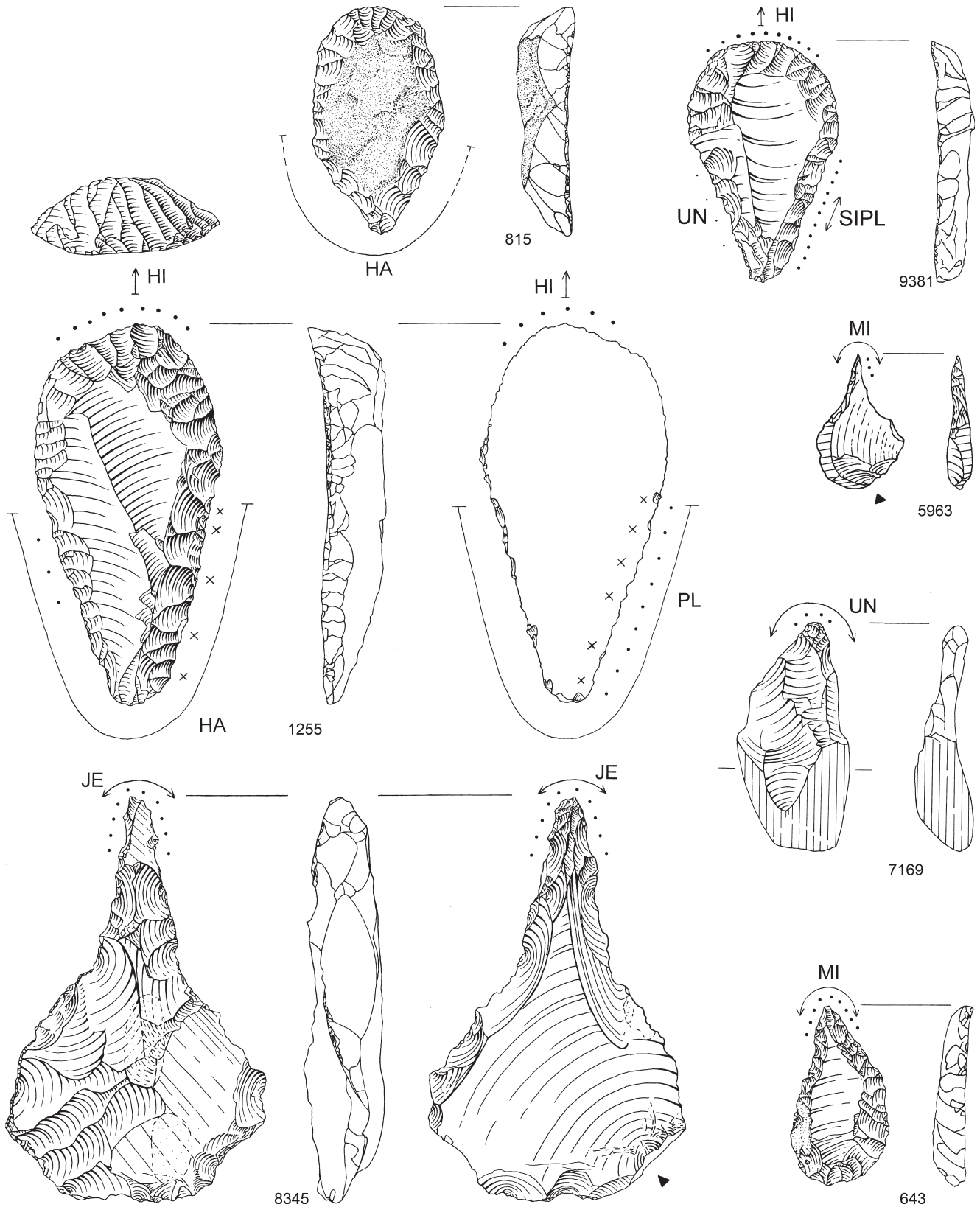


Figure 7.11 Tanged scrapers and borers (scale 1:1).

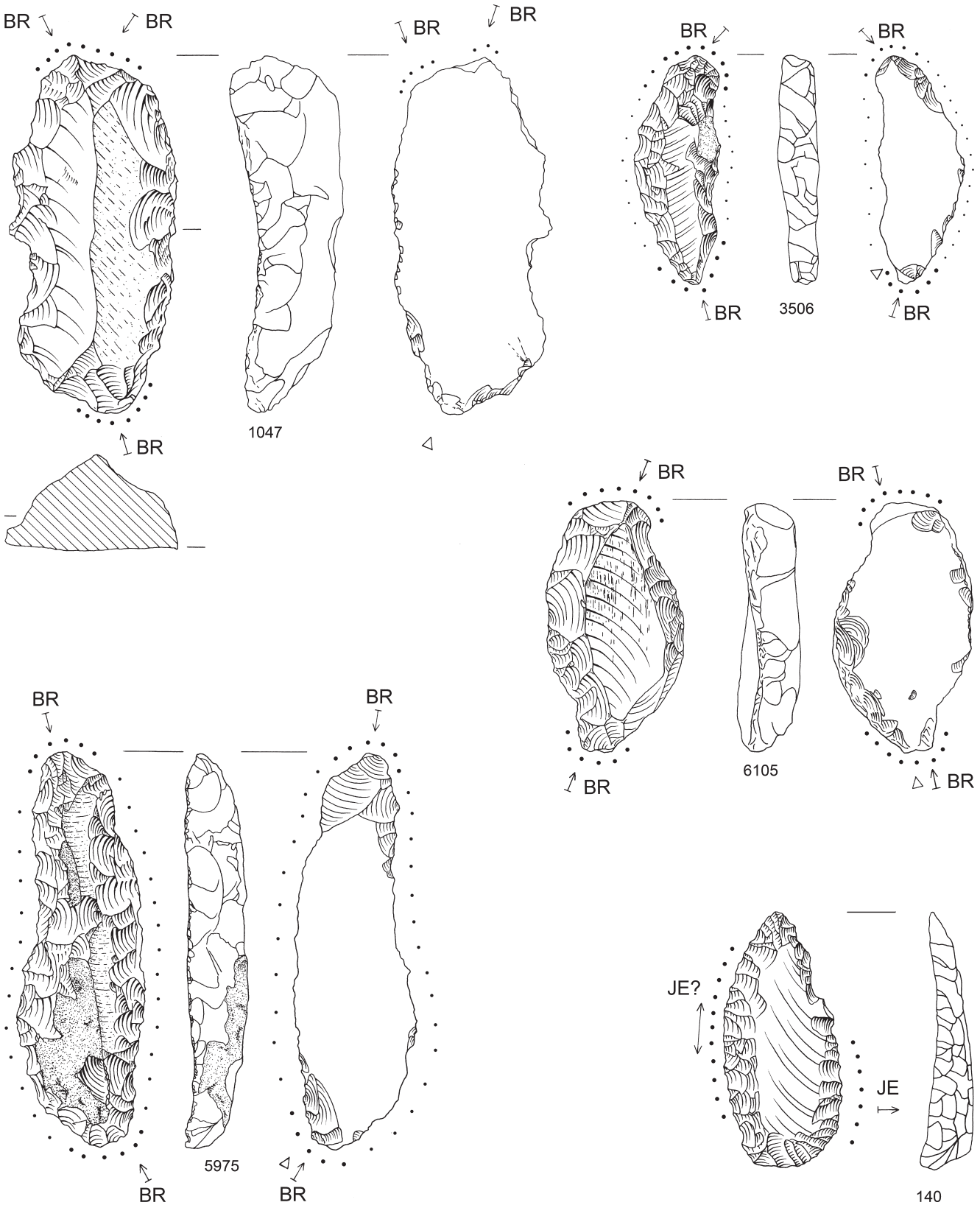


Figure 7.12 Strike-a-lights, two from grave 2. Retouched blade (no. 140). (scale 1:1).

