

THE FLINT MATERIAL FROM SWIFTERBANT, EARLIER NEOLITHIC OF THE NORTHERN  
NETHERLANDS

1. SITES S-2, S-4 AND S-51  
Final reports on Swifterbant II

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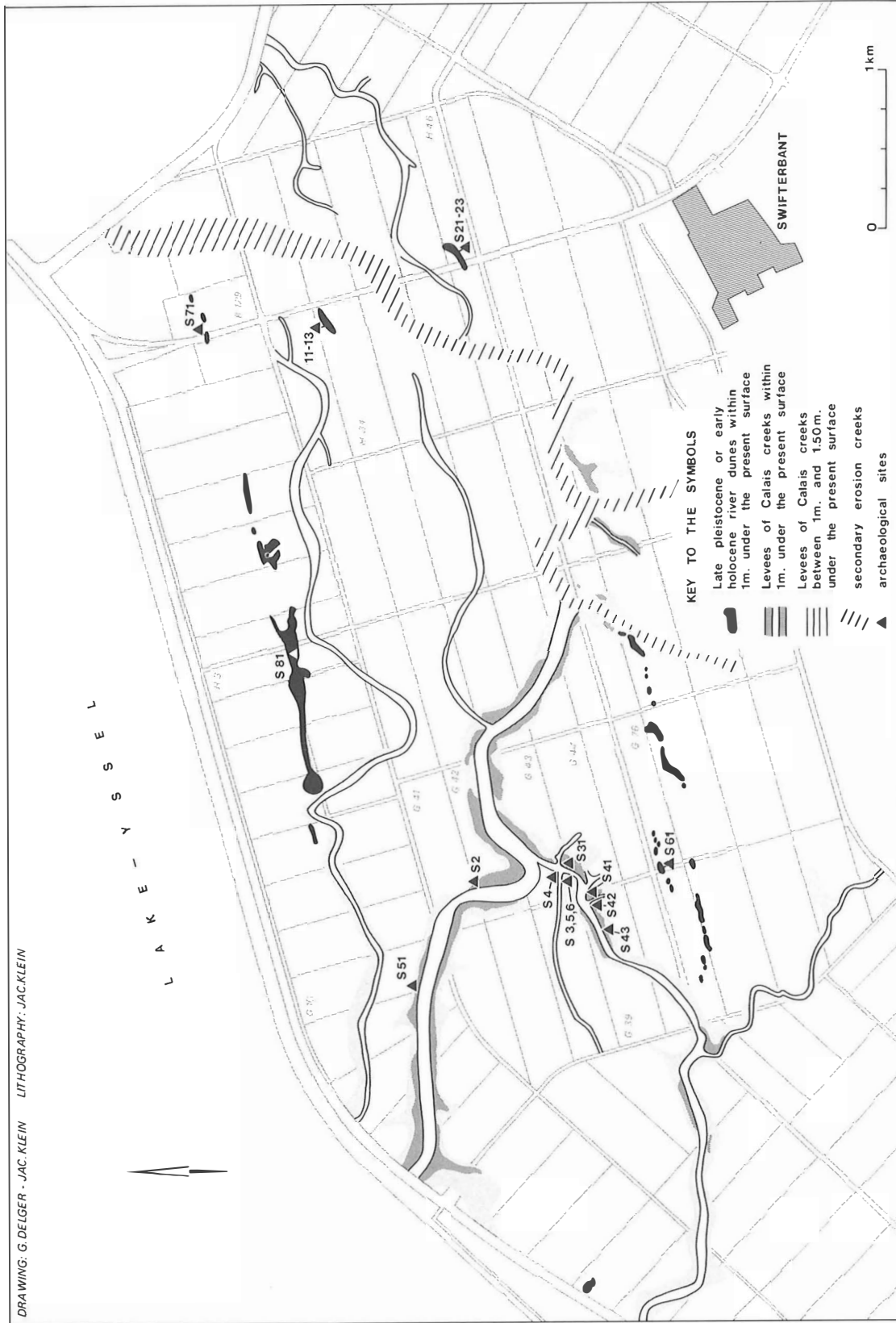


Fig. 1. Polder Oost-Flevoland, Swifterbant area. Location of sites on river dunes (Mesolithic-Neolithic) and on natural clay levees (Neolithic) (adapted from Ente).

## 1. INTRODUCTION

The study of the flint material of Swifterbant forms part of a broader study of Neolithic flint complexes. In this publication and in a second part to follow we will restrict ourselves to the publication of the basic data of the Swifterbant flint material. In the wider context problems of a more general and methodological character will be studied. Terms pertaining to the flint material used in the two papers on the Swifterbant artefacts will be discussed in the methodological contribution (Decckers in prep.).

For more information concerning the earlier Neolithic sites at Swifterbant we refer to the series of Swifterbant Contributions published in *Helinium XVI*, 1976 and subsequent parts<sup>1)</sup> and to the final reports on Swifterbant, which will be published in *Palaeohistoria*<sup>2)</sup>.

The studies have been made possible by a two year-grant from the Netherlands organisation for the advancement of pure research (Z.W.O.).

## 2. THE SWIFTERBANT EXCAVATIONS

### 2.1. Discovery, general situation, progress

After the closing of the dykes (1956) the Flevoland polder gradually became dry enough to permit geological investigation by the research division of the Polder Development Authority. It was in the course of this research that the fresh-water tidal delta and its traces of human habitation were found. From 1962 until 1967 G. D. van der Heide, at that time archaeologist of the Polder Development Authority, carried out trial excavations on the sites S-2 and S-11.

TABLE 1

site	lot number	period	state of excavation	situation	publication
S-2	G-42	Neolithic	largely excavated	clay levee	Van der Waals 1977
S-3	G-43	Neolithic	largely excavated	clay levee	Van der Waals 1977
S-4	G-43	Neolithic	trial trench	clay levee	Van der Waals 1977
S-5	G-43	Neolithic	trial trench, creek of S-3		Van der Waals 1977
S-6	G-43	Neolithic	small part excavated	clay levee	Van der Waals 1977
S-11					
S-12	H-34	Neolithic/Mesolithic <sup>1)</sup>	large trenches	sand dune	Whallon & Price 1976
S-13					
S-21					
S-22	H-46	Neolithic/Mesolithic	partially excavated	sand dune	De Roever 1976
S-31	G-43	Neolithic	not excavated	clay levee	
S-41	G-39	Neolithic	not excavated	clay levee	
S-42	G-39	Neolithic	not excavated	clay levee	
S-43	G-39	Neolithic	not excavated	clay levee	
S-51	G-16	Neolithic	excavated	clay levee	unpublished
S-61	H-76	Neolithic <sup>2)</sup>	partially excavated	sand dune	unpublished
S-71	H-129		not excavated	sand dune	
S-81	H-3		not excavated	sand dune	

<sup>1)</sup> R. Whallon (1976) believes that the site S-11/S-12 was inhabited during the transition from Mesolithic to Neolithic.

<sup>2)</sup> The excavation of site S-61 has just started. There is the possibility that Mesolithic material will also occur on this site.

For the Mesolithic/Neolithic sites we refer to figure 1, for the exclusively Neolithic sites to figure 2.

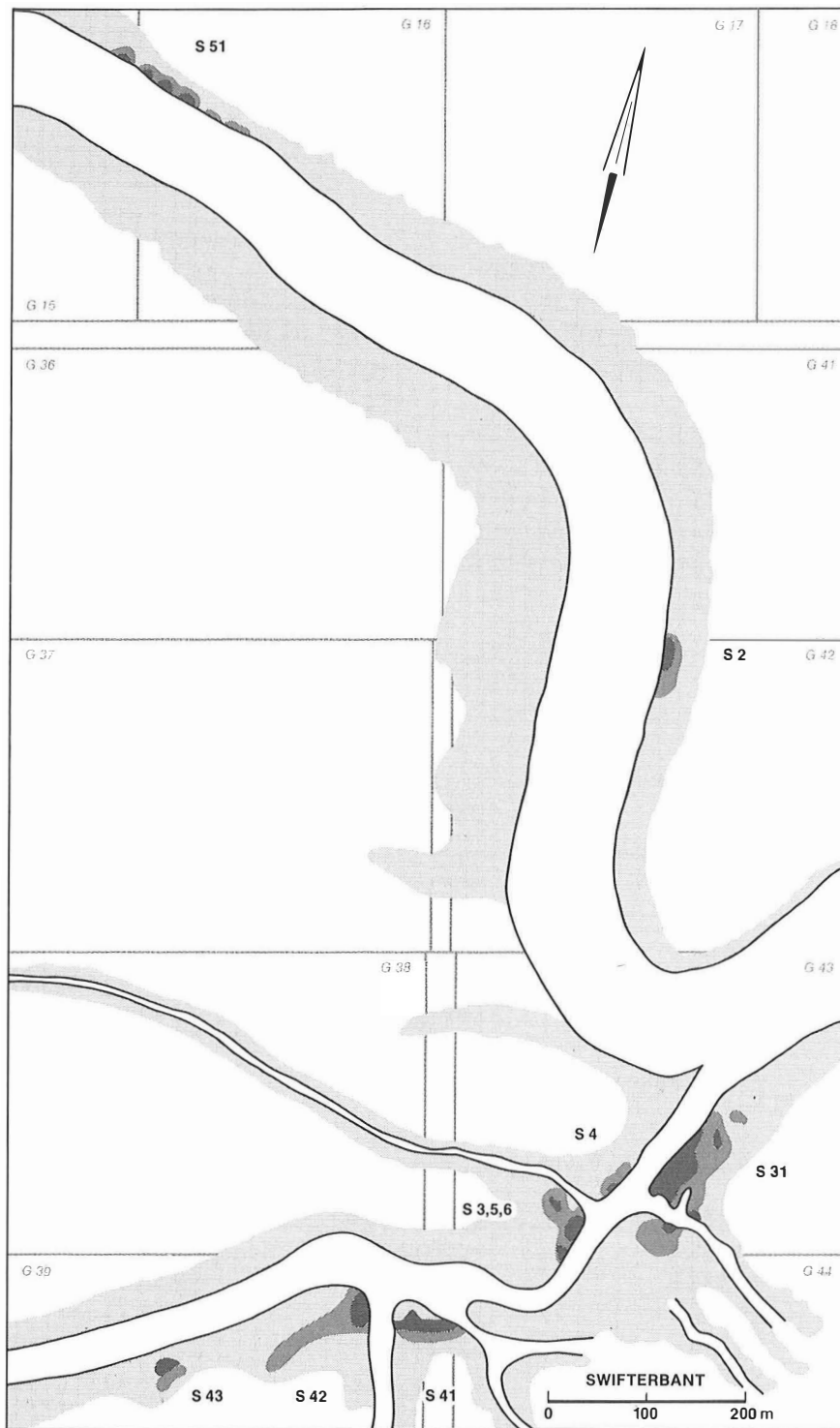


Fig. 2. Swifterbant. Location of the sites on natural levees.

The Biologisch-Archaeologisch Instituut of the University of Groningen (B.A.I.), together with

other institutions, started the second period of excavation in 1971. There will be a final campaign in

1979. The following sites were under excavation: S-2, S-3, S-4, S-5, S-6, S-21, S-51 and S-61. Sites S-11 and S-12 were excavated by R. Whallon of the University of Michigan, site S-22 by T. D. Price of the University of Wisconsin (Madison).

### 2.2. The sites and their situation

The sites can be divided into two groups, namely those situated on the late Pleistocene or early Holocene sand dunes and those situated on the clay levees. The former were inhabitable for a much longer period than the latter.

Available C-14 dates give the following rough scheme.

Mesolithic			
S-21/22	GrN 6708	6670 ± 35	BP
	GrN 6709	7775 ± 40	BP
	GrN 6710	6875 ± 45	BP
Mesolithic/Neolithic			
S-11	GrN 7214	6285 ± 45	BP
	GrN 7215	6330 ± 45	BP
Neolithic			
S-2	GrN 5606	5540 ± 40	BP (skeletons)
	GrN 7364	5300 ± 55	BP
S-3	GrN 6896	5230 ± 40	BP
	GrN 7043	5375 ± 40	BP

For detailed information on C-14 dates we refer to the Swifterbant contributions.

### 2.3. Excavation techniques and methods

For all finds made the exact three-dimensional location was recorded. All soil coming from the excavation was collected per square metre in layers of 10-15 cm and sieved with a 3 mm mesh. The purpose of sieving was to collect the small material overlooked by the excavators. With regard to the flint material the excavators hoped to find waste from secondary working (retouching). The result was very encouraging inasmuch as firstly an abundance of fishbones was found (Clason & Brinkhuizen 1978) and secondly an abundance of flint material, from which it was clear that sieving was vital for a balanced study of the material. Of the total number of pieces of flint 50% to 70% was

obtained by sieving. On the other hand sieving provided almost no information concerning the above-mentioned process of secondary working. It should be stressed that the high percentage of sieve finds is due to the character of the soil. Several techniques of excavating have been tried out, but it was only the method of excavating by very gradual, horizontal shovelling that gave a reasonable overall result. Other methods, e.g. trowelling, crumble and smear the wet clay in such a way that features like postholes are not recognizable.

## 3. THE SITE S-2

### 3.1. The site and its excavation

The site S-2 stands out from the other sites that have been found on the levees for two reasons. Firstly, it is situated on a large stream. S-2 was unique in this respect until 1977, when during an intensive boring campaign another site was discovered along the large stream, S-51 (Fokkens 1978). Secondly on site S-2 there is a small cemetery, but there are no hearths and only a few posts and postholes. All other sites with graves are situated on sand dunes. All the other clay-levee sites are situated around a small creek. Within these sites there is an abundance of posts, postholes and hearths.

Until recently it was thought that the different situation of S-2 and S-51 might also be reflected in different compositions of the find categories of

TABLE 2

	pottery	stone	flint	Total
<b>S-3</b>	1738 64%	186 7%	811 29%	2735 100%
<b>S-4</b>	476 58%	150 19%	189 23%	1602 100%
<b>S-2</b>	5708 86%	384 6%	524 8%	7807 100%
<b>S-51</b>	1278 91%	50 3.5%	78 5.5%	1731 100%

pottery, flint and stone (see table 2). The figures given here are the results for this year (1978)<sup>3)</sup>, but these do not differ from the figures obtained for the first years of excavating. Sites S-2 and S-51 have a remarkably high percentage of pottery. The distribution maps for pottery available at present, which will be published by J. P. de Roever, show that the pottery is distributed over a much larger area than the flint material (see fig. 3). There is a relation between the location of the sample taken and the percentages of pottery and flint.

Up until now (1978) ± 433 square metres of the site S-2 have been excavated. This is more than 75% of the settlement as defined as a blackish-grey coloration of the clay (Van der Waals 1977, Fokkens 1978). The extent to which this area is identical with the real activity area of this site will be established in the final campaign (1979) when an area will be excavated, also on top of the levee, immediately adjacent to S-2, and which shows no coloration.

### 3.2. The flint material

The total number of artefacts found on site S-2 was 1503. Of these 549 artefacts (36.5%) were found in situ, 131 were found during earlier excavations of Van der Heide in 1964 and 1967 (with no coordinates recorded for the individual finds) and 823 (54.8%) were artefacts obtained by sieving.

A primary division of the material gives:

11 nuclei	0.8%
430 flakes	28.6%
520 blades	34.6%
542 items of other flint material	36.0%

There are 9 pieces of flint that are completely covered by patina and cortex. Maximum dimensions of these nine pieces are 38 × 27 mm, minimum dimensions 14.8 × 12.5 mm.

#### 3.2.1. Cores (11)

All the cores are residual cores. Three categories can be distinguished as follows: A) 6 pieces of which half the surface is covered by cortex or negative scars which do not show intentional flaking;

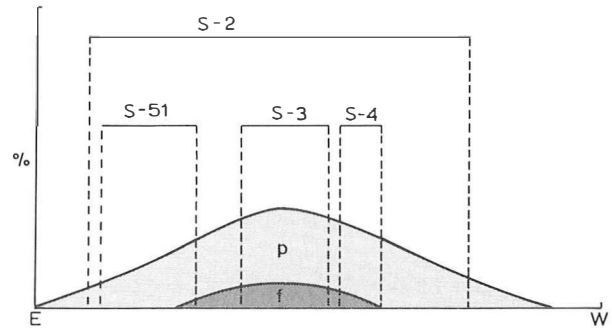


Fig. 3. Idealized scheme of the distribution of flint and pottery.

B) in 4 cases two opposite platforms exist; C) in 1 case there is only one platform. This remaining core had small flakes struck off at random. Of the 11 cores 1 was burned.

The 4 cores of group B give a first impression of being flakes and are morphologically very close to flakes that have been made thinner by flaking off two opposite ends. The cores mentioned here are characterized by negatives which extend over more than half the length of the artefact. All have two opposite striking platforms with a width of 1 mm or less.

