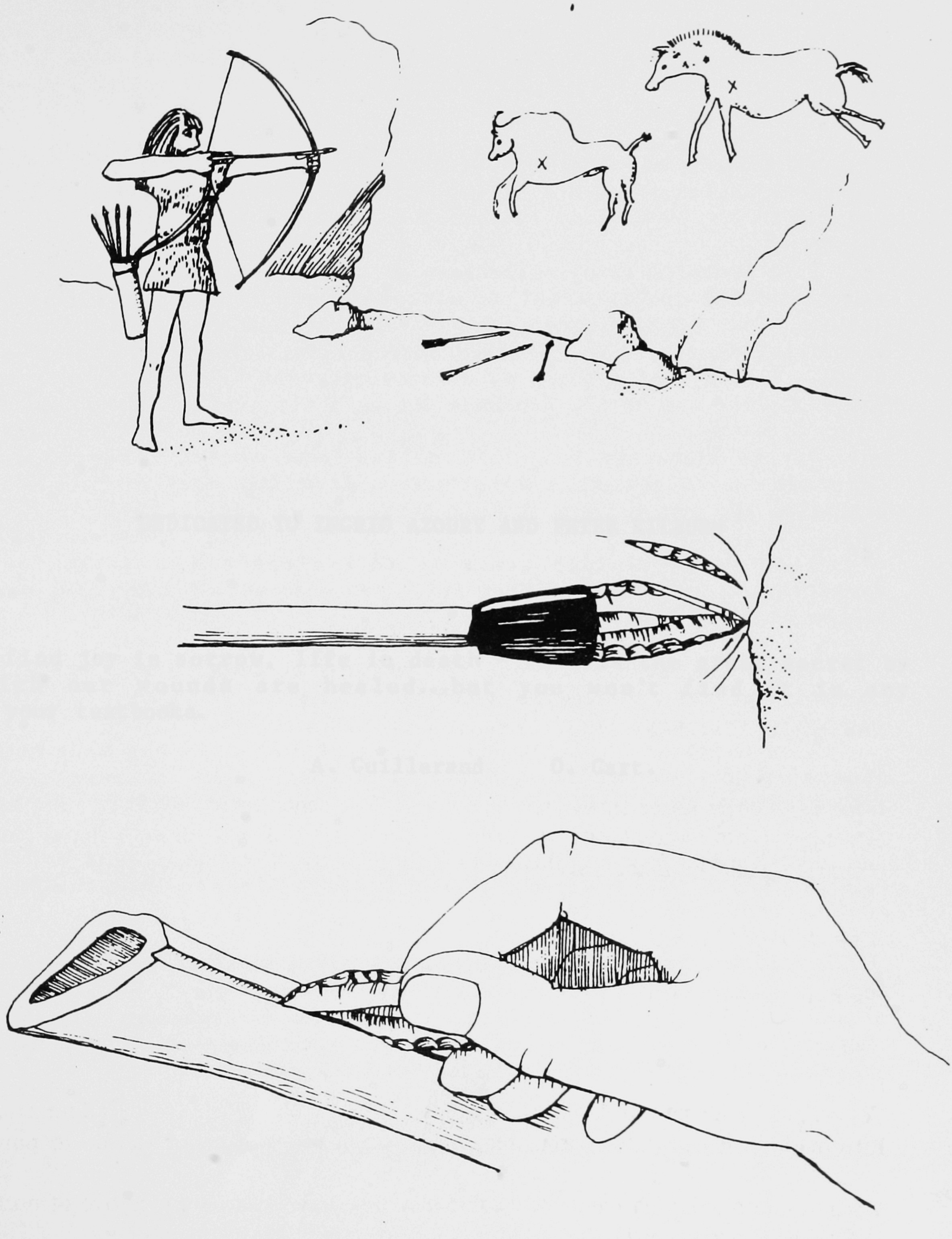
Ksar Akil
Lebanon

A Technological and Typological Analysis of the Later Palaeolithic Levels of Ksar Akil

Volume II: Levels XIII-VI

C. A. Bergman

with contributions by L. Copeland
and M. Newcomer



Impact fracture or a new burin blow technique at Ksar Akil?

DEDICATED TO INGRID AZOURY AND PETER KILBURN

To find joy in sorrow, life in death - that is the great secret by which our wounds are healed...but you won't find it in any of your textbooks.

A. Guillerand O. Cart.

Acknowledgments

I would like to express my thanks to Dr. M.H. Newcomer for his patient supervision of my doctoral research. Professor F.R. Hodson helped to clarify my thoughts concerning the quantitative aspects of my data. I am indebted to Dr. J. Moffet who endured my endless questions about computers and computing.

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I am particularily grateful to Professor A.E. Marks for his comments about my work on Ksar Akil. He also very kindly read several of the chapters in this volume.

Dr. S. Collcutt reviewed the numerical aspects of the data and checked that all the figures added up.

I am indebted to Mlle. Susan de Saint-Mathurin who made several photos of the excavation of Egbert available from the estate of the late Professor D.A.E. Garrod.

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Last, but certainly not least, I would like to thank my mother and father, Dr. and Mrs. R.A. Bergman. My mother, Mrs. P. Bergman, spent many hours editing this manuscript. My wife, S. Ingerson, supported me during the course of my studies and her encouragement helped to bring the work to a conclusion.

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CONTENTS

Preface to Volume II

L. Copeland

This volume is concerned with the later series of Upper Paleolithic industries at Ksar Akil rockshelter, namely the material excavated in 1937-8 by the Boston College expedition's sedimentologically-defined layers numbered XIII - VI. These levels succeed the earlier Upper Paleolithic deposits found in levels XXV - XIV, which have already been published as Volume I of this two-volume work (Azoury, 1986).

In this, the second volume, C. Bergman has undertaken an approach different from that used in previous studies of the Aurignacian at Ksar Akil - that of focusing on the flaking techniques of blank production adopted by the knappers of the artifacts in each level, to determine what these were, and to see how they changed from level to level through time. When examined in conjunction with a study of the tool typology, the result is a new look for the Upper Paleolithic sequence at Ksar Akil. This has led to an interpretation which, whether one agrees with it or not, must be seen as more broadly-based than the more conventional, typologically based, ordering of the sequence which has been current up till now (Copeland, 1986 and references).

The author has also made an effort to overcome the somewhat isolated position (both physically and culturally) of Ksar Akil vis-à-vis the rest of the Levant, particularly Palestine, and to correlate the facies which are present here (when this is possible) with the assemblages which are differently composed in the southern Levant. In the process he has tried to resolve certain terminological problems which have arisen as recently as 1981. These result from what seems to this writer as a misuse, in that it is too narrowly applied, of the term 'Aurignacian': it is used to define only one kind of assemblage present in the Levant (Gilead, 1981a,b; Marks, 1981). The definition proposed by Gilead in 1981 does not account for technical and typological variability such as is seen in the West European Aurignacian (Brezillon, 1969 : 38-39).

So as to remind the reader of what has already been described (see the chronological chart in Volume I, pages 4-5) and as a preview of what will be discussed in more detail in this volume, I will briefly review the main features of the Ksar Akil stratigraphic sequence, from the base to top of the deposits, 23m in all. This has become necessary since, soon after the publication of Volume 1, some 'lost' documents concerning Ksar Akil came to light to which I will make reference here, and since in the aforementioned chronological chart, no details as to the later industries were given.

The shelter was excavated in four seasons (1937-1938 and 1947-1948) by an American team from Boston College, led by Father Doherty for the first two seasons and by Father Ewing for the last two (Ewing, 1947). Subsequently, J. Tixier and a French team excavated in six seasons, 1969-1974/5 (Tixier, 1974; Tixier and Inizan, 1981). The prehistoric periods which the finds represent may be divided into four blocks, as follows and as set out in the Chart, Figure A which correlates the stratigraphy of the two excavations.

MIDDLE PALEOLITHIC: levels XXXVI - XXVI.

These levels contain late Levalloiso-Mousterian assemblages, included in alluvial deposits up to level XXVI (H.E. Wright, 1952; 1960); which is C.14 dated to 44,600 years B.P. Part of the material (from the 1947-8 season) was under study by J. Waechter at the time of his death. Documents concerning his findings have just recently come to light and are being prepared for publication by the present writer. Some levels (XXVIII-XXVI) have been studied at Harvard by A. Marks (Marks and Volkman, in press).

UPPER PALEOLITHIC, PHASES 1 AND 2 ('TRANSITIONAL'): levels XXV - XIV.

The material of the 1937-8 season has been published by Azoury in Volume I (1986). The assemblages in these levels develop upwards from an early Upper Paleolithic of a facies unique to north-central Lebanon (Phase 1, levels XXV-XXI, with chamfered pieces and Middle Paleolithic techniques of debitage) to a second phase (Phase 2, the first part characterised in levels XX-XVIII by backed blades and the second part in levels XVII-XV characterised by blades pointed by retouch). There is no C.14 date for these levels, but a Neanderthaloid maxilla was found in level XXV and a young adult Homo sapiens sapiens skeleton ('Egbert', later 'Egberta') was found, embedded in breccia, in level XVII. A series of photographs of this find and its recovery is published here for the first time (plates 20-29 Appendix 4); the anthropological details were published by Ewing in several reports (for example 1947, 1966).

LATER UPPER PALEOLITHIC ('AURIGNACIAN'): Levels XIII - VI (Boston College) and Phases VII - VI (levels 12 to 10H(1) of Tixier).

The 1937-8 material of the Boston College excavation forms the subject of the present volume, comprising 6-7m of deposits. There is a date of 28,000 B.P. for a depth of 7.5-6m; a symbol on Ewing's section seems to indicate that this refers to his level VIII, but depending on the square and layer-slope it might refer to either IX or VII instead.

Some of the material has been described previously: levels XIII - XII by Azoury (Volume 1) and levels VIII - VI by C. Dortch (unpublished 1970). Levels XI - IX are discussed here for the first time.

In 1969 a new excavation at Ksar Akil was initiated by J. Tixier. (Tixier, 1970; Tixier, 1974). He eventuallly reached the Upper Paleolithic levels which lay below the Epi-Paleolithic phases (Tixier & Inizan, 1981). There are two phases - VII and VI, which represent for him the "Aurignacien du Levant" and seem to correspond to levels X - VII of Boston College. C.14 dates were obtained as follows (although in the view of some workers they 'must be too early', there is good correspondence between the date of Ewing's level VIII at an equivalent depth and Tixier's lower level 10):

Tixier's level 12 (Phase VII): 32,000 $\pm$ 1,000 years B.P.

= top of Ewing's level X

Tixier's level 10, lower (Phase VI): (average of 3 dates) 27,000 years B.P.
= Ewing's level VIII

Tixier's level 10, upper (Phase V): (average of 4 dates) 26,000 years B.P.
= Ewing's level VIII

Tixier's level 9, (Phase IV): 27,350 B.P.

= Ewing's level VII

EPI-PALEOLITHIC (PRE-KEBARAN AND KEBARAN): levels V to I of Boston College; Phase III (end) to Phase I (levels 7 - 1 and A to C of Tixier)

The Epi-Paleolithic levels of the Boston College excavation were under study by J. Waechter at the time of his death, and are still unpublished. The material recovered (regarded as pre-Kebaran or transitional from Upper to Epi-Paleolithic) in V and Early Kebaran in IV - I was extensive, and included that found in the Extension Trench which was opened in the 1947-8 season (see this in plan, in figure i, Volume I). Photographs and sections of this Trench (which probably recovered at its base levels equivalent to level VI in the main excavation) are published here for the first time (Figure B; Plates 15-16 Appendix 4).

The top levels (Phases II - I) in the excavation of Tixier covered assemblages corresponding broadly to levels IV - II of Boston College in the main exposure; the 'sols d'habitat', A-C, near the shelter wall may correspond to Ewing's II. The following C.14 dates have been obtained by Tixier: 24,450 B.P. for level 4 (top of the Stony Complex 1) = Phase II, and, for the 'sol d'habitat C': 14,150 years B.P. (The chronological position of this floor (at the edge of Day's Pit and Ewing's excavation) is not entirely clear and I am wondering if it belongs to Level 3 (Phase I) rather than to Phase II. The first date is regarded as too early and the second one as too late (J. Tixier pers. comm.).

Other published data on Ksar Akil has been discussed already in Volume I, either (in the case of facts known up to 1970) by Azoury, or in the Preface by C. Bergman and the present writer; see our bibliography for relevant references later than 1970 and the bibliography of Azoury (Volume I, 1986) for pre-1970 references.

One aspect of our knowledge of Ksar Akil has not been dealt with in detail: the results of Tixier's re-excavation of the site. It would seem that for the forseeable future no further work can be carried out there, and since the excavator has not attempted a synthesis of the two digs, an opportunity to do so here is not to be missed. Only the upper levels are involved, but since there are no final reports the information must be pieced together - necessarily in an approximate and schematised form - based on what has been published, as well as on personal familiarity with the site over many years, both before and after its near-destruction by quarrying.

One difficulty experienced with correlation attempts is that three datum-points were used - 80.9m above sea-level by Ewing (1947), 75m by Wright (1952; 1960), and 76m by Tixier and Inizan (1981), who also used a grid placed at an angle slightly different (less than 5 degrees) from that of Ewing, although both purport to be oriented due north-south. Both made use of Day's access trench of 1926. Tixier's plan (Tixier & Inizan, 1981: figure 1) shows that he excavated at the peripheries of Ewing's workings in two areas - the sagital trench and the transverse (frontal) trench. The latter faces south, at the point where Ewing reduced the area to be excavated to that of the deep sounding shown in Figure A.

The section with which we are concerned here is the one published by Tixier & Inizan (1981: figure 2), showing the Upper Paleolithic levels in the transverse trench. From this we see that Tixier's 71m above sea-level is 5m below datum, giving a datum point of 76m - that is, one metre above that of Wright (we therefore do not understand the footnote [Tixier and Inizan 1981: 334] indicating that their datum was 1.1m below that of Ewing). Since Wright's datum of 75m is the one on the section currently in use (Newcomer, 1972; Copeland, 1975; Azoury, 1986) it is the one we shall use here, both in discussion and on the correlation chart, Figure A.

Tixier divides the deposits so far excavated into seven industrial phases, VII - I, which almost exactly duplicate those distinguished by Ewing in his levels IX - II, starting at the top of X.

Geomorphically, the seven cultural phases recognised by Tixier are contained in sedimentological units 12 - 1 with many sub-units marking alternations of stony with less stony lenses, without regard to the industrial differences. Using the heights above sea-level published by both authors, as well as allowing for the slope and the different grid angle, it can be seen that the deposits match up almost exactly, as shown in the correlation chart Figure A. The sediment sequence seems to be broadly as follows:

Ewing's level	II	=	Tixier's levels	1 - 3 (Phase I)
" "	III	=	" "	" "
" "	IV	=	" "	4 - 6 (Phase II)
" "	V & VI	=	" "	7 & 8 (Phase III)
" "	VII	=	" "	8AC 10A (Phase IV)
" "	VIII	=	" "	10B - 10H(1) (Phase V)
" "	IX	=	" "	10H2 - 11C (Phase VI)
" "	X	=	" "	12 (top) (Phase VII)

Of course this proposed correlation is open to question. While the deposits appear to line up stratigraphically, using both sections, there are difficulties in comparing the stone industries in both sets of levels, especially as concerns Ewing's IX - VIII and VI - V (see Bergman this volume: 2).

Culturally, the lower two phases of Tixier (VII and VI) are designated Aurignacian, and although VI is dominated by grattoirs and burins, VII is characterised more by small points and very few burins (a good confirmation of Bergman's results, as we shall see). In Phase IV a special type of truncation burin is characteristic; this tool type was found by Newcomer (1972) mainly in Ewing's level VI rather than VII, so that we seem to have it starting slightly earlier and spanning part of two of Tixier's Phases (it peaks in his levels 8a-9 equivalent to Ewing's level VI).

To sum up, in spite of certain discrepancies in typological correlations, the two digs are more or less consistent so far as the stratigraphy in general is concerned. Given that Ewing's deposits were dug from within the shelter overhang and Tixier's were outside this, we should not expect complete similarity. For the same reason, neither should we expect that the artifact densities or proportions in which tools were present should match closely, particularly as the amounts dug are not comparable (Bergman is dealing with many thousands of artifacts whereas the small exposure of Tixier produced 442 tools for Phases VI and VII). We have also been warned that (except for the two stony layers of Phases VI and II) the cultures and the deposits are not synchronously divided (Tixier & Inizan, 1981). What could be expected is an overall comparability, so far as can be divined from the two different type-lists used, in the industries at equivalent depths (allowing for the slope of the levels downwards toward the wadi), as well as equivalent dates; these two expectations would seem to be broadly confirmed.

We have already mentioned the dates (c.32,000 - 14,500 years B.P.). The reason that the earlier series is not looked upon with favour is that a somewhat later date is what we would have expected of an industry occurring toward the end of the Pleistocene. On the other hand, the relative positions of all the dates does leave room before the Holocene for the later Kebaran facies which, although eroded off the summit of the shelter deposits, are known to be present in the talus (and of course at the adjacent site of Abri Bergy [Copeland & Waechter, 1968] not to mention Antelias Cave [Copeland and Hours, 1971]).

As to the upper (Epi-Paleolithic) Phases, Tixier and Inizan regard Phase I as Proto-Kebaran but do not name the industries between it and the Upper Paleolithic of Phases VII and VI, except that they consider them as continuations of the evolving Aurignacian. This is not the place to go into the complex question of early Kebaran facies (see Besançon et al., 1977 and Copeland and Hours, 1977), but we recall the opinion of Waechter at the 1969 Conference, that Ewing's V was transitional. This makes it unclear where to end the Upper Paleolithic, in that Tixier amalgamates levels 7 and 8 into one phase which includes levels VI and V of Ewing. As Bergman will demonstrate, there is some justification for dividing them as did Ewing, and regarding VI as belonging to the Upper Paleolithic.

We have mentioned the small burins on a notch characteristic of level VI of Ewing. There is another type of tool which occurs slightly later, peaking in Ewing's level V and continuing into level IV: the Ksar Akil scraper (Copeland, 1984); this occurs in the 'right' place - Tixier's Phase II, above level 7. This artifact type is mentioned because it forms an extraordinary (because so distant) link with an industry in the Negev which, by extrapolation, should be of equivalent age. This brings up the possibility of either actual contact between groups or of the same groups migrating from one zone to another (this was discussed in Copeland, 1984 and by A. Marks, pers. comm.).

As to the new documentation mentioned earlier, this consisted of papers, photographs and charts consigned to J. Waechter by Ewing and his colleagues at the Peabody Museum. We have also obtained permission from Mademoiselle de Saint Mathurin to publish some photographs of the first seasons at Ksar Akil, taken by Father Doherty and sent to Professor Dorothy Garrod, who always took the greatest interest in Ksar Akil; these were found among her effects. They show the skeleton, 'Egbert' in 1938, before he was protected in cement. This complements another series (taken by Ewing in 1947-8) recording his subsequent recovery and preparation for shipment to America. According to a letter written by Ewing in 1966 to J.O. Brew of the Peabody Museum, Harvard, the original skull was given to the National Museum, Beirut. Bergman has included these pictures as Appendix 4.

Another document (see Figure B) seems to be a diagram made by Wright, showing in section the valley fill in the talus between the shelter and the level of the wadi. As plate 2 Appendix 4 shows, all this area had been terraced by local farmers but Wright was able to establish the nature of the underlying deposits (cf. the 'cuts' marked on the plan, figure i in Volume I). There is no indication on the diagram as to where the section was drawn, but it probably continued on from the lower end of the Extension Trench, passing through the dig house. We are able now to correct two words on figure i of Volume I: for 'artifacts to here' below the Extension Trench, read 'artif. terrace'.

Some letters included in the 'lost' archive indicate that the material of the 1937-8 material was divided up in Boston, representative collections being given to various institutions in the United States (e.g. Philadelphia and Chicago). We also learned recently of another collection in Cologne, West Germany (A. Gilbert pers. comm.), although it is not clear what material exists there. We now also have drawings of all the Levalloiso-Mousterian flakes and cores of the 1937-8 season, which were given to the National Museum, Beirut by Doherty and Ewing in 1938.

Gradually, therefore, some of the questions surrounding Ksar Akil are being answered or will be addressed soon. The present volume makes the important contribution: the much-needed and long awaited data on the Later Upper Paleolithic levels at the site.

L. Copeland, November, 1986

For bibliographic references, see Bergman's bibliography, <u>infra</u>.

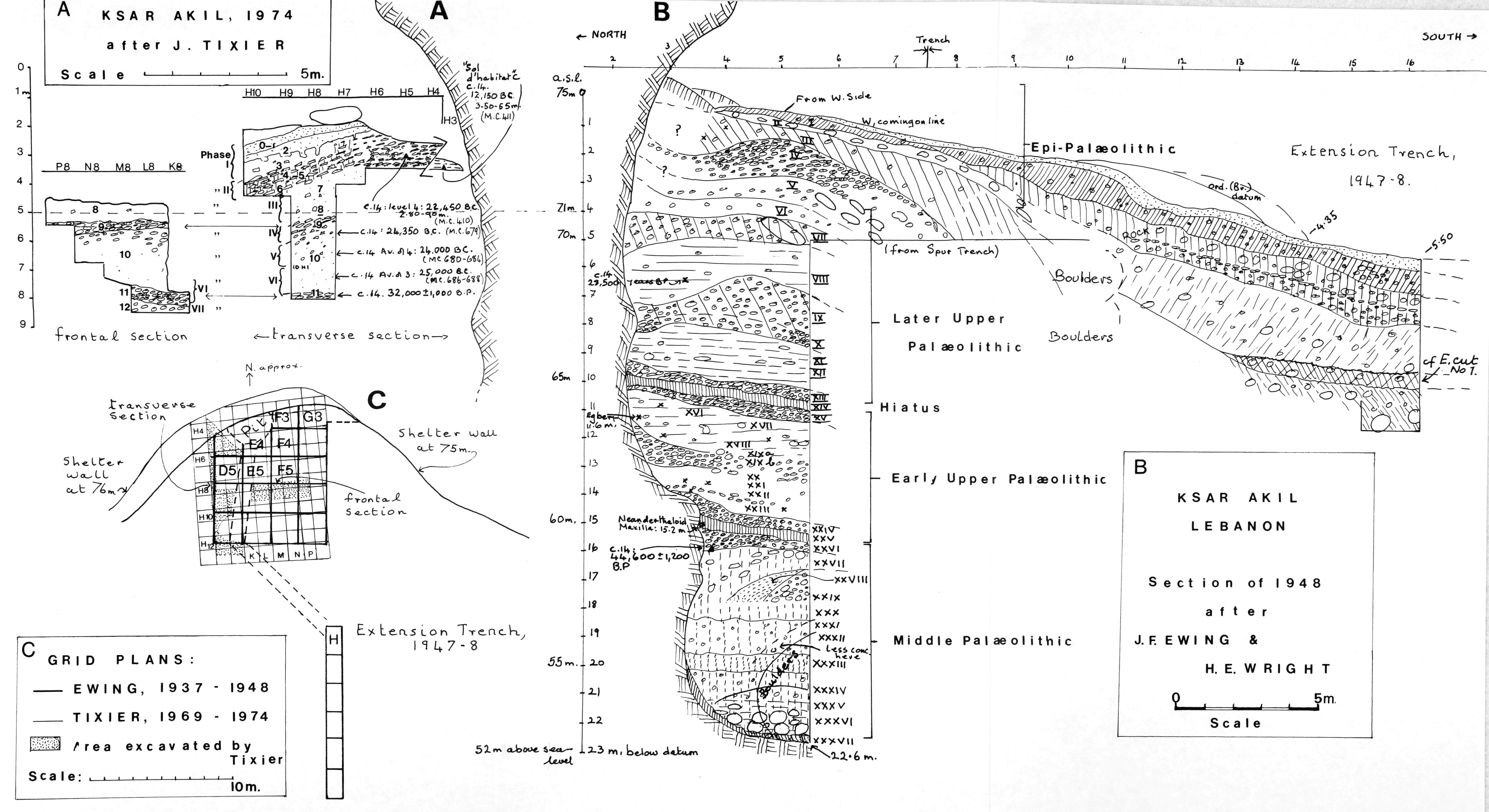
Fig. A: Suggested correlation of the stratigraphy of two excavations at Ksar Akil, based on altitudes above sea-level as published by the excavators.

A: The excavations of J. Tixier (1969-1974), in relationship to the shelter-wall, which is drawn back-to-back with the same wall present in the earlier excavation (Ewing et al., 1937-38; 1947-48). References: Tixier 1970; Tixier 1974; Tixier and Inizan 1981; the Monte Carlo Laboratory (C.14 dates B.C., standard deviations omitted).

B: The Boston College excavations under J.F. Ewing and others, including the Extension Trench of 1947-8 (for a continuation of this to the wadi bed, see Fig. B). The reader is advised to refer also to the plans published as Figs. i and ii in the Preface to Volume I (Azoury 1986). References: Ewing 1947; H.E. Wright Jr. 1960 and 1962: 532-557; an unpublished handwritten section in the possession of the Institute of Archaeology, London.

C: Approximate correlation of the grid plans of Ewing et al. (see Fig. ii, Volume I) and Tixier, based on the above-mentioned publications and documents. For clarity, the differences between the two has been slightly exaggerated (both were drawn as being oriented to the north).

Any mistakes or misrepresentations in A, B or C are the present writer's own, and not the fault of the excavators. The industrial phases named are placed according to Azoury (1986) for the Early Upper Paleolithic and to Bergman, this Volume, for the Later Upper Paleolithic. The Middle Paleolithic and Epi-Paleolithic phases, although described by J. Waechter at the 1969 London Symposium (see also Waechter 1976) are so far unpublished.



A
KSAR AKIL, 1974
after J. TIXIER
Scale 5m.
H10 H9 H8 H7 H6 H5 H4
H3
P8 N8 M8 L8 K8
Phase I
" II
" III
" IV
" V
" VI
VI
VII
"Sol d'habitat" C.14. 12,150 B.C. 3.50-55m. (M.C.411)
c.14: level 4: 22,450 B.C. 2.80-90m. (M.C.410)
c.14: 24,350 B.C. (M.C.679)
c.14 Av. of 4: 24,000 B.C. (MC 680-684)
c.14 Av. of 3: 25,000 B.C. (MC 686-688)
c.14. 32,000±1,000 B.P.
frontal section
←transverse section→
B
← NORTH
Trench
SOUTH →
a.s.l.
75m
71m
70m
65m
60m.
55m.
52m above sea-level
23 m. below datum
From W. Side
W. comingon line
Epi-Palæolithic
Extension Trench, 1947-8.
ord. (Br.) datum
4.35
5.50
ROCK
(from Spur Trench)
Boulders
Boulders
cf E. cut No 1.
c.14 28,500 years B.P.
Later Upper Palæolithic
Hiatus
Egbert 11.6 m.
Early Upper Palæolithic
Neandertheloid Maxilla: 15.2 m.
c.14: 44,600±1,200 B.P
Less conc here
Boulders
Middle Palæolithic
22.6 m.
B
KSAR AKIL
LEBANON
Section of 1948
after
J. F. EWING &
H. E. WRIGHT
0 5m.
Scale
N. approx.
C
transverse section
Shelter wall at 75m.
Shelter wall at 76m.
frontal section
H4 H6 H8 H10 H12
F3 G3
E4 F4
D5 E5 F5
K L M N P
Extension Trench, 1947-8
H
C
GRID PLANS:
EWING, 1937 - 1948
TIXIER, 1969 - 1974
Area excavated by Tixier
Scale: 10m.

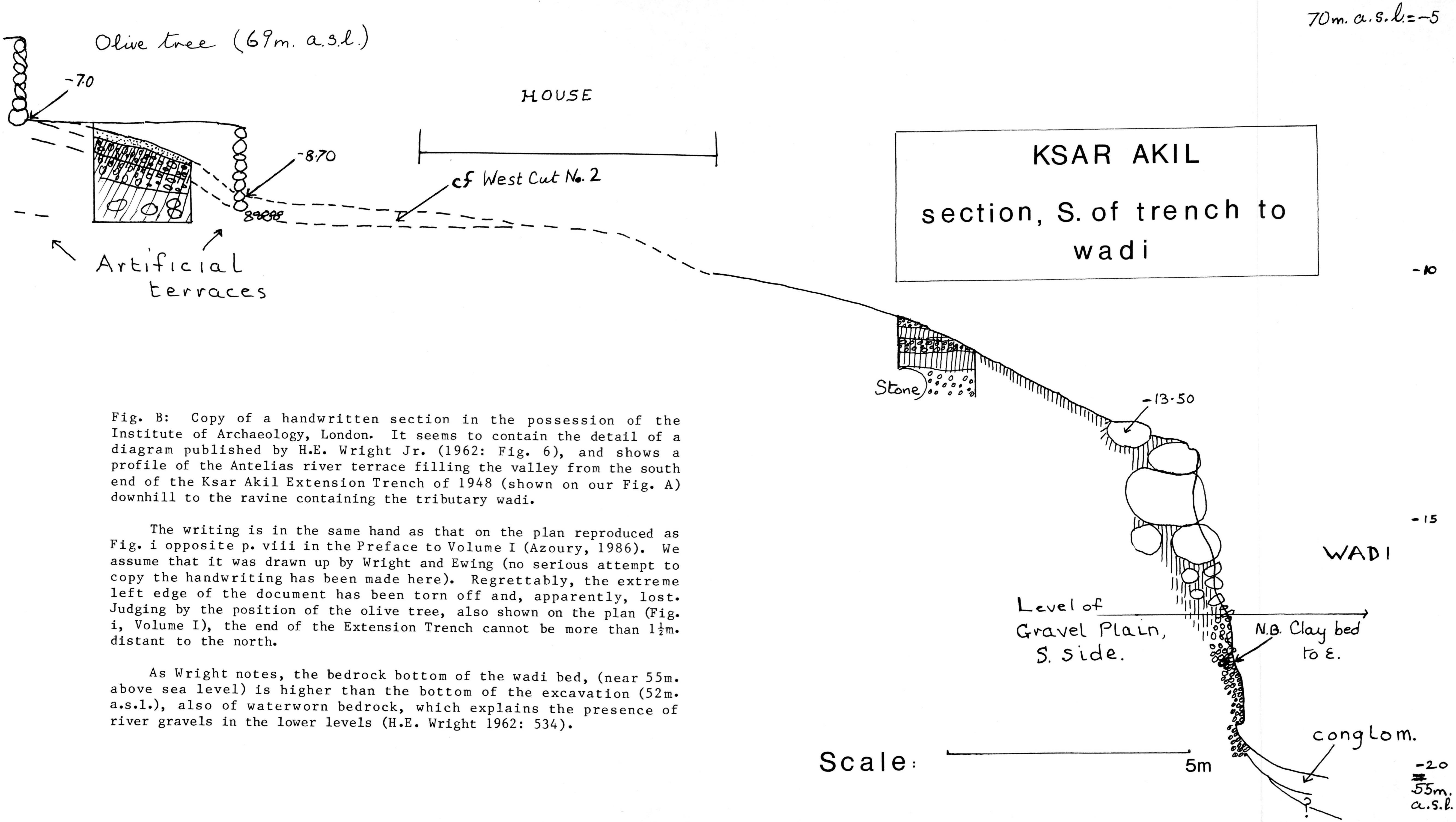


Fig. B: Copy of a handwritten section in the possession of the Institute of Archaeology, London. It seems to contain the detail of a diagram published by H.E. Wright Jr. (1962: Fig. 6), and shows a profile of the Antelias river terrace filling the valley from the south end of the Ksar Akil Extension Trench of 1948 (shown on our Fig. A) downhill to the ravine containing the tributary wadi.

The writing is in the same hand as that on the plan reproduced as Fig. i opposite p. viii in the Preface to Volume I (Azoury, 1986). We assume that it was drawn up by Wright and Ewing (no serious attempt to copy the handwriting has been made here). Regrettably, the extreme left edge of the document has been torn off and, apparently, lost. Judging by the position of the olive tree, also shown on the plan (Fig. i, Volume I), the end of the Extension Trench cannot be more than 1½m. distant to the north.

As Wright notes, the bedrock bottom of the wadi bed, (near 55m. above sea level) is higher than the bottom of the excavation (52m. a.s.l.), also of waterworn bedrock, which explains the presence of river gravels in the lower levels (H.E. Wright 1962: 534).

Introduction

History of Research at Ksar Akil

Ksar Akil is a rockshelter located 10 kilometers north-east of Beirut, in the Lebanon mountain range, about 3 kilometers from the coastal plain (figure 1). The site lies at the base of a limestone cliff on the right bank of the Antelias River Valley.

Excavations began in 1922 when 'treasure hunters' dug through the deposits to a depth of 15 meters. Work was continued by Day (1926 a, b) of the American University of Beirut, who recovered a small amount of flint and bone artefacts. Some of these were sent to Paris and London. The material sent to London is housed in the British Museum and consists mainly of retouched tools. A larger collection can be found at the Museum of the American University of Beirut in Lebanon. All of this material is stored in cloth bags and labelled according to the depth below datum at which it was collected. The artefacts come from eight arbitrary spits: 13-14 meters (m), 11-12 m, 9-10 m, 8 m, 7 m, 5-6.5 m, 2.5-3.5 m and 1-4 m. Very little faunal material exists in this collection and the nature of the excavation renders it scientifically useless.

Shortly after Day's excavation, the site was visited by Passemard (1927), during an archaeological survey in the area, and a small test trench was dug.

On the advice of the Abbé Breuil the rockshelter was excavated again in 1937. The archaeological team came from Boston College, Massachusetts, and was directed by Doherty (Murphy 1938; 1939; for a lengthy discussion of the work of the Boston College team see Bergman and Copeland 1986). In 1938 they were joined by Ewing, who acted as palaeontologist and anthropologist. These excavations represent the first serious attempt at understanding the Palaeolithic sequence at Ksar Akil. The bulk of the material recovered in 1937-1938 is currently stored at the Institute of Archaeology, London, and forms the basis of this volume.

During the first two seasons at the site, a datum point at 80.9 m above sea level was established (Ewing 1947). This datum should not be confused with that used on Wright's section (figure 3) which is apparently 75 m above sea level (see Copeland's discussion in the preface on the problems associated with the datum point). Excavations began in 2 m square units (figure 2) and reached a depth of 19 m, which was about 4 m above bedrock (Newcomer 1972: 7). The excavators did not employ three-dimensional recording of the artefacts but did attempt to follow the natural stratigraphy. After the first two seasons, the Second World War intervened and work was not resumed until 1947. The material excavated in the last two seasons (1947-1948) is housed in the Peabody Museum, Harvard University. The amount of material in the Peabody Museum appears to be roughly equal to that recovered in 1937-1938 (A.E. Marks pers. comm.). For an excellent series of previously unpublished photographs of the 1937-1938 and 1947-1948 Boston College excavations see appendix 4 in this volume.

In 1969 an important new series of excavations were begun by Tixier (1970; 1974; Inizan and Gaillard 1978; Tixier and Inizan 1981). Using careful techniques such as the three-dimensional mapping of artefacts, Tixier established a finely divided stratigraphic sequence. One of his more important observations concerns the fact that the archaeological phases recognised in his excavations do not follow sedimentological changes. After reaching a depth of some 8.75 m, corresponding roughly to the top of level X of the earlier excavations (see the stratigraphic correlation by Copeland in the preface), Tixier was forced to suspend his work at the site in 1975 because of the civil disturbances in Lebanon.

No attempt will be made in this volume to present a precise correlation of the assemblages excavated by the Boston College team with those of Tixier. There are several reasons for avoiding this: 1) many of Tixier's levels contain less than 100 retouched tools, 2) little detailed information has appeared on the flaking technology from the 1969-1975 excavations and 3) Tixier's type list is highly specific and difficult to compare with other lists in use in the Levant (for example, el-Wad points are said to be <u>outils caracteristiques</u> in level 12 but do not appear on the published type list; Tixier and Inizan 1981). From the description of the archaeological phases recognised by Tixier (Tixier and Inizan 1981: 360) it is possible to provide only the following rough comparison:

Boston College 1937-1938	Tixier 1969-1975	
<u>level</u>	<u>phase</u>	<u>level</u>
VI	IV	8AC-10A
?	V	10B-10H(1)
VII-VIII	VI	10H2-11C
IX-(X?)	VII	12

In the 1970s, a series of theses were completed dealing with the material from the 1937-1938 excavations at Ksar Akil. Dortch (1970) studied levels VIII-VI in the upper part of the sequence. He regarded these levels as late Levantine Aurignacian and directly related to the material found in levels XIII-IX. Based on the typology of the artefacts, he concluded that levels VIII and VII were similar as both have relatively large numbers of scrapers with few burins (Dortch 1970: 156). On the other hand level VI, which was characterised by burins and especially burins on a notch, represented the terminal Upper Palaeolithic at Ksar Akil.

As part of his dissertation on the Epi-palaeolithic of Palestine, Bar-Yosef (1970) examined levels I-IV of Ksar Akil. Levels I and II contained large numbers of non-geometric microliths (Bar-Yosef 1970: 49; table 7) which make up over 50% of the tool assemblages in both levels. He concluded that the "upper layers of Ksar Akil represent

Kebaran-type assemblages in which the obliquely truncated bladelets, however, are almost completely absent" (Bar-Yosef 1970: 50).

Azoury (1971; 1986) concentrated on the early Upper Palaeolithic levels at the site. Using the technology and typology of the artefacts, she was able to divide the sequence into three phases with several subphases. Levels XXV-XXI became Ksar Akil phase 1, while XX-XV became phase 2. Technologically, the former is characterised by a flaking technology that utilises platform faceting. Common products of debitage in levels XXIII and XXII are pieces morphologically identical to Levallois points. Also included in these assemblages are numerous chamfered pieces and truncation burins (Newcomer 1968-1969; Azoury 1986; Ohnuma and Bergman in press). In the second phase there is a shift in the flaking technology accompanied by the production of numerous retouched blades and points (Ksar Akil points or el-Wad points). Using the current terminology in the southern Levant, assemblages like that of level XVII (phase 2) would be regarded as Ahmarian (Gilead 1981a, b; Marks 1981; see glossary). Phase 2 was followed by a sterile level (XIV) and after this began the assemblages known as Levantine Aurignacian A (Wenner Gren Symposium 1969; Besançon et al. 1977; Azoury 1986).

A detailed study of the burins from the site was completed by Newcomer in 1972. His work dealt with the typology and technology of burin manufacture at Ksar Akil. He found that each of the phases is characterised by specific burin types or, like phase 2, a lack of burins altogether. The entire sequence is covered in his thesis and aside from minor differences he reaches the same basic conclusions as Dortch and Azoury.

Since 1972 numerous reports about the material from the earlier excavations have appeared (see for example, Newcomer 1971; 1974 a, b; Hours 1974; Copeland 1975; Besançon et al. 1977; Bergman and Newcomer 1983; Marks 1983a; Bergman in press). Those dealing with the flint artefacts have been mainly concerned with typological and technological changes in the assemblages over time. In general, they follow a unilinear model of development similar to that posited by Neuville (1951) in Palestine over 30 years ago (Wenner Gren Symposium 1969; Hours et al. 1973; Copeland 1975; Besançon et al. 1977). In the upper part of the sequence, levels XIII-VI at Ksar Akil, the stone tool assemblages were regarded as developmentally linked to each other and part of an unilinear evolution within the Aurignacian of Lebanon. As will be seen below, this position must be rejected for levels XIII-VI as there are breaks in the sequence previously regarded as Levantine Aurignacian A, B and C.

Problems in Studying the 1937-1938 Excavations of Ksar Akil

The nature of the 1937-1938 excavations has placed certain limitations on this study. Several problems were encountered during the course of examining the collections and these are outlined below.

1) Tixier's excavations have revealed that the upper levels have fine and complex stratigraphic divisions. The thick geological levels recognised by the Boston College team has caused some minor mixing of

the archaeological layers and their artefacts. It is possible that this mixing has led to a slight 'blurring' of breaks in the stratigraphic sequence. In one case it can conclusively be proven that some difficulty existed in separating two contiguous levels (IX and VIII) resulting in one of them appearing 'transitional' between two distinct phases. However it must be stated that, in the author's opinion, the degree of mixing is relatively insignificant and seems to be confined to the interfaces between contiguous levels.

2) It would appear that artefact collection was limited in many cases to recognisable tool forms. The general absence of 'chips', burin spalls and small tools (Tixier and Inizan 1981; Azoury 1986) is probably related in part to the mesh size of the sieves used. Murphy (1938: 237) reports that a 'medium grade' sieve was used on all the sediments. The fact that most of the digging was carried out by local untrained Lebanese, even though under supervision, probably also contributed to poor recovery.

3) The amount of material encountered caused the excavators to discard some of the artefacts. To quote Murphy (1939: 212): "The flint industry of Ksar Akil is extraordinary if we consider the abundance numerically, and this in spite of the area excavated. During the first campaign, even the number of rejections was high." It is impossible to be certain exactly what criteria were used when artefacts were thrown away (Azoury 1986: 88).

4) A further difficulty in studying this material has to do with the storage and handling of the artefacts since 1938. As far as is known the present collection at the Institute of Archaeology, London, consists of most of the material from the 1937-1938 seasons. A number of pieces have been individually marked with their level and square, while occasionally the depth below datum appears. These were then stored in labelled cardboard boxes. Frequently during this study a box labelled as coming from one square was discovered to contain artefacts from another. Many unmarked tools had to be discounted for the technological study in chapter 2 because of uncertainty regarding the excavation unit from which they had come. In a number of cases it was impossible to locate artefacts described or illustrated previously. This is in part due to the fact that some retouched tools were removed by Azoury to be drawn and are now in Beirut, Lebanon. Another factor which contributed to the problems above is that many people have examined the collections over the last 20 years leading inevitably to some artefacts being misplaced or returned to the wrong boxes.

All of these factors should cause anyone dealing with these collections to exercise extreme caution. As stated earlier, most work on the site has focused on the typology of the tools and their relative percentages in the various assemblages. For the above reasons none of the levels can be regarded as complete, and so studies based on tool or debitage frequencies alone can be misleading.

Purpose and Method

The main aim of this volume is to examine the flaking technology in levels XIII-VI from Ksar Akil. This work forms the second and concluding volume on the Upper Palaeolithic material from the site (volume I was written by Azoury 1986).

While parts of this sequence have been examined, there are three levels (XI, X and IX) that have not been described in detail. Levels X and IX are especially interesting because of recent developments in other parts of the Levant. Gilead (1981a: 7) points out that several levels at Qaftza Cave previously classified as Levantine Aurignacian B are now thought to belong to another cultural tradition altogether. As levels X and IX at Ksar Akil have been regarded as Aurignacian B (Besançon et al. 1977), it was felt worthwhile to see if this was true for Ksar Akil as well.

Recently, the use of the term Aurignacian in Levantine Palaeolithic studies has been changing. A new definition of the term has been proposed by prehistorians working in the southern Levant. As Ksar Akil was one of the earliest sites studied to have material described as Aurignacian the relevance of the new definition to levels XIII-VI will be considered.

One of the first problems that needed to be dealt with prior to analysis of the artefacts was the thickness of the archaeological layers. All previous research has accepted these as single units and treated the artefacts accordingly. In the technological study in chapter 2 of this work the arbitrary excavation spits have been used to reduce the overall thickness of the levels (figure 4). The artefacts have been studied as if each spit represented a distinct 'level.' The spits were then assessed in relation to each other as well as to the level as a whole. The use of this method has also provided an opportunity to examine the possibility of mixing between levels.

The selective collection of artefacts has certainly influenced the frequencies of the various tool types. To avoid biased results, this study has concentrated on the flaking technology as aspects of it can be found on both tools and debitage. However, typological analysis has not been eliminated as there is still information to be gained from the presence and morphology of the various tool types in a level. Chapter 3 (part 1) deals with the typology of the artefacts and presents detailed counts of the retouched tools in each level. The second part of chapter 3 integrates the technological and typological studies with the aim of understanding each complete assemblage.

It is worth noting that even if these collections were regarded as representative of the true stratigraphic sequence and its contents, the use of typological indices alone to define a culture or phase would be inappropriate. Most archaeological sites show some tendency towards horizontal variability. The assemblages studied here are nothing more than a collection of artefacts from a geological unit of excavation within a much larger area. While the presence of certain individual tool types may have some cultural significance, the chances are these are also related to specific activities at the site. An excellent example of this comes from the open-air site of Boker (area BE, level III) in the Negev (Marks 1976a), where most el-Wad points come from a relatively small area of the site.

The large number of artefacts recovered from the 1937-1938 excavations necessitated the use of sampling. Two squares were chosen, E4 and F4, and all of the artefacts which could be identified as belonging to a specific spit were examined. These two squares were selected because artefacts from both appear in almost every level from XXV to VI giving a complete sample from the entire Upper Palaeolithic sequence (see Azoury 1986 for an analysis of levels XXV-XII). In the technological analysis of the levels all of the retouched tools were measured as well as the complete pieces of debitage. Broken flakes and blades were excluded because they present incomplete information. It should be remembered, therefore, that the figures presented in the tables at the beginning of the discussion on each level are lower than the actual numbers of unretouched pieces. This particularly pertains to blades that are relatively thin and prone to breakage. For the total number of unretouched pieces in each level see pages 120-136.

To analyse the artefacts, a list was created composed of attributes that would best describe the flaking technology. Among these are the overall dimensions of a flake, blade or tool as well as its butt. These pieces were measured at the maximum length and width; the thickness measurement was obtained at the middle of the blank. The flaking angle was measured with an engineer's protractor or goniometer. The qualitative data include aspects of the lateral edges, distal end and profile (as in Marks 1976b: 372-373; see pages 279-283 in this volume). A method of determining the kinds of hammers used during flaking was also used (Ohnuma and Bergman 1982). These data were then counted and processed using the Statistical Package for the Social Sciences (Nie et al. 1975).

The type list used to describe the retouched tools in the chapter dealing with the typology of levels XIII-VI is taken from Hours (1974) and Azoury (1986). The definitions of each tool type offered by Azoury (1986: 42-62) are generally accepted and followed in this work. There have been a few modifications to her type list notably the removal of tools like chamfered pieces, which are absent in levels XIII-VI, and the grouping of all the carinated tools together (see the discussion on carinated tools in the glossary below). An abbreviated list consisting of the major classes of retouched tools in Hours' type list (1974) was used for the technological study.

Glossary

Most of the terminology in this text follows that of previous authors working in the Levant (Newcomer 1972; Hours 1974; Marks 1976b; Azoury 1986). However, a few terms are relatively new or open to subjective interpretation and warrant some discussion.

Ahmarian

This term, taken from the site of Erq al-Ahmar in Israel, has been introduced by prehistorians working in the southern Levant to describe Upper Palaeolithic flaked stone industries which are dominated by blade/lets as well as backed pieces and el-Wad points. Gilead (1981b: 340) describes the Ahmarian in the Negev and Sinai as being characterised by the "significant production of blade-bladelet debitage as well as retouched and backed blades, bladelets and points (≥ ca. 30-40%) and low to medium quantities of end-scrapers and burins (≤ ca. 40%)." At Ksar Akil the assemblages in phase 2 (eg. level XVII) would be regarded as Ahmarian (Gilead pers. comm; Gilead 1981a: 271) although the number of burins is exceptionally low.

Aurignacian

When Day (1926a) excavated at Ksar Akil in the 1920's he dug a shaft near the shelter wall some 15 m deep. In his brief report he stated that the material recovered in the various levels had no "marked differences" and "clearly belongs to the Upper Palaeolithic, although there are certain Mousterian types." Passemard (Day 1926a) remarked that it appeared to be entirely "Aurignacian although certain types are lacking, such as the Chatelperron point and the Gravette point."

The trend to compare and evaluate the site by using Western European terminology was continued by Murphy (1938). He also labelled the entire Upper Palaeolithic sequence as Aurignacian and divided it into three stages: Lower, Middle and Upper. Ewing (1947) however, referred to the material at 12.0-15.0 m below datum as a transitional zone containing a "mixture of Levalloiso-Mousterian and Aurignacian tool types." The next series of levels at 7.0-12.0 m were called Chatelperronian because they contained numerous backed blades and points similar to the French industry of the same name. Ewing divided the sequence into five distinct cultural phases: Levalloiso-Mousterian, Transitional, Chatelperronian, Middle Aurignacian and Gravettian. While most of the early reports on the site regard all the Upper Palaeolithic material as Aurignacian, Ewing (1947) was among the first to refer to a specific part of the sequence as the "true Aurignacian, very typical in nature." As can be seen from the discussion above the term Aurignacian was originally used in France and the Levant to designate all Upper Palaeolithic industries. Ewing, however, used this term in the same way as Peyrony, the French prehistorian, who regarded the Aurignacian as culturally distinct from other early Upper Palaeolithic material such as the Chatelperronian or Perigordian.

In 1969 an important conference on the terminology of the Palaeolithic in the Levant (Wenner Gren Symposium 1969) was held at the Institute of Archaeology, London. At the conference work on the site of Ksar Akil dominated the discussion on the Near Eastern Upper Palaeolithic. As Copeland (1986) remarks, the participants attempted to use the long sequence at Ksar Akil to establish a chronological framework for the Upper Palaeolithic. This would replace or supplement that proposed by Neuville (1951) and encompass the whole of the Levant. During the discussions Waechter proposed that the material in levels XIII-VI be referred to as Aurignacian. As he never published any reasons for calling this material Aurignacian it is felt worthwhile to reproduce the discussion on the subject below. The following excerpt was recorded by Azoury, Copeland and Newcomer at the Wenner Gren Symposium, London, 1969.

Waechter: Ksar Akil levels 13-11 are a Near Eastern Aurignacian. In 10 and 9 there is a great increase in the number of steep scrapers. Remove these and the rest of the industry looks much like 13-11.

Bordes: I have studied some of these levels and see close similarities with the French Aurignacian, so close in fact that 'Aurignacian' seems the best term for them. I made some tool counts, that for level 10 is as follows:

Ksar Akil level 10 (343 tools)

IG = 43.7

IB = 20.1 (IBd = 14, IBt = 5)

IGA = 25.9

"Font Yves points" = 9.6%

The cumulative graph for this level is strikingly similar to the Aurignacian of Font Yves.

Hours: Ksar Akil levels 13-9 seem to be the same culture.

Bar-Yosef: I suggest we call it 'Levantine Aurignacian' (agreement).

Hours: This is better than 'Antelian' as the site of Antelias was dug long ago and is now completely destroyed. We can subdivide levels 13-9, calling 13-11 'Levantine Aurignacian A' and 10 and 9 'Levantine Aurignacian B' (agreement).

Bar-Yosef: In Palestine there seems to be two phases also, for example, at Hayonim where there is a lower layer with el-Wad points and an upper layer without them.

Waechter: Ksar Akil levels 8-6 recall levels 13 and 12 but they are rougher and impoverished. The characteristics are as follows: 1) thick, poorly made scrapers, 2) small burins on a notch (which die out in 5 and 4), 3) small retouched blades and 4) Dufour bladelets in level 6.

Solecki: Perhaps the small size of this industry is related to the raw material.

Waechter: No, they seem to have had the same material as earlier levels but just preferred small tools.

Bordes: My count for level 6 gave the following:

Ksar Akil Level 6 (455 tools)

IG = 23.7

IB = 52.6 (IBd = 39.8, IBt = 11.2)

IGA = 8.2

Inverse retouched bladelets = 5%

Backed bladelets = 8.6%

'Font Yves points' = 0.7%

Level 6 is like an evolved Aurignacian with a reverse in the percentages of burins and grattoirs. The cumulative graph of this level is, oddly enough, like that for the lower Magdalenian in France.

Waechter: Level 5 is more Kebaran. I suggest we make a break between 6 and 5.

Bar-Yosef: But I thought you had previously indicated that the Kebaran began in level 4.

Waechter: Level 5 is perhaps transitional, but there are the unique serrated scrapers which occur only in levels 5 and 4. Although Rust, Echegaray, etc. have used the term Athlitian for the similar industry at el-Wad C I don't like it. El-Wad C is probably a local variant of Ksar Akil 8-6.

Ronen: The percentages of burins and scrapers at el-Wad C are very similar to those given by Bordes for level 6.

Bar-Yosef: Yes, and many of Garrod's 'steep scrapers' are cores which reduces the high percentage of steep scrapers at el-Wad C.

Waechter: I suggest we drop 'Athlitian' and call the industry from Ksar Akil levels 8-6 'Levantine Aurignacian C' (agreement).

As this lengthy quotation illustrates, the primary reasons in 1969 for labelling the material Aurignacian are typological. As much of the focus of prehistoric studies at this time was grounded in the 'Bordean method' of analysing assemblages by indices of tool types, it is hardly surprising that little was said about the flaking technology in these levels.

In 1977 Besançon et al. published an important study of the Upper Palaeolithic sequence at Ksar Akil and correlated it with other parts of the Levant. They used the terminology proposed by Waechter and accepted by the participants at the Wenner Gren Symposium (1969) to describe levels XIII-VI (ie. levels XIII-XI = Levantine Aurignacian A, levels X-VIII = Levantine Aurignacian B and levels VII-V = Levantine Aurignacian C). However, for some unstated reason levels VIII and VII were separated into different phases which was not part of the original scheme presented by Waechter. Once again, the typology of the artefacts seemed to be the main criterion for dividing the sequence. In spite of the detailed nature of the report, which was accompanied by illustrations of the typical tools, there was still no definition of the Aurignacian at Ksar Akil.

Recent work in the southern Levant has provided some important data for prehistorians working on the Upper Palaeolithic. It is now clear that the further south one travels from Lebanon the greater the divergence from the Upper Palaeolithic sequence at Ksar Akil. Ksar Akil can no longer be regarded as a Near Eastern 'type site' (Copeland

1986). Prehistoric sites in the Negev and Sinai have provided a different interpretation of the term Aurignacian (Gilead 1981a,b; Marks 1981) which is used to describe flake oriented assemblages containing numerous scrapers and burins. Gilead (1981b: 339) states that the Aurignacian is "technologically dominated by the production of flakes over blades and typologically by the end-scrapers (steep or flat), the burins or both ($\geq$ ca. 50%), as well as low quantities of bladelet tools ($\leq$ ca. 20%)."

Bar-Yosef (in press) has expanded the definition above to account for the presence of osseous tools stating that, "Over 50% of the tools and debitage are flakes, nosed and carinated scrapers are in abundance, Aurignacian blades are present and in cases of good bone preservation, numerous antler and bone tools." The relevance of these definitions to the site of Ksar Akil will be discussed in the concluding chapters.

Blade/let

For the purposes of the technological discussion in the first part of this work (all of the sections in chapter 2) there is no distinction made between a blade and a bladelet. The samples examined from levels XIII-IX display no bimodal distribution of widths indicating a separation between blades and bladelets. The unimodal distribution seen in figures 20 and 44 is directly related to the nature of the flaking sequence which initially produces large, wide blades that gradually become smaller and narrower as debitage proceeds. In most levels at Ksar Akil, there does not appear to be separate reduction sequences for blades and bladelets. An exception to this is level VI (and probably VII and VIII as well) where tiny bladelets are produced for microliths. Given the size of these tools in level VI (some are less than 14 mm long and 5 mm wide) it is highly likely that they do not derive from the reduction of a blade core but rather come from pieces normally classified as tools, like end-scrapers and burins.

In the type lists for levels XIII-VI on pages 120-136, the blades and bladelets are separated for descriptive purposes using the arbitrary measurement of 12 mm width suggested by Tixier (1963).

Break - archaeological and stratigraphic

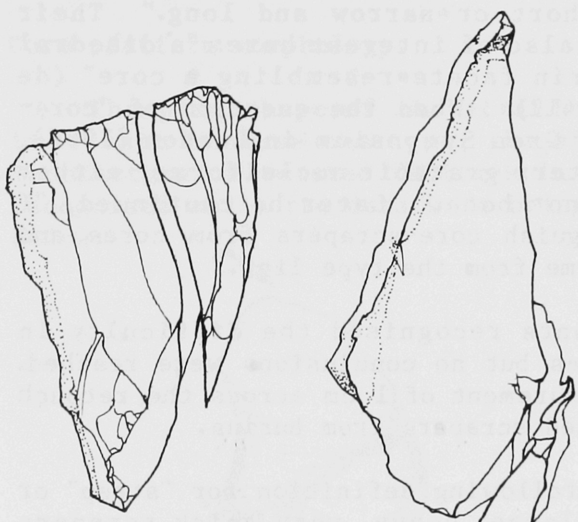
In this volume these terms have two slightly different meanings. Stratigraphic break is used to describe a major hiatus like the sterile level XIV that separates the early Upper Palaeolithic material in levels XXV-XV from levels XIII-VI. An archaeological break denotes a significant shift or change in the cultural material in the various levels discussed here.