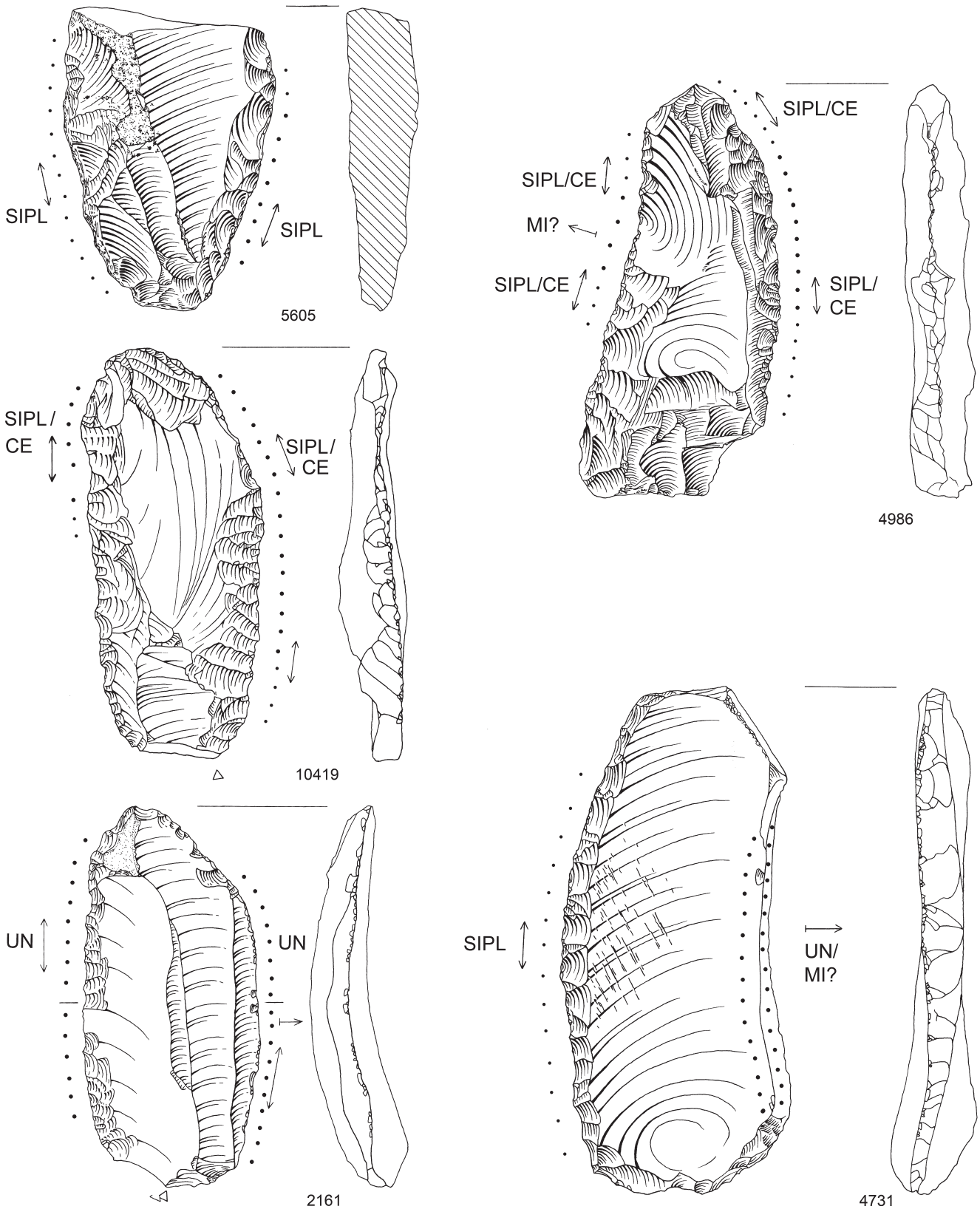


Figure 7.13 Retouched blades of imported flint (scale 1:1).

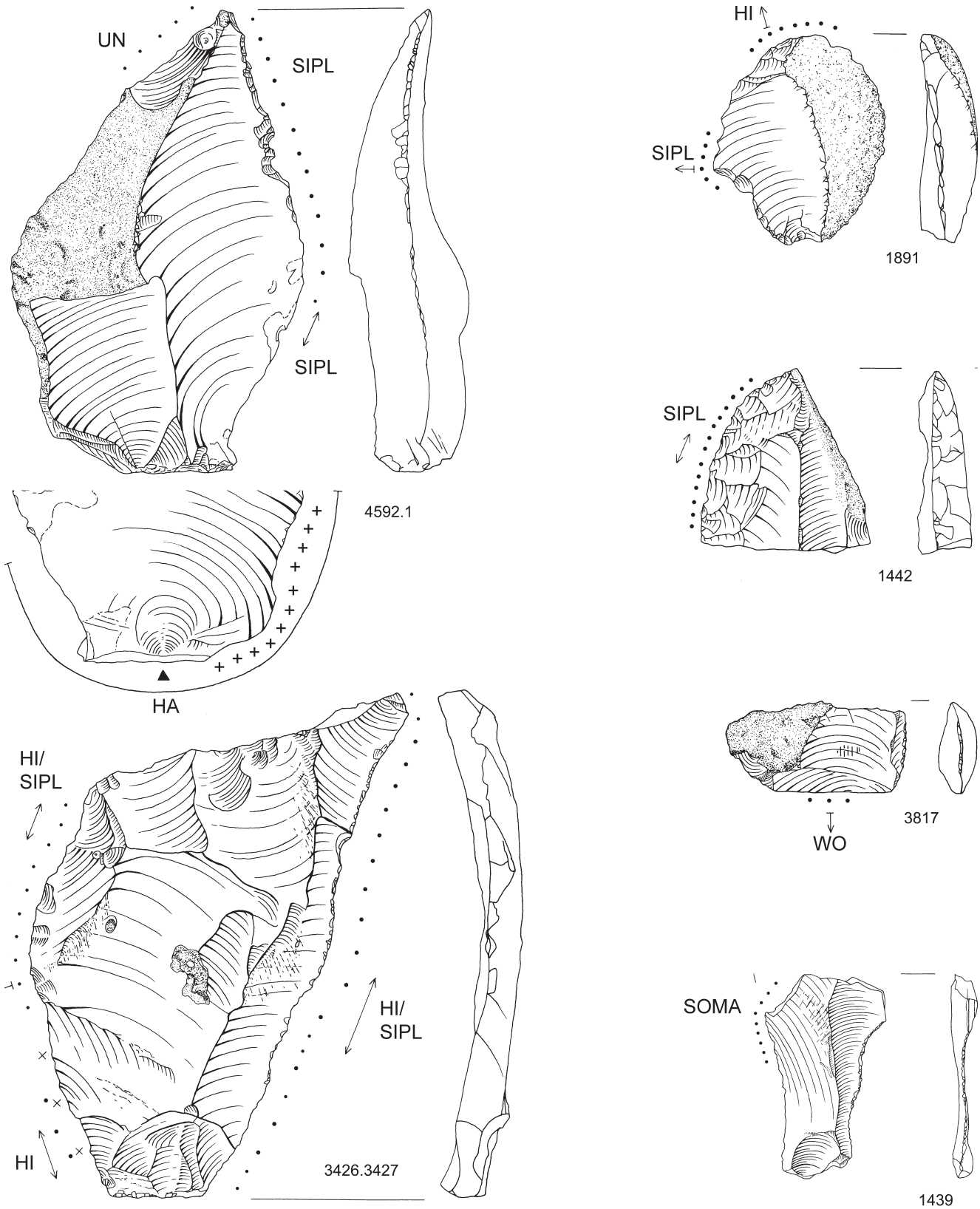


Figure 7.14 Retouched flakes (scale 1:1).

motion / contact material	longitudinal	transverse	boring	diagonal	pounding	shooting	transverse / longitudinal	hafting	hafting with tar	indet.	totals
plant											
plant unspec.	–	–	–	–	–	–	–	2	–	–	2
soft vegetal	1	–	–	–	–	–	–	–	–	–	1
siliceous plant	17	8	–	–	–	–	1	–	–	3	29
reeds	1	–	–	–	–	–	–	–	–	–	1
cereals	3	–	–	–	–	–	–	–	–	–	3
wood	2	3	–	–	–	–	–	–	–	1	6
animal											
bone	–	1	–	–	–	–	–	–	–	–	1
hide	1	14	–	–	–	–	1	–	–	–	16
fresh hide	–	2	–	–	–	–	–	–	–	–	2
soft animal	2	1	–	–	–	1	–	–	–	1	5
mineral											
mineral unspec.	1	7	6	1	–	–	–	–	–	–	15
soft stone	1	–	–	–	–	–	–	–	–	–	1
pyrite	–	–	–	–	32	–	–	–	–	–	32
jet	3	–	–	–	–	–	1	–	–	–	4
uncertain material											
bone / wood	2	1	1	–	–	–	–	–	–	–	4
hide / siliceous plant	4	1	–	–	–	–	2	–	–	–	7
soft material unspec.	1	2	1	–	–	–	–	–	–	1	5
unknown use	9	8	3	–	–	2	1	2	–	4	29
hafting											
with tar	–	–	–	–	–	–	–	–	9	–	9
material indet.	–	–	–	–	–	–	–	8	–	–	8
indet.	–	–	–	–	–	14	–	–	–	6	20
Totals	*48*	*48*	*11*	*1*	*32*	*17*	*6*	*12*	*9*	*16*	*200*

Table 7.4 The results of micro-wear analysis of 147 artefacts with 200 AUA's (actually used areas); contact material versus motion. The figures represent actually used edges and not individual tools, as one artefact may display more than one used zone.

and were probably produced elsewhere. The retouch is regular and more invasive.

At 63.7%, retouched flakes constitute by far the largest category of modified tools (fig. 7.14). Most were made from rolled pebbles, but there are also several large flakes of Cap Blanc Nez, Obourg and homogeneous black flint, which must have been brought to the site as such. One flake is notched.