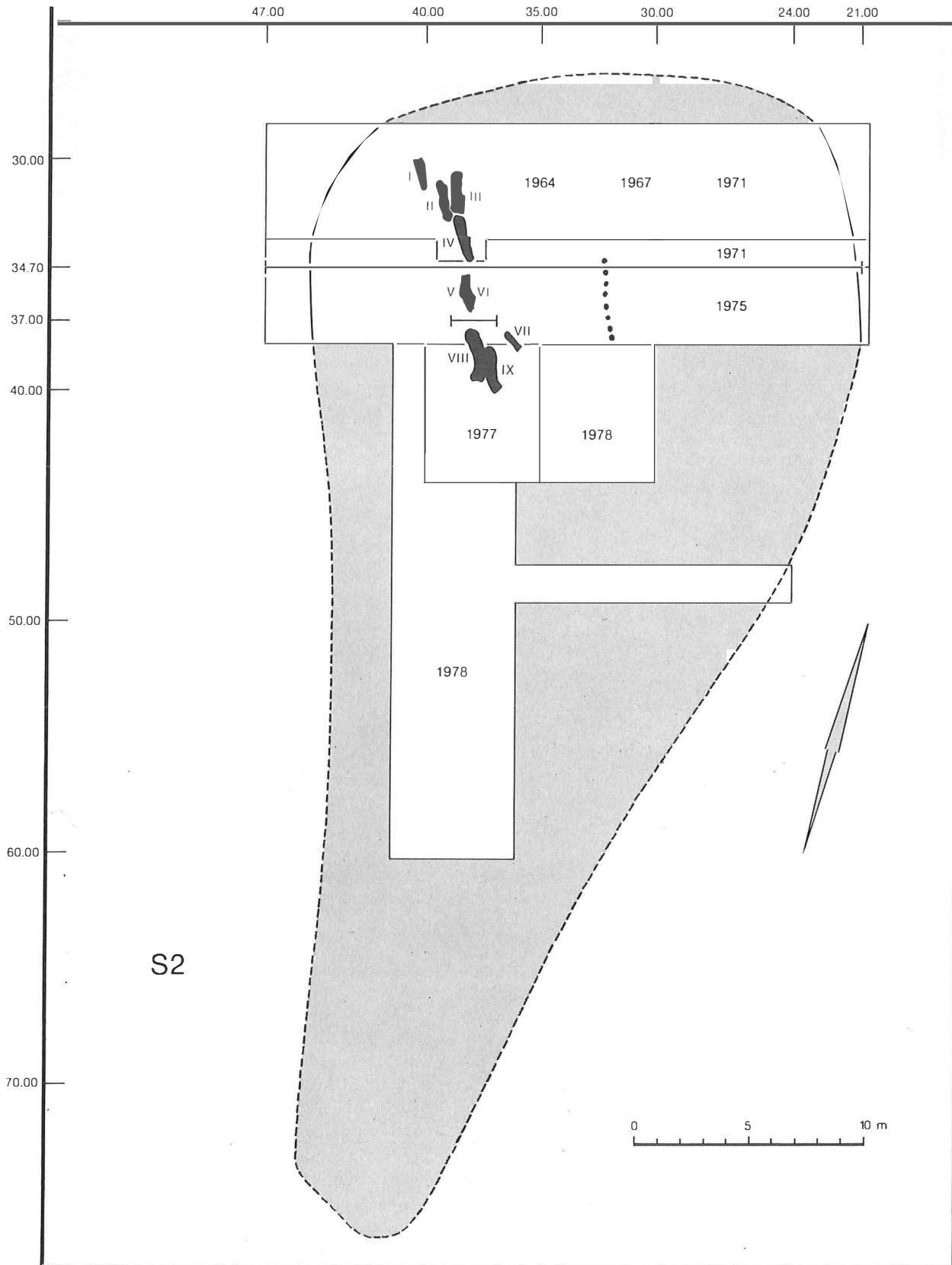
The remaining core is broken and originally had 2 opposite platforms. The still existing platform is wider than 1 mm and therefore forms a separate group. Maximum dimensions of the cores are between 22 and 27 mm.

There seems to be a discrepancy between the cores and the other waste material. The flake negatives have such small dimension that not enough flakes of the same order of dimensions are available.

In view of the heavy patina and the smoothed cortex it appears that only flint material that has been subject to severe erosion, e.g. transportation by ice, has been used. This is in accordance with the high percentage of waste material other than cores, flakes and blades, while taking into account the fact that the nearest source for raw material is the boulder-clay of Urk and Schokland (at 11.5 and 12.5 km distance respectively).

Fig. 4. Site S-2. Delineation of the site as defined by blackish-grey coloration. With roman numerals: graves. Black filled circles (dots): postholes. →

*The flint material from Swifterbant*



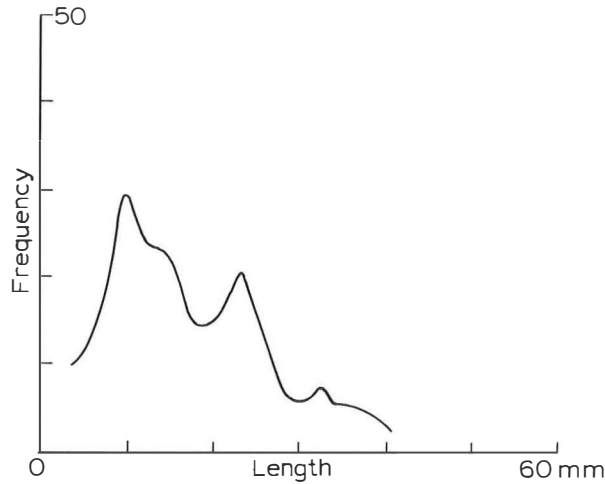


Fig. 5. Length curve of intact flakes. n = 216.

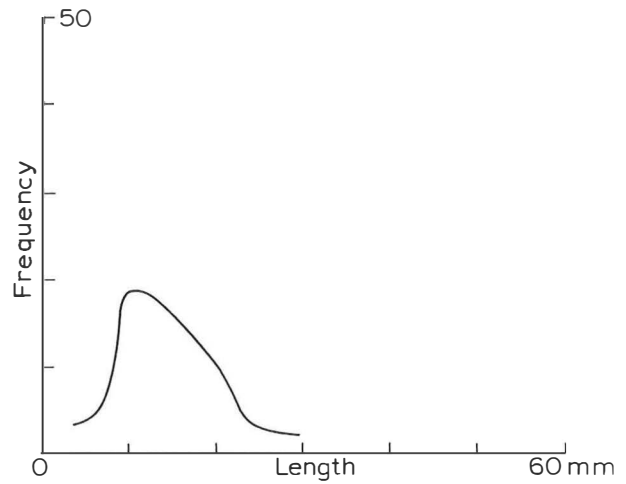


Fig. 6. Length curve of medial flake pieces. n = 93.

3.2.2. *Flakes* (430)

107 flakes are burned	25%
219 flakes show no cortex or patina	51%
66 flakes show cortex and/or patina all over the dorsal side	15%
50 flakes are distal pieces	12%
93 flakes are medial pieces	22%
38 flakes are broken, but have a platform (basal)	9%
19 flakes are broken along the distal-basal axis	4%
216 flakes are intact	50%

A distribution curve of the length of the intact flakes shows a sharp rise from the classes 5/6 mm to

9/10 mm where a peak is reached, after which the curve slopes gradually to 40 mm length. A similar curve is obtained for the medial pieces (fig. 5, 6). The curves for the distal and basal pieces are irregular. The maximum length is found in the group of intact flakes, being 48 mm. 83 flakes are at least twice as long as they are wide.

The following platforms occur:

platform with cortex or patina	38 (15%)
edged platform	114 (45%)
punctiform platform	36 (13%)
plain platform	69 (27%)

5 flakes indicate secondary flaking (see cores) on the platform side and the opposite side. None of

TABLE 3

Length of flakes of S-2.

	mean	stand.dev. S.D.	skewness	kurtosis	stand.error S.E.	median	n
intact	16.769	9.235	0.896	3.247	0.628	14.300	216
distal part	13.800	5.862	0.721	3.891	0.829	113.643	50
medial part	13.570	5.893	2.222	14.345	0.605	112.625	93
basal part	15.895	6.713	0.650	3.268	1.089	14.300	38



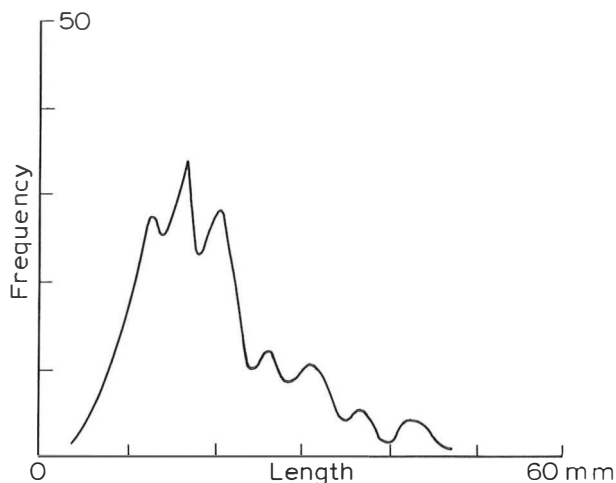


Fig. 7. Length curve of medial blade pieces. n = 265.

them shows a diamond-shaped cross section or has a carré or rectangular form, so that we are not justified in calling any of them a pièce esquille (Brezillon, 1968).

3.2.3. *Blades* (520)

- 209 blades are burned (40%)
- 360 blades show no cortex or patina (69%)
- 12 blades show cortex and/or patina all over the dorsal side (2%)
- 62 distal blade pieces (12%)
- 265 medial blade pieces (51%)
- 144 basal blade pieces (28%)
- 46 blades are intact (9%)
- 1 blade is broken along the distal-basal axis

Only for the group of medial blade parts is there some pattern in the distribution curve of the length. It shows a rise from 5 to 15 mm and slopes down afterwards to 45 mm (fig. 7). The maximum length is 63 mm in the group of intact blades. 224 blades are at least twice as long as they are wide.

The following platforms occur:

platform with cortex or patina formed platform	4	(2%)
platform dièdre	1	(0.5%)
platform, facetté convexe	2	(1%)
edged platform	1	(0.5%)
punctiform platform	46	(25%)
plain platform	8	(4%)
	122	(66%)

3.2.4. *Other flint material*

- 372 pieces are burned (68.6%)
- 244 pieces are without cortex or patina (45%)
- 153 pieces are covered by patina or cortex over an area less than 50% (28.2%)
- 106 covered for more than 50% (19.6%)
- 4 pieces show secondary retouch (0.7%); see also cores
- 2 pieces have been used as tools

3.2.5. *Tools* (all retouched tools are illustrated on figs. 29-34)

The following tools were found:

type code	
no.	
821	symmetric trapeze with acute basic angles

TABLE 4

Length of blades of S-2.

	mean	stand.dev.S.D.	skewness	kurtosis	stand.errorS.E.	median	n
intact	36.413	13.172	0.399	2.312	1.942	34.500	46
distal part	25.250	9.248	0.230	2.319	1.117	24.250	62
medial part	20.478	8.893	0.837	3.301	0.546	18.846	265
basal part	26.521	10.376	0.173	2.18	0.865	26.722	144

826	asymmetric trapeze with basic angles between 45 and 90°	1	999	tools not classified	3
			600/601	blade with gloss	67
883	asymmetric trapeze with acute basic angles, concave sides	1	603	blade with gloss and retouch for hafting?	2
195	asymmetric trapeze with acute basic angles, one side retouched ventrally and one side dorsally	1	604/605	blade with retouch combined with gloss	3
200	trapeze with one basic angle of 90°, short	2	606	blades with retouch combined with gloss and hafting	1
	total no. of trapezes	10		total no. of blades with gloss	73
			609	blade with nibbling	5
302	long blade borer	6	610/611	blade with traces of use or use retouch	55
300	short blade borer	3	613	blade with traces of use or use retouch and hafting	6
	total no. of borers	9		total no. of used blades	66
400	long blade scraper, convex	4			
405	short blade scraper, convex	6			
406	convex scraper	6	640	flake with nibbling	1
407	convex scraper on retouched flake	1	630	flake with traces of use or use retouch	1
408	round-scraper not completely retouched all round, type A	1		total	2
412	round-scraper completely retouched all round, type C	1			
425	double scrapers	2		total wear/use ret.	141 47%
440	flake with convex retouched side, so-called side scraper	2		total no. tools	295
	total no. of convex scrapers	23			
430	blade with concave scraper	2		Of the flakes 30 were retouched (7%) and 2 showed traces of use or use retouch (0.5%) (total = 7.5%).	
438	blade with nosed scraper	2		Of the blades 122 were retouched (24%) and 139 (27%) showed traces of wear or use retouch (total = 51%), of the other waste material 2 (0.4%).	
435	blade with denticulated scraper	5		Of the total assemblage 154 artefacts were retouched (10%) and 141 (9%) showed traces of wear or use retouch (total = 19%).	
	total	9		In figure 8 all trapezia have been plotted for width and length. Three trapezes have the same measurements, 14 mm × 14 mm, while the other trapezes deviate only 2-3 mm, with the exception of one trapeze with a 90° basic angle.	
433	long blade scraper, straight	1		Newell & Vroomans (1972), among others, have distinguished a type called a broken trapeze. The author has decided to refrain from this tool type and has classified the type as a short truncated blade. When the length and width of the long and short truncated blades are plotted (fig. 9) the two types form separate clusters. The length and width distribution of the short truncated blades is the same, although there is a wider margin than with the trapezes, which could indicate that they are	
434	short blade scraper, straight	4			
	total no. of straight scrapers	5			
450	short truncated blade	7			
451	long truncated blade	4			
	total no. of truncated blades	11			
250	blade retouched along one side	1			
570	blade with notch	4			
580	blade denticulated	6			
550	blade with retouch	53			
500	flake with long notch	2			
520	flake denticulated	1			
490	flake with retouch	17			

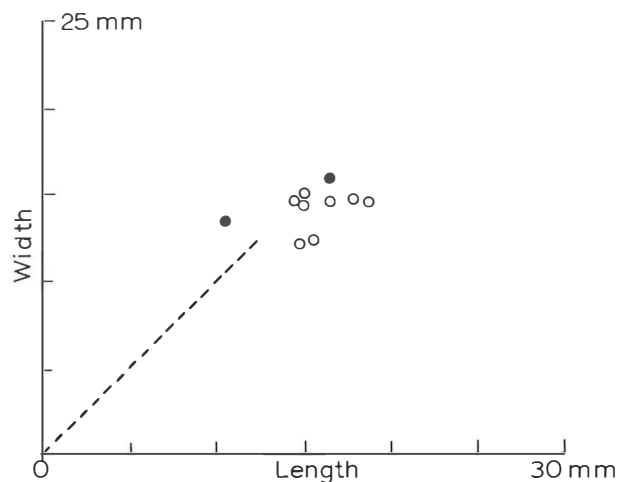
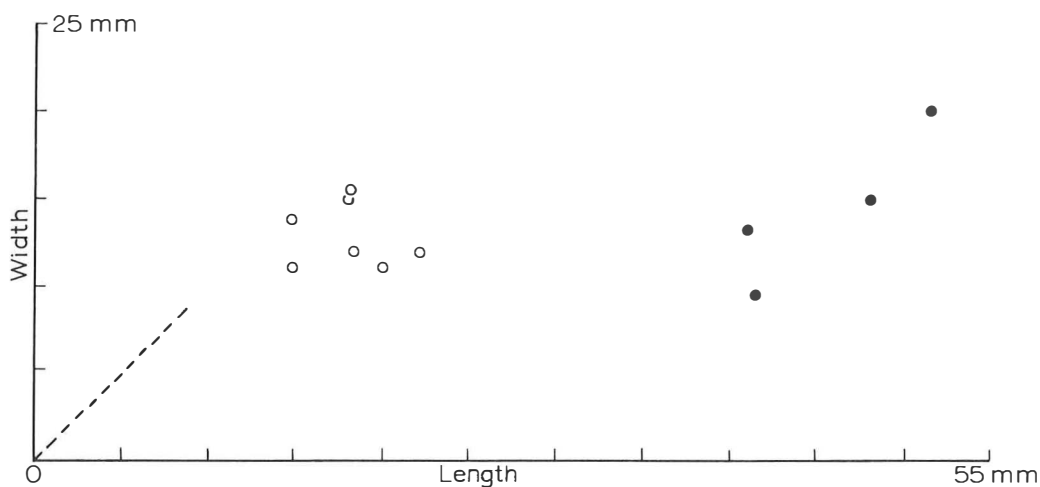


Fig. 8. Distribution of the variables length and width for the groups: • trapezia with one right basic angle; o trapezia with two acute angles.

related to the trapezes. None of the trapezes show any indications of the use of “technique de microburin” (Brezillon 1972) but the technique of making trapezes by way of truncated blades as mentioned by Bastian (1962) seems to be confirmed.