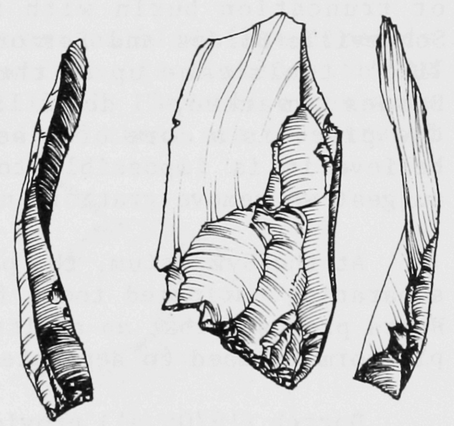
Burin spalls

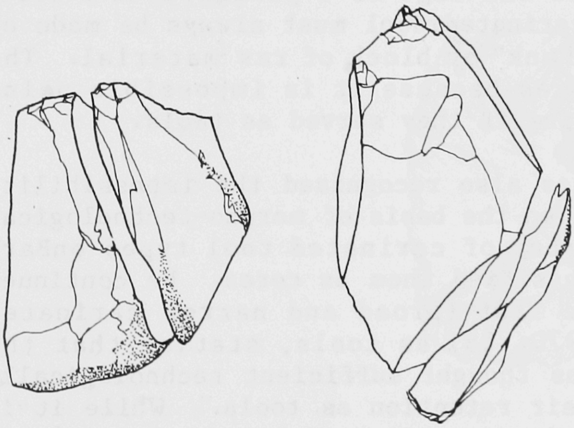
Unless an artefact could positively be identified as a burin spall, it was treated as an ordinary blank. Many spalls removed from multifaceted (or carinated) burins are identical to tiny bladelets produced on cores.

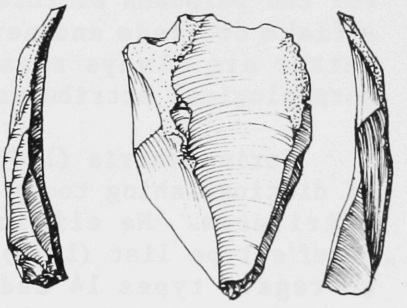
Butt, imitating a dihedral burin

This term was used by Tixier and Inizan in 1981 to describe a blank with a butt that appears to be a dihedral burin formed by two sets of facets (see also Newcomer 1972: 42). In reality, the piece is made by an offset blow that removes a substantial part of the platform and flaking face of the core. The butt is usually offset to the left of the long axis of the blank.









Carinated pieces or tools

This category of artefacts is one of the most problematic of all in levels XIII-VI. There have been many attempts to classify these tools in Western Europe and the Near East. The term carinated end-scraper appears on de Sonneville-Bordes and Perrot's type list (1954: 332) and is defined as an "end-scraper made on a thick flake having a profile of an inverted keel; the scraper front is made by lamellar retouch which may be wide and short or narrow and long." Their definition of a core-like burin is also of interest here: "a dihedral or truncation burin with many burin facets resembling a core" (de Sonneville-Bordes and Perrot 1956: 412). When the question of 'core-like' tools came up at the Wenner Gren Symposium in London (1969), Bordes remarked, "I don't like the term grattoir nucleiforme: either the piece is a core or a scraper, not both." Later he continued, "I believe it is impossible to distinguish core-scrapers from cores and suggest we remove grattoir nucleiforme from the type list."

At the Symposium, the participants recognised the difficulty in separating carinated tools from cores but no conclusions were reached. Hours proposed that an arbitrary measurement of 1 cm across the retouch platform be used to separate carinated scrapers from burins.

Dortch (1970: 41) provided the following definition for "steep" or carinated scrapers at Ksar Akil: "large, heavy, very thick scrapers made on massive flakes, very thick fragments or chunks, cores or fragments of cores..." He continued, "steep scrapers made on cores differ from cores only because of the extensive secondary retouch which has been applied to the periphery of the flaking face." The problem with this definition is that there is no way to tell what is retouch and what is simply preparation of the edge of a platform on a core. For the purposes of this work, a carinated tool must always be made on a flake or blade and never on a "chunk" or block of raw material. The latter are always regarded as cores because it is impossible using morphological attributes to determine if they served as tools.

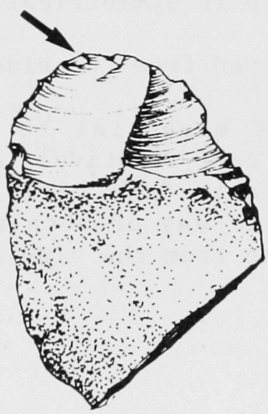
Goring-Morris (1980: 45-46) has also recognised the impossibility of distinguishing tools from cores on the basis of morpho-technological attributes. He eliminated a number of carinated tool types onBar-Yosef's type list (1970) and re-classified them as cores. He continues to regard types 14 and 15 on the list (broad and narrow carinated scrapers on flakes; Bar-Yosef 1970: 18) as tools, stating that the "fact that they occur on flakes was thought sufficient technologically and morphologically to warrant their retention as tools." While it is agreed that carinated tools must be made on flakes or blades, it should be pointed out that some blanks from levels XIII-VI come from cores made on flakes. These pieces are not the by-products of tool manufacture as some are quite large.

The approach used here is similar to Goring-Morris' in that it reduces the number of carinated tool types. No attempt is made to separate carinated scrapers from burins as it is difficult to prove that discrete types exist (Sala 1982). Tools are separated from cores simply on the basis of the type of blanks they produced. For example, in level XI there are numerous lateral carinated scrapers (as defined by Marks 1976b: 380-381). The removals forming the scraper edges are too short to have been used as blanks for tools in level XI. However, in level VI there are numerous non-geometric microliths and these tiny retouched bladelets could easily have been made on the by-products of carinated tool manufacture. In this level it must be admitted that pieces classed as tools may have served as cores just as French <u>lamelles Dufour</u> are often made on scraper spalls (de Sonneville-Bordes 1960).

Core platform morphology

The plan shape of the striking platforms on blade/let cores is important because one type, the offset platform, is linked with the manufacture of twisted debitage in levels XIII-XI. Several types were recognised while the data were being recorded and these are illustrated below:

offset



semicircular

straight

el-Wad points

Previous authors working on levels XX-XV at Ksar Akil (Hours 1974; Copeland 1975; Bergman 1981; Azoury 1986) have referred to blades pointed by retouch as Ksar Akil points. Similar tools from the Lagaman of Sinai have been called el-Wad points (Bar-Yosef and Phillips 1977). From the illustrations of both of the tool types it is obvious that they are typologically identical. It should be noted that when the term Ksar Akil point is used in this volume it is equivalent to the el-

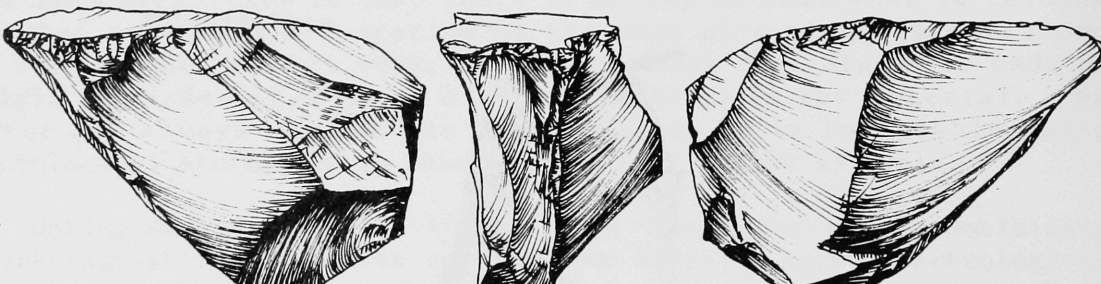
Wad points of the Lagaman.

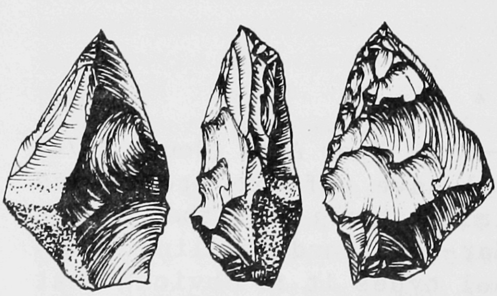
In Ksar Akil levels XIII-XI el-Wad points are made on twisted blade/lets and have asymmetrical tips. While these tools are morphologically quite distinct from the points found in southern Israel (Marks 1981: 350-351), they are identical to the tools that Garrod called Font Yves points in 1937 (Garrod and Bate 1937: 48). At the Wenner Gren Symposium in London (1969) it was decided to rename them el-Wad points.

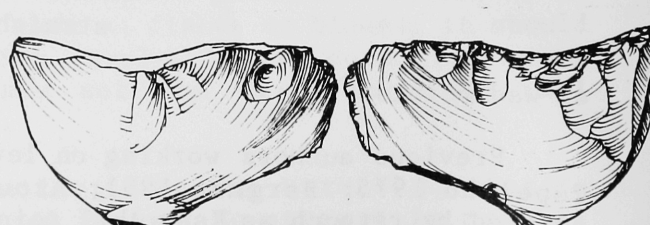
Another type of el-Wad point occurs in levels X and IX. These el-Wad variants differ from those described in the Negev (Marks 1976b: 381; Bergman 1981) in that they usually have only small amounts of inverse retouch at the proximal end of the piece. At Ksar Akil the blanks selected to make el-Wad variants are straight or curved and the pointed tip is symmetrical.

Flake removed from the side of a core platform

It is essential to keep the platform and flaking face on a blade/let core relatively narrow in order to successfully produce long, narrow blanks (see Texier 1982: figure 1). At Ksar Akil in levels XIII-VI one way of obtaining a narrow flaking face was to remove a large flake from the side of the striking platform.







Partially crested piece

This is a blade or flake in which cresting occurs on only part of the dorsal surface. It is often the result of core maintenance or repair (see Marks 1983b: figure 6-28 for an example of cresting used to repair a hinge fracture on the flaking face).

Stage (or phase)

These terms are used in a purely descriptive sense to designate the subdivisions of levels XIII-VI proposed in this volume. They are used only to describe the site of Ksar Akil and have <u>no relationship at all</u> to the scheme proposed by Neuville (1951) in Palestine. It should also be noted that they do not necessarily imply a unilinear or developmental evolution of the flaked stone industries within levels XIII-VI.

The following chapter and its individual sections will discuss the technology of the eight levels in detail. Each level is presented beginning with the deepest spit examined. A table listing the number of tools and debitage measured appears after the introductory remarks.

XIII: E4; F4 and F3

In level XIII three 2 m square units were excavated, E4, F4 and F3. The flint assemblage appears to have been embedded in cave earth and ash and/or in the upper stony layer of complex 2 (Ewing 1947). In complex 2 there is a red clay layer about 30 cm thick that represents a soil formed by intensive weathering of a calcareous brown earth. Ewing (1963) reported that the red clay was sterile and Wright (1962; Newcomer 1972; Azoury 1986) suggested that this represents a break in the stratigraphic sequence. Certainly, the stone industries recovered below this complex (Azoury 1986) differ technologically and typologically from those described in this volume.

All three squares were examined because the sample from this level is so small. Square E4 begins at 10.65 m and ends at 10.45 m. F4 starts at 10.40 m and finishes at 9.90 m. F3 begins at 10.30 m and ends at 9.70 m. The thicknesses of the spits are 20 cm, 50 cm and 60 cm, respectively.

Debitage	E4 10.45	F4 9.90	F3 9.70
flakes	6	62	3
blade/lets	13	62	5
crested pieces	-	8	-
core tablets	1	8	-
flake cores	3	11	1
blade/let cores	7	17	4
burin spalls	-	4	-
total	30	172	13
Tools			
scrapers	2	1	-
carinated pieces	1	-	1
burins	12	12	-
piercers	-	-	-
truncations	-	1	2
notches/denticulates	-	4	-
composite tools	-	1	-
retouched blade/lets	1	7	-
retouched flakes	2	1	2
el-Wad points	-	1	1
total	18	28	6

XIII E4 10.45

flakes (6)

The six flakes average 49 x 37 x 10 mm with standard deviations of 7, 11 and 1. The butts are rather large with a mean of 14 x 6 mm (s.d. = 3 and 1) which indicates that the point of percussion was well away from the edge of the striking platform. Only two examples show signs of platform abrasion. The fact that the point of percussion is on the platform rather than at its edge made this core preparation technique unnecessary. Half of the flakes have more than 25% of their dorsal surfaces covered with cortex. Five are soft hammer-struck, while the sixth example was unidentifiable because of the coarse grain of the flint (see Ohnuma and Bergman 1982 for problems in identifying flaking hammers on coarse grained flint).

blade/lets (13; figure 5: 5)

The 13 blade/lets average 53 x 19 x 7 mm with standard deviations of 10, 5 and 2. The butts are small with a mean of 6 x 3 mm (s.d. = 3 and 2). Their small size is due to the fact that the point of percussion was close to the platform edge. Careful preparation is essential to prevent crushing; accordingly 10 examples show signs of abrasion. All of the blade/lets are soft hammer-struck. In profile seven examples are twisted, while six are curved. Included in this group are five plunging blade/lets, all of which come from unidirectional cores except one, which comes from an opposed platform core. Three blade/lets are burned.

core tablet (1)

The only core tablet is hard hammer-struck and comes from a core with a plain platform.

flake cores (3)

One of the three flake cores is made on a flake with the lateral edges forming the striking platform. The removals are on the ventral surface and the flakes detached are short, terminating in hinge fractures. The second core has been flaked alternately (ie. where one flake removal scar forms the platform for the next flake detached) around its entire surface area. The final example has a single, plain platform and is only 28 mm in length. This last core appears to be a blade/let core in the final stages of reduction.

blade/let cores (7; figure 6: 1-2)

Five of these cores have single platforms, one has crossed platforms (Brezillon 1977: 89) and the last has two platforms that do not share the same flaking face. Most of the platforms are plain and two examples have platforms which, in plan, are offset to the left (as in figure 6: 1). In length they average 38 mm with the longest flaking face being 58 mm. (It must be remembered that this measurement is taken from cores that have been previously flaked and does not reflect initial core length). The flaking faces are curved in profile and the removals unidirectional. The majority have parallel scars with no twist. Two examples preserve cortex on their backs and one had a large flake removed from its side to narrow the width of the platform and flaking face (figure 6: 1).

end-scrapers (2; figure 5: 1)

There are only two examples of this type, one made on a blade and the other on a flake. The former is made on the proximal end of a blank that plunged and removed an opposed platform; this piece is also burned. The second example is made on a soft hammer-struck flake that is denticulated on its left lateral edge.

carinated piece (1; figure 5: 2)

The single example of this type is made at the proximal end of a thick, cortical blade. The tool measures 69 x 28 x 17 mm.

burins (12; figure 5: 3-4)

Nine of the 12 examples of this type are dihedral burins and three are truncation burins. Seven of these are made on flakes and three on blade/lets. One example is made on a core tablet and another is on a partially crested blade. In general, the blanks selected are short, averaging 48 mm, and thick, averaging 9 mm (s.d. = 8 and 5, respectively). Three burins have more than 25% of their dorsal surfaces covered with cortex. Of the dihedral burins five are offset and four are axial. The truncation burins consist of one example on a concave truncation and one on an oblique truncation as well as a multiple burin. One of the dihedral burins has a Corbiac burin (Bordes 1970) at its proximal end which may simply be a break that happened during sharpening of the tool. The author has noted this while rejuvenating several experimental dihedral burins. The 'accident' occurs well away from the intended point of percussion and may be due to flexion.

retouched blade/let (1)

A single example is made on a soft hammer-struck blade with a twisted profile. The retouch is fine and semi-abrupt and occurs on the dorsal surface of the left lateral edge.

retouched flakes (2)

Both of these tools are made on hard hammer-struck flakes which are short and thick. The retouch in both cases is direct, semi-abrupt and on one example occurs along the distal edge alone. This distal retouch is probably spontaneous (cf. Newcomer 1976). The other tool has partial retouch along both lateral edges.

Summary of XIII E4 10.45

There are only a few artefacts in this spit, which makes it difficult to provide detailed comments. All that can be said is that there are end-scrapers, burins, retouched pieces and a carinated tool present in XIII E4 10.45. Technologically, blade/lets from unidirectional cores with twisted profiles account for more than 50% of the small sample.

XIII F4 9.90

flakes (62; figures 9-10)

The 62 flakes in this sample have mean dimensions of 42 x 33 x 9 mm. The standard deviations for these measurements are 11, 11 and 4. Plain butts account for 68% of the total, while faceted butts make up 16%. The butts tend to be quite large, averaging 13 x 5 mm (s.d. = 8 and 4). Over half of the flakes have some cortex, which usually covers less than 50% of their dorsal surfaces. Of the 45 flakes suitable for the analysis of the flaking mode, over 60% were detached with a soft hammer. Offset debitage occurs on only two flakes and platform abrasion is equally rare with only six examples. Parallel lateral edges are most common, accounting for 65%. Seventy-six percent of all flakes have blunt distal ends (for definitions of edge morphology and distal terminations as used in this volume see Marks 1976b: 372-373). Most have between two and four previous removal scars, which are usually unidirectional (44%). Crossed scars account for 21% and multidirectional scars for 18%. In profile they are straight or curved (81%). Three flakes are burned.

XIII F4 9.90 flakes n=62

butt type	N	%
plain	42	67.74
faceted	10	16.13
cortical	4	6.45
crushed or broken	3	4.84
imitating a dihedral burin	1	1.61
not measured	2	3.23
cortex	33	53.23
platform abrasion	6	9.68
lateral edges		
parallel	40	64.52
converging	7	11.29
expanding	10	16.13
not measured	5	8.07
distal termination		
hinge fracture	8	12.90
pointed	2	3.23
blunt or cortical	47	75.81
not measured	5	8.07

dorsal scars		
unidirectional	27	43.55
opposed	1	1.61
crossed	13	20.97
multidirectional	11	17.74
not measured	10	16.13

profile		
straight	25	40.32
curved	25	40.32
twisted	5	8.07
not measured	7	11.29

blade/lets (62; figures 11-12)

There are 62 blade/lets with average dimensions of 42 x 14 x 5 mm (s.d. = 13, 6 and 3). The butts on these pieces tend to be small with a mean width and thickness of 6 and 3 mm, respectively. The standard deviations for these measurements are 4 and 2. The small butt size (found on most blade/lets measured in levels XIII-VI) indicates that the point of percussion was quite close to the edge of the striking platform, removing only a tiny part of it. For a comparison of the dimensions of butts on flakes and blade/lets in level XIII see figures 10 and 12. The tiny blade/let butts form a tight cluster on the scatter diagram, indicating an attempt by the knapper to strike close to the platform edge. The most common (73%) type of butt is plain. Cortex occurs on 26% of the blade/lets. Almost all of these have less than 50% of their dorsal surfaces covered. Over 90% of the blade/lets are soft hammer-struck with only a single example which was hard hammer-struck. Sixty-three percent have parallel lateral edges and the most common (71%) distal termination is blunt. Most blade/lets have between two and three previous removal scars on their dorsal surfaces. They are usually struck from single platform cores (92%), while 5% come from opposed platform cores. In profile they are most often twisted (56%), with curved profiles making up 27% and straight ones making up 15%. While twisted debitage occurs in almost every flaked stone assemblage, the high percentage in F4 9.90 clearly indicates the intention of the knappers to produce the twist. Four blade/lets plunged and removed the bases of single platform cores. Several blanks come from cores made on flakes having removed parts of the ventral surfaces of those pieces.

XIII F4 9.90 blade/lets n=62

butt type	N	%
plain	45	72.58
faceted	4	6.45
cortical	5	8.07
crushed or broken	5	8.07
imitating a dihedral burin	3	4.84
not measured	-	-

<u>cortex</u>	16	25.81
<u>platform abrasion</u>	52	83.87
<u>lateral edges</u>		
parallel	39	62.90
converging	15	24.19
expanding	6	9.68
not measured	2	3.23
<u>distal termination</u>		
hinge fracture	9	14.52
pointed	9	14.52
blunt or cortical	44	70.97
not measured	-	-
<u>dorsal scars</u>		
unidirectional	57	91.94
opposed	3	4.84
crossed	1	1.61
multidirectional	-	-
not measured	1	1.61
<u>profile</u>		
straight	9	14.52
curved	17	27.42
twisted	35	56.45
not measured	1	1.61

crested pieces (8)

There are eight crested pieces in the sample discussed here; seven are partially crested and one is entirely crested. The cresting on all of these is unidirectional. The totally crested blade is 67 mm long and gives a general idea of the initial length of a core before reduction (this piece is some 20 mm longer than the 'average' blade/let). The partially crested pieces are shorter and probably represent maintenance and repair during debitage. Some show clear signs of an attempt to undercut a hinge fracture on the flaking face.

core tablets (8)

One of the eight core tablets may actually come from a tool (ie. a 'scraper tablet' ; Bourlon 1908; Newcomer 1972: 272). However, the presence of small cores made on flakes makes it impossible to be certain about this artefact without refitting it.

flake cores (11; figure 7: 7-8)

Two of the 11 flake cores are made on flakes (truncated/faceted pieces). These are prepared by taking a flake and inversely truncating the ends (Solecki and Solecki 1970; Newcomer and Hivernel-Guerre 1974; Nishiaki 1985). Short blanks are then detached from the dorsal surface using the ridges as guides. Six cores have flakes detached around most of their surface area. There are two cores with single platforms and one discoidal core.

blade/let cores (17)

Four of the 17 blade/let cores are made on flakes. Sixteen have single platforms and one has two opposed platforms. The mean flaking angle is 61° with a standard deviation of 10. Over half of the cores have platforms which are semicircular in plan, while six are offset to the left. Most (13) have plain platforms, which are the result of the removal of a single flake. There are two cores with striking platforms that are unmodified, natural surfaces, while another two have faceted platforms. The average length of the flaking faces, which are generally curved, is 51 mm (s.d. = 12). Two cores have crested ridges on their backs, while another two examples have relatively flat backs formed by opposed flake removals.

burin spalls (4; figure 7: 6)

Three of the four burin spalls are secondary and one is primary. Most have plain butts which are the remnants of the spall removal surface (Newcomer 1972: 52-53) and come from dihedral burins. It should be noted that the secondary spalls may not necessarily be the result of sharpening, as it is possible to accidentally detach two spalls with one blow (Tixier 1958).

end-scraper (1)

A single example of this type is made on a flake that measures 42 x 30 x 4 mm. The flake was detached with a hard hammer and is entirely covered with cortex.

burins (12; figure 7: 1-2)

There are 12 burins of which six are made on blade/lets and four are on flakes; two burins are on crested pieces. The mean dimensions of these tools are 51 x 28 x 9 mm with standard deviations of 6, 9 and 3. About half of the burins have some cortex on their dorsal surfaces. Nine tools are curved in profile and one is straight. Four of the truncation burins are on an oblique truncation, one is on a convex truncation and the final example is made on lateral retouch. The burin on a convex truncation is multifaceted with some of the facets extending onto the ventral surface. There are three dihedral offset burins, one dihedral angle burin and one burin on a natural surface. A multiple mixed burin combines a burin on a convex truncation with a dihedral offset burin. Three of these tools are made at the proximal end and one is burned.

truncation (1)

A double truncation is made on a blade and combines an oblique truncation with a straight truncation. On both lateral edges there is direct, semi-abrupt retouch.

notches/denticulates (4)

Three of these tools are made on blade/lets and one is on a flake fragment. In each case the notches are retouched, that is, made by the removal of a series of tiny flakes as opposed to a single blow Clactonian notch. One tool has two contiguous notches and another has fine discontinuous retouch along its right lateral edge.

composite tool (1; figure 7: 3)

There is one composite tool that combines a carinated piece with a dihedral burin. It is made on a flake that measures 39 x 22 x 11 mm.

retouched blade/lets (7; figure 7: 5)

There are seven retouched blade/lets, averaging 48 x 13 x 4 mm (s.d. = 11, 7 and 2). The longest example is 71 mm. Two tools have small areas of their dorsal surfaces covered with cortex. All of the blanks selected are soft hammer-struck and two have offset debitage. Three are twisted in profile, two are curved and two are straight. Six blade/lets have direct retouch and one has inverse retouch. The retouch is usually fine or semi-abrupt.

retouched flake (1)

The only retouched flake is made on a soft hammer-struck blank. The retouch is partial on both lateral edges and on the right edge it is stepped and scaled (Bordes 1979: 10, figure 2). On the right edge there is also some retouch on the ventral surface that formed a platform for the removals on the dorsal surface. This 'technique' for producing scalar retouch was apparently used in Mousterian times to produce Quina scrapers (Lenoir 1973).

el-Wad point (1; figure 7: 4)

The single example of this type is made on a twisted blade detached with a soft hammer. The retouch used to shape the tool occurs on both lateral edges and the tip is offset to the right of the main axis of the blank. The typology of this tool is similar to the Ksar Akil points in levels XX-XV being essentially a blade pointed by retouch (Bergman 1981; Azoury 1986). However, the morphology of the blank produced and selected for this tool makes it appear markedly different.

Summary of XIII F4 9.90

The retouched tool assemblage in F4 9.90 is slightly larger than that of E4 10.45. Again, end-scrapers, burins and retouched pieces are present. In addition there are also notches, a truncation and a twisted el-Wad point. The debitage sample has over 100 artefacts and blade/lets with twisted profiles predominate. Offset debitage occurs on 40% of the sample.

XIII F4 9.70

flakes (3)

Two of the three flakes are hard hammer-struck. All of these have parallel lateral edges and terminate in blunt distal ends. Two have unidirectional scar patterns and one has crossed scars. In profile two are curved and one is straight.

blade/lets (5)

All of the blade/lets are soft hammer-struck. The butts are small and plain except one example that has a butt imitating a dihedral burin. In profile three blade/lets are twisted, one is curved and the last example is straight. One blade plunged and removed the base of a single platform core. This piece skirts the edge of a hinge fracture on the flaking face. In dealing with this common knapping accident, it is often best to attack from the side of the hinge to remove it. In this way the size of the hinge fracture is reduced a little at a time and a 'pile-up', which prevents further flaking, is avoided.

flake core (1; figure 8: 2)

The single flake core is made on a flake (truncated/faceted piece). The platform is made by an inverse truncation and flakes are removed on the dorsal surface.

blade/let cores (4)

Three of the four blade/let cores have single, faceted platforms. They vary in length from 62 to 36 mm and on one example the scars on the flaking face are twisted.

carinated piece (1; figure 8: 1)

There is only one carinated piece made on a blade that measures 55 x 23 x 8 mm.

truncations (2)

There are two convex truncations, one made on a flake and the other on a broken blade. The latter example is retouched and denticulated.

retouched flakes (2)

One of the two retouched flakes is made on a hard hammer-struck flake, while the other is on a soft hammer-struck flake. Both tools have partial semi-abrupt retouch on their dorsal surfaces. One of these tools is burned.

el-Wad point (1)

The single el-Wad point is made on a twisted blade with offset debitage. The retouch used to form the tip is bilateral and the point is offset to the right of the long axis.

Summary of XIII F4 0.70

This small sample includes the same types of artefacts noted in E4 10.45 and F4 9.90.

Summary of level XIII

Taken as a whole this level is characterised by burins with a few retouched blade/lets and el-Wad points. The el-Wad points are rare and always made on twisted debitage. Unlike phase 2 (levels XX-XV at Ksar Akil), the first layer after the hiatus in level XIV has more burins than end-scrapers (Newcomer 1972; Besançon et al. 1977; Azoury 1986). The unretouched pieces are dominated by blade/lets, with platform abrasion, soft hammer percussion and twisted profiles being consistent technological features. The combination of a developed blade/let technology with a tool kit composed of scrapers and burins departs from the definitions of both the Ahmarian and Aurignacian proposed by Gilead (1981a,b) for the southern Levant (see the discussion on these terms in the glossary of this volume).

XII: E4 and F4

In level XII three 2m squares were excavated, E4, F4 and F3. Two of these, E4 and F4, are described here. The level lies above the second stony complex (see figure 3) and the archaeological material was embedded in cave earth and ash (Ewing 1947; 1963). Square E4 starts at 10.00 m below datum and reaches a depth of 10.45 m. F4 begins at 9.70 m and finishes at 9.90 m. This indicates a thickness of 45 cm for the former and 20 cm for the latter. The table below gives the number of artefacts examined from these two excavation units.

Debitage	E4 10.00	F4 9.70
flakes	139	50
blade/lets	353	189
crested pieces	22	12
core tablets	8	6
flake cores	14	8
blade/let cores	62	32
burin spalls	4	7
total	602	304

Tools		
scrapers	21	17
carinated pieces	30	14
burins	85	53
piercers	2	-
truncations	15	12
notches/denticulates	9	2
composite tools	9	2
retouched blade/lets	33	38
retouched flakes	1	1
el-Wad points	16	21
total	221	160

XII E4 10.00

flakes (139)

The flakes from this unit have mean dimensions of 43 x 31 x 7 mm with standard deviations of 10, 10 and 4, respectively. The size of their butts is larger than those of the blade/lets (see below), averaging 14 x 5 mm (s.d. = 8 and 3). The butts are most often plain (49% of the total). Faceted butts make up 17% and flakes with cortical butts are 15%. Cortex occurs on about 40% of all flakes and less than 3% of these have more than half of their dorsal surfaces covered. Most flakes were detached with a soft hammer and 33% show signs of platform abrasion. The lateral edges are generally parallel (79%) and the distal ends are blunt (71%). There are usually between three and five previous removal scars on the dorsal surface, which are most often unidirectional (43%). Those with crossed and multidirectional scars make up about 20% each. In profile they are straight or curved (79%), with only 12% being twisted. Fifteen flakes were removed from the side of blade/let cores presumably to narrow the width of the platform and flaking face. A relatively narrow platform is essential for the manufacture of blade/lets. Four examples are Janus flakes having removed the butt ends of larger flakes (Newcomer and Hivernel-Guerre 1974; Tixier et al. 1980: figure 11). It is worth noting that some 'flakes' are almost certainly blade/lets, which, failing to be detached, terminated in hinge fractures. They are simply flakes by virtue of their length/width ratio which is roughly 1:1 (de Sonneville-Bordes 1960).

XII E4 10.00 flakes n=139

	N	%
<u>butt types</u>		
plain	68	48.92
faceted	24	17.27
cortical	21	15.11
crushed or broken	7	5.04
imitating a dihedral burin	2	1.44
not measured	17	12.23
<u>cortex</u>	55	39.57
<u>platform abrasion</u>	46	33.09
<u>lateral edges</u>		
parallel	110	79.14
converging	12	8.63
expanding	10	7.19
not measured	7	5.04
<u>distal termination</u>		
hinge fracture	19	13.67
pointed	6	4.32
blunt or cortical	99	71.22
not measured	15	10.79
<u>dorsal scars</u>		
unidirectional	59	42.45
opposed	6	4.32
crossed	30	21.58
multidirectional	29	20.86
not measured	15	10.79
<u>profile</u>		
straight	36	25.90
curved	74	53.24
twisted	16	11.51
not measured	13	9.35

blade/lets (353)

The blade/lets measured from this square have average dimensions of 48 x 15 x 5 mm with standard deviations of 13, 5 and 2. They are narrower and thinner than flakes. The butts are also smaller with a mean of 5 x 2 mm (s.d. = 4 and 1). They are usually plain (73%) and rarely faceted (2%). As the platforms of blade/let cores are carefully prepared it is not surprising that only 3% of the butts are cortical. Cortex occurs on 22% of the blade/lets, with only a few examples having more than half of their dorsal surfaces covered. As blade/lets are presumably produced at a later stage in the reduction sequence, one would expect relatively small amounts of cortex. All of the blade/lets examined were detached with a soft hammer, while 54% have offset debitage. The majority have parallel (65%) or converging lateral edges (31%) and the most common (61%) distal termination is blunt. Most blade/lets have between three and five previous removal scars, which are usually unidirectional (76%). In profile they are most often twisted (60%) and about 85% of all blade/lets have their point of percussion directly behind or beside a dorsal ridge. This is due to the fact that long parallel ridges are necessary to guide the force of the blow which detaches the blank. The mean flaking angle is 119° with a standard deviation of 10 (it should be noted that the flaking angle on blade/lets is always more acute than on flakes in the levels studied here). Included among the blade/lets are 12 examples that plunge. Nine of these come from unidirectional cores and three come from opposed platform cores. Seven blade/lets were detached from cores made on flakes and the longest measures 50 mm.

XII E4 10.00 blade/lets n=353

butt type	N	%
plain	256	72.52
faceted	7	1.98
cortical	12	3.40
crushed or broken	27	7.65
imitating a dihedral burin	15	4.25
not measured	36	10.20
cortex	78	22.10
platform abrasion	275	77.90
lateral edges		
parallel	229	64.87
converging	109	30.88
expanding	14	3.97
not measured	1	0.28

<u>distal termination</u>		
hinge fracture	32	9.07
pointed	95	26.91
blunt or cortical	215	60.91
not measured	11	3.12
<u>dorsal scars</u>		
unidirectional	269	76.20
opposed	14	3.97
crossed	46	13.03
multidirectional	5	1.42
not measured	19	5.38
<u>profile</u>		
straight	18	5.10
curved	98	27.76
twisted	212	60.06
not measured	25	7.08

crested pieces (22; figure 16: 4)

There are 22 complete crested blade/lets in this unit of which only three are totally crested. The longest of these is 84 mm. The others are partially crested, usually at the distal end, and may represent attempts to re-shape the flaking faces of blade/let cores which require a curved profile.

core tablets (8)

The eight core tablets were struck in the middle of the main flaking face and come from plain platformed cores. Three of these were detached with a soft hammer and two with a hard hammer; the other examples were unidentifiable. One core tablet is burned.

flake cores (14)

One of the 14 flake cores examined in this spit is made on a flake. Seven have multiple platforms, four have single platforms and three have two platforms. The multiplatformed cores have alternate removals of flakes over their entire surface area. Faceting of the platform on these cores appears to have been used to locally modify the flaking angle and to shape the platform during debitage. Most flaking faces are curved with a mean length of 41 mm (s.d. = 10). A discoidal core made on a flake has a domed flaking face.

blade/let cores (62; figure 16: 5)

Most blade/let cores have only one platform (46 examples). There are six cores with two unopposed platforms, five with opposed platforms and two with alternate platforms. The mean platform angle on these pieces is 70° with a standard deviation of 12. Most are semicircular in plan (50%), while 35% of the cores have platforms that are offset to the left. Over 75% of the platforms are plain and 11% are faceted. The flaking faces have a mean length of 42 mm with a standard deviation of 1. These are most often curved (91%). Three opposed platform cores have angular flaking faces (as in Bordes and Crabtree 1969: figure 1d). Most have twisted scars that are parallel or converging (58%). Almost all of the cores show signs of platform abrasion. The technique for producing blade/lets in E4 10.00 relies on striking close to the platform edge. It is essential to prepare that edge prior to delivery of the blow in order to avoid crushing it. Eight cores have some cresting at their bases, probably to maintain the shape of the flaking face. Most cores have cortical backs, while 15 examples have modified backs. Eight of these have flat backs formed by opposed flake removals and four are crested. A crested back is useful in helping to guide the removal of a core tablet.

XII E4 10.00 blade/let cores n=62

number of platforms	N	%
single platform	46	74.19
two, opposed platforms	5	8.07
two, unopposed platforms	6	9.68
two, alternate platforms	2	3.23
two, crossed platforms	-	-
multiple platforms	-	-
not measured	3	4.84
platform type		
plain	47	75.81
faceted	7	11.29
cortical/natural surface	2	3.23
ventral surface of a flake	2	3.23
not measured	4	6.45
platform abrasion	60	96.77

burin spalls (4; Figure 16: 3)

Three of the four burin spalls are secondary or sharpening spalls. One of these plunged and removed an opposed truncation burin.

end-scrapers (21; figure 14: 1-2)

Twenty-one end-scrapers were examined in this unit with average dimensions of 45 x 26 x 8 mm (s.d. = 19, 10 and 4). Fourteen tools are made on flakes and seven are on blade/lets. Ten of the tools have some cortex on their dorsal surfaces; eight have less than 50% of that surface covered. One scraper is made at the proximal end and it has a blunt distal termination. In profile the scrapers are usually straight or curved, with only four examples being twisted. Typologically, the most common tool (15) is the simple end-scraper. There are two double end-scrapers, two scrapers on retouched flakes and one inverse end-scraper. There is also one example of a Ksar Akil scraper with a typical denticulated scraper edge (see figure 14: 2). This tool type is thought to occur only in the late Palaeolithic levels (V and IV) at Ksar Akil (Copeland 1982) and may be intrusive.

carinated pieces (30; figure 14: 4-5)

Twenty-one of the 30 carinated pieces in this spit are made on flakes. One example is made on a partially crested piece. These tools have average dimensions of 35 x 23 x 8 mm with standard deviations of 12, 9 and 3, respectively. In width and thickness they do not differ much from blanks used to make end-scrapers. Eleven tools have cortex on their dorsal surfaces, while five examples are more than half covered. Four tools are made at the proximal end and three of these have blunt distal terminations. In profile they are straight or curved, while two tools have twisted profiles. There are two multiple tools, having carinated pieces at either end, and 12 lateral carinated scrapers (Marks 1976b: 380-381) with retouched edges oblique to the long axis of the blank. The retouch, which is often short (< 10 mm), starts on the dorsal surface and twists towards the ventral surface. Ten specimens are burned.

burins (85; figure 14: 6-7; 15: 1-2)

Only 22 of the 85 burins are made on blade/lets or blade/let fragments. Three tools are made on crested pieces, two are on core tablets and one is made on a plunging blade. The complete specimens average 43 x 26 x 9 mm with standard deviations of 11, 8 and 3, respectively. About half have some cortex, which usually covers less than 50% of the dorsal surface. Sixteen tools are made at the proximal end and usually have blunt distal terminations. In profile most are straight or curved (69%). Dihedral burins dominate the collection and many of these are multifaceted burins with flat-faced facets (40%). This contrasts with the early Upper Palaeolithic levels, XXV-XV, where these features are relatively insignificant. Newcomer (1972: 325) notes that in level XII the flat-faced carinated burin is the most common type, making up 23.32% of the 386 burins examined. There are 31 offset dihedral burins, 11 axial burins and four dihedral angle burins. Ten burins are made on unmodified or cortical surfaces, while three are on breaks. Also included among the dihedral burins are four multiple tools. There are eight burins on oblique truncations, seven on concave truncations and five on convex truncations. A multiple truncation burin combines a burin on lateral retouch with a burin on a concave truncation. One multiple mixed burin has a burin on an oblique truncation combined with a dihedral offset burin.

piercers (2; figure 15: 3)

Both piercers in this spit are made on blade/lets. One of these is atypical and the other has a flexion break at the tip.

truncations (15; figure 15: 4)

Seven of the 15 truncations are concave, seven are oblique and one is convex. They are most often made on blade/lets with average dimensions of 46 x 16 x 5 mm. Cortex is found on only three pieces, while two tools are made at the proximal end. One example is a partial truncation (Bordes 1978) with the line of retouch failing to cross the entire distal end.

notches/denticulates (9)

There are seven notches and two denticulates, with retouched notches being most common. Only three tools are unbroken; two are on blade/lets and one is on a flake.

composite tools (9; figure 14: 3)

Included in this group are three scrapers and three burins combined with carinated tools. There are also two end-scrapers with truncations and one scraper with a burin.

retouched blade/lets (33)

Twenty-five of the retouched blade/lets are broken and it is difficult to rule out the possibility that many are fragments of el-Wad points. The longest complete tool measures 53 mm and the shortest is 35 mm. The average width is 14 mm and the average thickness is 4 mm (s.d. = 4 and 1, respectively). Two tools have a small amount (10%) of cortex on their dorsal surfaces. They are made on soft hammer-struck blade/lets with 16 blanks having offset debitage. In profile they are most often twisted. The retouch is partial and only one tool has an edge which is totally retouched. Fine and semi-abrupt retouch occur most often and the retouch flakes are almost always short (cf. Tixier et al. 1980 : 87).

retouched flake (1)

A retouched flake has direct, invasive retouch on both lateral edges.

el-Wad points (16; figure 15: 5-10; 16: 1-2)

The complete el-Wad points in this spit have average dimensions of 42 x 11 x 3 mm with standard deviations of 5, 1 and 1. All of the examples that preserve their proximal ends are soft hammer-struck and about half have offset debitage. The dorsal scars are always unidirectional and 10 of the tools are twisted. They are made at the distal end and, in every case but three, two lines of retouch form the tip. The pointed tips are asymmetrical, due to the twist of the blank, and inclined to the right of the long axis.

Summary of XII E4 10.00

This is the first spit with a large enough sample of retouched tools and debitage to warrant detailed comments. Flakes are outnumbered by blade/lets in the collection from E4 10.00; blade/lets make up about 70% of the debitage in the entire level (see the type list for level XII on page 123). In general, flakes are less standardised in their attributes (a feature seen throughout levels XIII-VI); they generally have large butts, little evidence of platform abrasion and tend to be straight or curved in profile. The blade/let technology, however, shows a marked trend towards the production of twisted profiles (60% of the sample). The platforms of the blade/let cores are carefully prepared for the blow by abrasion and a soft hammer is always used. Undoubtedly, the reduction sequence begins with the production of large, wide blades and continues with the manufacture of smaller, narrower blanks. The blanks selected to make scrapers and burins generally have flake dimensions and are relatively thick (see Appendix 1 page 248). When blade/lets are used for these tool types, they often come from core preparation (eg. crested blades) or are cortical. This is in contrast to the blanks used for el-Wad points, which are usually quite thin and have no cortex. Typologically, burins are the most numerous component of the retouched tool sample. The high percentage of scrapers, carinated tools and burins as opposed to retouched blade/lets and el-Wad points fits the pattern of industries described as Aurignacian in the southern Levant. However, this spit, like level XIII, is also dominated by blade/lets which is not considered to be part of that tradition (Gilead 1981b: 339).

XII F4 9.70

flakes (50; figure 18)

The flakes measured from F4 9.70 have mean dimensions of 46 x 34 x 7 mm. The standard deviations for these measurements are 16, 13 and 4. The butts on these pieces tend to be large, averaging 15 x 5 mm (s.d. = 9 and 4). Seventy-two percent of the butts are plain and only 10% are faceted. Twenty flakes have cortex on their dorsal surfaces and two of these are almost entirely covered. The number of flakes detached by hard and soft hammers is roughly equal. Offset debitage occurs on 13% and platform abrasion is found on 32%. Eighty-four percent of the flakes have parallel lateral edges and the most common (78%) distal termination is blunt. Hinge fractures occur at the distal end of 16% of the flakes. There are usually between two and six scars on the dorsal surface and these are most often unidirectional (44%) or crossed (24%). Nearly 80% are straight or curved in profile, while twisted debitage accounts for 18% of the total. Three flakes have been removed from the side of blade/let cores to narrow the width of the striking platform and flaking face.

XII F4 9.70 flakes n=50

<u>butt type</u>	N	%
plain	36	72.00
faceted	5	10.00
cortical	2	4.00
crushed or broken	4	8.00
imitating a dihedral burin	1	2.00
not measured	2	4.00
<u>cortex</u>	20	40.00
<u>platform abrasion</u>	16	32.00

lateral-edges		
parallel	42	84.00
converging	2	4.00
expanding	4	8.00
not measured	2	4.00

distal termination		
hinge fracture	8	16.00
pointed	1	2.00
blunt or cortical	39	78.00
not measured	2	4.00

dorsal scars		
unidirectional	22	44.00
opposed	4	8.00
crossed	12	24.00
multidirectional	5	10.00
not measured	7	14.00

profile		
straight	3	6.00
curved	36	72.00
twisted	9	18.00
not measured	2	4.00

blade/lets (189; figures 19 and 20)

There are 189 complete blade/lets in this spit with average dimensions of 66 x 15 x 4 mm. The standard deviations are 28, 5 and 2. The butts are most often plain (74%) or crushed (11%). Fifty-one blade/lets have some cortex covering less than half of their dorsal surfaces. The blade/lets are almost always detached with a soft hammer. Over 50% have offset debitage and 78% show signs of platform abrasion at their proximal ends. The lateral edges are most often parallel (65%) or converging (23%). Blunt distal ends make up 64% of the total; pointed ends account for 22%. On the dorsal surfaces there are usually between three and five scars which are most often unidirectional (73%) or crossed (15%). In profile blade/lets are twisted (69%), less often curved (20%) or straight (5%). Included in the sample are seven plunging blade/lets and one of these is from an opposed platform core. Four blade/lets come from cores made on flakes and 3% are burned.

XII F4 9.70 blade/lets n=189

butt type	N	%
plain	140	74.07
faceted	4	2.12
cortical	3	1.59
crushed or broken	21	11.11

imitating a dihedral burin	4	2.12
not measured	17	9.00
cortex	51	26.98
platform abrasion	147	77.78
lateral edges		
parallel	122	64.55
converging	43	22.75
expanding	22	11.64
not measured	2	1.06
distal termination		
hinge fracture	23	12.17
pointed	42	22.22
blunt or cortical	121	64.02
not measured	3	1.59
dorsal scars		
unidirectional	138	73.02
opposed	3	1.59
crossed	29	15.34
multidirectional	3	1.59
not measured	16	8.47
profile		
straight	9	4.76
curved	37	19.58
twisted	130	68.78
not measured	13	6.88

crested pieces (12)

One of the 12 partially crested pieces is a flake. The longest example is 78 mm and the shortest is 26 mm. They have been detached by a soft hammer and usually have parallel edges with blunt distal terminations. The majority have twisted profiles (seven). There is only one example with bidirectional cresting and most are crested at the distal end of the blank.

core tablets (6)

The six core tablets all come from plain platformed cores. The largest example measures 67 x 28 x 6 mm.

flake cores (8)

Three of the eight flake cores appear to be blade/let cores in the final stage of reduction. The flaking faces of these cores served as platforms to detach a series of small flakes. The majority of flake cores have one (three examples) or two (four examples) platforms. There is only one core with multiple platforms. The platform arrangement on cores with two platforms is as follows: three with opposed platforms and one that is alternate. Most flake cores have plain platforms formed by a single flake removal (seven).

blade/let cores (32)

Of the 32 blade/let cores 84% have single platforms. That the majority of blanks come from single platform cores is clearly reflected in the blade/let sample where 73% have unidirectional scars. There are only four cores with two platforms; three are opposed and one has two platforms with separate flaking faces. The majority seem to be made on chunks of raw material (tabular or nodular flint) with only eight being made on thick flakes. The flaking angle on these cores averages 74° with a standard deviation of 8. The platforms are most often semicircular in plan with 18 examples. Over 80% of the platforms are formed by the removal of a single flake. The length of the flaking faces has a mean of 48 mm with a standard deviation of 14. They are most often curved in profile (30) and the scars on the flaking faces are usually parallel and twisted. Twenty-eight cores show signs of abrasion at their platform edges. Two cores have some cresting at the base and one has a flake detached from the side of its platform. Most cores have unmodified backs, while six have flat backs formed by opposed flake removals. Four cores have a crested ridge running down their backs.

XII F4 9.70 blade/let cores n=32

number of platforms	N	%
single platform	27	84.38
two, opposed platforms	3	9.38
two, unopposed platforms	1	3.13
two, alternate platforms	-	-
two, crossed platforms	-	-
multiple platforms	-	-
not measured	1	3.13
platform type		
plain	26	81.25
faceted	3	9.38
cortical/natural surface	2	6.25
ventral surface of a flake	-	-
not measured	1	3.13
platform abrasion	28	87.50

burin spalls (7; figure 17: 6)

Two of the seven burin spalls are primary. Two others have plunged and one removed an opposed end-scraper, while the other removed the proximal end of the blank.

end-scrapers (17; figure 17: 1-2)

Fourteen of the 17 end-scrapers in this spit are made on flakes. There is one scraper made on a core tablet. They have average dimensions of 40 x 29 x 9 mm (s.d. = 12, 7 and 3). Six tools have some cortex on their dorsal surfaces, which always covers less than 50%. Nine tools are straight or curved in profile and three are made on twisted debitage. Typologically, the most common (12 examples) is the simple end-scraper. Three are nosed scrapers and two scrapers are made on retouched blanks. Two of the scrapers are made on a lateral edge (cf. Marks 1976b: 380). Six tools have varying amounts of discontinuous retouch along their lateral edges and one example has Clactonian notches.

carinated pieces (14; figure 17: 3)

The 14 carinated pieces average 41 x 19 x 7 mm with standard deviations of 6, 4 and 2. Eight of these are made on flakes and six are on blade/lets. Only two examples have cortex and one has its dorsal surface entirely covered. Three tools are made at the proximal end; two of these have blunt distal terminations and one has a hinge fracture. In profile they are straight or curved and less often twisted (three). Included in this group are four lateral carinated scrapers and three burned tools.

burins (53)

The ratio of burins to scrapers in this sample is again high (about 3 to 1). The burins are most often made on flakes (28), less often on blade/lets (22). Three burins are made on crested pieces. The average dimensions of the complete specimens are 46 x 23 x 8 mm. The standard deviations are 11, 8 and 3. Nineteen burins have some cortex on their dorsal surfaces, but only two have more than half of that surface covered. Eight burins are proximal and these have blunt distal terminations. Eighteen tools are made on straight or curved blanks, while 13 have twisted profiles; the remainder are unidentifiable. Among the truncation burins there are eight on oblique truncations and three on concave truncations. One example is on lateral retouch and another on a convex truncation. There are three multiple truncation burins. The most common (23) dihedral types are the axial and offset burins. There are seven burins on a natural or unmodified (ie. lateral edge) surface. There are two examples each for those on breaks and dihedral angle burins. There are three multiple dihedral burins. Eight tools are burned.

truncation (12)

There are 12 truncations and the complete specimens average 46 x 13 x 4 mm with standard deviations of 15, 2 and 1. Two tools have a small (<20%) amount of cortex on their dorsal surfaces. The complete truncations are all made on soft hammer-struck blade/lets. There is one example made at the proximal end which has a distal break. Five tools are on twisted debitage, four have curved profiles and three are too fragmentary to determine the original profile. Typologically, there are eight concave truncations, two oblique truncations, one straight truncation and one convex truncation. One of the oblique truncations is made by fine retouch that may be spontaneous. Two truncations are partial, covering only part of the distal end.

notches/denticulates (2)

There is one denticulate made on a blade and one notch made on a flake.

composite tools (2)

There are two composite tools, one that combines a burin with a truncation and another that combines a burin with an end-scraper. In both cases the burins are at the proximal end of the piece. They are made on blade/lets and one example has a small amount of cortex on its dorsal surface.

retouched blade/lets (38)

Twenty-two of these 38 tools are fragmentary. The complete specimens average 48 x 14 x 4 mm. The standard deviations are 17, 5 and 2, respectively. Most of the tools have tiny, plain butts (28) and one has 10% of its dorsal surface covered with cortex. They are made on soft hammer-struck blade/lets and 24 have offset debitage. The dorsal scars are almost always unidirectional and in profile most are twisted (25 tools). The retouch is usually fine or semi-abrupt. Only one tool has abrupt retouch with an edge angle reaching 90° (Tixier et al. 1980: 89). The line of retouch is usually partial and the retouch flakes are always short. One tool is on a crested blade and four are burned.

retouched flake (1)

There is only one retouched flake with partial fine and semi-abrupt retouch along both lateral edges.

el-Wad points (21; figure 17: 4-5)

Nine of the 21 el-Wad points are fragmentary. The complete specimens have average dimensions of 45 x 11 x 4 mm. The standard deviations are 9, 2 and 1. The butts are always small and plain. Cortex occurs on a small part of one tool's dorsal surface. The complete points are all made on soft hammer-struck blanks and offset debitage is found on eight tools. The dorsal scars are unidirectional and there are seven points made on twisted debitage. The retouch used to make the points usually occurs on both lateral edges and is fine or semi-abrupt. Abrupt retouch is found on only two tools. The retouch flakes are short and never invasive. One point has a flute-like break on its ventral surface that may be due to impact (Bergman and Newcomer 1983).

Summary of XII F4 9.70

F4 9.70 is typologically and technologically similar to the previous spit. Both samples have roughly equal amounts of scrapers and burins, which make up over 40% the retouched tools. Burins outnumber scrapers and dihedral burins are more numerous than truncation burins. Among the carinated pieces the lateral carinated scraper is found in both spits. Retouched blade/lets and el-Wad points are once again generally made on twisted debitage. Blade/let manufacture in each spit is characterised by twisted profiles (60% in E4 10.00 and 69% in F4 9.70); the flakes do not share this tendency (12% in 10.00 and 18% in 9.70). The flaking direction is usually unidirectional and, not surprisingly, single platform blade/let cores are most numerous.

Summary of level XII

There is a remarkable degree of similarity between the two spits in level XII. Both samples are dominated by scrapers, carinated pieces and burins (62% in E4 10.00 and 53% in F4 9.70). Burins outnumber scrapers by a ratio of over 3 to 1. Dihedral burins are most numerous and these are frequently multifaceted with flat-faced facets (Newcomer 1972: figure 134). Truncations occur in roughly equal amounts in both assemblages. Retouched blade/lets and el-Wad points make up 22% of the tool sample in E4 10.00 and 37% in F4 9.70. These pieces are usually made on twisted blanks. Blade/let manufacture is characterised by twisted debitage with more than 60% in both samples and offset debitage is found on over 50% of these blanks. Although there are relatively large numbers of unretouched blade/lets, the flaking technology differs from that described for the southern Ahmarian (Marks 1981: 346-347; Gilead 1981a, b; Jones et al. 1983). Other major differences include the presence of carinated pieces as well as the morphology of the el-Wad points. At the same time the percentage of blade/let debitage in this level is too high for industries described as Aurignacian in Israel.

XI: E4 and F4

The texture of the deposits in level XI seems to be similar to that of the preceding level, i.e., "light brown earth with scattered flints, bones, angular stones and ash layers" (Wright 1962: 535). In Ewing's original section, levels XII and XI are not firmly divided and all that can be said is that they vary in thickness from about 150 to 190 cm (Newcomer 1972: 323).

A total of three 2 m squares (E4, F4 and F3) were excavated in 1937-1938 and two of these, E4 and F4, are reported on here. Level XI is stratigraphically more complicated than levels XIII and XII because of the number of arbitrary excavation spits. In square E4 most of these are unimportant because they contain few artefacts. The only spit with a substantial number of pieces is 9.65. Square F4 is much richer, with each sample having more than 100 pieces. The tables below give figures for those spits where more than 100 artefacts were examined.

Debitage	E4 9.65	F4 9.55	F4 9.30	F4 8.95	F4 8.85
flakes	38	37	141	183	10
blade/lets	48	69	220	82	62
crested pieces	8	7	19	11	4
core tablets	3	1	10	3	2
flake cores	18	2	5	9	5
blade/let cores	30	12	19	31	2
burin spalls	2	-	10	19	1
total	147	128	424	338	86
Tools					
scrapers	54	-	9	13	9
carinated pieces	54	20	18	19	12
burins	27	21	39	31	12
piercers	1	1	1	-	-
truncations	1	-	2	1	-
notches/denticulates	1	-	1	1	1
composite tools	4	4	2	-	-
retouched blade/lets	3	7	12	2	3
retouched flakes	-	-	-	-	-
el-Wad points	13	15	23	-	8
total	158	68	107	67	45

XI E4 9.85

end-scraper (1)

There was one broken simple end-scraper examined from this spit.

XI E4 9.65

flakes (38)

There are 38 flakes with mean dimensions of 44 x 34 x 8 mm. The standard deviations for these measurements are 16, 11 and 3. Most flakes have large, plain butts with average dimensions of 17 x 6 mm (s.d. = 8 and 3). Sixteen flakes are cortical, but only three of these have more than half of their dorsal surfaces covered. Thirteen of the flakes show signs of platform abrasion. The lateral edges are generally parallel (22), less often expanding (seven) or converging (four). The most common distal termination is blunt (21) followed by hinge fractures (seven). They generally have between three and four dorsal scars, which are usually unidirectional (16). Crossed and opposed scars occur on seven flakes, while five examples have multidirectional scars. In profile these pieces are usually straight or curved (27). Included in this sample are two flakes that were detached from the bases of blade/let cores. These were removed from unidirectional cores probably to reshape and maintain the curvature of the flaking faces. There are also three flakes that were removed from the sides of blade/let cores to narrow the platform width and flaking face. Six flakes are burned.

blade/lets (48)

The 48 blade/lets have average dimensions of 49 x 18 x 6 mm. The standard deviations for these are 14, 8 and 3, respectively. The butts tend to be small with a mean of 7 x 3 mm (s.d. = 6 and 2). Plain butts are found on 31 blade/lets whereas faceted butts occur on 6 pieces. Fifteen blade/lets are partially cortical and have less than half of their dorsal surfaces covered. All of the blade/lets except one were detached with a soft hammer. Forty examples utilised platform abrasion and only five have offset debitage. In plan the lateral edges are most often parallel (32), while seven have expanding edges and six have converging edges. The distal ends are usually blunt (37) and less often pointed (5). Most blade/lets have between three and six previous removal scars, which are most often unidirectional (27). The profiles of the blanks are equally divided between those that are straight or curved and those that are twisted. The flaking angle has a mean of 119° with a standard deviation of 8. The point of percussion is almost always next to or directly behind a dorsal ridge (40). One plunging blade removed the base of a unidirectional core and six blade/lets are burned.

crested pieces (8)

There are six crested blade/lets and two crested flakes. The longest is 85 mm and is only partially crested at its distal end. The single example of a totally crested piece is 37 mm long and has unidirectional cresting.

core tablets (3)

There are three core tablets from plain platformed cores; one example has blade dimensions and measures 56 x 24 x 7 mm.

flake cores (18)

Fourteen of the 18 flake cores have two or more platforms. Three cores have one platform and one specimen is broken. The cores with multiple platforms usually have been alternately flaked, that is, when the removal of one flake creates the platform for the next blow. Two cores are made on flakes with the platforms formed by an inverse truncation (truncated/faceted pieces). The flaking faces are most often curved and average 54 mm in length with a standard deviation of 7. Eight cores show signs of abrasion on their platforms.

blade/let cores (30)

Five of the 30 blade/let cores are made on flakes. Over 80% of all cores have single platforms, while five cores have two platforms. The latter are most often opposed, with only one example having alternate platforms. The flaking angles on these cores have a mean of 68° with a standard deviation of 11. The platforms are usually semicircular in shape (70%). Offset left platforms account for only 23%. They are most often made by a single flake removal (73%), while three cores have faceted platforms. The flaking faces are curved and average 37 mm in length with a standard deviation of 15. The removals are usually parallel (58%) and twisted scars occur on 32% of the cores. Seventy-three percent of the cores utilise abrasion to prepare the edge of the platform. Two cores have crested ridges along their backs. One example has its flaking face covered with red ochre.

