A MIDDLE PALEOLITHIC ARTEFACT SCATTER, AND A FEW YOUNGER FINDS, FROM NEAR MANDER NW OF OOTMARSUM (PROVINCE OF OVERIJSSEL, THE NETHERLANDS)

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CONTENTS

1. INTRODUCTION

In September 1979 H. Oude Rengerink (Ootmarsum) found a small Middle Paleolithic hand-axe in a field, where stones were abundant, near Mander. The find was reported by H.A.G. Kouijzer to the provincial archeologist A.D. Verlinde, who in turn informed the B.A.I. Some time later H. Oude Rengerink found also a small Middle Paleolithic flake in the field (see under 4.3.4.: no. 7).

Up until the end of 1982 in total ten days were spent by a number of students from the B.A.I. and amateur archeologists of the author's acquaintance (with an average of 5 persons per day) in searching the field. This resulted in a total number of 24 other finds, that can be placed in the Middle Paleolithic. In addition several hundred, presumably Neolithic, flint artefacts were collected. Previously H. Oude Rengerink had found a Bell-beaker 'knife' in the field (see under 4.1.).

The Middle Paleolithic finds can be distinguished from the younger artefacts by their relatively intense secondary surface modifications (see under 4.2.), and strictly speaking they can only be recognized as such on this basis.

Although we are concerned here with a typical surface-site (the finds come from the ploughed topsoil and have been shifted moreover by slope processes-solifluction), for a number of reasons this site is of great importance.

In the first place we are concerned here with the first Middle Paleolithic 'concentration' known to us in the northern half of the Netherlands. Up until now mainly isolated finds have been made in this region (Stapert, 1976b; 1979). In a few cases it seemed fairly certain that isolated finds (especially of hand-axes) form a separate find category (*e.g.* Drouwen and Anderen). Nevertheless these finds also made it clear that in this region 'concentrations' dating from this period must be taken into account. It is now possible to gain a first impression of how one should envisage such a Middle Paleolithic "concentration" in the geological circumstances prevailing in the Northern Netherlands. This is of some importance for, among other things, the still continuing discussion concerning the 'finds' of Vermaning (see the articles by various authors in the journal *Archeologische Berichten*; in addition see under 3.).

In the second place we are concerned here, mainly on the basis of the typology of the hand-axe, with a site of the *Moustérien de tradition acheuléenne*, as defined by Bordes (1953b; 1968). The presence of this tradition in the Netherlands has previously been suggested by us, mainly on the basis of the flat triangular hand-axe from Anderen (Stapert, 1976b).

The hand-axe from Mander appears to confirm this hypothesis quite convincingly, while moreover an impression can now be gained of the industry as a whole, although for the meantime we are still dealing with only very small numbers of tools. The hand-axe from Mander has previously been mentioned briefly (Stapert, 1980).

In this article also a second hand-axe find from the vicinity of Mander is discussed, found in c. 1978 at the *Molen van Bels*, alongside the stream the Mosbeek, by J.G. ten Hoopen (Mander); this find was also reported by H.A.G. Kouijzer. The writer of this article has come to the conclusion that the hand-axe from the *Molen van Bels* cannot date from the Middle Paleolithic, but that it must date from much later (the Neolithic?), on the basis of the natural surface modifications present on this specimen (see under 6.). In this connection knowledge of the local geology is of great importance (Van den Berg & Den Otter, this volume).

For the realization of this article thanks are due to many persons. In the first place of course H. Oude Rengerink and J.G. ten Hoopen for the opportunity to study their finds; in addition H.A.G. Kouijzer and A.D. Verlinde (R.O.B.) for reporting the finds; E.H.J. Ameling, Henni A. Bouman, D.C. Brinkhuizen, Jasmina Brinkhuizen-Miloj-ković, A.M. Huiskes, S. Jager, D. Kielman, G. Kortekaas, E. Kramer, J.S. Krist, J.L. Smit, Joke Strijbosch and A.L. Zandbergen, for their cooperation in searching the field (sometimes under unpleasant conditions); H.R. Roelink and J.M. Smit (B.A.I.), for the drawings; F.W.E. Colly (B.A.I.), for the photos of the artefacts and for making prints from my microscope-photos; M.W. van den Berg and C. den Otter (Soil Survey Institute and State Geological Survey), for their contribution concerning the geology of the region (see their article in this issue); Hillie Klaassens (B.A.I.) for the typing; Sheila

M. van Gelder-Ottway for the translation into English. To all of these persons I am most grateful.

2. THE MIDDLE PALEOLITHIC SITE

The hand-axe from Mander was found by H. Oude Rengerink on the southern edge of a field c. 0.5 km NE of Mander (figs. 1–4; the site lies c. 1 km south of the German border). This is a large field (c. 250 × 250 m) that is used by three different farmers (Braakhuis, Meier and Nijhuis). The coordinates of the middle of the field on the Topographical Map of the Netherlands (sheet 28F) are c.:496.775/253.375.

The site lies on the western slope of an ice-pushed ridge. This ice-pushed ridge, that continues further north into Germany, was pushed up by the ice-sheet during the third (last) stadial of the Saalian, at a time when the ice-front was stationary during the period of withdrawal of the ice-sheet to the north (phase III of Jelgersma & Breeuwer, 1975; see also Ter Wee, 1962; 1966; 1981; Maarleveld, 1953). This phase of standstill can be correlated with the *Rehburger Stadium* that is distinguished in Germany. Later the ice-pushed ridge presumably became covered by ice that moved over it, in view of the presence of (remnants of) boulder clay over the whole ice-pushed ridge.

After the ice-sheet had disappeared from the region, the ice-pushed ridge became subjected to erosion. Many erosion gulleys developed, of which the larger ones are visible on the Geomorphological Map of the Netherlands, sheet 28/29 (Kleinsman *et al*., 1978); fig. 2 has been drawn after this map. Van der Hammen (1952) described in detail the erosion gulleys on this ice-pushed ridge (see also Van den Akker & Knibbe, 1963). According to Van der Hammen these are 'fossil' periglacial valleys, that date in principle from the Pleniglacial of the last ice age. The amount of fill in these erosion gulleys is minimal; Tertiary sediments (ice-pushed) are generally present at very shallow depths under the valley floors. At the bottom of the valleys a coarse (gravel-bearing) layer is usually present which merges, outside the actual valleys, into a solifluction-layer. Furthermore in the Late Glacial the valleys became locally filled up with cover-sands (*ibid.*).

Fig. 1. Map of the Netherlands showing the location of the Mander site. (Drawing J.M. Smit, B.A.I.).

In the immediate surroundings of the site there are no large erosion gulleys present (see the map: fig. 2). However, many smaller erosion gulleys that are largely filled up with solifluction material and/or cover-sand would not be indicated on the map. When one is present at the site an east-west running depression is visible, approximately across the middle of the field. This is probably one such, largely filled up, erosion gulley.

The finds occur both on either side of this depression and in it (see under 3.). The artefacts show no clear signs of fluviatile rolling, however.

As appears from the maps (figs. 2, 3), the site is located almost at the bottom of the western slope of the ice-pushed ridge. At the top of the ice-pushed ridge a few plateau-like areas are visible, at about 70 m+N.A.P. (in Germany the ice-pushed ridge extends locally to above 80 m+N.A.P.). The site lies at c. 40 m+N.A.P. According to the geomorphological map the site lies in a strip around the 'high ice-pushed ridge', that is characterized as 'a ground moraine slope, covered in some places by filled up meltwater gulleys, covered by cover-sand'.

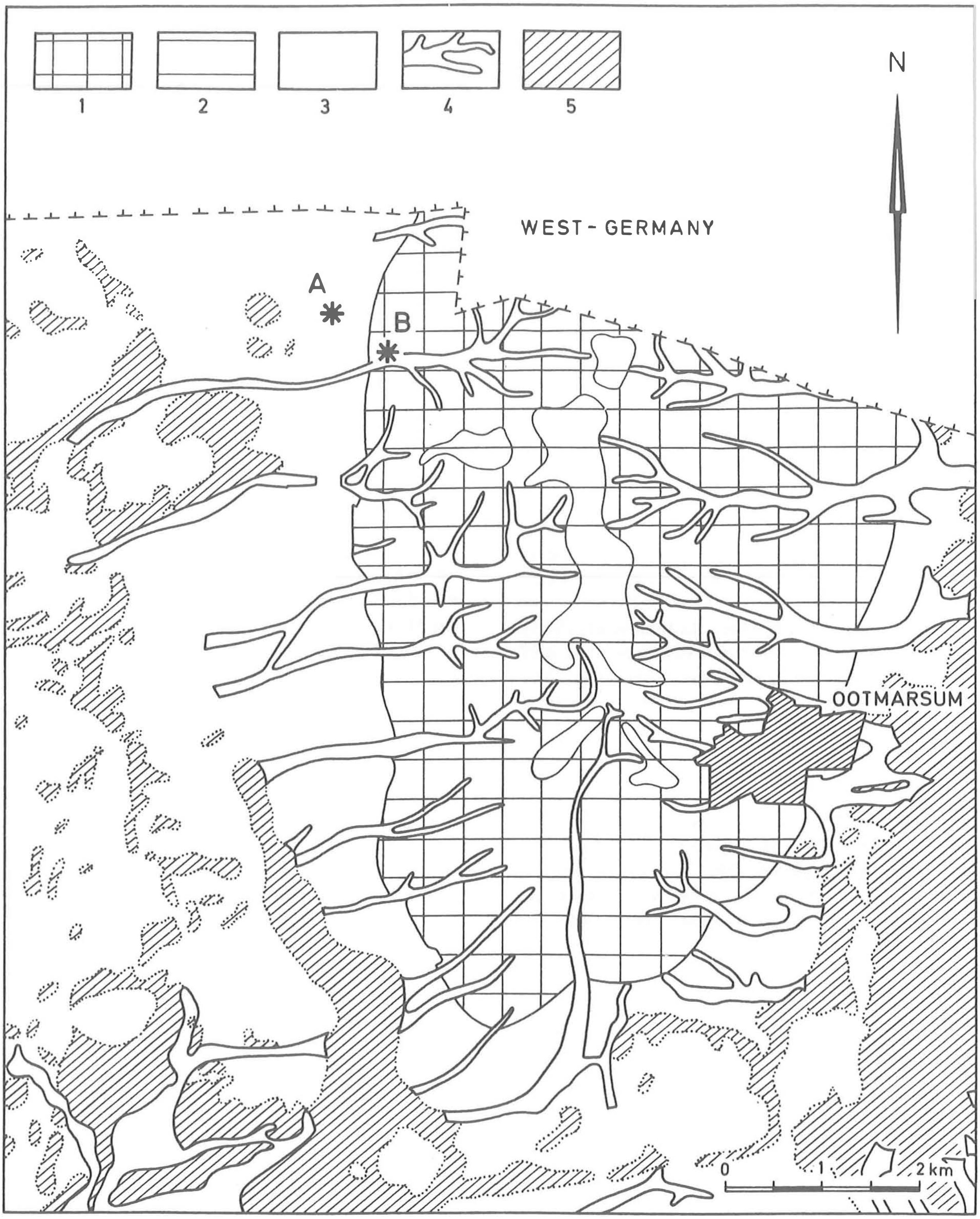


Fig.2. The ice-pushed ridge of Ootmarsum. Simplified after the Geomorphological Map of the Netherlands, sheet 28/29 (Kleinsman *et al.*, 1978). Key: 1. high ice-pushed ridge; 2. ice-pushed ridge plateaux; 3. slopes or level stretches of ground-moraine (in some cases covered with filled-up meltwater gulleys, or with cover-sand), and level stretches of snow-meltwater deposits; 4. erosion valleys (partly covered with cover-sand); 5. cover-sands and Holocene sediments. Sites: A. Middle Paleolithic site at Mander; B. site of hand-axe find at the *Molen van Bels*. Site A lies within the region that is described as a ground-moraine slope. (Drawing J.M. Smit, B.A.I.).

Fig. 3. Contour map of the ice-pushed ridge of Ootmarsum and surroundings. After the Topographical Map of the Netherlands, sheet 28F. Sites: A. Middle Paleolithic site at Mander; B. site of hand-axe find at the *Molen van Bels*. (Drawing J.M. Smit, B.A.I.).

The finds were all collected from the ploughed topsoil that is here 30-40 cm thick. In the topsoil also many erratic stones (consisting of *e.g* granite, etc.) of northern origin are present, including ventifacts. Under the topsoil, down to c. 90 cm below the surface, yellowish sand is present, in places somewhat loamy, without any stones. These are local slope deposits, according to Van den Berg & Den Otter. Underneath there follows a loamy layer, that is c. 35 cm thick and greyish-brown, resembling somewhat boulder-clay. Finally there follow greenish loam-bearing sands. For a more detailed description of the profile and the local geology see the contribution by Van den Berg & Den Otter (in this issue).

It is clear that the finds occur in an erosion-residue of boulder-clay. This material is essentially comparable with the so-called boulder-sand, as is present in many places on the boulder-clay plateau in the provinces of Friesland and Drente, immediately on top of the boulder-clay–this too is an erosion-remnant of boulder-clay that formed over a long period of time. Thus the finds from Mander fit in, from a geological point of view, with the other Middle Paleolithic finds known so far from the Northern Netherlands, that must all come from the boulder-sand (Stapert, 1976a & b; 1979).

3. HORIZONTAL DISTRIBUTION OF THE MIDDLE PALEOLITHIC FINDS

The spot at which the hand-axe was found is known exactly: it is indicated on the sketch-map of the field (fig. 4) by an asterisk. The find-spots of the Middle Paleolithic artefacts that were immediately recognized as such while the field was being searched are indicated on the map by small circles. In the course of searching over the field all the flints that were picked up were kept. Later these collections were examined again for the presence of any artefacts. This was done because Middle Paleolithic artefacts are not always very easy to recognize; this applies notably to those artefacts that have become secondarily fragmented by frost-splitting–this is regularly the case (see under 4.2.). Regarding the finds that were later isolated from the collections made in this way, in a number of cases it is known from which part of the field they originate, since the flints were

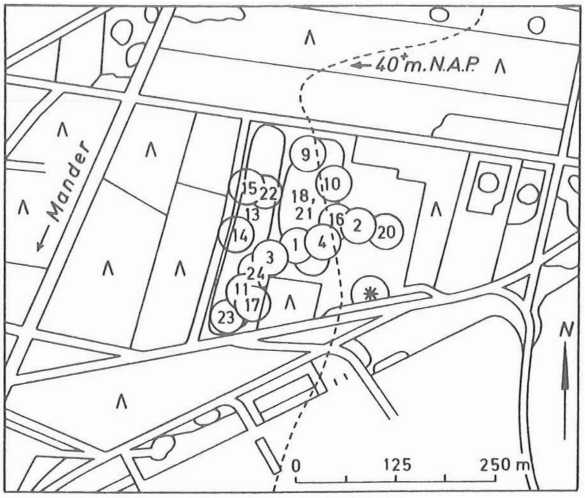


Fig. 4. Scetch-map of the Middle Paleolithic site at Mander (after the Topographical Map of the Netherlands, sheet 28F). The asterisk indicates the spot where the hand-axe was found; the numbers indicate the sites of the other finds, in as far as these are known (in the case of some finds it is only known from which part of the field they come). (Drawing D. Stapert/J.M. Smit, B.A.I.).

in general collected from separate strips of the field.