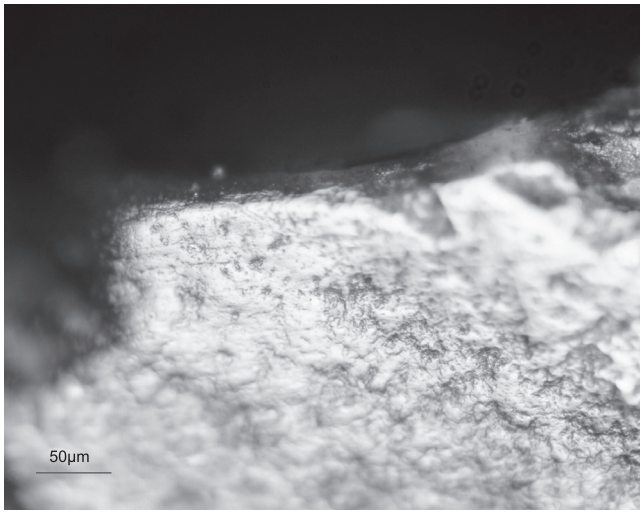
The remaining tool categories include several cores with retouch and some retouched pieces for which the primary classification could not be specified.

7.7 Artefact use

7.7.1 Introduction

A total of 373 artefacts were examined for traces of use. This sample included 204 implements from trench 10. The

Figure 7.15 Use-wear traces formed in contact with silicious plants, cereals, wood and hide.
a-c various varieties of bright polishes interpreted as resulting from contact with silicious plants (200×)
d polish showing resemblance to that obtained by harvesting cereals (200×)
e possible wood working traces (100×)
f rounding and matt polish formed in hide scraping (200×)



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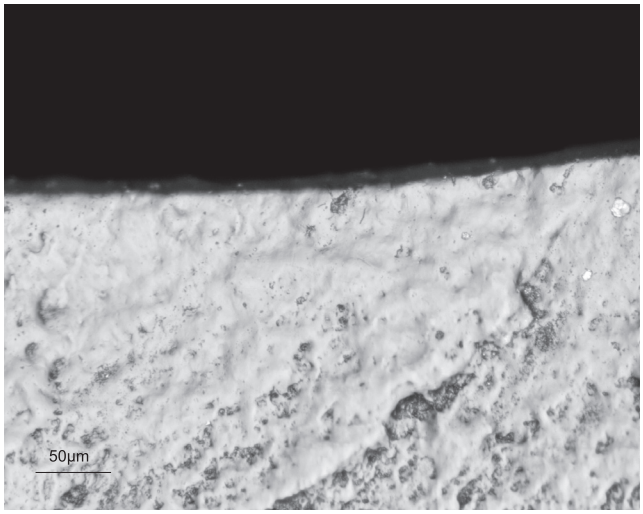

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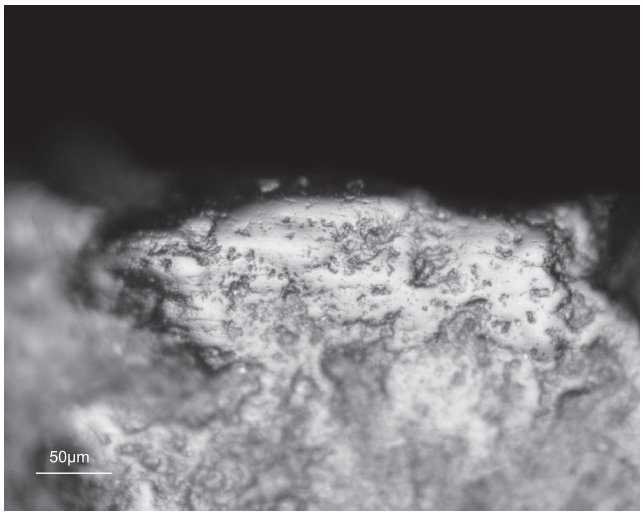

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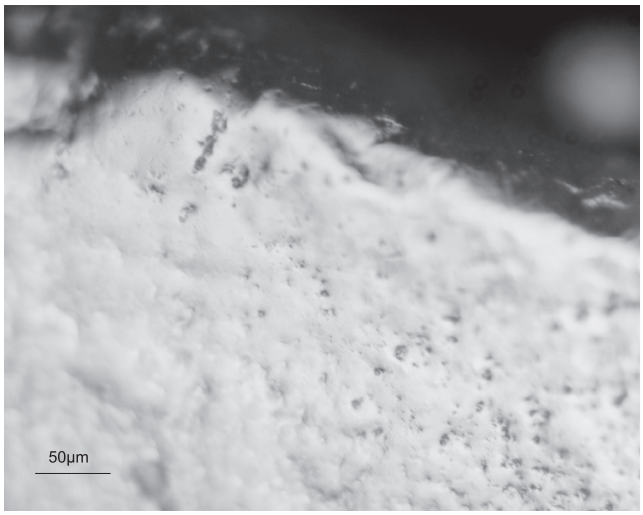

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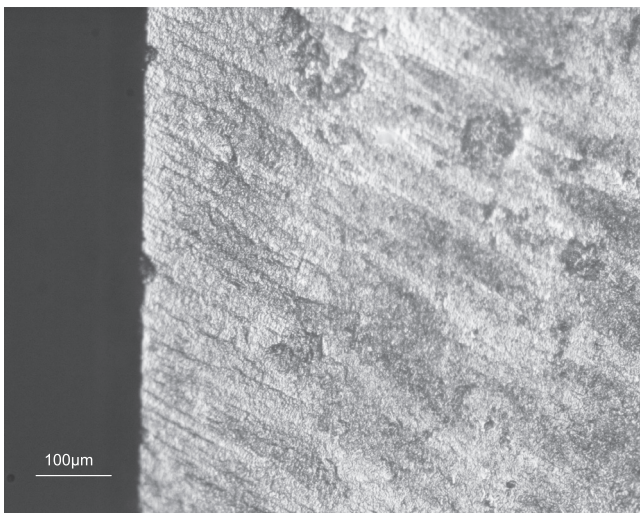

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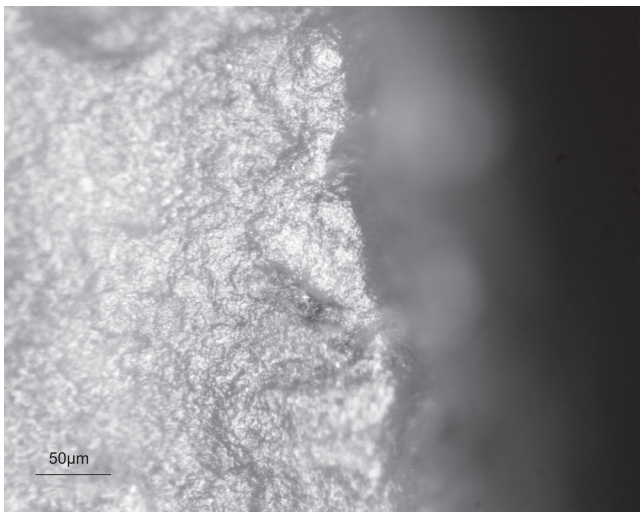

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rest of the material from trench 10 was either very small or very irregularly shaped, and was not studied microscopically. The results of the use-wear analysis of the material from trench 10 were used to assess the representativeness of the sample taken from the other trenches, consisting of 169 artefacts, selected from each typological category. Blades were given preferential treatment because it is known from experience that this tool type was used frequently and for a variety of purposes. This meant that there was a higher chance of spotting rare contact materials that would otherwise not have been noted.

A total of 200 actually used areas (AUAs) were distinguished on 147 artefacts. This implies that 39.4% of the artefacts examined, displayed traces of use. Several tools had more than one used edge: 41 tools had two AUAs, 10 tools were used on three edges, and two implements had four AUAs. Triangular points, scrapers, pointed blades, strike-a-lights and retouched blades most frequently showed more than one actually used area. The tools were found to have been used for a variety of activities (table 7.4).

7.7.2 Plant processing and woodworking

Silicious plants were the most frequently inferred contact material (table 7.4, figs. 7.15 a-c). In the majority of these cases the category of plant could not be identified due to the absence of characteristic features. One AUA displayed the fluid, very bright polish indicative of reed working. Most tools however showed a plant polish that could not be differentiated. Many of the tools concerned were used in a longitudinal (cutting) motion. Transverse motions indicative of processing activities, were less frequently observed. This is in sharp contrast with the Late Mesolithic Hardinxveld sites and also the Swifterbant sites S2 and S3 and Brandwijk (Van Gijn *et al*. 1998, 2001a, b, pers. observation; Bienenfeld 1985, 1988). These tools are assumed to have played a role in the preparation of reeds and other silicious plant material for further use in plaiting or basketry activities. Some such tools were found at Wateringen 4, but none displayed the smooth polish that was so prominent on the Late Mesolithic and Early Neolithic blades. Interestingly, these traces were not observed on Vlaardingen flint tools either. This implies a change in activity pattern somewhere during the early Middle Neolithic, most probably in basketry and plaiting techniques. It is difficult to ascertain whether this was related to a shift in subsistence.[4]

Tools showing traces of woodworking were rare, certainly considering the amount of wood that was chopped and chiselled near the site. Two axes display a smooth, domed gloss, characteristic of contact with wood, in their use retouch. One was clearly used in a transverse, chopping motion, the other oddly enough seems to have been used to cut wood, as the motion is indisputably longitudinal (fig. 7.15e). Other woodworking tools should be viewed in connection with the few examples of fine woodworking found at the site (chapter 11). They include a pointed blade used to shave wood. This implement, made on Obourg flint, is remarkable in that it displays three zones of use, each entirely different in character (fig. 7.9, no. 4937). Two flakes, one of which is unmodified, were also used on wood. One point, made on the cutting edge of a polished axe flake, displays traces of wood chiselling, but this probably relates to the axe to which this flake belonged before it was modified into a point (fig. 7.7, no. 4167).