XI E4 9.65 blade/let cores n=30

number of platforms	N	%
single platform	25	83.33
two, opposed platforms	4	13.33
two, unopposed platforms	-	-
two, alternate platforms	1	3.33
two, crossed platforms	-	-
multiple platforms	-	-
not measured	-	-
platform type		
plain	22	73.33
faceted	3	10.00
cortical/natural surface	-	-
ventral surface of a flake	2	6.67
not measured	3	10.00
platform abrasion	22	73.33

burin spalls (2; figure 23: 3-4)

There were two burin spalls examined from this spit both of which plunged and removed tools on the opposite end. One detached an end-scraper and the other a truncation burin.

end-scrapers (54)

Thirty-six of the 54 end-scrapers are made on flakes or flake fragments. One tool is made on a core tablet, while two others are on crested pieces. The mean dimensions of the complete examples are 49 x 28 x 10 mm. The standard deviations for these measurements are 13, 7 and 6, respectively. Eighteen tools have some cortex, which in 12 cases covers less than 25% of the dorsal surface. Seven scrapers are made at the proximal end and four of these have blunt distal terminations. In profile the tools are usually straight or curved (76% of the total). The simple end-scraper is the most common type (37 examples). There are 11 end-scrapers on retouched blanks with direct, semi-abrupt lateral retouch. Five scrapers are nosed and two of these are combined with simple end-scrapers. The other double scraper is made on a flake and has direct, total retouch along both lateral edges. The retouch on three scrapers is a secondary patina and one scraper was converted from a burin. Another was made on a blank that had been previously heated. This is not a case of deliberate heat treatment, but rather a blank which had been accidentally heated and subsequently retouched (Griffiths et al. in press). Twenty-four percent are burned.

carinated pieces (54)

There are 54 carinated pieces and the complete examples have mean dimensions of 35 x 27 x 10 mm. The standard deviations for these measurements are 8, 8 and 4. They are usually made on flakes or flake fragments (42 examples). Three tools are made on crested pieces. Cortex occurs on 22 pieces and half of these have about 50% of their dorsal surfaces covered. Twelve tools are made at the proximal end to take advantage of its relative thickness. It is impossible to make this class of artefacts on thin blanks. In profile they are usually straight or curved (61%). Typologically, the majority (67%) are lateral carinated scrapers. The retouch on these pieces always originates from the dorsal surface and twists towards the ventral but does not cover it. A special platform is rarely prepared for the retouch and the removals forming the edges have an average length of only 16 mm (s.d. = 4). Fourteen percent of the carinated pieces are burned.

burins (27)

There were 27 burins examined in spit 9.65 and 16 of these are on flakes and 11 are on blade/lets. The average dimensions of these pieces are 42 x 24 x 9 mm. The standard deviations for these measurements are 6, 6 and 3, respectively. Cortex occurs on half of the burins (13) and always covers 40% or less of the dorsal surface. In profile most burins are curved, while four examples are straight and one is twisted. There are 15 dihedral burins and 10 truncation burins. The most common dihedral types are the axial and offset burins, which account for eight of the total. There are three burins on a break, two dihedral angle burins and two burins made on unmodified lateral edges. The truncation burins are most often made on concave truncations (six examples). There is one tool made on each of the other truncation types: oblique, straight and convex. A multiple truncation burin has two spalls detached from the same truncation and one of these plunged. There is one burin made on a nosed scraper with the scraper edge removed by the spall (Newcomer 1972: 195). One multiple mixed burin combines a dihedral angle burin with a burin on a straight retouched truncation. Seven burins are multifaceted with flat-faced facets. Five tools display signs of preparation (retouch) along a lateral or distal edge prior to detachment of the spall. One of the truncation burins has a secondary patina on both its retouched truncation and burin facet. Finally, one tool has a stop notch on its lateral edge.

piercer (1)

The only piercer in this spit is made at the proximal end of a blade.

truncation (1)

There is one straight truncation made on a blade 59 mm long.

notch/denticulate (1)

The single example of a denticulate is made on a thick flake. The denticulation is on the dorsal surface along the left lateral edge.

composite tools (4)

Three of these four tools combine an end-scraper with a burin. The fourth example combines an end-scraper with a carinated piece. Three tools are on blade/lets and one is on a flake; two examples have small amounts of cortex (20%) on their dorsal surfaces. Two burins are dihedral and the third example is a burin made on a lateral Clactonian notch. One tool is burned.

retouched blade/lets (3)

The three retouched blade/lets are all fragmentary. The retouch on two tools is fine and direct, while the third example has direct, abrupt retouch. In all cases the retouch covers only part of a lateral edge.

el-Wad points (13; figure 23: 1-2)

Nine of the 13 el-Wad points are broken tools. The largest complete point measures 43 x 9 x 4 mm. They are rather thin, averaging about 3 mm with a standard deviation of 1. The complete tools are on soft hammer-struck blanks and offset debitage occurs on six examples. The dorsal scars are always unidirectional and most tools have twisted profiles. The pointed tips are offset to the right of the long axis, except in two cases. Ten points have two lines of converging retouch at the tip, while the remainder have only one line. One tool has partial, inverse fine retouch on its right lateral edge. Four examples are burned.

miscellaneous (4)

One transverse side-scraper is made on a thick, wide flake measuring 57 x 94 x 16 mm. There is also one splintered piece and two flakes broken intentionally (Bordes 1953; Bergman et al. 1983).

non-flint artefacts and objects (3)

Included in the collection from this excavation unit are three small water-rounded pebbles; the largest measures 40 x 17 x 15 mm.

Summary of XI E4 9.65

There are some interesting differences between the tool sample in this spit, the deepest examined in level XI, and those in level XII. Typologically, the burin to scraper ratio is more than 3 to 1 in the spits examined from level XII, while in XI E4 9.65 the reverse is the case. Among the carinated tools there is an increase in the number of lateral carinated scrapers. Technologically, the method of producing blade/lets is similar with both spits in level XII and XI E4 9.65 having significant numbers of twisted blanks (XII E4 10.00, 60%; XII F4 9.70, 69%; XI E4 9.65, 50%). The overall impression is that the artefacts in XI E4 9.65 are directly related to those in level XII (Newcomer 1972: 380; Besançon et al. 1977).

XI E4 9.61

end-scraper (1)

There is one broken end-scraper made on a flake.

XI E4 9.60

burin (1)

A single multiple dihedral burin combines two burins on a break.

XI F4 9.55

flakes (37)

The 37 flakes have mean dimensions of 43 x 34 x 7 mm with standard deviations of 10, 10 and 3. Most flakes have plain butts (18) which average 13 x 5 mm (s.d. = 8 and 3). Half of the flakes have some cortex (19) but only one of these has more than 50% of its dorsal surface covered. The majority (24) have parallel lateral edges and the most common distal termination is blunt (29). Most flakes have a unidirectional or crossed scar pattern. They are usually straight or curved in profile (25), while 12 are twisted. One flake was removed from the side of a blade/let core in order to narrow the platform width and flaking face. Another flake, also from a blade/let core, appears to have been struck from the side of the core to undercut a hinge fracture on the flaking face. One flake is covered with red ochre.

blade/lets (69)

The 69 blade/lets measured have mean dimensions of 48 x 16 x 5 mm with standard deviations of 12, 5 and 2. The majority of these pieces have small butts that average 5 x 2 mm. The standard deviations for these measurements are 3 and 1. Plain butts account for 84% of the total, whereas faceted butts make up only 1%. Seventeen blade/lets have some cortex that usually covers less than half of their dorsal surfaces. All but one of the blade/lets were soft hammer-struck; the exception was detached with a hard hammer. Sixty-five percent have offset debitage and platform abrasion occurs on 85%. Most blade/lets have parallel lateral edges (68% of the total). There are 22% with converging edges and 7% with expanding edges. Sixty-three percent have blunt distal ends, while 18% have hinge fractures and 15% have pointed ends. The majority have between three and six dorsal scars, which are most often unidirectional (51%). In contrast to the flakes the majority of blade/lets are twisted (78%). There are two blade/lets that come from cores made on flakes and the largest is 74 mm long. Eighteen percent are burned.

crested pieces (7)

The seven crested pieces consist of six blade/lets and one flake. All of these are partially crested and only one example has a bidirectional crest. The longest example is 71 mm and the majority are soft hammer-struck.

core tablet (1)

The single core tablet comes from a plain platformed core and measures 61 x 23 x 6 mm.

flake cores (2)

Both flake cores in this spit are multiplatformed. The platforms are created by the alternate removal of flakes during debitage. One core shows signs of platform abrasion.

blade/let cores (12)

Seven of the twelve cores described here have two platforms; only two of these are opposed and share the same flaking face. The flaking angles average 63° with a standard deviation of 18. The shape of the platform is most often semicircular and it is usually formed by a single flake removal (11), which obviously results in blanks with plain butts. All of the cores have curved flaking faces that average 42 mm in length (s.d. = 11). The flaking scars on these cores are usually parallel, while four examples have twisted removals. Abrasion of the platform edge was utilised on every core and two cores have some cresting at the base to maintain the curvature of the flaking face. Two examples have crested ridges on their backs.

carinated pieces (20; figure 23: 5,7)

There are 20 carinated pieces of which 14 are made on flakes or flake fragments. They have mean dimensions of 40 x 28 x 9 mm (s.d. = 7, 4 and 3). Five tools have some cortex that covers less than 25% of the dorsal surface. In profile they are most often straight or curved with only one tool being made on twisted debitage. There are six lateral carinated scrapers. One carinated piece is multiple, having tools at each end.

burins (21)

Twelve of the 21 burins are on flakes or flake fragments. Two burins are made on crested pieces and one is on a core tablet. The mean dimensions of the complete tools are 44 x 25 x 7 mm. The standard deviations are 12, 8 and 3, respectively. Seven burins have some cortex on their dorsal surfaces that always covers less than half of that surface. Four burins are made at the proximal end and these have blunt distal terminations. In profile they tend to be straight or curved. Typologically, the most common dihedral burin is offset (eight). There are two axial dihedral burins, one burin on a break and one burin on an unmodified lateral edge. The burin on a concave retouched truncation is the most numerous truncation burin (three examples). There are two burins each on convex and oblique truncations and one burin on lateral retouch. One multiple mixed burin made on a blade combines a burin on lateral retouch with a burin on an unmodified lateral edge. Three of the burins are burned.

piercer (1)

There is one piercer made on a blade that is twisted. The retouch forming the tip of the tool occurs on both edges and is direct, semi-abrupt and abrupt.

composite tools (4)

There are four composite tools; one is on a blade and the rest are on flakes. Two tools combine burins with end-scrapers and another combines a burin with a truncation. The burins are all dihedral and the truncation is convex. A final example has a carinated piece and an end-scraper.

retouched blade/lets (7)

Four of these tools are broken. The longest complete specimen measures 63 mm and the shortest is 34 mm. Six are made on soft hammer-struck blanks with small butts. Two tools are twisted in profile and also have offset debitage. The retouch on these pieces is fine or semi-abrupt and usually discontinuous. One tool has inverse retouch.

el-Wad points (15)

There are 13 complete el-Wad points in this spit. The average dimensions of these tools are 35 x 10 x 3 mm with standard deviations of 5, 2 and 1. Twelve tools are made on soft hammer-struck blanks with offset debitage. The dorsal scar pattern is always unidirectional. Ten are twisted at the proximal end to the right of the main axis which results in the majority of pointed tips being offset. They are usually made by two lines of converging fine or semi-abrupt retouch.

miscellaneous (1; figure 23: 6)

There is one splintered piece in this spit.

Summary of XI F4 9.55

The retouched tool sample from this spit includes carinated pieces, burins and twisted el-Wad points, while the blade/lets produced in spit F4 9.55 are usually twisted (78% of the small sample of 69). The technology of blank manufacture, as well as the morphology of the tools, indicates that the material in this spit is similar to XI E4 9.65.

XI E4 9.36

blade/let (1)

The only blade measures 53 x 15 x 5 mm. It is soft hammer-struck with parallel lateral edges and a blunt distal end.

burin (1)

There is one burin on a convex retouched truncation made at the proximal end of a blade 71 mm long.

XI F4 9.30

flakes (141; figure 26)

There are 141 flakes with mean dimensions of 38 x 34 x 8 mm (s.d. = 13, 15 and 4). The butts are large, averaging 14 x 6 mm (s.d. = 9 and 4). They are most often plain (65%), while 17% have faceted butts and 14% have cortical butts. Over 50% of all flakes have some cortex on their dorsal surfaces and seven of these are entirely covered. Most flakes are soft hammer-struck and 34% show signs of platform abrasion. The majority of flakes have parallel (69%) or expanding lateral edges (26%). Three-quarters of the distal terminations are blunt and over 20% terminate in hinge fractures. Most flakes have between two and five previous removal scars, which are unidirectional (39%) or crossed (25%). In profile most flakes are straight or curved (68%), while 32% are twisted. The flaking angles on these pieces have a mean of 111° with a standard deviation of 9. One flake was removed from the side of a blade/let core to narrow the platform width and flaking face. Another example was struck from the side of the flaking face to undercut a hinge fracture. One flake with bidirectional scars has two proximal ends. This is not the result of a 'bipolar' technique but rather a case in which the flake failed to be detached by a blow at one end of the core. A second platform was used and the removal succeeded, detaching the opposite end with its point and cone of percussion. Twenty-five percent of all flakes are burned.

XI F4 9.30 flakes n=141

butt type	N	%
plain	92	65.25
faceted	24	17.02
cortical	19	13.48
crushed or broken	6	4.26

imitating a dihedral burin	-	-
not measured	-	-
<u>cortex</u>	73	51.77
<u>platform abrasion</u>	48	34.04
<u>lateral edges</u>		
parallel	97	68.79
converging	6	4.26
expanding	37	26.24
not measured	1	0.71
<u>distal termination</u>		
hinge fracture	30	21.28
pointed	5	3.55
blunt or cortical	106	75.18
not measured	-	-
<u>dorsal scars</u>		
unidirectional	55	39.01
opposed	8	5.67
crossed	35	24.82
multidirectional	25	17.73
not measured	18	12.77
<u>profile</u>		
straight	21	14.89
curved	75	53.19
twisted	45	31.92
not measured	-	-

blade/lets (220; figure 27)

The 220 blade/lets have mean measurements of 43 x 15 x 5 mm; the standard deviations are 15, 6 and 3. The butts on these pieces tend to be small with an average of 5 x 2 mm (s.d. = 4 and 1). The majority of the butts are plain (74%), while faceted butts make up only 5%. Sixty blade/lets have cortex that almost always covers 25% or less of the dorsal surface. All of the blade/lets were soft hammer-struck except seven that were detached with hard hammers. Seventy-five percent of the blade/lets show signs of platform abrasion and 25% have offset debitage. In plan the lateral edges are most often parallel (76%) or converging (16%). The most common distal termination is blunt (72%) followed by pointed (18%). Most blade/lets have between three and five dorsal scars which are usually unidirectional (63%) or crossed (20%). In profile the blade/lets are most often twisted (67%) and of these 43% have the twist proximal and to the right. Almost 70% of all blade/lets have their point of percussion directly behind or beside a dorsal ridge. The flaking angle on these pieces has a mean of 118° with a standard deviation of 11. Included in this group are nine plunging blade/lets; two of these come from opposed platform cores. Several of the blade/lets are quite short (<20 mm) and probably come from tool manufacture or abrasion of the striking platform. However, there are cores from this spit that are as short as 21 mm and so these could be 'true' blanks and not just waste from core preparation or tool manufacture. Thirteen percent of the blade/lets are burned and one is covered with red ochre.

XI F4 9.30 blade/lets n=220

butt type	N	%
plain	163	74.09
faceted	11	5.00
cortical	6	2.73
crushed or broken	29	13.18
imitating a dihedral burin	4	1.82
not measured	7	3.18
cortex	60	27.27
platform abrasion	165	75.00
lateral edges		
parallel	168	76.36
converging	35	15.91
expanding	16	7.27
not measured	1	0.46
distal termination		
hinge fracture	20	9.09
pointed	40	18.18
blunt or cortical	158	71.82
not measured	2	0.91
dorsal scars		
unidirectional	138	62.73
opposed	10	4.55
crossed	44	20.00
multidirectional	10	4.55
not measured	18	8.18
profile		
straight	13	5.91
curved	59	26.82
twisted	147	66.82
not measured	1	0.46

crested pieces (19)

There are 17 crested blade/lets and two crested flakes. The only totally crested blade measures 59 mm. Sixteen of these pieces are partially crested, with the crest formed by unidirectional removals. They are usually crested at the distal end only.

core tablets (10)

Eight of the 10 core tablets are flakes and two are blades. They are usually struck off from the middle of the core's flaking face. There is, however, one tablet that has been detached by a side blow which probably indicates an attempt to change the position of the flaking face (Brezillon 1972: 97). The complete specimens average 39 x 30 x 5 mm (s.d. = 6, 12 and 2).

flake cores (5)

Three of the five flake cores in this unit are made on larger flakes. One of these is atypical and may in fact be a splintered piece. Two examples have their platforms formed by inverse retouch or truncation (truncated/faceted pieces) with the dorsal ridges acting as guides for the force of the blow.

blade/let cores (19; figure 24: 9)

Only two of the 19 blade/let cores could be identified as being made on flakes. The majority of the cores have a single platform (16 examples) and one example has an opposed platform. The flaking angle averages about 64° with a standard deviation of 11. In plan most platforms are semicircular (13) and the rest are offset to the left. Seventeen striking platforms are prepared by the removal of a single flake. One core has a platform that is a natural, patinated surface. The flaking faces are always curved, with an average length of 39 mm (s.d. = 11). Most cores have a unidirectional scar pattern on the flaking face (15). The removals are most often parallel (12) and six cores have scars that are twisted. All of the cores show signs of platform abrasion. Over half (10 examples) have cortical backs.

burin spalls (10)

Four of the 10 burin spalls come from dihedral burins and one comes from a truncation burin. The latter example plunged and removed the opposite end of the blank. Three spalls show that the blank's lateral edges were retouched prior to delivery of the burin blow.

end-scrapers (9; figure 24: 1)

All nine end-scrapers are made on flakes. These average 52 x 38 x 10 mm with standard deviations of 8, 2 and 2. Four tools have cortex on their dorsal surfaces and one of these has 65% of its dorsal surface covered. Only one scraper was made at the proximal end and it has a blunt distal termination. Six tools are curved in profile, while two examples are twisted; the last example is fragmentary. There are seven simple end-scrapers, one end-scraper on a retouched piece and one shouldered end-scraper. One simple end-scraper has a secondary patina on its retouched edge. The end-scraper on a retouched piece has total semi-abrupt, invasive retouch along both lateral edges.

carinated pieces (18; figure 24: 2)

Fourteen of the 18 carinated pieces are on flakes or flake fragments. The complete specimens measure 39 x 23 x 10 mm. The standard deviations are 10, 4 and 4. Eleven tools have cortex and five of these have more than half of their dorsal surfaces covered. Six examples are at the proximal end and have blunt distal terminations. In profile the majority of the blanks selected are straight or curved. There are seven lateral carinated scrapers and two tools are burned.

burins (39)

Of the 39 burins 26 are made on flakes or flake fragments. Three tools are made on crested pieces. The complete tools have mean dimensions of 41 x 26 x 10 mm. The standard deviations are 8, 9 and 4. Almost half (17) have some cortex and eight of these have more than 50% of their dorsal surfaces covered. In profile they are most often straight or curved (28). Dihedral burins are the most numerous with 29 examples. There are nine dihedral offset burins, six dihedral angle burins, six burins on a natural surface, four burins on a break and two axial dihedral burins. One of the two multiple dihedral burins combines a dihedral offset burin with a burin on a natural surface. The other has two dihedral axial burins. Of the nine truncation burins there are two examples each on oblique, concave and convex truncations. There is one burin on a straight truncation. The two multiple truncation burins both have concave truncations. A multiple mixed burin has an offset dihedral burin and a concave truncation burin. One burin is made on a blank that had been accidentally heated and then made into a tool by burin blows. A number of burins have some preparation retouch on their lateral edges (six). Four tools still have signs of a distal truncation that existed prior to the blow making them dihedral burins. Flat-faced facets occur on 14 burins. Ten of the burins are burned.

piercer (1; figure 24: 3)

There is one piercer made on a short blade. The retouch forming the tip converges from both lateral edges.

truncations (2)

Both truncations are made on short blades. The longest example is 32 mm. One tool is a straight truncation made at the distal end by fine retouch which may, in fact, be spontaneous. The second is made at the proximal end and is oblique.

notch/denticulate (1)

There is one notch which is made on a broken flake. A Clactonian notch was made on the right lateral edge at the distal end.

composite tools (2)

The two composite tools are made on flakes. One combines an end-scraper with a carinated tool, while the other is an end-scraper and a burin. The second example is made on the lateral edges of a flake which is 46 mm wide.

retouched blade/lets (12; figure 24: 4-6)

There are 12 retouched blade/lets and only three are complete specimens. Included in this group is one backed blade. The longest tool measures 72 mm. They are made on soft hammer-struck blanks and three have offset debitage. Eight tools are twisted in profile. The retouch is usually fine or semi-abrupt and often covers only part of a lateral edge. The exception to this is the backed blade with total direct, semi-abrupt and abrupt retouch on the left lateral edge.

el-Wad points (23; figure 24: 7-8)

Fourteen of the 23 el-Wad points are broken and the complete specimens have mean dimensions of 38 x 10 x 3 mm (s.d. = 9, 2 and 1). Those that have their proximal ends preserved always have small, plain butts. The dorsal scar pattern is always unidirectional and the majority of the complete specimens are twisted proximally. The tips are most often offset to the right of the main axis and formed by two converging lines of retouch that is usually direct, fine or semi-abrupt. Only one tool has inverse retouch; another has its butt removed by direct retouch. Four points are burned.

non-flint artefacts and objects (8 ; figure 24a)

Included in this group are one piece of red ochre, an ochre preparation tool, a possible hammerstone and five water-rounded cobbles. The hammerstone has battering at one end, while another cobble measuring 114 x 98 x 39 mm has crushed and powdered red ochre at both ends. There is one nodule of flint that measures 86 x 75 x 56 mm.

Summary of XI F4 9.30

The sample from this unit has the same tool types noted in the preceding spits. Technologically, there is still an important emphasis on the manufacture of twisted blade/lets (67% of the total of 220 examined).

XI E4 9.25

blade/lets (7)

The longest blade/let measures 61 mm and the shortest is 42 mm. They all have tiny, plain butts and are soft hammer-struck. In profile five are twisted and two are curved.

end-scrapers (9)

The nine end-scrapers have mean dimensions of 52 x 32 x 7 mm with standard deviations of 5, 6 and 1. One end-scraper has less than 25% of its dorsal surface covered by cortex. In profile they are most often curved (five). There are four simple end-scrapers, three end-scrapers on retouched blanks and two double end-scrapers. One tool is made at the proximal end and another has retouch facets that are a secondary patina.

carinated pieces (3)

Two of the three carinated pieces are lateral carinated scrapers. They are all made on flakes of which two are partly cortical. One tool is made at the proximal end.

burins (2)

One burin is made on a blade and the other is on a flake. Both have their dorsal surfaces covered with cortex. One tool is made on an inverse convex truncation at the proximal end. The other is a multiple mixed burin that combines a burin on a concave truncation with an offset dihedral burin. This tool is made off the axis of percussion with the burins on the lateral edges.

retouched blade/let (1)

There is one broken backed blade.

XI E4 9.10

flakes (5)

There are five flakes with average dimensions of 40 x 34 x 8 mm. The standard deviations are 14, 6 and 2. Two butts are faceted, one is plain and one is cortical. One flake was removed from the side of a blade/let core to narrow the platform width and flaking face.

blade/lets (8)

The longest of the eight blade/lets is 57 mm and the shortest is 24 mm. They have tiny, plain butts and are soft-hammer struck. Four have unidirectional scars, two are crossed and one is opposed. The majority are twisted in profile (five).

blade/let cores (4)

One of the four blade/let cores has two flaking faces on opposite sides of the same platform. They all have semicircular platforms and three of these are formed by the removal of a single flake. One core has a faceted striking platform. The flaking faces are curved in profile and have a mean length of 40 mm with a standard deviation of 8. All of the cores are flaked unidirectionally and the majority converge at their bases (three).

end-scraper (1)

The only end-scraper is made on a thick flake with a plain butt. The flake is partially crested and straight in profile. The retouch forming the edge is a secondary patina and the tool is burned.

carinated pieces (3)

Two of these tools are lateral carinated scrapers. One is made at the proximal end of a flake with expanding edges and a blunt distal end.

retouched flake (1)

A broken flake has direct, semi-abrupt and abrupt retouch along its entire left edge.

non-flint artefacts and objects (2)

There are two water-rounded cobbles which measure 84 x 74 x 49 mm and 77 x 65 x 31 mm.

XI F4 8.95

flakes (183; figure 25: 4-5)

The 183 flakes have average dimensions of 24 x 22 x 5 mm with standard deviations of 11, 8 and 3. The butts on these pieces tend to be larger than those on blade/lets with a mean width and thickness of 10 x 3 mm (s.d. = 8 and 2). They are most often plain (64%); faceted butts make up about 17%. Thirty-nine percent of the flakes have some cortex on their dorsal surfaces. Nineteen of these have more than half of that surface covered. Most flakes were detached with a soft hammer, while only 8% were detached with a hard hammer. Platform abrasion occurs on 30% of all flakes. The majority have parallel lateral edges (66%) and the distal end is most often blunt (69%). Hinge fractures occur on 29% of the flakes. Most have between one and four dorsal scars that are usually unidirectional (53%) or crossed (20%). In profile the flakes are most often straight or curved (66%). Twisted debitage accounts for 34%. The flaking angle on these pieces has a mean of 108° with a standard deviation of 14. Seven flakes were removed from the sides of blade/let cores to narrow the platform width and flaking face. One of these is short enough to have come from the side of a nosed scraper (cf. Bells 1938). Two flakes were detached from cores made on larger flakes. Not included in the above measurements are two Clactonian notch spalls and six tiny flakes that almost certainly come from retouching a tool like an end-scraper (Newcomer and Karlin in press). Twenty-seven percent of all flakes are burned.

XI F4 8.95 flakes n=183

butt types	N	%
plain	117	63.93
faceted	31	16.94
cortical	18	9.84
crushed or broken	17	9.29
imitating a dihedral burin	-	-
not measured	-	-

cortex	71	38.80
platform abrasion	55	30.06
lateral edges		
parallel	121	66.12
converging	5	2.73
expanding	49	26.78
not measured	8	4.37
distal termination		
hinge fracture	53	28.96
pointed	4	2.19
blunt	126	68.85
not measured	-	-
dorsal scars		
unidirectional	97	53.01
opposed	11	6.01
crossed	37	20.22
multidirectional	13	7.10
not measured	25	13.66
profile		
straight	20	10.93
curved	101	55.19
twisted	62	33.88
not measured	-	-

blade/lets (82)

The 82 blade/lets examined have mean dimensions of 44 x 15 x 5 mm with standard deviations of 15, 6 and 3. The butts tend to be small averaging 5 x 2 mm (s.d. = 4 and 1). Most of these are plain (74%). Cortex occurs on 10 blade/lets and four of these have more than half of their dorsal surfaces covered. Most are soft hammer-struck with only one example being detached with a hard hammer. Platform abrasion occurs on 74% and offset debitage on 24%. Most blade/lets have parallel (65%) or converging lateral edges (24%). Blunt distal ends account for 59% of the total and pointed ends account for 22%. Most blade/lets have between three and five dorsal scars which are unidirectional (67%) or crossed (13%). In profile the majority are twisted (60%). The flaking angle on these pieces has a mean of 113° with a standard deviation of 23. There is one blade that plunged from an opposed platform core. Thirteen percent of the blade/lets are burned.

XI F4 8.95 blade/lets n=82

	N	%
butt type		
plain	61	74.39
faceted	5	6.10
cortical	3	3.66
crushed or broken	7	8.54
imitating a dihedral burin	-	-
not measured	6	7.32
cortex	10	12.20
platform abrasion	61	74.39
lateral edges		
parallel	53	64.63
converging	20	24.39
expanding	6	7.32
not measured	3	3.66
distal termination		
hinge fracture	10	12.20
pointed	18	21.95
blunt or cortical	48	58.54
not measured	6	7.32
dorsal scars		
unidirectional	55	67.07
opposed	2	2.44
crossed	11	13.42
multidirectional	-	-
not measured	14	17.07
profile		
straight	9	10.98
curved	19	23.17
twisted	49	59.76
not measured	5	6.10

crested pieces (11)

Nine of the 11 crested pieces are blade/lets and two are flakes. There is only one totally crested blade which measures 38 mm in length.

core tablets (3)

There are three hard hammer-struck core tablets from plain platformed cores.

flake cores (9)

There are nine flake cores and most of these have multiple platforms which are formed by alternate removals. Only three of the cores show any signs of platform preparation by abrasion.

blade/let cores (31)

Of the cores that could have their raw material identified only three were made on flakes. Most cores have single platforms (65%) and the flaking angles have a mean of 68° with a standard deviation of 11. Most platforms are semicircular in plan (73%) and the majority are formed by the removal of a single flake (71%). The majority of the flaking faces are curved (94%) and have a mean length of 37 mm with a standard deviation of 10. The scars on the flaking faces are generally parallel (79%) and 23% are twisted. All of the cores show evidence of platform abrasion. The majority have no modification of their backs, while seven cores have crested ridges running down their backs.

XI F4 8.95 blade/let cores n=31

number of platforms	N	%
single platform	20	64.52
two, opposed platforms	5	16.13
two, unopposed platforms	3	9.68
two, alternate platforms	-	-
two, crossed platforms	-	-
multiple platforms	-	-
not measured	3	9.68
platform type		
plain	22	70.97
faceted	5	16.13
cortical/natural surface	2	6.45
ventral surface of a flake	-	-
not measured	2	6.45
platform abrasion	31	100.00

burin spalls (19; figure 25: 3)

There are 19 burin spalls of which one is a plunging spall that removed an opposed carinated piece. Another example detached an opposed truncation burin.

end-scrapers (13)

Six of the 13 end-scrapers are on blades or blade fragments. One scraper is made on a partially crested blade. These tools have mean dimensions of 58 x 32 x 9 mm. The standard deviations are 10, 11 and 3. One scraper has 20% of its dorsal surface covered with cortex. In profile they are most often curved, while four tools are twisted. There are seven simple end-scrapers, four end-scrapers on retouched blanks, one nosed end-scraper and one inverse end-scraper. Two tools have denticulates on their lateral edges. The scrapers made on retouched blanks have semi-abrupt or abrupt lateral retouch.

carinated pieces (19; figure 25: 1-2)

Of the 19 carinated tools 11 are broken. They are most often on flakes (17) and have average dimensions of 34 x 23 x 9 mm. The standard deviations for these measurements are 6, 5 and 3. Fourteen of the blanks are partially cortical, while seven have more than half of their dorsal surface covered. Most tools are straight or curved in profile. One example is made on a plunging blade from an opposed platform core. There are 11 lateral carinated scrapers and two of these have retouched distal edges to guide the removals forming the tool's edge. Five carinated tools are burned.

burins (31)

There are 31 burins of which 17 tools are made on flakes or flake fragments. One burin is made on a core tablet, one is on a partially crested blade and another is on a broken plunging spall. The complete specimens have average dimensions of 43 x 24 x 8 mm with standard deviations of 13, 12 and 4. Eight tools have some cortex that usually covers less than 25% of the dorsal surface. They are most often curved in profile and there are four examples each with straight or twisted profiles. Twenty-three are dihedral burins and the dihedral offset burin is the most common type (10 examples). There are seven burins made on a cortical surface or unmodified lateral edge. Four tools are multiple dihedral burins and two are burins on breaks. The most common truncation burin is on an oblique truncation (three examples). There are two burins on concave truncations and one on a convex truncation. The only multiple truncation burin has two sets of spalls detached from the same concave truncation. There is one multiple mixed burin that combines an axial dihedral burin with a burin on an oblique truncation. Six tools utilised retouch to guide the removal of the spall and nine have flat-faced facets. Six burins are burned.

truncation (1)

There is one oblique truncation made on a blade that measures 99 x 39 x 17 mm. The truncation is distal and made by direct, abrupt retouch.

notch/denticulate (1)

The single denticulate is made on a blade that is twisted in profile. The denticulation is on the right lateral edge and covers it totally.

retouched blade/lets (2)

One of these two tools is broken. The complete specimen measures 38 x 9 x 3 mm and is made on a soft hammer-struck blank with offset debitage. On both specimens the retouch is fine and direct.

miscellaneous (1)

There is one intentionally broken blade that measures 41 x 19 x 5 mm.

non-flint artefacts and objects (6)

Included in the collection from this spit are six water-rounded pebbles, the largest of which measures 45 x 24 x 19 mm.

Summary of XI F4 8.95

This sample differs typologically from those below it in the complete absence of el-Wad points. Lateral carinated scrapers are an important component of the collection (11 examples or 16% of the 67 retouched tools). Twisted debitage makes up 60% of the 82 blade/lets examined. The morphology of the tools and the technology of blank manufacture is identical to the other spits in level XI.

XI F4 8.85

flakes (10)

There are only 10 complete flakes from spit 8.85 and these have average dimensions of 34 x 22 x 5 mm (s.d. = 10, 5 and 2). Most have plain butts (seven examples). One flake was detached from a core made on a larger flake.

blade/lets (62)

The 62 blade/lets have mean dimensions of 34 x 12 x 4 mm with standard deviations of 11, 5 and 3. The butts are small, averaging 5 x 2 mm (s.d. = 3 and 1) and are most often plain (73%). Sixteen examples have some cortex on their dorsal surfaces. Most were detached with a soft hammer and 80% utilised platform abrasion prior to detachment. Fifty-two percent of the blade/lets have offset debitage. The lateral edges are usually parallel (70%) and the most common distal termination is blunt (66%). Most blade/lets have between three and five previous removal scars that are usually unidirectional (77%). In profile the majority are twisted (61%), while blade/lets with curved profiles make up 29%. The flaking angle on these pieces averages 122° with a standard deviation of 6. The point of percussion relative to the dorsal scars is usually behind or beside (75%) a dorsal ridge. Included in this group are four blanks that come from cores made on flakes. Three blade/lets plunged and one of these comes from an opposed platform core. Over 20% are burned.

crested pieces (4)

There are four partially crested blade/lets and the longest example measures 43 mm. One example comes from a core made on a flake and removed the proximal end of that piece.

core tablets (2)

One of the two core tablets comes from a core made on a flake.

flake cores (5)

Two of the five flake cores have multiple platforms formed by the alternate removal of flakes. The other examples all have single platforms. The longest flaking face on a single platform core is 45 mm and the shortest is 31 mm.

blade/let cores (2)

There are two blade/let cores which have single platforms. The platforms are semicircular and are formed by the removal of a single flake. They have curved flaking faces, the longest being 56 mm and the shortest 29 mm.

burin spall (1)

There is one primary spall that is broken.

end-scrapers (9)

Seven of the nine end-scrapers are made on flakes or flake fragments. The complete specimens have average dimensions of 50 x 31 x 7 mm. The standard deviations for these measurements are 6, 5 and 1. Four scrapers are partially cortical and one is entirely covered with cortex. In profile all the complete scrapers are curved except one that is twisted. The simple end-scraper is the most numerous (six examples). There are three end-scrapers made on blanks that also have direct, semi-abrupt retouch. One tool has invasive, stepped and scaled retouch and another has a Clactonian notch on its right lateral edge.

carinated pieces (12; figure 25: 7-9)

There are 10 carinated pieces made on flakes and one on a blade which have mean dimensions of 36 x 28 x 13 mm (s.d. = 6, 5 and 4). One tool is made on a partially crested piece. Most tools have some cortex that usually covers more than half of their dorsal surfaces. Six examples are made at the proximal end and these have blunt distal terminations. In profile they are always straight or curved. The most common type is the lateral carinated scraper (seven examples).

burins (12)

Five of the 12 burins are made on flakes or flake fragments. Three tools are made on crested pieces. The entire specimens have average dimensions of 43 x 24 x 10 mm (s.d. = 15, 7 and 3). Cortex occurs on seven tools and always covers less than half of the dorsal surface. All of the complete burins are straight or curved in profile. Dihedral burins are the most numerous (eleven examples) and there is one burin on a straight truncation. There are four dihedral offset burins, three burins on unmodified lateral edges, two dihedral axial burins and one burin on a break. A multiple dihedral burin combines a burin on a break with a dihedral axial burin. Four burins are made at the proximal end and flat-faced facets occur on three examples. One spall plunged and removed a proximal end. Another example has facets that are a secondary patina. Four burins are burned.

notch/denticulate (1)

There is one notch made on a broken flake. This piece has two retouched notches that are adjacent to each other on the same lateral edge.

retouched blade/lets (3)

The longest of these tools measures 40 mm. The blade/lets are all soft hammer-struck and two have small, plain butts. The retouch on these pieces is always direct and discontinuous. In two cases it is fine and semi-abrupt, while the third example has abrupt retouch.

el-Wad points (8)

Five of the eight points are broken and the largest complete tool measures 36 x 10 x 2 mm. They tend to be rather thin with a mean of 2 mm and a standard deviation of 1. The complete points are made on soft hammer-struck blade/lets and only one has offset debitage. Five tools are twisted in profile. Most points are made by fine or semi-abrupt retouch converging from both edges (six). The majority have their pointed tips offset to the right of the long axis (six). One of the broken tools has a flute-like impact fracture at its tip.

miscellaneous (1; figure 25: 6)

There is one side-scraper (<u>lame mâchuré</u> ?) made on a large blade which measures 96 x 47 x 11 mm. The retouch forming the edge is invasive and slightly scalar.

Summary of XI F4 8.85

This spit appears to be typologically and technologically similar to the other spits in this level.

Summary of level XI

The sample from this level continues along the same pattern as level XII and is dominated by scrapers, carinated tools and burins. Burins still outnumber scrapers (excluding carinated types) although they are less numerous than in level XII. Dihedral burins tend to outnumber truncation burins and multifaceted types occur fairly frequently. Carinated tools are common and this level is characterised by an increase in lateral carinated scrapers. Blade/let tools decline in number and represent 19% of the 445 tools examined. This figure is lower than that of level XII, where they account for 28% of the 381 tools counted in squares E4 and F4. Levels XII and XI are both characterised by twisted blade/lets with offset debitage (blade/let debitage accounts for 51% of the blanks in level XI; see page 125).

It is fairly certain that these two levels are directly related, a fact that has been noted previously (Newcomer 1972: 332; Besançon et al. 1977; Azoury 1986: 228). Like the two levels below, XII and XIII, this layer has a strong Aurignacian typology combined with a blade/let based technology. This combination excludes these assemblages from the definitions of both the Aurignacian and Ahmarian as proposed for flaked stone industries in the southern Levant. As the material in levels XIII-XI seems to be relatively unique (Besançon et al. 1977) and distinct from phase 2, it is proposed that it continue to be regarded as stage 3 of Ksar Akil.

X: E4 and F4

Level X varies in depth from about 30 to 60 cm. Three 2m square units are represented in the Institute collections: E4, F4 and F3. Only two squares were examined and the deepest, E4, has spits at 8.65 and 8.10 m below datum. Square F4 has spits at three different depths: 8.60, 8.40 and 8.10 m. This level has a higher concentration of stones in its sediment than levels XI or XII. The tables below give the number of artefacts examined from squares E4 and F4.

Debitage	E4 8.65	F4 8.60	F4 8.40	E4 8.10	F4 8.10
flakes	50	19	182	90	30
blade/lets	403	26	272	349	54
crested pieces	31	-	26	27	-
core tablets	5	-	6	3	-
flake cores	10	6	3	15	2
blade/let cores	46	7	10	42	8
burin spalls	4	-	-	-	-
total	549	58	499	526	94

Tools	E4 8.65	F4 8.60	F4 8.40	E4 8.10	F4 8.10
scrapers	7	-	1	72	2
carinated pieces	11	-	-	3	-
burins	36	-	-	13	-
piercers	1	-	-	-	-
truncations	1	-	-	1	-
notches/denticulates	-	-	-	-	-
composite tools	3	-	-	9	-
retouched blade/lets	43	-	23	-	13
retouched flakes	-	-	-	-	2
el-Wad points	59	1	22	15	11
total	161	1	46	113	28

X E4 8.65

flakes (50; figure 42)

There are 50 flakes with average dimensions of 43 x 31 x 7 mm (s.d. = 11, 10 and 3). The butts on these pieces tend to be large with a mean of 12 x 4 mm (s.d. = 8 and 3). The majority of these are plain (58%) or faceted (26%). Cortex occurs on 19 flakes but only four of these have more than half of their dorsal surfaces covered. Of the flakes that could have their flaking mode identified there are roughly equal amounts of hard and soft hammer-struck pieces. Forty percent show signs of platform abrasion. Most flakes have parallel lateral edges (80%) and blunt distal ends (76%). They usually have between three and five previous removal scars, which are most often unidirectional (64%). Crossed and opposed scars account for 16% each. Straight or curved profiles make up over 90% of the total. The flaking angle on these pieces has a mean of 120° with a standard deviation of 10. Two flakes plunged removing opposed platforms and three were detached from the sides of blade/let cores to narrow the platform width and flaking face. Another flake removed the base of a unidirectional blade/let core. Twelve percent of the flakes are burned.

X E4 8.65 flakes n=50

butt types	N	%
plain	29	58.00
faceted	13	26.00
cortical	4	8.00
crushed or broken	2	4.00
imitating a dihedral burin	-	-
not measured	2	4.00
cortex	19	38.00
platform abrasion	20	40.00
lateral edges		
parallel	40	80.00
converging	5	10.00
expanding	5	10.00
not measured	-	-
distal termination		
hinge fracture	8	16.00
pointed	4	8.00
blunt or cortical	38	76.00
not measured	-	-
dorsal scars		
unidirectional	32	64.00
opposed	8	16.00
crossed	8	16.00
multidirectional	2	4.00
not measured	-	-
profile		
straight	9	18.00
curved	38	76.00
twisted	3	6.00
not measured	-	-

blade/lets (403; figure 32: 1-5; figures 43-45)

The 403 blade/lets have mean dimensions of 46 x 14 x 4 mm; the standard deviations for these are 14, 5 and 2. The butts are often quite small, averaging 5 x 2 mm (s.d. = 3 and 1). They are most often plain (82%), while 13% of the blade/lets have crushed or broken butts. Seventy blade/lets have some cortex on their dorsal surfaces but only six have more than half of that surface covered. Over 95% of these pieces were detached with a soft hammer. About 90% of all blade/lets show signs of platform abrasion at their proximal ends and offset debitage occurs on only 11% of these blanks. Parallel lateral edges occur on 60% and converging edges are found on 36%. The most common distal termination is blunt (58%) or pointed (31%). Most blade/lets have between three and six dorsal scars, which are most often unidirectional (86%). In profile 55% are straight or curved. The flaking angle has a mean of 123° with a standard deviation of 9. The point of percussion is almost always behind or to the side of a dorsal ridge (97%). Thirteen percent of the blade/lets are burned.

X E4 8.65 blade/lets n=403

butt type	N	%
plain	330	81.89
faceted	12	2.98
cortical	2	0.50
crushed or broken	52	12.90
imitating a dihedral burin	1	0.25
not measured	6	1.49
cortex	70	17.37
platform abrasion	359	89.08
lateral edges		
parallel	242	60.05
converging	145	35.98
expanding	15	3.72
not measured	1	0.25
distal termination		
hinge fracture	36	8.93
pointed	125	31.02
blunt or cortical	234	58.07
not measured	8	1.99
dorsal scars		
unidirectional	347	86.10
opposed	6	1.49
crossed	44	10.92
multidirectional	5	1.24
not measured	1	0.25
profile		
straight	33	8.19
curved	187	46.60
twisted	153	37.97
not measured	30	7.44

crested pieces (31)

The majority of the 31 crested pieces are blade/lets; three examples are flakes. The longest entirely crested blade/let is 83 mm and the shortest is 39 mm. Most of these have plain butts, while there are two examples with faceted butts. Over 1/3 of all crested pieces have some cortex on their dorsal surfaces. In profile 19 examples are twisted. Most of these pieces are only partially crested at the distal end and unidirectional removals are used to form the crest on 25 specimens. Only one example is burned.

core tablets (5; figure 32: 6-7)

Three core tablets are flakes and two are blades. The largest example measures 94 x 32 x 14 mm. Most were detached from plain platformed cores, the single exception comes from a core with a faceted platform.

flake cores (10; figure 32: 8-9)

The majority of the 10 flake cores are multiplatformed. There are two examples with opposed platforms and one discoidal core. In the first group, the platforms are formed by the alternate removal of flakes during the course of debitage. The longest flaking face measures 52 mm and the shortest 39 mm. Most cores have been flaked over their entire surface area and only one example has a back which is cortical.

blade/let cores (46; figure 33: 1-2; 34: 1-3; 35: 1-2)

The most numerous type of core from this spit is the single platform blade/let core (42 examples). There are four cores with two platforms and three of these are opposed. The mean flaking angle on these pieces is 64° with a standard deviation of 8. Most platforms are semicircular in plan (84%) and were formed by the removal of a single flake (91%). There is only one core with a faceted striking platform. The flaking faces are almost always curved and have a mean length of 45 mm with a standard deviation of 12. The removal scars on these cores are usually parallel or converging (89%) with no twist. Platform abrasion occurs on 42 of the 46 (91%) cores. The back of the core is most often cortical or unmodified, while five examples have a crested ridge running down the back.

X E4 8.65 blade/let cores n=46

number of platforms	N	%
single platform	42	91.30
two, opposed platforms	3	6.52
two unopposed platforms	1	2.17
two, alternate platforms	-	-
two, crossed platforms	-	-
multiple platforms	-	-
not measured	-	-
platform type		
plain	42	91.30
faceted	1	2.17
cortical/natural surface	1	2.17
ventral surface of a flake	-	-
not measured	2	4.35
platform abrasion	42	91.30

burin spalls (4)

Two of the four burin spalls plunged. One removed the proximal end of the blank and the other an end-scraper on the opposite end.

end-scrapers (7; figure 30: 1)

There are four tools made on flakes and two on blades; one example is on a crested piece. They have mean dimensions of 47 x 27 x 11 mm. The standard deviations for these measurements are 10, 4 and 3. The majority of the scrapers are made on blanks with straight or curved profiles. One of the tools has its proximal end removed by an intentional break. There are three simple end-scrapers, two shouldered end-scrapers, one double end-scraper and one end-scraper on a retouched piece. The last two tools both have total, direct, semi-abrupt retouch on their lateral edges. One of the shouldered end-scrapers also has both edges covered by retouch; the butt on this piece has been partly removed by inverse retouch.

carinated pieces (11; figure 30: 2-4)

Eight of the 11 carinated tools in this spit are on flakes or flake fragments. The complete specimens have average dimensions of 34 x 23 x 14 mm with standard deviations of 7, 8 and 3. Five examples are made on blanks with some cortex and three tools have at least half of their dorsal surfaces covered. Four tools are made at the proximal end; three of these have blunt distal terminations and one ends in a hinge fracture. In profile five are straight and two are curved; four tools are too fragmentary to determine the original profile shape. There are two lateral carinated scrapers.

burins (36; figure 30: 5-6; 31: 1-2)

Of the 36 burins there are 23 made on truncations. Most are on flakes (22) and the complete tools have average dimensions of 49 x 29 x 10 mm (s.d. = 10, 9 and 3). Three burins are on crested pieces and one is on a core tablet. Fourteen burins have some cortex on their dorsal surfaces, but only four have more than half of that surface covered. Seven burins are made at the proximal end and in profile most of the burins are straight or curved. The most common types are the burins on oblique and concave truncations (eight examples each). There are five tools on convex truncations and two on lateral retouch. One of the former is made on an inverse truncation. The most numerous dihedral burin is the offset burin (five), followed by the axial burin and the burin on a break (three examples each). There are two burins on natural, unmodified surfaces. One of the axial dihedral burins is made on an old side-scraper and the burin facets are a secondary patina. Three burins have retouch that helped to guide the removal of the spall and two burins produced spalls that plunged. Six burins are burned.

piercer (1)

The only piercer is made on a narrow bladelet and measures 25 x 6 x 2 mm. The retouch forming the tip converges from both lateral edges.

truncation (1)

A single oblique truncation is made on a long blade measuring 79 x 16 x 4 mm.

composite tools (3; figure 31: 3)

Two of these tools are on thick flakes. All of the blanks used have some cortex and two have half of their dorsal surfaces covered. The tool types that are combined are end-scrapers and burins. The end-scrapers are all simple and the burins are as follows: a multiple burin on a break, a burin on an oblique truncation and a burin on a lateral notch. The last example is made on the edges of the blank rather than at the ends and the notch is Clactonian.

retouched blade/lets (43; figure 31: 4-8)

Only four of the 43 retouched blade/lets are complete tools. The largest of these measures 37 x 8 x 2 mm. All of the complete blade/lets are soft hammer-struck and the flaking direction on these pieces is unidirectional. In profile the majority are straight or curved. Most of these tools have fine retouch (26 examples). There are 15 pieces with direct, semi-abrupt retouch and two with abrupt retouch. Many of these broken tools are probably fragments of el-Wad points and one example has a flute-like impact fracture in association with a flexion break. Three pieces are burned.

el-Wad points (59; figure 31: 9-11)

Only half of the 59 el-Wad points still have their proximal ends intact. All of these have tiny, plain butts that average 2 x 1 mm (s.d. for the first measurement is 1). Three tools are complete and the largest is 50 x 10 x 3 mm and the smallest is 29 x 7 x 2 mm. They are made on thin, narrow blade/lets that have an average width and thickness of 8 x 2 mm (s.d. = 1 and 1). Unlike most other classes of retouched tools, cortex is entirely absent in this group. The blanks used were always detached with a soft hammer. In profile the majority appear to be straight or curved . Most of the tools are made with two lines of converging retouch (62%). In plan 90% are symmetrical, with the pointed tip in line with the long axis of the blank. There are seven el-Wad variants (Marks 1976b: 381; Bergman 1981) that have inverse fine and semi-abrupt retouch which is usually on the right lateral edge at the proximal end. This tool type was originally called the <u>Abu Halka point</u> by Azoury and is unknown in levels XIII-XI. Six points are burned.

miscellaneous (1)

There is one flake that has a proximal intentional break.

Summary of X E4 8.65

The first spit in level X departs markedly from those below it in level XI. Typologically, the sample contains a reduction in the relative numbers of burins and end-scrapers from 47% in XI 8.85 to 27% in X 8.65. Carinated tools are also less common dropping from 27% in XI 8.85 to 7% in X 8.65. Newcomer (1972: 332, 380) noted this decrease in the numbers of carinated tools in level X, stating that "level 10 may be seen as the beginning of a trend away from carinated and flat-faced carinated burins which are so characteristic of levels 11-13...". In the sample of el-Wad points, the variants with inverse retouch appear for the first time. These differ from those in the Negev published by Marks (1976b: 381) in that the inverse retouch is usually confined to the proximal end only. Although el-Wad points are found in levels XIII-XI, they are morphologically quite distinct from those in X 8.65 because of the technology of the blade/lets used. This change in technology is characterised by a decline in the number of blade/lets with offset debitage and twisted profiles.

X F4 8.60

flakes (19)

The 19 flakes have average dimensions of 47 x 31 x 8 mm with standard deviations of 13, 8 and 4. The butts on these pieces tend to be plain (12 examples) and large. Six flakes have some cortex and all of these have less than half of their dorsal surfaces covered. The cortex on one of the flakes shows signs of chattering, which means the nodule almost certainly comes from a derived context such as a river or beach. In plan the lateral edges are usually parallel (12) and the distal terminations are most often blunt with 14 examples. Most flakes have between three and five dorsal scars, which are usually unidirectional (nine). Seven flakes have crossed scars and there is one example each with opposed and multidirectinal scars. In profile 15 flakes are straight or curved and four are twisted. Five flakes are burned.

blade/lets (26)

The 26 blade/lets have mean dimensions of 51 x 17 x 5 mm with standard deviations of 14, 5 and 2. The butts are generally small and average 5 x 2 mm (s.d. = 4 and 1). They are most often plain, while four have faceted butts and three have crushed or broken butts. Cortex occurs on two blade/lets covering only 25% of their dorsal surfaces. They are soft hammer-struck and offset debitage occurs on only 4 of these pieces. The lateral edges are usually parallel (19 examples) and the distal ends tend to be blunt with 17 examples. Most blade/lets have between three and five dorsal scars that are usually unidirectional and twisted profiles occur on 16 pieces. Two blade/lets are burned.

flake cores (6)

Most flake cores have three or more platforms (four examples). These multiplatformed cores are usually flaked by alternate removals. They do not have prepared platforms but rather take advantage of the surface presenting the best flaking angle. The longest flaking face comes from a single platform core and is 68 mm. Only one flake core shows signs of platform preparation by abrasion.

blade/let cores (7)

Six of the seven blade/let cores have a single platform. One core has two platforms that are crossed. In plan most platforms are semicircular, while two have offset left platforms. The platform is always made by the removal of a single flake. The mean length of the flaking faces is 38 mm with a standard deviation of 15. The flaking direction is always unidirectional (the example with crossed platforms has two distinct flaking faces). All seven cores show signs of abrasion at their platform edges.

el-Wad point (1)

A broken el-Wad point is the only retouched tool examined from this spit. It is made on a soft hammer-struck blade and has two converging lines of retouch forming the tip.

non-flint artefacts and objects (2)

There are two water-rounded cobbles; the larger measures 49 x 41 x 10 mm.

Summary of X F4 8.60

There are too few artefacts to say much about this spit. The general impression is that it contains material similar to X 8.65.

X F4 8.40

flakes (182; figure 36: 12)

The 182 flakes have mean dimensions of 29 x 27 x 6 mm with standard deviations of 9, 9 and 3. The butts on these pieces tend to be large measuring 11 x 4 mm (s.d. = 6 and 3) and plain (72%). Cortex is found on 64 flakes and 16 of these have most of their dorsal surfaces covered. The flakes tend to be soft hammer-struck and platform abrasion occurs on 68 (37%) flakes. In plan most flakes have parallel edges (74%), while 15% have expanding edges and only 3% have converging edges. The distal ends are usually blunt (69%) or hinge fractures (25%). Most flakes have between two and five previous removal scars, which are usually unidirectional (58%). Twenty-one percent have crossed scars, 6% have opposed scars and 3% have multidirectional scars. Most flakes are straight or curved in profile (86%). The flaking angle on these pieces has a mean of 115° with a standard deviation of 7. One flake plunged and comes from an opposed platform core. Another example was removed from the side of a blade/let core to narrow the platform width and flaking face. Not included in the above measurements are 12 tiny flakes with markedly curved profiles that almost certainly come from tool manufacture.

X F4 8.40 flakes n=182

	N	%
<u>butt type</u>		
plain	131	71.98
faceted	14	7.69
cortical	13	7.14
crushed or broken	24	13.19
imitating a dihedral burin	-	-
not measured	-	-
<u>cortex</u>	64	35.17
<u>platform abrasion</u>	68	37.36
<u>lateral edges</u>		
parallel	135	74.18
converging	5	2.75
expanding	27	14.84
not measured	15	8.24
<u>distal termination</u>		
hinge fracture	45	24.73
pointed	10	5.50
blunt or cortical	126	69.23
not measured	1	0.55
<u>dorsal scars</u>		
unidirectional	106	58.24
opposed	11	6.04
crossed	38	20.88
multidirectional	5	2.75
not measured	22	12.09

profile

straight	18	9.89
curved	139	76.37
twisted	25	13.74
not measured	-	-

blade/lets (272)

The 272 blade/lets have mean dimensions of 34 x 11 x 3 mm (s.d. = 13, 4 and 1). The butts on blade/lets are smaller than those on flakes, averaging 3 x 1 mm. The standard deviation for the first measurement is 2. Most are plain with 81% and 9% of the butts are crushed or broken. Fifty-two blade/lets have some cortex on their dorsal surface but only four of these have more than half of that surface covered. About 80% of the blade/lets are soft hammer-struck. Over 90% have platform abrasion and like the two previous spits, offset debitage is relatively rare, being found on only 11% of the blade/lets. The lateral edges are most often parallel or converging (91%) and the distal terminations are usually blunt (51%). Thirty-four percent have pointed ends. Most blade/lets have between two and five scars that are most often unidirectional (89%). Like the other spits in level X, most blade/lets have straight or curved profiles (60%). Over 95% have the point of percussion directly behind or to the side of a dorsal ridge. The flaking angle on these pieces averages 122° with a standard deviation of 8. Five blade/lets come from cores made on flakes. There are four plunging blade/lets that come from opposed platform cores. Another plunging blade comes from a core with alternate platforms. Eight percent of the blade/lets are burned.