As is evident from the sketch-map, the finds occur randomly distributed over the whole field. There is no apparent connection with the east-west running depression across the middle of the field. It seems very probable that more artefacts could be found on the adjacent parcels of land; however, these we searched hardly or not at all. Naturally, in recent times the finds have been scattered to some extent as a result of ploughing. But an originally small concentration could not have been scattered in this way over a distance greater than 250 m, because the field is ploughed in three separate parts. The scatter of artefacts is thus very extensive–the actual present-day diameter must in any case be greater than 250 m, and is possibly considerably larger.

It can clearly be assumed that the original concentration was much smaller, and that it was present higher up the slope. As the result of tens of thousands of years of solifluction that occurred after the artefacts were left behind, these must have gradually shifted down the slope (towards the west) and at the same time must have become more widely scattered, also in a N–S direction.

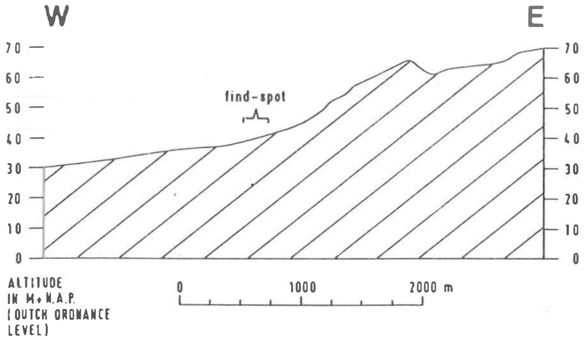


Fig. 5. East-west profile through the Middle Paleolithic site at Mander (based on the Topographical Map of the Netherlands, sheet 28F). (Drawing D. Stapert/J.M. Smit, B.A.I.).

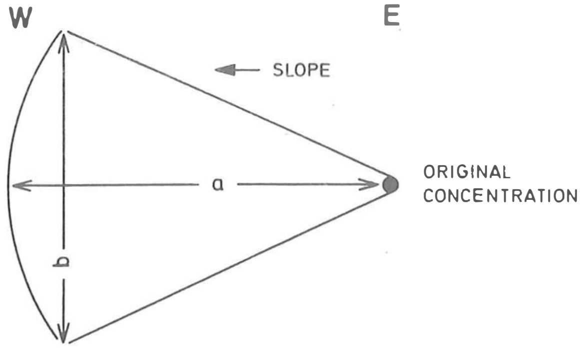


Fig. 6. Schematic diagram showing the shifting down the slope of an original find concentration as a result of solifluction over a long period. (Drawing D. Stapert/ J.M. Smit, B.A.I.).

Fig. 5 shows an E–W cross-section of the ice-pushed ridge through the site. It can clearly be seen that the site is located at the bottom of the steeper part of the slope. The slope at the site is not particularly steep–calculated over a distance of 500 m, going up the slope from the find-spot, it measures only about 1°.

In the Western Canadian Arctic, French (1976) measured rates of shifting as a result of solifluction of about 1.5 cm per year, with slopes of 2–4°. In a table in his book in which various measurements made by others are listed (table 7.1) the lowest measured value given is 0.4 cm per year.

In the case of Mander we should take into account a period of 40–60,000 years with periglacial conditions prevailing after the artefacts were left behind (see under 5.). For the rates of shifting that apply here we can suggest, as a cautious estimate, figures of 0.5–1 cm per year. This gives figures of between 200 and 600 m for the possible shifting, down the slope, of the artefacts from their original position. Figure 6 gives a schematic illustration of the shifting process discussed here. What the approximate ratio *a*:*b* could be in this case I would not venture to estimate, though it seems probable to me that in general *a* will be bigger than *b*. In the case of Mander the distance *b* measures *at least* 250 m, so an estimate for *a* in the order of magnitude of 0.5 km certainly does not seem to be exaggerated here.

'Concentrations' of Middle Paleolithic 'artefacts' in the boulder-sand of Drente with diameters of 3.10×2.00 m and 2.15×1.20 m (the concentrations A and B respectively of Vermaning's 'find-spot' Hogersmilde–see Van der Waals & Waterbolk, 1973: 49) therefore seem inconceivable to me, even with less steep slopes. In view of the genesis of boulder-sand, original concentrations must have become considerably scattered in the course of some tens of thousands of years. Moreover primary *in situ* occurrences of Middle Paleolithic material in modern excavations almost always show original concentrations that are already larger than 1–3 m across. In view of all these facts, the data from Mander thus provide an extra independent argument against the authenticity of the 'Middle Paleolithic artefacts' that have been sold by Vermaning (see also Stapert, 1975a; 1980).

The original site at Mander must thus be visualized as lying some hundreds of metres higher up the slope. This makes it clear that an excavation here would be completely pointless. This site is thus a typical example of a surface-site, from which the quantity of known material can be increased by the efforts of amateur archeologists, who can be very useful in this way.

4. THE FINDS

4.1. A few general remarks

As mentioned previously, in the field flint artefacts have been found dating not only from the Middle Paleolithic but also from more recent prehistoric periods. The latter are distinguishable from the Middle Paleolithic specimens on account of the fact that they are

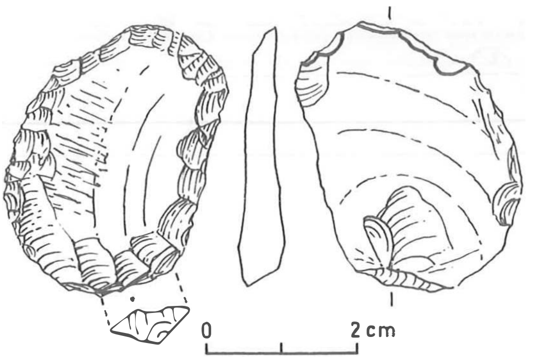


Fig. 7. Knife, dating from the Late Neolithic (probably Bell-beaker tradition), found by H. Oude Rengerink at the Middle Paleolithic site at Mander. (Drawing H.R. Roelink, B.A.I.).

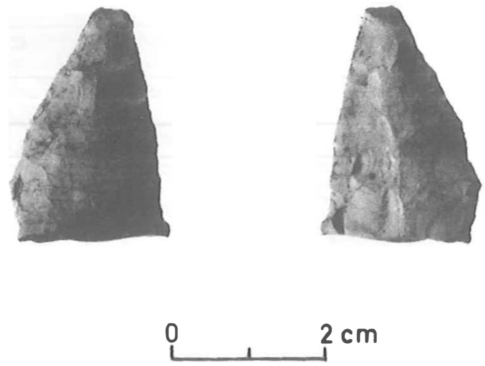


Fig. 8. Burnt fragment of flint dagger (possibly of Scandinavian type), found by G.J. Boekschoten at the Middle Paleolithic site at Mander. (Photo F.W.E. Colly, B.A.I.).

hardly or not patinated, while the Middle Paleolithic artefacts are relatively severely weathered (see under 4.2.).

Up until now about 300 flints from younger periods have been collected by us, but these certainly do not represent any great density of finds. Also no distinctly limited concentration of these finds can be demonstrated in the field. Qualitatively the material is poor: thus there are only 4 reasonable blades present. The finds consist for the most part of small flakes and small irregular cores. Among the tools ten short scrapers are present, and in addition five *pièces esquillés*. Distinct Mesolithic tools, such as microliths, are absent; the short scrapers are therefore probably indicative of sparse inhabitation during the Late Neolithic and/or the Early Bronze Age. H. Oude Rengerink found the flint object illustrated in fig. 7; it is a Late Neolithic 'knife'–comparable tools are known *i.a.* in a Bell-beaker context. G.J. Boekschoten found, in the most western part of the field, the object illustrated in fig. 8; it is a burnt fragment of a flint dagger, possibly of Scandinavian type. These are mostly dated to the Late Neolithic or the Early Bronze Age (Bloemers, 1968).

A few coarse sherds of pottery (tempered with crushed granite) probably date from the Iron Age (pers. comm. J.N. Lanting).

In total we now possess 26 definite finds from the Middle Paleolithic, that are described here below. It must be realized, however, that the problem of naturally produced pseudo-artefacts is always clearly present in such geological situations. The finds described form the ultimate selection, but there are some dozens of other specimens that have been interpreted for various reasons as pseudo-artefacts, although in a number of cases they closely resemble artefacts. The diagnostic characteristics that have been used here have already been described elsewhere (Stapert, 1975b); the specimens concerned are flake-like objects, or naturally fractured pieces of flint with 'retouch'.

The flint used is variable, but is clearly of northern origin (moraine). Moderately fine-grained flint with greyish tints is mainly present. Generally the artefacts have been struck from previously frost-split fragments (and not from complete nodules); this is evident *i.a.* from the regular occurrence of old frost-split faces on the dorsal surfaces of the flakes (these are shaded grey in the drawings).

4.2. Natural surface modifications

As mentioned above, the Middle Paleolithic finds can be isolated on the basis of their secondary surface modifications. The specimens are considerably weathered; the degree of weathering and the types of weathering phenomena present correspond to those of the other Middle Paleolithic finds known to us from the Northern Netherlands (that come from the boulder-sand).

The various phenomena do not need to be extensively discussed again here (see Stapert, 1976a).

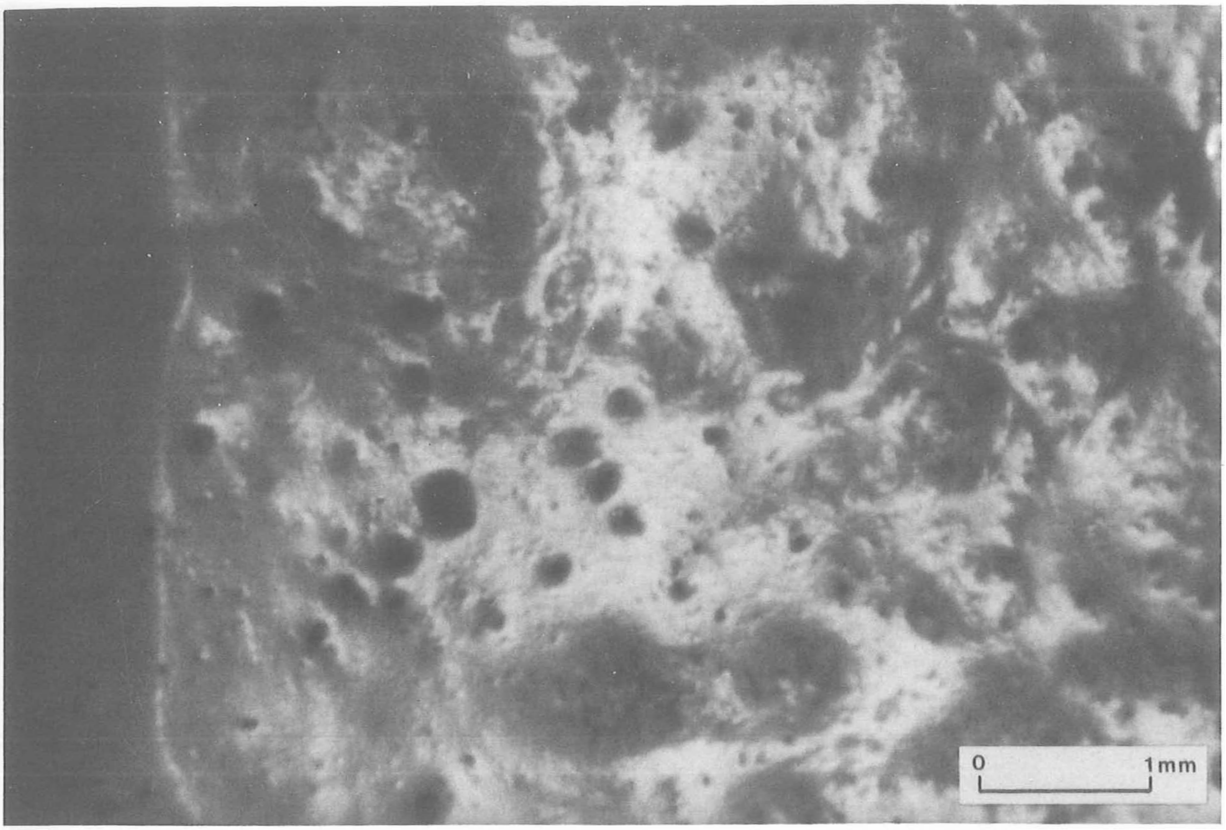


Fig. 9. Heavily pitted surface of flake no. 14. Photo taken using a stereomicroscope by D. Stapert (B.A.I.).

Table 1. Natural surface modifications on the Middle Paleolithic finds from Mander.
Key: + present; ++ abundantly present; † hardly present; ? possibly present; – not present.

	Hand-axe	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	No(+)	%
White patina	+	+	?	†	+	+	+	+	+	+	+	–	+	+	+	?	+	+	+	+	+	+	+	†	–	+	20	76
Brown patina	†	†	+	+	–	–	+	–	†	–	+	+	†	+	†	–	–	–	–	–	–	–	–	–	?	–	6	23
Wind-gloss	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	26	100
Small pits	+	+	+	+	+	++	+	+	+	+	+	+	+	+	++	+	+	+	†	+	++	+	+	+	+	+	25	96
Cryoturbation retouche	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	26	100
Scratches	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	26	100
Pressure cones	+	+	+	+	+	?	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	?	24	92
Rounding	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	26	100
Secondary frost-splitting	+	+	+	–	–	–	?	–	?	–	?	–	+	–	–	–	–	–	–	?	–	+	–	+	–	+	7	26

In table 1 is summarized the occurrence of 9 different phenomena on the 26 Middle Paleolithic artefacts. The general wind gloss is typical for Middle Paleolithic artefacts from the northern half of the Netherlands. Partly associated with this are small pits. These phenomena indicate that after the artefacts were left behind they lay on the surface for a considerable time and were exposed to the action of wind-blown sand, during a period when there was no covering vegetation. Some specimens have become heavily pitted (fig. 9). In view of the geological situation the period involving the action of

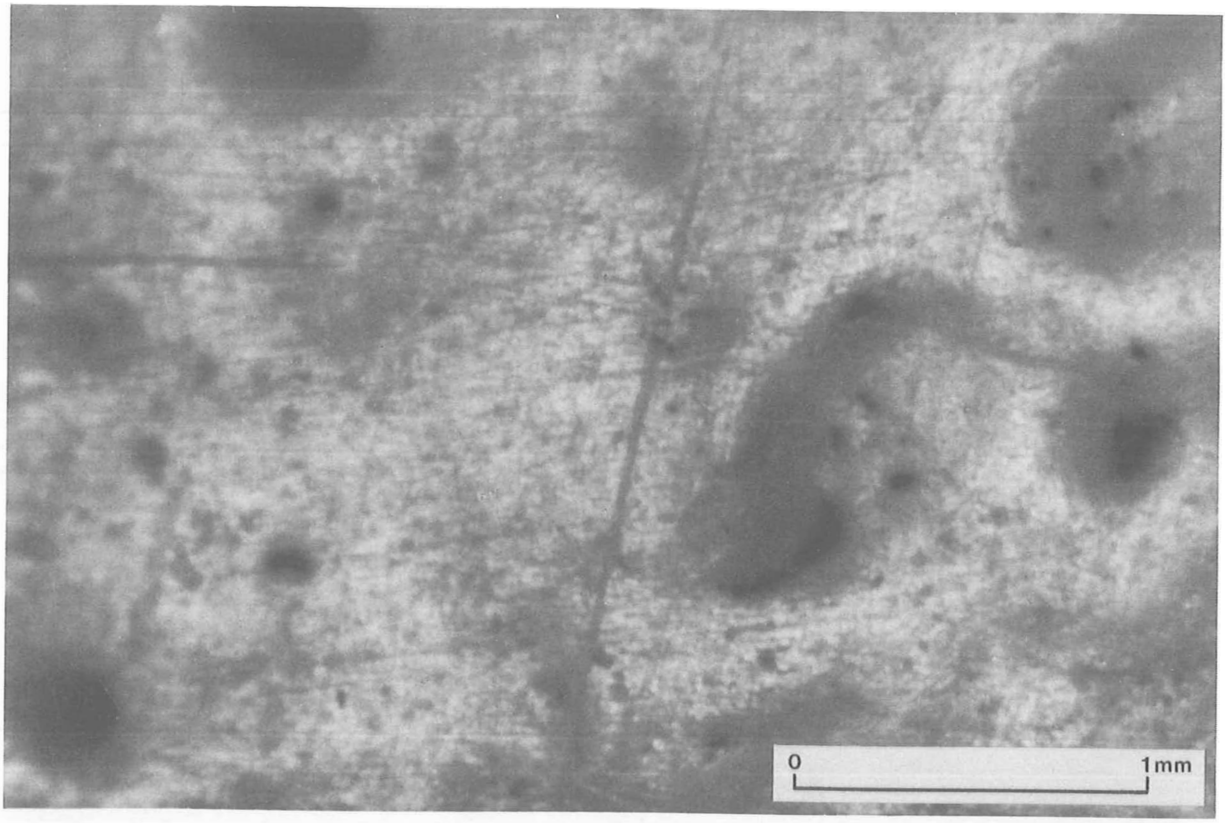


Fig. 10. Scratches on the ventral surface of flake no. 8. Photo taken using a stereomicroscope by D. Stapert (B.A.I.).