In comparison with other contemporary assemblages the percentage of woodworking tools is surprisingly low: only 3% of the used zones relate to woodworking, versus 8.1% at Wateringen 4 (Van Gijn 1997). At Gassel, 18 of the 30 artefacts examined (60%) displayed wear traces formed in woodworking (Bienenfeld 1989). Traces of contact with wood however often resemble various post-depositional traces, so the figure obtained for Gassel may not be entirely representative. At Schipluiden, woodworking traces observable on the hard stone and bone tools compensate for the small number of flint woodworking tools (see chapters 8 and 9).

7.7.3 Cereal harvesting

A few of the implements show traces formed in cutting silicious plants that look very much like the traces observed on our experimental sickles. Three zones on two implements (one on a scraper (fig. 7.10, no. 1037) and two on a retouched blade (no. 4986) display a smooth, bright, highly linked polish (figs. 7.15d). The band of polish is however not as wide as that on the experimental sickles used to cut stems. The traces on the tools bear a closer resemblance to traces on implements that were used to snap and cut off ears. Some of the tools that were interpreted as having been used on silicious plants may actually have been sickles. This holds especially for a large pointed blade (fig. 7.9, no. 2857) and two retouched blades (fig. 7.13, no. 10,419 and no. 4731), which show this very bright polish suggestive of use as a sickle.

Five tools, all displaying silicious plant polish, were sampled for phytolith analysis (see chapter 8). Only one sample, from tool no. 10,419, revealed a small dendriform shape with papilles. No phytoliths were observed on the other four implements. The presence of sickles comes as a bit of a surprise as no sickles were encountered in the Wateringen 4 assemblage. The presence of sickles does however agree with the results of the analysis of the botanical macro-remains (chapter 19) and with the presence of grinding stones (chapter 8). Sickles may have had a special significance for the inhabitants as one of them (no. 4986) displays some patches of a reddish residue that may be ochre. A similar residue has been observed on three sickles from Ypenburg (Van Gijn, pers. observ.).

Figure 7.16 A selection of strike-a-lights together with a piece of radial pyrite.

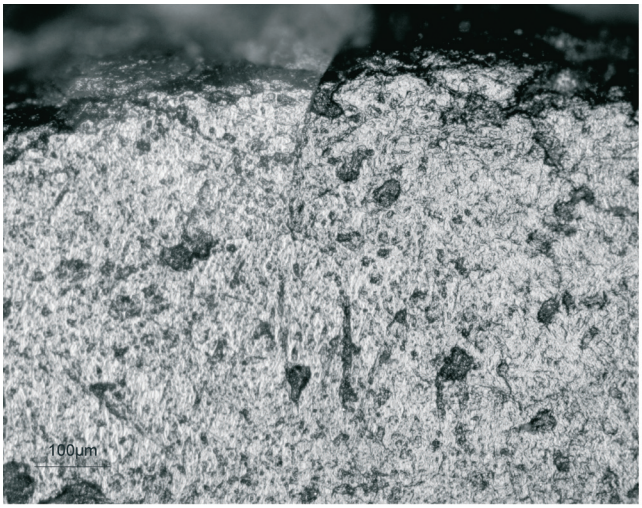
7.7.4 Making fire

One of the surprises of Schipluiden was a large number of strike-a-lights (fig. 7.16), three of which were found in the hand of the skeleton in grave 2 accompanied by a nodule of pyrite (fig. 5.3; fig. 7.12). They may originally have been contained in a small pouch.

A total of 32 zones, on 27 tools, displayed traces associated with a use as strike-a-light. The traces are very characteristic, comprising a very rounded protrusion showing a multitude of small impact fractures. The fractures could be clearly made out under the stereomicroscope (fig. 7.17c). Other characteristic features are linear traces of a matt, rough polish (figs. 7.17b). Most of these strike-a-lights have a very glossy appearance, probably due to the release of fine pyrite powder that acted as an abrasive on the tool's surface (fig. 7.17a). Almost all the strike-a-lights were severely worn and they were also more frequently used on two sides than other types of tools. This will have been facilitated by their shape, generally elongated, usually with one or two pointed ends. The strike-a-lights seem to have been curated tools, used for a considerable time. Our experimental implements did not come close to the prehistoric tools in terms of the extent of wear, even after several hours of use, and never displayed the characteristic glossy surface.

Until recently, strike-a-lights were not differentiated typologically. Only after use-wear analysis has it become clear that many large borers or reamers with rounded tips actually had nothing to do with boring or drilling, but were involved in fire making. Strike-a-lights have been found in the Netherlands in various chronological contexts, notably in Upper Palaeolithic (Oldeholtwolde, Stapert/Johansen 1999), Late Mesolithic (Hardinxveld-Giessendam Polderweg, Van Gijn *et al*. 2001a) Late Neolithic funnel-beaker (Van Gijn, pers. observ.) and Bronze Age (Van Gijn/Niekus 2001) contexts. At Wateringen 4 no tools were identified as strike-a-lights at the time of the analysis (1994/'95), but on hindsight some of the artefacts identified as tools for drilling mineral substances were most probably actually strike-a-lights (Van Gijn 1997, fig. 32f). This may also apply to a heavily worn tool bearing traces formed in boring soft stone that was classified as a borer at Hekelingen III (Van Gijn 1990, fig. 67c): this tool may likewise have to be reinterpreted as a strike-a-light.

Strike-a-lights must have been significant for the inhabitants of Schipluiden, not in the least because they were considered sufficiently worthwhile to accompany the deceased as grave goods. The fact that they were used for



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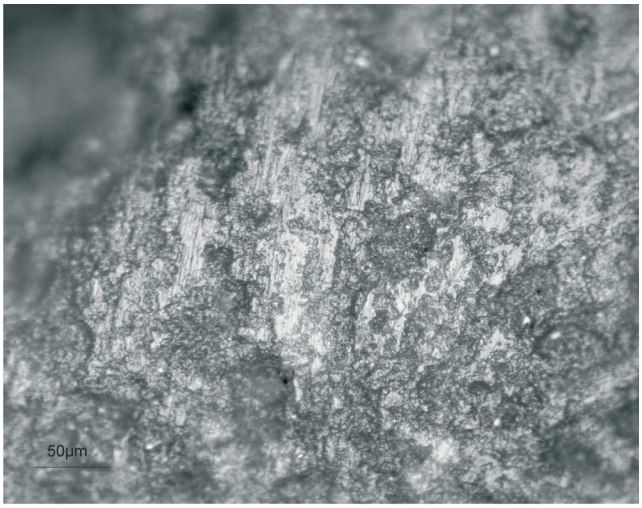

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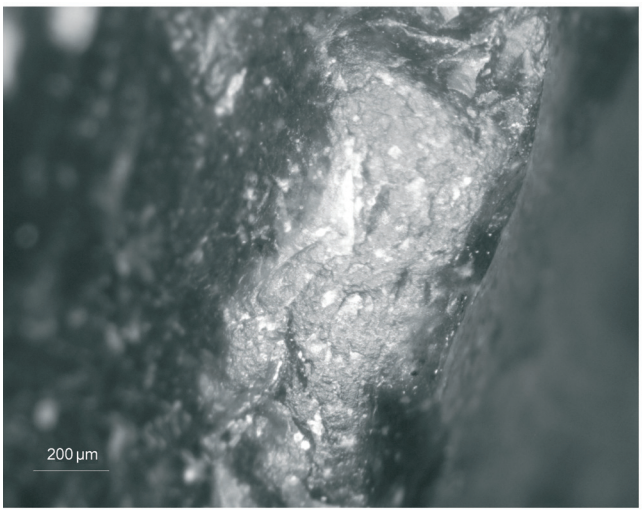

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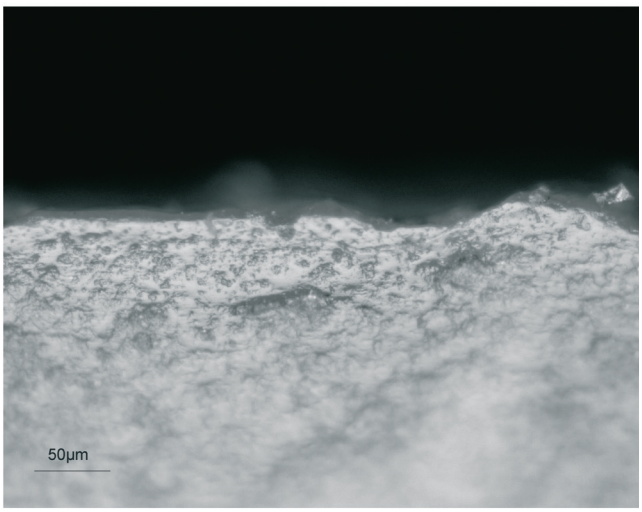