X F4 8.40 blade/lets n=272

butt type	N	%
plain	220	80.88
faceted	14	5.15
cortical	12	4.41
crushed or broken	24	8.82
imitating a dihedral burin	-	-
not measured	2	0.74
cortex	52	19.12
platform abrasion	248	91.18

lateral edges

parallel	166	61.03
converging	82	30.15
expanding	22	8.09
not measured	2	0.74

distal termination

hinge fracture	24	8.82
pointed	92	33.82
blunt or cortical	139	51.10
not measured	17	6.25

dorsal scars

unidirectional	242	88.97
opposed	7	2.57
crossed	18	6.62
multidirectional	2	0.74
not measured	3	1.10

profile

straight	24	8.82
curved	139	51.10
twisted	105	38.60
not measured	4	1.47

crested pieces (26)

Only two of the 26 crested pieces have flake dimensions. The longest totally crested blade is 70 mm and the shortest is 30 mm. The butts on these pieces are most often plain (16) and all of them are soft hammer-struck. In profile 16 are straight or curved and 10 are twisted. The majority of the crested pieces examined have a partial distal crest (12). Unidirectional crests (19) outnumber bidirectional ones. Two examples are burned.

core tablets (6)

All six core tablets come from cores with plain platforms and four specimens have small amounts of cortex on their dorsal surfaces. In profile these pieces are curved (five) or straight (one). One core tablet is burned.

flake cores (3)

One of the three flake cores is a core made on a flake with the striking platform formed by an inverse truncation (truncated/faceted piece). Another piece is a multiplatformed core and the last example has two platforms which are not opposed. The flaking faces on this core are not on the same axis and the longer is 46 mm and the shorter is 29 mm. Platform abrasion occurs on the edge of one of the platforms.

blade/let cores (10)

Seven blade/let cores have single platforms and three have two platforms. In the latter group two are opposed and one is alternate. They have mean flaking angles of 66° with a standard deviation of 7. Eight cores have platforms that are semicircular in plan and most are made by the removal of a single flake. The flaking faces are always curved and they have a mean length of 41 mm (s.d. = 11). Every blade/let core shows signs of abrasion on the platform edge. Five of the cores have unmodified, cortical backs.

end-scraper (1; figure 36: 1)

One badly broken end-scraper was examined from this spit.

retouched blade/lets (23; figure 36: 2-7)

Only five of the 23 retouched blade/lets are complete specimens. The largest measures 33 x 10 x 3 mm and the smallest is 22 x 8 x 2 mm. The blanks used to make these tools have a mean width and thickness of 8 and 3 mm, (s.d. = 2 and 1). All of the complete pieces have small, plain butts and are soft hammer-struck. In profile most of the complete or nearly complete tools (14) are straight or curved. The most common types of retouch are direct, fine and semi-abrupt (18 examples). Abrupt retouch is found on only three examples. Four tools have inverse retouch and these may be fragments of el-Wad variants. One broken retouched blade, much wider than the average for the group (17 mm), has invasive, stepped and scaled retouch on both lateral edges.

el-Wad points (22; figure 36: 8-11)

The sample of el-Wad points from this spit includes seven complete specimens. The largest example measures 40 x 8 x 2 mm and the smallest is 24 x 7 x 2 mm. The mean width and thickness for the entire sample is 8 x 2 mm with standard deviations of 1 and 1. All of the points that preserve their proximal ends have small, plain butts and are soft hammer-struck. Seventeen points have unidirectional dorsal scars and the majority are straight or curved in profile (15). Most el-Wad points are made by two converging lines of retouch (13). Eleven tools are symmetrical having their pointed tip bisected by the long axis of the blank. The rest are too fragmentary to be certain of their plan shape. There are two el-Wad variants: one has total, alternate, semi-abrupt retouch (as in Jones et al. 1983: figure 9-9) and the other has abrupt inverse retouch at the proximal end on the right lateral edge.

non-flint artefacts and objects (3)

Included in this category are two fragments of water-rounded cobbles and one piece of red ochre.

Summary of X F4 8.40

The retouched tool sample from this spit has a simple end-scraper as well as retouched blade/lets, el-Wad points and el-Wad variants. These tools have been noted in E4 8.65 and are identical morphologically. Technologically, blade/lets with straight or curved profiles (60%) outnumber those with twisted profiles (37%). Offset debitage continues to be much less common (11% of the sample of 272) than in levels XIII-XI. Blade/lets are most numerous in this sample which is clearly directly related to the other two already described from level X.

X E4 8.10

flakes (90; figure 38: 7)

The 90 flakes have mean dimensions of 38 x 29 x 6 mm with standard deviations of 8, 9 and 2. The butts on these pieces tend to be large with average dimensions of 12 x 4 mm (s.d. = 8 and 2). Seventy-four percent of these are plain and 12% are faceted. Twenty-seven percent of all flakes have part of their dorsal surfaces covered with cortex. Most were detached with a soft hammer and platform abrasion occurs on 54% of the flakes. In plan the lateral edges are most often parallel (81%) and the distal terminations are most often blunt (76%). Most flakes have between two and six scars that are unidirectional (59%). Twenty percent of the flakes have crossed scars and 11% have multi-directional scars. In profile they are generally straight or curved (74%), while 23% are twisted. The flaking angle on these pieces has a mean of 113° with a standard deviation of 10. Two flakes were removed from the sides of blade/let cores to narrow the platform width and flaking face. Another example plunged and removed an opposed, alternate platform. One flake is covered with red ochre and five are burned.

X E4 8.10 flakes n=90

	N	%
butt type		
plain	67	74.44
faceted	11	12.22
cortical	4	4.44
crushed or broken	6	6.67
imitating a dihedral burin	-	-
not measured	2	2.22
cortex	24	26.67
platform abrasion	49	54.44
lateral edges		
parallel	73	81.11
converging	7	7.78
expanding	8	8.89
not measured	2	2.22
distal termination		
hinge fracture	11	12.22
pointed	9	10.00
blunt or cortical	68	75.56
not measured	2	2.22

dorsal scars		
unidirectional	53	58.89
opposed	5	5.56
crossed	18	20.00
multidirectional	10	11.11
not measured	4	4.44

profile		
straight	12	13.33
curved	55	61.11
twisted	21	23.33
not measured	2	2.22

blade/lets (349)

The mean dimensions of the 349 blade/lets are 43 x 14 x 4 mm with standard deviations of 12, 5 and 2. The butts on these pieces tend to be small and plain (88%) with a mean of 5 x 1 mm (s.d. for the first measurement is 3). Fifty-five blade/lets are partially cortical and only nine of these have more than half of their dorsal surfaces covered. All of the blade/lets were detached with a soft hammer. Platform abrasion occurs on 90% of the blade/lets and offset debitage on about 10%. The lateral edges are most often parallel (62%) and 34% have converging edges. The distal ends are blunt (61%) or pointed (31%). The dorsal surface usually has between three and six scars, which are most often unidirectional (85%). In profile 71% are straight or curved, while 29% are twisted. The flaking angle on these pieces has a mean of 120° with a standard deviation of 7. The point of percussion is almost always behind or beside a dorsal ridge (96%). There are three plunging blade/lets and two of these are from opposed platform cores. Two blade/lets come from cores made on flakes. About 10% of the blade/lets are burned.

X E4 8.10 blade/lets n=349

butt type	N	%
plain	307	87.97
faceted	2	0.57
cortical	7	2.01
crushed or broken	33	9.46
imitating a dihedral burin	-	-
not measured	-	-
cortex	55	15.76
platform abrasion	314	89.97
lateral edges		
parallel	216	61.89
converging	119	34.10
expanding	13	3.73

not measured	1	0.29

distal termination		
hinge fracture	25	7.16
pointed	108	30.95
blunt or cortical	213	61.03
not measured	3	0.86

dorsal scars		
unidirectional	297	85.10
opposed	10	2.87
crossed	31	8.88
multidirectional	-	-
not measured	11	3.15

profile		
straight	33	9.46
curved	216	61.89
twisted	100	28.65
not measured	-	-

crested pieces (27)

Two of the 27 crested pieces are flakes. The longest totally crested blade is 76 mm. Seven examples have some cortex that always covers less than 25% of the dorsal surface. Most are curved in profile (15), with the remaining 12 being twisted. The crested pieces are usually formed by unidirectional removals (23) and the majority are only partially crested at the distal end of the blank. Four crested pieces are burned.

core tablets (3)

The three core tablets come from cores with plain platforms.

flake cores (15)

Most flake cores have multiple platforms which are created by the alternate removal of flakes during debitage. A flake scar is used as a platform if it presents a suitable surface. This method of flaking does not rely on the special preparation of a platform and debitage can continue from almost any point on the core's surface. There are four examples with one platform and one that has two, opposed platforms. The flake cores have a mean flaking face length of 37 mm with a standard deviation of 14. Five cores have abrasion on the edges of their striking platforms.

blade/let cores (42; figure 38: 8; 39: 1)

All but five of these cores have single platforms. Four of these have platforms which do not share the same flaking face and only one example has opposed platforms. The flaking angle on the blade/let cores has a mean of 63° with a standard deviation of 8. All of the platforms are semicircular in plan and most are formed by the removal of a single flake. The mean length of the flaking faces is 38 mm with a standard deviation of 10. All of the flaking faces are curved and the scars tend to be parallel or converging without a twist. Abrasion of the platform edge is found on every core. Almost 50% of the cores have cortical backs, while the rest have been modified by flaking. In three cases flaking was abandoned due to flaws in the raw material that resulted in hinge fractures.

X E4 8.10 blade/let cores n=42

number of platforms	N	%
single platform	37	88.10
two, opposed platforms	1	2.38
two, unopposed platforms	2	4.76
two, alternate platforms	1	2.38
two, crossed platforms	1	2.38
multiple platforms	–	–
not measured	–	–
platform type		
plain	37	88.10
faceted	2	4.76
cortical/natural surface	2	4.76
ventral surface of a flake	–	–
not measured	1	2.38
platform abrasion	42	100.00

end-scrapers (72; figure 37: 1-2)

There are 72 end-scrapers in excavation unit E4 8.10, which is the largest number examined for any single spit in level X. The complete specimens have average dimensions of 48 x 32 x 9 mm. The standard deviations are 11, 7 and 3. Fifty-eight tools are made on flakes and nine are made on blade/lets. Four of the blanks selected to make tools are crested and one is a core tablet. Almost half of the scrapers (32) have some cortex on their dorsal surfaces. Six have 50% or more of that surface covered. Four tools are made at the proximal end; three of these have blunt distal terminations and one has a hinge fracture. In profile the complete scrapers are most often straight or curved (81%), while only 12% are made on twisted blanks. There are 52 simple end-scrapers, 18 end-scrapers on retouched pieces and two shouldered end-scrapers. Thirteen tools have total retouch along one or both edges, which in nine cases is semi-abrupt. Many of the scrapers have discontinuous retouch on their lateral edges which may be edge damage due to use or natural agents. Three scrapers are made off the axis of percussion on a lateral edge. Eighteen percent of the scrapers are burned.

carinated tools (3; figure 37: 3-4)

One of the three carinated tools is a lateral carinated scraper. Two examples are made at the proximal end and one tool is burned.

burins (13; figure 37: 5)

The thirteen burins have mean dimensions of 44 x 29 x 11 mm (s.d. = 12, 9 and 5). Eight are made on flakes and three are on blade/lets; there is one example each on a core tablet and crested piece. Three tools have cortex and one of these has its dorsal surface entirely covered. One tool is made at the proximal end of a blade. In profile they are usually made on blanks that are curved. Nine burins are dihedral and three are on truncations. The most common dihedral type is the burin on a natural surface (four examples). There are three dihedral offset burins, one burin on a break and one multiple dihedral burin that combines two burins on breaks. The three truncation burins include two burins on oblique truncations and one multiple truncation burin. Both the truncation and the facets on the last piece are a secondary patina. There is one multiple mixed burin that combines a burin on an unmodified lateral edge with a burin on a convex retouched truncation. Five burins are burned.

truncation (1)

There is one concave truncation made on a broken blade. The truncation is oblique to the long axis of the blank.

composite tools (9; figure 37: 6)

All of the nine examples of this type combine end-scrapers and burins. Eight are made on flakes and one is made on a blade. Three tools have some cortex and one has 80% of its dorsal surface covered. In profile six are curved and three are straight. There are five examples with dihedral burins and four with truncation burins. The end-scrapers are all simple and in seven cases are made at the proximal end. One composite tool is burned.

el-Wad points (15; figure 38: 1-5)

Two of the fifteen el-Wad points are broken and the complete specimens have mean dimensions of 38 x 7 x 2 mm. The standard deviations are 7, 2 and 1. The butts on these tools are always small and plain. All of the points are made on soft hammer-struck blade/lets which are straight or curved in profile. They are most often made by two lines of retouch (12), which is usually fine or semi-abrupt. Eleven points are symmetrical in plan and two el-Wad variants have their butts removed by inverse retouch on the right lateral edge.

miscellaneous (3; figure 38: 6)

There are two splintered pieces and one side-scraper made on a wide flake, measuring 52 x 81 x 14 mm.

non-flint artefacts and objects (2)

There are two water rounded cobbles and one example measures 98 x 100 x 35 mm. This cobble has battering and breakage at one end, which probably resulted from its use as a hammerstone.

bone and antler artefacts (2; figure 39: 2-3)

Two bone awls from this spit are the only osseous tools recovered from level X in 1937-1938. (Newcomer - inventory of the bone and antler tools from Ksar Akil [see appendix 3]; Newcomer 1974b).

Summary of X E4 8.10

The large number of end-scrapers (mainly simple end-scrapers) combined with the absence of retouched blade/lets distinguishes the sample from 8.10 from those below it. Technologically, the large numbers of blade/lets with straight or curved profiles (71% out of 349 examples) combined with unidirectionally flaked blade/let cores shows that this spit is identical to the others in level X. Offset debitage occurs on only 10% of the blade/lets and is linked to the general decline of blanks with twisted profiles.

X F4 8.10

flakes (30)

There are only 30 unretouched flakes that have mean dimensions of 34 x 24 x 6 mm (s.d. = 6, 8 and 3). The butts are usually plain (20) and large. Cortex occurs on small areas of eight flakes. The lateral edges are almost always parallel and terminate in blunt distal ends. Fifteen flakes have dorsal scars which are unidirectional and there are four examples each with opposed and multidirectional scars. In profile 26 specimens are straight or curved. Four flakes are burned.

blade/lets (54)

The 54 blade/lets have average dimensions of 38 x 13 x 4 mm with standard deviations of 10, 4 and 3. The butts on these pieces are smaller than those on flakes with a mean of 4 x 2 mm (s.d. = 3 and 1). Cortex occurs on 13 pieces but only two of these have more than half of their dorsal surfaces covered. The majority were detached with a soft hammer (83%) and offset debitage is found on 14% of the sample. Most blade/lets have parallel lateral edges (67%) with blunt distal ends (64%). They usually have between three and six dorsal scars that are unidirectional (85%). In profile they are generally curved or straight (56%), while twisted blade/lets make up 39%. Five blade/lets are burned.

flake cores (2; figure 41: 2)

There is one discoidal core and one core made on a flake with a distal inverse truncation forming the platform (truncated/faceted piece).

blade/let cores (8)

All of the blade/let cores have single platforms. In plan the platforms are semicircular (seven) or offset left (one). Seven cores have plain striking platforms made by the removal of a single flake, while one has a faceted platform. The flaking faces are all curved and have a mean length of 39 mm with a standard deviation of 6. Only two cores have twisted scars and all of them utilise abrasion to prepare the platform.

end-scrapers (2; figure 40: 1-2)

Two simple end-scrapers were examined in this spit. One of these is made on a core tablet, while the other is on the lateral edge of a wide flake.

retouched blade/lets (13; figure 40: 3)

Eleven of the 13 retouched blade/lets are broken tools. The larger of the two complete examples measures 49 x 9 x 3 mm and the smaller is 24 x 7 x 2 mm. Of the tools that preserve their proximal ends, nine have small, plain butts. They were all detached with a soft hammer. The blanks have unidirectional scars on their dorsal surfaces and the profiles are generally straight or curved; there are only two examples made on twisted debitage. The retouch forming the tool is usually direct, fine and semi-abrupt with only one tool having abrupt retouch. There are three tools with inverse retouch.

retouched flakes (2)

Both of these tools are made on soft hammer-struck flakes that are curved in profile. One tool has fine retouch and the other has semi-abrupt retouch, which in both cases is direct.

el-Wad points (11; figure 40: 4-7)

Only two of the 11 el-Wad points are complete specimens. The larger is 38 x 12 x 3 mm and the smaller is 37 x 7 x 2 mm. In profile all of the points are straight or curved. The retouch forming the tip is almost always bilateral; there is only one example with a single line of retouch. Five tools are symmetrical with the pointed tip roughly divided by the long axis. Two are el-Wad variants with inverse retouch on the right lateral edge.

miscellaneous (2; figure 41: 1)

There are two intentionally broken flakes and one splintered piece.

Summary of X F4 8.10

The retouched tool assemblage from this spit is small and consists of the same types found in the other spits described previously. The flaking technology is identical to the rest of level X.

Summary of level X

This level differs from levels XIII-XI in a number of ways. Typologically, there is an increase in the numbers of el-Wad points and retouched blade/lets to around 33% of the 1734 tools (see pages 127 - 128); the increase in these types is particularly marked in the sample from squares E4 and F4. It is interesting to note that Tixier's (Tixier and Inizan 1981: 363) small sample of 84 tools from level 12, believed to be comparable to the top of level X in the 1937-1938 excavations (see Copeland's comments in the preface), contains 45.2% of these types. Tixier and Inizan remark that for level 12 the el-Wad points are <u>outils caracteristiques</u>. El-Wad variants appear for the first time and these usually have small amounts of inverse retouch on the right lateral edge at the proximal end. End-scrapers outnumber burins both in the sample described in this section and over the level as whole.

The blade/let technology has a number of features that are similar to that in levels XIII-XI. These include plain platforms, platform abrasion, the core tablet technique and cresting. These 'developed' in phase 2 (levels XX-XV) and appear to be relatively static in the later Upper Palaeolithic levels. Levels XIII-XI, however, have large numbers of blade/lets with offset debitage and twisted profiles. Blade/lets with straight or curved profiles are more numerous in level X and offset debitage drops to around 11% of the sample. Blade/lets make up over 70% of the debitage (see page 127) and given the typology and technology of the artefacts, this level <u>appears</u> closer to the southern Ahmarian than to the southern Aurignacian. However, the presence of various Aurignacian tool types, like carinated tools (11% of the total collection from all three squares), makes the material slightly different from the southern Ahmarian. It is suggested, therefore, that level X be regarded as the beginning of stage 4 at Ksar Akil rather than Levantine Aurignacian B.

IX: E4 and F4

Level IX is located in the same sedimentological unit as level X and ranges in depth from 40 to 150 cm. Two excavation units were examined, squares E4 and F4, out of a total of eight 2m squares excavated (D5, D6, D7, E4, F3, F4, G3 and G4). The few artefacts marked D5, D6 and D7 probably come from the top of level IX as the D series seems to have been excavated only through to level VIII (Newcomer 1972: 339). Square E4 has three spits at 7.65, 7.55 and 7.24 m below datum. F4 has two spits at 7.75 and 7.25 m. The radiocarbon determination, obtained from shells collected between 6.00 7.50 m below datum, yielded a date of 28,840 +/- 380 B.P., which covers part of this level as well as VIII and VII (Vogel and Waterbolk 1963: 174).

Debitage	F4 7.75	E4 7.65	E4 7.55	F4 7.25	E4 7.24
flakes	65	117	19	274	1
blade/lets	238	82	15	193	4
crested pieces	23	-	-	17	-
core tablets	11	1	1	9	-
flake cores	9	7	12	12	-
blade/let cores	20	3	1	52	-
burin spalls	9	7	-	-	-
total	375	217	48	557	5

Tools	F4 7.75	E4 7.65	E4 7.55	F4 7.25	E4 7.24
scrapers	7	27	38	5	25
carinated pieces	5	7	5	1	3
burins	14	12	6	13	3
piercers	-	-	1	-	-
truncations	-	-	2	-	-
notches/denticulates	-	2	-	-	-
composite tools	1	3	1	1	-
retouched blade/lets	1	123	6	18	-
retouched flakes	-	1	3	-	-
el-Wad points	2	12	-	3	-
total	30	187	62	41	31

IX F4 7.75

flakes (65; figure 49: 5)

There are 65 flakes which have mean dimensions of 42 x 35 x 9 mm (standard deviations = 11, 13 and 4). The butts on these pieces tend to be large, with a mean of 14 x 5 mm (s.d. = 7 and 3). Most are plain (59%), while faceted butts make up 11% of the total. Twenty flakes are partially cortical and three more are entirely covered with cortex. Most flakes were detached with a soft hammer and 31% show signs of platform abrasion. In plan the majority have parallel lateral edges (65%) and the distal ends are usually blunt (80%). Eleven percent terminate in hinge fractures. Most flakes have between three and five previous removal scars, which are most often unidirectional (45%) or crossed (19%). In profile the flakes are curved or straight (80%). The flaking angle on these pieces has a mean of 106° with a standard deviation of 9. Included in this group is one broken flake that is an accident Siret (Tixier et al. 1980: 103) and a 'Janus' flake (figure 49: 5).

IX F4 7.75 flakes n=65

	N	%
butt type	N	%
plain	38	58.46
faceted	7	10.77
cortical	8	12.31
crushed or broken	7	10.77
imitating a dihedral burin	-	-
not measured	5	7.69
cortex	23	35.39
platform abrasion	20	30.77
lateral edges		
parallel	42	64.62
converging	10	15.39
expanding	7	10.77
not measured	6	9.23
distal termination		
hinge fracture	7	10.77
pointed	2	3.08
blunt or cortical	52	80.00
not measured	4	6.15
dorsal scars		
unidirectional	29	44.62
opposed	2	3.08
crossed	12	18.46
multidirectional	7	10.77
not measured	15	23.08
profile		
straight	3	4.62
curved	49	75.39
twisted	9	13.85
not measured	4	6.15

blade/lets (238; figure 49: 1-4, 6-10)

The 238 blade/lets have mean dimensions of 44 x 13 x 4 mm with standard deviations of 13, 6 and 2. The butts are smaller than those on flakes with a mean of 2 x 1 mm. The standard deviation for the first measurement is 1. Most are plain (85%), while 10% of the blade/lets have crushed or broken butts. Thirty-seven blade/lets have some cortex and eight of these have more than half of their dorsal surfaces covered. Eighty percent of the blade/lets are soft hammer-struck and 95% utilised platform abrasion. Only three blade/lets have offset debitage. Most have parallel or converging edges (97%). Sixty-seven percent have blunt distal ends and 26% have pointed ends. Most blade/lets have between three and five dorsal scars, which are usually unidirectional (88%). Sixty-five percent of the blade/lets have straight or curved profiles and 30% are twisted. The flaking angle on these pieces has a mean of 119° with a standard deviation of 5. The point of percussion is almost always behind or beside a dorsal ridge (97%). Eighteen blade/lets are burned.

IX F4 7.75 blade/lets n=238

	N	%
butt type		
plain	203	85.29
faceted	1	0.42
cortical	4	1.68
crushed or broken	24	10.08
imitating a dihedral burin	-	-
not measured	6	2.52
cortex	37	15.55
platform abrasion	225	94.54
lateral edges		
parallel	164	68.91
converging	67	28.15
expanding	7	2.94
not measured	-	-
distal termination		
hinge fracture	16	6.72
pointed	62	26.05
blunt or cortical	159	66.81
not measured	1	0.42
dorsal scars		
unidirectional	209	87.82
opposed	11	4.62
crossed	15	6.30
multidirectional	3	1.26
not measured	-	-

profile

straight	20	8.40
curved	135	56.72
twisted	71	29.83
not measured	12	5.04

crested pieces (23)

Most of these are only partially crested (18) and the largest totally crested blade measures 43 x 12 x 9 mm. Five have some cortex that always covers less than half of the dorsal surface. Most crested pieces are twisted in profile (13). The cresting is usually unidirectional (16) and located at the distal end (12).

core tablets (11; figure 49: 12)

Two of the 11 core tablets are blades and the rest are flakes. They all come from cores with plain platforms and the largest measures 100 x 35 x 16 mm.

flake cores (9; figure 50: 3-4)

Only one of these cores has a single platform and the rest are multiplatformed. There is also one core on a large flake with platforms made by inverse truncation (truncated/faceted piece). The striking platforms on the multiplatformed cores are created by the alternate removal of flakes; a suitable surface to deliver the blow is selected as debitage proceeds. Only two cores utilised platform abrasion to prepare the edge prior to the removal of the blank. Most cores are flaked over their entire surface area with only two examples having cortical backs.

blade/let cores (20; figure 50: 1-2)

Nineteen cores have single platforms, while one example has two, crossed platforms. The mean flaking angle on these pieces is 62° with a standard deviation of 6. The platforms are all plain except one which is a patinated, natural surface. The flaking faces are generally curved and have a mean length of 37 mm with a standard deviation of 11. The flaking direction is unidirectional and the scars are parallel or converging with no twist. The platforms usually show signs of abrasion to prepare the core's edge prior to delivery of the blow. Fourteen cores have cortical backs. Two blade/let cores appear to be in the initial stages of preparation. The first is a cylindrical nodule which had a series of cortical blades removed from a plain platform to create parallel ridges. The other was abandoned after a platform and crested ridge were formed.

burin spalls (9; figure 49: 11, 13-16)

Five burin spalls are secondary or sharpening spalls. Seven examples show that the edge of the blank was retouched prior to the spall being detached; one spall plunged removing a broken proximal end.

end-scrapers (7; figure 48: 1-2, 4)

There are seven complete end-scrapers with average dimensions of 50 x 26 x 8 mm. The standard deviations are 15, 7 and 4. Four tools are made on flakes and three are on blade/lets. Three scrapers are partially cortical and one example has its entire dorsal surface covered. In profile they are usually straight or curved (six). The most common type comprises simple end-scrapers (three) and there is one example of each of the following types: double end-scraper, end-scraper on a retouched piece, inverse end-scraper and shouldered end-scraper. The end-scraper on a retouched piece has total, semi-abrupt, invasive retouch on both lateral edges; the butt on this tool has been removed by retouch.

carinated pieces (5; figure 48: 3)

The five carinated pieces are all on flakes and have average dimensions of 34 x 29 x 10 mm (s.d. = 7, 6 and 4). Two tools have cortex and one of these has 80% of its dorsal surface covered. In profile they are straight or curved. Included in this group is a lateral carinated scraper. Two tools are proximal and one carinated piece is burned.

burins (14; figure 48: 5)

Eight of the 14 burins are made on flakes or flake fragments. The complete pieces have mean dimensions of 47 x 22 x 9 mm with standard deviations of 12, 7 and 4; they are straight or curved in profile. The burin on a break is most common with four examples. There are two dihedral axial burins and one dihedral offset burin. The most common truncation burin is on a concave truncation (three), while one burin is on an oblique truncation. There are two multiple mixed burins: one combines a burin on a break with a burin on an oblique truncation, while the second example has a burin on lateral retouch with a dihedral angle burin. Finally, there is one broken burin made on a plunging spall. Three burins are proximal and one has burin facets that are a secondary patina. Four tools are burned.

composite tool (1)

The single example of this type combines a burin on a break with a simple end-scraper. It is made on a flake that measures 51 x 39 x 17 mm.

retouched blade/let (1)

The only example is made on a broken blade. The retouch forming the tool is semi-abrupt.

el-Wad points (2; figure 48: 6-7)

The larger el-Wad point measures 39 x 7 x 2 mm and the smaller measures 29 x 6 x 2 mm. Both have small, plain butts and the blanks were detached with a soft hammer.

miscellaneous (1)

There is one burned intentionally broken flake.

non-flint artefacts and objects (7)

There are seven water-rounded cobbles and the largest of these measures 120 x 96 x 54 mm.

Summary of IX F4 7.75

This sample from the deepest spit examined in level IX has only a few retouched tools. Retouched blade/lets and el-Wad points are rare, with a total of three examples. The sample of debitage is larger and the same technological features found in level X are present. These include the virtual absence of offset debitage as well as reduced numbers of blade/lets with twisted profiles (30% of total). Blade/let debitage and single platform blade/let cores dominate the sample examined in IX 7.75.

IX E4 7.65

flakes (117; figure 53: 15; figure 60)

The 117 flakes have mean dimensions of 25 x 23 x 6 mm with standard deviations of 7, 8 and 3. The butts on these pieces tend to be large, averaging 12 x 4 mm (s.d. = 7 and 3). Most butts are plain (74%) or cortical (11%). Thirty-six flakes have some cortex and six of these are entirely covered. Most flakes were detached with a soft hammer, while hard hammer-struck examples make up 18% of the total. Platform abrasion occurs on 33% of all flakes. In plan most have parallel lateral edges (77%) and the distal ends are most often blunt (71%). Most flakes have between two and five previous removal scars, which are usually unidirectional (69%) or crossed (14%). In profile they are curved (76%) or straight (9%). The flaking angle on these pieces has a mean of 109° with a standard deviation of 9. Two flakes were removed from the sides of blade/let cores to narrow the platform width and a smaller example seems to have been detached from the side of a scraper (cf. Bells 1938). Eleven percent of the flakes are burned.

IX E4 7.65 flakes n=117

butt type	N	%
plain	86	73.50
faceted	5	4.27
cortical	13	11.11
crushed or broken	7	5.98
imitating a dihedral burin	-	-
not measured	6	5.13
cortex	36	30.77

platform abrasion	39	33.33
lateral edges		
parallel	90	76.92
converging	5	4.27
expanding	21	17.95
not measured	1	0.86
distal termination		
hinge fracture	10	8.55
pointed	5	4.27
blunt or cortical	83	70.94
not measured	19	16.24
dorsal scars		
unidirectional	81	69.23
opposed	2	1.71
crossed	16	13.68
multidirectional	2	1.71
not measured	16	13.68
profile		
straight	11	9.40
curved	89	76.07
twisted	12	10.26
not measured	5	4.27

blade/lets (82; figure 53: 16-18; figure 61)

The 82 blade/lets have mean dimensions of 32 x 11 x 3 mm with standard deviations of 13, 5 and 2. The butts tend to be plain (90%) and small, averaging 3 x 1 mm (s.d. for the first measurement is 2). Only seven blade/lets have cortex and two of these have half of their dorsal surfaces covered. Over 85% are soft hammer-struck, while two blade/lets were detached with a hard hammer. Platform abrasion occurs on 94% of the blade/lets and 17% have offset debitage. The lateral edges are parallel or converging and the distal terminations are usually blunt (67%). Twenty-seven percent of the blade/lets have pointed ends and 6% terminate in hinge fractures. Most blade/lets have between three and six previous removal scars, which are unidirectional (90%). In profile they are straight or curved (68%). The flaking angle on these pieces has a mean of 119° with a standard deviation of 8. The point of percussion is always behind or beside a dorsal ridge. Included in the sample but not in the figures above are 14 miniscule bladelets ($<$ 15 mm in length) that probably come from tool manufacture or platform abrasion. Seventeen percent of the blade/lets are burned.

IX E4 7.65 blade/lets n=82

	N	%
butt type		
plain	74	90.24
faceted	-	-
cortical	1	1.22
crushed or broken	7	8.54
imitating a dihedral burin	-	-
not measured	-	-
cortex	7	8.54
platform abrasion	77	93.90
lateral edges		
parallel	56	68.29
converging	26	31.71
expanding	-	-
not measured	-	-
distal termination		
hinge fracture	5	6.10
pointed	22	26.83
blunt or cortical	55	67.07
not measured	-	-
dorsal scars		
unidirectional	74	90.24
opposed	2	2.44
crossed	6	7.32
multidirectional	-	-
not measured	-	-
profile		
straight	11	13.42
curved	45	54.88
twisted	26	31.71
not measured	-	-

core tablet (1)

A single core tablet measures 24 x 28 x 8 mm.

flake cores (7)

Six flake cores are multiplatformed and one has a single platform. The length of the flaking face on the single platform core is 25 mm. Platform abrasion occurs on only one core.

blade/let cores (3; figure 53: 19-20)

Two of these cores have one platform and the third example has opposed platforms. The platforms are plain and two are formed by the removal of a single flake. The flaking faces are curved and the longest is 31 mm. The edges of the platform all show signs of abrasion.

burin spalls (7)

Six of the seven burin spalls are broken. Five spalls are primary and two are from sharpening. Three spalls show that the lateral edge was retouched prior to delivery of the burin blow.

end-scrapers (27; figure 51: 1-7)

Eighteen of the 27 end-scrapers are made on flakes or flake fragments. Two tools are made on core tablets and one is on a partially crested blade. The complete specimens have mean dimensions of 38 x 28 x 10 mm (s.d. = 10, 9 and 2). As can be seen from these figures a number of scrapers are made on relatively short (20-30 mm; see figure 51: 5, 7) blanks; this feature was also noted by Copeland (1975: 342) who remarked that short, thick flakes were one component of the debitage in level IX. Nine tools have some cortex on their dorsal surfaces, which usually covers less than 30%. In profile the complete tools are all straight or curved. The nosed end-scraper is most common (11 examples). There are eight end-scrapers on retouched pieces, six simple end-scrapers and two shouldered end-scrapers. Six tools are made on the lateral edges of flakes and four of these are nosed scrapers. The nosed and shouldered scrapers have lamellar removals forming their edges and some have thick, carinated profiles; the longest removal forming a nosed scraper's edge is 18 mm. One nosed scraper has a Clactonian notch adjacent to the scraper edge (cf. Bells 1938) and two tools are burned.

carinated pieces (7; figure 51: 8)

The seven carinated pieces are all made on flakes; only two examples are complete. One tool has 35% of its dorsal surface covered with cortex. One carinated tool is made on a lateral edge of a wide flake that measures 26 x 49 x 20 mm. Four tools are totally retouched around their edges; this retouch is invasive, semi-abrupt and abrupt. Three carinated pieces are burned.

burins (12; figure 51: 9-11; 52: 1)

Only one of the 12 burins is on a blade and the complete tools have mean dimensions of 33 x 26 x 10 mm with standard deviations of 6, 9 and 4. Six tools are partially cortical but only two of these have more than 50% of their dorsal surfaces covered. In profile seven are curved and four are straight. Seven burins are on truncation and four are dihedral burins. The most common truncation burin is on a convex truncation (three). Two burins are on oblique truncations and two are on concave truncations. Two burins are on breaks and one of these is an intentional break (Bergman et al. 1983). There is one dihedral straight burin and one multiple tool with two burins on the same break. A multiple mixed burin combines a dihedral burin made on a plunging facet with a burin on a concave truncation. One tool is made at the proximal end and two burins have lateral edges that were retouched prior to removal of the spall.

notches/denticulates (2; figure 52: 2)

There is one notch and one denticulate from this spit. They are both made on flakes and the denticulate has its dorsal surface entirely covered with cortex. Both tools are made with direct retouch.

composite tools (3; figure 52: 3)

Two of these tools combine scrapers with burins and the third combines a burin with a carinated tool. Two of the burins are on truncation and one is dihedral. All three tools are on flakes and one has 15% of its dorsal surface covered with cortex.

retouched blade/lets (123; figure 52: 4, 7-16; 53: 1-11)

The majority of these tools are broken (105) and some may be fragments of el-Wad points. The complete specimens have mean dimensions of 26 x 8 x 2 mm (s.d. = 7, 2 and 1). Of the tools with intact butts most are small and plain. All of these pieces have unidirectional dorsal scars except one with crossed scars. In profile the majority are straight or curved and only 10 tools are made on twisted debitage. Most have fine or semi-abrupt retouch (117) and the retouch flakes are always short. However, one strangled blade (lame à étranglement; de Sonneville-Bordes and Perrot 1956b: 552) has invasive retouch (figure 52: 4). Twenty tools have inverse retouch, which usually occurs at the proximal end on the right lateral edge (13). If these are bases of el-Wad variants, the possibility exists that these broken points were brought back to the rockshelter in their shafts to be replaced (Bergman and Newcomer 1983). Ten of these tools are burned.

retouched flake (1)

There is only one retouched flake which has fine retouch on its left lateral edge.

el-Wad points (12; figure 53: 12-14)

Only three of the 12 el-Wad points are complete specimens. The largest point measures 33 x 7 x 2 mm and the smallest example is 25 x 6 x 2 mm. The butts are always small and plain. The majority of these tools have their pointed tips formed by only one line of retouch (10). They are all made with fine or semi-abrupt retouch except one example with distal abrupt retouch.

miscellaneous (3; figure 52: 5-6)

Included in this category is one intentionally broken blade and a Mousterian point. The Mousterian point has a faceted convex butt and measures 50 x 42 x 10 mm. There is also one thin piece of tabular flint which has been 'retouched' (figure 53: 6).

non-flint artefacts and objects (3)

There is one flint nodule which measures 47 x 46 x 21 mm and two water-rounded cobbles. One of the cobbles has some ochre-staining.

Summary of IX E4 7.65

This spit has a substantial number of retouched blade/lets and el-Wad points, which together make up 72% of the tool sample. Scrapers outnumber burins, a tendency which is reflected in the entire assemblage (see pages 129-130). The blade/lets continue to be straight or curved in profile (68%) and only 17% have offset debitage. Although more flakes were measured in 7.65 the blade/let technology is consistent with that found in IX 7.75.

IX E4 7.55

flakes (19)

The 19 flakes have mean dimensions of 39 x 36 x 9 mm (s.d. = 11, 11 and 4). The butts are usually plain (14) and only one flake has a convex faceted butt. Six flakes are partially cortical and three of these have about half of their dorsal surfaces covered. Sixteen flakes have parallel lateral edges and the distal terminations are usually blunt (10) or hinge fractures (eight). Most flakes have between two and four dorsal scars which are usually unidirectional (13). In profile all of the flakes are straight or curved. One broken hard hammer-struck flake is an <u>accident Siret</u>. Three examples are burned.

blade/lets (15)

The 15 blade/lets average 35 x 12 x 3 mm with standard deviations of 8, 3 and 2. The butts, when intact, are always plain and generally small, averaging 4 x 1 mm (s.d. for the first measurement is 1). Three pieces have some cortex that only covers 10% of their dorsal surfaces. All of the blade/lets are soft hammer-struck and two have offset debitage. In plan most have parallel lateral edges and blunt distal ends. Three blade/lets terminate in hinge fractures. They all have unidirectional scars except one that has opposed scars. In profile 10 are straight or curved and the rest are twisted.

core tablet (1)

The only core tablet is a flake that measures 31 x 30 x 7 mm. It was detached with a hard hammer from a core with a plain platform.

flake cores (12)

Most flake cores have multiple platforms (nine), while two have single platforms and one has opposed platforms. The single platform cores have curved flaking faces that measure 32 mm and 22 mm. The opposed platform core has a relatively straight flaking face which is

37 mm long. Five of these cores show signs of platform abrasion.
blade/let core (1; figure 54: 9)

The only blade/let core measured from this unit has two, opposed platforms. One platform is plain and the other is a natural surface; the curved flaking face measures 37 mm. Platform abrasion was used to prepare the core for the blow of the hammer.

end-scrapers (38; figure 54: 1-3)

Thirty-six of the 38 end-scrapers are made on flakes or flake fragments. The complete specimens have mean dimensions of 40 x 28 x 11 mm (s.d. = 8, 7 and 3). Fifteen scrapers have some cortex but only two have large parts of their dorsal surfaces covered. Only one scraper is made at the proximal end and it has a distal hinge fracture. In profile most are straight or curved, while only two scrapers are made on twisted debitage. There are 17 simple end-scrapers, 12 end-scrapers on retouched blanks, six nosed end-scrapers and two shouldered end-scrapers. There is also one inverse end-scraper. The retouch on the lateral edges tends to be semi-abrupt or abrupt and in 11 cases totally covers at least one edge. One scraper edge is a secondary patina and another was made on a flake that had been accidentally heated. Three scrapers are burned.

carinated pieces (5; figure 54: 4-5)

Two of the five carinated pieces are fragmentary. The largest tool measures 35 x 25 x 14 mm and the smallest is 25 x 20 x 15 mm. Three tools are partially cortical. One example is made at the proximal end and another is on a lateral edge. Four tools have additional retouch along one or both lateral edges. This is always semi-abrupt or abrupt and sometimes invasive.

burins (6)

Five burins are made on flakes and one is on a blade. They have mean dimensions of 45 x 29 x 11 mm (s.d. = 8, 8 and 3). Four tools have some cortex that always covers less than 20% of their dorsal surfaces. All of the burins are straight or curved in profile. There are five dihedral burins and one truncation burin. Two dihedral burins are axial and one is offset. Two burins are made on unmodified lateral edges and the single truncation burin is on a concave truncation.

piercer (1; figure 54: 6)

There is one piercer made on a soft hammer-struck blade which measures 54 x 20 x 8 mm. The retouch forming the tip is direct, invasive, semi-abrupt and converges from both lateral edges.

truncations (2)

One of these tools is made on a blade fragment and the other is on a flake measuring 51 x 33 x 10 mm. The former is an oblique truncation and the latter is a concave truncation.

composite tool (1)

One shouldered end-scraper is combined with a concave truncation. The tool is made on a wide, thick blade measuring 38 x 18 x 12 mm.

retouched blade/lets (6; figure 54: 7)

Four of the retouched blade/lets are broken. The larger complete specimen measures 37 x 13 x 4 mm and the smaller is 22 x 7 x 2 mm. Three tools have tiny, plain butts and are soft hammer-struck. Half of the tools are twisted in profile. The retouch on two is abrupt, with both complete examples having direct fine retouch.

retouched flakes (3; figure 54: 8)

The larger complete retouched flake measures 57 x 41 x 12 mm and the smaller measures 40 x 37 x 7 mm. The retouch in both cases is semi-abrupt and abrupt. One broken tool has a refitted retouch flake which is large enough to be confused with a blank detached from a core.

non-flint artefacts and objects (2)

There are two water-rounded cobbles and the larger measures 70 x 65 x 42 mm.

Summary of IX E4 7.55

The sample from this spit is small. Like spit 7.75 the burins and scrapers outnumber the retouched blade/lets. Both the morphology of the tools and the technology of blank manufacture appear to be the same as in the other spits already discussed in level IX.

IX F4 7.25

flakes (274)

The 274 flakes have mean dimensions of 31 x 26 x 6 mm with standard deviations of 10, 10 and 3. The butts tend to be plain (74%) and large, averaging 12 x 5 mm (s.d. = 8 and 3). There is some cortex on 106 flakes and 35 of these have 75% or more of their dorsal surfaces covered. Most are soft hammer-struck and platform abrasion occurs on 39%. In plan the lateral edges are most often parallel (78%) and the distal ends are usually blunt (75%), while 21% terminate in hinge fractures. Most flakes have between two and five scars which are usually unidirectional (66%). The flakes are generally curved (70%) or straight (19%) in profile. The flaking angle has a mean of 108° with a standard deviation of 6. Also included in this group but not in the above measurements are two Clactonian notch spalls. Eighteen flakes are burned.

IX F4 7.25 flakes n=274

butt type	N	%
plain	203	74.09

faceted	18	6.57
cortical	18	6.57
crushed or broken	29	10.58
imitating a dihedral burin	-	-
not measured	6	2.19
<u>cortex</u>	106	38.69
<u>platform abrasion</u>	106	38.69
<u>lateral edges</u>		
parallel	214	78.10
converging	2	0.73
expanding	38	13.87
not measured	20	7.30
<u>distal termination</u>		
hinge fracture	58	21.17
pointed	8	2.92
blunt or cortical	204	74.45
not measured	4	1.46
<u>dorsal scars</u>		
unidirectional	181	66.06
opposed	14	5.11
crossed	36	13.14
multidirectional	13	4.75
not measured	30	10.95
<u>profile</u>		
straight	53	19.34
curved	193	70.44
twisted	22	8.03
not measured	6	2.19

blade/lets (193; figure 56: 1-12)

The 193 blade/lets have mean dimensions of 41 x 12 x 3 mm with standard deviations of 12, 5 and 2. The butts are almost always plain (91%) and small, averaging 3 x 1 mm (s.d. for the first measurement is 1). Thirty-six blade/lets are partially cortical and only eight of these have more than half of their dorsal surfaces covered. All of the blade/lets are soft hammer-struck. Platform abrasion occurs on 93%, while only 5% have offset debitage. Most blade/lets have parallel lateral edges (54%). The distal ends are usually blunt (58%) or pointed (32%). They have between three and six dorsal scars that are usually unidirectional (91%). In profile most blade/lets are straight (11%) or curved (70%). The flaking angle on these pieces has a mean of 112° with a standard deviation of 6. The point of percussion is always behind or beside a dorsal ridge. Eleven blade/lets are burned.

IX F4 7.25 blade/lets n=193

butt type	N	%
plain	175	90.67
faceted	1	0.52
cortical	2	1.04
crushed or broken	15	7.77
imitating a dihedral burin	-	-
not measured	-	-
cortex	36	18.65
platform abrasion	179	92.75
lateral edges		
parallel	104	53.89
converging	72	37.31
expanding	15	7.77
not measured	2	1.04
distal termination		
hinge fracture	12	6.22
pointed	62	32.12
blunt or cortical	112	58.03
not measured	7	3.63
dorsal scars		
unidirectional	176	91.19
opposed	2	1.04
crossed	15	7.77
multidirectional	-	-
not measured	-	-
profile		
straight	22	11.40
curved	135	69.95
twisted	35	18.14
not measured	1	0.52

crested pieces (17; figure 56: 13)

Five of the 17 crested pieces are totally crested and the longest is 65 mm. Most of these have plain butts and they are all soft hammer-struck. Nine examples are partially crested at the distal end. Unidirectional cresting occurs on 15 pieces.

core tablets (9)

The largest core tablet measures 77 x 34 x 15 mm and the smallest is 33 x 29 x 5 mm. All nine pieces come from cores with plain platforms. Two examples are burned.

flake cores (12; figure 56: 14)

Ten flake cores are multiplatformed with the platforms created by the alternate removal of flakes during debitage. There are two examples with single platforms. Both of these cores have curved flaking faces that measure 34 mm and 30 mm. Most of the cores are flaked around their entire surface area.

blade/let cores (52; figure 56: 15-17; 57: 1-5; 58: 1-4)

The 52 blade/let cores most often have single platforms (45). There are five cores with two, opposed platforms. The flaking angle has a mean of 73° with a standard deviation of 8. The platforms are usually semicircular in plan (90%) and plain (92%). Those with plain platforms are made by the removal of a single flake. The cores have curved flaking faces that average 35 mm in length (s.d. = 8). The removals are usually parallel or converging and there are four cores with twisted scars. They all utilise platform abrasion to prepare the core's edge. Three cores are crested at their bases, presumably to shape the flaking face and maintain its curved profile. Most have cortical backs (60%). Eight cores have flat backs formed by opposed removals and one example has a crested ridge.

IX F4 7.25 blade/let cores n=52

number of platforms	N	%
single platform	45	86.54
two, opposed platforms	5	9.62
two, unopposed platforms	-	-
two, alternate platforms	-	-
two, crossed platforms	-	-
multiple platforms	-	-
not measured	2	3.85
platform type		
plain	48	92.31
faceted	3	5.77
cortical/natural surface	1	1.92
ventral surface of a flake	-	-
not measured	-	-
platform abrasion	52	100.00

end-scrapers (5; figure 55: 1)

There are only two complete end-scrapers which measure 50 x 20 x 12 mm and 40 x 40 x 12 mm. Two tools have cortex that covers less than 15% of their dorsal surfaces. One scraper is proximal and another is made on a lateral edge. Three are simple end-scrapers and two are end-scrapers on retouched pieces. Both of the latter have their left edges totally covered by abrupt retouch. Two scrapers are burned.

carinated piece (1)

There is only one carinated tool made on a broken cortical flake.

burins (13; figure 55: 2)

There are six burins made on flakes and five on blade/lets; two tools are made on core tablets. The complete specimens measure 43 x 27 x 9 mm (s.d. = 10, 9 and 3). Five examples are cortical and two of these have 3/4 of their dorsal surfaces covered. The majority of the burins are straight or curved in profile and there is only one example made on a twisted blade. The most common types are the offset dihedral burin (three) and burin on a break (three). There are two axial dihedral burins, one dihedral angle burin and one burin on a cortical surface. There are also two truncation burins, with one made on an oblique truncation and the other on lateral retouch. A multiple mixed burin combines a burin on a convex truncation with a dihedral offset burin. One burin is made at the proximal end and another has a spall that plunged. Two burins are burned.

composite tool (1)

There is one composite tool that combines an end-scraper with a burin. The tool measures 47 x 18 x 7 mm. The burin is on lateral retouch with the retouch covering an earlier burin facet.

retouched blade/lets (18; figure 55: 3-15)

There are only five tools that are complete specimens. The largest is 45 x 7 x 3 mm and the smallest is 23 x 5 x 2 mm. They are made on soft hammer-struck blanks and the dorsal scar pattern is generally unidirectional. Most are straight or curved in profile. The retouch is usually direct, fine and semi-abrupt. Inverse retouch occurs on four tools and three of these are probably the bases of el-Wad variants (figure 55: 13, 15).

el-Wad points (3; figure 55: 16-17)

One of the three el-Wad points, an el-Wad variant, is fragmentary. The larger complete tool measures 42 x 8 x 3 mm and has a small plain butt that is 3 x 1 mm. Two tools have retouch converging from both lateral edges to form symmetrical tips. The el-Wad variant has inverse semi-abrupt retouch at the proximal end on the right lateral edge.

miscellaneous (2)

There are two intentionally broken flakes; one is a mesial fragment and the other is a proximal fragment. There is also one broken and patinated <u>obsidian</u> flake from this spit. It is certainly worth noting that the nearest available obsidian source is in northern Syria or Turkey.

Summary of IX F4 7.25

Although the sample from this spit is again dominated by flakes, many of which are quite short, it is technologically similar to those below with the production of blade/lets having straight or curved profiles (81%). Typologically, there are roughly equal proportions of end-scrapers/burins and retouched blade/lets.

IX E4 7.24

flake (1)

A single 'Janus' flake was examined from IX E4 7.24.

blade/lets (4)

Four blade/lets were examined from this spit. They all have plain butts and two are hard hammer-struck.

end-scrapers (25; figure 59: 1-2)

Three of the 25 end-scrapers are broken. Most of these are made on flakes (17) averaging 35 x 24 x 8 mm (s.d. = 9, 5 and 2). One scraper is made on a core tablet and another is on a crested blade. Five have some cortex and one of these has about 60% of its dorsal surface covered. Four are proximal and three of these have blunt distal ends. Twenty-two tools are on blanks with straight or curved profiles. The most common types are the nosed and shouldered end-scrapers (17). There are four simple end-scrapers and four end-scrapers on retouched blanks. Three of the last group of tools have both lateral edges covered with direct, semi-abrupt retouch. In one case the retouch is stepped and scaled. One tool has an edge that is a secondary patina and another has its butt removed by bifacial retouch. A nosed scraper has its butt broken by battering at the proximal end (a feature more commonly seen in levels VIII and VII; see figure 69: 6, 7).

carinated pieces (3)

Two carinated pieces are made on flakes and the third example is made on a thick blade which was retouched after the blank had been heated.

burins (3; figure 59: 3)

Of the three burins one is a dihedral offset burin and another is a multiple truncation burin that combines a burin on a straight truncation with a burin on lateral retouch. There is also one multiple mixed burin that combines a dihedral angle burin with a burin on a straight retouched truncation. All of these tools are made on flakes.

Summary of IX E4 7.24

The presence of relatively large numbers of nosed and shouldered scrapers combined with the absence of virtually any other tool type makes this sample appear different to the others discussed in level IX. The fact that the sample from the entire level has 612 of these tools (see page 129) caused previous authors to regard levels IX and VIII as related (Dortch 1970: 126; Besançon et al. 1977); in addition, level IX was viewed as transitional between X and VIII. Level VIII is technologically quite different to IX being a flake industry dominated by nosed and shouldered scrapers (see the following section). The top of level VIII begins at depths of 5.15 - 5.30 m below datum extending downwards to a depth of 6.75 - 7.35 m (Dortch 1970: 66). Near the shelter wall layer VIII reaches a depth of 7.35 m (Dortch 1970: 14; figure 3 in this volume). The excavation units closest to the wall are the partial squares, F2 and G2 (poorly represented in the Institute collections), and the complete squares F3 and G3 (see figure 3). One square excavated by the Boston College team, G3, has a depth of 7.25 m and is said to belong to level IX. An examination of the stratigraphic section of Wright (figure 3) shows that for this square level VIII extends 10 cm beyond the depth of 7.25 m. It would appear that the material in G3 7.25 is really part of level VIII and not IX. Indeed, a diagram found among the site documentation in Waechter's possession, presumably prepared by Ewing, shows that the separation between levels VIII and IX was open to some doubt during the course of excavation (figure 4a). This clearly indicates that <u>at least part of level IX is mixed</u> which renders any counts of the retouched tools or debitage suspect.

Summary of level IX

Level IX is technologically identical to X in that most blade/lets have straight or curved profiles (over 60% in F4 7.75, E4 7.65 and F4 7.25), as well as a low percentage of offset debitage. Like level X blade/let debitage predominates with 58% of the sample of over 30000 pieces (see pages 129-130). The highest spit examined in the level, E4 7.24, contains a number of nosed and shouldered scrapers and it is felt that it is actually part of level VIII where these tools predominate. In the author's opinion there is no direct relation between levels IX and VIII as they are technologically quite distinct (see the following section). The deepest spits in level IX have a blade/let technology identical to that in level X, while level VIII is strongly flake oriented (see also Newcomer 1972: 342). Due to the problem of mixing discussed above it is difficult to say anything about level IX except that: 1) the deepest spits contain material similar to level X and 2) the closer the spits are to the junction of levels IX and VIII the greater the chances of mixing. This observation has important implications for the tool counts for level IX on pages 129-130. It is felt that this level should have a lower percentage of shouldered and nosed scrapers, while the number of retouched blade/lets and el-Wad points should be higher.

VIII: F3

Level VIII is less stony than levels IX and X. It is extremely thick (about 150 to 230 cm) and the radiocarbon date mentioned in the previous section covers the whole of this level. There are eight 2m squares represented in the Institute collections: D5, D6, E4, F2, F3, G2, G3 and G4. For some unknown reason no flaked stone artefacts are present from square F4 and there are virtually none from E4. Also, the material from E4 was collected from the entire level with no artefacts recovered from arbitrary spits. Another contiguous square, F3, which has two spits at 6.74 and 6.24 m below datum, was therefore examined.

Debitage	F3 6.74	F3 6.24
flakes	60	146
blade/lets	16	44
crested pieces	1	4
core tablets	-	3
flake cores	6	62
blade/let cores	-	1
burin spalls	-	-
total	83	260
Tools		
scrapers	1	35
carinated pieces	-	12
burins	-	1
piercers	-	-
truncations	-	1
notches/denticulates	2	6
composite tools	-	1
retouched blade/lets	2	5
retouched flakes	2	10
el-Wad points	-	-
total	7	71

VIII F3 6.74

flakes (60)

The 60 flakes have mean dimensions of 28 x 25 x 6 mm with standard deviations of 9, 10 and 3. The butts on these pieces are large, averaging 15 x 5 mm (s.d. = 9 and 3). Most butts are plain (66%), while 18% are faceted. Twenty-one flakes have some cortex and four of these have 80% of their dorsal surfaces covered. The flakes are most often hard hammer-struck, while only 16% are detached with a soft hammer. This is the first spit encountered in levels XIII-VI in which significant numbers of flakes were detached with a hard hammer. Platform abrasion occurs on 30% of all flakes. In plan the lateral edges are usually parallel (88%) with most distal ends being blunt (70%). Twenty-six percent of the flakes terminate in hinge fractures. Most have between two and five dorsal scars, which are often unidirectional (50%). Those with crossed scars and multidirectional scars make up 23% each. In profile they are almost always straight or curved (93%). Seven flakes are burned.

blade/lets (16)

The 16 blade/lets average 27 x 10 x 3 mm with standard deviations of 4, 2 and 1. The smallest example measures 19 x 8 x 2 mm. The tiny size of some of these pieces is due to the fact that they are probably waste from carinated tool manufacture. The butts are small and plain with a mean of 3 x 1 mm (s.d. for the first measurement is 1). All of these pieces were detached with a soft hammer and four have offset debitage. They have unidirectional dorsal scars and, in profile, they are equally divided between those that are straight or curved and those that are twisted.

crested piece (1)

One partially crested blade measures 73 x 21 x 7 mm. The crest is distal and formed by bidirectional removals.

flake cores (6)

Four of these cores are multiplatformed and two have single platforms. One of the latter is flaked around the entire circumference of a plain platform. The longest flaking face measured is 26 mm and the shortest is 20 mm.

end-scraper (1)

There is one end-scraper on a retouched blade. The scraper is proximal and the left lateral edge is totally covered with direct abrupt retouch.

notches/denticulates (2)

There are two denticulates; one is made on a flake and the other on a blade. The latter example has about 25% of its dorsal surface covered with cortex.

retouched blade/lets (2)

Both of these tools are broken and one is made on a narrow bladelet with a width of 5 mm. This piece has parts of its right and left lateral edges covered with direct fine retouch. The second example is on a wide blade (18 mm) and has both edges covered with semi-abrupt, stepped and scaled Aurignacian retouch (Brézillon 1977: 113).

retouched flakes (2)

These tools are also broken and have both edges totally covered with semi-abrupt, stepped and scaled retouch.