Most of the gloss extends only 1 to 2 mm on the artefact side and is for the most part related to nibbling.

Fig. 9. Distribution of the variables length and width for the groups: o short truncated blade; • long truncated blade.



### 3.3. The distribution of the flint material

#### 3.3.1. Vertical distribution

Vertical plots have been made for 1 m strips, both for N-S and E-W directions. None of these plottings gave any indication of different living floors. The flints are evenly distributed over the blackish-grey level when plotted against drawn profiles. In the field we noticed some concentrated black areas in the profile. The distribution of the flint material did not show any relation to these areas.

Plotting of flint in weight classes did not give any different pattern from an even distribution. Thus the flint gave no indication of the existence of reed layers or mats, as found in site S-3, which could have resulted in the separation of the larger from the smaller pieces of flint.

#### 3.3.2. Horizontal distribution

The following features were noticed in the field (fig. 4). A row of nine graves: no associated flint material was found during the excavation. During work on the skeletal material a flake was found in association with grave no. I. In association with grave no. VI, one flake was found as well as a blade with use traces. For other associated finds we refer to the publications in Helinium. There is a discrepancy between on the one hand the C-14 dates for the layer and one of the graves and on the other hand observations in the field, whereby the burial pits seem to be dug halfway into the settlement

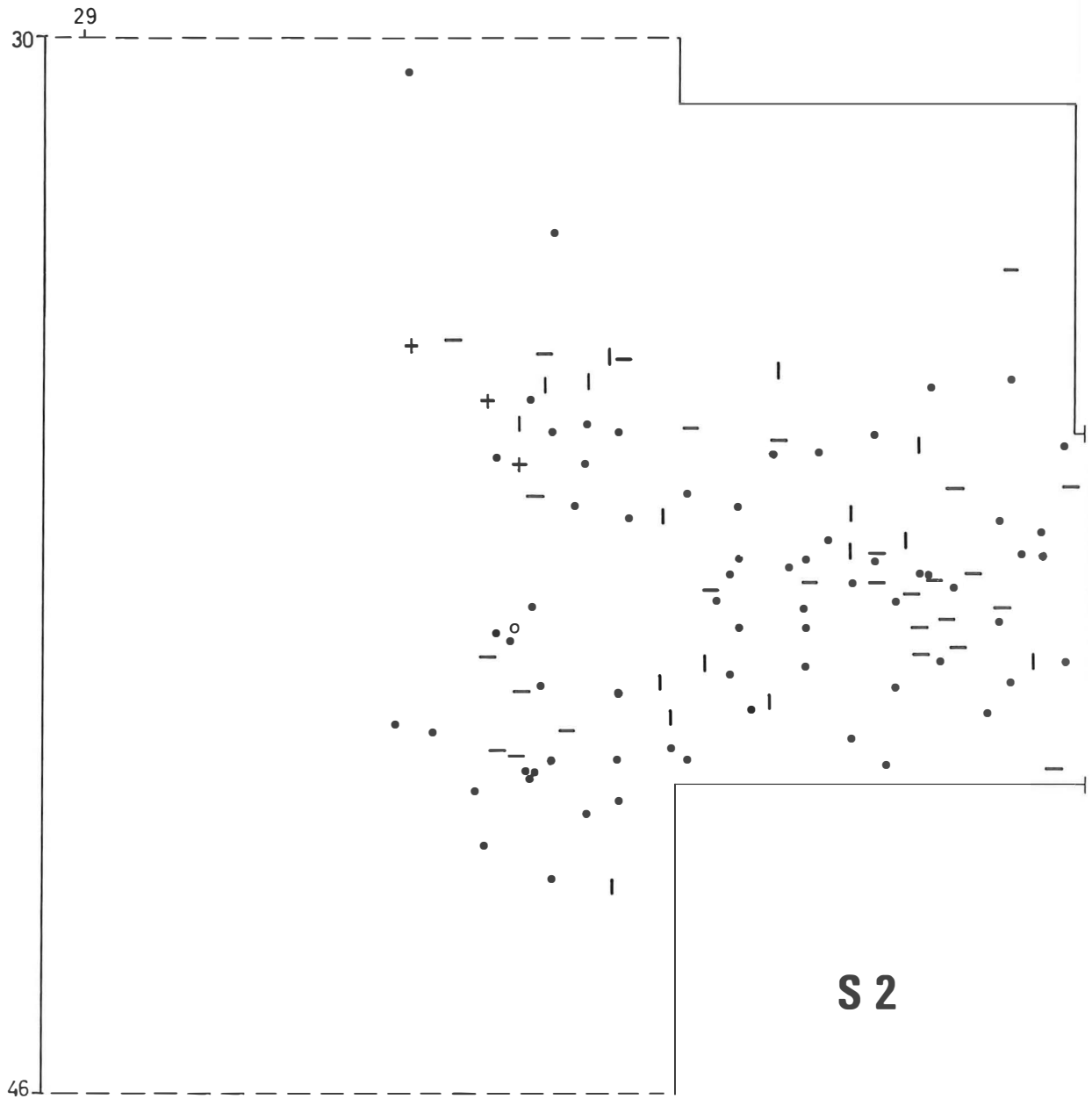


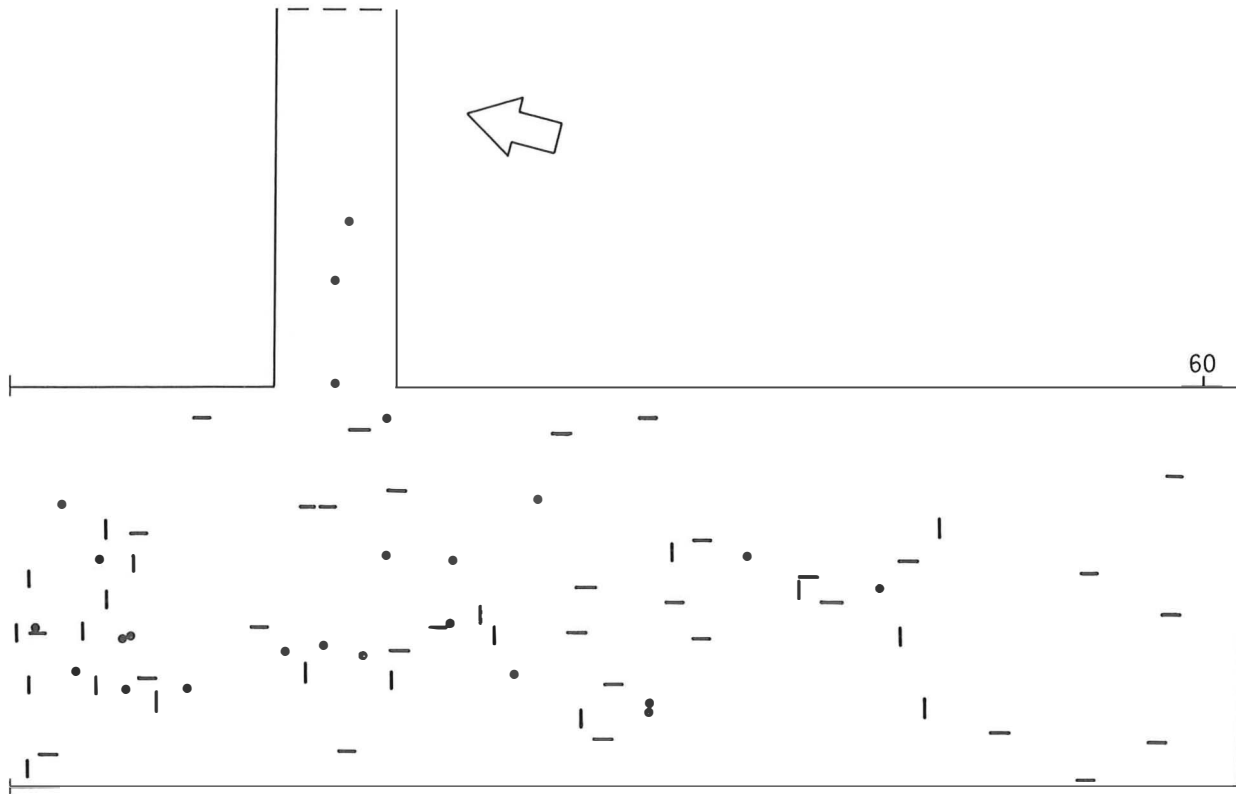
Fig. 10. Site S-2. Distribution of unburned flint material.

layer (Van der Waals 1977, p. 11). With regard to the distribution of flint (see fig. 10, 11, 12) there seems to be no relation with the graves. The main concentration partially covers the row of graves. Assuming that the above 3 finds were in distinct association with the graves, which is reasonable for

the two pieces of flint from grave VI, found among the bones of the skeleton, flint could be expected in the filling of the pits which lay in the concentration area of the flint. This is not the case however.

The distribution of the pottery also shows no interference with the graves, so we must assume that most of the material was "deposited" after the burials.

With the exception of a row of postholes, which



- distribution of not burned waste
- blade
  - flake
  - | rest
  - raw material

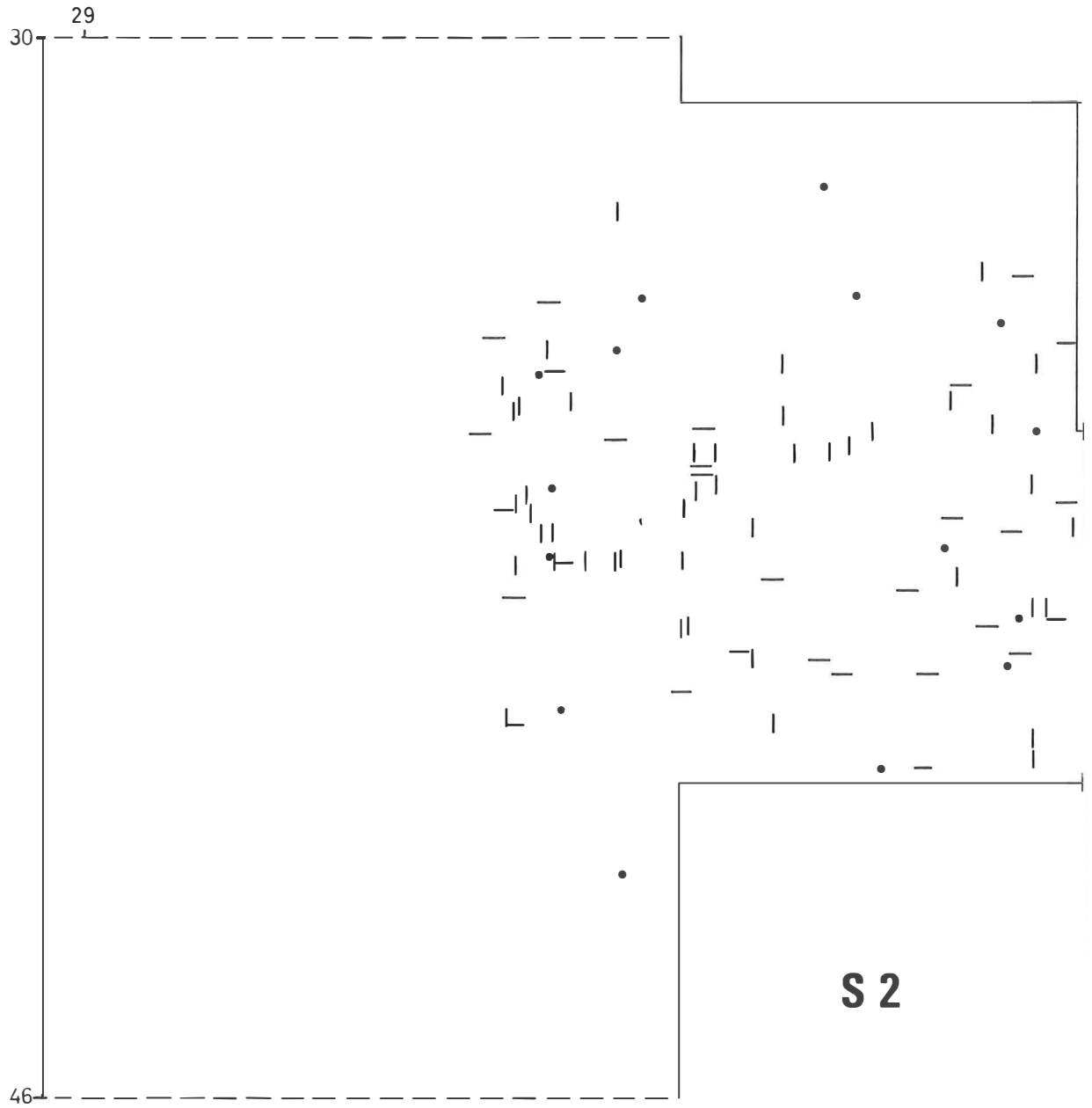


lay on the edge of the settlement and outside the area in which the flint is distributed, no clear features were found.

Distribution maps have been made for all primary groups: cores, flakes, blades and other waste material, divided into burned and unburned. None of these maps show any difference from the total distribution pattern. Only the plotting in which weight was the discriminant showed a pattern (fig.

13-16). For the 0-0.15 g class there are two main concentrations. The southern concentration (1) gradually disappears in the weight classes 0.16-0.50 g and 0.51-1.00 g. The other area (2) shows that the 0-0.15 g group lies marginal to the main concentration of the 0.16-0.5 g group, which splits up and gradually disappears in the higher weight groups.

When we plot the different types from the tool type-list (fig. 12), the distribution, when enough



items are available, is the same as the distribution of the total number of types. When we consider only the large class of scrapers, the types convex and straight scrapers are found to be mainly concentrated in the northern part of the area (20 to 44 m E-W) and the denticulated scrapers in the southern part. The lack of spatially differentiated tooltypes also implies that there are no specific tool clusters.

In the last years of the project it was becoming

clear that for different reasons some results, in particular in relation to spatial distribution of the other find categories, would be available too late. Therefore it was assumed that the material which was obtained by sieving would give at least an indication of the find density of the other materials. The total weight of the different categories that were obtained by sieving in 1978 were used for mapping.

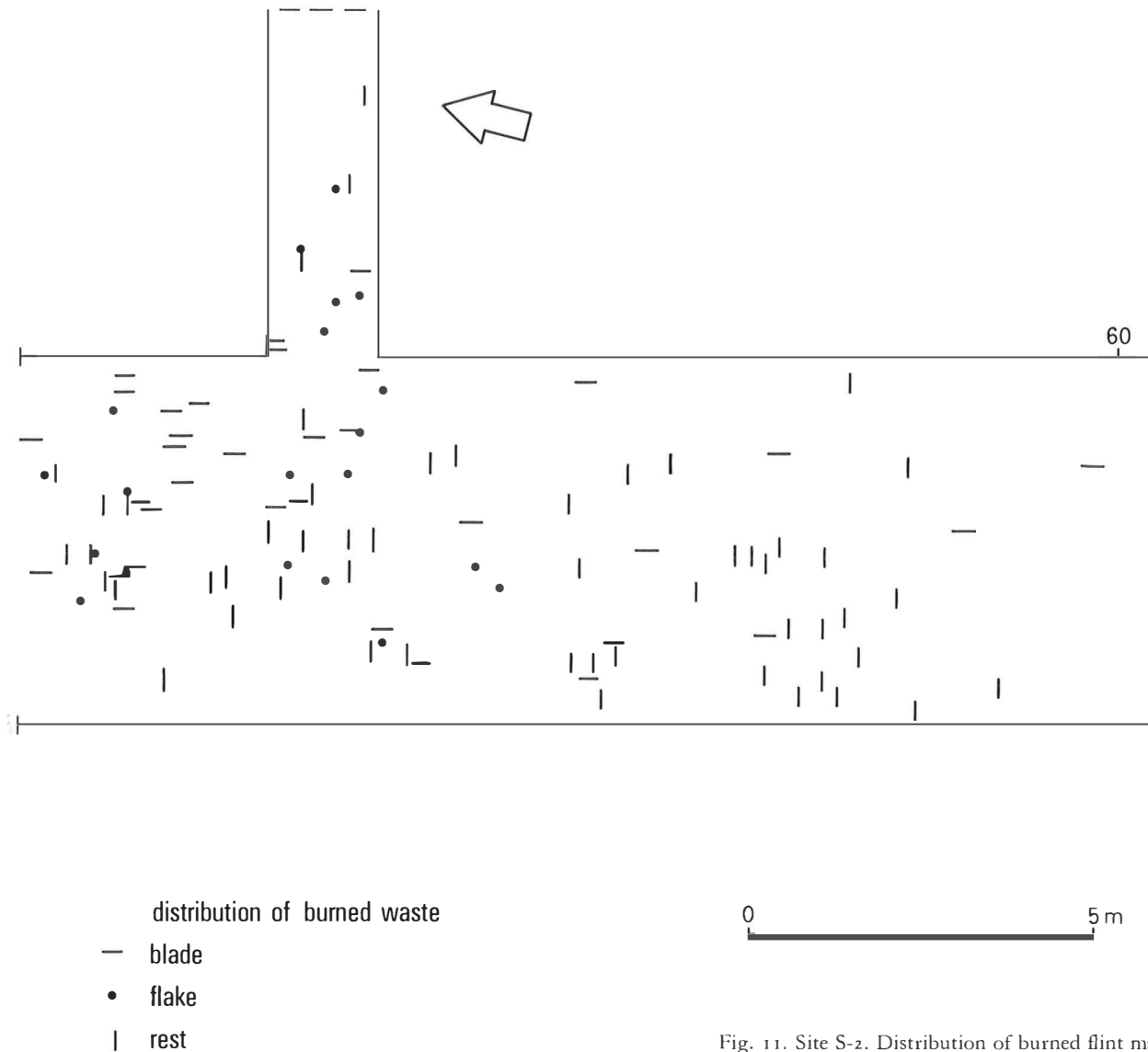


Fig. 11. Site S-2. Distribution of burned flint material.