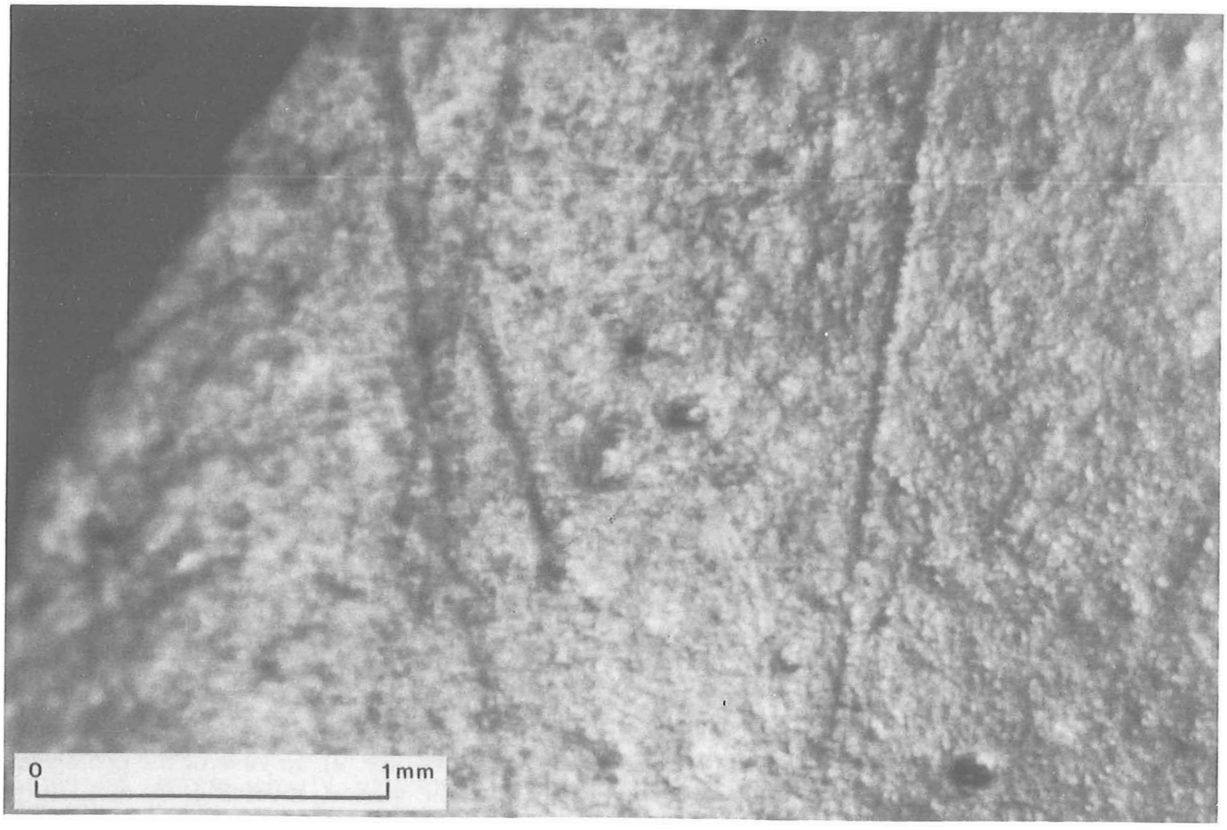


Fig. 11. Some scratches on flake no. 17. Photo taken using a stereomicroscope by D. Stapert (B.A.I.).

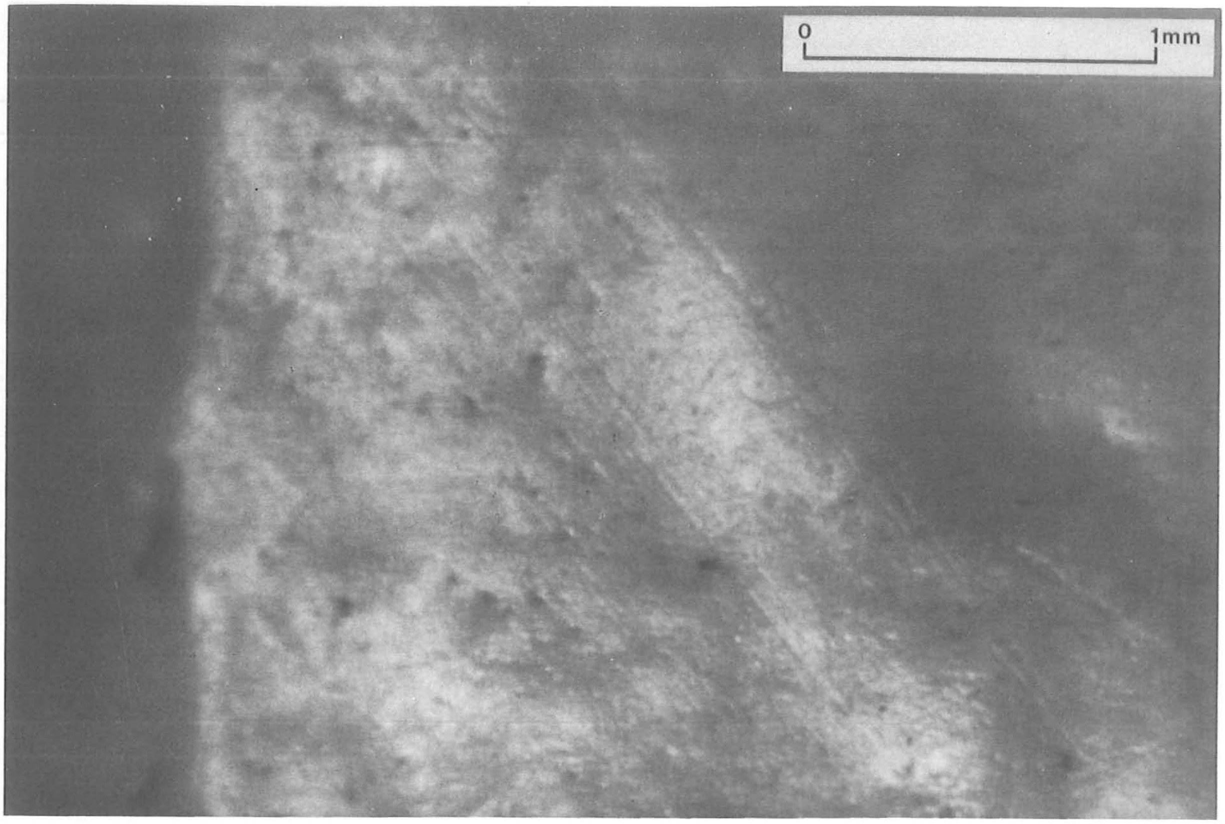


Fig. 12. Cluster of subparallel scratches and pressure cones on flake no. 8. Photo taken using a stereomicroscope by D. Stapert (B.A.I.).

wind-blown sand could only have been the last ice age.

Scratches, pressure cones and 'cryoturbation retouch' are connected with periglacial soil movements. Figures 10–14 show a few examples of these phenomena (photos taken with a stereomicroscope, Wild M5A). Seeing that for scratches and pressure cones to develop some considerable pressure must be assumed, the most likely process for the genesis of these phenomena is cryoturbation, for with solifluction the forces exerted are much less strong. These features must also have developed during the last ice age.

Another general feature is a limited roundedness of ridges and edges. Here this is not the result of fluviatile rolling, but probably of slow-acting solution processes in the soil.

Of the coloured patinas either white patina or brown patina is nearly always present, sometimes both. White patina is clearly more usual, and it is known that this can develop relatively rapidly.

Seven finds certainly became fragmented by frost-splitting after they had been abandoned, and this is possibly the case with four other finds. This is also a regularly occurring phenomenon with other Middle Paleolithic finds from the Northern Netherlands (see *e.g.* Stapert 1976b; 1979).

Finally, a few specimens show so-called 'friction gloss' (not mentioned in the table), a phenomenon of which the genesis is unknown to me.

4.3 Description of the Middle Paleolithic finds

4.3.1. *The hand-axe* (figs. 15, 16)

Several measurements of the hand-axe are as follow:

L max. (L)	7.7 cm
W max. (m)	5.6 cm
T max. (e)	1.7 cm
W ¼ from the top	3.1 cm

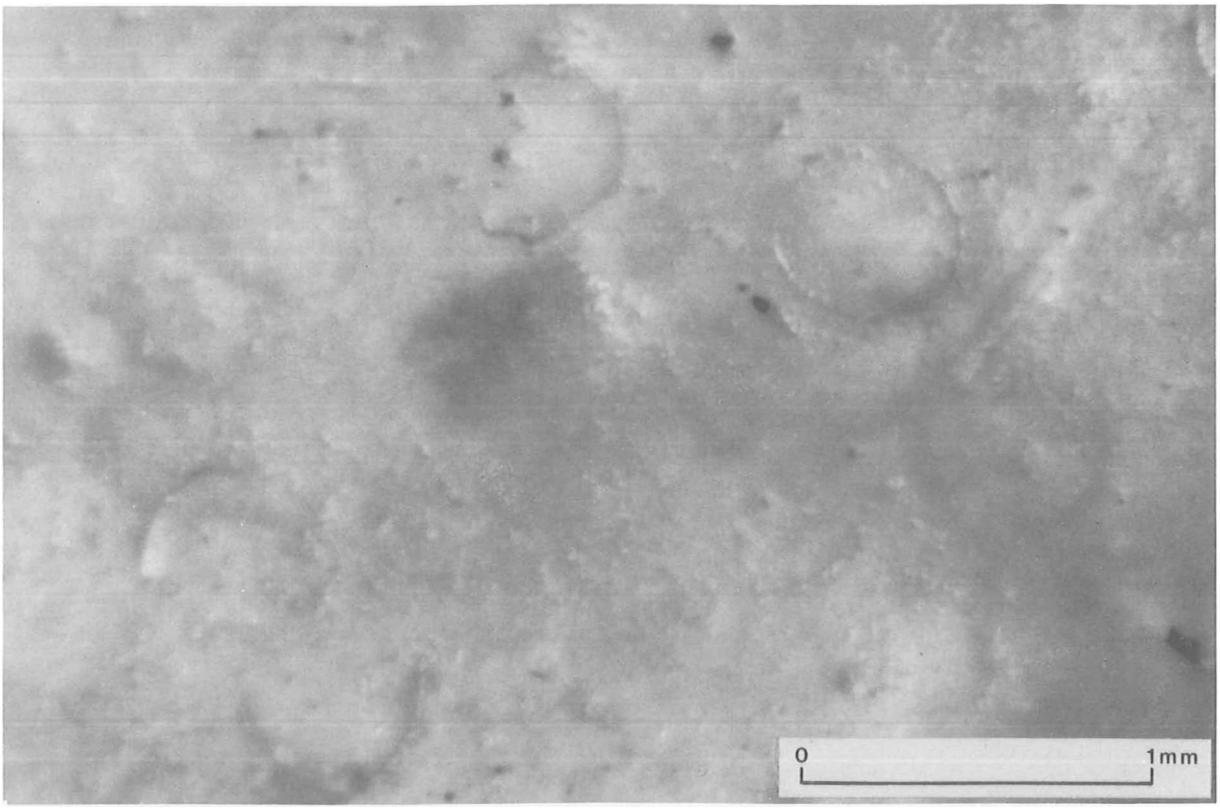


Fig. 13. Pressure cones on flake no. 13. Photo taken using a stereomicroscope by D. Stapert (B.A.I.).

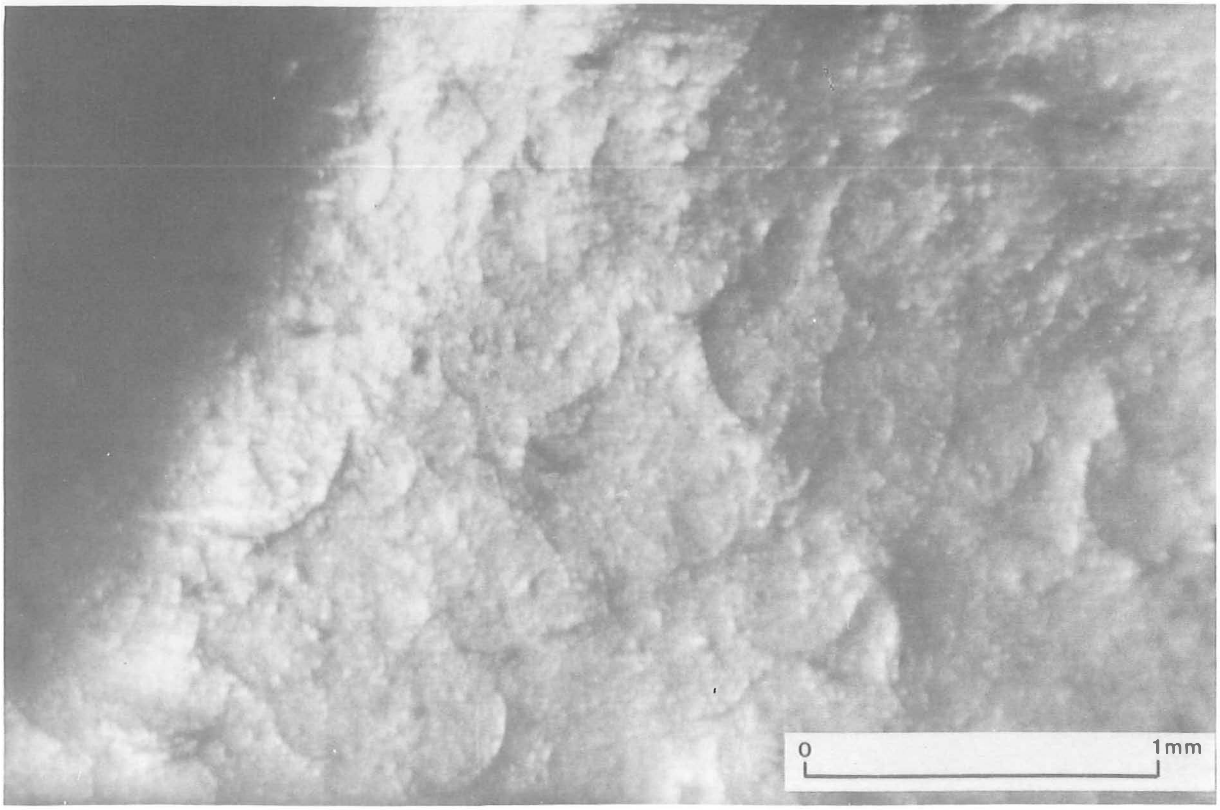


Fig. 14. Abundant pressure cones close to a ridge on the *disque* (no. 22). Photo taken using a stereomicroscope by D. Stapert (B.A.I.).