Summary of VIII F3 6.74

The sample from this spit is discussed with F3 6.24, because it is so small.

VIII F3 6.24

flakes (146; figure 63: 6-9; 64: 1-5; figure 66)

The 146 complete flakes have mean dimensions of 30 x 28 x 8 mm with standard deviations of 12, 9 and 4. The butts are usually plain (77%) and large, averaging 14 x 6 mm (s.d. = 9 and 3). Fifty-four flakes are partially cortical and more than half (30) of these have 50% of their dorsal surfaces covered. Most are hard hammer-struck, while 14% were detached with a soft hammer. Platform abrasion occurs on 19% and only two have offset debitage. Most have parallel lateral edges (73%), while 17% have expanding edges. The distal ends are blunt (74%) or end in hinge fractures (25%). The flakes usually have between two and five dorsal scars, which are unidirectional (52%) or multidirectional (28%). In profile the flakes are generally curved (86%). The flaking angle has a mean of 119° with a standard deviation of 8. One flake was removed from the side of a blade/let core and another was detached from the side of a nosed scraper. Ten percent of the flakes are burned.

VIII F3 6.24 flakes n=146

butt type	N	%
plain	113	77.40
faceted	8	5.48
cortical	10	6.85
crushed or broken	4	2.74
imitating a dihedral burin	-	-
not measured	11	7.53
cortex	54	36.99
platform edges	28	19.18
lateral edges		
parallel	107	73.29
converging	11	7.53
expanding	25	17.12
not measured	3	2.06
distal termination		
hinge fracture	36	24.66
pointed	1	0.69
blunt or cortical	108	73.97
not measured	1	0.69

dorsal scars

unidirectional	76	52.06
opposed	3	2.06
crossed	19	13.01
multidirectional	41	28.08
not measured	7	4.80

profile

straight	7	4.80
curved	125	85.62
twisted	9	6.16
not measured	5	3.43

blade/lets (44; figure 67)

Some of the 44 blade/lets in this sample are quite small having mean dimensions of 27 x 10 x 3 mm (s.d. = 13, 6 and 2). Many of these pieces probably derive from the manufacture of the nosed and shouldered scrapers, with carinated profiles, which are quite numerous in this level. The butts are tiny averaging 3 x 1 mm (s.d. for the first measurement is 1). Four are partially cortical and two of these have half of their dorsal surfaces covered. They are all soft hammer-struck and nine have offset debitage. They have parallel or converging lateral edges and the distal ends are usually blunt (30). Most have between three and four scars that are almost always unidirectional (39). In profile they are often straight or curved (24), while 17 are twisted.

crested pieces (4)

Three of the four crested pieces are blade/lets and one is a flake. The only totally crested blade measures 62 x 20 x 12 mm and has a unidirectional crest.

core tablets (3)

The largest of the three core tablets measures 38 x 24 x 13 mm. They all come from cores which had plain platforms.

flake cores (62; figure 64: 6; 65: 1-2)

The majority (54) of the 62 flake cores have multiple platforms. Flaking takes place at any point on the core's surface and platforms are not prepared but rather suitable surfaces are utilised as flaking proceeds. Eight cores have one platform. The longest flaking face is 32 mm and the shortest is 15 mm. The scars on the flaking faces are usually multidirectional (53). Four cores are made on flakes and one was flaked after it had been heated. Another example has battering on part of its flaking face (figure 64: 6).

blade/let core (1)

The only example of this type has a single plain platform. The flaking face is curved and measures 59 mm.

end-scrapers (35; figure 63: 1-3)

Twenty-seven of the 28 unbroken end-scrapers are made on flakes and have mean dimensions of 30 x 28 x 10 mm (s.d. = 8, 6 and 2). Thirteen tools have some cortex but only one example is entirely covered. Two tools are made at the proximal end and have blunt distal terminations. In profile almost all of the complete scrapers are straight or curved. The most common type is the simple end-scraper (19 examples). There are 12 nosed and shouldered scrapers and four end-scrapers on retouched flakes. Four tools are made on the lateral edges of flakes and three of these are nosed scrapers. Three have been made on old, patinated blanks and their retouched edge is a secondary patina. Seven scrapers are burned.

carinated pieces (12)

The twelve carinated pieces are all on flakes or flake fragments and have mean dimensions of 31 x 26 x 13 mm (s.d. = 6, 7 and 2). The blanks selected tend to be slightly thicker than those used for scrapers. As the retouch always originates from the ventral surface, thick blanks are essential to make this class of artefact. Five tools have some cortex and three of these have about 60% of their dorsal surfaces covered. In profile they are straight (eight) or curved (two). Five tools also have retouched lateral edges and four of these have both edges covered with direct, abrupt retouch. Another example has semi-abrupt, stepped and scaled, retouch on both edges that is a secondary patina.

burin (1)

There is one dihedral offset burin made on a flake.

truncation (1)

An oblique truncation is made on a flake and measures 39 x 38 x 11 mm.

notches/denticulates (6; figure 63: 4)

There are four denticulates and two notches that are usually made on flakes. The retouch on these pieces is direct.

composite tool (1)

The single composite tool combines a nosed scraper with a distal oblique truncation. The tool is made on a flake that measures 39 x 35 x 9 mm.

retouched blade/lets (5; figure 63: 5)

Three of these five tools are fragmentary. One retouched blade measures 57 x 23 x 8 mm and has part of its right lateral edge covered with invasive, stepped and scaled retouch. A tiny bladelet (13 x 5 x 1 mm) has direct, fine retouch covering its entire left edge. This piece has a markedly curved and twisted profile and probably comes from tool manufacture.

retouched flakes (10)

These tools are all broken. They are equally divided between those which have one or both edges retouched. The retouch is usually semi-abrupt (seven), while three tools have some abrupt retouch. It is always direct and in two cases is invasive.

miscellaneous (2)

There are two intentionally broken pieces and one of these removed the edge of a scraper.

bone and antler artefacts (7; figure 65: 3-6)

Five of the seven osseous tools could have their material identified: two are bone and three are probably antler. Included in the collection from this spit are four points, two bone awls and a fragment of a point or awl (Newcomer inventory of the bone and antler tools from Ksar Akil [see appendix 3]; Newcomer 1974b).

Summary of level VIII

This level is technologically and typologically quite distinct from those below it. The tool sample discussed here is small and consists mainly of scrapers, carinated tools and retouched flakes. Among the scrapers there are significant numbers of nosed and shouldered tools (over 30% of the total assemblage of 3697 tools; see page 131). Burins are rare in this sample with only one dihedral burin. There is at least one example of a tool made on a retouch 'chip'. Technologically, the debitage is dominated by hard hammer-struck flakes. When describing the blanks selected to make burins Newcomer (1972: 342) writes that "level 8 is more clearly flake dominant than 9". Level IX has large numbers of blade/lets and blade/let cores, while F3 6.24 has only one blade/let core and over 60 relatively shapeless flake cores.

These technological differences suggest a break between levels IX and VIII. Level VIII should no longer be grouped with levels X and IX as part of the subphase Levantine Aurignacian B (levels X-VIII of Besançon et al. 1977). It is suggested that it is classified as a separate stage (5) of the Upper Palaeolithic of Ksar Akil. The assemblage from level VIII, unlike those from XIII-IX, clearly fits the description of the Aurignacian of the southern Levant.

VII: F4

The sediment in level VII is more stony than that of VIII. It was excavated in a block that varies in thickness from about 50 to 130 cm. No material could be located from square E4 and Dortch (1970: 16) does not list this unit among the other six 2m squares (D6, F2, F3, F4, G3 and G4) with flaked stone artefacts in the 1937-1938 collections. A single artefact from E4, a large ochre grinding slab, is reported on here. It should be noted that the material from F4 was collected over the entire depth of level VII and there were no separate excavation spits recorded. A few bone tools are labelled '7B' but no depth is provided and the significance of this subdivision is unclear (Newcomer 1972: 347-348).

<u>Debitage</u>	F4
flakes	24
blade/lets	22
crested pieces	2
core tablets	2
flake cores	2
blade/let cores	13
burin spalls	1
total	66

<u>Tools</u>	
scrapers	124
carinated pieces	26
burins	15
piercers	5
truncations	1
notches/denticulates	2
composite tools	3
retouched blade/lets	5
retouched flakes	8
el-Wad points	3
total	192

VII E4

There was only one artefact examined from this square, an ochre grinding slab that measures 190 x 140 x 58 mms. It has a flattened and concave surface covered with crushed red ochre (figure 73a).

VII F4

flakes (24)

The 24 flakes have mean dimensions of 41 x 33 x 9 mm with standard deviations of 17, 12 and 2. Eighteen flakes have plain butts and four are faceted. They tend to be large, averaging 19 x 8 mm (s.d. = 14 and 6). Seven flakes are partially cortical and one is entirely covered with cortex. Most are hard hammer-struck and only four flakes show signs of platform abrasion. The lateral edges are most often parallel (21) and the distal ends blunt (20). The dorsal scars are usually unidirectional (15) and less often multidirectional (four) or crossed (five). In profile they are all curved except one that is twisted. One flake plunged and removed the base of a single platform core. Four flakes were removed from the sides of blade/let cores to narrow the flaking face and two smaller examples may have been detached from the sides of scrapers. Two flakes are burned.

blade/lets (22)

The 22 blade/lets average 44 x 14 x 5 mm with standard deviations of 13, 6 and 3. The butts on these are all plain and tend to be small, with a mean of 5 x 2 mm (s.d. = 4 and 1). One thick blade is hard hammer-struck, while all the rest are soft hammer-struck. Platform abrasion occurs on 15 pieces and five have offset debitage. The lateral edges are generally parallel or converging and the distal ends are most often blunt or pointed. They have between four and five dorsal scars, which are usually unidirectional (14). In profile the majority are twisted (12).

crested pieces (2)

There are two partially crested flakes. They both have distal unidirectional crests.

core tablets (2)

The larger of the two core tablets measures 45 x 20 x 5 mm.

flake cores (2)

One of the two flake cores is made on a flake. The other is a multiplatformed core.

blade/let cores (13; figure 72: 6)

Two cores are made on flakes. Ten have single platforms and two have opposed platforms. The platforms have a mean flaking angle of 64° with a standard deviation of 9. In plan 11 platforms are semicircular and two are offset left. All of the platforms are plain except two that are patinated, natural surfaces. The flaking faces are usually curved and have a mean length of 28 mm with a standard deviation of 7. All of the platforms show signs of abrasion. One core has been flaked around the entire circumference of its platform and another example has been flaked on opposite sides of the same platform. This core has two flaking faces that are back to back.

burin spall (1)

There is one burin spall that is primary and comes from a truncation burin.

end-scrapers (124; figures 69-70; 71: 1-4)

The 124 end-scrapers are the largest number examined from any 2 m square excavation unit. There are 108 tools made on flakes or flake fragments. There is also one example on a core tablet. The complete tools have mean dimensions of 38 x 30 x 11 mm with standard deviations of 11, 7 and 3. Forty-three tools have some cortex and 23 of these have more than half of their dorsal surfaces covered. Seven tools are proximal; four have blunt distal ends, while three have hinge fractures. The scrapers are generally straight or curved in profile. The simple end-scraper is the most common (63 examples). Seven of these are associated with lateral notches or denticulation. The 27 end-scrapers on retouched blanks usually have direct, semi-abrupt or abrupt lateral retouch. Seven of these have invasive retouch that in some cases is stepped and scaled. One end-scraper is made on an Aurignacian blade (figure 69: 7). There are 27 nosed and shouldered scrapers that tend to be made on thicker blanks than the other types. They have a mean edge thickness of 14 mm (s.d. = 3), while the mean for the other scraper types is only 9 mm (s.d. = 3). Most nosed scrapers have lamellar removals and carinated profiles. Three of the five double end-scrapers combine simple scrapers and two combine simple scrapers with shouldered scrapers. Finally, there is one atypical Ksar Akil scraper (Copeland 1982).

This level shows the greatest variation in the morphology of scraper edges. In many cases they are ogival or straight. There are a number of tools in which the 'arch' shape of the edge is quite narrow and acute, making them morphologically similar to becs. Ten tools have edges that are a secondary patina and two are made on blanks that have been heated. Three tools have their butts removed by retouch and seven have battering at the end opposite the scraper edge (see figures 69: 6-7; 70: 7). This damage is often associated with a visible polish on either surface and has been experimentally reproduced by using replicas of these tools as "retouchers" (Newcomer, pers. comm. as well as the author's own experimentation). Four scrapers are burned.

carinated pieces (26; figure 71: 5-8)

Only three of these tools are made on blade/lets. They have mean dimensions of 30 x 26 x 14 mm with standard deviations of 6, 7 and 3. Half of the tools have some cortex that usually covers a small area of the dorsal surface. Two tools are made at the proximal end and one of these has a blunt distal end. They are straight (11) or curved (13) in profile. There are two double carinated tools and one of these has a retouched edge that is splintered. Four tools are made on the lateral edges of wide flakes. One tool is made on a blank that had been previously heated and another has a secondary patina. One example made on a blade has its retouch originating from the lateral edge, while the others are all retouched from the ventral surface. There are two burned carinated pieces.

burins (15; figure 71: 9; 72: 1-2)

Ten of the 15 burins are made on flakes and have mean dimensions of 42 x 25 x 9 mm (s.d. = 8, 7 and 2). Five burins have some cortex and one of these is entirely covered. In profile they are straight or curved with only one tool made on twisted debitage. Three of the 10 dihedral burins are offset burins, three are axial burins, two are dihedral angle burins, one burin is on a break and one burin is on an unmodified lateral edge. There are two burins on oblique truncations, one burin on a concave truncation and one burin on lateral retouch. The final truncation burin is made on an old Mousterian point with the burin facets being a secondary patina. Flat-faced facets occur on nine tools. Newcomer (1972: 349) examined the burins from this level and reports that flat-faced facets are found on 42.32%. In levels X, IX and VIII they are found on 21.53%, 19.04% and 22.32% respectively. It should be noted that the increase in flat-faced facets is linked to a general increase in the number of multifaceted burins. One burin is burned.

piercers (5)

There are five becs which are all made on flakes. They have mean dimensions of 29 x 32 x 12 mm with standard deviations of 4, 5 and 1. Two tools have half of their dorsal surfaces covered with cortex. In profile they are all straight. Four tools are offset and are made by abrupt retouch on the distal edge converging with semi-abrupt retouch on a lateral edge. The retouch is direct on all five tools.

truncation (1)

One double truncation is made on a blade that measures 43 x 20 x 8 mm. The truncations are concave and oblique.

notches/denticulates (2; figure 72: 3)

One of the two denticulates is on a thick blade and the other is on a flake. The former measures 70 x 32 x 17 mm and is backed and denticulated. One of these tools is burned.

composite tools (3)

Two of these combine end-scrapers and burins, while the third is an end-scraper and an inverse straight truncation. All of these tools are made on flakes.

retouched blade/lets (5)

Four of the five retouched blade/lets are broken tools. The complete specimen is an Aurignacian blade measuring 84 x 27 x 8 mm. This tool has its entire left lateral edge covered with semi-abrupt, stepped and scaled retouch (Brézillon 1977: 260).

retouched flakes (8)

Five of these tools are broken. The largest complete tool is 64 x 41 x 8 mm and the smallest is 34 x 32 x 8 mm. The retouch is always semi-abrupt or abrupt, which in one case is invasive. One tool has a distal intentional break.

el-Wad points (3; figure 72: 4-5)

Two of the three el-Wad points are complete. The larger is 38 x 10 x 2 mm and the smaller is 28 x 9 x 2 mm. The pointed tips in two cases are symmetrical and one is offset. One el-Wad point is burned.

miscellaneous (2)

There is one intentionally broken flake and a double side-scraper made on a flake measuring 53 x 41 x 11 mm. This tool has both lateral edges covered with semi-abrupt, invasive retouch.

non-flint artefacts and objects (12; figure 73: 1)

Included here is one hammerstone that measures 57 x 39 x 18 mm and has battering at both ends. There are ten water-rounded cobbles and pebbles as well as a small nodule of ironstone.

bone and antler artefacts (3)

All of these tools come from level '7B' and are probably made of antler. Two are point fragments and one may be either a fragment of an awl or point (Newcomer - inventory of the bone and antler tools from Ksar Akil [see appendix 3]; Newcomer 1974b).

Summary of level VII

The sample from level VII is dominated by scrapers which make up 65% of the retouched tools examined in square F4. These tools show a wide diversity in the morphology of their edges. Nosed and shouldered types account for 22% of the total of 124 scrapers examined. The small sample of debitage consists of equal amounts of flakes and blade/lets. However, as can be seen on the type list for level VII (pages 133-134) flakes account for 90% of the 5115 unretouched pieces. Most tools are made on flakes (82%; see appendix 1 on page 257) with relatively few on blade/lets (17%; figure 74). Another similarity with level VIII is the presence of relatively large numbers of osseous tools. It is interesting to note that as the el-Wad points decline in number from levels X and IX, there is an increase in the number of bone and antler points (Bergman in press). Due to the above technological considerations this assemblage should be grouped with level VIII in stage 5.

VI: F4

Level VI is less stony than the preceding level and ranges in thickness from 60 to 90 cm. A total of eight 2 m squares were excavated in 1937-1938: D5, D6, D7, E3, F3, F4, G3 and G4. There are no artefacts from square E4 and therefore only the material from F4 was examined. As in level VII F4 the material discussed below was collected over the depth of the entire level and there are no arbitrary spits.

Debitage	F4
flakes	6
blade/lets	107
crested pieces	5
core tablets	-
flake cores	2
blade/let cores	27
burin spalls	-
total	147

Tools	
scrapers	54
carinated pieces	34
burins	47
piercers	-
truncations	-
notches/denticulates	3
composite tools	7
retouched blade/lets	71
retouched flakes	-
el-Wad points	4
total	220

VI F4

flakes (6)

The largest of the six flakes measures 56 x 61 x 21 mm. Five of the flakes are cortical and two of these have half of their dorsal surfaces covered. Two flakes are hard hammer-struck, one is soft hammer-struck and the rest are unidentifiable.

blade/lets (107; figure 79: 3; figure 81)

The 107 complete blade/lets have mean dimensions of 30 x 7 x 2 mm with standard deviations of 10, 4 and 1. Some of these blanks are quite small and may not come from a normal blade/let core reduction sequence. These tiny bladelets (cf. Tixier 1963) probably derive from tool manufacture; they are selected for the manufacture of non-geometric microliths and lamelles Dufour in level VI. The butts are almost always small and plain. Five blade/lets have tiny amounts of core reduction.

The presence of carinated tools and lamelles Dufour would seem to place this material within the Aurignacian tradition as defined in the southern Levant (Marks 1981: 347). It is worth pointing out here that Tixier and Inizan (1981: 360) regard material comparable to this from their excavations as part of an Aurignacian evolving "in situ" at Ksar Akil. For descriptive purposes level VI is classified as stage 6 in this volume.

Type list Levels XIII-VI

by I. Azoury and C.A. Bergman

This chapter is divided into two sections and the first part presents a detailed inventory of levels XIII-VI. The second part integrates the data provided by the type lists with the technological information in chapter 2. It should again be stated here that in the technological analyses in the previous sections it was decided to study only the artefacts which could still be assigned to their precise excavation units (ie. the correct 2 m square and excavation spit). The aim of this method was to reduce the thickness of each level and gain a better understanding of the stratigraphy. This provided an opportunity to gauge the degree of mixing between levels. It would seem that there was actually very little disturbance of the archaeological material aside from some slight mixing at the boundaries between separate levels (a fact occasionally noted by the excavators themselves, see the summary of level IX in chapter 2). Indeed, most of the excavation spits appear to belong in the levels originally designated by the excavators. This being the case every tool which could be identified as belonging to a specific level was counted and recorded on the type list.

The type list presented here is primarily derived from Azoury's (1986; unpublished manuscript) work on levels XXV-XII at Ksar Akil. She, in turn, developed her list after consulting that proposed by Hours at the Wenner Gren Symposium (1969) on the terminology of the Palaeolithic of the Near East. A number of changes have been made to Azoury's type list and these include the following: 1) tools like chamfered pieces, Mousterian points and pointes à face plane have been removed because they are absent in levels XIII-VI, 2) the carinated tools have been grouped together due to the impossibility of separating discrete types like carinated scrapers or burins and 3) a few tool types, like the el-Wad variant, have been added to the list because of their chrono-stratigraphic significance. The type list follows the same order as Azoury's (1986) to make comparison with levels XXV-XIV easier.

The following section discusses the complete retouched tool assemblage recovered from each individual layer. After the list of tools there is a brief discussion highlighting the important features of the level.

The lateral retouch on the former group is semi-abrupt and abrupt, which in two cases is inverse. One double scraper combines two simple scrapers and a second example combines a simple scraper with a nosed scraper. One tool has its butt removed by retouch and another has a battered proximal end (figure 75: 2). Four tools are made on the lateral edges of flakes, two are on crested blades and another one is on a core tablet. Twelve percent of the scrapers are burned.

carinated pieces (34; figure 75: 7)

Twenty-seven of these tools are made on flakes and the complete specimens have mean dimensions of 38 x 25 x 12 mm (s.d. = 8, 6 and 4). Ten examples are partially cortical and eight of these have more than half of their dorsal surfaces covered. Four are made at the proximal end and there are two each with blunt distal ends and hinge fractures. In profile most tools are straight, while nine examples are curved. The majority are made on the width of the blank with the removals beginning at an edge parallel or transverse to the long axis (like a burin). Four examples are made on the thickness of the blank with the retouch originating from the ventral surface. Twenty-two tools have prepared surfaces from which the blows are struck. It should be noted that most of these 'tools' could produce blanks for the manufacture of microliths in this level and the possibility exists that some of these are cores (cf. Tixier and Inizan's comment "<u>Les burins nucleiformes plans ne sont peut-etre que des nucleus...</u>"; 1981: 357).

burins (47; figure 76: 1-4; 77: 1-7)

The 47 burins have mean dimensions of 37 x 25 x 8 mm with standard deviations of 11, 8 and 3. Thirty-three tools are made on flakes and 12 are on blades; two burins are made on core tablets. Sixteen tools have some cortex and five of these are entirely covered. Most are straight or curved in profile with only seven made on twisted debitage. Twenty-six burins are dihedral and 20 are truncation burins. The most common dihedral burins are the axial and offset with ten examples each. There are three dihedral angle burins, one burin on a break and two multiple dihedral burins. The burins on concave truncations and Clactonian notches (Newcomer 1971; 1972: 173) are the most numerous truncation burins with eight examples each; there is one burin on a convex truncation. One of the two multiple truncation burins combines a burin on a concave truncation with a burin on an oblique truncation. The other combines a burin on a notch with a burin on lateral retouch. One truncation burin is made on an inverse truncation. Eighteen of the burins examined here have flat-faced facets or are multifaceted. Newcomer (1972: 353) notes that in level VI 46.92% of all burins have flat-faced facets.

notches/denticulates (3)

All three denticulates are made on flakes. One of these tools is made on an intentionally broken piece.

composite tools (7)

Four tools combine end-scrapers and burins, two combine carinated pieces and scrapers and one is a truncation combined with a scraper. They are all made on flakes with mean dimensions of 37 x 28 x 9 mm (s.d. = 6, 3 and 3).

retouched blade/lets (71; figure 78: 1-24)

Only 16 of these tools are complete specimens; they have mean dimensions of 22 x 5 x 2 mm (s.d. = 6, 1 and 1). The smallest tool measures only 13 x 4 x 1 mm and the blank may have come from tool manufacture. The complete blanks are all soft hammer-struck and 20% have offset debitage. The dorsal scars are always unidirectional. The tools which are relatively complete are most often twisted (61% or 43 tools). Most have fine or semi-abrupt retouch and there is only one backed piece (figure 78: 24). Fine retouch occurs on 48 examples and the retouch is most often direct (52 examples). Ten have alternate retouch (lamelles Dufour) and four are inversely retouched on one lateral edge.

el-Wad points (4; figure 78: 25-26)

The largest el-Wad point is on a blade that measures 60 x 15 x 4 mm. The smallest is 39 x 9 x 2 mm. Three have small plain butts and all are soft hammer-struck. Two tools are made on twisted debitage. The retouch forming the tips converges from both edges in two cases. The other two have only one line of retouch. Three are symmetrical with the long axis dividing the pointed tip.

miscellaneous (1; figure 79: 1-2)

There are two splintered pieces recovered from this excavation unit.

bone and antler artefacts (9)

There are four bone awls, one bone point and one antler point. Two tools are too fragmentary to distinguish whether they are points or awls. The final example is a point whose material is unidentifiable (Newcomer - inventory of the bone and antler tools from Ksar Akil [see appendix 3]; Newcomer 1974).

Summary of Level VI

The presence of burins on a notch and 71 retouched blade/lets, many of which are microliths, distinguishes this sample from the two previous levels. The microliths are typically made on tiny, twisted blanks. The numbers of lamelles Dufour and retouched blade/lets in the collection from level VI (page 135) is significantly lower than in Tixier's excavation (in levels 8AC to 10C they account for c. 30% of each assemblage; Tixier and Inizan 1981) which is probably a better reflection of this stone industry at Ksar Akil. The burins have increased to 21% of the sample and the scrapers have declined in number (25%) to about 1/3 of the total examined in level VII. The blade/let technology is characterised by 63% with twisted profiles and 33% with offset debitage. Many small bladelets are probably by-products of carinated tool manufacture as well as true bladelet (cf. Tixier 1963) core reduction.

The presence of carinated tools and lamelles Dufour would seem to place this material within the Aurignacian tradition as defined in the southern Levant (Marks 1981: 347). It is worth pointing out here that Tixier and Inizan (1981: 360) regard material comparable to this from their excavations as part of an Aurignacian evolving "in situ" at Ksar Akil. For descriptive purposes level VI is classified as stage 6 in this volume.

Type list Levels XIII-VI

by I. Azoury and C.A. Bergman

This chapter is divided into two sections and the first part presents a detailed inventory of levels XIII-VI. The second part integrates the data provided by the type lists with the technological information in chapter 2. It should again be stated here that in the technological analyses in the previous sections it was decided to study only the artefacts which could still be assigned to their precise excavation units (ie. the correct 2 m square and excavation spit). The aim of this method was to reduce the thickness of each level and gain a better understanding of the stratigraphy. This provided an opportunity to gauge the degree of mixing between levels. It would seem that there was actually very little disturbance of the archaeological material aside from some slight mixing at the boundaries between separate levels (a fact occasionally noted by the excavators themselves, see the summary of level IX in chapter 2). Indeed, most of the excavation spits appear to belong in the levels originally designated by the excavators. This being the case every tool which could be identified as belonging to a specific level was counted and recorded on the type list.

The type list presented here is primarily derived from Azoury's (1986; unpublished manuscript) work on levels XXV-XII at Ksar Akil. She, in turn, developed her list after consulting that proposed by Hours at the Wenner Gren Symposium (1969) on the terminology of the Palaeolithic of the Near East. A number of changes have been made to Azoury's type list and these include the following: 1) tools like chamfered pieces, Mousterian points and <u>pointes à face plane</u> have been removed because they are absent in levels XIII-VI, 2) the carinated tools have been grouped together due to the impossibility of separating discrete types like carinated scrapers or burins and 3) a few tool types, like the el-Wad variant, have been added to the list because of their chrono-stratigraphic significance. The type list follows the same order as Azoury's (1986) to make comparison with levels XXV-XIV easier.

The following section discusses the complete retouched tool assemblage recovered from each individual layer. After the list of tools there is a brief discussion highlighting the important features of the level.

Ksar Akil 1937-1938 Level XIII

Tool Type	N	%
1 simple end-scraper	3	6.52
2 double end-scraper	-	-
3 end-scraper on a retouched piece	-	-
4 end-scraper on an Aurignacian blade	-	-
5 shouldered and nosed scrapers	-	-
6 Ksar Akil scraper	-	-
7 end-scraper/burin	-	-
8 end-scraper/truncation	-	-
9 burin/truncation	-	-
10 piercer/bec	-	-
11 burin on a break or natural surface	1	2.17
12 dihedral axial or symmetrical burin	4	8.70
13 dihedral offset or asymmetrical burin	8	17.39
14 dihedral angle burin	1	2.17
15 multiple dihedral burin	-	-
16 burin on a straight truncation	-	-
17 burin on an oblique truncation	5	10.87
18 burin on a concave truncation	1	2.17
19 burin on a notch	-	-
20 burin on a convex truncation	1	2.17
21 burin on lateral retouch	1	2.17
22 multiple truncation burin	1	2.17
23 multiple mixed burin	1	2.17
24 carinated tools	2	4.35
25 Aurignacian blade	-	-
26 straight truncation	-	-
27 oblique truncation	-	-
28 concave truncation	-	-
29 convex truncation	2	4.35
30 double truncation	1	2.17
31 notch	4	8.70
32 denticulate	-	-
33 el-Wad point	2	4.35
34 el-Wad variant	-	-
35 backed and retouched blades	6	13.04
36 bladelet with direct retouch	1	2.17
37 bladelet with inverse retouch	1	2.17
38 bladelet with alternate retouch	-	-
total	46	99.97
Bone and antler tools	-	
Debitage		
flakes	152	42.46
blades	147	41.06
bladelets	59	16.48
total	358	100.00

Level XIII is the first archaeological layer after the stratigraphic break in level XIV (Newcomer 1972; Azoury 1986). The industries below level XIV in phase 2 are typologically characterised by end-scrapers and Ksar Akil points with very rare burins (Azoury 1986). Level XIII, on the other hand, is dominated by burins which make up 52.15% of the small sample of 46 tools. The next most common tool types are the backed and retouched blades which make up 13.04%. There are only three end-scrapers and carinated pieces are equally rare with only two examples.

The presence of so many burins in level XIII immediately separates it from phase 2 (levels XX-XV) which is characterised by a paucity of that tool type (Newcomer 1972: 379; Besançon et al. 1977; Azoury 1986: 164). The scrapers, burins and carinated pieces are the most numerous tool types (63.04%) which typologically fits the definition of the Aurignacian in the southern Levant. However, the assemblage is blade/let dominated (57.54%) which differs from the material described in Israel.

Ksar Akil 1937-1938 Level XII

Tool Type	N	%
1 simple end-scraper	49	7.46
2 double end-scraper	3	0.46
3 end-scraper on a retouched piece	4	0.61
4 end-scraper on an Aurignacian blade	1	0.15
5 shouldered and nosed scrapers	10	1.52
6 Ksar Akil scraper	1	0.15
7 end-scraper/burin	20	3.04
8 end-scraper/truncation	2	0.30
9 burin/truncation	7	1.07
10 piercer/bec	6	0.91
11 burin on a break or natural surface	42	6.39
12 dihedral axial or symmetrical burin	52	7.92
13 dihedral offset or asymmetrical burin	81	12.33
14 dihedral angle burin	22	3.35
15 multiple dihedral burin	20	3.04
16 burin on a straight truncation	2	0.30
17 burin on an oblique truncation	22	3.35
18 burin on a concave truncation	13	1.98
19 burin on a notch	-	-
20 burin on a convex truncation	6	0.91
21 burin on lateral retouch	-	-
22 multiple truncation burin	5	0.76
23 multiple mixed burin	14	2.13
24 carinated tools	96	14.61
25 Aurignacian blade	1	0.15
26 straight truncation	10	1.52
27 oblique truncation	24	3.65
28 concave truncation	18	2.74
29 convex truncation	2	0.30
30 double truncation	-	-
31 notch	13	1.98
32 denticulate	7	1.07
33 el-Wad point	44	6.70
34 el-Wad variant	-	-
35 backed and retouched blades	38	5.78
36 bladelet with direct retouch	13	1.98
37 bladelet with inverse retouch	5	0.76
38 bladelet with alternate retouch	4	0.61
total	657	99.98
Bone and antler tools	-	

Debitage

	N	%
flakes	899	30.44
blades	1876	63.53
bladelets	178	6.03
total	2953	100.00

This level continues the pattern established in level XIII with burins accounting for 42.47% of the assemblage. Dihedral burins are most numerous and make up 77.78% of the 279 burins. Carinated pieces become more prominent (14.61%) and end-scrapers are again relatively scarce with only 68 examples (10.35%). El-Wad points increase in number to 6.70% and combined with the retouched blade/lets account for 15.83%. The Aurignacian index for level XII, which includes tool types 4, 5, 24 and 25, is rather low at 16.44.

Like level XIII, the morphology and percentage of the retouched tools in level XII would seem to place this material within the Aurignacian tradition as defined in the southern Levant. However, the unretouched pieces are overwhelmingly dominated by blades and bladelets (69.56%) which distinguishes this material from the flake dominated Aurignacian (see discussion of the term Aurignacian in the glossary).

Ksar Akil 1937-1938 Level XI

Tool Type	N	%
1 simple end-scraper	189	15.76
2 double end-scraper	8	0.67
3 end-scraper on a retouched piece	13	1.08
4 end-scraper on an Aurignacian blade	2	0.17
5 shouldered and nosed scrapers	30	2.50
6 Ksar Akil scraper	-	-
7 end-scraper/burin	55	4.59
8 end-scraper/truncation	5	0.42
9 burin/truncation	14	1.17
10 piercer/bec	5	0.42
11 burin on a break or natural surface	43	3.59
12 dihedral axial or symmetrical burin	22	1.84
13 dihedral offset or asymmetrical burin	75	6.26
14 dihedral angle burin	23	1.92
15 multiple dihedral burin	22	1.84
16 burin on a straight truncation	3	0.25
17 burin on an oblique truncation	26	2.17
18 burin on a concave truncation	21	1.75
19 burin on a notch	-	-
20 burin on a convex truncation	8	0.67
21 burin on lateral retouch	4	0.33
22 multiple truncation burin	5	0.42
23 multiple mixed burin	15	1.25
24 carinated tools	337	28.11
25 Aurignacian blade	4	0.33
26 straight truncation	10	0.83
27 oblique truncation	9	0.75
28 concave truncation	4	0.33
29 convex truncation	13	1.08
30 double truncation	4	0.33
31 notch	15	1.25
32 denticulate	8	0.67
33 el-Wad point	159	13.26
34 el-Wad variant	-	-
35 backed and retouched blades	20	1.67
36 bladelet with direct retouch	19	1.59
37 bladelet with inverse retouch	4	0.33
38 bladelet with alternate retouch	5	0.42
total	1199	100.02
Bone and antler tools	-	

Debitage

flakes	1865	48.54
blades	1396	36.34
bladelets	581	15.12
total	3842	100.00

Typologically, there are some important differences between levels XI and XII. Burins decrease in number to 22.27% of the assemblage but are still more numerous than the scraper types (see also Azoury 1986: figure 197); the dihedral burins are most numerous (69.29% of the 267 burins). End-scrapers and carinated tools, including numerous lateral carinated scrapers, double in number and together make up 48.29%. The number of el-Wad points also increases and, with the retouched blade/lets, accounts for 17.26% which is similar to level XII. The Aurignacian index is 31.11 which is almost twice that of level XII.

The debitage is less clearly blade oriented than level XII with 51.46% of the 3842 pieces. Like the two earlier levels this one is also characterised by an Aurignacian typology combined with a developed, if somewhat specialised, blade/let technology.

Ksar Akil 1937-1938 Level X

Tool Type	N	%
1 simple end-scraper	352	20.30
2 double end-scraper	21	1.21
3 end-scraper on a retouched piece	45	2.60
4 end-scraper on an Aurignacian blade	2	0.12
5 shouldered and nosed scrapers	71	4.10
6 Ksar Akil scraper	-	-
7 end-scraper/burin	64	3.69
8 end-scraper/truncation	5	0.29
9 burin/truncation	7	0.40
10 piercer/bec	6	0.35
11 burin on a break or natural surface	36	2.08
12 dihedral axial or symmetrical burin	21	1.21
13 dihedral offset or asymmetrical burin	73	4.21
14 dihedral angle burin	9	0.52
15 multiple dihedral burin	29	1.67
16 burin on a straight truncation	7	0.40
17 burin on an oblique truncation	56	3.23
18 burin on a concave truncation	23	1.33
19 burin on a notch	-	-
20 burin on a convex truncation	9	0.52
21 burin on lateral retouch	6	0.35
22 multiple truncation burin	14	0.81
23 multiple mixed burin	18	1.04
24 carinated tools	192	11.07
25 Aurignacian blade	6	0.35
26 straight truncation	5	0.29
27 oblique truncation	23	1.33
28 concave truncation	6	0.35
29 convex truncation	10	0.58
30 double truncation	-	-
31 notch	27	1.56
32 denticulate	19	1.10
33 el-Wad point	203	11.71
34 el-Wad variant	67	3.86
35 backed and retouched blades	29	1.67
36 bladelet with direct retouch	192	11.07
37 bladelet with inverse retouch	63	3.63
38 bladelet with alternate retouch	18	1.04
total	1734	100.04
Bone and antler tools	2	
Debitage		
flakes	2679	26.99
blades	3352	33.77
bladelets	3895	39.24
total	9926	100.00

Level X departs typologically from those below in that el-Wad points and retouched blade/lets account for about 1/3 (32.99%) of the 1734 tools. Unlike the el-Wad points in levels XIII-XI these tools are generally narrow and straight or curved in profile (Bergman 1981: figure 1-3). Included in this group are el-Wad variants which usually have a small amount of inverse retouch on the right lateral edge. End-scrapers (28.32%) outnumber burins (17.36%) which are still primarily composed of dihedral types (55.81% of the 301 burins). Carinated tools become less numerous at 11.07% and the Aurignacian index is about half (15.63) of that in level XI.

The debitage is mainly composed of blades and bladelets which account for 73.01%. Unlike levels XIII-XI where the blade/lets are usually twisted, most of these pieces are straight or curved in profile. The typology of level X is the least Aurignacian in appearance of any layer described so far. The technology is blade/let oriented and clearly differs from industries classified as Aurignacian in the southern Levant.

Ksar Akil 1937-1938 Level IX

Tool Type	N	%
1 simple end-scraper	983	26.80
2 double end-scraper	31	0.85
3 end-scraper on a retouched piece	135	3.68
4 end-scraper on an Aurignacian blade	10	0.27
5 shouldered and nosed scrapers	612	16.69
6 Ksar Akil scraper	-	-
7 end-scraper/burin	73	1.99
8 end-scraper/truncation	37	1.01
9 burin/truncation	12	0.33
10 piercer/bec	28	0.76
11 burin on a break or natural surface	47	1.28
12 dihedral axial or symmetrical burin	21	0.57
13 dihedral offset or asymmetrical burin	56	1.53
14 dihedral angle burin	36	0.98
15 multiple dihedral burin	22	0.60
16 burin on a straight truncation	12	0.33
17 burin on an oblique truncation	29	0.79
18 burin on a concave truncation	65	1.77
19 burin on a notch	-	-
20 burin on a convex truncation	21	0.57
21 burin on lateral retouch	12	0.33
22 multiple truncation burin	29	0.79
23 multiple mixed burin	21	0.57
24 carinated tools	329	8.97
25 Aurignacian blade	3	0.08
26 straight truncation	17	0.46
27 oblique truncation	72	1.96
28 concave truncation	43	1.17
29 convex truncation	21	0.57
30 double truncation	2	0.06
31 notch	91	2.48
32 denticulate	29	0.79
33 el-Wad point	147	4.01
34 el-Wad variant	51	1.39
35 backed and retouched blades	18	0.49
36 bladelet with direct retouch	434	11.83
37 bladelet with inverse retouch	91	2.48
38 bladelet with alternate retouch	28	0.76
total	3668	99.99
Bone and antler tools	6	
Debitage		
flakes	13084	42.18
blades	5746	18.52
bladelets	12189	39.30
total	31019	100.00

In contrast to level X this level is made up mainly of end-scrapers which are 48.28% of the 3668 tools. Many of these are nosed and shouldered (16.69% of the total assemblage). Burins are again rather poorly represented and decline in number to 10.12%. El-Wad points and variants when combined with the retouched blade/lets account for 20.97%. The Aurignacian index is higher than that of level X at 26.01. As was pointed out in chapter 2 there is good evidence to support the belief that the highest spits (7.24-7.25 m in squares F3 and G3) in this level are really part of level VIII. Indeed, it is interesting to note that 61% of the nosed and shouldered scrapers that can still be assigned to their precise excavation unit come from the top part (7.24 - 7.25 m) of layer IX. If these pieces are removed from the above list the percentage of type 5 decreases to around that of level X. Another point worth noting is that two of the six osseous tools from this level come from G3 7.25 (see appendix 3) and are probably from level VIII.

The technique for producing blades and blade/lets is identical to that in level X and these artefacts make up 57.82% of the 31019 unretouched pieces.

Ksar Akil 1937-1938 Level VIII

Tool type	N	%
1 simple end-scraper	904	24.45
2 double end-scraper	42	1.14
3 end-scraper on a retouched piece	219	5.92
4 end-scraper on an Aurignacian blade	7	0.19
5 shouldered and nosed scrapers	1252	33.87
6 Ksar Akil scraper	-	-
7 end-scraper/burin	91	2.46
8 end-scraper/truncation	78	2.11
9 burin/truncation	9	0.24
10 piercer/bec	134	3.63
11 burin on a break or natural surface	68	1.84
12 dihedral axial or symmetrical burin	23	0.62
13 dihedral offset or asymmetrical burin	24	0.65
14 dihedral angle burin	36	0.97
15 multiple dihedral burin	10	0.27
16 burin on a straight truncation	13	0.35
17 burin on an oblique truncation	19	0.51
18 burin on a concave truncation	38	1.03
19 burin on a notch	-	-
20 burin on a convex truncation	13	0.35
21 burin on lateral retouch	3	0.08
22 multiple truncation burin	13	0.35
23 multiple mixed burin	13	0.35
24 carinated tools	151	4.08
25 Aurignacian blade	4	0.11
26 straight truncation	19	0.51
27 oblique truncation	43	1.16
28 concave truncation	43	1.16
29 convex truncation	38	1.03
30 double truncation	10	0.27
31 notch	78	2.11
32 denticulate	49	1.33
33 el-Wad point	44	1.19
34 el-Wad variant	-	-
35 backed and retouched blades	10	0.27
36 bladelet with direct retouch	127	3.44
37 bladelet with inverse retouch	30	0.81
38 bladelet with alternate retouch	42	1.14
total	3697	99.99
Bone and antler tools	32	
Debitage		
flakes	4703	73.34
blades	869	13.55
bladelets	841	13.11
total	6413	100.00

This level is dominated by scrapers (65.57%), while burins are relatively few in number (7.38%). Nosed and shouldered types are the most common scrapers (33.87% of the total assemblage), while dihedral burins account for 58.97% of the 273 burins. The el-Wad points and retouched blade/lets decrease in number to only 6.84%. Significantly, there are no el-Wad variants. The Aurignacian index at 38.25 is high. An important component of the assemblage from level VIII is the presence of 32 osseous tools.

The debitage is made up of flakes (73.34%) with relatively few blades and bladelets. This is the first time in levels XIII-VI where flakes are numerically superior. The typology and technology of the artefacts in level VIII closely fit the pattern of industries which are called Aurignacian in the southern Levant (Gilead 1981a: 260).

Ksar Akil 1937-1938 Level VII

Tool Type	N	%
1 simple end-scraper	680	22.87
2 double end-scraper	30	1.01
3 end-scraper on a retouched piece	129	4.34
4 end-scraper on an Aurignacian blade	3	0.10
5 shouldered and nosed scrapers	1125	37.84
6 Ksar Akil scraper	1	0.03
7 end-scraper/burin	83	2.79
8 end-scraper/truncation	65	2.19
9 burin/truncation	16	0.54
10 piercer/bec	93	3.13
11 burin on a break or natural surface	45	1.51
12 dihedral axial or symmetrical burin	24	0.81
13 dihedral offset or asymmetrical burin	47	1.58
14 dihedral angle burin	69	2.32
15 multiple dihedral burin	21	0.71
16 burin on a straight truncation	7	0.24
17 burin on an oblique truncation	40	1.35
18 burin on a concave truncation	35	1.18
19 burin on a notch	7	0.24
20 burin on a convex truncation	7	0.24
21 burin on lateral retouch	1	0.03
22 multiple truncation burin	10	0.34
23 multiple mixed burin	18	0.61
24 carinated tools	128	4.31
25 Aurignacian blade	6	0.20
26 straight truncation	17	0.57
27 oblique truncation	29	0.98
28 concave truncation	13	0.44
29 convex truncation	16	0.54
30 double truncation	6	0.20
31 notch	78	2.62
32 denticulate	28	0.94
33 el-Wad point	8	0.27
34 el-Wad variant	-	-
35 backed and retouched blades	25	0.84
36 bladelet with direct retouch	21	0.71
37 bladelet with inverse retouch	19	0.64
38 bladelet with alternate retouch	23	0.77
total	2973	100.03
Bone and antler tools	66	
Debitage		
flakes	4616	90.24
blades	427	8.35
bladelets	72	1.41
total	5115	100.00

In level VII end-scrapers make up 66.20% of the assemblage with nosed and shouldered scrapers being particularly common (37.84%). Burins and carinated tools are relatively rare and the former account for 11.13%, while the latter are only 4.31%. The el-Wad points and retouched blade/lets decline to their lowest percentage (3.23%) in the upper part of the Ksar Akil sequence. The Aurignacian index is the highest (42.45) recorded in levels XIII-VI. Sixty-six bone and antler tools were recovered from this level.

Flakes are again very strongly (90.24%) represented in the debitage. The overall impression is that levels VII and VIII are directly related as the typology of the tools and the technology of blank manufacture are virtually identical.

Ksar Akil 1937-1938 Level VI

Tool Type	N	%
1 simple end-scraper	173	14.50
2 double end-scraper	21	1.76
3 end-scraper on a retouched piece	28	2.35
4 end-scraper on an Aurignacian blade	-	-
5 shouldered and nosed scrapers	81	6.79
6 Ksar Akil scraper	1	0.08
7 end-scraper/burin	39	3.27
8 end-scraper/truncation	11	0.92
9 burin/truncation	19	1.59
10 piercer/bec	15	1.26
11 burin on a break or natural surface	42	3.52
12 dihedral axial or symmetrical burin	46	3.86
13 dihedral offset or asymmetrical burin	107	8.97
14 dihedral angle burin	19	1.59
15 multiple dihedral burin	38	3.19
16 burin on a straight truncation	16	1.34
17 burin on an oblique truncation	47	3.94
18 burin on a concave truncation	48	4.02
19 burin on a notch	67	5.62
20 burin on a convex truncation	15	1.26
21 burin on lateral retouch	7	0.59
22 multiple truncation burin	39	3.27
23 multiple mixed burin	16	1.34
24 carinated tools	64	5.37
25 Aurignacian blade	-	-
26 straight truncation	7	0.59
27 oblique truncation	18	1.51
28 concave truncation	6	0.50
29 convex truncation	4	0.34
30 double truncation	-	-
31 notch	41	3.44
32 denticulate	9	0.75
33 el-Wad point	11	0.92
34 el-Wad variant	-	-
35 backed and retouched blades	20	1.68
36 bladelet with direct retouch	59	4.95
37 bladelet with inverse retouch	38	3.19
38 bladelet with alternate retouch	21	1.76
total	1193	100.03
Bone and antler tools	16	
Debitage		
flakes	804	50.63
blades	227	14.30
bladelets	557	35.08
total	1588	100.01

Level VI represents a return to the dominance of burins (42.50%) after their relative scarcity in levels X-VII. The percentages of dihedral and truncation burins are roughly equal and the burin on a notch is especially characteristic of level VI (13.22% of the 507 burins). El-Wad points are relatively rare (0.92%) and retouched blade/lets, including lamelles Dufour, account for 11.57%. The Aurignacian index is much lower than the two previous levels being only 12.15. There are 16 bone and antler tools in the collection from level VI.

This level has slightly more unretouched flakes (50.63%) than blade/lets (49.37%). The typology as well as the technology of the tools seems to place this assemblage within the Aurignacian tradition. However, it is not clear whether this material is directly related to that found in levels VII and VIII. Indeed, the typology of the retouched tools is quite distinct from those two levels and the debitage is less definitely flake oriented.

Summary of levels XIII-VI

The technology for making blade/lets appears in the earliest Upper Palaeolithic levels at Ksar Akil (Azoury 1986; Ohnuma 1986). The techniques practiced in level XXIII, for example, include the use of cresting and faceting of the striking platforms. Common by-products of blade manufacture are elongated Levallois points (Besançon et al. 1977; Bergman 1981; Marks 1983a). The blades tend to be relatively thick with large butts, indicating that the point of percussion was well on to the platform. Many of these pieces appear to be soft hammer-struck (Ohnuma and Bergman 1982; Ohnuma 1986). In phase 2, levels XX-XV, there is a shift away from cores with faceted platforms. In these levels most blades have tiny, plain butts. They are soft hammer-struck and platform abrasion is used to prepare the core's edge prior to delivery of the blow. This preparation is essential when striking close to the platform edge to avoid crushing it. Unlike levels XXV-XXI, where localised faceting is used to repair a damaged platform, a core tablet is usually detached removing the entire surface in levels XX-XV. Cresting is extensively used in phase 2 to prepare the core for blade manufacture as well as to correct accidents of debitage like hinge fractures.

The first level encountered after the stratigraphic break in the sequence at level XIV contains many of the same technological features found in phase 2. The blade/lets in level XIII are soft hammer-struck and platform abrasion is a consistent feature. The blade/let butts are small, indicating that the hammer was striking quite close to the platform edge. Most cores have single, plain platforms and, not surprisingly, the blade/lets usually have plain butts. A major difference between this level and those in phase 2 is the number of blade/lets with twisted profiles. In the small sample examined from level XIII over 50% of these blanks are twisted.

As can be seen on the type list for this level an important difference between level XIII and the levels in phase 2 is the presence of large numbers of burins. These are rare in levels XX-XV (Newcomer 1972: 379), while in level XIII they account for about half of the tools.

Flakes are most often used for the manufacture of tools like scrapers and burins. These pieces are often cortical and relatively thick. The blade/let technology in level XIII produces thin blanks which are generally unsuitable for these classes of tools. Blade/lets are used for making el-Wad points and the only two examples from the level are twisted in profile.

Level XII is technologically identical to XIII and in the sample from squares E4 and F4 blade/lets with twisted profiles account for over 60% of the 542 pieces measured. Offset debitage is also common and is found on ca. 50% of all blade/lets. The number of pieces with blade dimensions, that is 12 mm width (Tixier 1963), outnumber bladelets by over 10 to 1. Most blade/lets have been detached from unidirectionally flaked cores.

Burins are once again the predominant tool types and account for

42.47% of the assemblage. Dihedral burins are the most numerous and many of these are multifaceted and have flat-faced facets (the carinated and flat-faced carinated burins of Newcomer 1972: 380). The end-scrapers are relatively rare with only 68 examples out of 657 tools. El-Wad points and retouched blade/lets make up 15.83%.

In both units examined in level XII flakes or flake fragments are most often used for the manufacture of scrapers, carinated pieces and burins (see also Azoury 1986: figures 66-67); these tools are usually straight or curved in profile, a pattern seen throughout levels XIII-VI. Blade/lets are selected to make tools like truncations and el-Wad points. As stated above the blade/let technology in this level produces twisted blanks which has a direct influence on the morphology of the el-Wad points.

Level XI is technologically similar to XII in that it is also blade/let oriented and blanks with twisted profiles are most numerous (over 55% of the sample of 302 pieces in F4 9.30 and F4 8.95). Blades outnumber bladelets by a reduced ratio of about 2 to 1.

Typologically, there are important differences between levels XI and XII. The burins decrease in number to 22.27% of the sample of 1199 tools. End-scrapers and carinated tools account for about half of the retouched tool assemblage. Particularly characteristic of level XI are the lateral carinated scrapers. The el-Wad points and retouched blade/lets occur in similar numbers to level XII and make up 17.26%.

In all spits examined in level XI flakes and flake fragments are most often used for scrapers, carinated tools and burins. Blade/lets are used for el-Wad points which are usually twisted in profile. Crested pieces and core tablets are rarely utilised and are always selected for making scrapers, carinated tools or burins.

Level X, which is strikingly blade/let oriented (73.01% of 9926 blanks), departs technologically from levels XIII-XI in that most blade/lets are straight or curved in profile. Offset debitage, which is associated with the manufacture of twisted profiles, occurs on only 11% of over 1000 blade/lets measured. Another important difference is that bladelets (blanks with a width of 12 mm; Tixier 1963) outnumber blades. Other technological features remain the same and these include plain butts, platform abrasion, the core tablet technique and unidirectional cores.

The most common tool types are the retouched blade/lets and el-Wad points (32.99% of the 1734 tools). A variant of the el-Wad points occurs for the first time in this level and has small amounts of inverse retouch at the proximal end. The points are morphologically different from those in the levels below. The examples in level X are narrow, straight or slightly curved in profile and have symmetrical tips. End-scrapers outnumber burins and the carinated tools decline dramatically in number from level XI (see also Newcomer 1972: 380-381).

Blank selection for tool manufacture follows the same pattern as the three earlier levels with flakes generally used for scrapers, carinated tools and burins. When blade/lets are selected for these tool types they are often cortical or come from core preparation. The el-Wad points are always made on the thinner, non-cortical blade/lets.

Level IX has an identical blade/let technology to the previous level. The sample of debitage is less strongly blade/let oriented with 57.82% of the 31019 unretouched pieces. The blade/lets are most often straight or curved (over 60% of the sample of 513 pieces in E4 7.75, E4 7.65 and F4 7.25) and offset debitage continues to be uncommon. Bladelets, less than 12 mm in width, outnumber blades by about 2 to 1.

The tool assemblage of this level, which is mixed (see chapter 2), is primarily composed of scrapers (48.28%) of which 34.56% are nosed or shouldered. If it were still possible to assign all the artefacts to their correct spits and eliminate the pieces from level VIII (see comments on page 130) this would reduce the Aurignacian elements significantly. Burins continue to be few in number and only account for 10.12%. The el-Wad points and variants combined with retouched blade/lets account for 20.97%.

Flakes are most often used for scrapers, carinated tools and burins, while blade/lets are used for el-Wad points and variants. This tendency is repeated in each of the levels between XIII and IX. It may reflect a need for thicker, wider blanks to make tools like scrapers and thinner, narrower pieces for the points (Bergman 1981; Bergman and Newcomer 1983). It is virtually impossible to make scrapers and burins on thin blanks while points must be thin in order to fit the shaft of the projectile.

The first flake dominated assemblage occurs in level VIII where they make up 73.34% of the 6413 unretouched pieces. The flakes are hard hammer-struck and tend to have plain butts. Unlike most blade/let butts, those on flakes are rather large indicating that the point of percussion was on the platform rather than at its edge. As such platform abrasion is only occasionally used to prepare the core's edge. The sample of cores is primarily composed of shapeless flake cores with multidirectional scars. These pieces are presumably flaked alternately where the removal of one flake creates a platform for the next blow. On these examples a special platform is not prepared and debitage can occur at any suitable point on the core's surface.

Over half of the tool kit in level VIII is made up of scrapers. Nosed and shouldered scrapers are especially characteristic (33.87%). Burins are scarce and account for 7.38%. El-Wad points and retouched blade/lets sharply decline in number from the two previous levels and make up only 6.84%. The el-Wad variant is completely absent in this assemblage. There are 32 bone and antler tools in level VIII including awls and points.

The flaking technology is almost completely dominated by flakes and it is hardly surprising that most tools are made on this type of blank. One tiny retouched bladelet appears to be made on a retouch 'chip' which probably comes from scraper manufacture. <u>It is highly likely that this class of artefact is underrepresented in the Institute collections from levels VIII-VI.</u>

Level VII is directly related to VIII and has an even greater percentage of flakes (90.24% of 5115 blanks).

The sample of tools is made up primarily of scrapers with nosed and shouldered types accounting for 37.84% of the tool kit. This level shows a great diversity in the form of scraper edges. A number of tools have ogival retouched edges which are quite acute making them similar in appearance to becs. Burins and carinated tools continue to be rare and together account for 15.44% of the tools. The el-Wad points and retouched blade/lets decrease in number to only 3.23%. The number of osseous tools is twice (66 examples) that of level VIII.

The majority of tools measured from VII F4 are made on flakes. The exceptions, of course, are the few retouched blade/lets and el-Wad points.