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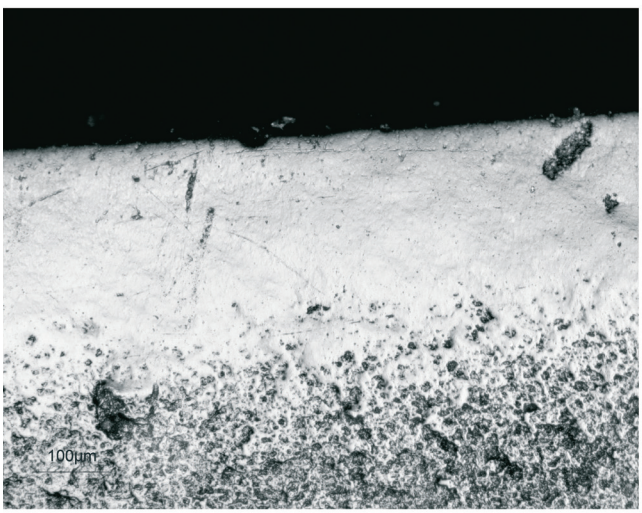

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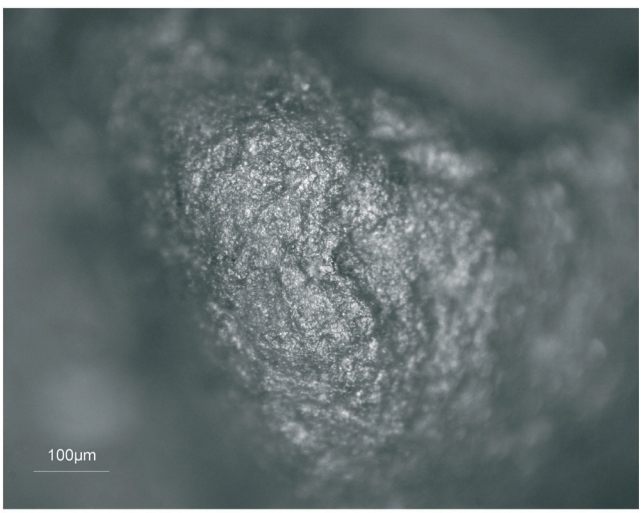

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a very long period (years rather than hours) also points to a special meaning of these implements. This is further corroborated by the raw material chosen for their production: although half of them were made on rolled pebbles, a considerable number were made on imported flint, notably Obourg flint or flint that could not be specified.

7.7.5 Hide working

Hide working seems to have been an important activity at the site. Most tools employed in this task are scrapers, used in a transverse motion (figs. 7.10 and 7.15f). Only two tools showed traces pointing to the cutting of hide. This indicates that the flint implements were used in the cleaning, preservation and currying of the hides, rather than in their processing into for instance items of clothing, an activity in which we assume cutting implements played a role. The variation visible in the character of the hide-working traces reflects at least two general stages of hide-working: the cleaning of fresh hides and the currying of dried or tanned hides. Some tools display a greasy-looking band of polish suggestive of contact with fresh hide, others have a heavily abraded edge with a dull, rough polish more indicative of the currying stage of the hide-working sequence.

A total of seven edges display a polish that is reminiscent of contact with both silicious plants and hide (referred to as HI/SIPL in the figures). The polish is quite bright and reflective, with a smooth texture, but extensive rounding is visible, and the band of polish follows every minor protrusion along the edge, just like typical 'hide-polish'. We have no experimental equivalence of this particular type of polish. It bears a close resemblance to the elusive 'polish 10'. 'Polish 10' was first encountered at the Michelsberg site of Maastricht-Klinkers (Schreurs 1992), but has not been reproduced experimentally. It was also found at Brandwijk (Van Gijn 1998) and Wateringen 4 (Van Gijn 1997). At the latter two sites it was only observed on imported tools. It bears similarities to both the polishes produced by silicious plants and hides. The contact material responsible for this polish is not yet known. One explanation for this type of wear may be that the tools were employed to cut finished hides into strips and smaller pieces.

Hide-working traces were encountered predominantly on scrapers: 12 of the 29 scrapers examined displayed traces interpreted as resulting from contact with hide. They include two beautiful tanged scrapers with adhering specks of tar and other indications of hafting, such as friction gloss (fig. 7.11, nos. 1255 and 9381). The polish on one of the implements suggests contact with fresh hide, whereas the rounding of the edge of the other (no. 9381) suggests a use in the currying phase of hide processing. The latter tool had first been used to cut silicious plants before it was retouched into a scraper (fig. 7. 11). Both scrapers were resharpened before being discarded. One blade of homogeneous black imported flint was used to cut hide on both lateral sides.

7.7.6 Working mineral substances: making ornaments from soft stone

A surprisingly large number of artefacts turned out to have been used on mineral substances. Excluding the implements used to strike pyrite, a total of 20 AUAs display traces formed in cutting, scraping, drilling and carving mineral material (figs. 7.17d, e). The majority of the mineral-working traces could not be linked to a specific contact material. The motions include predominantly drilling, followed by cutting and incidentally scraping. The borers may very well have been used in the production of beads and pendants of amber, jet and quartzite. Three tools display the very bright, smooth polish that was also obtained in jet-cutting experiments (fig. 7.17d). Two of them have two used edges. Such traces should not come as a surprise, considering the number of semi-finished jet beads found at Schipluiden (chapter 8), but it is interesting to note the types of tools selected for this activity: all three tools were 'special': a pointed blade, a carefully retouched blade that looked rather like a tanged scraper and a huge borer of highly mottled Belgian flint.

Wateringen 4 also yielded several tools bearing traces of mineral working, including a few borers (Van Gijn 1997, 178). Mineral working has only rarely been demonstrated for Michelsberg assemblages. For example, only one stone-working tool was found at Maastricht-Klinkers (Schreurs 1992). The absence of such traces may however also be partially attributable to a lack of experimental reference pieces in some of the earlier microwear analyses, and it is very likely that stone-working activities played a more prominent part in the Neolithic than so far assumed.

◀ Figure 7.17 Use-wear traces formed by working on various flint varieties.
a-c strike-a-lights (a: 100×; b: 200×; c: 50×)
d traces from contact with jet (200×)
e traces from unknown mineral substance (100×)
f traces from unknown material (100×)

7.7.7 Bone working

Only a few bone-working traces were observed: one implement displays traces closely matching those found on experimental bone-working tools and four other tools were used on either bone or wood.

It is very strange that tools for working bone and antler are so rare or even absent, because waste of bone and antler indicates that these materials were indeed locally processed into tools and objects. There is evidence of the manufacturing of awls from red deer metapodia (chapter 10). Implements were also made from antler, as testified by the presence of waste from the groove-and-splinter technique (chapter 10). This strange anomaly was previously also noted at the two Late Mesolithic sites of Hardinxveld-Giessendam where, as at Schipluiden, the number of flint artefacts with traces produced by bone and antler was surprisingly small in comparison with the numerous waste products of bone and antler tool production (Van Gijn *et al*. 2001a, b). This is difficult to explain because flint, with its sharp cutting edges, is essential for the manufacture of bone and antler objects. Moreover, cut marks have been found on a number of bone and antler artefacts whose morphological attributes indicate that they are flint knives (chapter 10). For some reason bone- and antler-working tools are missing from the sample selected for use-wear analysis. This can probably not be attributed to chance. It is more likely that we used the wrong selection criteria. We have of course studied only a very small number of artefacts microscopically, and we must have missed the tools used for this activity. At the later Vlaardingen sites many unmodified tools with a protrusion or a sturdy edge display traces of bone/antler working (Van Gijn 1990). Apparently the occupants of Schipluiden chose a different kind of edge for the manufacture of bone and antler implements, a type of edge that is evidently not represented in our sample. However, it may also simply mean that the manufacture of bone and antler tools was not a frequently occurring activity, especially bearing in mind the relatively small amount of worked bone and antler relative to the long occupation of the dune.

7.7.8 Shooting

Quite a large number of triangular points were found at Schipluiden. A total of 41 points were selected for use-wear analysis, 17 of which were found to display traces of impact, sometimes associated with linear traces of polish.[5] Such traces are commonly associated with shooting. Thirteen of the points display traces of hafting. Eight of those points also bear remnants of birch bark tar (fig. 7.8). The presence of used arrowheads indicates that retooling took place at the site and that hunting was practised at Schipluiden.

7.7.9 Unknown contact materials

This category actually comprises two types of tools: tools showing well-defined types of polish for which we just do not (yet) have experimental counterparts (listed as unknown use in table 7.4) and tools with more ambiguous traces, usually not developed sufficiently to have resulted in distinctive features in the polish (listed as indet. in table 7.4). The first category includes a total of 29 AUAs, with a wide variety of represented motions. Examples of unspecified soft contact materials are meat and green plants not containing silica – even after an hour of contact – those two materials leave only minor traces, which are hard to interpret archaeologically.