W in the middle (n)	5.0 cm
W ¼ from the base	5.6 cm
distance from place of W max. to base (a)	1.9 cm
T in the middle	1.6 cm
distance from place of T max. to base	2.4 cm
weight	64.0 gr.
angle (in the middle) of the left edge (I) (measured over 1 cm)	c. 60°
angle (in the middle) of the right edge (measured over 1 cm)	c. 50°

This gives the following indices according to Bordes (1961):

L/a	4.05
n/m × 100	89.29
L/m	1.38
m/e	3.29

Consequently the specimen can be described, according to the classification of Bordes (*ibid.*), as a *biface subtriangulaire. Bifaces subtriangulaires* are divided by him into 2 groups: a. with convex edges, b. with a convex base. The hand-axe from Mander belongs to group b.

The hand-axe was made out of a flake. Part of the ventral surface of the flake has remained preserved (see face II on the drawing). It is clearly visible that whoever made the hand-axe tried to remove the bulb of percussion in such a way that the transverse cross-section would be regularly biconvex (see the cross-section in the drawing). This was done by means of striking off a couple of flakes, probably using a hammer stone, in view of the relatively deep percussion-bulb impressions–as a result of this the left edge (of face I) of the hand-axe is irregular in side-view. Most of the other flake negatives on the hand-axe have fairly shallow percussion-bulb impressions (especially on face I), so in general soft percussion must have been applied. On the drawing a small circle indicates the probable original location of the point of percussion of the flake.

Along the left edge of face I there is still a cortex-remnant (greyish, thin). Also face II has been worked for the most part, so the specimen cannot be described as a *pointe moustérienne à bulbe enlevé*, although it is reminiscent of this to some extent, mainly because of the fact that the tool was made from a flake.

A small part of face II has disappeared, as a result of secondary frost-splitting (in the drawing shaded grey with regular stippling). Various other frost cracks are visible in the hand-axe (mainly on face II), along which splitting has not yet taken place.

A few traces of recent damage are present, *i.a.* along the right edge of face II near the base. From these traces of damage it can be seen that the flint used is light grey and moderately fine-grained, with brownish patches and bands. Most of the other small traces of damage shown in the drawing (*e.g.* on both sides of the top) are subrecent–these are not fresh but are distinctly less weathered than the rest of the surface of the hand-axe. (A sheen is often present, but no white patina, so one gets the impression that the wind-gloss originated later than the white patina). Here we are most probably concerned with 'cryo-turbation retouch'–this is often steep and thus breaks through the otherwise straight edge.

Apart from a few brown patches, the hand-axe is covered with white patina, that is much more intensely developed on face II than on face I. In addition both faces are covered with distinct wind-gloss, and also rather a lot of small pits are visible. Ridges and edges of the hand-axe are rounded to some extent (not as a result of fluviatile rolling).

With the aid of a stereomicroscope many old scratches can be seen, sometimes in the form of subparallel clusters, and pressure cones; these phenomena were presumably caused by cryoturbation. Also a few recent scratches are visible, that are probably the result of ploughing–to which quite a lot of traces of rust can be ascribed as well.

The hand-axe is present in the collection of H. Oude Rengerink; good copies of it are to be seen in the Rijksmuseum Twente in Enschede, and in the B.A.I. in Groningen. For a further discussion of the typology of the hand-axe see under 5.

4.3.2. *The disque* (no. 22, figs. 21, 26)

A few measurements of this tool are as follow:

L max.	4.2 cm
W max.	3.7 cm
T max.	1.2 cm
weight	20.9 gr.

Here we are concerned with a fine specimen of a small tool that can best be classified as a *disque*. Bordes (1961) distinguishes 2 forms.

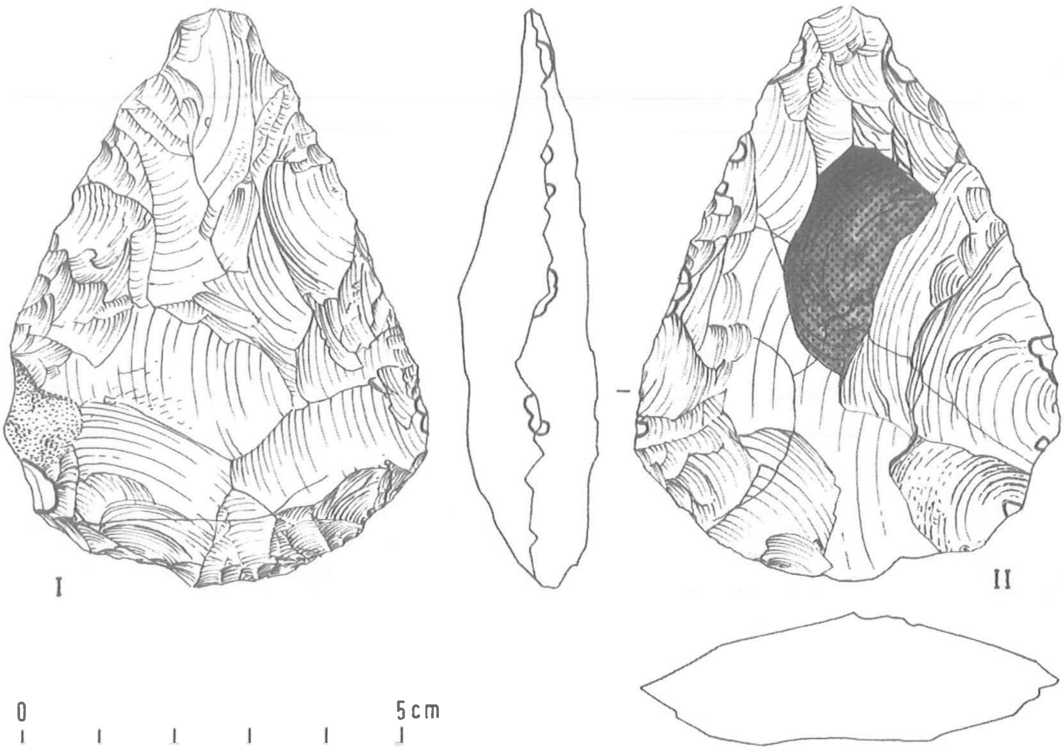


Fig. 15. The hand-axe from Mander, found by H. Oude Rengerink. Key to the drawings: left white with a slightly thicker outline-patches
regular stippling (only indicated on the hand-axe)-secondary frost-split faces; solid circle-position of point of percussion; open circle-presumed position of point of percussion no longer present. (Drawing H.R. Roelink, B.A.I.).

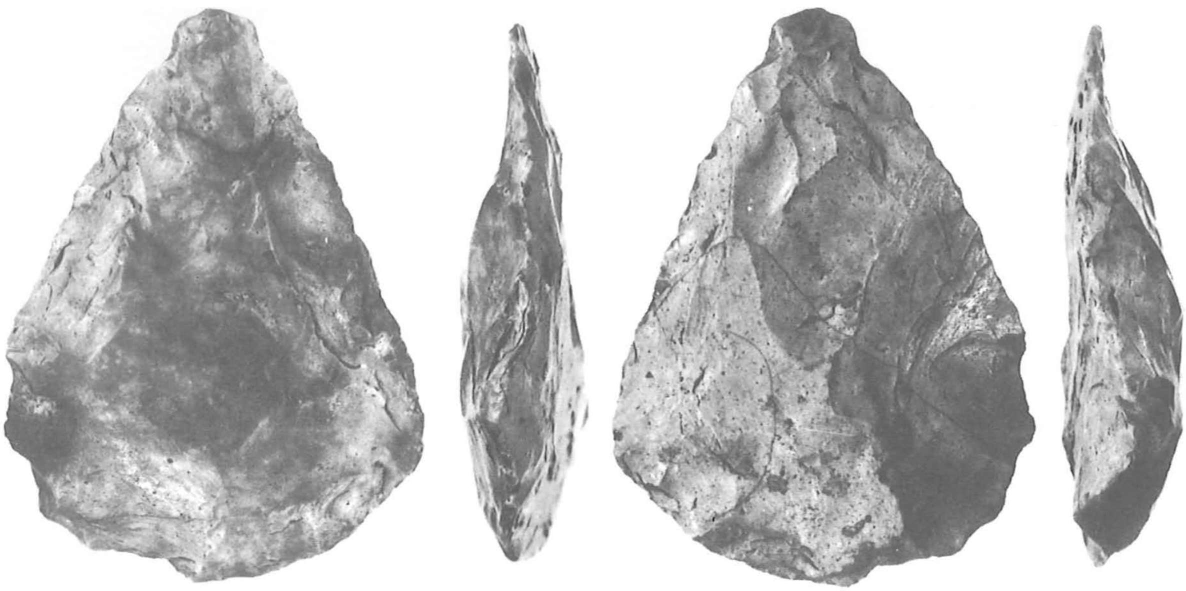


Fig. 16. The hand-axe from Mander. (Photos F.W.E. Colly, B.A.I.).

The first consists of *disques* that have been made from flakes, by means of bifacial retouching all around. The second form consists of specimens that have been made in the same way as small discoid Levallois cores, but that are flatter and more regular. The borderline between this form and small Levallois cores is of course arbitrary, but in general it can be said that *disques* are too small and too flat to permit their being used as cores.

In the case of the Mander *disque* we are concerned with the second of the two above-mentioned types. The lower surface largely consists of cortex (brown and thin, with just underneath it a brown zone 2–3 mm thick).

Along two short edges small striking platforms have been created, from which the upper surface could be worked. Also outside these striking platforms, from the ridges, flakes have been removed from the upper surface. The angles of the two striking platforms with the upper surface are c. 60° and 65–70°.

The flint used is fine-grained, with a few coarser parts. For the natural surface modifications present on the tool see table 1.

4.3.3. *The cores*

Within the material 4 cores are present, including a typical Levallois core (no. 1), a core that is reminiscent of Levallois cores for blades (*strunkförmiger Kernsteine* of Bosinski, 1967; no. 12), and 2 irregular or fragmented cores (nos. 24, 25), of which one (no. 24) can be regarded as a half-finished specimen (that went wrong) of a Levallois core for flakes. The 4 cores are discussed briefly here below; for the surface modifications present see table 1.

No. 1 (figs. 17, 22). Part of the core has been broken off secondarily due to frost-splitting, so a few of the measurements given immediately below (those indicated by an asterisk) are not the original ones.

L*	5.8 cm
W max.	5.1 cm
T max.	2.6 cm
weight*	81.7 gr.

This is a typical Levallois core for flakes, of the 'classic type' (Bordes, 1980). The fracture surface caused by frost-splitting does not have white patina, in contrast to the upper surface of the core that has a fairly thick white patina (c. 0.5 mm); the lower surface is much less intensely patinated.

The core has been prepared completely, but no Levallois flake has been struck off it. A frost crack runs through the core (see fig. 17). This was already present in the flint before the process of working, in view of the fact that one of the flake negatives on the upper surface comes to a dead end at this crack, with a step-fracture. It is probable that whoever made the core, after thus becoming aware of the presence of this crack, presumed that no Levallois flake could be struck off successfully from the core, without breaking. Another possible explanation is that one of the negatives that was supposed to form the striking platform for the Levallois flake turned out rather deep (see the side-view shown in the drawing).

On the lower surface of the core, that largely consists of cortex (thin, cream coloured), a few remnants can be seen of the negatives that formed the striking platform around the core, but that have disappeared for the most part as a result of the subsequent preparation of the upper surface, and by secondary frost-splitting.

A few negatives on the upper surface give the impression of having originated as a result of hard percussion (they show relatively deep percussion bulb impressions), which as a general rule is unusual (see Bordes, 1947; 1961). Nevertheless the preparation of the upper surface was successful; it shows the characteristic somewhat saddle-shaped vaulting (*dos de tortue*: Bordes, 1961).

No. 12 (figs. 19, 25). Also from this core a part has disappeared as a result of secondary frost-splitting.

L*	4.4 cm
W max.	4.5 cm
T max.	2.6 cm
weight*	49.7 gr.

The fracture surface that originated as a result of frost-splitting does not have a white patina like the rest of the surface of the core, but it is glossy. The core must originally have been 1–2 cm longer, with a more or less rectangular shape. The lower surface consists mainly of cortex (thin, whitish-grey) and an old frost-split face. Along both short edges striking

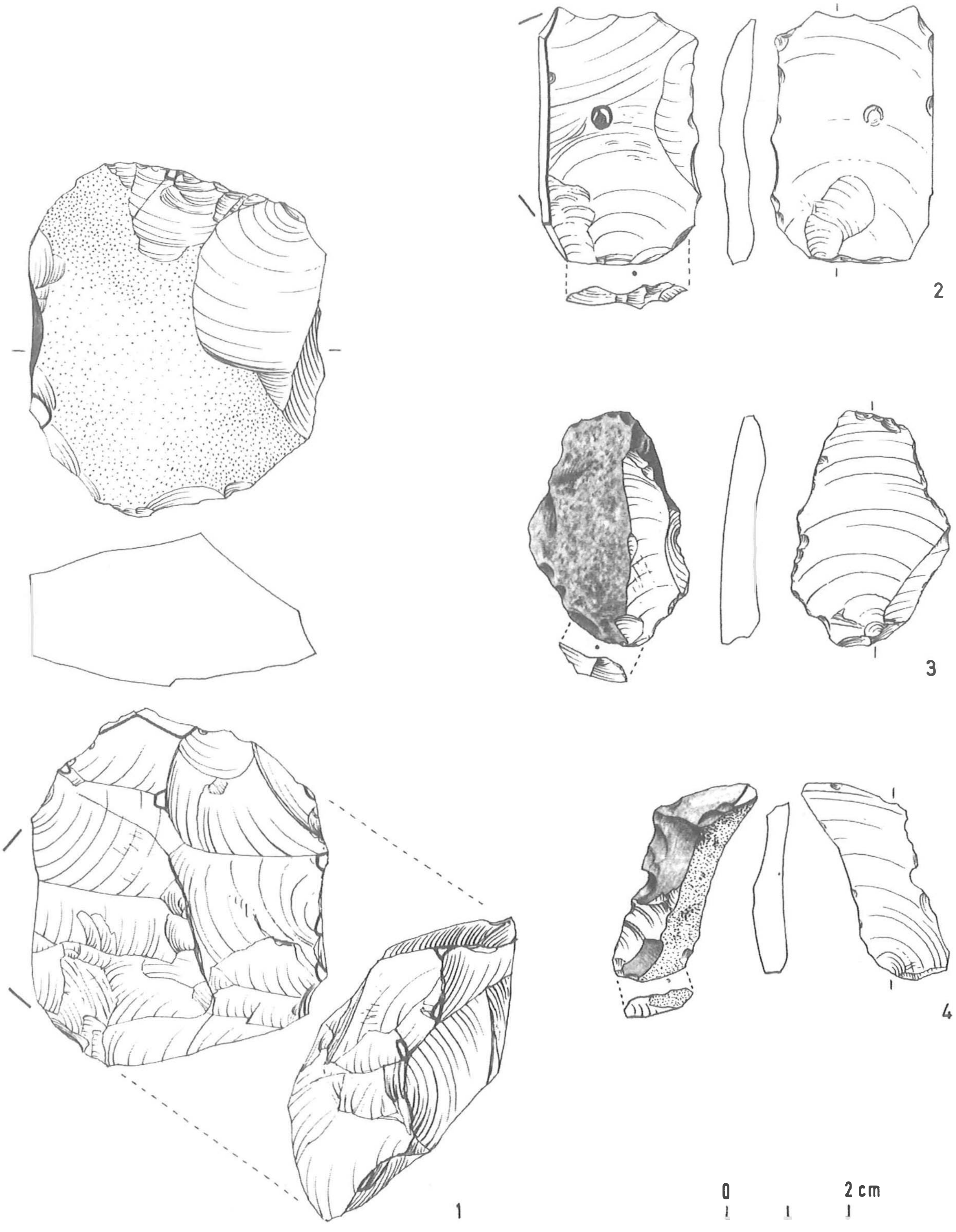


Fig. 17. Middle Paleolithic finds from Mander. 1. Levallois core (the fracture is the result of secondary frost-splitting); 2. fragment of possible Levallois flake (the fracture was caused by secondary frost-splitting); 3, 4. flakes. (Drawing H.R. Roelink, B.A.I.).

platforms have been prepared. From each of these striking platforms in total at least 5 flakes were struck off, some of which were short blades.