Level VI has fewer flakes than the two previous levels and they account for 50.63%. There appear to be two separate reduction sequences for the production of blades and tiny bladelets. While many blades and bladelets are produced in normal core reduction sequences there are numerous miniscule bladelets which appear to be the by-products of tool manufacture. Bladelets outnumber blades in the sample of 1588 pieces of debitage.

The tool sample is characterised by burins which account for 42.50%. This level contains relatively large numbers of small truncation burins and burins on a notch. The el-Wad point is rare (0.92%), while retouched blade/lets, including lamelles Dufour, account for 11.57%. There are 16 bone and antler tools in this level.

The blanks selected to make scrapers, carinated tools and burins are predominantly flakes. A number of the lamelles Dufour appear to be made on the by-products of carinated tool manufacture as they are too small to be part of the reduction of a blade/let core.

The density of artefacts fluctuates over levels XIII-VI. The table below presents the average number of artefacts recovered per cubic meter as well as the percentage of retouched tools relative to the number of unretouched flakes and blade/lets.

Level	Number of 2m units	Artefact density m^3	% of tools in each level
XII	3	401.11	18.20
XI	3	420.08	23.79
X	3	1619.44	14.87
IX	8	1156.23	10.58
VIII	8	137.36	36.57
VII	7	222.19	36.76
VI	8	96.56	42.90

Assuming that the method of collecting artefacts remained the same throughout these levels the above data show distinct differences in the pattern of artefact manufacture and use between levels XIII-IX and VIII-VI. In levels X and IX, for example, it would appear that a great deal of blank production took place with relatively few of these pieces being further modified into tools. Levels VIII-VI, on the other hand, display a much more intensive use of the raw material with many blanks being retouched into tools (for a similar conclusion see Newcomer 1972: 344-345). This is also confirmed by the nature of the tool kit where many thick nosed and shouldered scrapers, with carinated profiles, appear to have undergone several episodes of sharpening (for example, the removal of a small flake from the side of the scraper's edge; Bells 1938). The above table clearly shows the difference of approach towards flaking the raw material of the knappers in levels VIII-VI which may be due to an entirely different cultural background.

Conclusion

Discussion

The following discussion is divided into two parts. The first part will examine the site of Ksar Akil, the individual levels and their relation to each other. In particular the question of whether this sequence represents a unilinear evolution within the Levantine Aurignacian will be addressed. The second part will briefly examine the relationship between Ksar Akil and other Upper Palaeolithic sites in the northern Levant.

The present interpretation of levels XIII-VI offered by Besançon et al. (1977) divides them into three sub-phases and designates them A, B and C. These sub-phases are regarded as developmentally related, with each having varying percentages of Aurignacian tool types such as nosed or carinated scrapers. According to these authors, levels XIII-XI represent the first Aurignacian influence at Ksar Akil and were called "Levantine Aurignacian A". This sub-phase is unknown elsewhere and characterised by Aurignacian blades, nosed and carinated scrapers, multi-faceted and carinated burins and twisted el-Wad points. A change in the industries was noted in levels X-VIII and these were designated "Levantine Aurignacian B". Unlike the previous sub-phase, comparable material was identified in both Syria and Israel. At Ksar Akil, Aurignacian B is said to be characterised by carinated scrapers and burins as well as el-Wad points. The final subdivision encompassed levels VII-V and was called "Levantine Aurignacian C". These levels contain carinated tools, burins on a notch (level VI), non-geometric microliths and lamelles Dufour.

The above outline is typological in scope and the major technological differences between the levels are overlooked. Most prehistorians working in the 1960's used the methods developed by French archaeologists who thought that all that was needed to characterise Palaeolithic cultures was typological indices. While there is nothing inherently wrong with typological studies it must be recognised that they provide only certain limited kinds of information about stone tools. It is important to supplement this information by examining other aspects of prehistoric implements notably their method of manufacture. The flaking technology is fundamental to understanding and interpreting stone artefacts as it has a direct affect on tool morphology. For example, the reason that el-Wad points in levels to XIII-XI are asymmetrical in plan is due to the blade/let technology which produces numerous twisted blanks with offset debitage. It must be emphasised that the flaking technology determines, to a large extent, the morphology of the tools produced by prehistoric knappers (Marks 1981: 346). Any analysis of a stone tool assemblage is incomplete without an account of the flaking technology.

Since the early 1920's there has been a tendency to evaluate the long sequence at Ksar Akil as representing a continuous developmental evolution of Upper Palaeolithic cultures in Lebanon. This same view is maintained by Besançon et al. (1977) and effectively means that a relatively stable population occupied Ksar Akil for some 20 to 30,000 years. Is it really possible that the stone industries of Ksar Akil, spanning the entire Upper Palaeolithic, are part of an uninterrupted evolution? This would seem to be an improbable situation and the model proposed by this author is that, for levels XIII-VI, there are several groups of levels which do show developmental continuity but they are clearly separated from each other by breaks in the archaeological sequence.

Current research in the southern Levant has rejected the unilinear model of development as being unsuitable to explain cultural evolution. It is now generally recognised that at least two traditions exist that overlap geographically and to some extent temporally. The first, the Ahmarian (see glossary), is characterised by a developed blade/let technology and a high percentage of retouched blade/lets. This latter group is made up of retouched and backed blade/lets as well as el-Wad points and can make up 30-40% of an assemblage. The second tradition is primarily flake-oriented with burins and end-scrapers constituting 50% or more of the retouched tools. This tradition has been named the Aurignacian (see glossary). These definitions were originally applied to assemblages recovered from open-air sites in the Negev and Sinai. It is highly likely, therefore, that there will be some regional variations within the Aurignacian and Ahmarian in other parts of the Levant. Indeed, it is possible that a third, distinct facies exists in the northern Levant.

There are differences reported in the assemblages from cave sites (or rockshelters) and those in the open air (Marks 1981: 371). Gilead (1981a: 269) identifies layer E at Kebara and level 9 at Qafzeh as Ahmarian, even though these assemblages have a higher number of scrapers and burins (34% for Kebara E and 43% for Qafzeh 9; Ziffer 1978; Ronen and Vandermeersch 1972) than most open-air sites further south. It has been pointed out by Marks (1981: 269) that the upper levels at Ksar Akil have different percentages of scrapers and burins than the southern sites. These tools make up between 30% and 37% at Ksar Akil (Tixier's excavations) in contrast to the less than 25% for the southern Ahmarian and the more than 45% for the southern Aurignacian. These differences may relate to variations in site functions or the intensity and duration of occupation at the various sites. A fact that may support the latter contention is the presence of "re-cycled" tools made on old, patinated blanks that are relatively common at Ksar Akil and presumably absent at open-air sites.

The following discussion will examine the question of the unilinear development of levels XIII-VI at Ksar Akil as well as assess the relevance of the definitions proposed in the southern Levant for Upper Palaeolithic flaked stone industries.

As stated above, the "Levantine Aurignacian" levels of Ksar Akil have traditionally been thought to begin with level XIII. These industries follow Upper Palaeolithic phase 2 (Besançon et al. 1977; Azoury 1986), which is represented by levels XX-XV at the site. The flint industries of this phase are characterised by scrapers, retouched blade/lets, Ksar Akil points, <u>pointes à face plane</u> and few burins. Technologically, blade/let manufacture undergoes an evolution in these levels. In the early part of phase 2 the blades are relatively thick and have large, faceted butts. These gradually become thinner in levels XVIII-XVI and have tiny, plain butts. It is interesting to note that in both cases soft hammers are used to detach blades (Ohnuma 1986). The main change in the approach of the knappers seems to be in core preparation and how the blades are detached. On the earlier blades the point of percussion is on the platform resulting in large butts and thicker blanks (Azoury 1986), whereas in levels XVIII-XVI the blow falls at the edge of the platform producing tiny butts and thinner blanks (Bergman 1981). The industries of phase 2 at Ksar Akil would currently be regarded as Ahmarian (Gilead 1981a: 271).

After the sterile layer XIV the stone tool assemblages undergo a change. Azoury (1986: 177) believed this geological layer coincided with a major break in the archaeological sequence. However, many aspects of the blade/let technology of the latter part of phase 2 remained the same. These include the use of cresting and the core tablet technique. Like phase 2 the core platforms are plain and the blow is still delivered close to the platform edge resulting in thinner blanks with tiny butts. There is one important difference between level XIII and the levels in phase 2 and that is the presence of large numbers of blade/lets with twisted profiles (56% in XIII F4 9.90) and offset debitage. In level XIII burins outnumber scrapers by about 8 to 1; burins are extremely rare in phase 2. El-Wad points are also present in level XIII but unlike the Ksar Akil points in levels XX-XV they are made on twisted blade/lets (Bergman 1981).

Level XII is typologically and technologically similar to level XIII. Indeed, the small sample from XIII probably represents a part of level XII which was separated out stratigraphically. Unretouched blade/lets predominate in the debitage sample making up 70% of the 2953 pieces. Technologically, blade/let manufacture is characterised by twisted debitage (60% in E4 10.00 and 69% in F4 9.70). More than 50% of the blade/lets in both spits have offset debitage. Level XII also has numerous burins, usually dihedral, which outnumber scrapers by about 4 to 1. Newcomer (1972: 325) examined the burins from this level and reports that the single most common type (23.32%) is the flat-faced carinated burin. This type of burin is multifaceted with all the removals forming the edge on the ventral surface. Retouched blade/lets and el-Wad points tend to be made on twisted blanks and account for 16% of the 657 tools.

Level XI has some typological differences with XIII and XII. Most notable is the presence of large numbers of lateral carinated scrapers. In the deepest spit examined in level XI, E4 9.65, there are 36 lateral carinated scrapers out of a total of 54 carinated tools. Burins decline in number to about half of their percentage in level XII. The scrapers, carinated pieces and burins form the predominant tools in this level accounting for about 70%. The blade/let debitage is similar to XII and is still characterised by twisted profiles with each spit in level XI having 50% or more.

The typological and technological similarities among all three levels seem to indicate a high degree of continuity (see figures 83-87). Unretouched blade/lets are the most numerous class of debitage in all three levels and the flaking technology, with many of the same technical features of phase 2, is characterised by a predominance of twisted profiles. All three assemblages are primarily composed of scrapers, carinated tools and burins; retouched blade/lets and el-Wad points are present in smaller numbers and tend to be twisted in profile. The el-Wad points are asymmetrical with the pointed tip usually offset to the right of the main axis. Obviously these tools are morphologically quite different from those described from the Ahmarian of the southern Levant (Marks 1981). While the presence of large numbers of unretouched blade/lets makes these assemblages appear technologically similar to the Ahmarian, the tool kits differ from those described for that tradition. At the same time a developed blade/let technology is not regarded as a feature of industries currently classified as Aurignacian in the south (Marks 1981: 350-351). In effect, what we have in levels XIII-XI is a blade based technology with a strong Aurignacian typology. As these assemblages are unique to Ksar Akil, it is recommended that they be classified as stage 3 until more data appears from similar sites and the cultural definitions outlined above are adapted to the northern Levant.

The spits in level X mark a significant departure from those below. This level has numerous unretouched blade/lets which account for 73% of the 9926 pieces of debitage. Like levels XIII-XI, these are soft hammer-struck and utilise platform abrasion prior to delivery of the blow. A major difference occurs in the amount of twisted debitage (see figure 84). In those spits that have substantial numbers of blade/lets, the majority are straight or curved in profile (E4 8.65, 55%; F4 8.40, 60%; E4 8.10, 71%). Offset debitage drops to around 11% of the sample. Typologically, the numbers of el-Wad points and retouched blade/lets increase to 1/3 of the 1734 tools. In contrast to levels XIII-XI the blade/lets selected to make el-Wad points in level X are straight or curved. The points are symmetrical in plan with the pointed tips roughly divided by the long axis of the blank. El-Wad variants appear for the first time and usually are inversely retouched on the right lateral edge at the proximal end. A few examples have total inverse or alternate retouch. Scrapers outnumber burins and the carinated tools decline to around 11% of the tools. The decrease in the number of carinated tools is linked to a reduction in the number of multifaceted burins in level X (Newcomer 1972: 336).

The following level, IX, displays a broadly similar pattern to that of X. Scrapers outnumber burins by a ratio of 4 to 1. As stated in chapters 2 and 3 there is strong evidence indicating that part of this level is mixed. If the material which belongs in level VIII is removed the number of nosed and shouldered scrapers decreases significantly. Carinated tools account for only 9% of the assemblages, while multifaceted burins remain fewer in number than simple burins (Newcomer 1972: 340). Retouched blade/lets and el-Wad points make up about 21% of the retouched tool assemblage. The blade/let technology is identical to level X and is still characterised by blanks with straight or curved profiles (F4 7.75, 65%; E4 7.65, 68% and F4 7.25, 81%).

The differences between level X and levels XIII-XI have been noted by almost every investigator who has examined these collections (Copeland and Hours 1971; Newcomer 1972: 336; Besançon et al. 1977). The close technological relationship between levels X and IX has also been noted, while Copeland (Copeland and Hours 1971; Copeland 1975) has pointed out the typological differences which are probably related to some mixing at the top of level IX. In spite of recognising the break with the earlier material, X and IX were regarded as part of a linear development within the Aurignacian tradition and directly related to levels XIII-XI (Besan½on et al. 1977). The interpretation offered here recognises the break between XIII-XI and X-IX but does not regard them as developmentally related. The typological and technological differences outlined above are too great to treat levels X and IX as direct descendants of levels XIII-XI (see figures 83-87). It is suggested that levels X and IX be regarded as a separate and distinct unit at Ksar Akil and termed stage 4.

Once again, the tool kits in levels X and IX are primarily composed of scrapers and burins, with a few carinated tools, which seems to exclude them from the retouched blade/let and point oriented Ahmarian tradition. However, the blade/let technology as well as the morphology of the el-Wad points is suggestive of the Negev Ahmarian (cf. the site of Boker; A.E. Marks pers. comm.). These assemblages may represent a regional variant of the southern Ahmarian and typologically reflect differences in site function. They could also at the same time be part of a third, undefined tradition in Lebanon which is nonetheless related to the other blade/let oriented assemblages in the Levant.

Level VIII represents another break in the archaeological sequence at Ksar Akil. For the first time in the upper levels the unretouched pieces are dominated by flakes (73% of 6413 unretouched pieces) and flake cores. Debitage is characterised by alternate removals of flakes which often have a crossed or multidirectional scar pattern on their dorsal surfaces. Scrapers dominate the assemblage with 66% and half of these are nosed or shouldered. Burins are rare and account for 7%, while retouched blade/lets and el-Wad points are equally scarce. An important aspect of the assemblage is the presence of 32 bone and antler tools (Newcomer 1974b; appendix 3 this volume). These are virtually absent in levels X and IX where only eight pieces were recovered.

This level was regarded by Dortch (1970: 126) to be related to IX because of certain typological similarities (see discussion on level IX above). "The assemblages of both of these layers are dominated by large numbers of scrapers, including end-scrapers, thick flake scrapers, flat and thick nose scrapers and steep scrapers of several types." While the increase in nosed and shouldered scrapers (due to mixing) was noted in level IX, the technological samples are entirely different: level IX is blade/let dominated, while VIII is flake dominated. Waechter (Wenner Gren Symposium 1969; 1976) regarded level VIII as distinct from IX and classified it as Levantine Aurignacian C.

Level VII is similar to VIII in that the sample is also dominated by flakes (90%). Scrapers outnumber burins by a ratio of almost 6 to 1. Many of the scrapers are nosed or shouldered which make up 38% of the 2973 tools. The scraper edges in this level display a wide range of morphology with some being ogival or "rostrate." The latter term was introduced by Dortch (1970: 40) to describe tools made on relatively thick blanks that are similar to nosed scrapers but have an edge that is much narrower and elongated. In fact, these tools appear closer to becs than scrapers. The sample of osseous tools from this level is quite large, consisting of 10 awls and 50 points (Newcomer 1974b; appendix 3 this volume).

Levels VIII and VII are the first two levels described in the upper part of the Ksar Akil sequence which are flake dominated. Both are characterised by scrapers, including numerous nosed and shouldered examples, with relatively few burins. There is a marked increase in the number of bone and antler tools relative to the other parts of the Ksar Akil sequence. An examination of the three-pole graphs (cf. Doran and Hodson 1975: 132-134) always shows these two assemblages clustering away from levels XII-IX regardless of the variables plotted. It is suggested that these levels should no longer be separated as in Besançon et al. (1977) where level VIII is part of Aurignacian B and level VII is part of Aurignacian C. Levels VIII and VII are the first levels described in this volume which clearly fit the pattern of industries described as Aurignacian in the southern Levant. It is proposed that they be reclassified, for descriptive purposes, as stage 5 at Ksar Akil.

The final level studied, VI, departs from the pattern established in VIII and VII in that it has significant numbers of burins. Included among these tools are the small burins on Clactonian notches. Among the scrapers the nosed and shouldered types are less prominent in this level (7%). Also present in the sample of tools are a small number of lamelles Dufour with inverse or alternate retouch. Judging by the figures for comparable material in Tixier's excavations (Tixier and Inizan 1981) the lamelles Dufour are underrepresented in the 1937-1938 collections. The unretouched pieces are made up of more flakes (51%) than blade/lets and the flaking technology appears to have two distinct reduction sequences for the production of blades and bladelets. The first produced relatively large blades, while the other produced tiny bladelets for the manufacture of microliths. The latter may result from the process of carinated tool manufacture.

Level VI has clear typological differences with levels VIII and VII, mainly the presence of large numbers of burins. It may be directly related to these levels but the evidence from the 1937-1938 collections is less clear than that provided by Tixier and Inizan (1981) , who see level VI as part of an Aurignacian evolving in situ at Ksar Akil.

In summary, the following revised sequence is proposed:

1) As previously stated, levels XIII-XI represent stage 3 at Ksar Akil which follows a break in the stratigraphic sequence at level XIV. These assemblages are composed of twisted blade/lets and an Aurignacian tool typology. When compared with the Aurignacian and Ahmarian assemblages in the southern Levant these levels form a third, discrete group (see figure 87).

2) Levels X and IX, which is mixed, are regarded as distinct from XIII-XI and called stage 4. These levels have large numbers of unretouched blade/lets which are usually straight or curved in profile. The tool

kits have more scrapers than burins and retouched blade/lets with the el-Wad points account for up to 1/3 of the assemblage. Once again these two levels appear to be separate from the southern Aurignacian and Ahmarian (see figure 87).

3) The following levels, VIII and VII, are technologically different from those below being almost entirely composed of flakes. Nosed and shouldered scrapers are especially characteristic, while burins are rare. Both levels contain relatively large numbers of bone and antler tools. These two levels are grouped together in stage 5 and represent the closest parallel to the southern Aurignacian (see figure 87).

4) Level VI is characterised by numerous burins and some lamelles Dufour. The debitage is flake oriented and the flaking technology has at least two reduction sequences aimed at the production of large, wide blades and tiny bladelets. This level is classified as stage 6 and probably represents the start of the terminal Upper Palaeolithic at Ksar Akil.

Level	Phase or Stage
XXV-XXI	1
XX-XV	2
XIV	stratigraphic break
XIII XII XI	3
X IX (mixed)	4
VIII VII	5
VI	6

Radiometric dating

There is a C14 date of 28,840 +/- 380 BP (GrN-2195) from Ksar Akil obtained from shells collected between 6-7.5 m which covers the following levels: top of level IX, level VIII and the bottom of level VII (Vogel and Waterbolk 1963). Most authors assign this date to level VIII even though it can never be regarded as belonging to a distinct level in the stratigraphic sequence. However, as Copeland points out in the preface this date seems to compare well with a slightly earlier date of 32,000 +/- 1000 BC (Tixier and Inizan 1981) for a level excavated by Tixier which is probably comparable to the top of level X of the 1937-1938 excavations.

The Site of Ksar Akil in the Context of the Upper Palaeolithic of the Northern Levant

Lebanon

It is generally agreed that material comparable to levels XIII-XI is absent in other parts of Lebanon (Besançon et al. 1977). Recently, Copeland (1983: 334) reported that Levantine Aurignacian A (levels XIII-XI) "is known so far only at Ksar Akil, but probably connected with the Ahmarian tradition recently recognised in the southern Levant." It is unlikely that any direct connection between levels XIII-XI and the southern Ahmarian does exist as the typology and technology differ so greatly. Typologically, the material from levels XIII-XI contains large numbers of scrapers, carinated tools and burins which markedly contrasts with the southern Ahmarian and its tool kits composed of retouched blade/lets and points. Boker A, a Negev Ahmarian site, has twisted profiles on only 42% of its blades, while at Boker BE the percentage ranges from 45% in level I to 14% in level VI (Jones et al. 1983: table 9-8). At Ksar Akil, levels XIII-XI, the percentage of twisted blade/lets is never less than 50% and can be greater than 65%.

Levels X and IX have been compared with two other Lebanese sites. One of these, Antelias Cave, is also in the Antelias River Valley and has material that is described as similar to levels X and IX at Ksar Akil (Copeland and Hours 1971; Copeland 1983). Very little is known about the present collections from Antelias Cave except that the site was excavated in 1947-1948 by Ewing. His preliminary sounding recovered flint and bone artefacts from seven distinct levels. The two levels that concern this work are IV and III. Level IV is typologically dominated by scrapers (40%) and burins (20%) (Copeland and Hours 1971). There are some carinated tools as well as 16 el-Wad points. One of the latter tools is a typical el-Wad variant, while the others illustrated are made on twisted debitage (Copeland and Hours 1971; plate 1: 8). Also included in the small sample are four chamfered pieces that are certainly intrusive and raise the question of the extent of mixing of archaeological levels during excavation. The sample of cores and debitage consists of 342 pieces. Of these, single platform blade/let cores and blade/lets are the most numerous.

Level III of Antelias Cave has also been compared to X and IX at Ksar Akil and is also dominated by scrapers (38%) followed by burins (23%). Among the scrapers the nosed and shouldered types are prominent. El-Wad points make up less than 1%, while non-geometric microliths account for 17%. Technologically, blade/lets and single platform blade/let cores are the most numerous.

One cannot help but feel that a great deal is missing from the Antelias Cave collections. As at Ksar Akil, some selective retention must have taken place and so typological comparisons can be misleading. There seems to be a fairly good basis for comparing level IV with levels X and IX at Ksar Akil. As for level III, the scarcity of el-Wad points and the morphology of certain scrapers, as well as their percentages, hint at connections with levels VIII and VII (Copeland and

Hours 1971: 85). However, the technology of level III as represented by the cores and debitage is different from the sample examined from levels VIII or VII at Ksar Akil.

Abu Halka, which is about 70 km north of Ksar Akil, has also produced an industry comparable to levels X and IX at Ksar Akil (Copeland 1975; Azoury 1986). In his report on the site, Haller (1942-1943) writes that in level IVc the assemblage is composed of 94 blade/let tools and 137 burins and scrapers. The high percentage of the former does indicate some similarity with level X. It is interesting to note that in the assemblage from IVc there are only three burins busques (carinated burins). The relative scarcity of this type was also noted in levels X and IX at Ksar Akil. It would appear that blade/lets as well as single platform blade/let cores are also a feature of this industry (Haller 1942-1943: 16).

Another Lebanese site which yielded Upper Palaeolithic material is Bezez Cave (Adlun). This site, like the other two, is on the coast and is located some 60 km south of Beirut. The small sample has been studied in detail by Copeland who lists 42 tools and 216 pieces of debitage from level A (Copeland 1983: 351; table A.3). In a thorough discussion of the relative chronology of the material from this level she concludes that it is similar to levels VIII and VII at Ksar Akil (Copeland 1983: 357).

Syria

The only Upper Palaeolithic site described in Syria which has material similar to that from Ksar Akil is Yabrud (Copeland 1975). This important series of sites is located some 80 kms north of Damascus (Rust 1950; Solecki and Solecki 1966). The town of Yabrud lies west of the anti-Lebanon mountains in the Skifta Valley.

Several different archaeological sites have been excavated at Yabrud but only one of these has material which is relevant to this work. Shelter II is located on the north side of the valley at a height of 1400 m. The material recovered in Shelter II by Rust (1950; Ziffer 1981) encompasses 10 archaeological levels. He labelled all of the Upper Palaeolithic material Aurignacian and divided the sequence as follows:

Levels 10-8	= Late Mousterian
Levels 7-6	= Lower Aurignacian
Levels 5-4	= Middle Aurignacian
Level 3-2	= Upper Aurignacian or Atlitian
Level 1	= Micro-Aurignacian

The most recent study of the site has been published by Ziffer (1981) and his results are summarised here. Levels 7 and 6 are the earliest Upper Palaeolithic levels encountered in Shelter II; the amount of material collected from both is relatively small. The assemblages are made up of more scrapers than burins, while in level 7 retouched blade/lets and el-Wad points account for over 30% of the tools.

A.E. Marks (pers. comm.) recently examined the material from Yabrud and felt that there were problems with the artefacts in level 7. In a letter to the author he states that there are two kinds of stone tools in this level: the first group has relatively fresh edges, while the second group appears to have been exposed on the surface for a long period of time and has extensive edge damage. Marks' overall impression is that these artefacts must be regarded with some caution.

The following levels, 5-2, are all basically blade/let oriented (up to 70% of the debitage). There is little detailed technological information provided in Ziffer's (1981) report but it would seem that these pieces have plain or punctiform butts. Typologically, scrapers, including various Aurignacian types, usually dominate over burins which are generally dihedral. The number of el-Wad points fluctuates throughout these levels; in level 5 they are the single most numerous type (26.9%). In level 2 the retouched blades make up 27.4% of the tools and when combined with the el-Wad points they account for over 30% of the assemblage.

In his discussion on the relationship between this material and other Levantine Upper Palaeolithic sites Ziffer presents a table illustrating the divisions of the Ksar Akil sequence (Ziffer 1981: table 2). The discussion of Ksar Akil is most unusual as his division of the levels is not based on any published work. Aside from this problem it must be stated that a great deal appears to be missing from the collections of Yabrud probably as a result of selective collection. Levels 7 and 6 are relatively poor in material which makes it difficult to compare them with other sites, although Ziffer (1981: table 2) believes that they are related to Ksar Akil phase 2 (levels XX-XV; Azoury 1986).

It is generally agreed that the material in levels 5-2 at Yabrud has similarities with levels X and IX (not level VIII which is grouped with IX in Ziffer's table 2) at Ksar Akil. Both sets of assemblages are blade/let based and scrapers, including some Aurignacian types, dominate over burins which are usually dihedral. There are medium to high frequencies of retouched blade/lets and el-Wad points but no mention is made of el-Wad variants in Shelter II.

Israel

There are several important sites in northern Israel and these have been recently studied by Bar-Yosef (Bar-Yosef and Tchernov 1966; 1970; in press), Ronen (Ronen and Vandermeersch 1972; 1976), Ziffer (1978a, b) and Goring-Morris (1980). Included among the Upper Palaeolithic cave sites in the Mount Carmel region are Sefunim, Rakefet, el-Wad and Kebara. In Galilee two other cave sites have been excavated, Qafza and Hayonim. The sites of el Quseir in the Judean desert and Fazael IX in the lower Jordan valley have also produced comparable material to Ksar Akil.

The site of Sefunim or Iraq el-Baroud (Ronen 1968; Ziffer 1978a) is located in Mount Carmel at an altitude of 125 m. Two levels, 10 and 8, have been published which contain flake dominated assemblages (Ronen 1976). Typologically they contain about twice as many scrapers as burins. The retouched blade/lets and el-Wad points make up 18% of the tools in level 10 and 23% in level 8. The technology and typology of this material appears closest to levels VIII and VII at Ksar Akil although these assemblages have a higher scraper to burin ratio. Another difference is the slightly inflated number of retouched blade/lets at Sefunim; the reduced number of these tools at Ksar Akil may be due to poor recovery.

Rakefet is located in the eastern flank of Mount Carmel about 300 m above sea level. Ziffer (1978a) reports that three levels (IV, III and II) have assemblages that are flake dominated as well as containing numerous Aurignacian tool types.

The well-known site of el-Wad, 10 km south-east of Atlit, was excavated by Garrod from 1929-1933 (Garrod and Bate 1937; 1954). Ronen (1976: table 5) has summarised the data from levels D2, D1 and C. All three of these levels contain flake oriented assemblages. The lowest two, D2 and D1, are scraper dominated with high percentages of Aurignacian types (carinated scrapers, nosed and shouldered scrapers). Burins, retouched blade/lets and el-Wad points tend to be poorly represented. El-Wad D2 and D1 are certainly related to Ksar Akil VIII and VII (a fact also noted by Dortch 1970), while el-Wad C, like level VI at Ksar Akil, is a flake oriented assemblage dominated by burins.

Kebara is another important site in the Mount Carmel region (Turville-Petre 1932; Garrod 1954; Stekelis 1955a, b; Ziffer 1978a, b). Two flake dominated assemblages occur in levels D2 and D1. The deepest Upper Palaeolithic level, E, is probably part of the earlier Ahmarian tradition (Gilead 1981a: 253). Levels D2 and D1 are basically scraper dominated with numerous Aurignacian types, like the nosed and shouldered scrapers. Burins and el-Wad points are rare. These assemblages are comparable to levels VIII and VII at Ksar Akil.

The last four sites in this brief review are located outside the Mount Carmel area. The cave of Qafza is near Nazareth in the southern flanks of the Galilee mountains (Neuville 1934; Ronen and Vandermeersch 1972). The material in layer D of Neuville's excavations (equal to level 6 of Vandermeersch) is flake dominated with scrapers outnumbering burins 2 to 1. The retouched blade/lets and el-Wad points make up about 27% of the tools. If it were not for the low percentage of blade/let debitage (37%) at Qafza this material would look like levels X and IX at Ksar Akil.

Hayonim is also located in the Galilee mountains about 30 km north of Qafza (Bar-Yosef and Tchernov 1966; Ronen 1976; Gilead 1981a; Belfer-Cohen and Bar-Yosef 1982). Two levels, D3 and D2, have flake oriented assemblages with a scraper to burin ratio of over 2 to 1 (Gilead 1981a: 259). Retouched blade/lets account for only 18% in D3 and 9% in D2. El-Wad points are rare or absent. Once again, it would seem that this material is best compared with levels VIII and VII at Ksar Akil (Bar-Yosef pers. comm.).

At the rockshelter of el Quseir (Perrot 1955), located 25 km south-east of Bethlehem, level C has produced a flake oriented industry (the blade index is only 15) dominated by scrapers (scraper index = 65) with few burins. Nosed and shouldered scrapers are said to be "very numerous" (Perrot 1955: 499). The assemblage has a paucity of retouched blade/lets and seems identical to Ksar Akil levels VIII and VII.

Fazael IX is an open-air site in the lower Jordan valley with a flake industry typologically dominated by burins which account for about 70% of the tool kit (Goring-Morris 1980: tables 5 and 6). Among these tool types are numerous burins on Clactonian notches morphologically identical to those from Ksar Akil level VI but made on larger flakes. The proportion of retouched blade/lets is low at roughly 7%. This industry appears to be remarkably similar to level VI at Ksar Akil although it has an exceptionally high number of burins.

In 1976 Ronen published a detailed comparative study of the Upper Palaeolithic sites in northern Israel. He divided the material into the following three groups: A) The Kebara-Qafza group which is composed of Kebara E and Qafza 9-7, B) The Hayonim-Sefunim group which is composed of Hayonim levels D3 and D2, Sefunim 10 and 8, el-Wad E and Qafza D, and C) The el-Wad group which is composed of levels D2, D1 and C at el-Wad. The assemblages in group A are technologically dominated by blade/lets (ca.55%) with over 40% of the tool kit made up of retouched blade/lets and el-Wad points. Group B is flake oriented with unretouched blade/lets making up between 30-37%. The retouched tools are mainly scrapers and burins which account for over 50% of the tools. El-Wad points are poorly represented and never reach more than 10%. Group C is also flake based in the debitage and two of the assemblages (el-Wad D2 and D1) are scraper dominated with a ratio of scrapers to burins of over 2 to 1.

The blade/let oriented assemblages in Ronen's group A are stratigraphically older than groups B and C. It has been suggested by Gilead (1981a: table 7.6) that this material corresponds to the southern Ahmarian. It is highly likely that Ksar Akil phase 2 (levels XX-XV) is also part of this tradition (Gilead 1981a: 271).

Ronen states that material comparable to levels XIII-XI is absent from northern Israel (Ronen 1976: 172). He equates part of his group B with Ksar Akil levels X and IX. Typologically there may be some similarities (like at Qafza D) but the technology of group B is flake based, while levels X and IX are dominated by unretouched blade/lets. Most of the material described above (ie. el-Wad D2 and D1; Kebara D2 and D1; Hayonim D3 and D2; el Quseir C) appears to be related to levels VIII and VII which are flake industries characterised by various scraper types (ie. carinated, nosed and shouldered scrapers). Gilead (1981a: 260) states that one of the features of the assemblages of this type is "the more pronounced frequencies of carinated and nosed scrapers in the north. While the carinated and/or nosed end-scrapers constitute in most cases more than half of the end-scraper group and give the 'Aurignacian' character to the assemblages, they are rare in the Negev and Sinai sites."

The following tentative correlation is a summary of the data presented in the last three sections and compares levels XIII-VI at Ksar Akil with other Upper Palaeolithic material in the northern

Levant. Due to the unfortunate fact that radiometric dates from northern Levantine sites are extremely scarce or considered suspect (Ronen 1976: 170; Gilead 1981a: 261) it is based entirely upon the reported typology and technology of the flaked stone artefacts as well as their relative stratigraphic positions.

Ksar Akil levels		Lebanon	Syria	Israel
XIII-XI	stage 3	?	?	?
X-IX	stage 4	Antelias IV Abu Halka C	Yabrud 5-4 Yabrud 3-2?	?
VIII-VII	stage 5	Antelias III? Bezez A	?	Sefunim 10,8 el-Wad D2-D1 Kebara D2-D1 Hayonim D3-D2 el-Quseir C
VI	stage 6	?	?	el-Wad C Fazael IX

It would seem from the above table that a major part of the Ksar Akil sequence represented by levels XIII-IX has not been identified yet in northern Israel which may be due to the fact that this time period is represented by assemblages which are composed differently or to problems of preservation in the cave sites (Bar-Yosef and Vandermeersch 1972). However, it does appear that the blade/let based technologies in both Lebanon and northern Israel are older than the relatively short-lived flake industries. The Ksar Akil Upper Palaeolithic sequence shows a pronounced tendency from the beginning towards blade/let based technologies. In the upper part of the sequence the blade/let oriented assemblages of levels XIII-IX are overlain by flake industries which are dated radiometrically to around 28,000 B.P.

It seems worthwhile to consider here the revelance of the new interpretation of the term Aurignacian (see glossary pages 7-10), proposed by prehistorians working in Israel, to the site of Ksar Akil. As stated earlier the use of the terminology to describe stone age cultures in Europe has a long history in the Levant. At Ksar Akil the material in levels XX-XV was said to be Chatelperronian due to the large numbers of backed and partially backed blades as well as "Chatelperron points". Stone tool assemblages with large numbers of carinated tools, "Font Yves points" and Aurignacian blades were naturally called Aurignacian. In 1977 Besançon et al. published an article discussing the Ksar Akil sequence and its relationship to the Palaeolithic of the Levant. In accordance with the decisions taken at the Wenner Gren Symposium (1969) they described the material in levels XIII-VI as Levantine Aurignacian (see glossary pages 7-10). Copeland (1986) has rightly pointed out that the use of a European term like Aurignacian should imply a certain degree of similarity between assemblages in Europe and the Levant. On this point it is worth noting that Francois Bordes, an expert on the Palaeolithic of Europe, saw sufficient similarities between level X at Ksar Akil and the Aurignacian of Font Yves to warrant calling the Lebanese material

Aurignacian. However, according to the definition of Aurignacian proposed in the southern Levant level X would be excluded from this designation because it is technologically a blade/let dominated industry. This raises an important question and that is whether it is appropriate to use a European cultural term in a manner which departs from its original meaning.

It may be that part of the problem concerning the definition of the term Levantine Aurignacian, at least in regards to flaking technology, is due to the apparent absence of material similar to Ksar Akil levels XIII-IX in Israel. It would seem that most of the material discussed above is related to Ksar Akil levels VIII and VII (stage 5). These levels, as well as many of the assemblages described from northern Israel, are technologically dominated by flakes with numerous scraper and burin types. If these assemblages are the only type recovered so far in Israel it is hardly surprising that they are the only ones regarded as Aurignacian.

To conclude, if the new interpretation is accepted by prehistorians in the northern and southern Levant then the only levels studied here from Ksar Akil which can be called Aurignacian are VIII-VI. However, this excludes material which Bordes as a European prehistorian described as Aurignacian. Until some kind of consensus can be achieved by prehistorians working in the Levant the present author has decided to label the assemblages in levels XIII-VI by reference to a stage.

Conclusion

The site of Ksar Akil has one of the longest stratigraphic sequences in the world. There are around 23 meters of geological and cultural deposits spanning the Middle Palaeolithic, Upper Palaeolithic and Epi-palaeolithic periods. This second volume, concerned with the upper part of the sequence, has examined levels XIII-VI. The material has been divided into four stages (3-6) which chronologically follow those reported by Azoury (1986) and labelled stages (phases) 1 and 2. Unlike the early Upper Palaeolithic levels at Ksar Akil it is felt that stages 3-6 are not developmentally related and should not be refered to as (Levantine Aurignacian) A, B and C. This position is mainly the result of the abrupt and major technological changes noted between several groups of levels. Whether the material in levels XIII-VI belongs entirely to the Levantine Aurignacian is an unresolved question. Levels XIII-XI appear to be confined to Ksar Akil, while levels X and IX have some technological and typological similarities with the Negev Ahmarian. Both sets of assemblages from Ksar Akil are technologically dominated by blade/lets with varying percentages of Aurignacian tools. It would appear that levels XIII-VI display cultural development which is uniquely Lebanese and yet at the same time fit into the broad framework proposed in other parts of the Levant. It is hoped that this work has succeeded in pointing out the similarities, while also emphasising the differences.

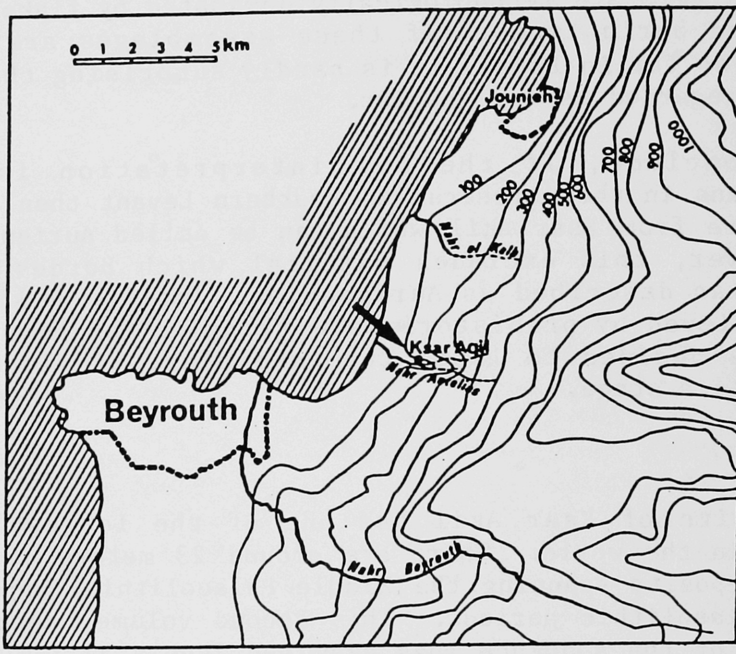


Figure 1

Map of the area surrounding Ksar Akil (after Tixier 1970).

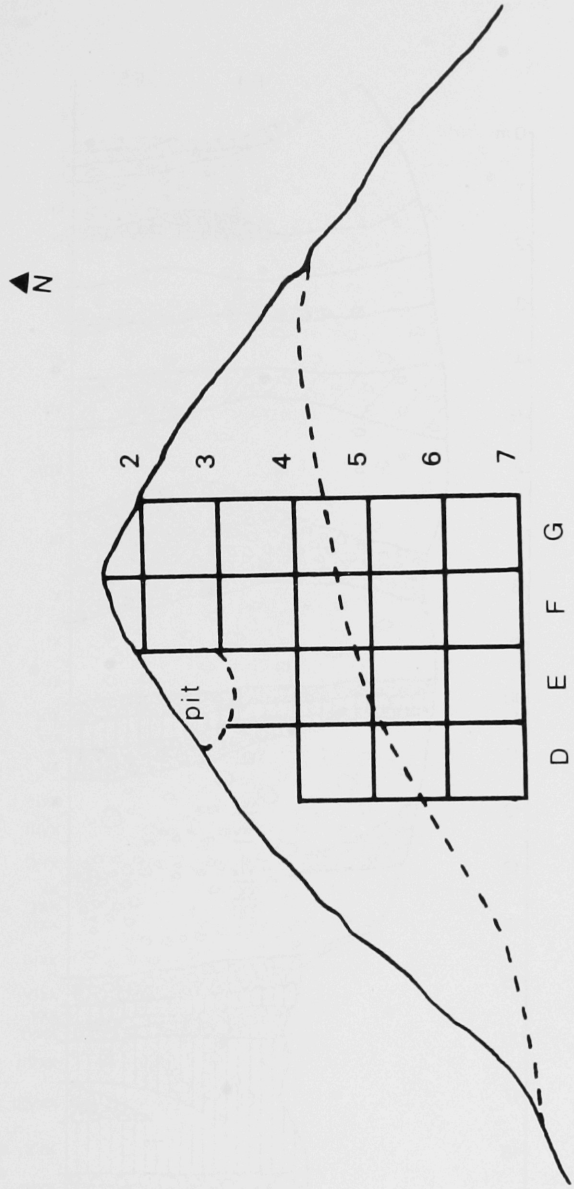


Figure 2

Grid system utilised by the Boston College team in 1937-1938 (1 cm = 2 m square).

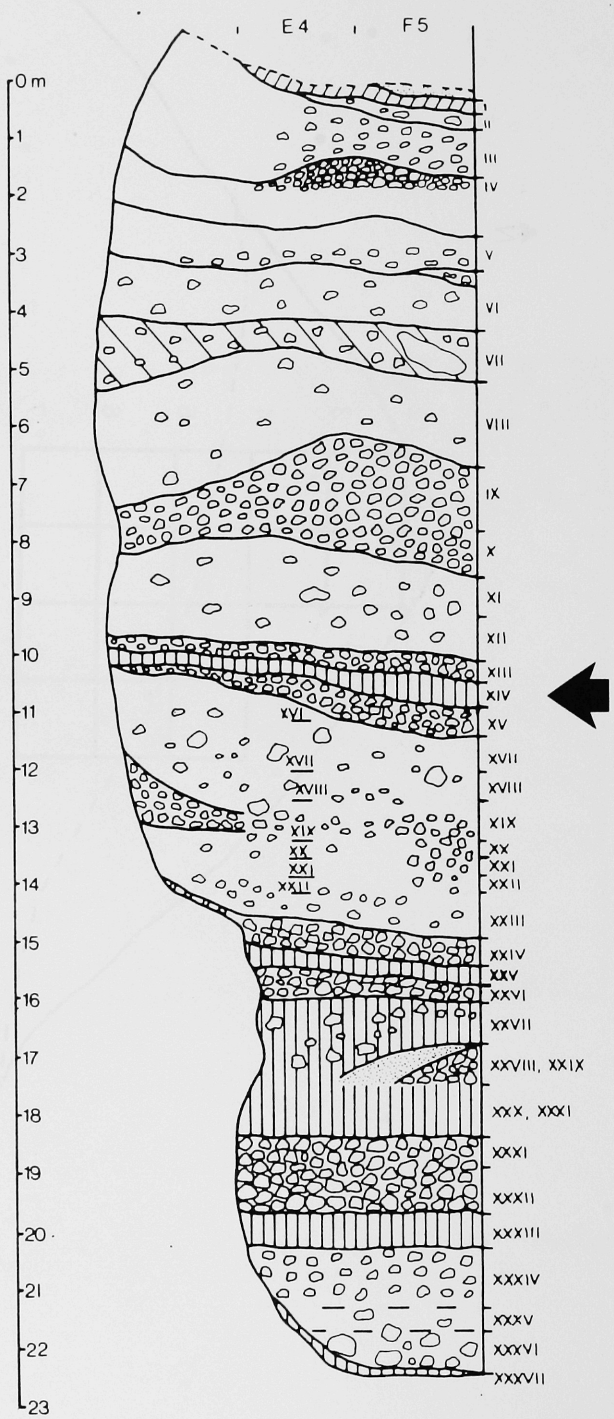


Figure 3

Stratigraphic section of Ksar Akil established by the Boston College team (datum point at 75 m above sea level). Stony complex 2 is indicated by the arrow.

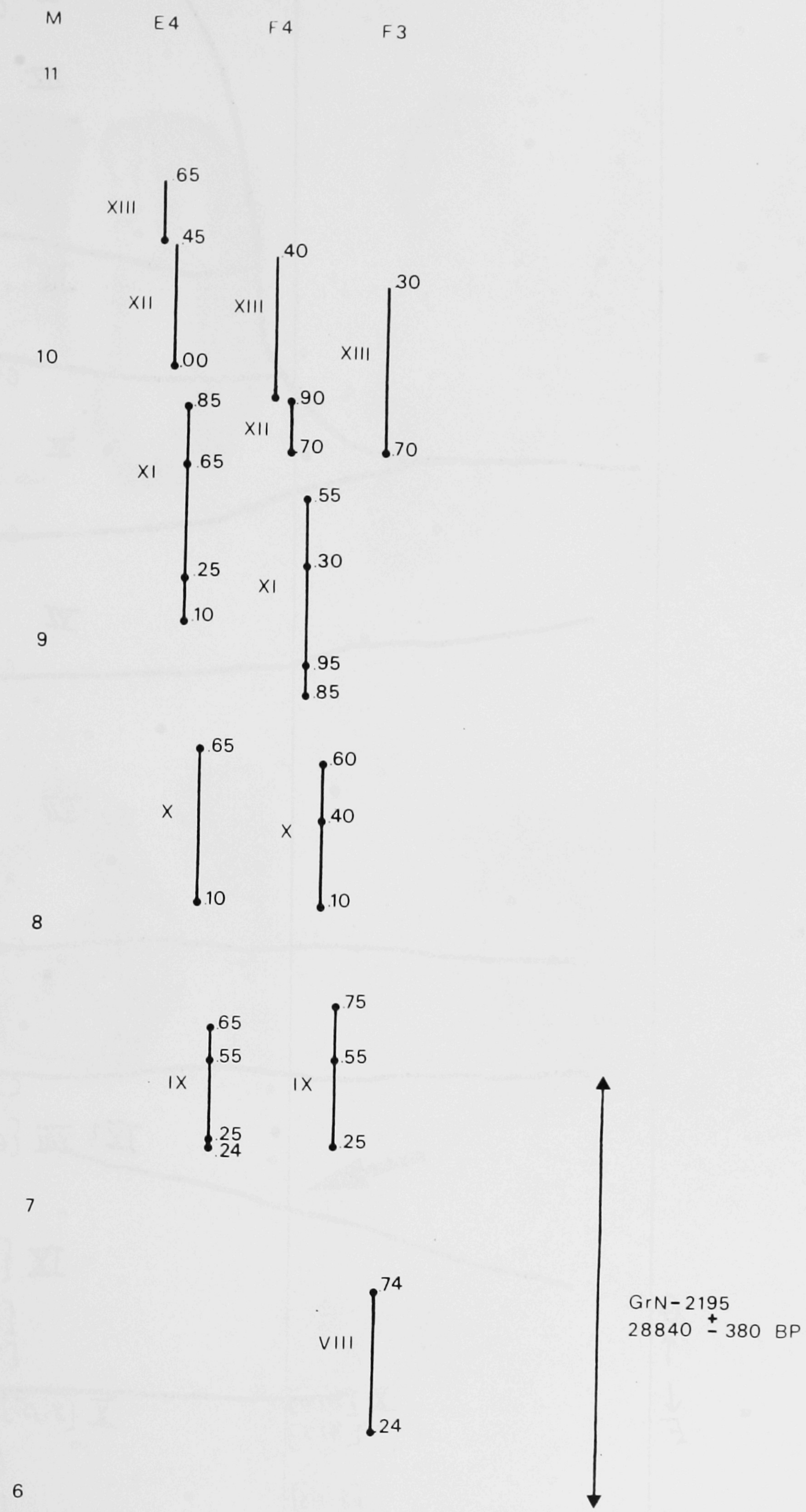


Figure 4

Stratigraphic column illustrating the relative positions of the arbitrary spits in squares E4, F4 and F3. The radiocarbon date appears at the right and encompasses parts of levels IX, VIII and VII.

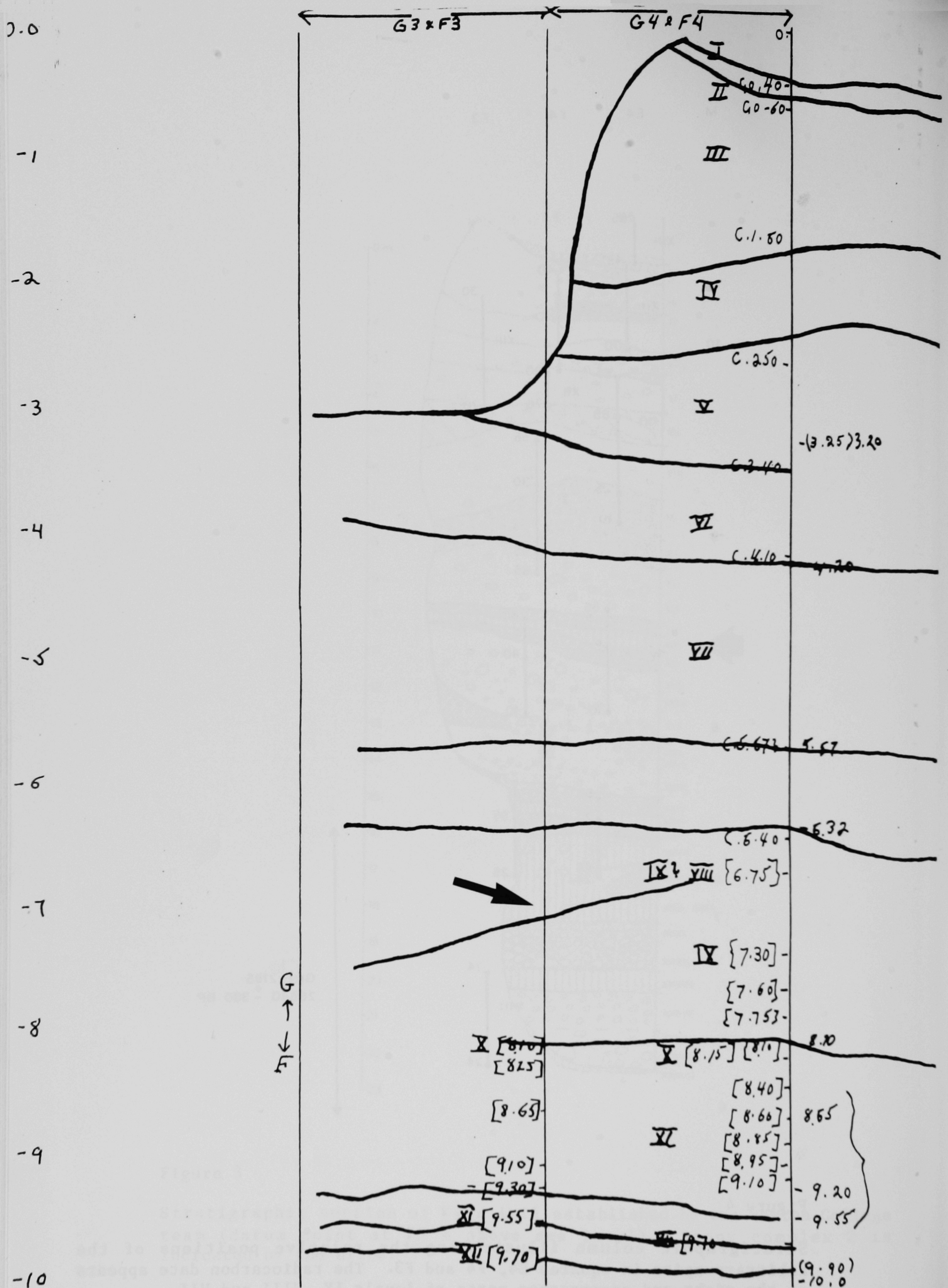


Figure 4a

Copy of a section prepared by Ewing showing that some difficulty existed in separating levels VIII and IX.