The fishbone sample is very small, never exceeding 0.1 g per square metre. Until now there seems to be a spatial difference between the small concentrations in the upper and lower level. With the exception of the group of blades with traces of use and/or gloss no other tool-type could be associated with the fishbones. But in view of the large number of these blades compared with other tool types, this could be expected.

Also plotted was the distribution of charcoal obtained by sieving. This charcoal was not evenly distributed in the different levels, but showed two main concentrations. The assumption that they could indicate hearths, and therefore could relate to the distribution of burned flint, was not born out. Also the plotting of bone obtained by sieving, mainly consisting of pieces of burned bone, did not show any distinct pattern.

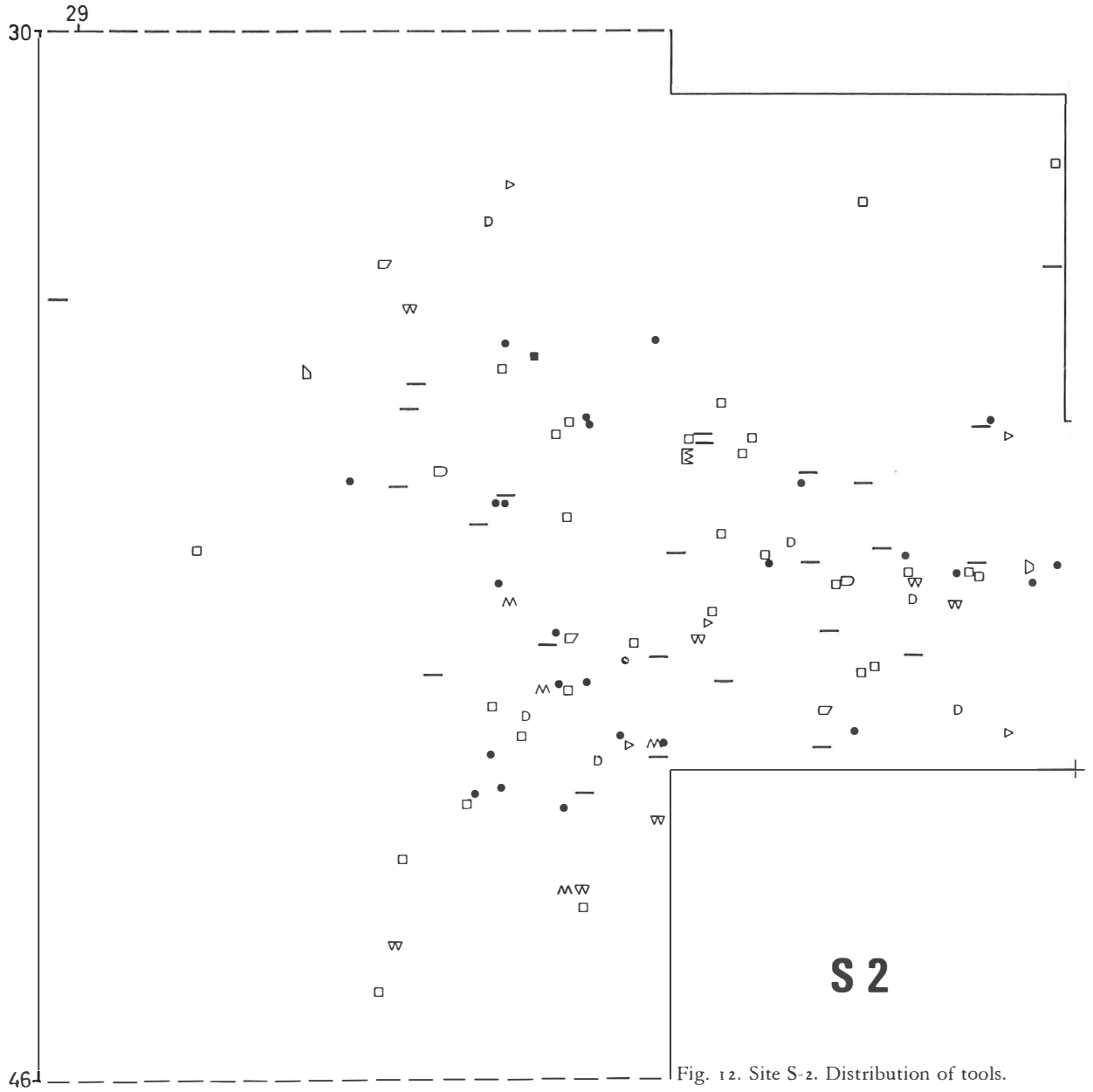


Fig. 12. Site S-2. Distribution of tools.

#### 4. THE SITE S-4

##### 4.1. The site and its excavation

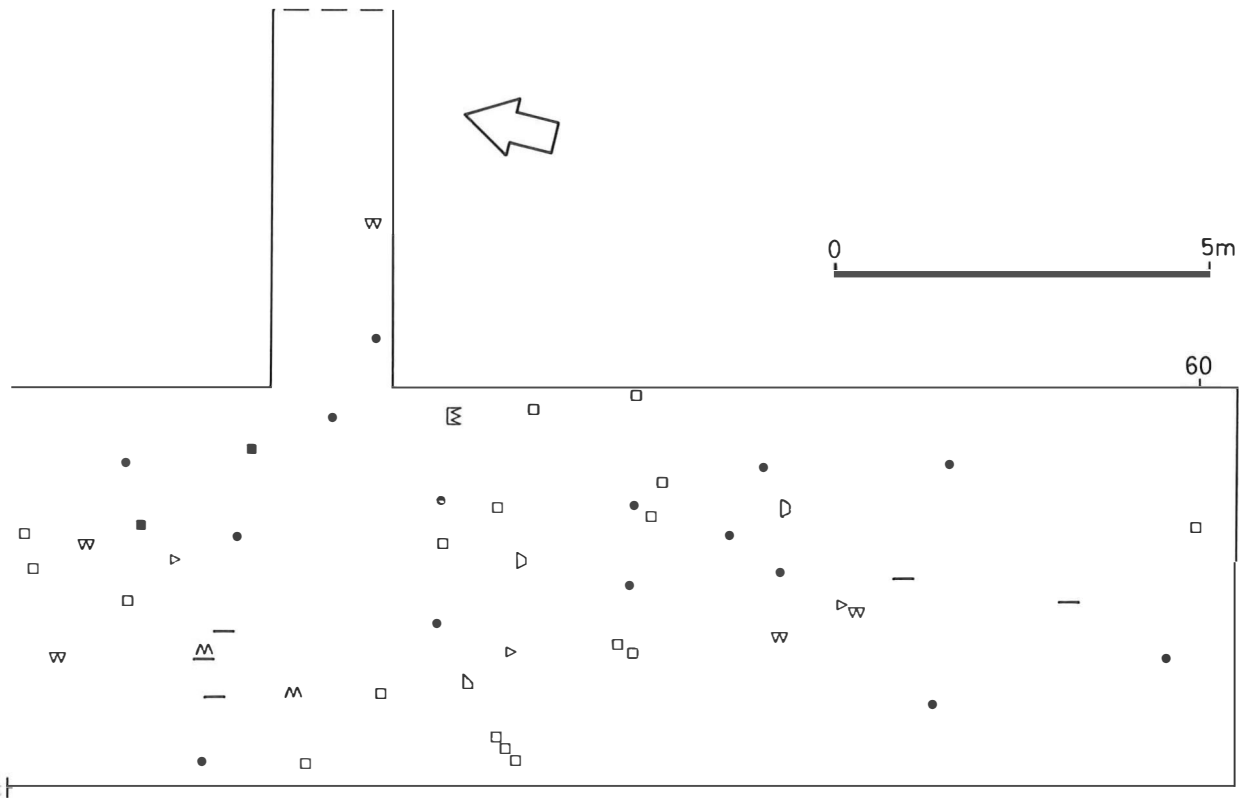
S-4 is one of the natural levee sites. The general appearance of this site and its relation to the other

sites in the area has been described in the series of articles entitled "Swifterbant contributions" (e.g. Van der Waals 1977).

Only a small part of the area forming site S-4 (Fokkens 1978) was excavated in 1974 under the supervision of L. Hacquebord (see fig. 17). The main purpose was to establish the relation to the adjacent site S-3 and to obtain a small sample of



*The flint material from Swifterbant*



distribution of tools

- ▷ trapeze with one right basal angle
- ◁ trapeze with two acute basal angles
- ◻ truncated blade
- △ borer
- ∩ flake with retouch
- blade with retouch

- ∩ blade with notch; blade denticulated
- ◻ blade with gloss
- blade with use or use-retouch
- ▷ short blade scraper, convex
- ◻ long blade scraper, convex
- flake scraper, convex
- ⊞ denticulated blade scraper

find material for comparison with other sites.

A trench was opened of  $8 \times 2$  m, which should have given a cross-section of the levee showing the situation of the site on it. Unfortunately a later intrusion had interfered with the cultural layer in an area of  $2 \times 2$  m, while another part of the trench cut into the area where the levee shelves rather steeply into the creek and apparently only contains

redeposited or eroded material. This leaves an area of 4 m by 2 m of the trench in which the cultural layers are still in situ. The trench was too short to reach the back swamps. It was noticed during the excavation that another cultural layer appeared underneath separated by a sterile clay layer in the last  $3\frac{1}{2}$  m (E-W). Registration and sieving were carried out in the normal way in the undisturbed area.

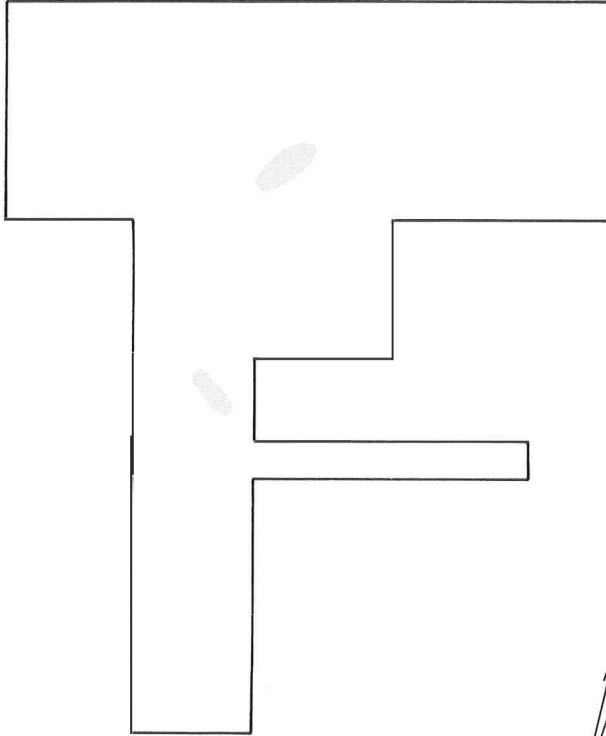


Fig. 13. Site S-2. Distribution of cores.

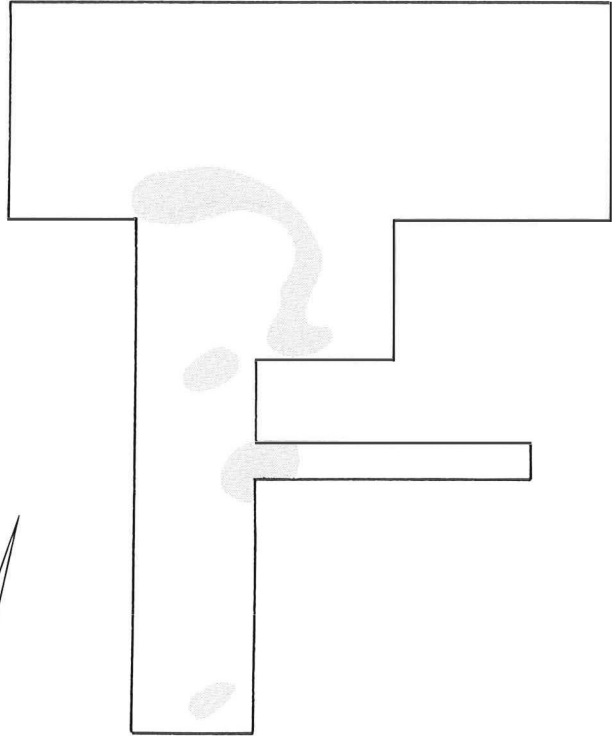


Fig. 14. Site S-2. Distribution of the weight group 0-0.15 g.



Fig. 15. Site S-2. Distribution of the weight group 0.16-0.50 g.

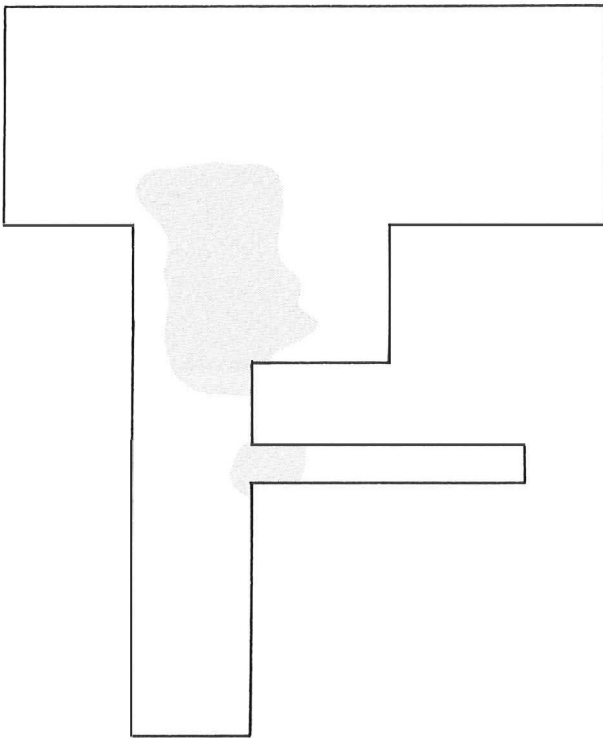
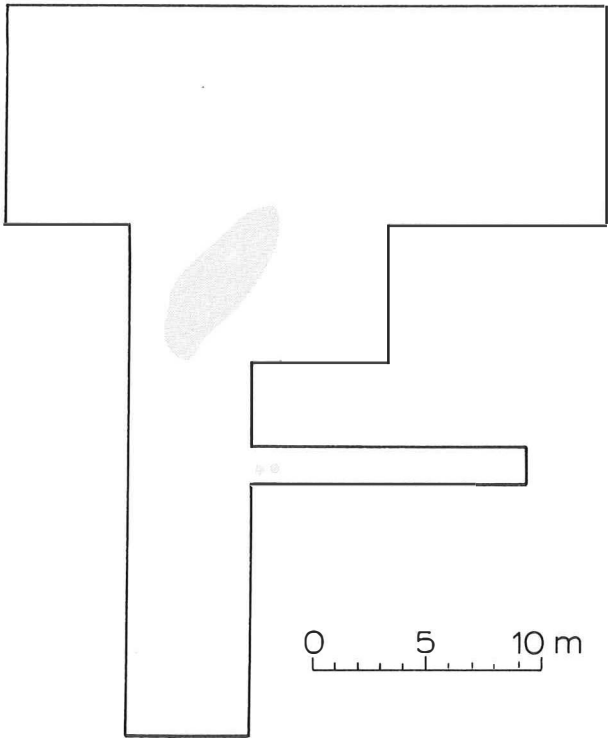


Fig. 16. Site S-2. Distribution of the weight group 0.51-100 g.