The core therefore strongly resembles Levallois cores for blades (*strunkförmiger Kernsteine* of Bosi
what atypical on account of its small size. The angle of the striking platform still present with the upper surface is c. 55°. The flint used is grey and moderately fine-grained.

No. 24 (figs. 21, 27).

L max.	6.5 cm
W max.	5.3 cm
T max.	2.4 cm
weight	77.7 gr.

The lower surface of this core consists largely of cortex (thin, white) and old frost-split faces; also on the upper surface remains of cortex have been preserved. The upper surface has been worked for the most part, by striking off flakes from the ridges all around, like a Levallois core for flakes. On the lower surface, however, only a few small negatives are visible, that could have served as striking platform for this preparation; for a large part of the circumference this was not necessary, because the original angle was already suitable.

In the upper surface a frost crack is visible. This was already present before the flint was worked, and must have resulted in several flakes coming off the core in a broken state. Moreover 2 deep negatives in the middle of the upper surface must have originated under the influence of this frost crack (see the longitudinal cross-section in fig. 21).

It must be assumed that whoever made the core subsequently discarded the specimen, because it was not suitable for further working. The artefact can thus best be described as a half-finished Levallois core, that went wrong (for a more or less analogous case, see core no. 1).

The flint used is of good quality, fine-grained, and brownish-grey in colour.

No. 25 (fig. 21). From this core at least one part is missing, possibly two, as a result of secondary frost-splitting and/or cryoturbation.

L*	4.0 cm
W*	3.7 cm
T*	1.3 cm
weight*	20.5 gr.

The lower surface of the core consists almost completely of old frost-split faces. On the upper surface two good flake negatives are visible, struck from different directions. In view of the fragmentary character of the core it is not possible to ascertain to which type it belonged. The secondary fracture surface does show wind-gloss, but a much less intense white patina than the surface of the flake negatives. The flint used is fine-grained and grey in colour.

4.3.4. *The flakes*

The remaining finds consist of 20 flakes, including several Levallois-like ones. The specimens are described briefly here below. The natural surface modifications present are given in table 1. A number of measurements and other attributes are presented in table 2. The length and width are measured as the sides of a circumscribing rectangle, that are respectively parallel and perpendicular to the striking direction. The flaking angle was measured as the angle between the striking platform remnant and a tangent over the furthermost projecting part of the bulb of percussion.

An asterisk indicates that the measurements given are not the original ones, as a result of later fractures (mostly secondary frost-splitting). The averaged measurements have been calculated on the basis of the intact specimens.

No. 2 (fig. 17). This flake has been broken secondarily by frost-splitting. The fracture surface shows *i.a.* white patina and wind-gloss, but no brown patina like the rest of the surface. The flake has a facetted striking platform remnant. Dorsally a number of negatives are visible with different striking directions. It is therefore very well possible that we are concerned here with a fragment of a Levallois flake. One of the dorsal negatives, however, makes the impression of having originated as a result of hard percussion (relatively deep percussion-bulb impression). Also the flake itself was obtained by hard percussion, in view of the distinct percussion bulb and circular fractures near the point of percussion. The flint used is fine-grained and of good quality.

No. 3 (fig. 17). A small flake, obtained by hard percussion in view of the presence of a distinct percussion bulb, a percussion cone and circular

Table 2. The flakes from Mander. An asterisk indicates that the measurements concerned are not the original ones, as a result of later fragmentation (frost-splitting).

	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	23	Mean	SD	N
Length (cm)	4.1	3.9	3.3	5.0	4.3*	2.5	2.6	3.7	5.5*	5.1	5.0	4.6	1.2	2.9	2.3	4.6	2.2*	2.6	2.9	2.6*	3.5	1.16	16
Width (cm)	2.7*	2.6	2.3	3.9	3.7*	2.8	2.7*	2.9	4.1	3.1	2.5	4.0	1.5	2.3	2.1	2.0	2.3	2.5	2.9*	3.7*	2.6	0.69	14
Max. thickness (cm)	0.5*	0.7	0.7	0.9	0.6*	0.8	0.6	0.8	1.2	1.4	2.0	1.0	0.4	4.9	0.5	0.6	0.6	0.7	0.9*	1.2*	0.9	0.40	16
Weight (gr)	8.6*	7.1	3.3	17.2	9.0*	4.5	4.3*	7.2	21.7*	19.6	22.2	16.2	1.0	4.9	2.7	6.0	3.4*	5.5	7.4*	9.6*	9.0	7.10	13
'Flaking angle' (°) ca.	100.0	108.0	94.0	126.0	100.0	88.0	102.0	94.0	115.0	95.0	119.0	122.0	120.0	104.0	95.0	?	98.0	109.0	105.0	102.0	105.1	10.90	19
Length of platform remnant (cm)	2.0	1.3	1.2	2.5	1.6	1.2	2.0	1.1	3.8	1.5	1.3	1.9	1.5	1.7	2.0	?	2.2	1.0	2.7*	2.0	1.77	0.66	18
Max. thickness of platform remnant (cm)	0.3	0.4	0.3	0.4	0.4	0.4	ca.0.6	0.3	1.0	1.2	0.3	0.9	0.4	0.5	0.4	?	0.4	0.5	0.5*	0.5	0.5	0.24	19
Thickness of platform remnant at point of percussion (cm)	0.3	0.4	0.3	0.4	0.3	0.4	ca.0.6	0.3	0.8	1.2	0.3	0.9	0.4	0.5	0.4	?	0.4	0.5	0.4	0.5	0.5	0.24	19
Percussion cone	?	+	+	?	+	+	?	+	+	?	+	?	+	+	+	?	+	?	?	+			
Circular breaks at point of percussion	+	+	?	?	+	?	+	?	+	?	+	?	+	?	?	?	+	?	?	+			
Platform remnant consisting of cortex (c), old frost-split faces (f), negatives (n)	n	n	n,c	n	n	c	n	n	n	n	n	n	f	c,f,n	f,n	?	f,n	f	f	f			
Platform remnant flat (f), *dièdre* (d), facetted (fc)	fc	d	d	fc	fc	f	fc	fc	fc	f	fc	f	f	d	fc	?	fc	f	f	f			
Number of (larger) dorsal negatives	4	1	1	ca.5	2*	5	1	2	3*	2	3	ca.4	1	1	1	1	1	3	ca.6*	1			
Number of (larger) dorsal negatives with same striking direction as flake	2	1	1	2	1	2	1	2	3	2	3	ca.2	1	1	1	1	1	3	?	0			
Percussion scar	+	+	–	+	–	+	+	+	+	+	+	+	–	+	–	–	+	+	+	+			
Old frost-split faces	–	+	+	–	–	–	–	+	+	+	+	+	+	+	+	–	+	–	+	+			
Cortex	–	–	+	–	–	+	+	–	–	+	+	+	+	+	–	+	–	–	–	–			
(Sub) recent damage	–	–	+	+	–	–	–	–	+	–	+	+	–	–	–	+	–	–	+	+			

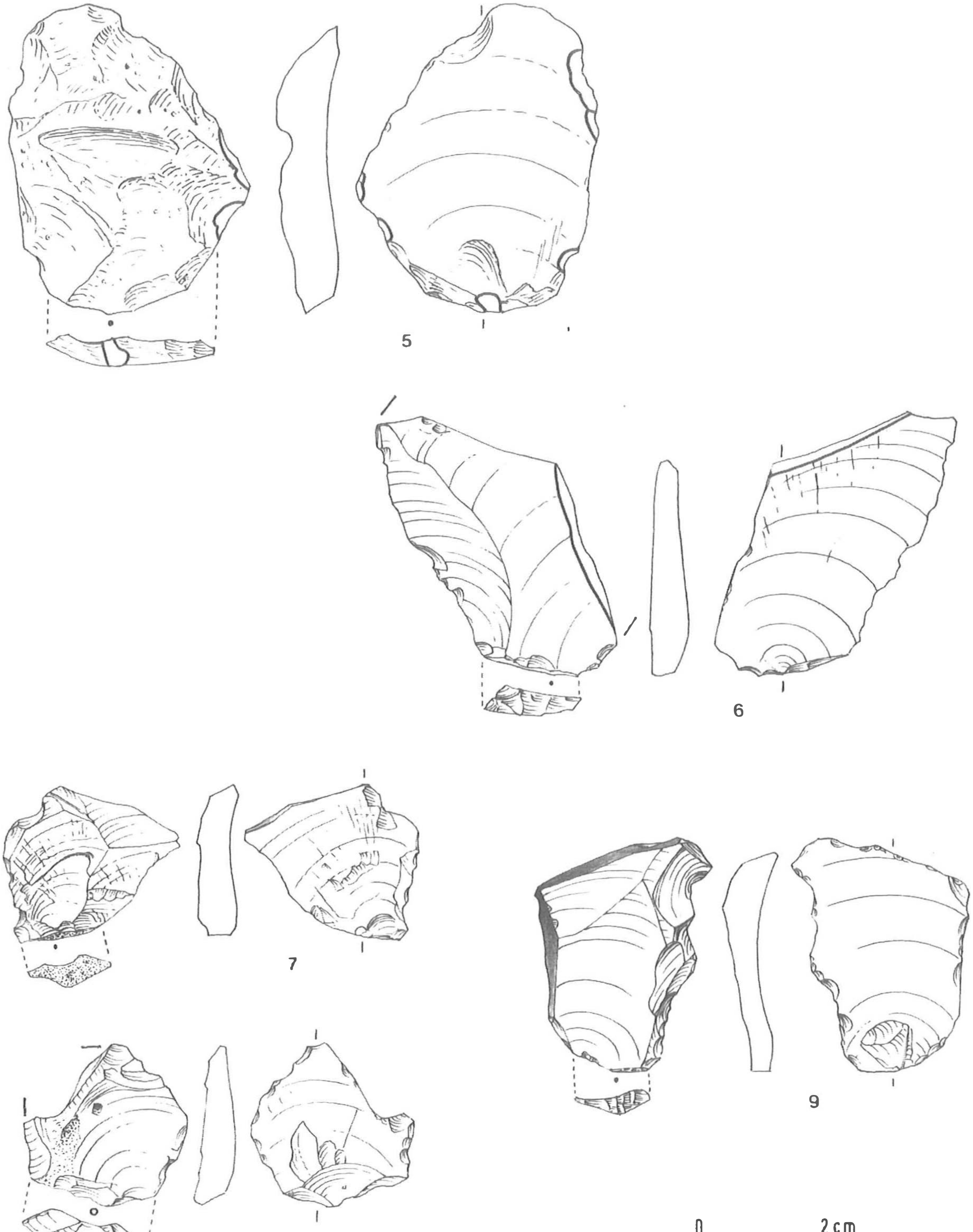


Fig. 18. Middle Paleolithic finds from Mander. 5. Levallois-like flake (very severely weathered); 6. possibly fragment (secondary frost-splitting) of Levallois flake; 7, 8. small flakes; 9. borer-like tool. (Drawing H.R. Roelink, B.A.I.).

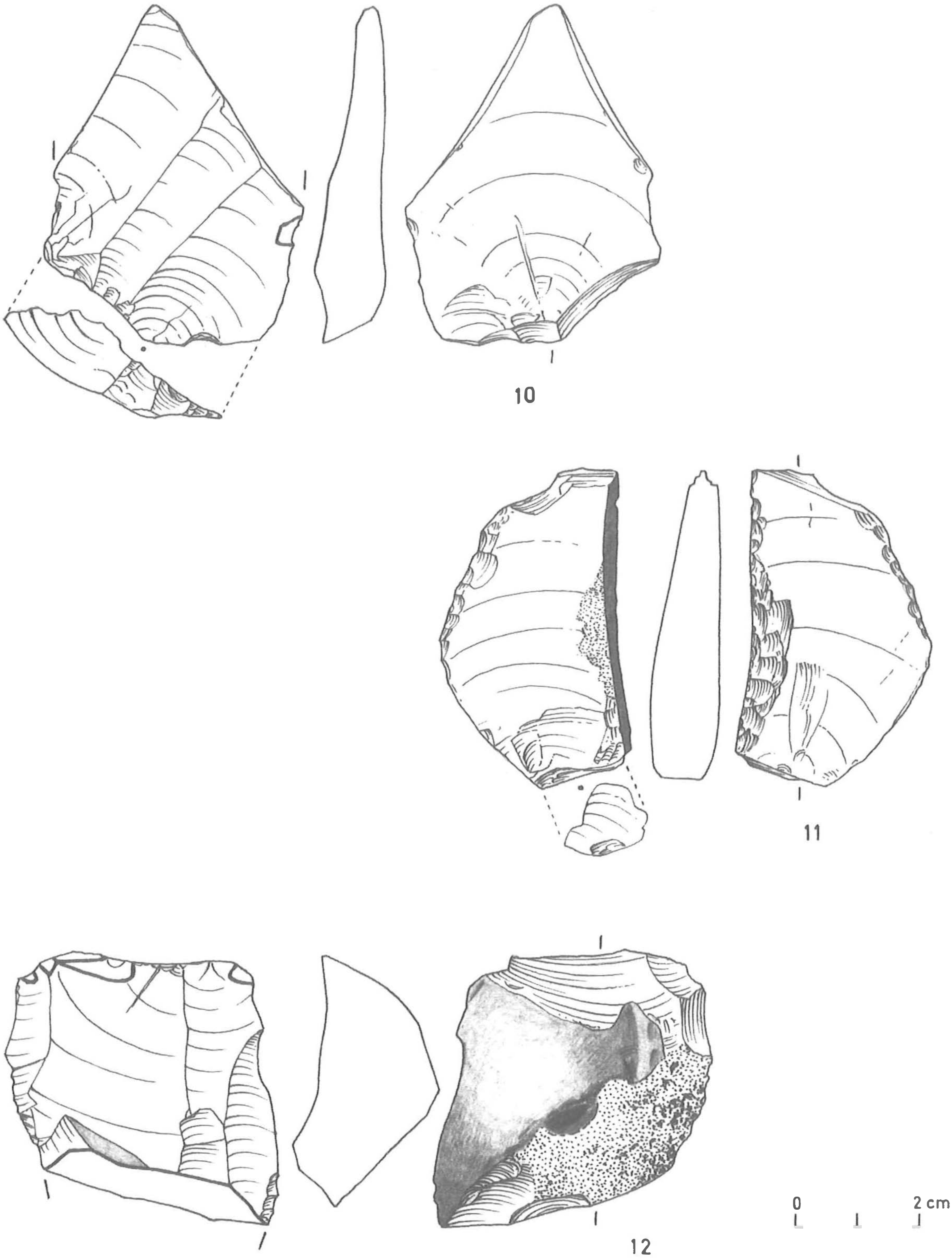


Fig. 19. Middle Paleolithic finds from Mander. 10. possibly fragment (secondary frost-splitting) of Levallois flake; 11. *couteau à dos naturel* with ventral retouching; 12. Levallois core for (short) blades–the fracture is the result of secondary frost-splitting. (Drawing H.R. Roelink, B.A.I.).

fractures near the point of percussion. The striking platform remnant consists of 2 negatives, and can thus be described as a *talon dièdre* (Bordes, 1961). Dorsally only one negative is visible, with approximately the same striking direction as the flake itself, and an old frost-split surface. The flint used is fine-grained, of a somewhat 'glassy' kind.