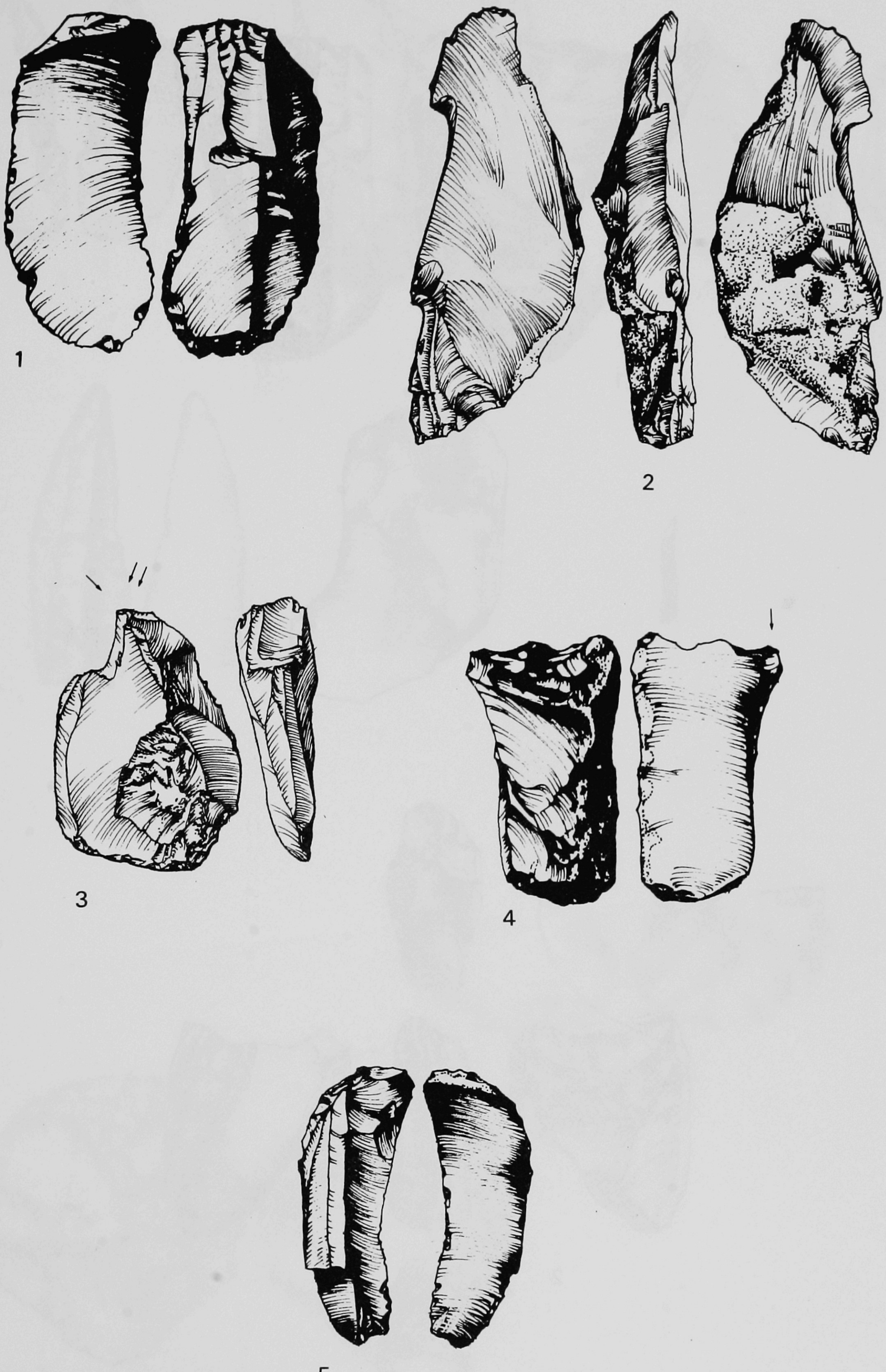


Figure 5

XIII E4 10.45

1. end-scraper on a plunging blade 2. carinated piece 3. dihedral burin 4. truncation burin 5. blade from a core made on a flake

(scale 1:1; proximal end down)

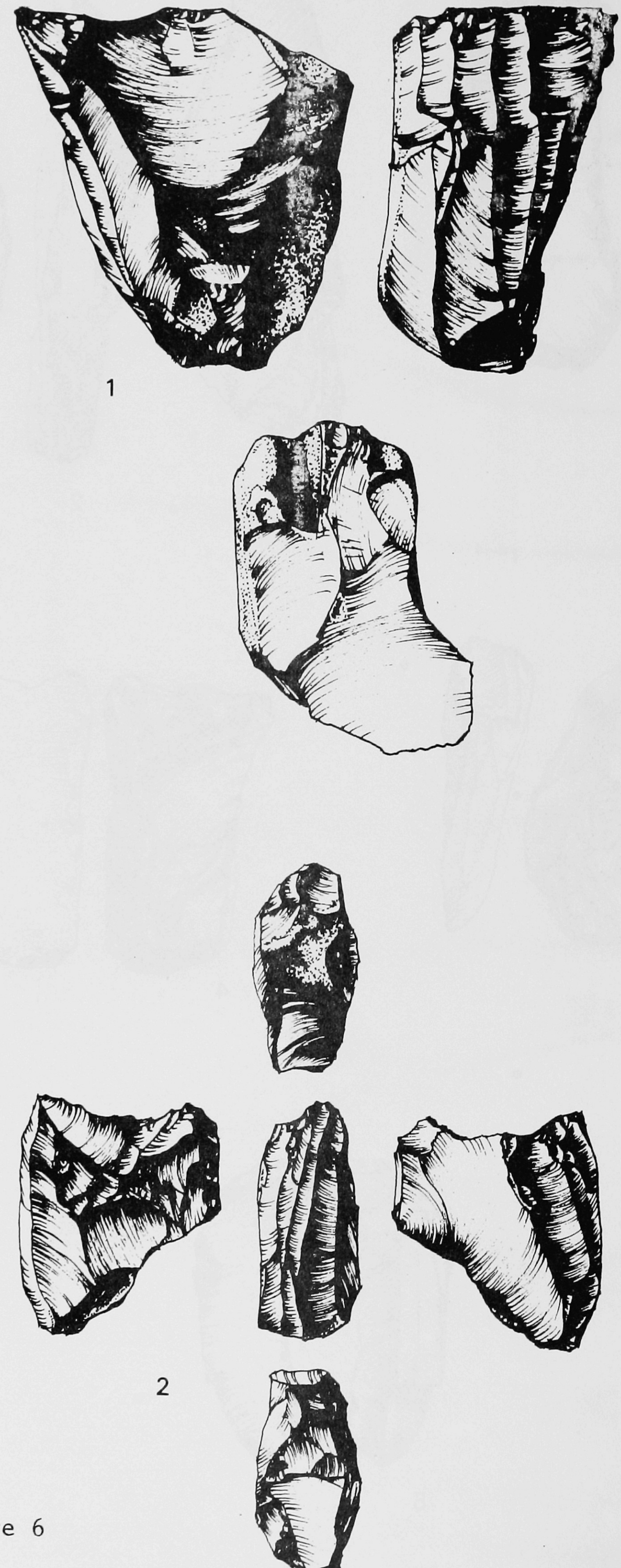


Figure 6

XIII E4 10.45

1. blade/let core 2. blade/let core on a flake (scale 1:1)

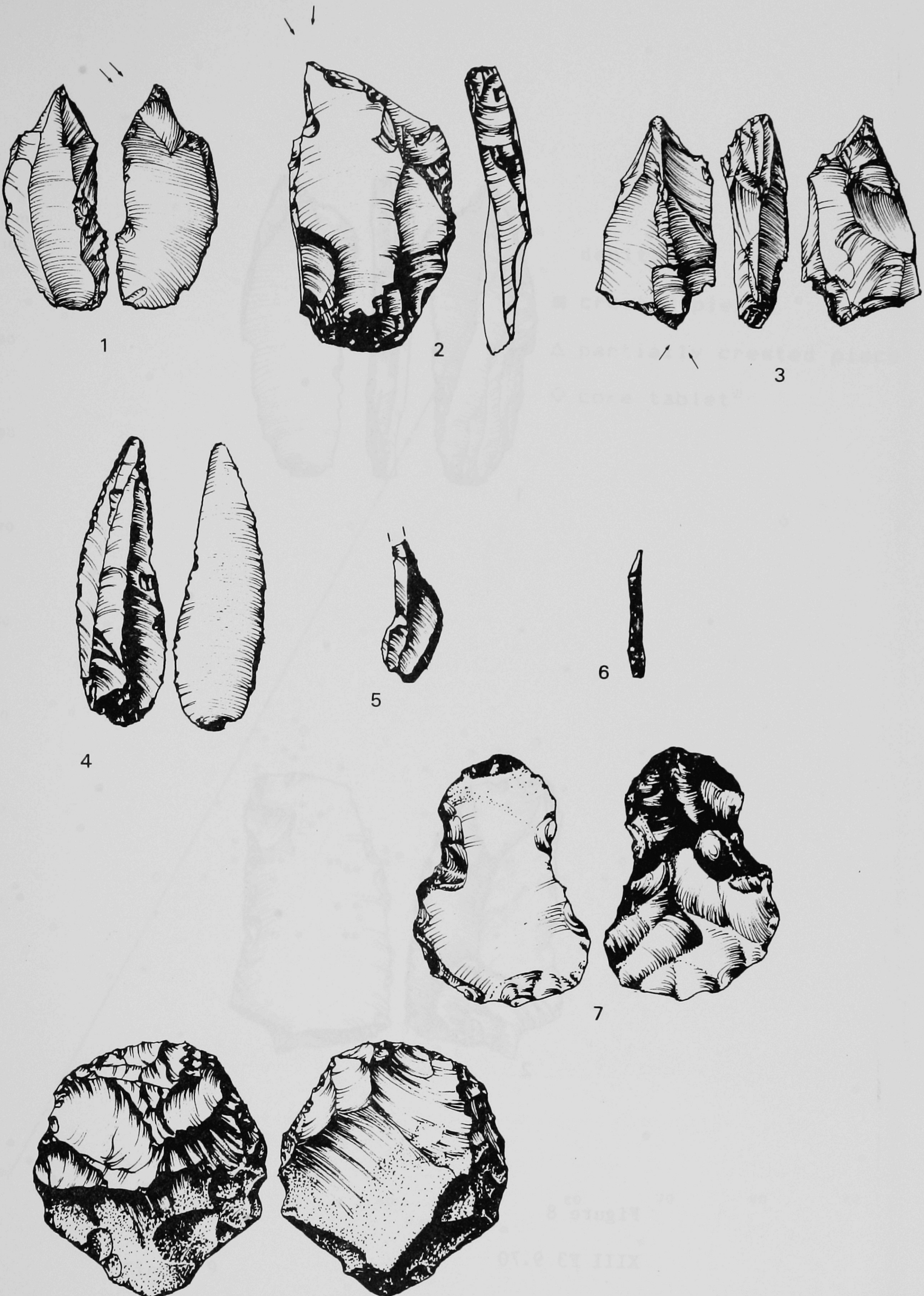
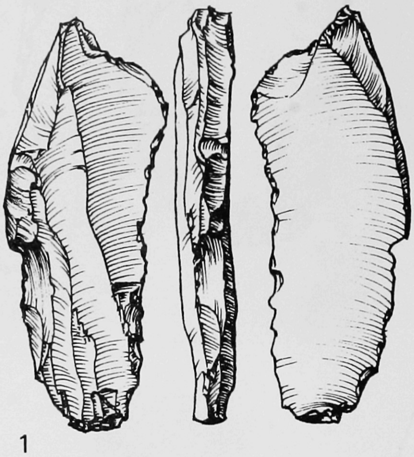


Figure 7

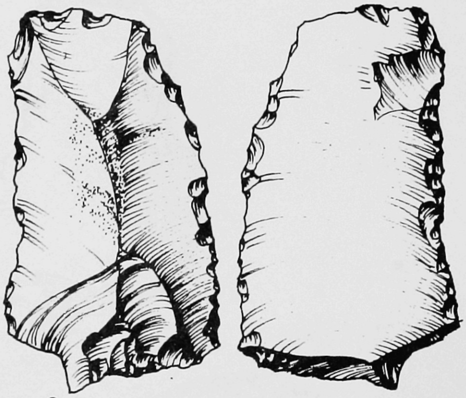
XIII F4 9.90

1-2. dihedral burins 3. burin/carinated piece 4. el-Wad point 5. retouched blade 6. burin spall 7. truncated/faceted piece 8. discoidal core

(scale 1:1; proximal end down)



1



2

Figure 8

XIII F3 9.70

1. carinated piece 2. truncated/faceted piece

(scale 1:1; proximal end down)

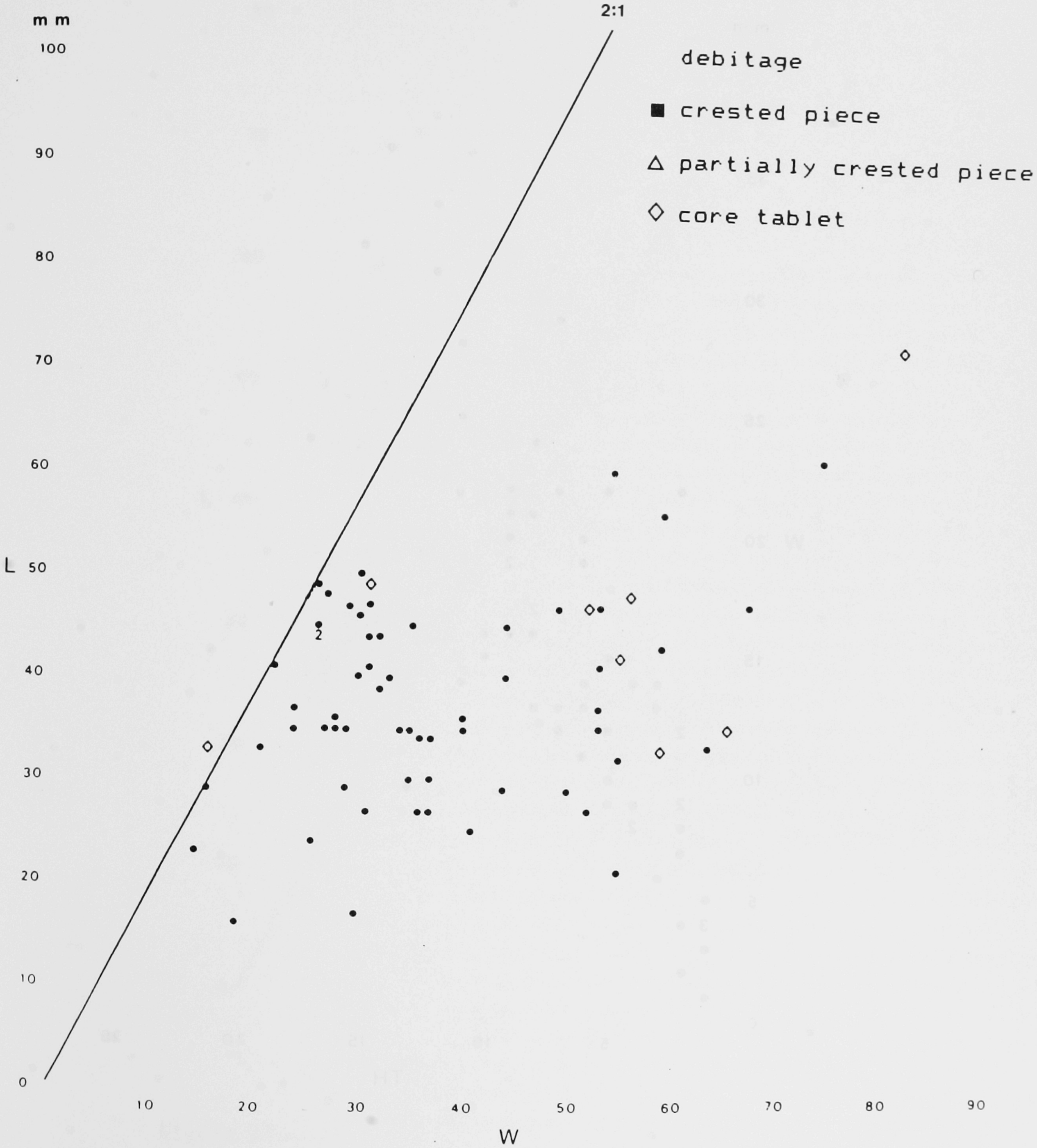


Figure 9

XIII F4 9.90

L/W scatter diagram for flakes and core tablets.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

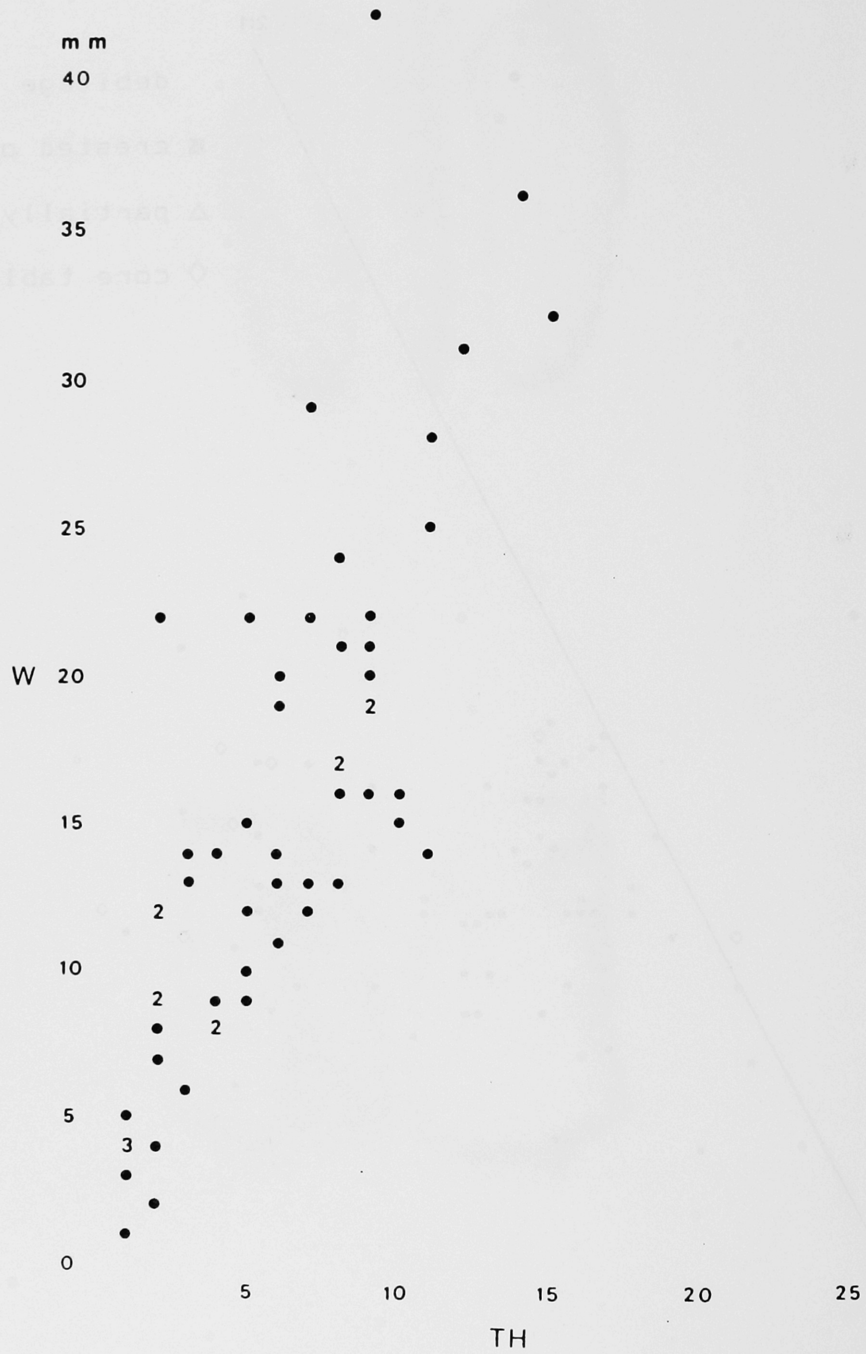


Figure 10

XIII F4 9.90

W/TH scatter diagram for flake butts.

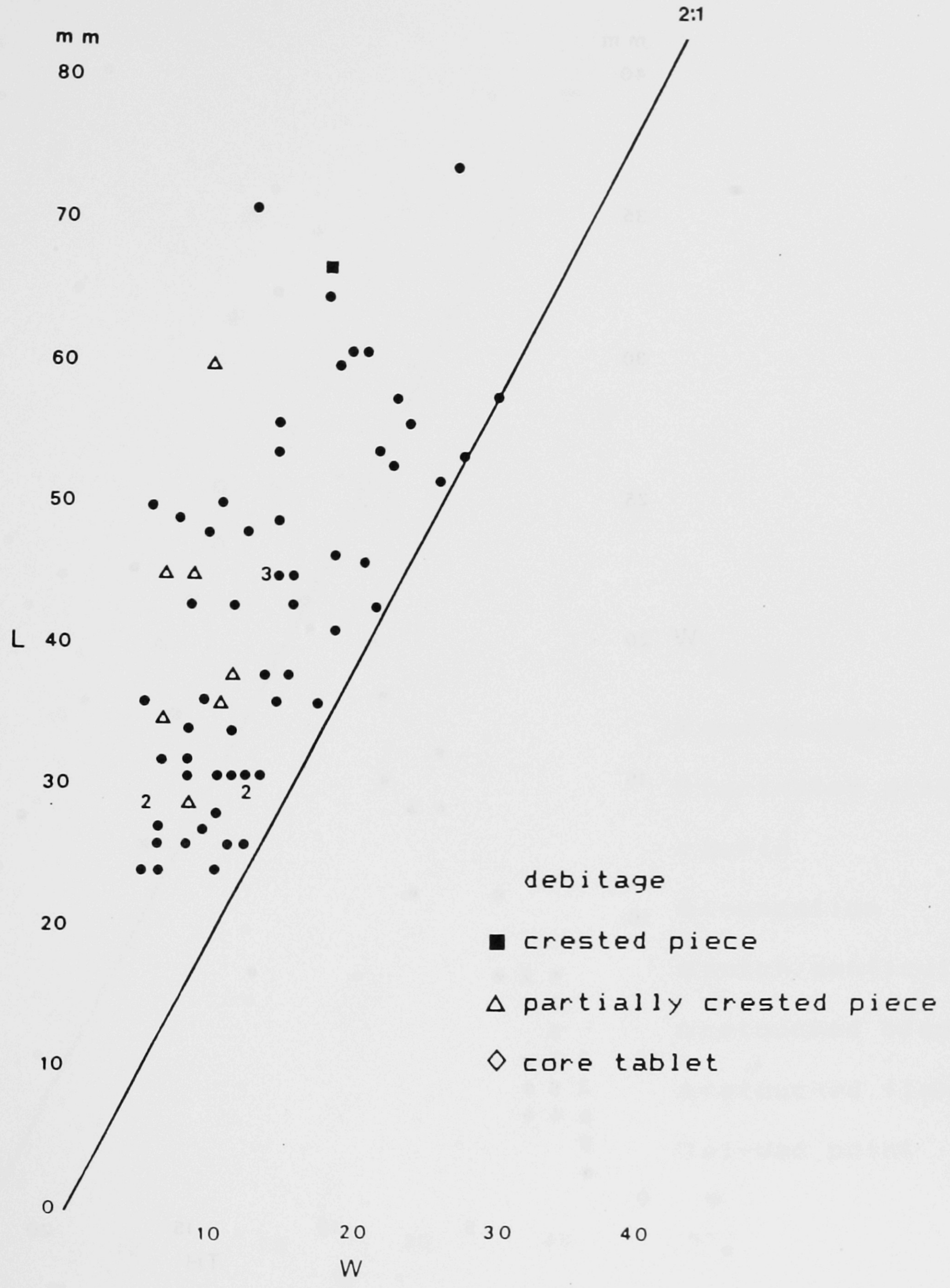


Figure 11

XIII F4 9.90

L/W scatter diagram for blade/lets and crested pieces.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

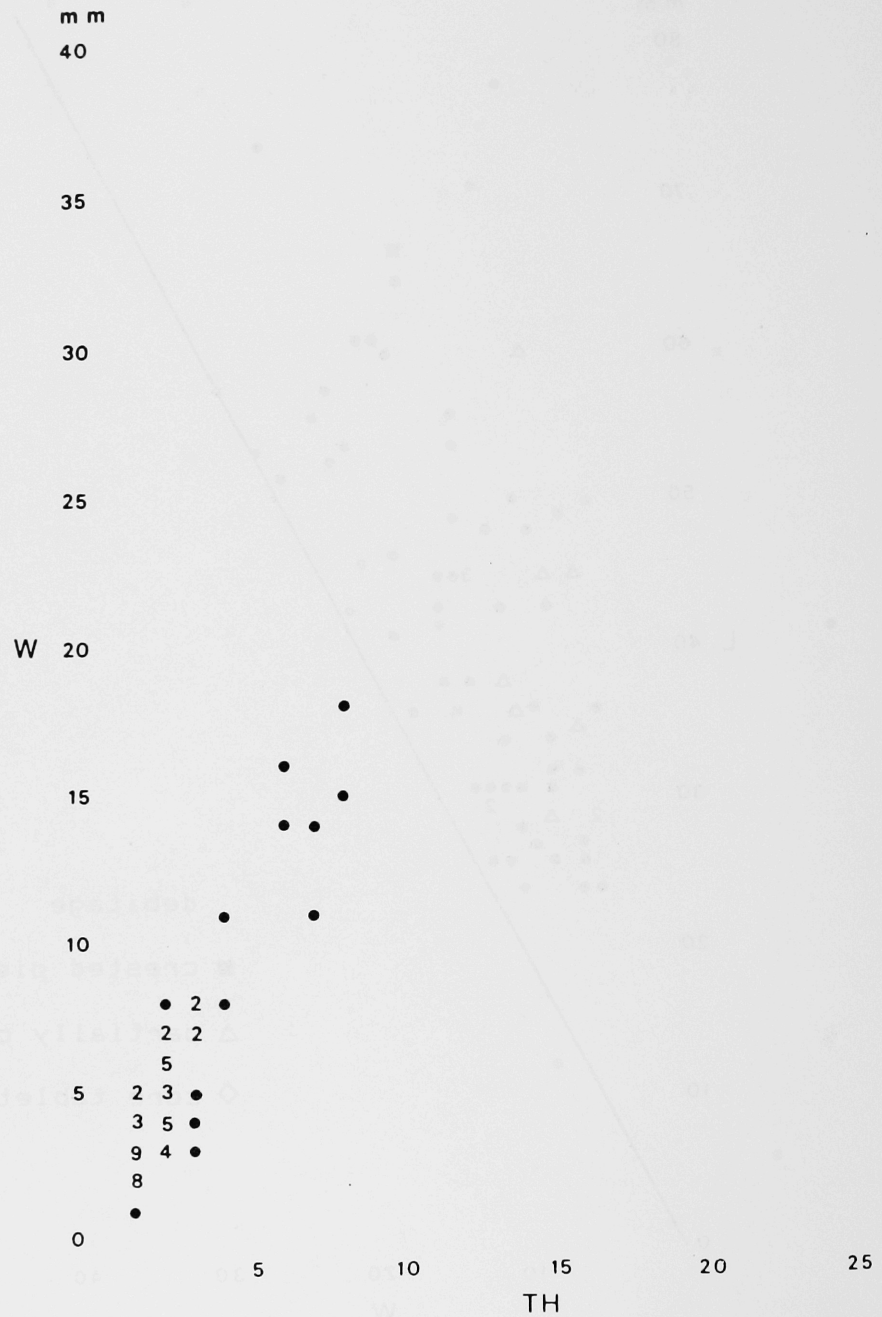


Figure 12

XIII F4 9.90

W/TH scatter diagram for blade/let butts.

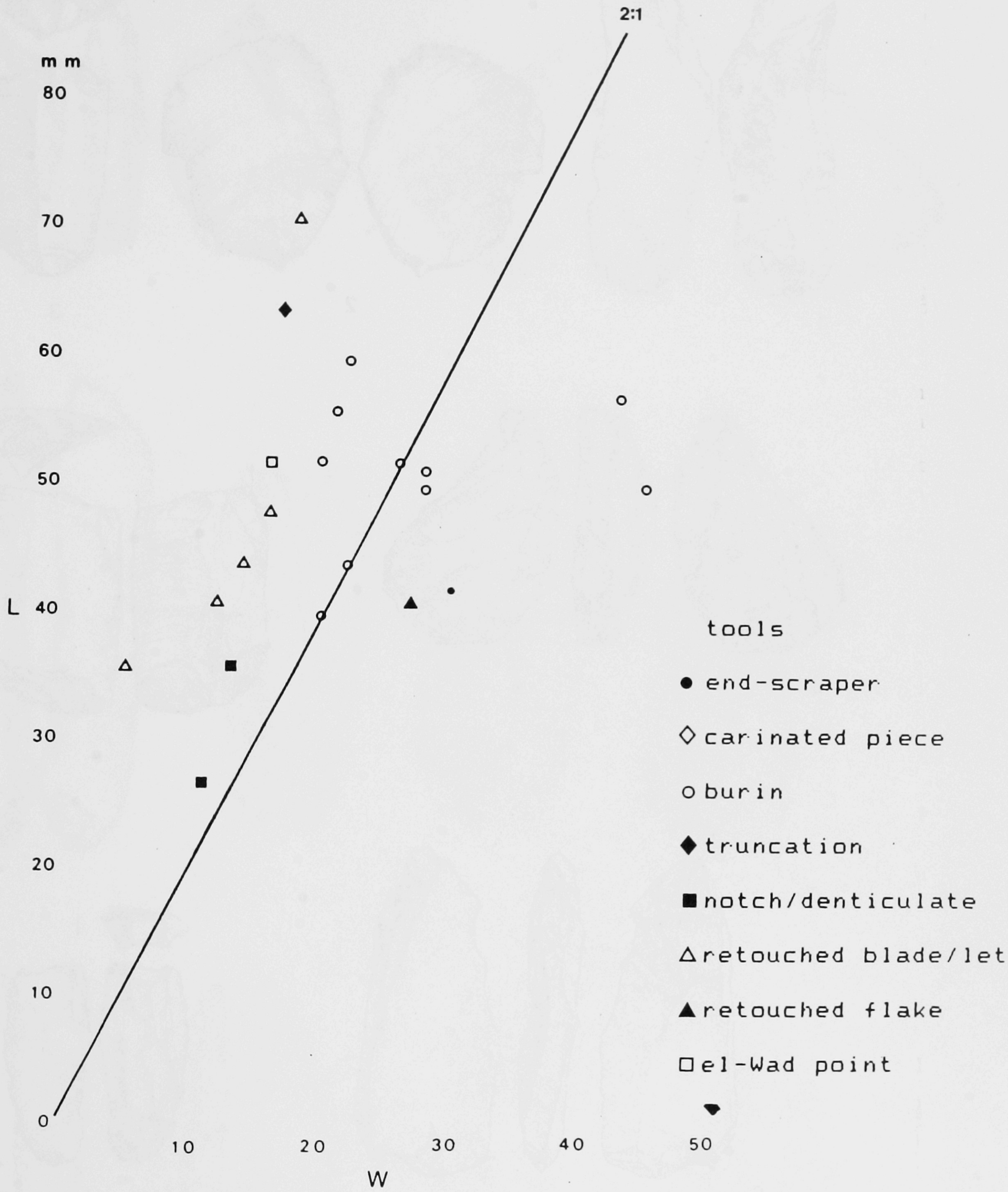


Figure 13

XIII F4 9.90

L/W scatter diagram for tools.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

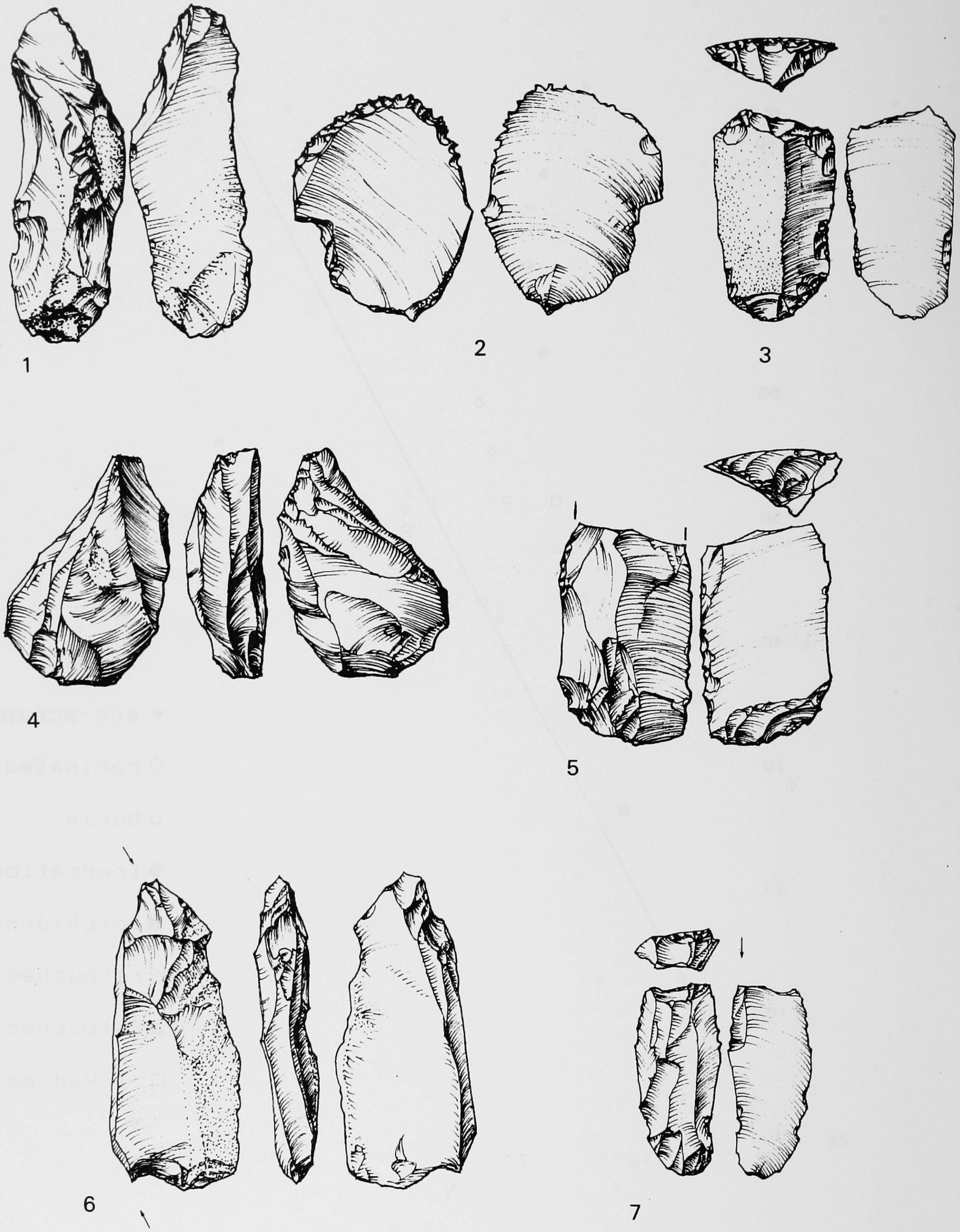


Figure 14

XII E4 10.00

1. inverse end-scraper 2. Ksar Akil scraper 3. scraper/truncation 4. carinated piece 5. lateral carinated scraper 6. multiple truncation burin 7. truncation burin

(scale 1:1; proximal end down)

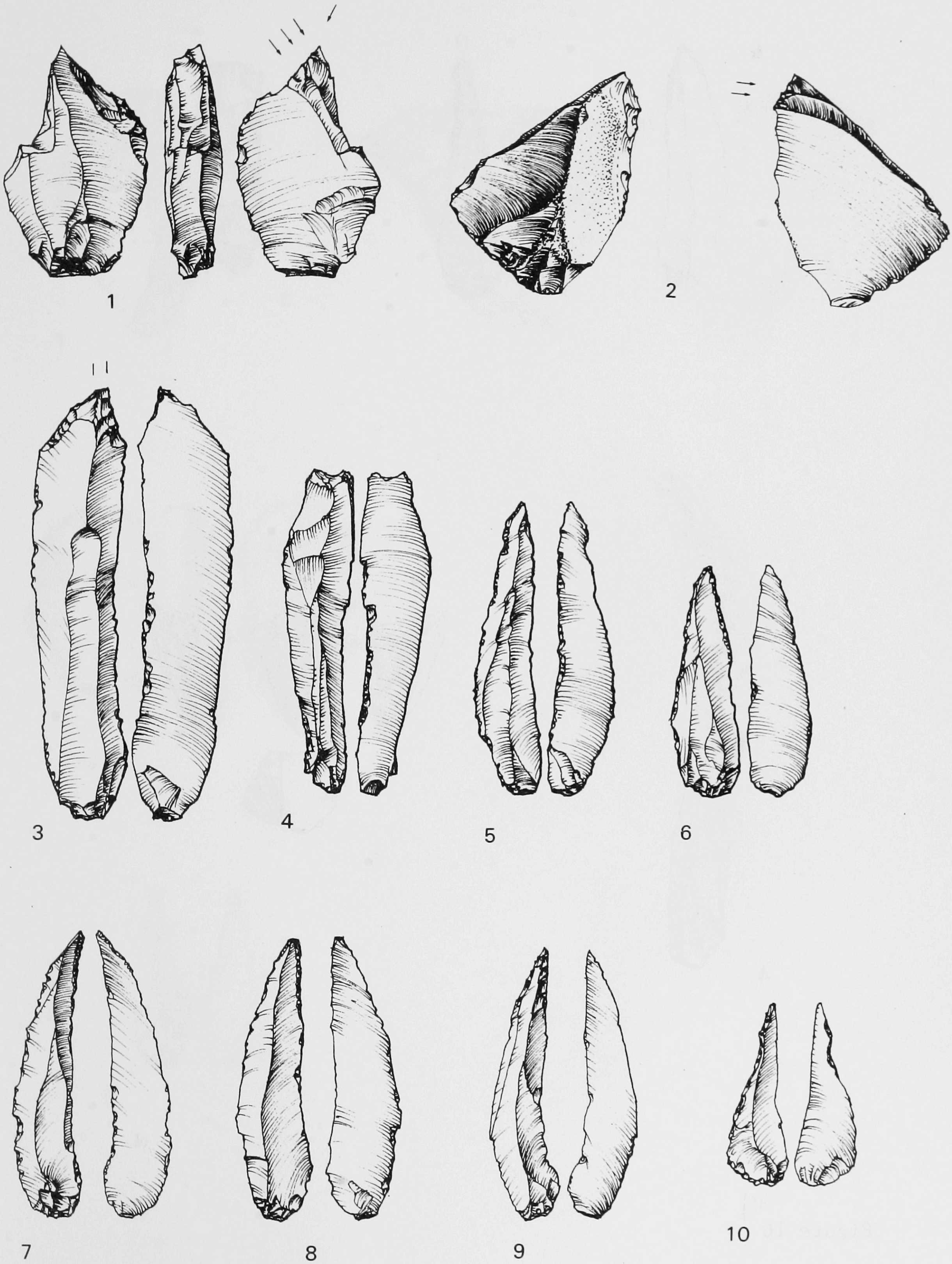


Figure 15

XII E4 10.00

1-2. dihedral burins 3. piercer 4. truncation 5-10. el-Wad points

(scale 1:1; proximal end down)

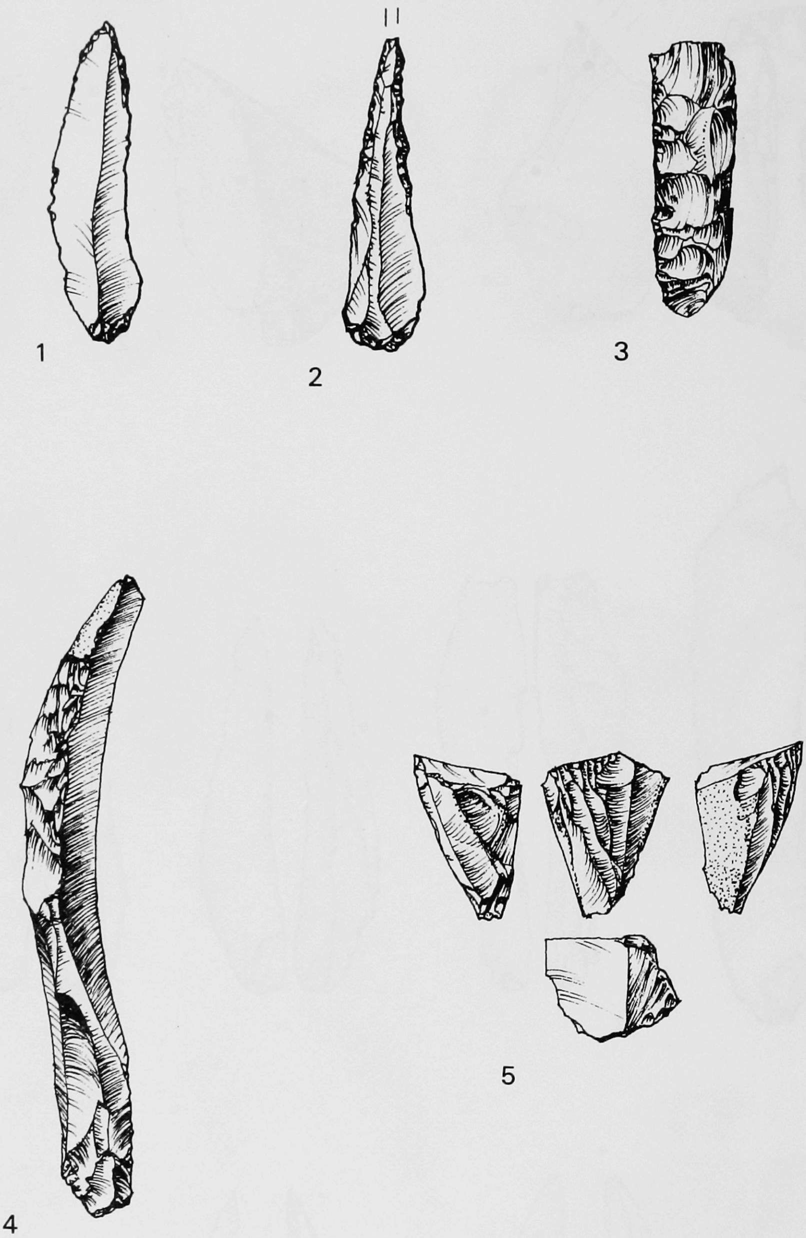


Figure 16

XII E4 10.00

1-2. el-Wad points 3. spall from a multifaceted truncation burin 4. partially crested blade 5. blade/let core

(scale 1:1; proximal end down)

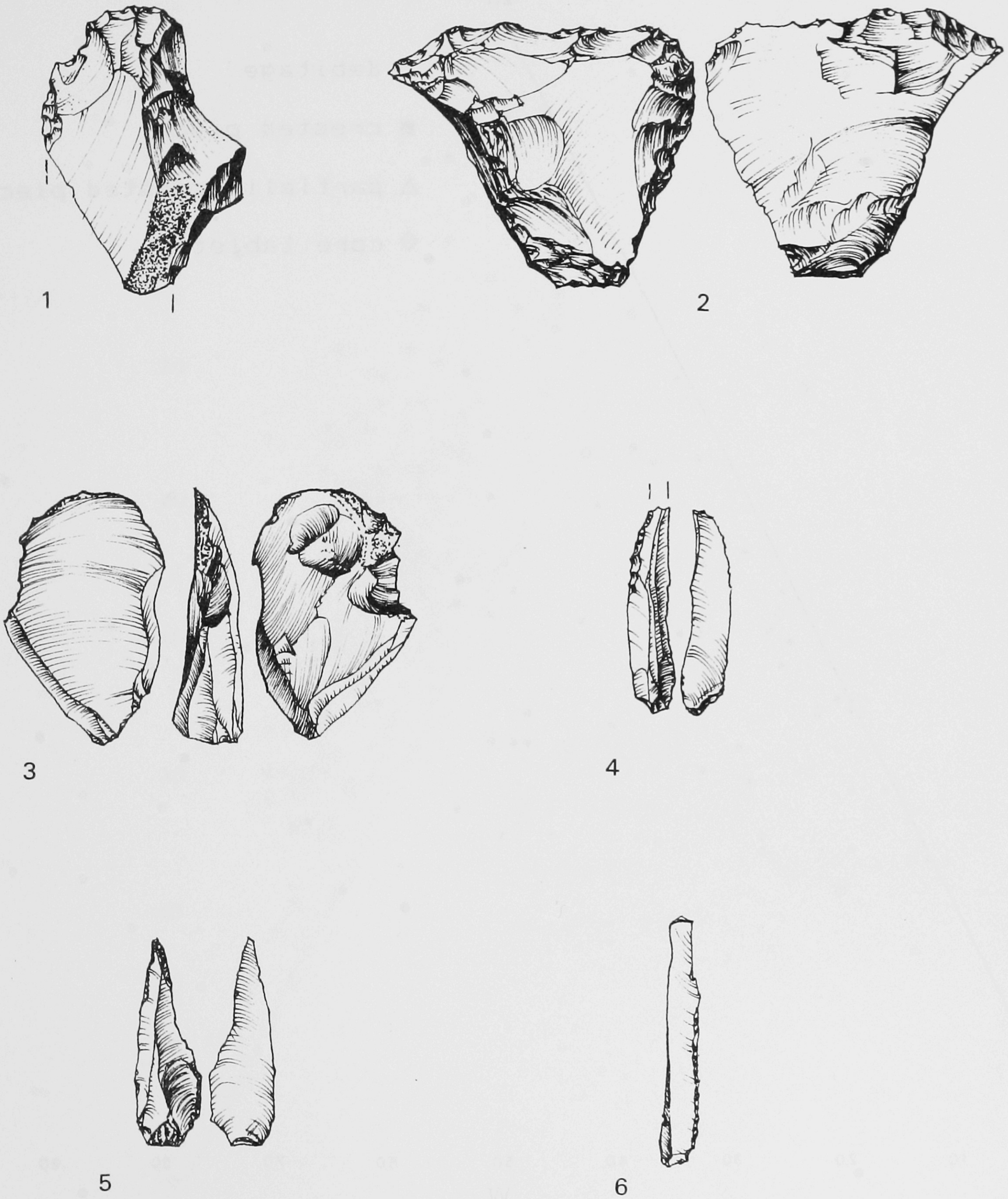


Figure 17

XII F4 9.70

1. nosed scraper 2. scraper made on a lateral edge 3. carinated piece
4-5. el-Wad points 6. burin spall

(scale 1:1; proximal end down)

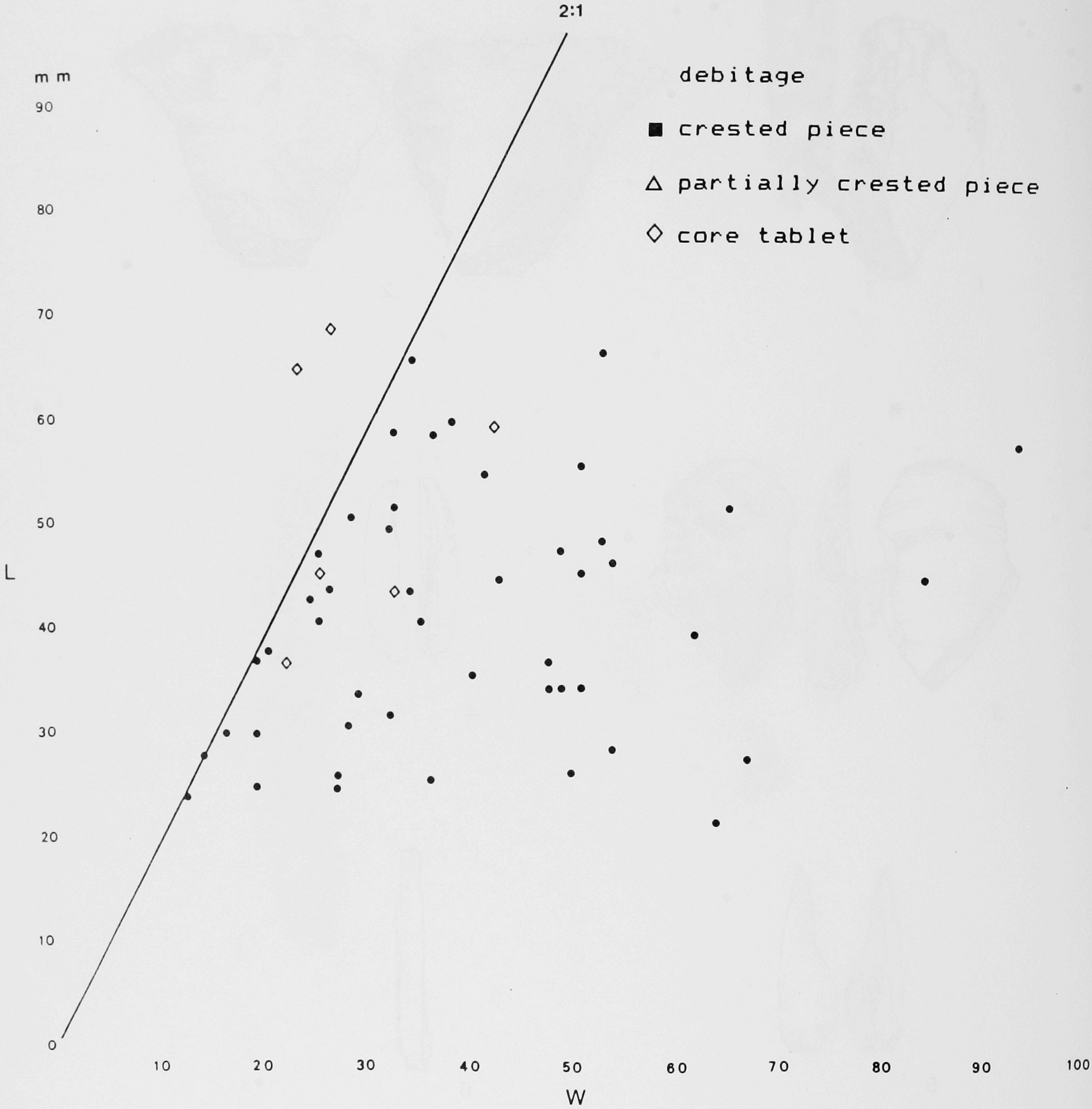


Figure 18

XII F4 9.70

L/W scatter diagram for flakes and core tablets.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

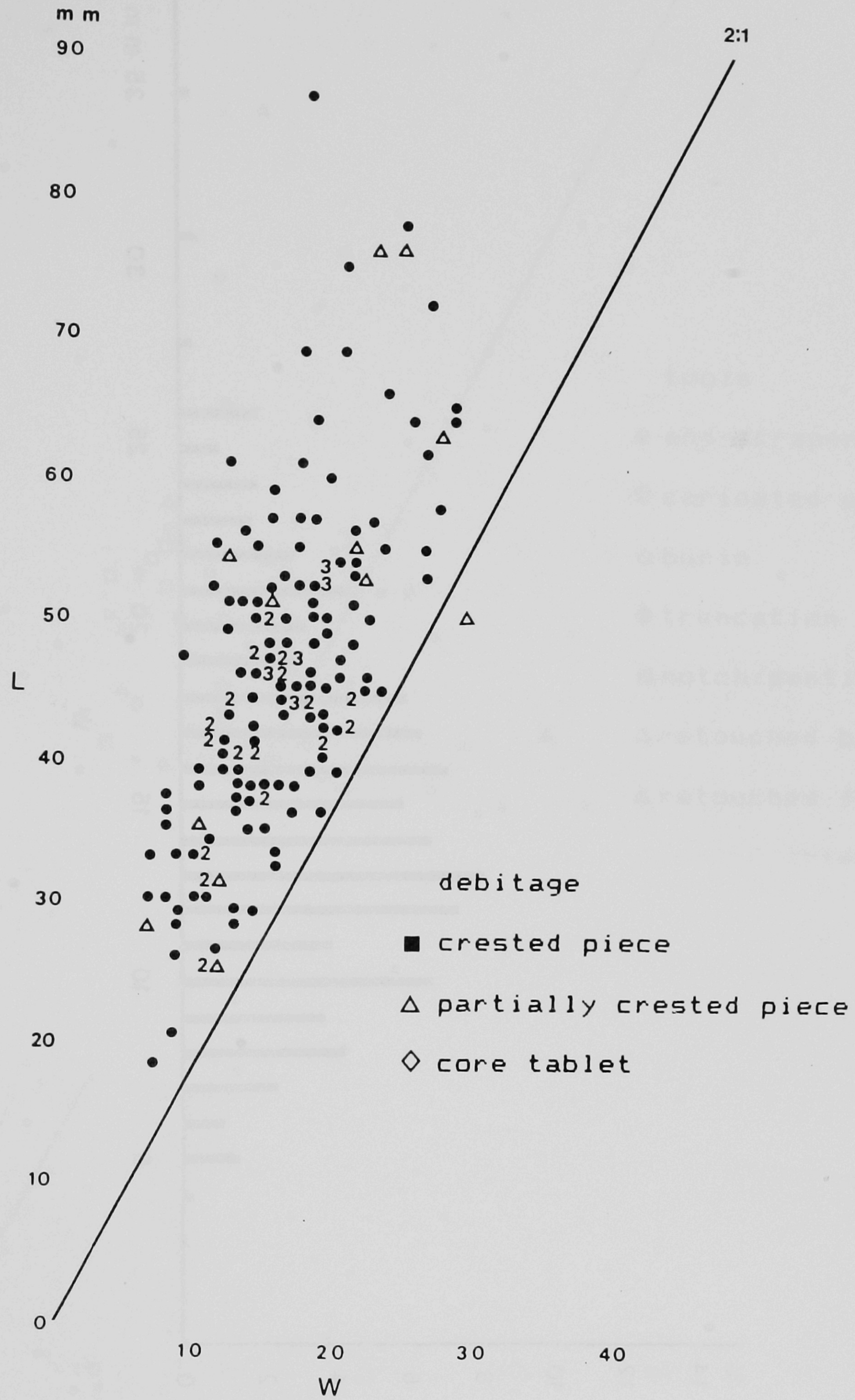


Figure 19

XII F4 9.70

L/W scatter diagram for blade/lets and crested pieces.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

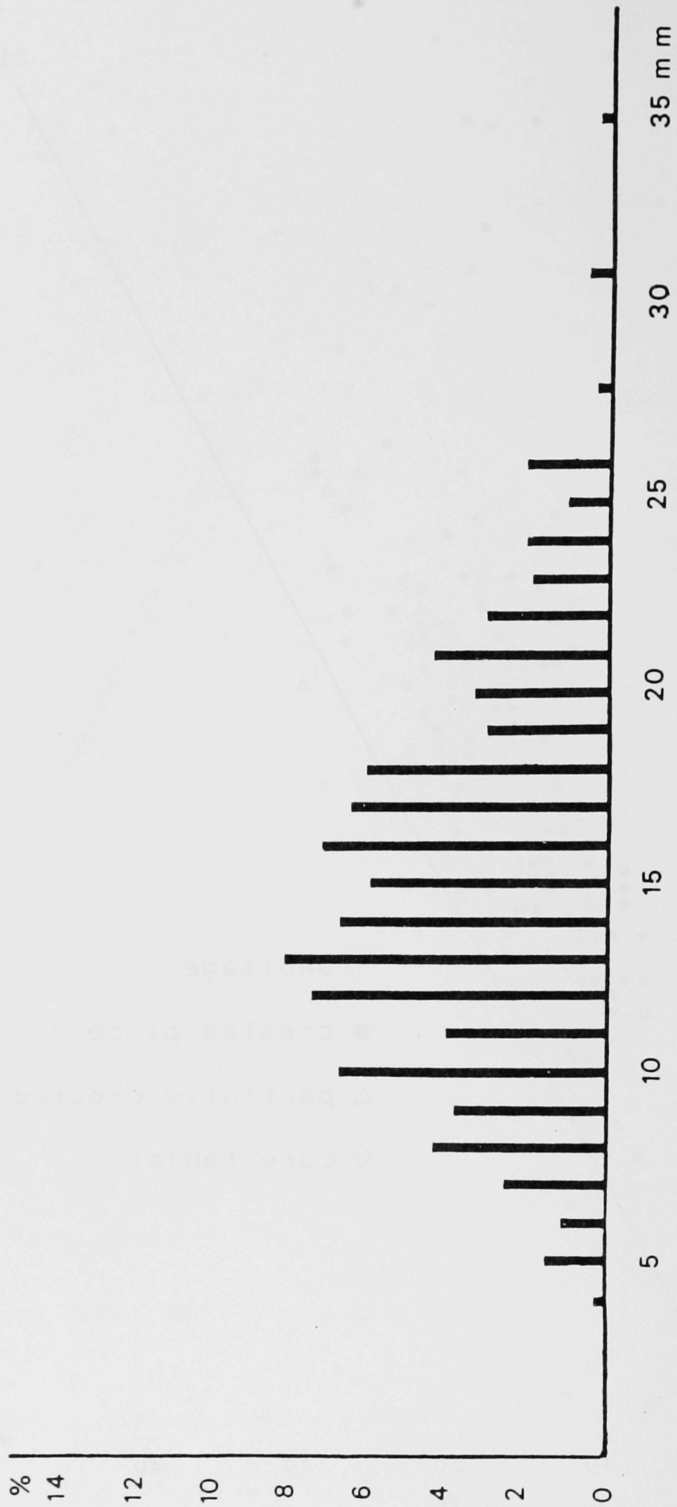


Figure 20

XII F4 9.70

Bar graph of blade/let widths.

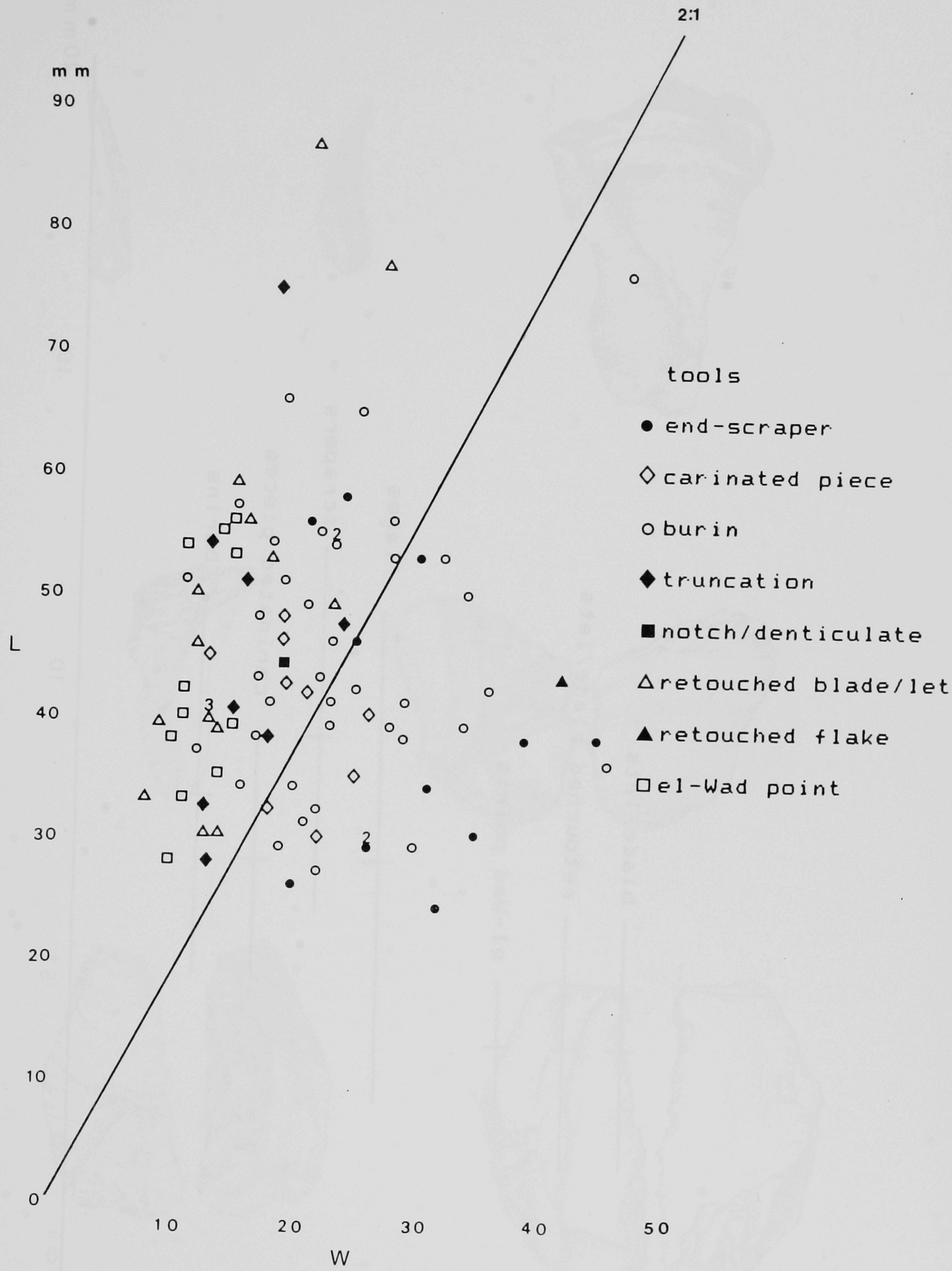


Figure 21

XII F4 9.70

L/W scatter diagram for tools.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

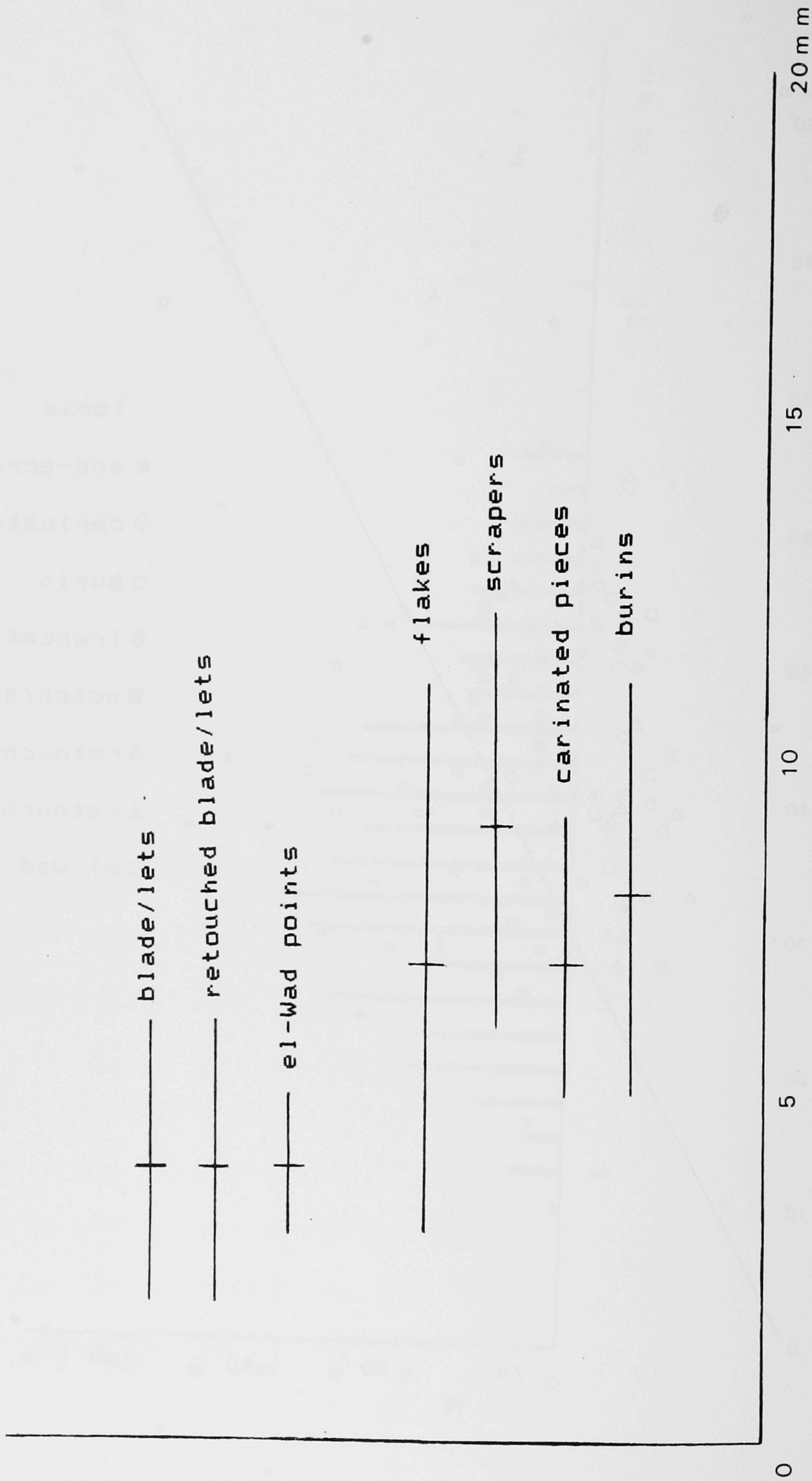


Figure 22

XII F4 9.70

Graph of mean blank and tool thicknesses.