7.7.10 Hafting traces

Hafting traces are notoriously elusive but can definitely be distinguished (Rots 2002). Nine implements bore tiny fragments of a black substance interpreted as tar (fig. 13.3). The positions of the tar fragments on the tool, for example on the base of an arrowhead, substantiate this interpretation (fig. 7.8). One piece of birch bark tar was found at Schipluiden (see chapter 13), further corroborating the proposition that implements were hafted and retooled at the site itself. Another twelve artefacts displayed other kinds of traces interpreted as resulting from hafting, such as patches of friction gloss, rounding or an abrupt end of the use-wear polish. The incidence of hafting is not very great. Many tools were evidently used without a haft.

7.7.11 The relationship between form and function

One of the central research questions that can be addressed via wear-trace analysis is whether tool types were made with specific functions in mind (table 7.5). For example, scrapers are commonly associated with hide working and axes with chopping wood. Several such relationships could be demonstrated for the flint implements from Schipluiden. Most hide-working traces were indeed observed on scrapers (62.5% of the hide traces and 100% of the fresh hide-working traces), but scrapers were not used for this purpose alone. On the contrary, scrapers seem to have been fairly multifunctional, as suggested by the range of different types of contact materials, even if that range is not all that great (pyrite, plants and unknown materials). This was also observed at Wateringen 4 (Van Gijn 1997).

Another tool type that is strongly bound to a specific function is the point. Half of the triangular points displayed impact traces indicative of their use as arrowheads, but one of them actually served as a strike-a-light.

Another function-specific tool type is the borer. Although the contact materials varied, borers were essentially used for drilling. The Schipluiden borers seem to have been used predominantly for drilling mineral substances.

motion / artefact type	longitudinal	transverse	boring	diagonal	pounding	shooting	transverse / longitudinal	hafting	hafting with tar	indet.	totals
geometric microlithic points	–	–	1	–	–	1	–	–	–	1	3
triangular points	1	–	–	–	1	10	–	3	5	–	20
leaf-shaped points	1	–	–	–	–	1	–	–	1	3	6
half product points	1	3	–	–	1	2	–	1	2	–	10
point undetermined	–	–	–	–	–	1	–	1	–	–	2
single borer	–	2	7	–	–	–	–	–	–	–	9
single reamer	–	–	1	–	–	–	–	–	–	–	1
combination tool	–	1	1	–	1	–	–	–	–	1	4
scraper	2	11	–	–	1	–	–	4	–	2	20
side scraper	1	3	–	–	–	–	–	–	–	–	4
tanged scraper	1	2	–	–	–	–	–	1	–	1	5
axe	1	1	–	–	–	–	–	–	–	–	2
pointed blade	5	1	–	1	2	1	2	–	–	2	14
strike a light	–	–	–	–	15	–	–	–	–	–	15
retouch general	–	1	–	–	1	–	–	–	–	–	2
retouched blade	19	7	–	–	2	–	2	–	–	2	32
blade steep retouch	–	–	–	–	–	–	–	–	–	1	1
blade border retouch	1	–	–	–	–	–	1	–	–	–	2
retouched flake	8	8	–	–	2	–	1	2	–	2	23
retouched core	–	1	–	–	1	–	–	–	–	–	2
flake core	–	–	–	–	4	–	–	–	–	–	4
not modified	7	7	1	–	1	1	–	–	1	1	19
Totals	*48*	*48*	*11*	*1*	*32*	*17*	*6*	*12*	*9*	*16*	*200*

Table 7.5 The relationship between form and function of 200 actually used edges: artefact type versus motion.

With their characteristic rounded tip and elongated shape, strike-a-lights are very homogeneous tools in terms of use. Their typical shape can be clearly identified by the naked eye, and was actually the criterion used in classifying artefacts as strike-a-lights, so the homogeneity of this tool type is not surprising. What is however remarkable is that a wide range of tool types were used as strike-a-lights, including a triangular point, a scraper, a pointed blade and retouched blades, flakes and cores. Apparently, any tool with a sturdy tip capable of withstanding blows and allowing a firm grip was deemed suitable for starting fires, possibly as a secondary function.

The pointed blades are an intriguing tool type as they seem to have been highly multifunctional. They were used as strike-a-lights, to cut plants (possibly cereals in this case), to work hide and mineral substances such as jet and so forth. The type seems to have been used rather like our Swiss knives. The same multifunctionality is also reflected by the retouched blades and flakes. These tools were used on a variety of contact materials. Many of both the pointed and the retouched blades, along with the retouched flakes and the strike-a-lights, showed several used zones: six retouched blades showed two AUAs, four showed three used zones and one four such zones.

7.8 Spatial patterning

The various raw materials were found all over the dune, with no apparent concentrations. A large proportion of the flint came to light in the dump zone on the southeastern slope. The same holds for the tool types – they, too, appeared to be randomly distributed across the site, again, of course, with a concentration in the dump zones. We finally attempted to plot the activities carried out at the site (figs. 7.18a-c). The only concentration that is possibly meaningful is that comprising one jet-working implement and one used on mineral material found close to two semi-finished jet beads (fig. 7.18c).

7.9 Diachronic differentiation

The dune seems to have been continuously occupied, from *c*. 3630 to 3380 BC (chapter 2). Within this time span, four

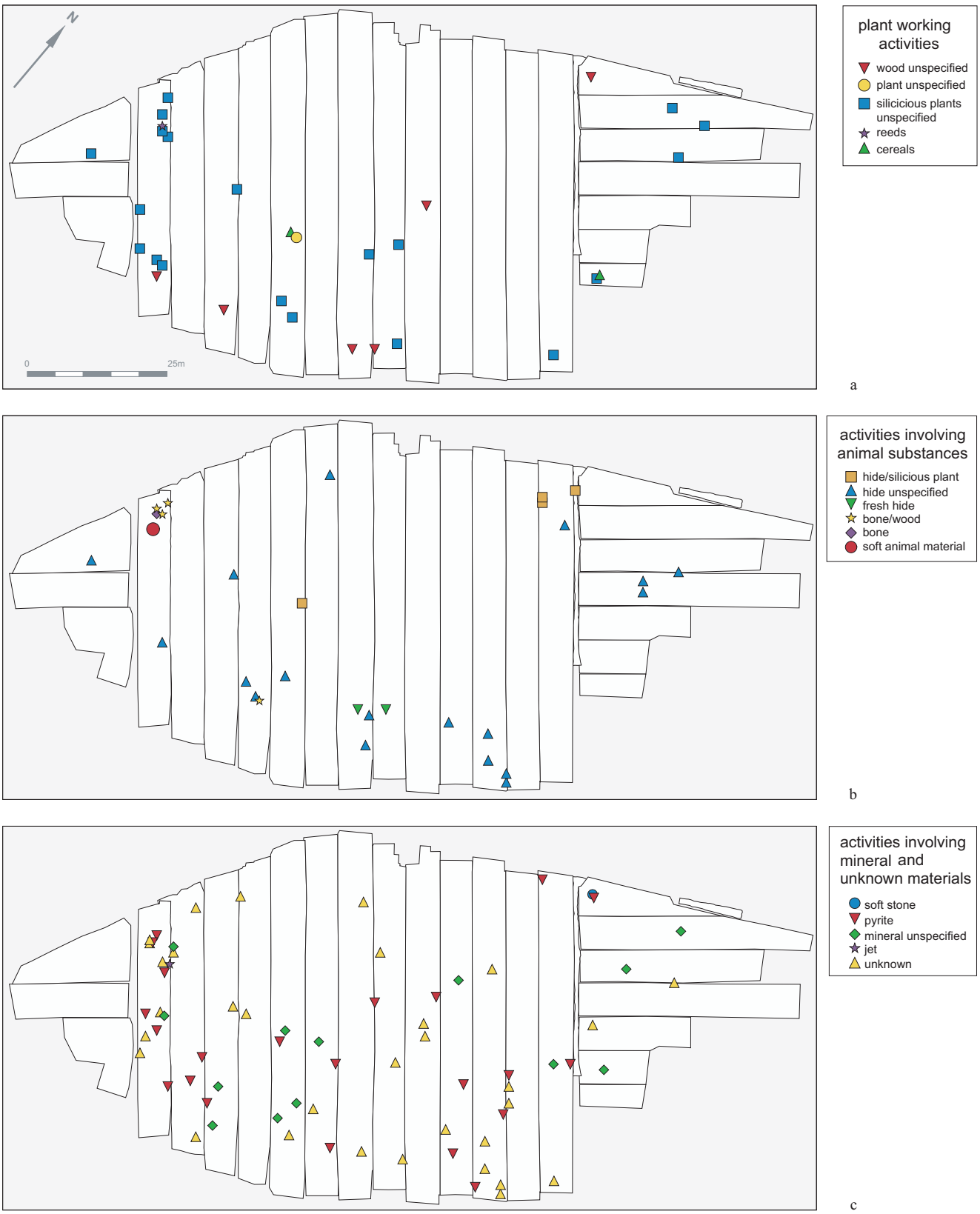

Figure 7.18 Distribution patterns of the activities inferred from micro-wear analysis.

flint variety	N= phase 1	phase 2a	phase 2b	phase 3	phase 1-3	totals	% phase 1	phase 2a	phase 2b	phase 3	phase 1-3	totals
rolled pebbles	4	97	162	434	842	1539	.	60.2	54.2	57.6	58.2	57.7
Cap Blanc Nez	–	5	9	9	38	61	.	3.1	3.0	1.2	2.6	2.3
Obourg	–	3	4	16	23	46	.	1.9	1.3	2.1	1.6	1.7
black, homogeneous	–	–	2	5	10	17	.	–	0.7	0.7	0.7	0.6
light grey Belgian	–	–	–	5	12	17	.	–	–	0.7	0.8	0.6
various Belgian	1	10	6	15	29	61	.	6.2	2.0	2.0	2.0	2.3
Spiennes/Rijckholt	–	1	1	1	2	5	.	0.6	0.3	0.1	0.1	0.2
northern	–	–	1	–	2	3	.	–	0.3	–	0.1	0.1
indet.	–	45	113	269	490	917	.	28.0	38.0	35.7	33.8	34.4
Totals	*5*	*161*	*298*	*754*	*1448*	*2666*	.	*100*	*100*	*100*	*100*	*100*

Table 7.6 Flint variety versus occupation phase.