No. 4 (fig. 17). This small flake was presumably obtained by hard percussion, in view of the relatively big percussion bulb and the presence of a percussion cone. Dorsally remnants of the cortex (thin, white) and old frost-split faces have been preserved, in addition to a small negative. The flint used is light grey and fine-grained.

No. 5 (figs. 18, 23). This is a very severely weathered flake, of which notably the dorsal surface has become heavily pitted, so the negatives present are hardly visible anymore. Here we are most probably concerned with a hard percussion flake, in view of the distinct percussion bulb. It can just be seen that the striking platform remnant is probably facetted. As far as can be seen the dorsal surface shows a number of negatives struck from different directions. Moreover the flake has cutting edges all around, so with some reservation we can speak of a Levallois flake. The flint used is light grey and moderately fine-grained.

No. 6 (fig. 18). This flake is fragmentary. A number of fractures are present, that date from approximately the same time as the flake, since the degree of patination of the fracture surfaces does not differ much from that on the rest of the surface. It is therefore not clear whether secondary frost-splitting is concerned here, but this is very well possible. As is evident from the drawing it must originally have been a fairly large flake. The flake has a facetted striking platform remnant, and must have originated as a result of hard percussion, in view of the presence of a relatively large percussion bulb and circular fractures near the point of percussion. Dorsally 2 large negatives are visible, with different striking directions. It is very well possible that this specimen was a Levallois flake, but there can be no certainty about this in view of its fragmentary character. The flake was struck from fine-grained flint of good quality.

No. 7 (fig. 18). A small flake with a plain striking platform remnant, consisting of cortex (thin, grey). The flake was probably obtained by means of hard percussion, in view of the distinct percussion bulb. Dorsally a number of negatives are visible. The flint is moderately fine-grained. This flake was found by H. Oude Rengerink.

No. 8 (fig. 18). A small flake, of which a small piece has broken off distally, probably as a result of secondary frost-splitting; the fracture surface is slightly less patinated than the rest of the surface.

In addition to a number of negatives, dorsally a small remnant of the cortex has been preserved (thin, white). The striking platform remnant is facetted, and the flake was presumably obtained by means of hard percussion, in view of the distinct percussion bulb and circular fractures near the point of percussion. The flint used is light grey and moderately fine-grained.

No. 9 (fig. 18). This flake has a facetted striking platform remnant. It is not certain in which way the flake was obtained; a percussion bulb and a percussion scar are indeed present, but the bulb is rather flat, while in addition no circular fractures are visible near the point of percussion.

Dorsally various negatives are visible, but here we are not concerned with a typical Levallois flake. Left and distally, on the dorsal surface, remnants of old frost-split faces have been preserved, that make angles of c. 57° and 66° respectively with the ventral face, so this artefact cannot possibly be classified as a *couteau à dos natural*.

Along the right edge of the flake and distally, in addition to abundant fine retouching, that must be the result of cryoturbation, some larger retouching is visible, that appears to be intentional. We can therefore classify this as a borer-like tool. The flake has been struck from fine-grained flint of good quality.

No. 10 (fis. 19, 22). Also this flake is fragmentary; as a result of 2 fractures a relatively large part has disappeared. The two fracture surfaces are approximately as old as the flake itself, because the degree of patination is approximately the same as for the rest of the surface. It is therefore not

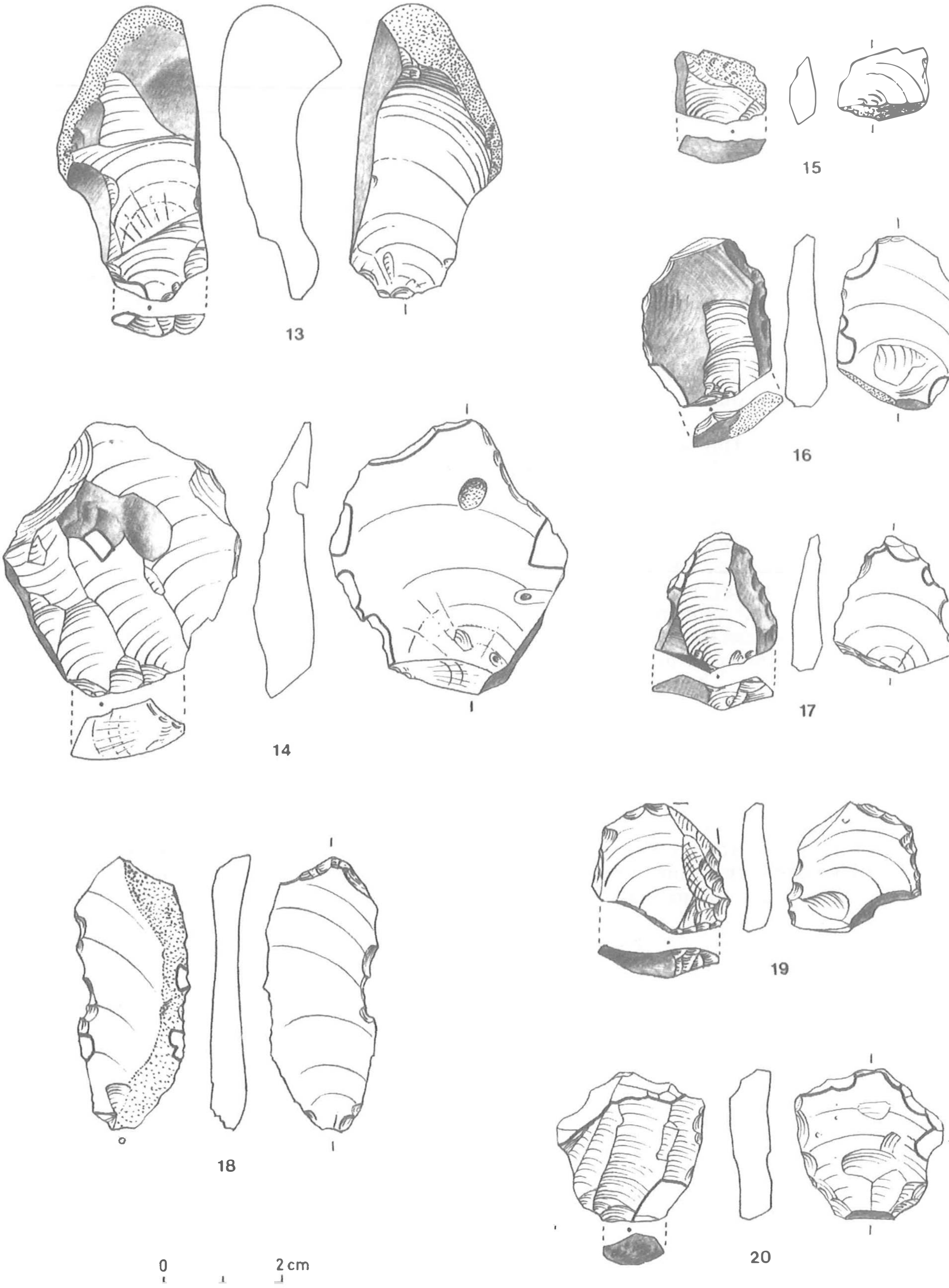


Fig. 20. Middle Paleolithic finds from Mander. 13. flake; 14. Levallois-like flake (very severely weathered); 15, 16, 17, 19, 20. small flakes; 18. *couteau à dos naturel* (atypical). (Drawing H.R. Roelink B.A.I.).

certain, though very well possible, that the fractures are the result of secondary frost-splitting.

The flake was certainly obtained by means of hard percussion, in view of the presence of a large bulb of percussion and circular fractures near the point of percussion. The relatively big striking platform remnant is facetted. Dorsally three negatives are present. It is probable that we are here concerned with a Levallois flake, but in view of the fragmentary character there can be no absolute certainty about this. The flint is moderately fine-grained, and contains many small fossil fragments.

No. 11 (fig. 19). This flake has a somewhat atypically shaped percussion bulb, so it is conceivable that here we may be concerned with a pseudo-artefact. The most important reason for interpreting the specimen as artificial is the presence of 2 good dorsal negatives with the same striking direction as the flake itself. This is probably a hard percussion flake; the fairly wide striking platform remnant is plain.

On the right a transversely oriented old frost-split face is present over the entire length of the flake. The flake can therefore be classified as a *couteau à dos naturel*. This natural back (thickness varying from 0.5–1.2 cm) is thinner in some places on account of ventral retouching, that is probably artificial. The other retouching, especially along the left edge of the flake, must be explained as having originated naturally, as a result of cryoturbation. This retouch is to some extent bifacial, and much more irregular and steeper than the ventral retouching. The artefact has been struck from moderately fine-grained bryozoan flint.

No. 13 (fig. 20). This is a fairly thick, plunging flake. The right edge consists of an approximately transversely running old frost-split face. Elsewhere too remnants of old frost-split faces and of the cortex (thin, dirty white) have been preserved. Dorsally three negatives are visible with the same striking direction as the flake itself. The flake was obtained by means of hard percussion, in view of the distinct percussion bulb and circular fractures near the point of percussion. The flint used is moderately fine-grained.

No. 14 (fig. 20). This hard percussion flake (distinct percussion bulb) was struck from moderately fine-grained flint with abundant fossil fragments, including bryozoa. The striking platform remnant consists of a larger negative struck from one of the sides, and was not prepared any further. Dorsally a number of negatives are visible from different directions, so here we can speak of a Levallois flake. The specimen has become heavily pitted, however, as a result of weathering, so it is not possible to ascertain the artificial character of the negatives in all cases. Moreover a few remnants of old frost-split faces are visible (including an approximately transversely oriented part of the left edge). The flake can therefore best be described as Levallois-like.

No. 15 (fig. 20). Although this flake is very small it must have been obtained by hard percussion, in view of the presence of a percussion cone and circular fractures near the point of percussion. The striking platform remnant is plain, and probably consists of an old frost-split face. Dorsally, in addition to remnants of cortex (thin, grey) and an old frost-split face, two small negatives are visible. The flint used is moderately fine-grained.

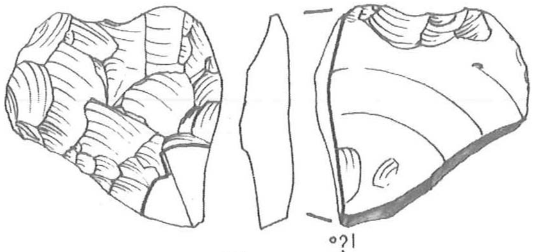
No. 16 (fig. 20). Also this small flake was obtained by means of hard percussion, in view of the relatively large percussion bulb and the presence of a percussion cone.

The remaining part of the striking platform mainly consists of a remnant of the cortex (thin, dirty white) and an old frost-split face (*talon dièdre*).

Dorsally one negative is visible, in addition to old frost-split faces. The flint used is light grey and fine-grained.

No. 17 (fig. 20). A small flake, obtained by means of hard percussion in view of the distinct percussion bulb. The striking platform remnant is facetted, but consists to some extent of a remaining part of an old frost-split face. The flint used is fine-grained.

No. 18 (fig. 20). This is a blade-like flake, that has a back along the right edge, formed by cortex (thin, light grey). The angle made by the back with the ventral surface is however not really blunt (on average c. 50°), so here we cannot speak of a typical *couteau à dos*



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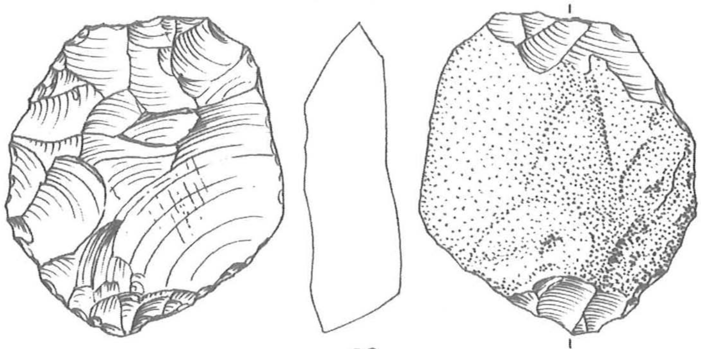

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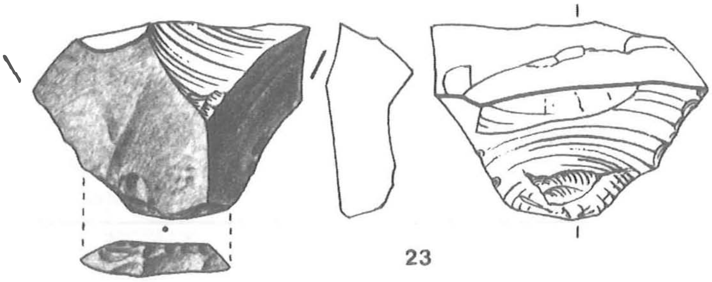