4.2. The flint material

244 flint objects were found: 189 were found during the excavation and 55 were obtained by sieving (22.5%). Only two flint objects were found in the lower cultural layer: a basal blade fragment with use retouch (type code 610) and a whole flake without cortex.

The material from the upper layer can be divided as follows:

- 8 cores (3%)
- 112 flakes (46%)
- 76 blades (32%)
- 46 other flint material (19%)

There are no pieces of flint completely covered by patina or cortex.

4.2.1. Cores (8)

All the cores were residual cores. One core is covered for more than 50% with cortex and patina, has one platform with several flakes struck off and another flake struck off random. Three cores also have one platform, two with a platform exceeding 1 mm in length and width, and one with a platform 1 mm wide. All 3 have little or no cortex.

Four cores have two platforms. All cores show negatives of flakes but none show any of blades. Dimensions are between 21-30 mm for length and 8-23 mm for width.

4.2.2. Flakes (112)

28 flakes are burned (25%)

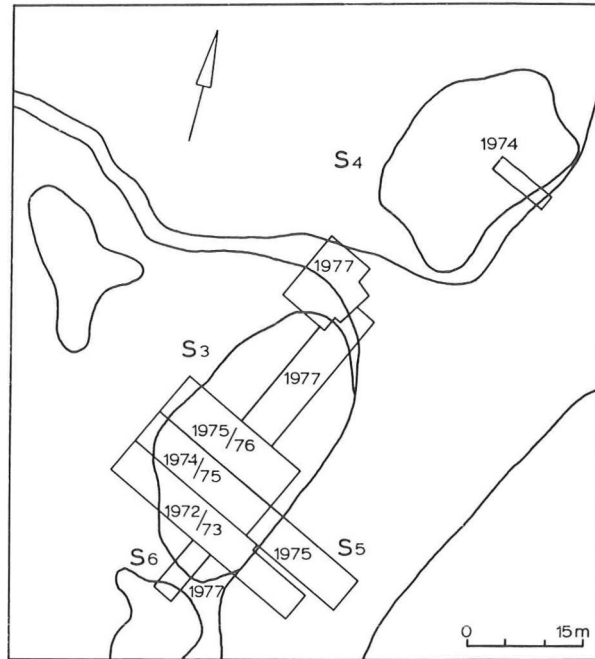


Fig. 17. Mapping of sites S-3, S-5, S-6 and S-4 with excavated areas and years of excavation. Drawing H. Fokkens & J. H. Zwier.

55 flakes show no cortex or patina (49%)  
 16 flakes show cortex or patina all over the dorsal side (14%)  
 There are 18 distal flake parts (16%), 12 medial parts (11%) and 20 basal parts (18%).  
 52 flakes are intact (46%)  
 None of the length plottings show a curve. Among the intact flakes values are slightly higher, from 10-19 mm. The maximum length is 36 mm in the group of intact flakes.

TABLE 5

Length of flakes of S-4.

	mean	stand.dev.S.D.	skewness	kurtosis	stand.error S.E.	median	n
intact	17.763	6.899	0.820	3.130	1.957	16.929	52
distal part	15.722	4.775	0.334	1.950	1.125	15.500	18
medial part	12.167	4.218	0.410	2.060	1.218	11.500	12
basal part	17.400	6.954	0.633	2.656	1.555	16.500	20

13 flakes are twice as long as they are wide.

The following platforms were observed:

platform with cortex or patina	14	(12%)
dièdre	2	(2%)
facetté	2	(2%)
facetté convexe	1	(1%)
edged	30	(27%)
punctiform	7	(6%)
plain	11	(10%)

5 flakes show secondary flaking from the platform side and the opposite side. One flake shows secondary retouching from 4 sides.

Noteworthy is one flake that is part of a polished flint axe. There are indications of polished flint axes only on sites S-3 and S-4.

4.2.3. *Blades* (76)

- 27 blades are burned (35%)
- 45 blades show no cortex or patina (48%)
- 1 blade shows cortex all over the dorsal side (1%)
- 17 distal blade parts (22%)
- 22 medial parts (29%)
- 28 basal parts (36%)
- 9 blades are not broken (12%)

Plottings of the length for intact blades, basal, medial and distal blade parts showed neither a normal, nor bimodal distribution nor an uniform distribution. The longest blade was 47 mm. 39 blades were twice as long as they were wide.

The following platforms were noticed:

- 1 (2.8%) with cortex or patina
- 1 (2.8%) formed
- 3 (8.5%) facetté
- 12 (34.2%) edged
- 4 (11.4%) punctiform
- 14 (40%) plain, normal

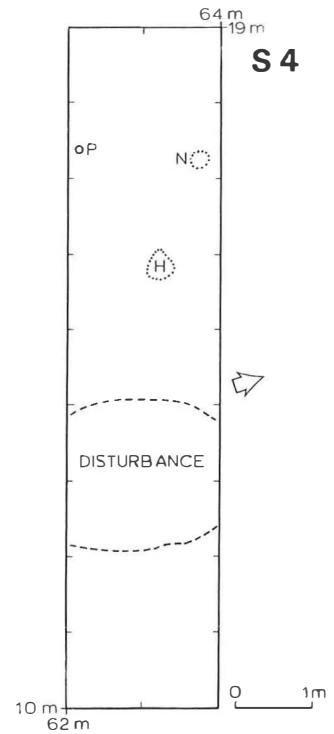


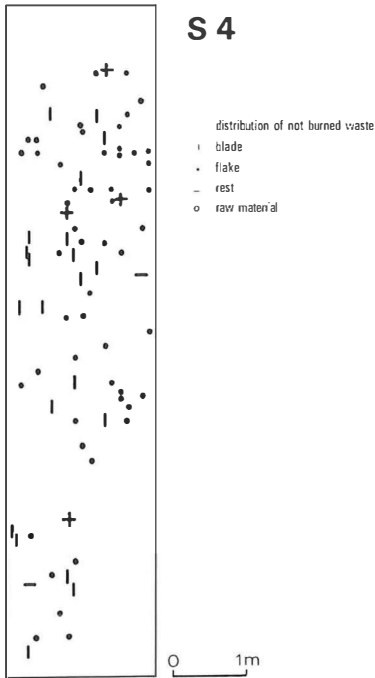
Fig. 18. Site S-4. Map of features. H: hearth. N: concentration of hazelnuts.

Fig. 22. Site S-4. Distribution in percentages per square metre of unburned flint material.

TABLE 6

Length of blades of S-4.

	mean	stand.dev. S.D.	skewness	kurtosis	stand.error S.E.	median	n
intact	32.556	12.126	-0.287	1.677	4.042	34.000	9
distal part	20.235	6.476	0.298	2.901	1.571	20.000	17
medial part	19.682	9.037	0.401	1.762	1.931	17.500	22
basal part	20.429	9.739	0.900	3.198	1.840	17.000	28



↑ Fig. 19. Site S-4. Distribution of unburned flint material.

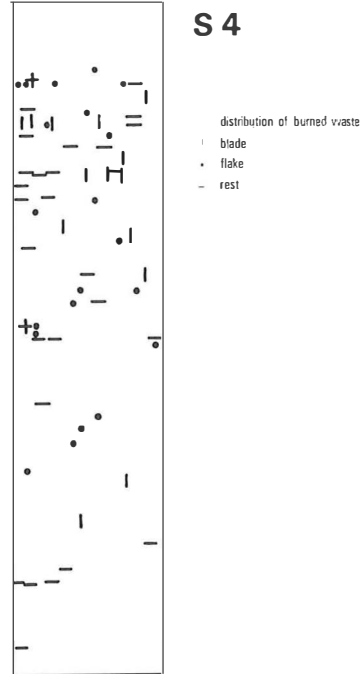


Fig. 20. Site S-4. Distribution of burned flint material. ↑

Fig. 23. Site S-4. Distribution in percentages per square metre of burned flint material.

17%	10%
6%	9%
0%	6%
6%	3%
4%	0%
1%	1%
10%	0%
3%	

20%	16%
0%	11%
4%	4%
0%	2%
3%	1%
4%	1%
6%	1%
2%	

Fig. 21. Site S-4. Distribution of tools.

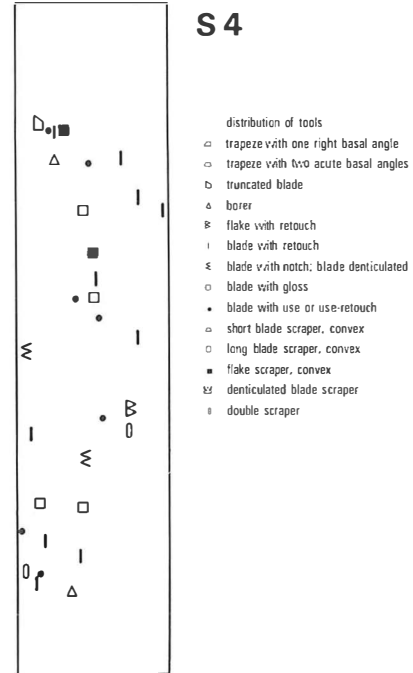


Fig. 24. Site S-4. Distribution in percentages per square metre of tools.

21.4%	17.3%
6.6%	9.9%
6.2%	5.3%
6.6%	2.9%
3.7%	5.3%
2.5%	0.0%
0.6%	0.4%
2.5%	

4.2.4. *Other flint material* (46)

38 artefacts show traces of burning (73%)

14 artefacts show no cortex or patina (30.4%)

20 artefacts show 50% or more patina/cortex (47.4%)

60 artefacts show less than 50% patina/cortex (13%)

The following tools were found:

type code	no.		
302	long blade borer	2	
400	long blade scraper, convex	1	
405	short blade scraper, convex	1	
406	convex scraper	2	
425	double scraper	1	
	total no. of convex scrapers	5	
931	scraper, straight	1	
560	blade with long notch	2	
550	blade with retouch	10	
601	blade with gloss	4	
610/611	blade with use retouch or traces of wear	8	
630	flake with use retouch or traces of wear	1	
	total no. of tools showing traces of wear/use	13	
	total no. of tools	33	

Of the flakes 3 were retouched (2.6%) and one showed traces of wear (0.8%). Of the blades 17 were retouched (22%) and 12 showed traces of wear or use retouch (16%) (total 38% of the blades).

Of the total assemblage 20 artefacts were retouched (8%) and 13 had traces of wear or use retouch (5%) (total = 13%).

## 4.3. The distribution of the flint material

4.3.1. *Vertical distribution*

The vertical distribution shows a homogeneous distribution through the blackish-grey layer. There is no weight difference in the vertical distribution.

4.3.2. *Horizontal distribution*

The following features and disturbances were noted. A large disturbance between 12 and 14 m E-W. One pole was found (rgn. 1670), as well as a concentration of hazelnuts and a hearth (see fig. 18).

Figs. 22, 23 and 24 give the distribution in percentages per square metre for the groups total flint assemblage (24), burned flint (23) and unburned flint (22). Although there are differences in the percentages per square metre for the different groups of burned and unburned flint they follow in general the total distribution of flint. The same general tendency is found in the distribution of the weight groups. For the two lowest weight groups 0-15 cg and 15-50 cg it can be said that the spatial distribution is more distinctive: 75% of the lowest weight group is in the flint concentration in 17-18

TABLE 7

Length of flakes of S-51.

	mean	stand.dev. S.D.	skewness	kurtosis	stand.error S.E.	median	n
intact	15.026	11.450	1.860	6.145	1.857	11.500	38
distal part	11.571	6.214	0.087	1.578	2.349	12.000	7
medial part	13.000	6.135	0.676	3.472	1.771	12.500	12
basal part	13.667	7.384	0.127	1.664	1.907	15.000	15

m E-W. This tendency is also noted in the sites S-2 and S-51. In distinct flint concentrations within the sites the lower weight classes are overrepresented compared with the other groups. The distribution of tools follows the general distribution of flint. There is possibly a tendency for tool-type 550 (re-touched flake) to occur around the hearth. This is difficult to establish with certainty, however, in view of the limited extent of the excavation. Data for the distribution of other categories of material, like stone and bone, were not available.

## 5. THE SITE S-51

### 5.1. The site and its excavation

Soon after the start of the excavation of S-51 it became clear that the major part of this site had been washed away by the creek, that only a strip of one to two metres of the cultural layer was still left *in situ* and that most of the coloration belonged to the transition from cultural layer to back swamp, a phenomenon already encountered on the other sites.

Not all the soil could be sieved. This was compensated for by sieving 3-litre probes of every square metre, *i.e.* about 2% of the soil normally sieved<sup>4</sup>).

### 5.2. The flint material

The total number of flints is 225: 79 (35%) were found in situ and 146 were obtained by sieving. They can be divided into:

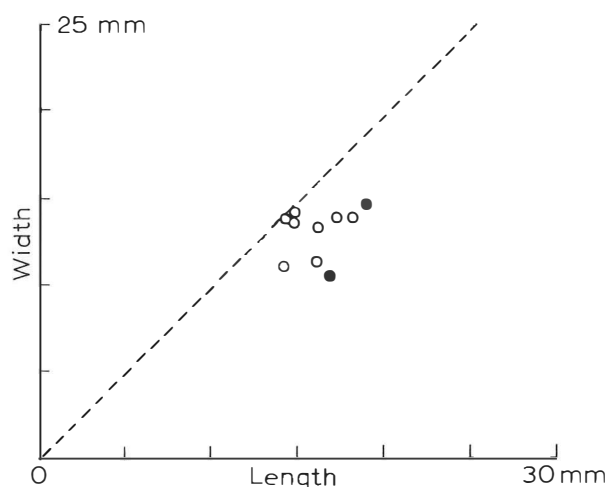


Fig. 25. Site S-51. Plotting of length (X-axis) and width (Y-axis) of the trapezes with two acute basic angles of site S-2 (o) and site S-51 (•).

- 4 cores (2%)
- 84 flakes (37%)
- 61 blades (27%)
- 76 items of other flint material (34%)

There are two pieces of flint completely covered by cortex or patina, measuring 40 × 28 mm and 11 × 8 mm respectively.

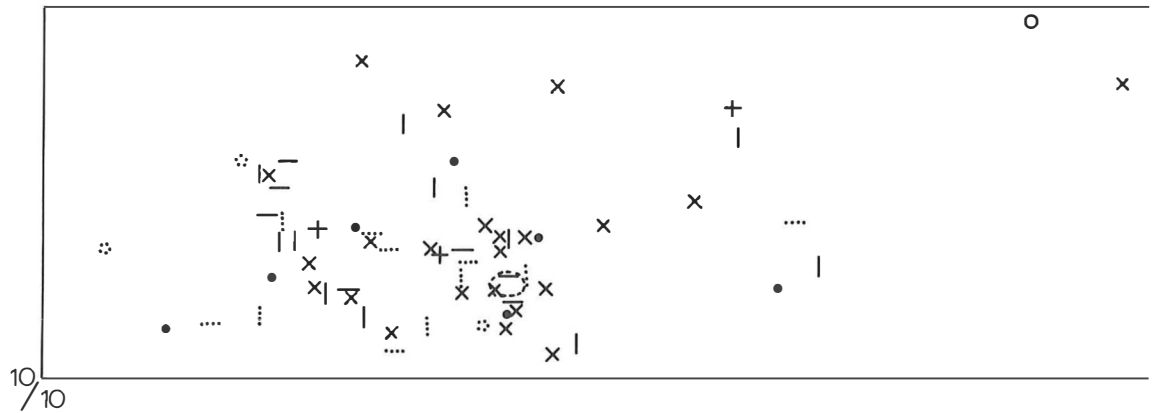
#### 5.2.1. Cores

The largest core has one platform larger than 1 × 1 mm from which 2 blades had been struck off; the rest of the core was patinated (dimensions 35 × 10 mm). One piece has blade-like flakes struck off one edge leaving negatives that seem to be too large for

TABLE 8

Length of blades of S-51.

	mean	stand.dev. S.D.	skewness	kurtosis	stand.error S.E.	median	n
intact	42.500	10.766	0.861	3.180	4.395	44.000	6
distal part	29.100	10.826	0.243	1.361	3.424	33.500	10
medial part	17.800	7.433	0.872	3.564	1.487	17.250	25
basal part	24.167	8.820	0.107	2.233	2.079	23.000	18



distribution of flint material

- | blade not burned
- flake not burned
- rest not burned
- raw material
- × tool
- ⋮ blade burned
- ⊘ flake burned
- ⋯ rest burned

retouch. On the other hand it is questionable whether such flakes, measuring  $10 \times 5$  mm, were useful at all.

The remaining 2 cores, measuring  $15 \times 6$  mm, show even smaller negatives and have edged platforms (length more than 1 mm, width 1 mm or less).