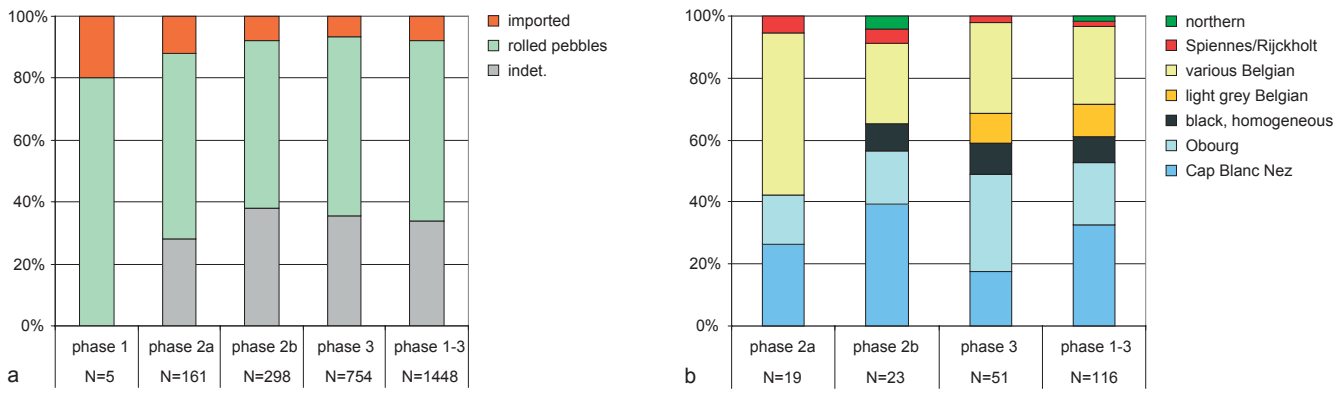

Figure 7.19 Composition of the flint assemblage per phase.
a ratio of rolled pebbles and all 'imported' flint varieties
b composition of the category of imported flint

occupation phases have been distinguished (chapter 2). As much of the flint came from the 'occupation layer' Unit 20, about half of the total amount could not be attributed to a specific occupation phase (54.4%) and only five implements were dated to phase 1. Sufficiently large samples are however available for the other three phases, 2a, 2b and 3, and no diachronic differences are observable between those phases as regards the types of raw materials used (table 7.6; fig. 7.19). The relative percentages of imported flint and rolled pebbles remained unchanged throughout the occupation period, as did the types of imported flint. This means that the contact networks of the local community remained stable in character through the generations.

A similar picture emerges from the analysis of tool typology through time (table 7.7). Again, insufficient implements could be dated to phase 1 to allow a meaningful assessment. The percentages of tool types dating from the other three occupation phases are entirely comparable, differing to only a minor extent. Although the numbers of implements examined for traces of wear are relatively small, it is likely that the activities carried out at the site remained constant through time, too, suggesting a stable site function. The only exception concerns a decrease in the proportion of flake cores from phase 2a (34%) through phase 2b (17%) to phase 3 (15%), compensated by an increase in retouched flakes and unmodified pieces. It is not clear what meaning should be attributed to this shift, as it is not compensated by an increase in for example blade cores.

artefact type	N= phase 1	phase 2a	phase 2b	phase 3	phase 1–3	totals	% phase 1	phase 2a	phase 2b	phase 3	phase 1–3	totals
geometric microlithic point	–	–	1	1	4	6	.	–	+	+	+	+
triangular point	–	6	14	25	43	88	.	4	5	3	3	3
leaf-shaped point	–	–	–	2	3	5	.	–	–	+	+	+
halfproduct point	–	–	12	13	16	41	.	–	4	2	1	2
point indetermined	–	1	1	5	7	14	.	1	+	1	1	1
borer	–	4	2	7	12	25	.	3	1	1	1	1
burin	–	–	–	–	4	4	.	–	–	–	+	+
scraper	–	4	2	19	27	52	.	3	1	3	2	2
combination tool	–	–	1	–	2	3	.	–	+	–	+	+
axe	–	1	3	3	7	14	.	1	1	+	1	1
pointed blade	–	1	5	7	18	31	.	1	2	1	1	1
strike a light	–	3	2	8	21	34	.	2	1	1	2	1
retouched blade	1	2	3	11	17	34	.	1	1	2	1	1
retouched flake	–	31	87	208	389	715	.	19	29	28	27	27
retouched core	–	2	4	5	6	17	.	1	1	1	+	1
retouched block	–	–	1	–	1	2	.	–	+	–	+	+
retouched type unknown	–	–	5	13	19	37	.	–	1	2	1	1
notched flake	–	–	–	–	1	1	.	–	–	–	+	+
core preparation piece	–	5	9	19	90	123	.	3	3	3	6	5
flake core	3	54	49	111	318	535	.	34	17	15	22	20
blade core	–	–	–	–	1	1	.	–	–	–	+	+
core not identifiable	–	–	–	–	1	1	.	–	–	–	+	+
core rejuvenation piece	–	3	5	9	41	58	.	2	2	1	3	2
not modified	1	44	92	288	400	825	.	27	31	38	28	31
Totals	*5*	*161*	*298*	*754*	*1448*	*2666*	.	*100*	*100*	*100*	*100*	*100*

Table 7.7 Flint, artefact types by occupation phase.

7.10 Conclusions

7.10.1 Raw materials and their provenances

The flint from Schipluiden is to a large extent comparable with the flint found at contemporary sites in the region. The range of raw materials used is the same, with a strong emphasis on rolled pebbles that were probably available fairly close by, possibly even on the beaches. This was supplemented with finished tools of imported flint from southern Belgium, from Hainaut in the west to (possibly) the Hesbaye area in the east. The assemblage may contain a few pieces of Rijckholt flint, but, if so, it is an atypical material that cannot be distinguished from the flint from Spiennes. If the pieces concerned are indeed of Rijckholt flint, then it was probably collected from the Meuse river gravels in the central part of the Dutch province of Limburg, and its procurement was embedded in the same exchange/mobility context as that of the hard stone.

7.10.2 Tool types and their affinities

Besides the ranges of raw materials, the ranges of tool types represented at Wateringen 4 and Schipluiden are also similar: pointed blades, scrapers, triangular points and retouched blades. A notable difference is the presence of tanged scrapers and strike-a-lights at Schipluiden and their absence at Wateringen 4. No parallels for the tanged scrapers have been found in the literature; this tool type seems to be unique to Schipluiden. The tools are made of imported Belgian flint and were very finely worked (possibly by pressure flaking). They were most likely imported as finished products. Strike-a-lights may not have been identified as such in previous analyses, and have been classified as reamers or heavy borers instead. A few implements from Wateringen 4 with a rounded tip that were interpreted as having been used on a mineral substance are probably indeed strike-a-lights. Ypenburg also yielded strike-a-lights (pers. observ.; Koot/Van der Have 2001). Further east, the same probably holds for one of the

reamers from Kraaienberg (Louwe Kooijmans/Verhart 1990, fig. 30, tool no. 26).

When we compare these coastal assemblages with what has been found at Michelsberg sites in Belgium, the most notable difference is the absence of tranchet axes at the coast (Vanmontfort *et al*. 2001/2002*;* Vermeersch 1987/1988). This tool type is frequently encountered at Belgian Michelsberg sites, but seems to be absent at inland Michelsberg sites in the Netherlands, too. The tool type was for example not found at Gassel (Verhart/Louwe Kooijmans 1989) or Kraaienberg (Louwe Kooijmans/Verhart 1990). The points and scrapers do seem to agree with what has been observed for the Michelsberg culture elsewhere. As mentioned above, the tanged scrapers have not been observed anywhere else, but this may be due to different typological classifications by different researchers. As for the size of the Schipluiden artefacts, only some of the large imported blades show the macrolithic character that is so typical of many Michelsberg assemblages. Generally speaking, large blades proper of the kind observed at Kraaienberg seem to be absent at Schipluiden.