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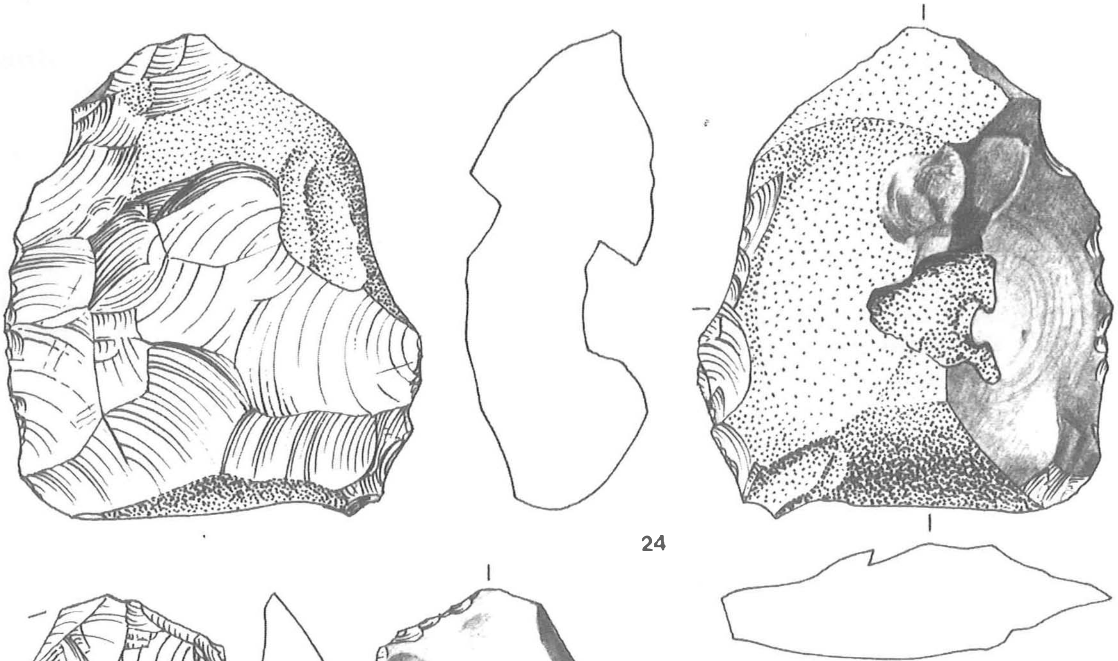

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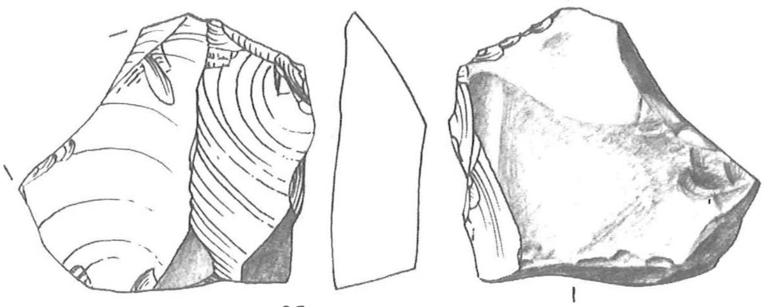

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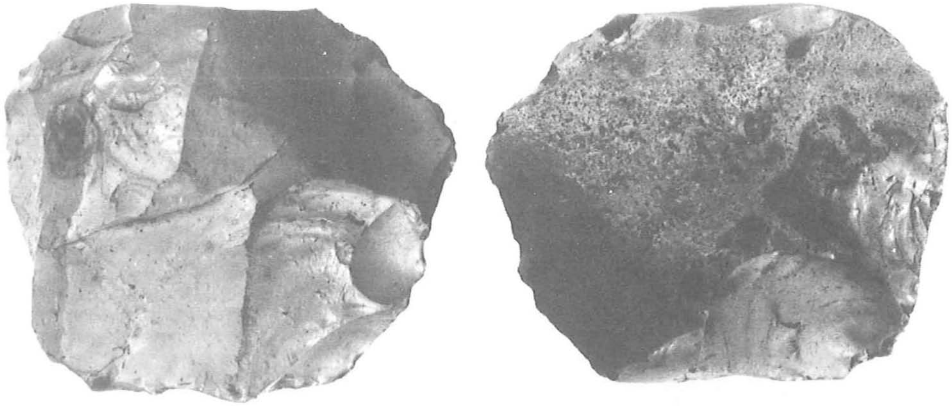

Fig. 22. Levallois core (no. 1). (Photo F.W.E. Colly, B.A.I.).

naturel. Dorsally one large negative is visible. The striking platform remnant has largely disappeared as a result of cryoturbation retouch that developed later.

The blade was presumably obtained by means of soft percussion, in view of the rather flat percussion bulb. Distally retouching is present, that probably also originated as a result of cryoturbation. The flint used is light grey and fine-grained.

No. 19 (fig. 20). A small hard percussion flake (large percussion bulb, percussion cone and circular fractures near the point of percussion). Dorsally one large and many small negatives are present.

The striking platform remnant consists for more than 50% of an old frost-split face, and in addition probably a number of negatives, and has in fact more the character of a *talon dièdre* than of a typical facetted striking platform remnant. The flint used is fine-grained. Distally a small part of the flake has possibly disappeared as a result of secondary frost-splitting.

No. 20 (fig. 20). A small severely weathered flake (presumably obtained by means of hard percussion), of which the surface has become heavily pitted. The striking platform remnant consists of old frost-split faces. Dorsally a number of negatives are visible with approximately the same striking direction as the flake itself. Distally and elsewhere some traces of subrecent damage are present, that can best be explained as cryoturbation retouch; on this retouching wind-gloss is present but not white patina as on the rest of the surface. The flint used is light grey and fine-grained.

Fig. 21. Middle Paleolithic finds from Mander. 21. possibly fragment (secondary frost-splitting) of Levallois flake. 22. *disque*; 23. flake fragment; 24. half-finished Levallois core that went wrong; 25. fragment of core (secondary frost-splitting). (Drawing H.R. Roelink, B.A.I.).

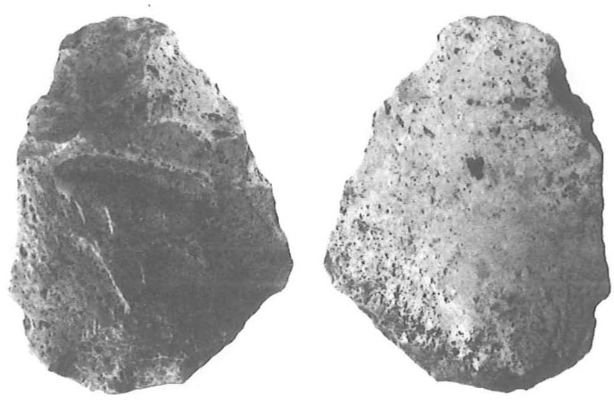

Fig. 23. Levallois-like flake (no. 5), very severely weathered. (Photo F.W.E. Colly, B.A.I.).

No. 21 (fig. 21). This is a (presumably hard percussion) flake of which approximately one half is missing; the fracture surface is clearly younger than the flake (wind-gloss is present, but no white patina), and almost certainly originated as a result of secondary frost-splitting. The preserved part of the striking platform remnant is plain, and consists of an old frost-split face. Dorsally many negatives are visible having been struck from different directions, so it strongly resembles a Levallois flake. However, the specimen is not typical

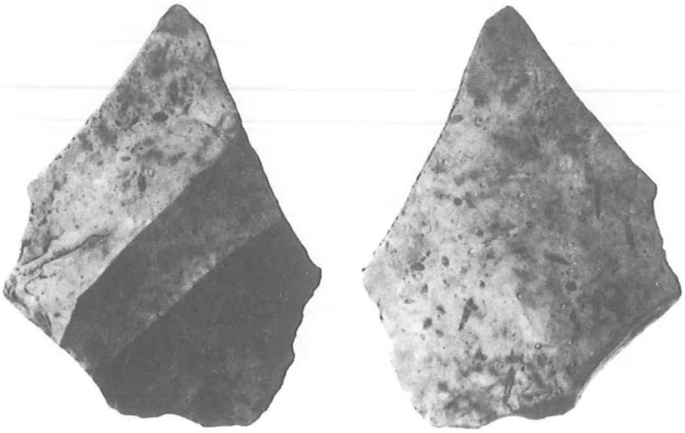

Fig. 24. Fragment of possible Levallois flake (no. 10). (Photo F.W.E. Colly, B.A.I.).

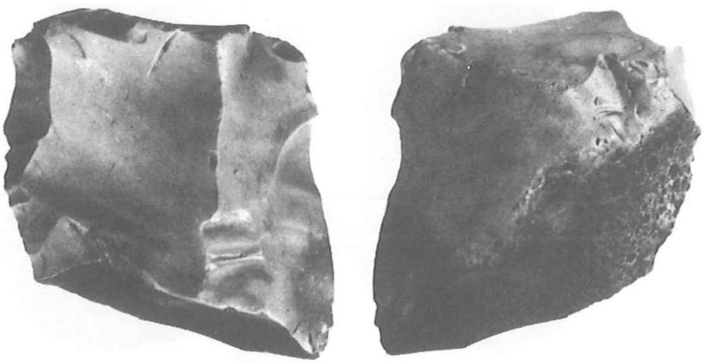

Fig. 25. Levallois core for (short) blades (no. 12); the fracture was caused by secondary frost-splitting. (Photo F.W.E. Colly, B.A.I.).

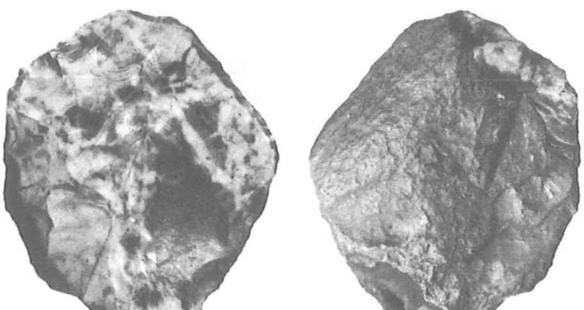

Fig. 26. The *disque* (no. 22). (Photo F.W.E. Colly, B.A.I.).

and moreover it is fragmentary. The flint used is light grey and moderately fine-grained.

No. 23 (fig. 21). This is a proximal fragment of a flake. The fracture surface is clearly more recent than the flake, and almost certainly originated as a result of secondary frost-splitting. Dorsally a fragment of a negative is visible, coming from a striking platform lying opposite, while in addition old frost-split faces are present. This must be a hard percussion flake, in view of the distinct percussion bulb, a percussion cone and circular fractures near the point of percussion. The striking platform remnant is flat, and consists of old frost-split faces. The flint used is brownish-grey and fine-grained.

4.4. Summarizing remarks

The material that has been collected so far (26 specimens) can be summarily described as follows:

1 *biface subtriangulaire* (made from a flake),
1 *disque*,
1 Levallois core (for flakes),
1 fragment of a Levallois core (for short blades),
1 half-finished Levallois core (for flakes),

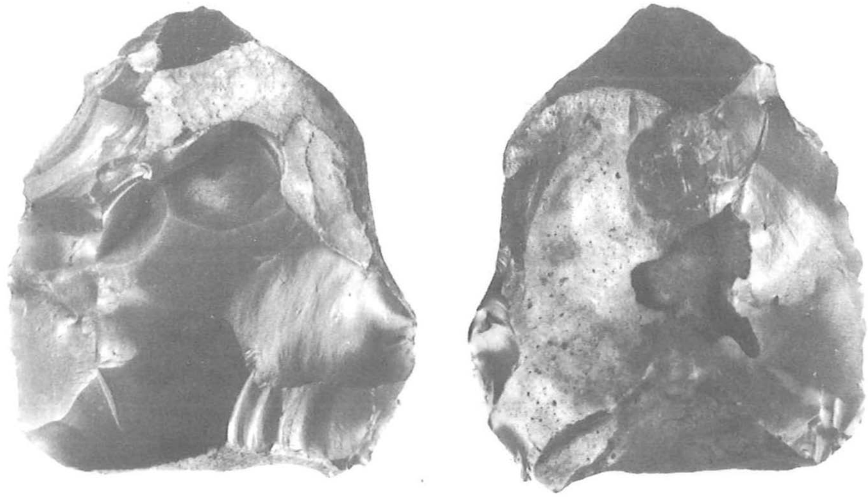

Fig. 27. Half-finished Levallois core that went wrong (no. 24). (Photo F.W.E. Colly, B.A.I.).

1 core fragment,
1 borer-like tool,
2 *couteaux à dos naturels* (one atypical),
4 fragments of possible Levallois flakes,
2 Levallois-like flakes,
11 flakes (hard percussion).

The Levallois core technique is clearly represented. The number of tools is of course very small; somewhat remarkable is the total absence of distinct side-scrapers, that as a general rule constitute a significant proportion of Middle Paleolithic complexes. Many of the specimens are quite severely weathered. Moreover they have mostly been affected by cryoturbation, while rather many (7 almost certainly, 4 possibly) have been secondarily fragmented as a result of frost-splitting.

5. COMPARISON WITH OTHER SITES

Small and flat triangular hand-axes, particularly if they have been made from flakes, appear to be one of the few types of hand-axe that can be well dated archeologically. According to Bordes (1961) they occur notably (in France) only during a relatively short period, from *l'extrême fin* of the Upper Acheulian until c. halfway through the *Moustérien de tradition acheuléenne* (MTA). It is thought that very small forms occur up until the end of the MTA, but in general, according to Bordes, flat triangular hand-axes *pourraient constituer un bon fossile du MTA ancien* (*ibid.*: 58). In the opinion of Bordes the frequently small hand-axes of the MTA could have been (to some extent) shafted.

Bordes (1953; 1958) distinguishes within the MTA two 'types', namely A and B, that are consistently chronologically consecutive at a single site. In the MTA type A relatively many hand-axes occur (usually 10–15% of the tools), among which – especially initially – are triangular ones, in addition to *cordiformes* (that form the largest group as a general rule). Also *i.a. couteaux à dos* occur, but not in large numbers. In the MTA type B far fewer hand-axes occur (usually 4–5%), among which there are no or very few triangular ones, and relatively many *couteaux à dos.* The few hand-axes are usually fairly small, and *peu soignés* (in this connection Bordes (1972) elsewhere uses the term 'degenerate'). The MTA type B is furthermore characterized by the regular occurrence of 'Upper Paleolithic' tool forms.

In view of the fact that at Mander we are concerned with a carefully worked sub-triangular hand-axe (made from a flake), it can most probably be associated with the MTA type A. This also applies to the flat triangular hand-axe from Anderen–that specimen is larger and has no cutting base (Stapert, 1976b).

It now appears very probable, in any case, that the MTA is represented in the Northern Netherlands. This presumably applies to the Southern Netherlands too (as indicated by *i.a.* the small *cordiforme* from Mill: Stapert, 1977).

In France the MTA is known for both cave/*abri* sites as well as for open-air sites. One of the best known is Pech-de-l' Azé in the Dordogne (Bordes, 1954/1955). During the excavation by Bordes, *couche* 4 (*Foyer, Abri* Ib) yielded almost 33,000 artefacts, including 155 hand-axes. From this same layer M.R. Vaufrey had previously collected 216 hand-axes. For the most part these are small *cordiformes*, but triangular forms also occur, that are comparable to the Mander specimen. In addition the finds included a *pointe foliacée biface* and 4 *disques*, among other types.

Bordes is of the opinion that the first occurrence of the MTA in this cave can be dated to around the Würm I/II interstadial.

Laville (1973) gives a detailed discussion of the chronology of the cave and *abri*-fills in the Dordogne, on the basis of sedimentological research. From his table (between pp. 656 and 657) it is evident that the MTA type A appears in Le Moustier from the time of his Würm I, phase VII; during Würm II (phases I and II) MTA type B occurs there. In Pech-de-l'Azé the MTA type A is dated by him in the first part of phase I of Würm II, after which there follows a transition industry A/B, and subsequently MTA type B in the phases III and IV. The MTA in Combe-Grenal is dated in Würm II, phase VIII; *i.e.* just before the Würm II/III interstadial. This last-mentioned interstadial can most probably be correlated with either or both of the Hengelo and Denekamp interstadials that have been distinguished in the Netherlands (Waterbolk, 1972).