5.2.2. *Flakes* (84)

burned	32 (27%)
dorsal side partially covered with cortex	36 (43%)
dorsal side totally covered with cortex	3 (4%)
flakes without cortex or patina	44 (52%)
distal parts left	7 (8%)
medial parts left	12 (14%)
basal parts left	15 (18%)
intact flakes	38 (45%)

The small number of cases for the categories of intact flakes and basal, medial and distal parts show an even distribution when the length is plotted.

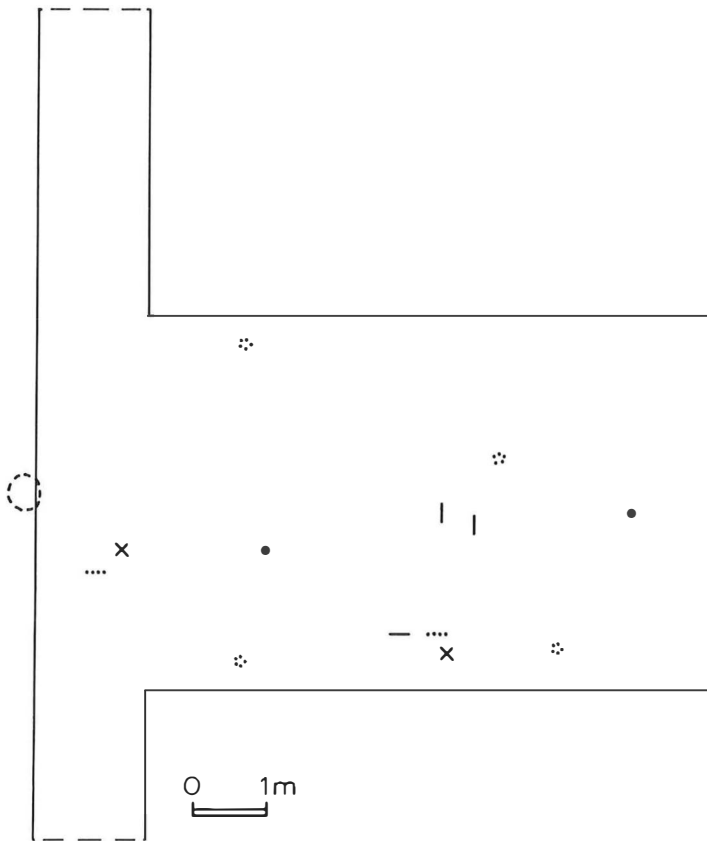
- 4 flakes have a platform with cortex or patina (6.6%)
- 33 flakes have an edged platform (55%)
- 8 flakes have a punctiform platform (13.4%)
- 16 have a plain platform (25%)
- 11 flakes are twice as long as they are wide

5.2.3. *Blades* (61)

A total of 12 blades are burned (20%).

dorsal side partially covered by patina or cortex	36 (43%)
blades without cortex or patina	44 (52%)





**S51**

Fig. 26. Site S-51. Distribution of the flint material.

No blade is totally covered by patina or cortex on the dorsal side.

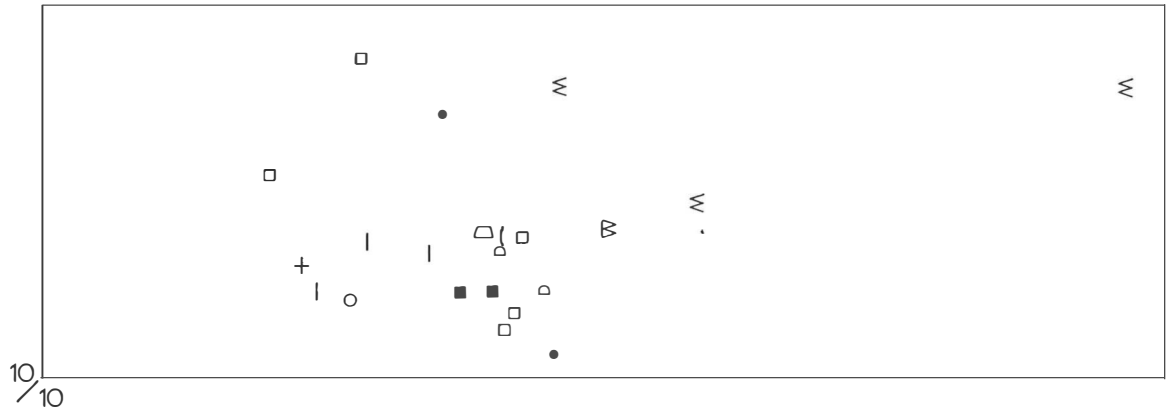
- distal part left : 10 blades (17%)
- medial part left : 25 blades (41%)
- basal part left : 18 blades (30%)
- intact blades : 6 (10%)
- 8 blades have an edged platform (33%)
- 18 blades have a plain platform (66%)
- 24 blades are twice as long as they are wide

5.2.4. Other flint material (76)

- 46 artefacts show traces of burning (60%)
- 32 artefacts show no cortex or patina (42%)
- 8 artefacts are covered for 50% or more by cortex and patina (11%)
- 1 artefact was used as a tool

5.2.5. Tools

type code		
no.		
820	symmetric trapeze with acute basic angles	1
883	asymmetric trapeze with 2 acute angles and concave sides	1
	total no. of trapezes	2
405	short blade scraper, convex	6
407	convex scraper on retouched flake	5
	total no. of convex scrapers	11
438	blade with nosed scraper	1
435	blade with denticulated scraper	1
	total	2



distribution of tools

- |   |                                      |   |                               |
|---|--------------------------------------|---|-------------------------------|
| ◻ | trapeze with one right basal angle   | ● | blade with use or use-retouch |
| ◻ | trapeze with two acute basal angles  | ( | flake with use or use-retouch |
| ◻ | truncated blade                      | ◊ | short blade scraper, convex   |
| △ | borer                                | ◻ | long blade scraper, convex    |
| ⊞ | flake with retouch                   | ■ | flake scraper, convex         |
|   | blade with retouch                   | ⊞ | denticulated blade scraper    |
| ⊞ | blade with notch; blade denticulated | ○ | round scraper                 |
| ◻ | blade with gloss                     | + | straight scraper on flake     |

429	straight scraper	1	630	flake with use retouch or traces of wear/use	3
570	blade with notch	2			
580	blade denticulated	1		total no. of tools showing traces of wear/use retouch	27
550	blade with retouch	4		total no. of tools	41
490	flake with retouch	4			
600/601	blade with gloss	7		The two trapezes that have been found are plotted together with the trapezes of site S-2 (fig. 25).	
609	blade with nibbling	1			
610/611	blade with use retouch or traces of wear	3		5.3. The distribution of the flint material	

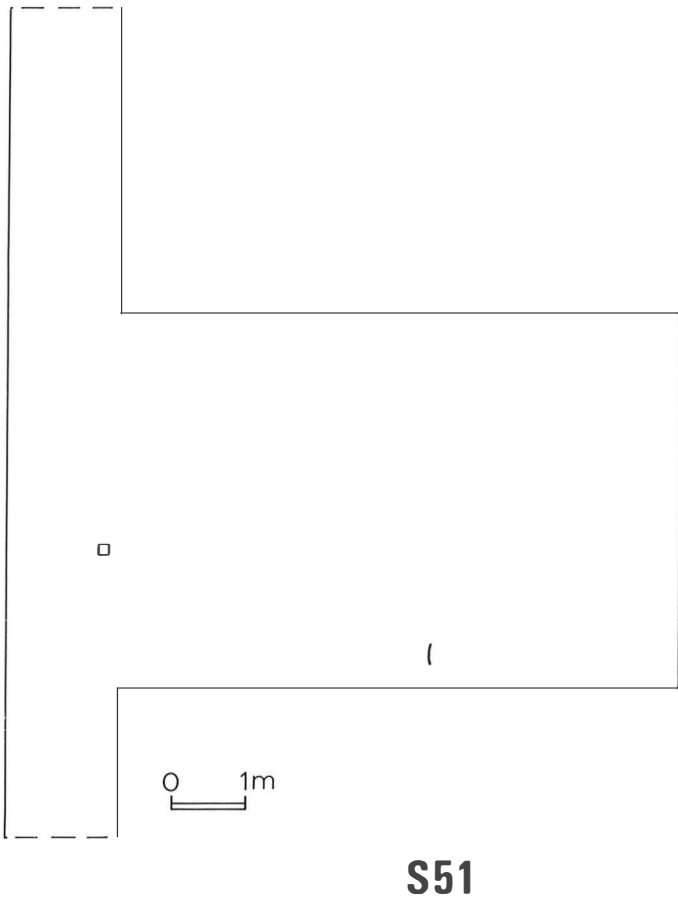


Fig. 27. Site S-51. Distribution of tools.

#### 5.3.1. Vertical distribution

Vertical plots have been made for the 1-m strips in front of available profiles (10 m E-W and 10 m N-S, 26 m N-S and 35 m N-S). Although the number of flints is small, the distribution seems to be rather homogeneous in the black layer.

#### 5.3.2. Horizontal distribution

The following features were found:

1. A hearth was found in the profile of 26 m N-S (see fig. 26), which for the most part is still under the profile. It was clearly separated from the cultural layer by a sterile clay layer underneath the cultural layer. As the different figures (26/27) show there are no associated flints.
2. A feature consisting of a bone axe, a wooden shaft, two stones and two associated pieces of flint, of which one piece has been classified as unburned waste material and the other as a tool: a short convex blade scraper. If we look at the distribution of the flint per square metre, we see



		4.4		0.4									0.9	
XIV	0.4	4.0	1.8	0.4	1.3	0.9	0.4		0.9	0.9			0.4	0.4
XIII	0.4	0.4	2.2	7.1	3.1	4.0	2.7	1.3	0.4	1.3		0.4	0.4	0.4
XII	0.4		0.9	4.4	2.2	5.3	5.3	1.8		2.2	0.4		1.3	
XI		0.4	0.9	1.3	3.6	1.3	2.7	0.9	1.3	0.9	1.3	0.4	0.9	
X														1.3
	10	12	14	16	18	20	22	24						

Fig. 28. Site S-51. Distribution in percentages per square metre of the total flint assemblage.

that this feature is close to a concentration area (fig. 28).

The high percentage of flint obtained by sieving gives a more realistic distribution of flint per square metre than the flint found during the excavation. The distributions shown in fig. 26, 27 (flint found during the excavation) and fig. 28 (flints obtained by sieving per square metre) do match for a large part, but the former misses the flint concentration in the north-western corner. For this reason only the figures for flints obtained by sieving per square metre were used for an analysis of the distribution of the different categories.

If we consider the two lowest weight groups (0-15 cg and 16-50 cg) we notice a concentration (1) in XII/XIV-11/12; XIV/XV-12/13 (12% of total of weight class 0-15 cg) and XIII/XIV-12/13 (6%).

No flint of higher weight occurs in this concentration. The other concentration (2) is present in square XII/XIII-13/14, and is part of the second large flint concentration (fig. 20) in which for all the weight classes there are rather high values, as would be expected in view of the high percentages in the total amount of flint. For the rest of the weight classes there is no large deviance from the general distribution of flint. The distribution of the groups flakes, blades and other waste material is difficult to interpret, while especially the number of blades is rather small (maximum 3 pieces). Blades seem to be underrepresented in concentration 1, while 3 blades occur in square XII/XIII-30/31 where no other flint is found. The distribution of the groups burned and unburned shows no deviation from the general distribution pattern, considering these either as a whole or as separate categories of flakes, blades and other waste material.

		0.4							
					0.4	0.4			
		0.9	0.4		1.3		0.4		
0.9	0.9	0.9	0.4	1.3					
	0.9	1.3	0.4	2.2	1.3	0.9			
		28		30		32		34	

## 6. NOTES

- 1 Van der Waals & Waterbolk 1976, Ente 1976, Hacquebord 1976, Whalon & Price 1976, De Roever 1976, Van der Waals 1977, Casparie et al. 1978, Clason 1978, Clason & Brinkhuizen 1978, De Roever 1979.
- 2 Meiklejohn & Constandse-Westermann 1978.
- 3 The data have kindly been provided by Mrs. J. P. de Roever.
- 4 A breakdown of the required technical equipment (a concrete mixer annex waterpump) and the impossibility of its immediate replacement or repair due to the building traders holiday were responsible for this failure. The sieving was carried out after the excavation by members of the local group of the A.W.N. (Archaeologische Werkgemeenschap Nederland) at Lelystad, which worked out of doors in bitterly cold weather.