7.10.3 Flint procurement network

In their flint-procurement strategies, the occupants of Schipluiden seem to have turned in a direction different from that of the Late Mesolithic and earlier Neolithic wetland inhabitants of the same general area. At the Late Mesolithic sites of Hardinxveld-Giessendam Rijckholt-type flint was reasonably common. The most striking example is a large pre-core of Rijckholt flint found at Polderweg that was not exploited for tool production at all, and a large Rijckholt blade found at De Bruin (Van Gijn *et al*. 2001a, b). At the Middle Neolithic site of Brandwijk, Rijckholt flint was still imported, but then probably as finished products, considering the complete absence of knapping waste and cores of this material at this site (Van Gijn 1998). It is not clear why the subsequent Hazendonk people deviated from this practice and turned in a more southerly direction for their flint procurement. The fact that some of the contemporary sites around Antwerp show the same range of raw materials suggests the existence of social networks between the two areas that determined the flint procurement practices.

7.10.4 Knapping techniques

The knapping techniques reflected by the Schipluiden flint are still rather sophisticated compared with the techniques of the subsequent Vlaardingen group. There is evidence of core preparation and rejuvenation, and the striking platform was also often prepared. But the small rounded pebbles constituting the main category of employed raw material greatly limited the possible reduction techniques and processes. Bipolar reduction was commonly practised, the implements were small and many were only minimally retouched. These practices continued in the subsequent Vlaardingen group, in which the flint from Hekelingen III bears the closest similarity to the Schipluiden flint, with a similar range of raw materials. The Leidschendam flint is different in that it contains virtually no imported material and the site's inhabitants relied exclusively on (locally available) small rolled pebbles (Van Gijn 1990).

7.10.5 Craft activities

The range of activities attested for by use-wear analysis is broad. Wood was chopped with flint axes, but most of the woodworking was actually done with the aid of non-flint tools. The coarser wood cleaving and cutting was done not with flint tools but with large quartzite flakes (chapter 8; fig. 7.20), whereas the fine woodworking was done with the aid of small bone chisels (chapter 10). Silicious plants such as reeds or stinging nettles were cut, but, oddly, virtually no transversely used silicious plant processing tools were found. Such processing tools are common features in Late Mesolithic and Early Neolithic assemblages and are easily identified. It is therefore unlikely that this absence is due to overlooking of the relevant traces. More likely it represents a shift in technology, reflecting a change in basketry, plaiting and rope techniques, but it may also be related to a shift in subsistence. Bone awls were still used in the same fashion on silicious plants as in the Late Mesolithic, forming the toolkit for basketry and plaiting, alongside the flint knives used for harvesting the necessary raw material (chapter 10). The large number of silicious plant cutting tools indicates that wild plants were still important, and that only the processing techniques had probably altered.

Other craft activities include the making of beads out of jet and possibly also amber. Several borers display traces of working mineral substances. It is not strange that such tools were encountered, considering the number of semi-finished jet beads found in the site (chapter 9). Fire making seems to have been an important activity. Traces formed in striking pyrite constitute the largest category of use-wear traces. This should however be viewed in relation to the duration of occupation and the fact that these traces are highly visible and cannot be overlooked (we may actually have 100% coverage here). Other categories of worked material have all been missed to various degrees because they show no macroscopic features on flint making artefacts identifiable as tools. The large category of retouched flakes certainly includes many butchering knives, craft-working implements and sickles, but definitely no more strike-a-lights.

7.10.6 Subsistence

With respect to subsistence we found evidence of two activities: shooting and cereal harvesting. Points with impact

Figure 7.20 Toolkit for coarser wood-working tasks: flint axe, stone axe and flakes of quartzite, together with a piece of waste of primary wood-working *(cf.* figs. 11.8 and 11.10).

traces indicate that hunting was practised and that arrows were repaired and retooled at the site. A few tools with traces formed in contact with soft animal tissues may indicate that the animals were also butchered and processed at the site. The presence of sickles supports the assumption, developed in the analysis of the botanical macro-remains, that cereals – more specifically naked barley – were grown by the inhabitants in the close vicinity, in spite of the brackish wetland conditions (chapter 19). The micro-wear traces on the sickles are not typical in the sense that they do not display a broad band of highly reflective polish as commonly observed on LBK sickle blades. Instead, they show a polish quite similar to some of our smoother experimental polishes. It should be noted that some sickles may also have been included in the category of tools identified as used for 'cutting silicious plants'; if so, they did not display the subtle characteristics needed to distinguish them from this general category.

7.10.7 Group composition and site function

The wide range of activities demonstrated to have taken place at various moments at the Schipluiden site points to the long-term presence of complete households. Differentiating gender-specific tasks is a notoriously difficult enterprise due to the great cultural variation in labour division across gender lines. However, we would contend that it is very likely that women were present at the site, considering the range of tasks that were carried out. Basketry, rope making, bead manufacture and possibly also hide processing may have been the tasks in which women were involved. Flint working and hunting are commonly considered specifically male tasks, although it is sometimes claimed that women may have produced some tools themselves: simple flakes for household tasks (Gero 1991). In the case of Schipluiden they may have worked the small rolled pebbles, maybe by means of bipolar reduction. The crude mistakes made in jet bead manufacture suggest that children were involved in the initial production stages of the beads. The presence of children of different ages and at least one woman is attested by the physical remains (chapter 5).

Whether the site was a (temporary) base camp or a permanent settlement cannot be decided on the basis of the results of this study alone. The variety of features, the spatial analysis and the archaeozoological data indicate that the site was probably occupied permanently, on a year-round basis (chapters 3-4, 22-23). The results of the analysis of the flint assemblage certainly do not contradict this supposition.

7.10.8 Social and ideological significance

Although most flint may not have had any special significance for the inhabitants, the fact that people took the trouble to import high-quality flint from the south, in spite of the fact that they probably had sufficient raw material available closer by, indicates that the exchange networks through which they obtained this material must have been of great social and cultural importance for the Schipluiden people. This is also suggested by the fact that many of the imported tools show well-developed use-wear traces, some resulting from different contact materials, indicating that those tools were valued in a special way and curated. This holds especially to one heavily used sickle, made of import flint, that seemed to have been rubbed with ochre prior to deposition indicating a special connotation. Flint may even incidentally have been attributed some ideological meaning, as testified by the three strike-a-lights that accompanied the dead man in grave 2, along with a nodule of pyrite, probably contained in a pouch. These objects most probably constituted the man's personal tool kit. The fact that no grave goods other than body ornaments were found in graves at 'coastal sites' such as the Swifterbant graves and those of the Ypenburg cemetery (Koot/Van der Have 2001) suggests that the man had a specific function during his life. Interestingly, this particular combination of grave goods – strike-a-lights and pyrite – has been observed in several burials of the *Bandkeramik* culture in southern Germany and also at Niedermerz, an LBK cemetery much closer to our region (Dohrn-Ihmig 1983; Nieszery 1992). The fire-making tools were always placed near the arms or the head and are invariably associated with male graves. This suggests that it was a southern tradition. The position of the Schipluiden grave goods – in the hand close to the mouth – evokes an image of someone blowing the sparks resulting from the striking of the pyrite with flint in order to make a fire. With fire traditionally having special connotations in traditional societies, it can be suggested that the dead man was a religious specialist, *e.g.* a shaman.

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notes

1 For tool typology and raw materials, use was made of the list of Archis, the centre for digital archiving of the Dutch National Trust.

2 The active search for the exact sources of the different types of flint at Schipluiden using our own reference collection and by consulting Dr M.E.Th. de Grooth (Bonnefantenmuseum, Maastricht) and Prof. dr P. Crombe (University of Ghent, Belgium) made it clear that the internal variation of the different sources is very large indeed. Different layers within the same source yield flint of different colours, textures, grain sizes and even with different inclusions. Rijckholt itself is the best example of this, with flint varying from a very fine-grained (but never translucent) homogeneous black variety to a very coarse-grained light grey material with many inclusions of even more chalky flint.

3 Besides the complete and almost complete axes there are also hundreds of smaller axe fragments, mostly flakes and waste. Some of those flakes display the original edge of the axe, for example part of the cutting edge or the side. These flakes are not discussed in this section (but see section 7.6.1). They were studied for a BA thesis by Karsten Wentink (2004).

4 Although generally this type of perpendicularly oriented silicious plant polish is associated with basketry (e.g Juel Jensen 1994), it cannot be entirely excluded that it is actually related to a subsistence task: the peeling of starchy roots of waterplants. Experiments in which this task was reproduced have so far, not resulted in a polish that is convincingly similar to that observed on the archaeological tools, but this may be due to the short duration of the experiments. Experiments are currently being conducted in which large amounts of roots are being processed.

5 Shooting an arrowhead results in highly characteristic microscopic linear impact traces that are commonly referred to as MLITS (Fischer *et al.* 1984; Van Gijn 1990).

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