A more difficult question is with which Dutch interstadial the French Würm I/II can be correlated. Waterbolk (*ibid.*) proposes the Moershoofd interstadial, and thus not one or more interstadials of the Early Glacial (Amerfoort, Brørup, Odderade: see Zagwijn, 1975). His argument is that the Early Glacial stadials were not sufficiently cold to have been able to have had much effect in Southern France. Bordes (in Waterbolk, 1972; discussion) does not agree with this, however. If Waterbolk is right, then the MTA could date entirely from *after* the Early Glacial. In that case for the Dutch material there remains in fact only the Moershoofd interstadial, at least if one assumes that in this region the Lower Pleniglacial was too cold for human inhabitation.

The available data (summarizing surveys in *i.a.*: Mellars, 1969; Laville, 1973) make it clear, however, that the French Würm I was much less cold and dry than the Würm II: there are fewer indications of frost in the sediments, and (far) fewer reindeer in the faunas. This climatic succession is not what one would expect if the French Würm I/II is supposed to correspond to the Dutch Moershoofd interstadial: one would presume rather the reverse situation, because then the Würm I would have to be correlated with the cold Lower Pleniglacial.

Usually the French Würm I/II is therefore correlated with the Brørup interstadial (*e.g* Mellars, 1969; Collins, 1970). Now that the existence of a third Early Glacial interstadial, namely the Odderade interstadial, has been definitely established (Averdieck, 1967; Zagwijn, 1975), it seems more obvious to me to correlate the French Würm I/II with that interstadial.

Consequently it can be assumed that the MTA occupation (at least that of type A) took place already during the Early Glacial, but evidently in the final part of this period, in view of Laville's results. The increasing scarcity of MTA type B, going from the Dordogne towards the north (the MTA type B is not clearly in evidence, for example, in Belgium: Ulrix-Closset, 1975; De Laet, 1979), could then be well explained by the much more severe climatological conditions that prevailed there during the Lower Pleniglacial.

In Northern France many open-air sites of the MTA are known (Seine valley: Bordes, 1953; Somme valley: Commont, 1914; see also Tuffreau 1971; 1978; 1979). Tuffreau places the MTA material of St. Just-en-Chausée (lowest layer) in the *Début Glaciaire*, and the sites Marcoing and Catigny at the beginning of the *Pleniglaciaire Inférieur* (Tuffreau, 1979) or at the end of the *Début Glaciaire* (Tuffreau, 1971; 1978). With the sites of Northern France it is evidently MTA type A that is mostly concerned, in view of the occurrence of *i.a.* triangular hand-axes.

In Belgium the site of Sainte-Walburge was previously attributed by Ulrix-Closset (1975) to the MTA (type A). Recently, however, this site has been regarded as belonging to the Upper Acheulian (Bosinski, 1978; Ulrix-Closset, 1980). Reinterpretation of the previously described profile (De Puydt *et al.*, 1912) makes it probable, moreover, that the most important find layer (*cailloutis inférieur*) can be dated in the Saalian (Roebroeks, 1981). Ulrix-Closset (1980), in her overview table, mentions only one well-dated MTA site in Belgium, namely Franquenies. From a recent publication about this site (Michel & Haesaerts, 1975) it is reasonable to assume that it dates from the transition from the Odderade interstadial to the *Pleniglaciaire* A.

The most important site in England is Oldbury (Collins, 1970). Unfortunately this site cannot be dated precisely, but it most probably dates from the first half of the last ice age. Among the finds from this site are a few hand-axes of the so-called Paxton type, that are unknown in the Netherlands. The site of Paxton itself is dated 'early in the last glaciation' (see also Paterson & Tebbutt, 1947).

As far as the German sites are concerned, the discussion in Stapert (1979) is referred to, as no newer or more precise datings have become available in the meantime.

With regard to the *disque* from Mander it can be said that these tools are no unusual phenomenon at MTA sites. Mention has already been made above of the 4 *disques* from Pech-de-l'Azé (*couche* 4). From the previously mentioned Belgian site of Franquenies 6 *disques* are known (Michel & Haesaerts, 1975). *Disques* also occur, however, at older sites, notably of the Upper Acheulian. In the Netherlands they are present, for example, within the material from Rhenen, that can be dated in the first half of the Saalian, before the period of ice-cover (Stapert, 1981).

To summarize, it can be said that the finds from Mander, on the basis of dated comparable finds in other countries, most probably date from the Early Glacial of the last ice age, in particular from the later phases of this period. The geological data do not contradict this possible dating, but they cannot confirm it either.

6. THE HAND-AXE (NEOLITHIC?) FROM THE MOLEN VAN BELS (figs. 28, 29)

The coordinates of this site (B in figs. 2, 3) on the Topographical Map of the Netherlands (sheet 28F) are approximately: 253.900/496.350. The distance from this site to the above-described Middle Paleolithic site is about half a kilometre. The site is located in the attractive valley of the Mosbeek, that has relatively steep slopes here. The specimen was found when the sheet-piling of the canal near the mill of Bels was being put straight; in the course of the digging operations concerned the artefact was found in the topmost 0.5 m below the surface. From a few borings made at the spot it is evident that the hand-axe could not have been found *in situ*, but in soil shifted from elsewhere, most probably the soil that was moved at the time when the canal was dug. At a slight distance away from the canal the stratigraphy was as follows:

0–60 cm	disturbed soil
60–130 cm	coarse sand with much gravel
130–160 cm	greyish-green loamy sand

The greenish sediment at the bottom undoubtedly dates from the Tertiary and was pushed by the ice. The coarse layer consists of material washed out by the stream, and was probably formed during the Pleniglacial of the Weichselian (see also the contribution by Van den Berg & Den Otter, and under 2.).

For the origin of the hand-axe there are thus two possibilities: a. the gravel-bearing layer, b. the topsoil. We shall return to the question of dating after the description of the specimen.

A few measurements of the hand-axe are given below. Part of the top has disappeared recently, so some measurements (those indicated by an asterisk) are not the original ones. The indices according to Bordes are based on the estimated original measurements.

L*	8.0 cm
L max (original, estimated) (L)	9.1 cm
W max (m)	6.0 cm
T max (e)	1.6 cm
W in the middle (estimated) (n)	5.4 cm
distance from point of W max to base (a)	2.5 cm
weight*	79.5 g.
angle in middle of left edge (of l)	c.48°
angle in middle of right edge (of l)	c.45°

Thus we obtain the following indices according to Bordes (1961):

L/a	3.64
n/m × 100	90.00
L/m	1.52
m/e	3.75

According to the typology of Bordes (*ibid.*) the specimen can consequently be described as a *cordiforme*. It is a fairly flat hand-axe, that is almost certainly made from a flake. Along

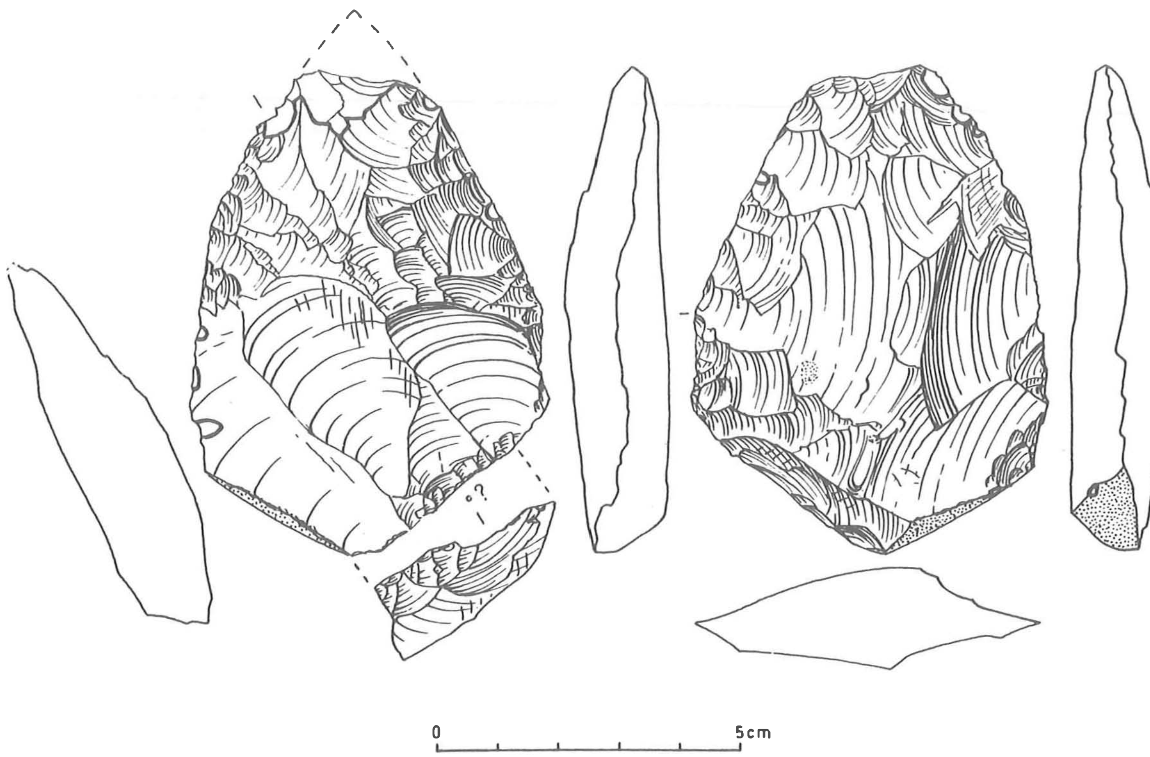

Fig. 28. The hand-axe (Neolithic?) from the *Molen van Bels*. (Drawing H.R. Roelink, B.A.I.).

the right edge (of I, see fig. 28) part of the striking platform remnant (L 3.2 cm, T 1.3 cm) appears to be preserved; the original ventral face of the flake is no longer visible, however, as a result of the later working. The base is not a cutting edge but consists of cortex (thin, greyish-white), in addition to the possible striking platform remnant.

From a number of traces of recent damage it is evident that the flint used is moderately fine-grained and grey in colour, with white patches and fossil fragments, including bryozoa. Here we are clearly concerned with flint of northern origin.

The hand-axe has been carefully worked, and apart from the base it has a regular, symmetrical shape. Probably the top part was originally finished off as a point. On face I a number of large parallel negatives are visible, coming from that part of the striking platform remnant that has been preserved–these were probably already present on the flake before it was worked into a hand-axe. Most of the negatives are fairly flat, without deep percussion bulb impressions, so probably soft percussion was applied in the process of working. However, the flake out of which the hand-axe was made must have been struck by a hammer stone, in view of the relatively thick striking platform remnant. Both edges have been worked into a convex shape, and are fairly straight in side view. Notably the top part (especially on face I) has been carefully retouched.

The specimen is only slightly weathered. Face I has remained fresh for the most part, apart from some very slight gloss and a little (patchy) white patina. Face II has a higher gloss, although this is no typical wind-gloss. Moreover face II has a more intense white patina than face I. There is hardly any rounding-off of ridges and edges.

With the aid of a stereomicroscope a few scratches are visible, but these make the impression of being recent. In the surface there are also various traces of recent damage, which in view of the presence of traces of rust are probably the result of contact with iron (digging) tools.

No distinct small pits, old scratches or

Fig. 29. The hand-axe (Neolithic?) from the *Molen van Bels*. (Photo F.W.E. Colly, B.A.I.).

pressure cones were observed.

From a strictly typological point of view the hand-axe from the *Molen van Bels* fits very well into the MTA, like the specimen from Mander discussed here above. Small flat *cordiformes*, notably if they have been made out of flakes, are fairly typical for the MTA, like flat triangular forms.

In this case, however, there is good reason to assume that the tool must date from much later than the Middle Paleolithic. For the specimen is hardly weathered, in contrast to the material from Mander that is relatively severely weathered. Taking into account the local geological conditions, this leads to the conclusion that the specimen must date from the Holocene.

In this region the valley of the Mosbeek does not have a thick fill. Notably there is no loam or clay or anything similar present, in which any Middle Paleolithic tools could have remained preserved in a (relatively) unpatinated state. In fact the fill only consists of a relatively thin layer of coarse sediment, under which one usually finds (at a very shallow depth under the surface) ice-pushed Tertiary or Lower Pleistocene sediments. If any Middle Paleolithic artefacts were present in the coarse layer then one would expect them to be weathered to about the same extent as the material from Mander described here above, and moreover they would possibly be rolled as well. Concerning the local geology see further the contribution of Van den Berg & Den Otter (this issue).

The conclusion is that the implement from the *Molen van Bels* cannot originate from the coarse sediment, and that it must thus date from the Holocene.

As far as I am aware, during the Holocene the only phase of prehistory for which we know of typologically 'real' hand-axes is the Neolithic. In Belgium a number of hand-axes have been found in a clearly Neolithic context (see *e.g.* Danthine, 1939). Also in the Southern Netherlands hand-axes have been found at Neolithic sites. The clearest example is probably the triangular hand-axe from the *Grand Atelier* near the Neolithic flint-mines in the surroundings of St. Geertruid (Stapert, 1981a).

For the meantime it therefore appears to be most probable that the specimen from the *Molen van Bels* also dates from the Neolithic. On the slopes of the Mosbeek, at the site of the find, we collected on the surface a few not or hardly patinated flakes, that could very well date from the Neolithic, although because of the absence of any distinct tools there can be no certainty about this.

From the Northern Netherlands one other comparable find, a fairly small hand-axe, is known, that was found in Rolde. This probably also dates from the Holocene, and for the same reason, namely because the specimen is hardly or not at all patinated (Stapert, 1976b).

7. SUMMARY

In this article a Middle Paleolithic site at

Mander (province of Overijssel) is described. The site lies almost at the bottom of the western slope of the ice-pushed ridge of Ootmarsum (see figs. 1-3). Here we are concerned with surface-material, from the ploughed topsoil of a fairly large field (fig. 4), in which also many erratics of northern origin are present. In addition to several hundred younger artefacts (presumably dating from the Late Neolithic and/or Early Bronze Age) so far a total of 26 Middle Paleolithic artefacts have been collected: 1 *biface subtriangulaire* (made out of a flake), 1 *disque*, 1 Levallois core for flakes, 1 Levallois core for blades, 1 half-finished Levallois core for flakes that went wrong, 1 core fragment, 1 borer-like tool, 2 *couteaux à dos naturels* (one atypical), 4 fragments of possible Levallois flakes, 2 Levallois-like flakes. 11 flakes (hard percussion).

Notably the typology of the hand-axe indicates that the site belongs to the *Moustérien de tradition acheuleénne* (MTA) of Bordes, probably to the MTA type A.

The finds are relatively intensely weathered and patinated (see table 1). Almost always present are phenomena such as wind-gloss and features that are the result of periglacial soil movements like cryoturbation. Moreover many specimens have been fragmented due to secondary frost-splitting.

The areal extent of the site (see fig. 4) makes it clear that the finds have shifted downhill (probably over a distance in the order of magnitude of 0.5 km), as a result of solifluction processes during some tens of thousands of years. From a geological viewpoint it is virtually impossible that any material primarily *in situ* could still be present at the original site. An excavation would therefore be senseless. Moreover it is not possible to date the finds exactly. Comparison with finds in other countries makes it probable that the site dates from the Early Glacial of the last ice age.

At the end of the article (under 6.) a second hand-axe find from the same region is discussed (found at the *Molen van Bels*). On the basis of the fact that this specimen is hardly weathered, compared with the material from Mander, it is concluded that this hand-axe must date from the Holocene (presumably the Neolithic).

Apart from the material from Mander also a few other (isolated) finds from both the Northern and Southern Netherlands can be placed typologically in the MTA, so the presence of this tradition in the Netherlands now appears to be very probable.

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Manuscript completed in 1983.