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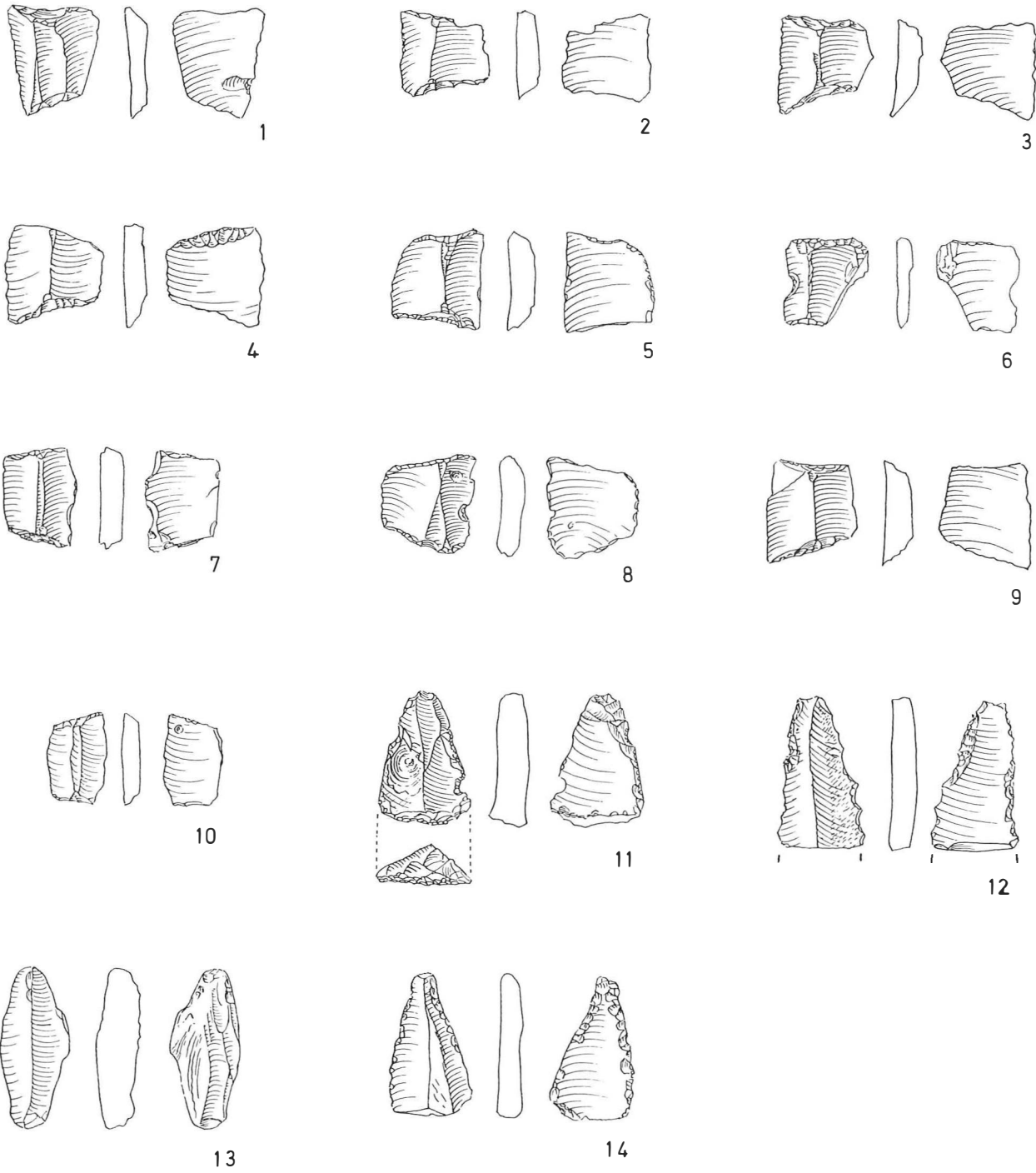
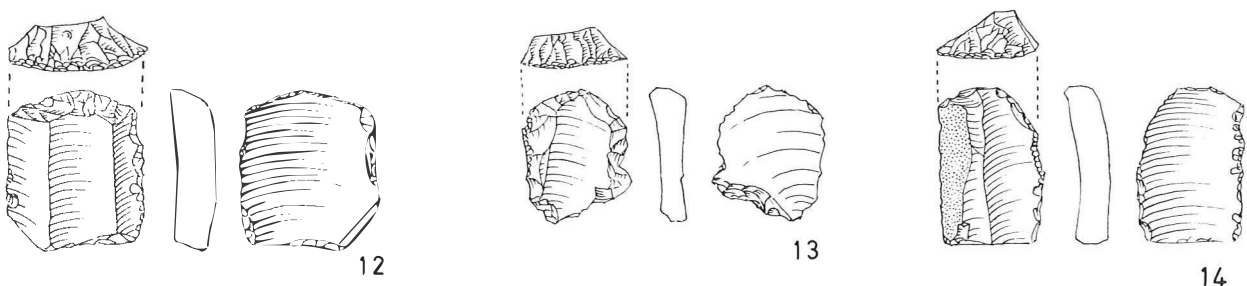
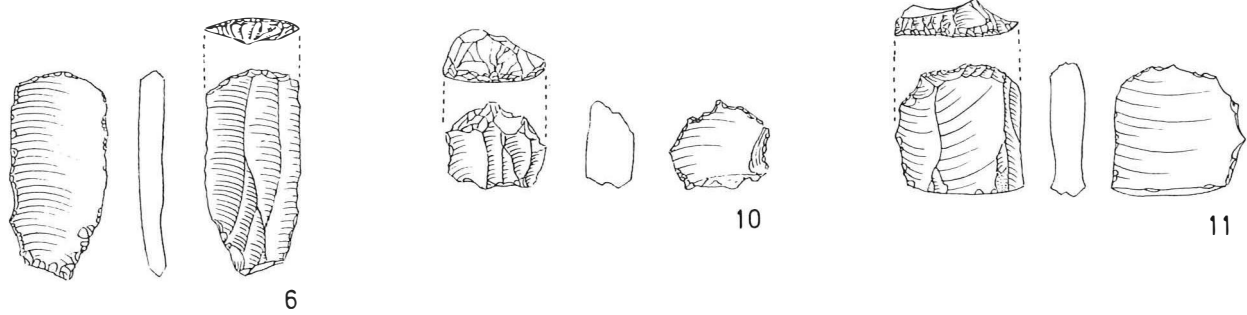
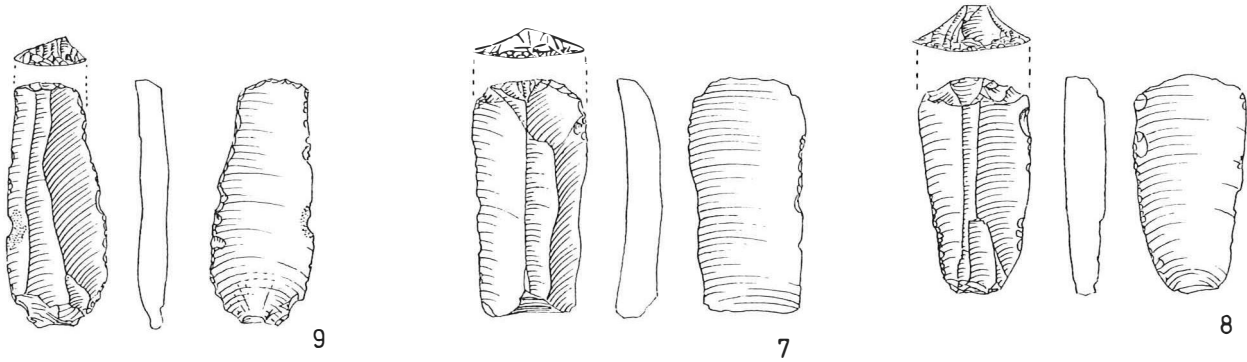
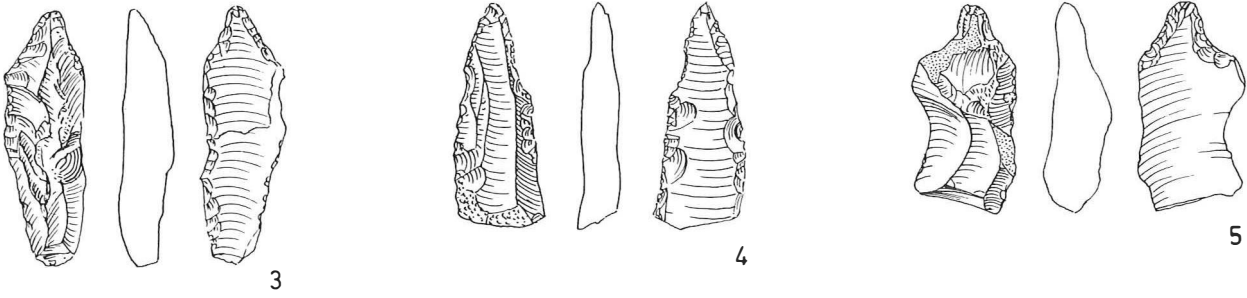
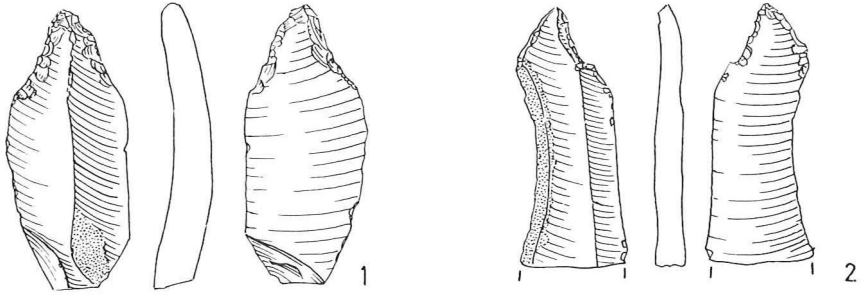


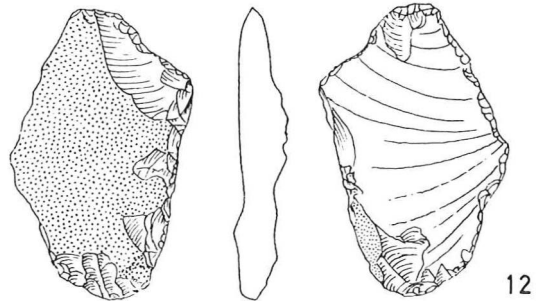
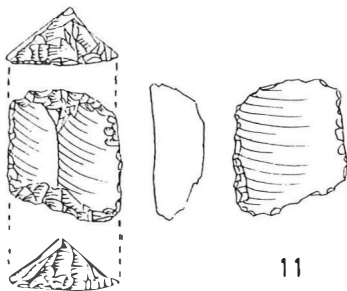
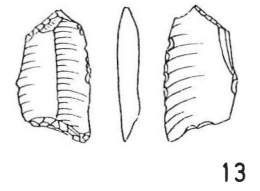
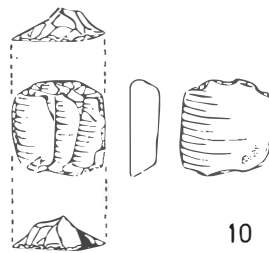
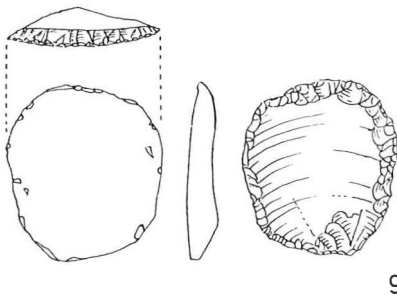
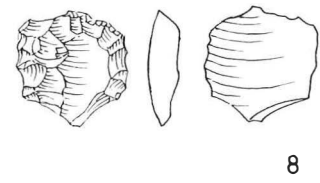
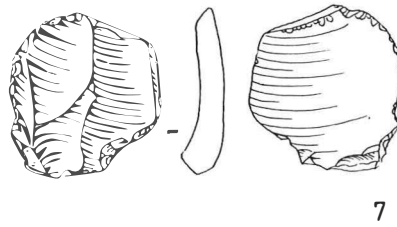
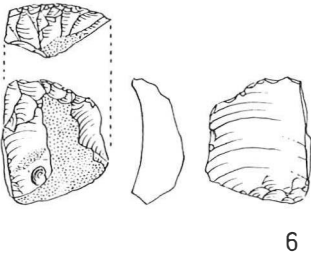
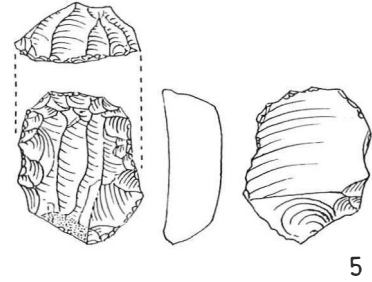
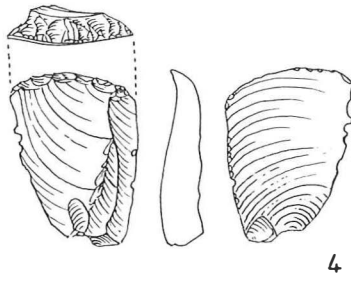
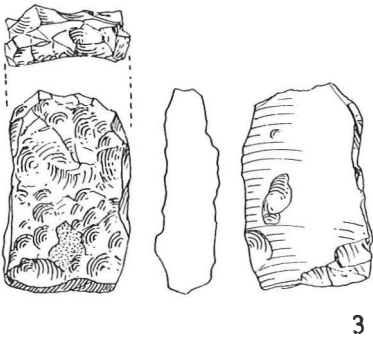
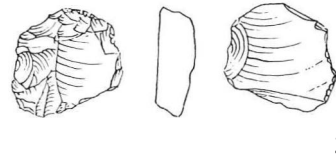
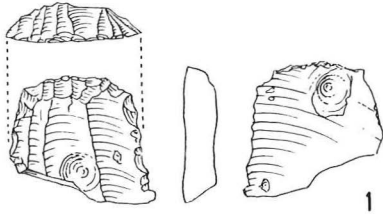
Fig. 29. Site S-2. Symmetric trapeze with acute basic angles: 1, 2, 3, 4, 5, 6, 7, 8. Trapeze with one straight basic angle: 9, 10. Blade borer: 11, 12, 13, 14.

Fig. 30. Site S-2. Blade borer: 1, 2, 3, 4, 5. Long blade scraper, convex: 6, 7, 8, 9. Short blade scraper, convex: 10, 11, 12, 13, 14. →

Fig. 31. Site S-2. Short blade scraper, convex: 1, 2. Convex scraper: 3, 4, 5, 6, 7, 8. Round scraper: 9. Double scraper: 10, 11. Concave scraper: 12, 13. → →

*The flint material from Swifterbant*







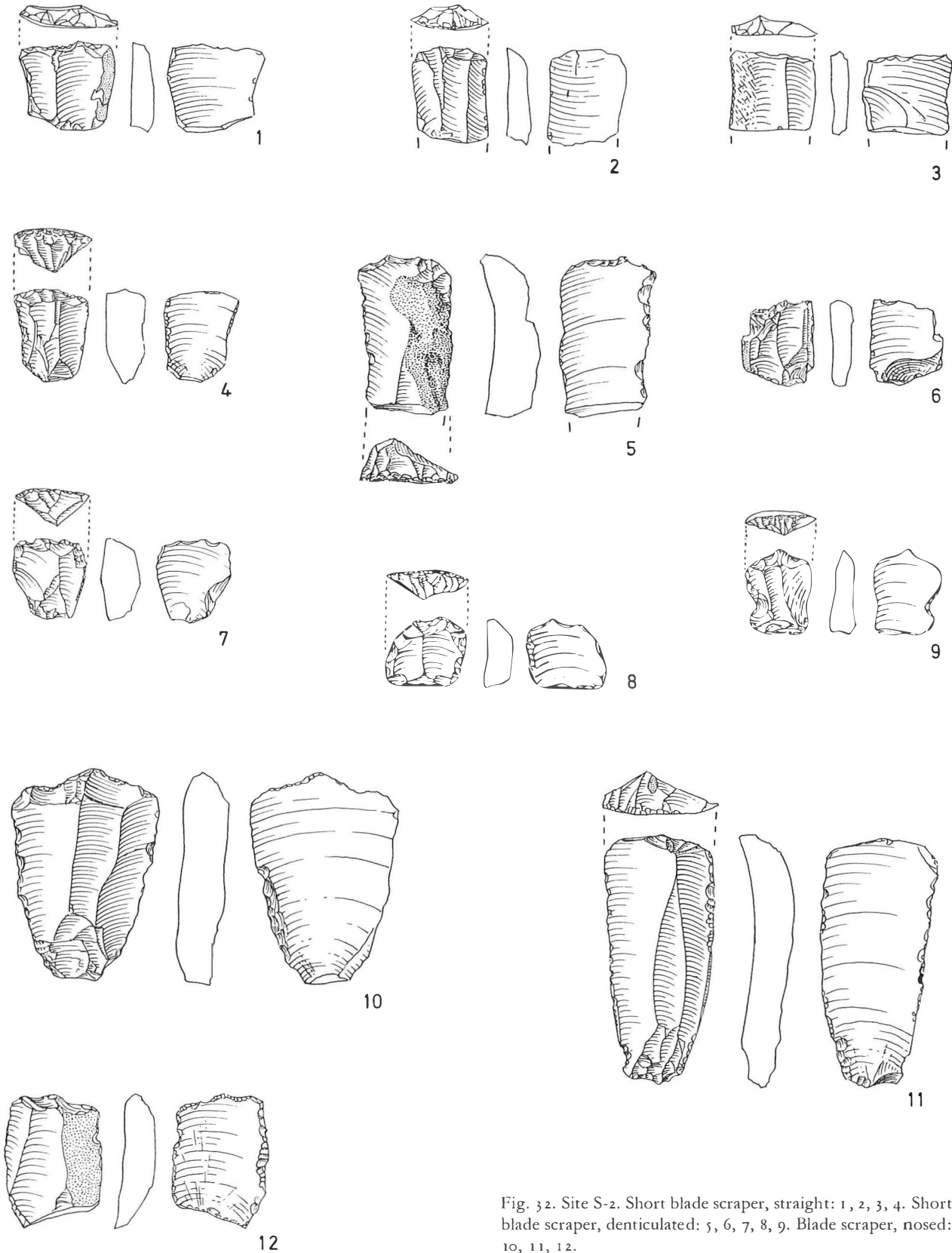
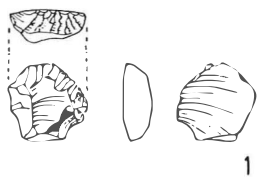
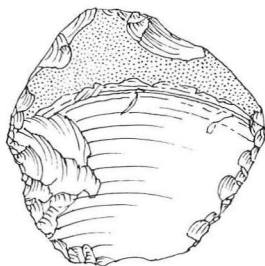


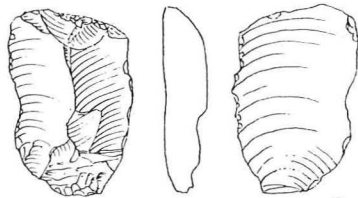
Fig. 32. Site S-2. Short blade scraper, straight: 1, 2, 3, 4. Short blade scraper, denticulated: 5, 6, 7, 8, 9. Blade scraper, nosed: 10, 11, 12.



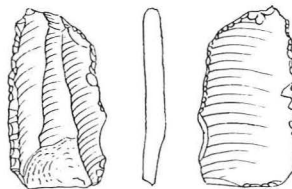
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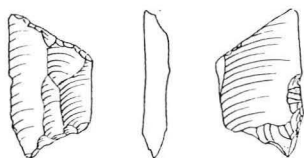
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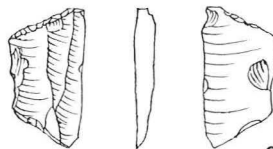
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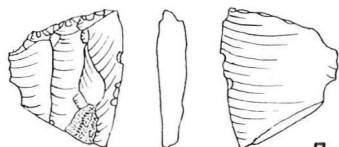
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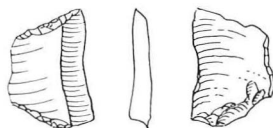
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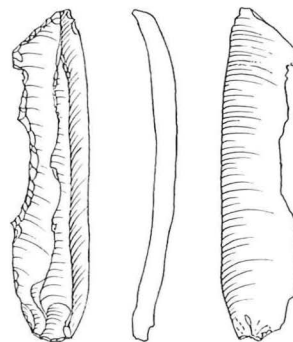
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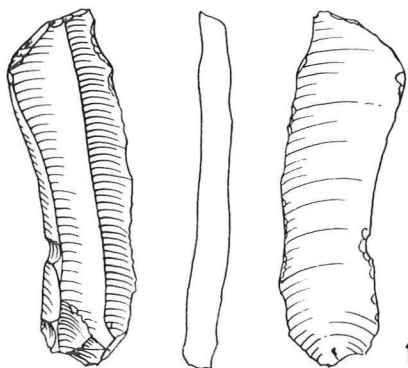
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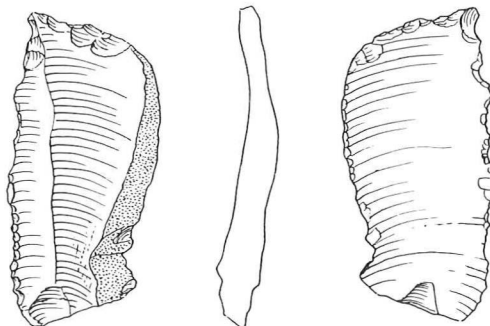
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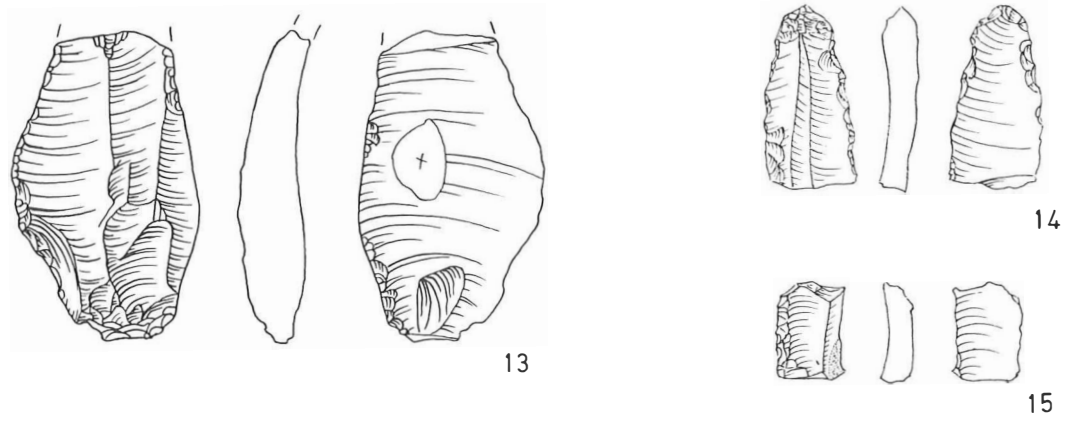
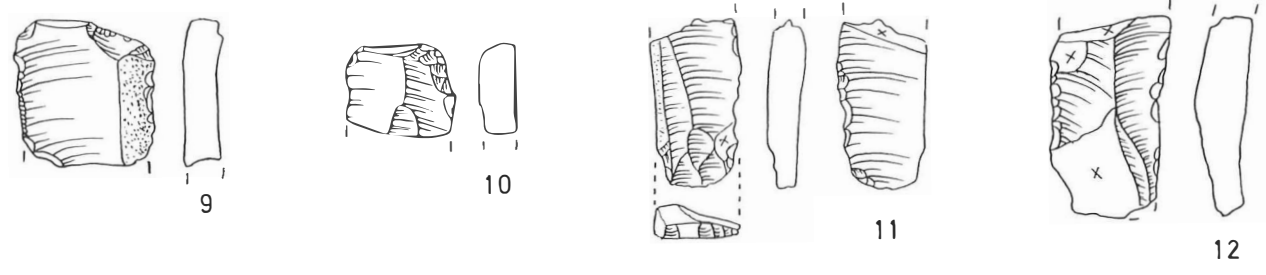
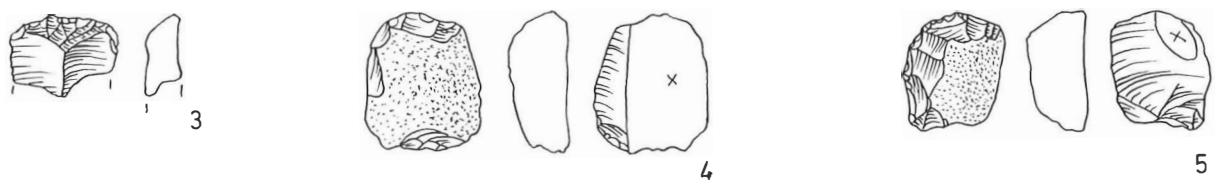
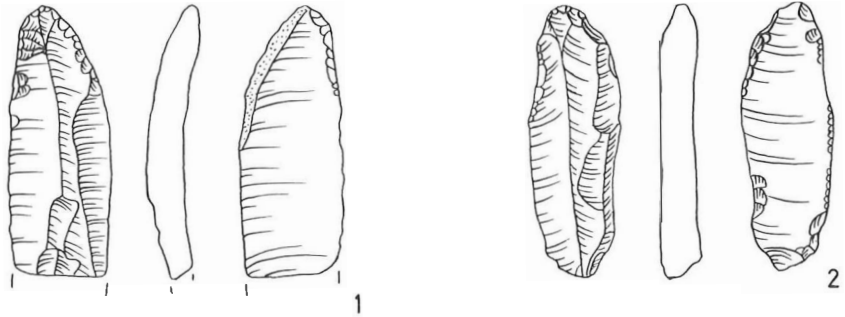


10



11

The flint material from Swifterbant



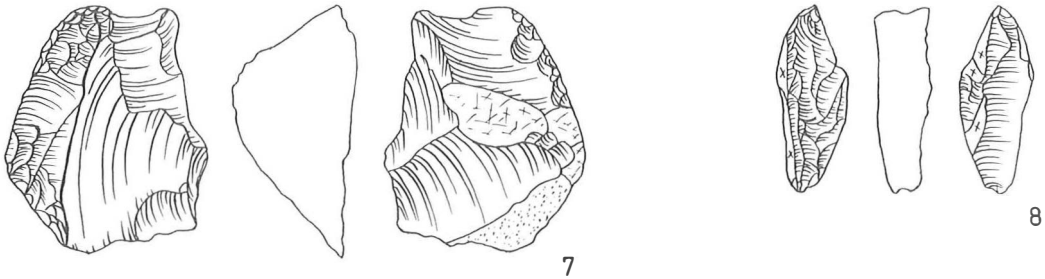
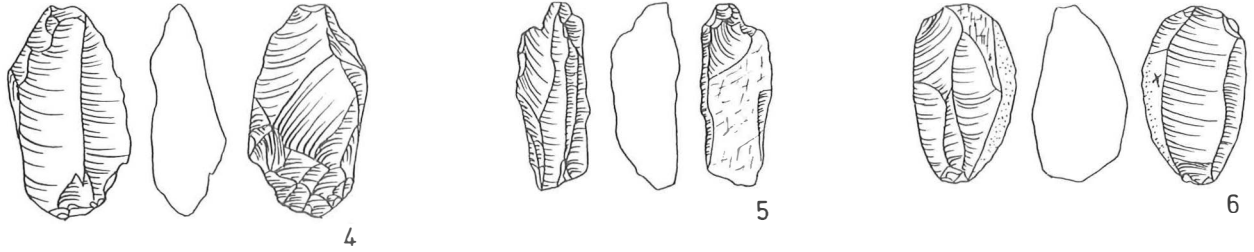
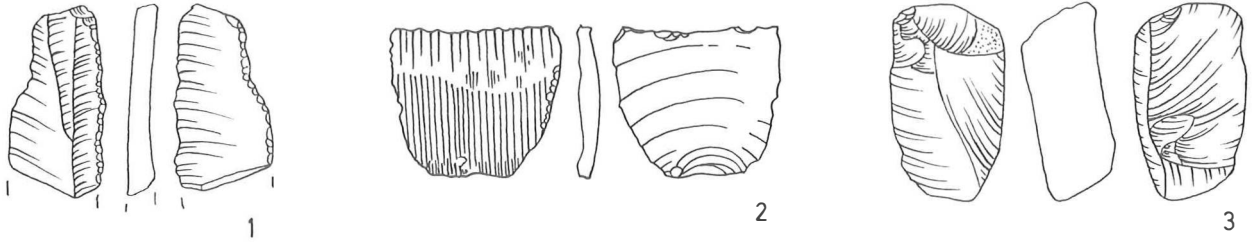


Fig. 35. Site S-4. Blade with notch: 1. Fragment of polished flint axe: 2. Cores: 3, 4, 5, 6, 7, 8. Flake with secondary flaking: 9, 10, 11.

Fig. 33. Site S-2. Flake with convex retouched scraper side: 1, 2. Short truncated blade: 3, 4, 5, 6, 7, 8. Long truncated blade: 9, 10, 11. ← ←

Fig. 34. Site S-4. Long blade borer: 1, 2. Short blade scraper, convex: 3. Convex scraper: 4, 5. Double scraper: 6. Straight scraper: 7. Blade with retouch: 8, 9, 10, 11, 12. Site S-2. Retouched flake, blade: 14, 15. ←

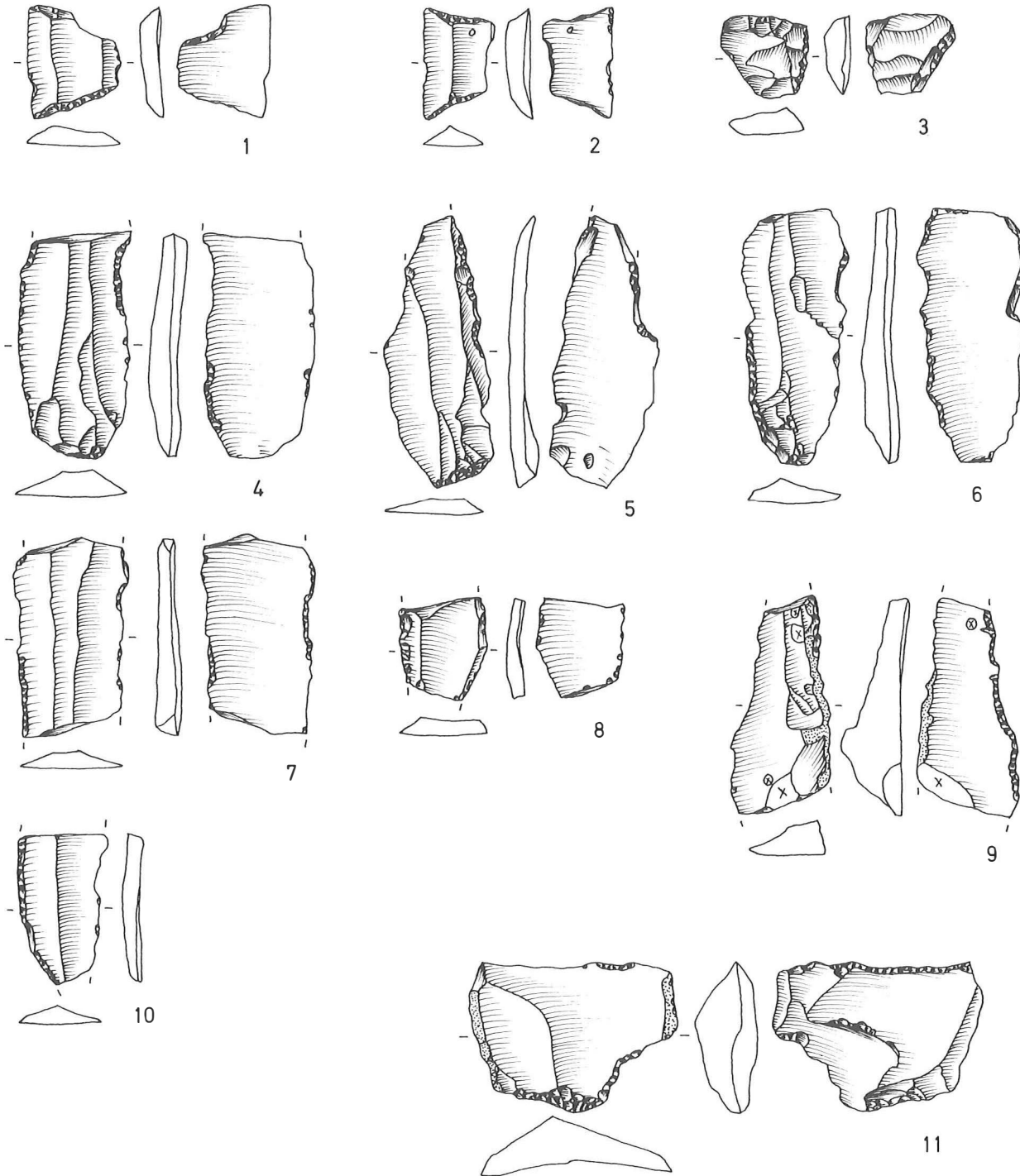


Fig. 36. Site S-51. Symmetric trapeze with acute basic angles: 1. Asymmetric trapeze with two acute basic angles: 2. Straight scraper: 3. Blade, notched or denticulated: 4, 5, 6, 9. Blade with retouch: 7, 8, 10. Retouched flake: 11.

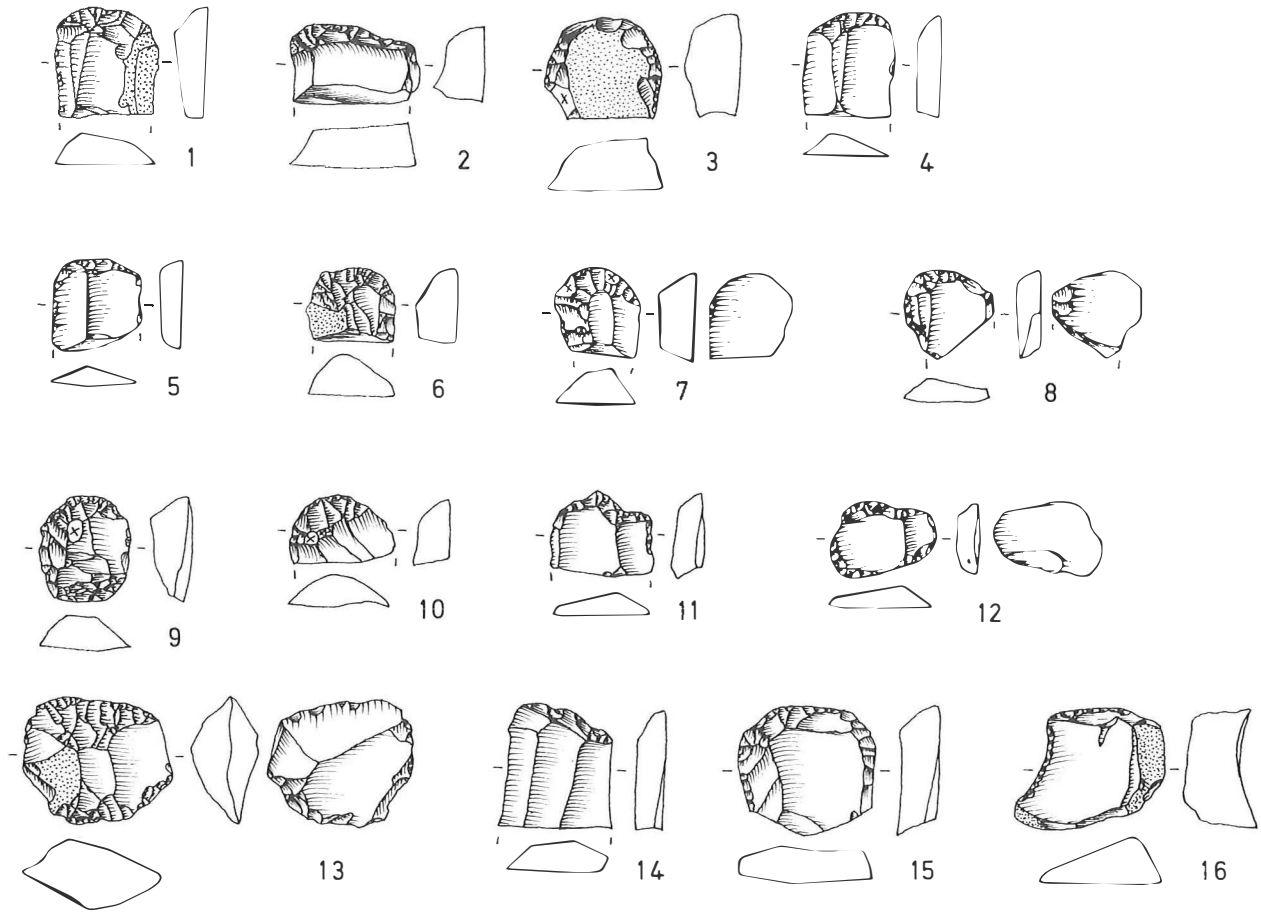


Fig. 37. Site S-51. Short blade scraper, convex: 1, 4, 5, 6, 7, 10. Convex scraper on retouched flake: 3, 8, 9, 15, 16. Retouched flake: 2, 12, 13. Blade with nosed scraper: 11. Blade with denticulated scraper: 14.