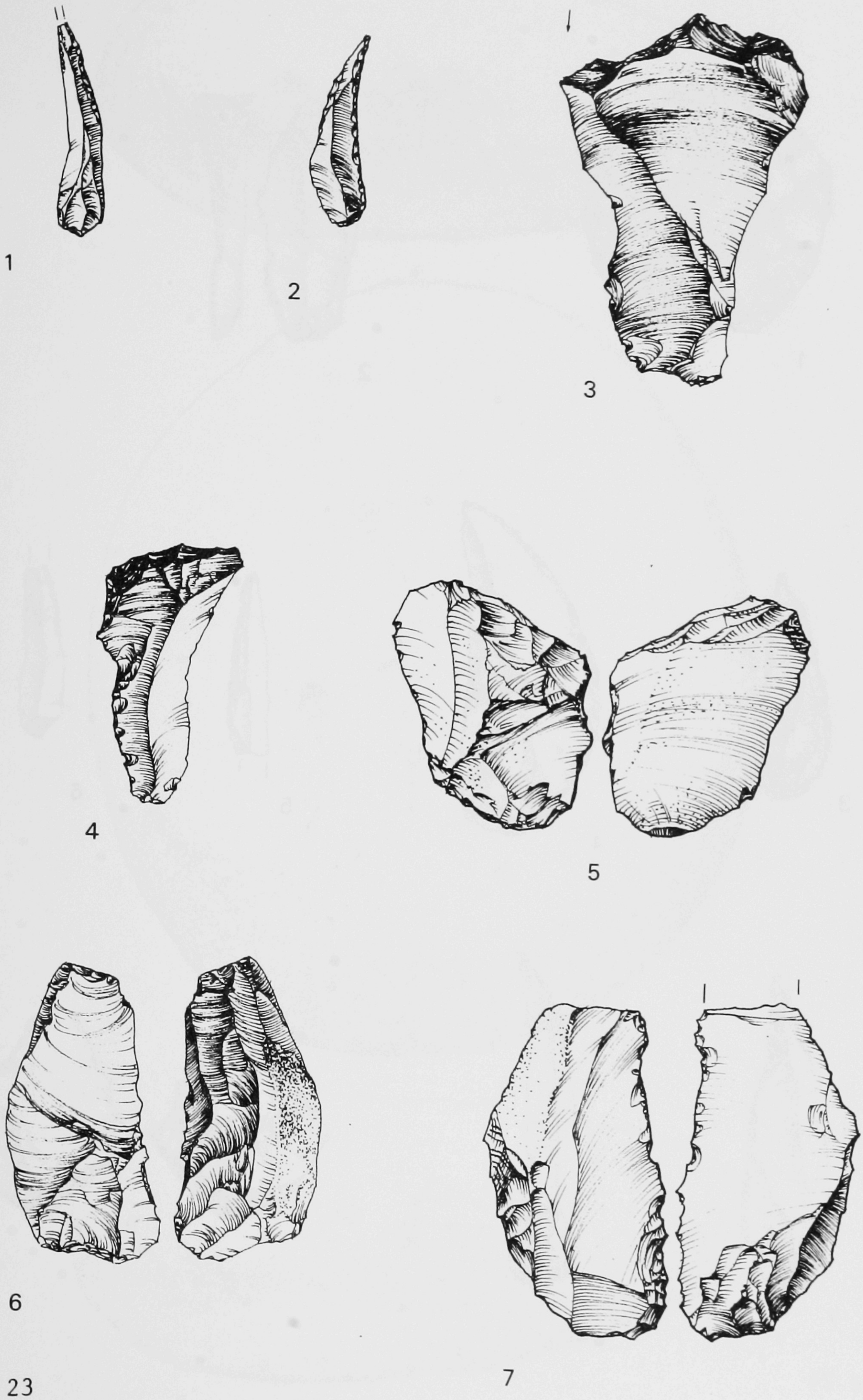


Figure 23

XI E4 9.65

1-2. el-Wad points 3-4. burin spalls; 3 removed an opposed truncation burin and 4 removed an opposed scraper.

XI F4 9.55

5,7. lateral carinated scrapers 6. splintered piece

(scale 1:1; proximal end down)

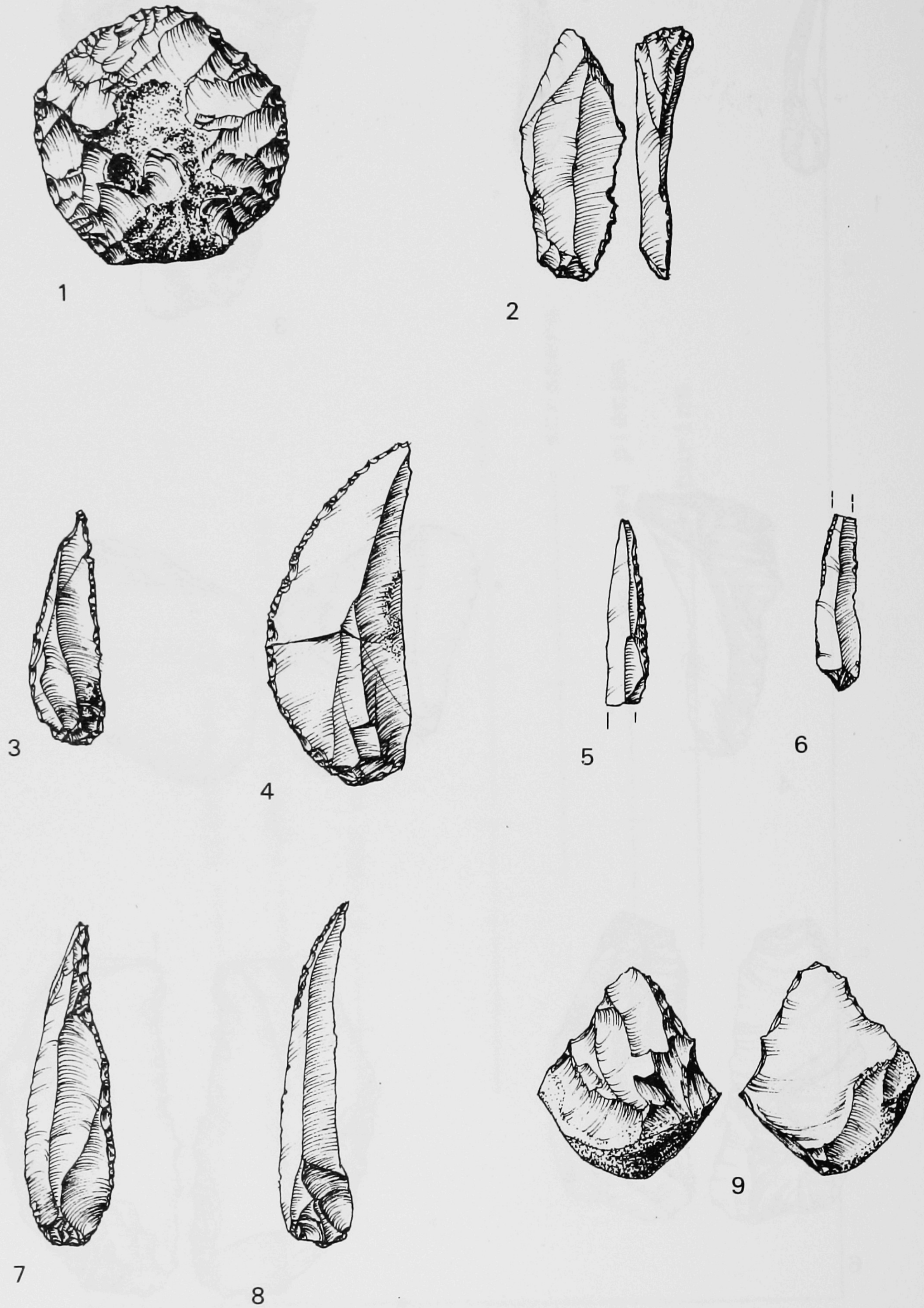


Figure 24

XI F4 9.30

1. end-scraper on a retouched piece 2. carinated piece 3. piercer 4. backed blade 5-6. retouched blade/lets 7-8. el-Wad points 9. blade/let core

(scale 1:1; proximal end down)

Figure 24a

Cobble used to crush ochre from XI F4 9.30. This piece has signs of battering at both ends as well as crushed red ochre. (scale 1:1)

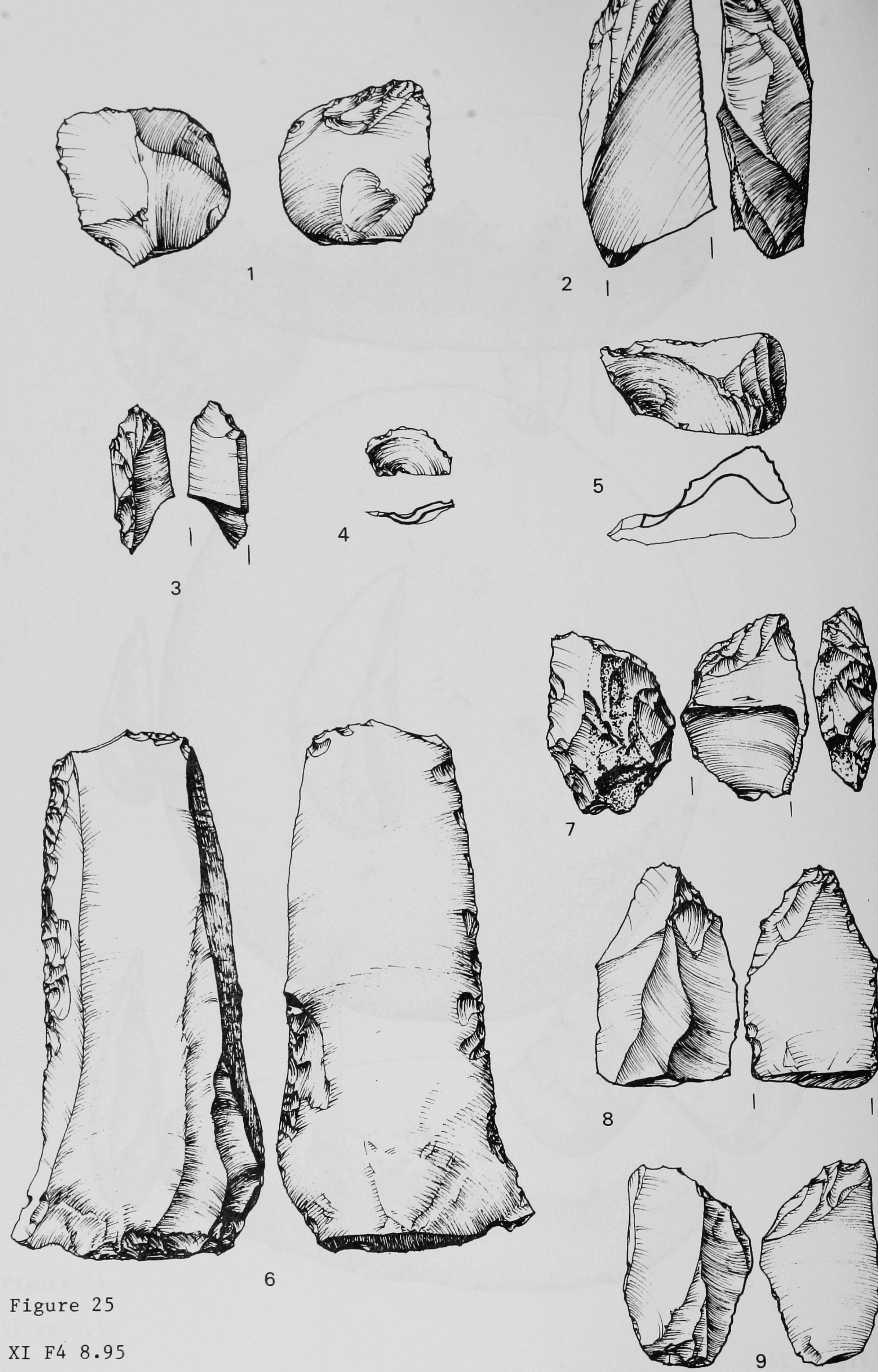


Figure 25

XI F4 8.95

1. lateral carinated scraper 2. carinated piece 3. plunging spall which removed an opposed carinated piece 4. Clactonian notch spall 5. flake detached from the side of a scraper XI F4 8.85

6. side-scraper (lame mâchuré?) 7-9. lateral carinated scrapers

(scale 1:1; proximal end down)

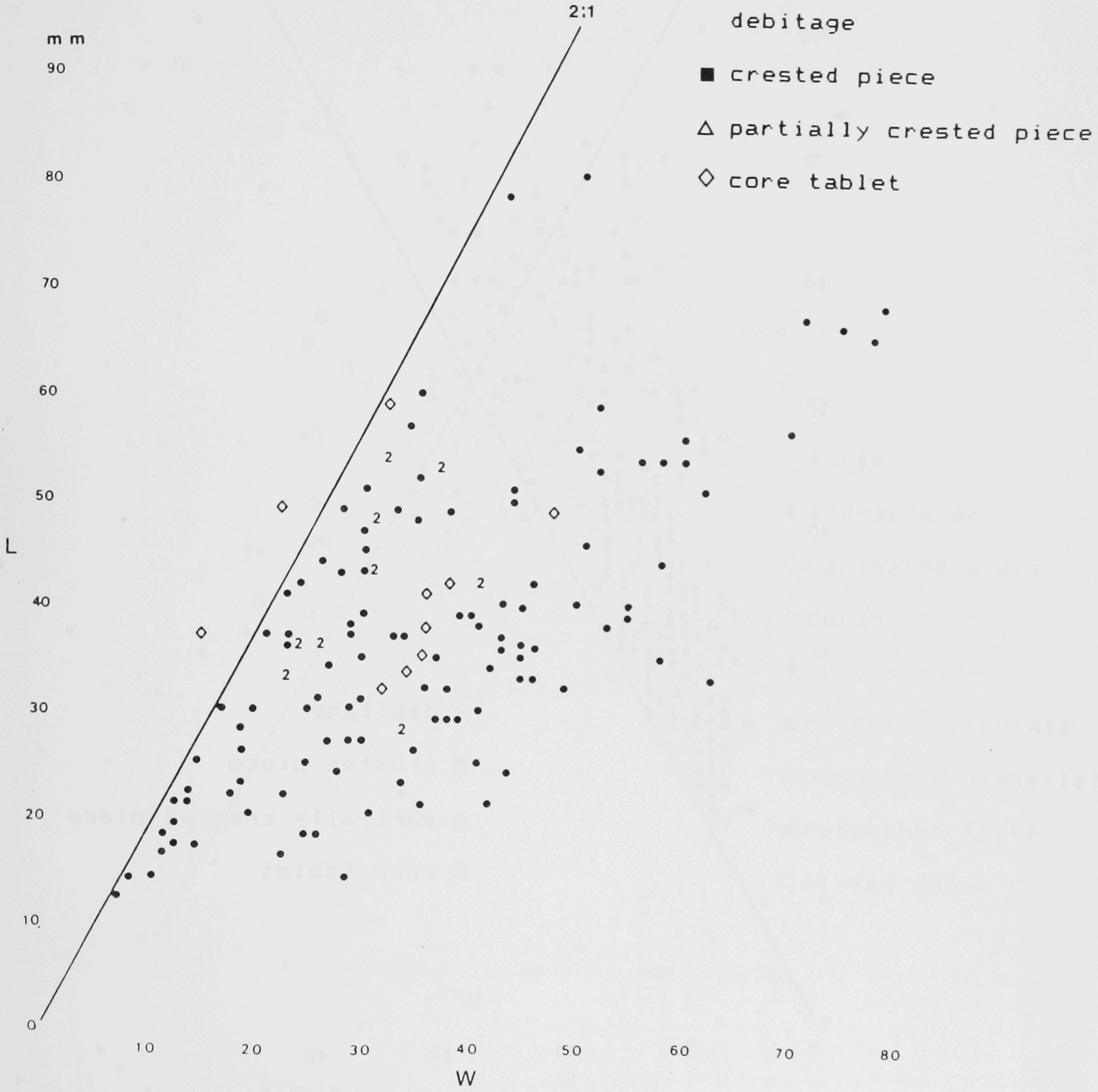


Figure 26

XI F4 9.30

L/W scatter diagram for flakes and core tablets.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

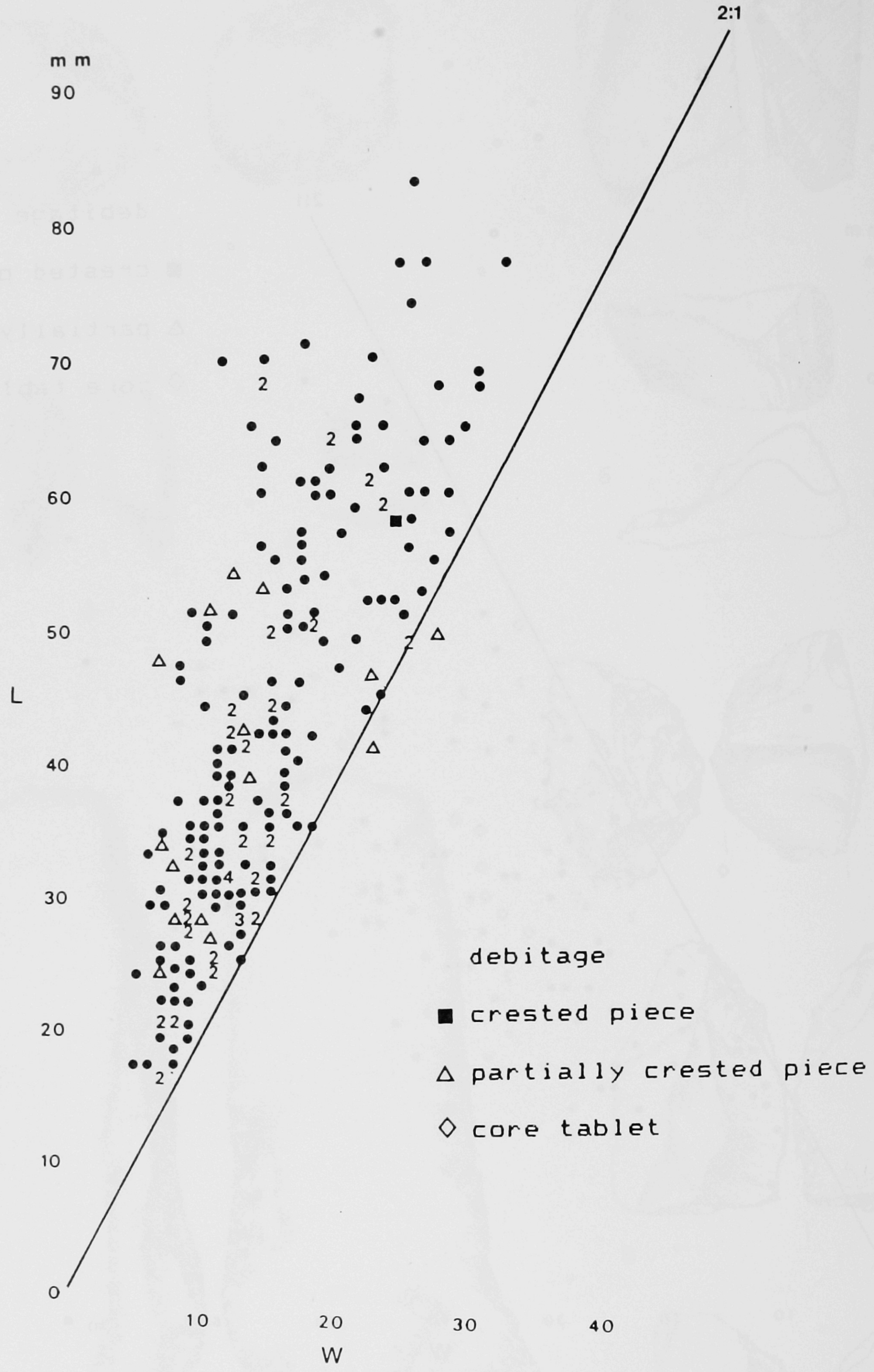


Figure 27

XI F4 9.30

L/W scatter diagram for blade/lets and crested pieces.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

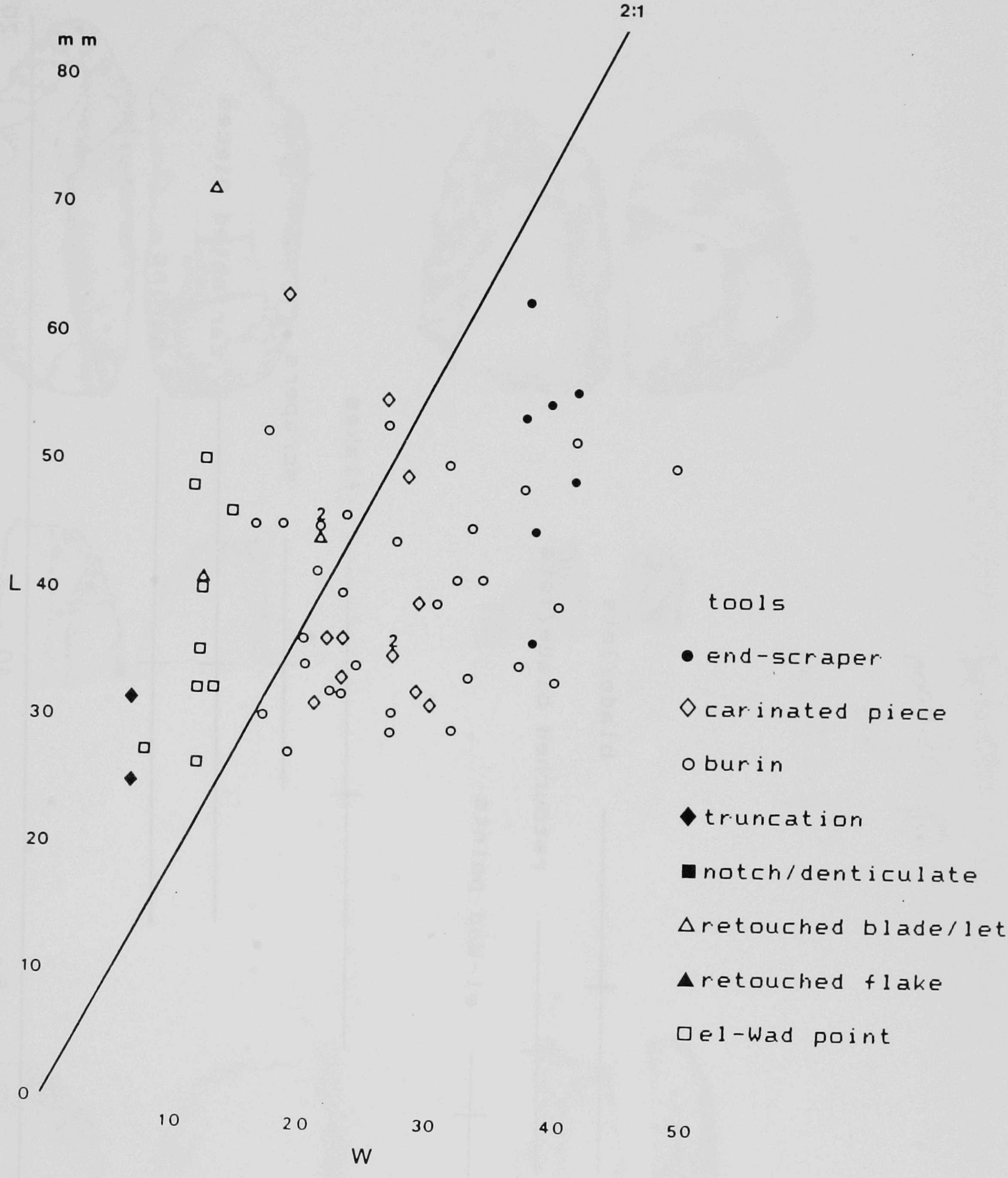


Figure 28

XI F4 9.30

L/W scatter diagram for tools.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

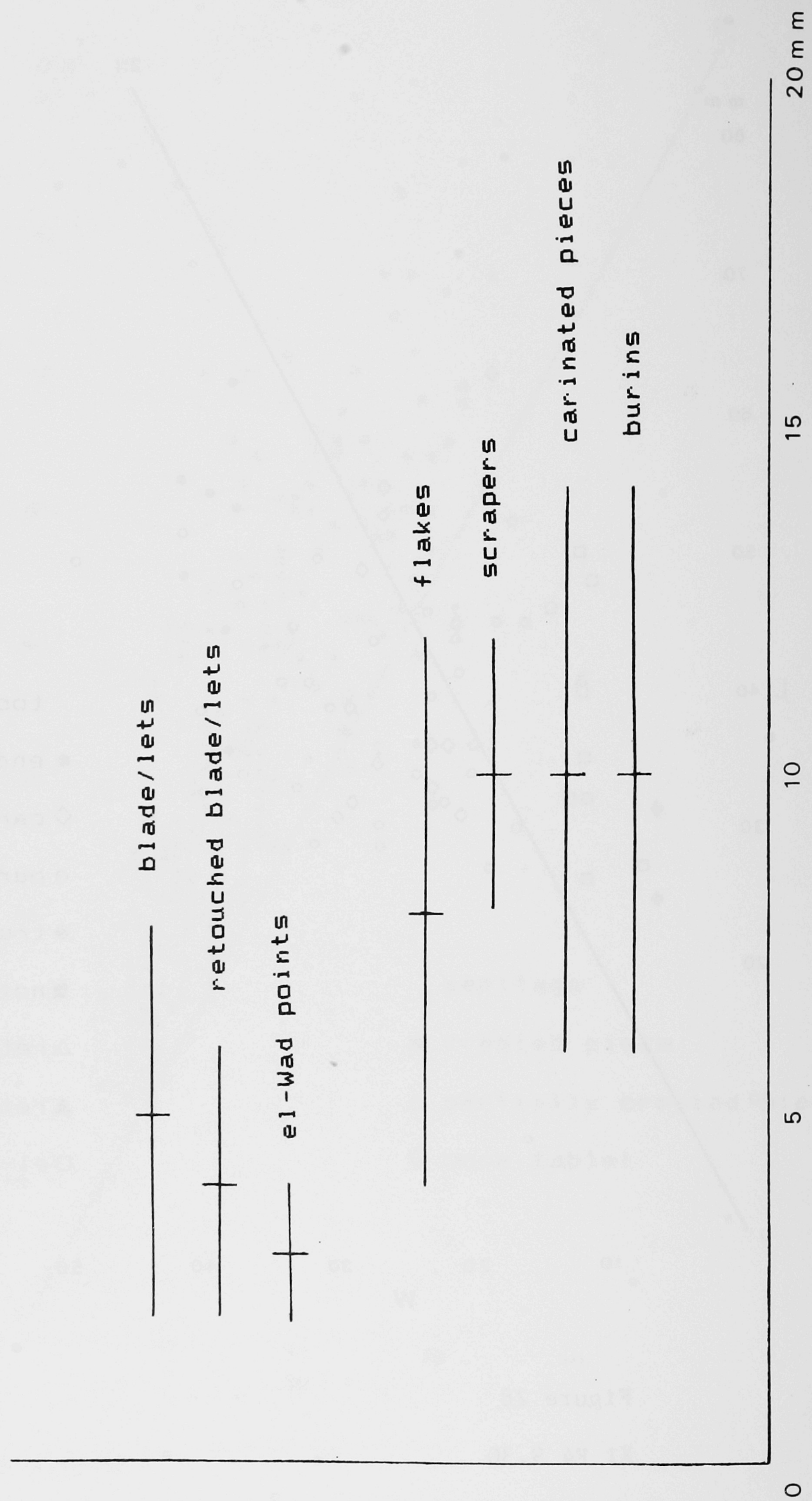


Figure 29

XI F4 9.30

Graph of mean blank and tool thicknesses.

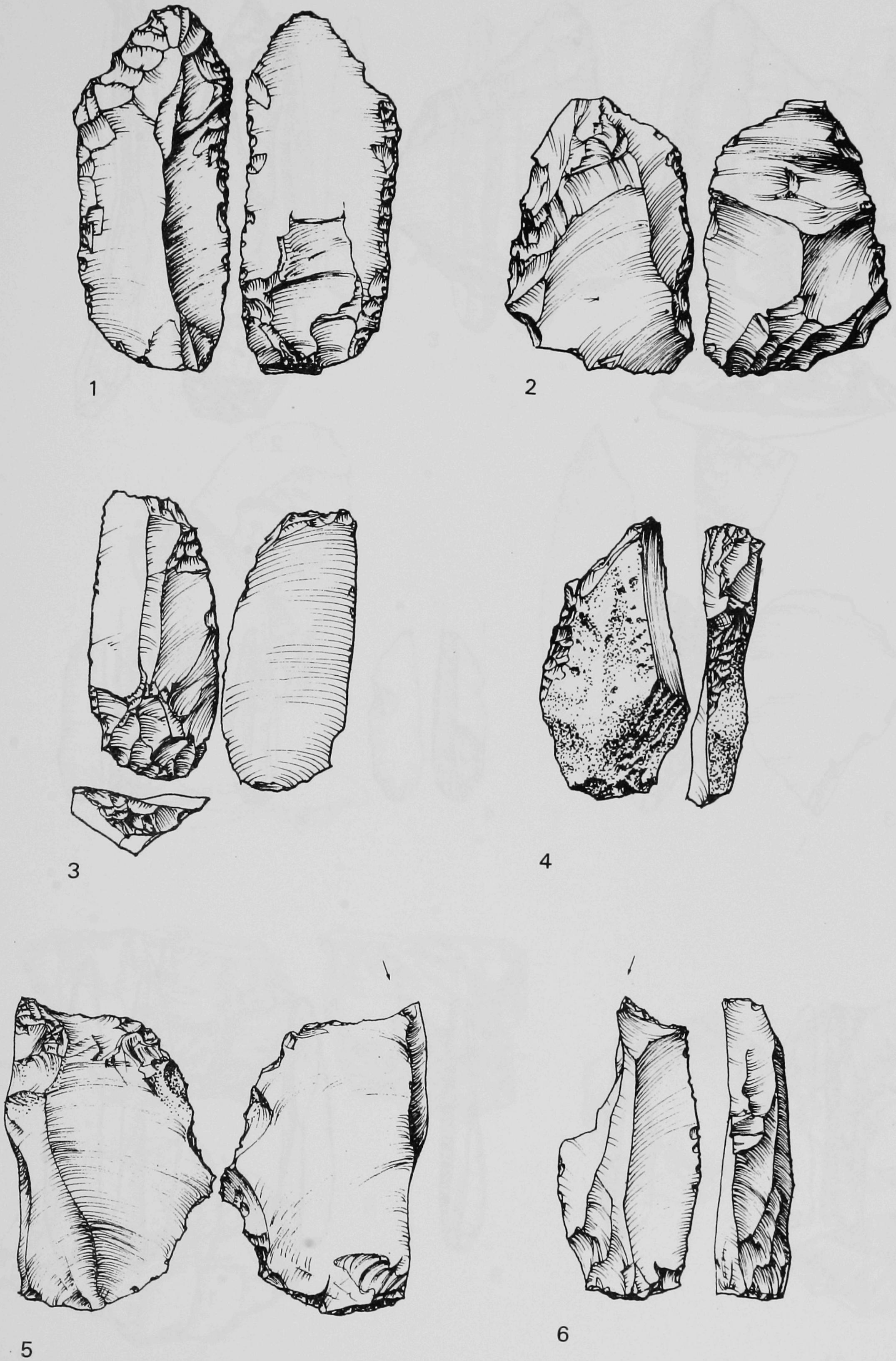


Figure 30

X E4 8.65

1. shouldered scraper 2-3. lateral carinated scrapers 4. carinated piece 5-6. truncation burins; 5 is on a core tablet

(scale 1:1; proximal end down)

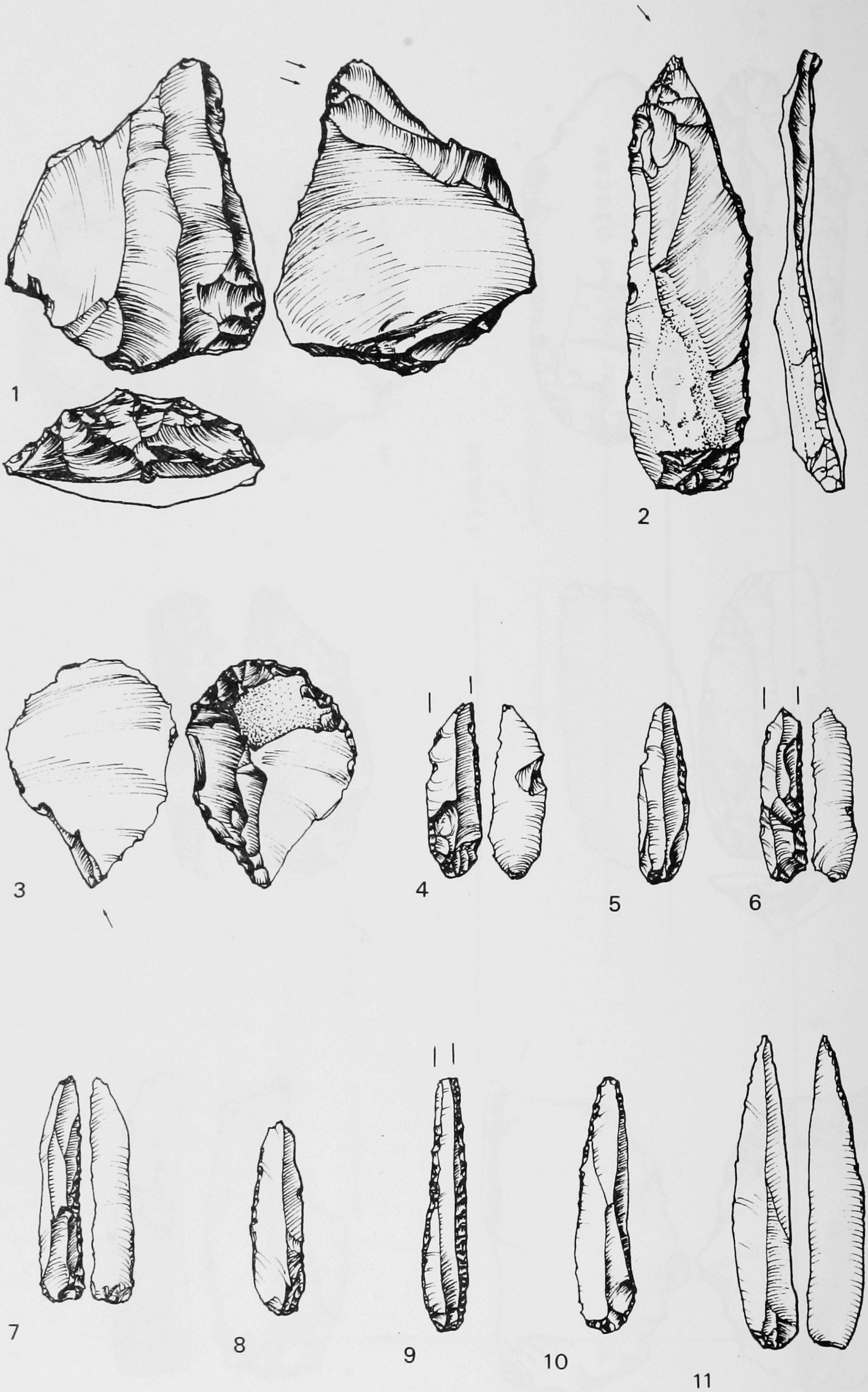


Figure 31

X E4 8.65

1. dihedral burin 2. truncation burin 3. burin/scraper 4-8. retouched blade/lets 9-10. el-Wad points 11. el-Wad variant

(scale 1:1; proximal end down)

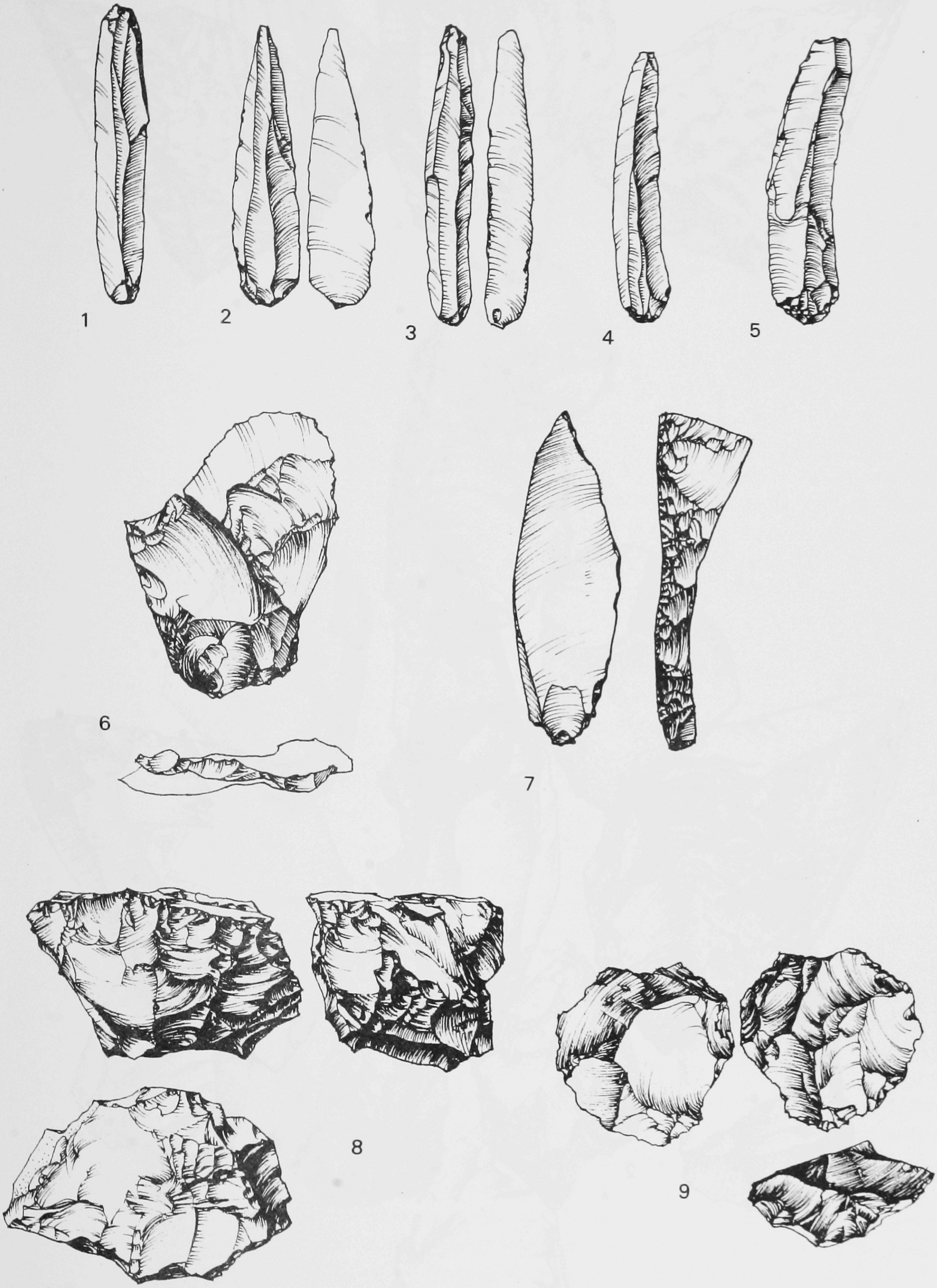
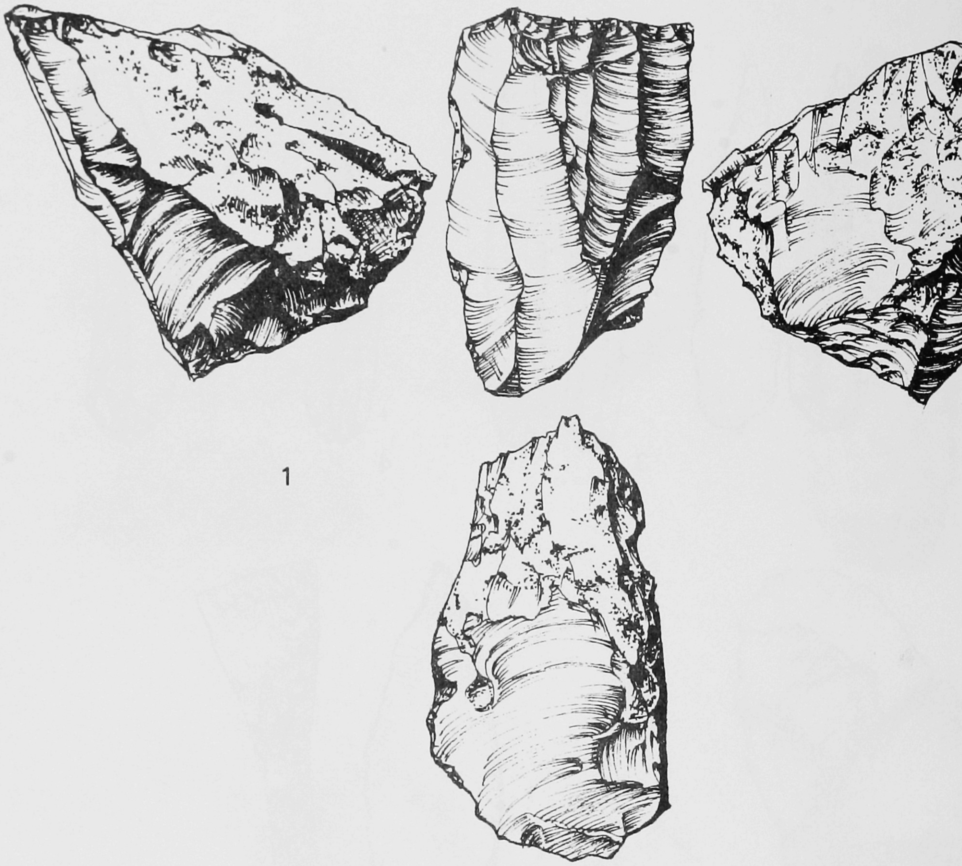


Figure 32

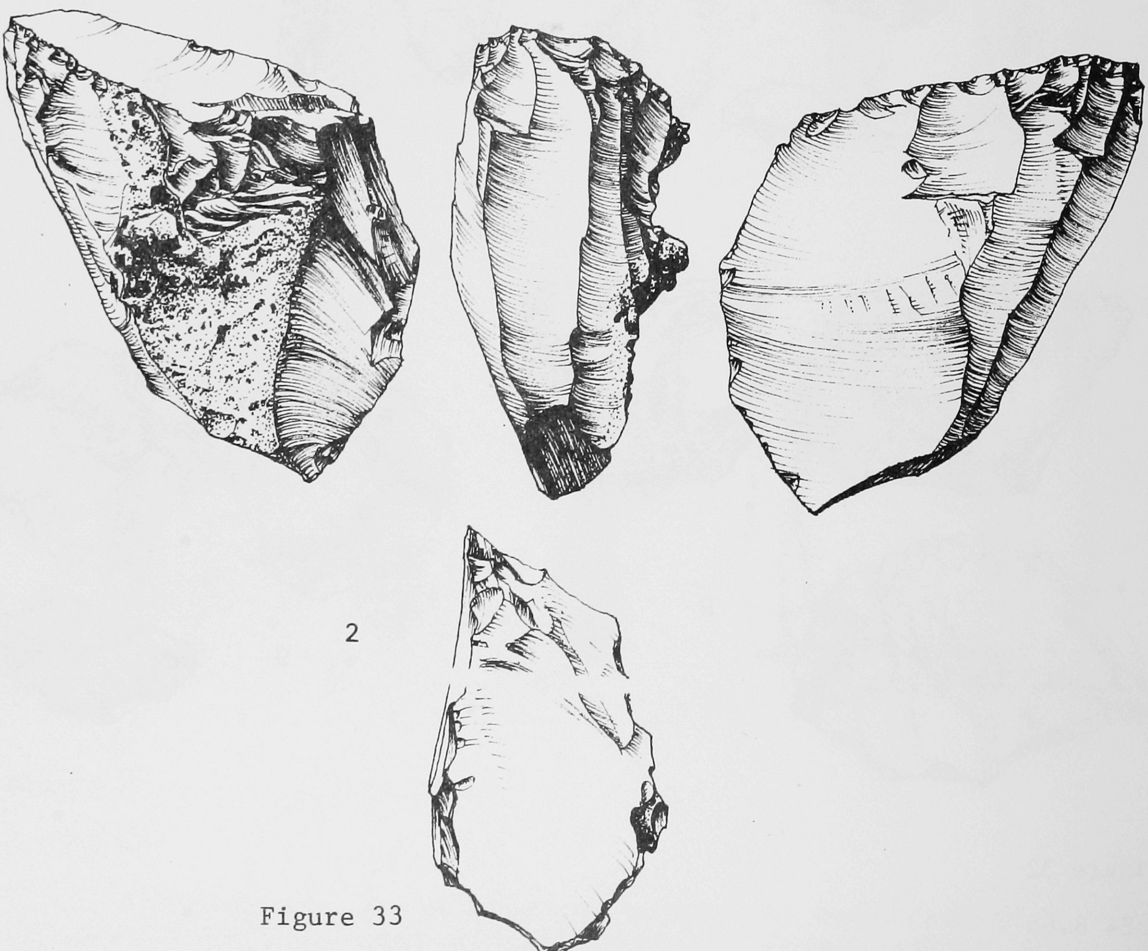
X E4 8.65

1-5. unretouched blade/lets 6-7. core tablets 8. flake core 9. discoidal core

(scale 1:1; proximal end down)



1



2

Figure 33

X E4 8.65

1-2. blade/let cores (scale 1:1)

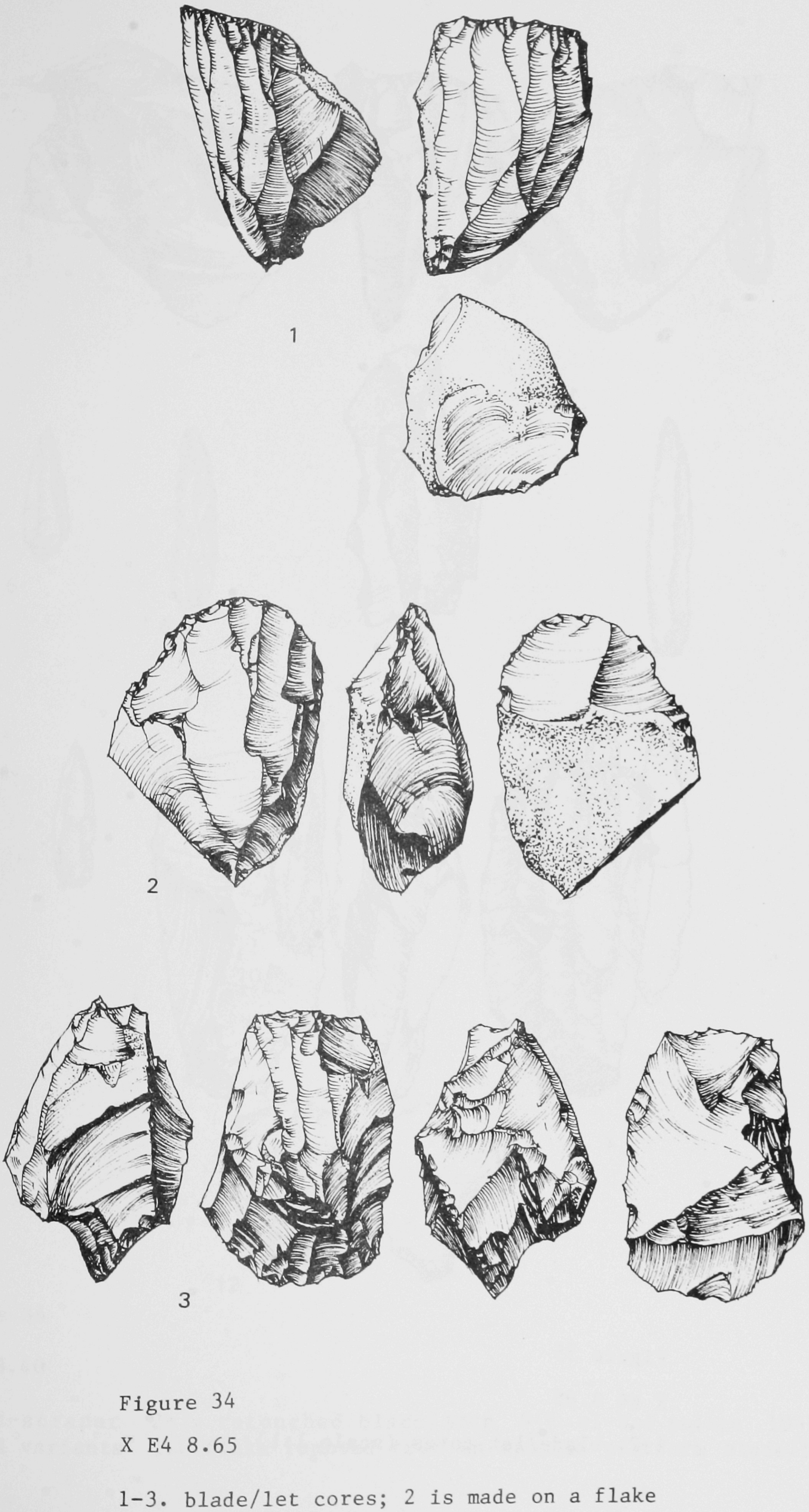


Figure 34

X E4 8.65

1-3. blade/let cores; 2 is made on a flake

(scale 1:1)

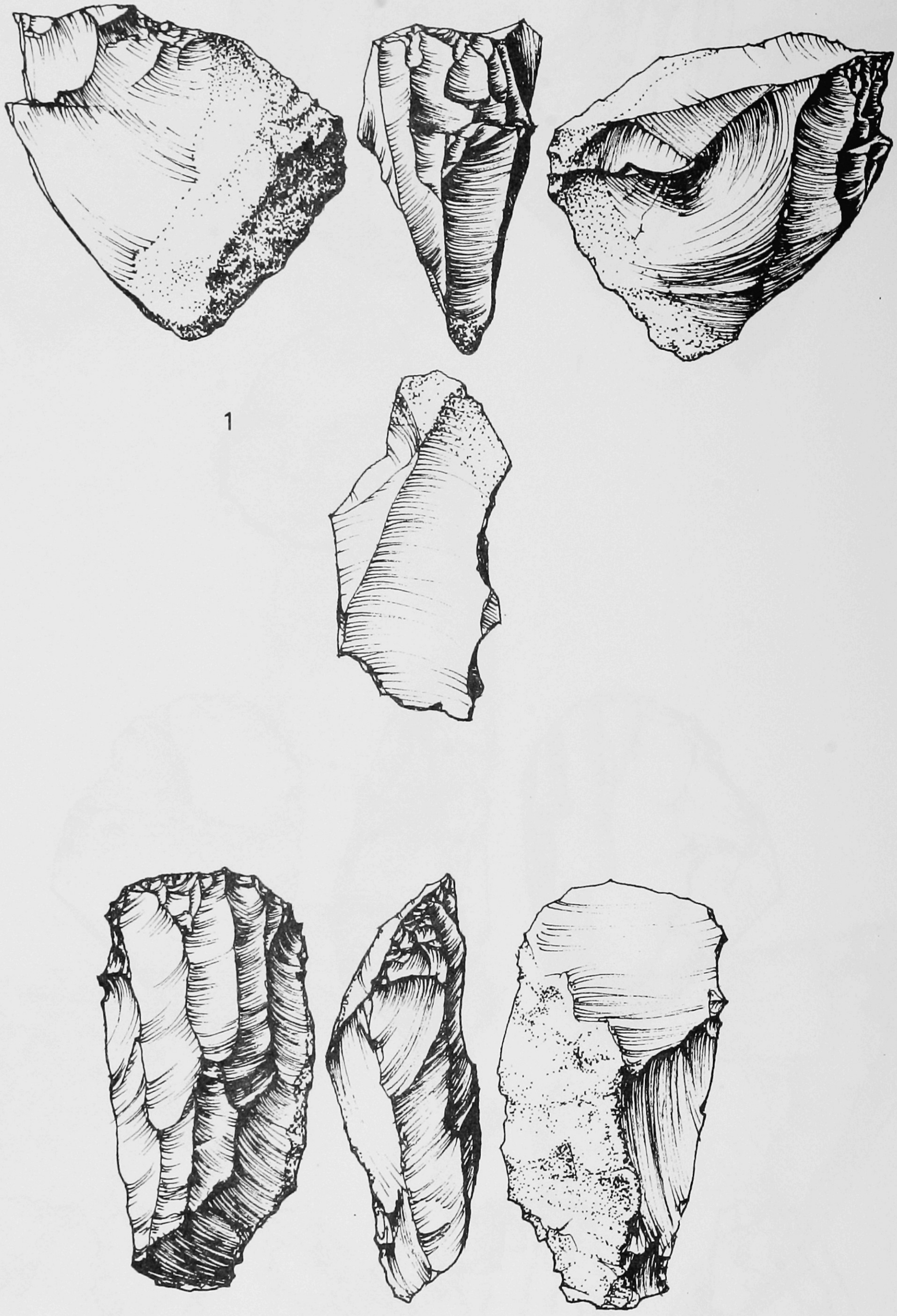


Figure 35

X E4 8.65

1-2. blade/let cores (scale 1:1)

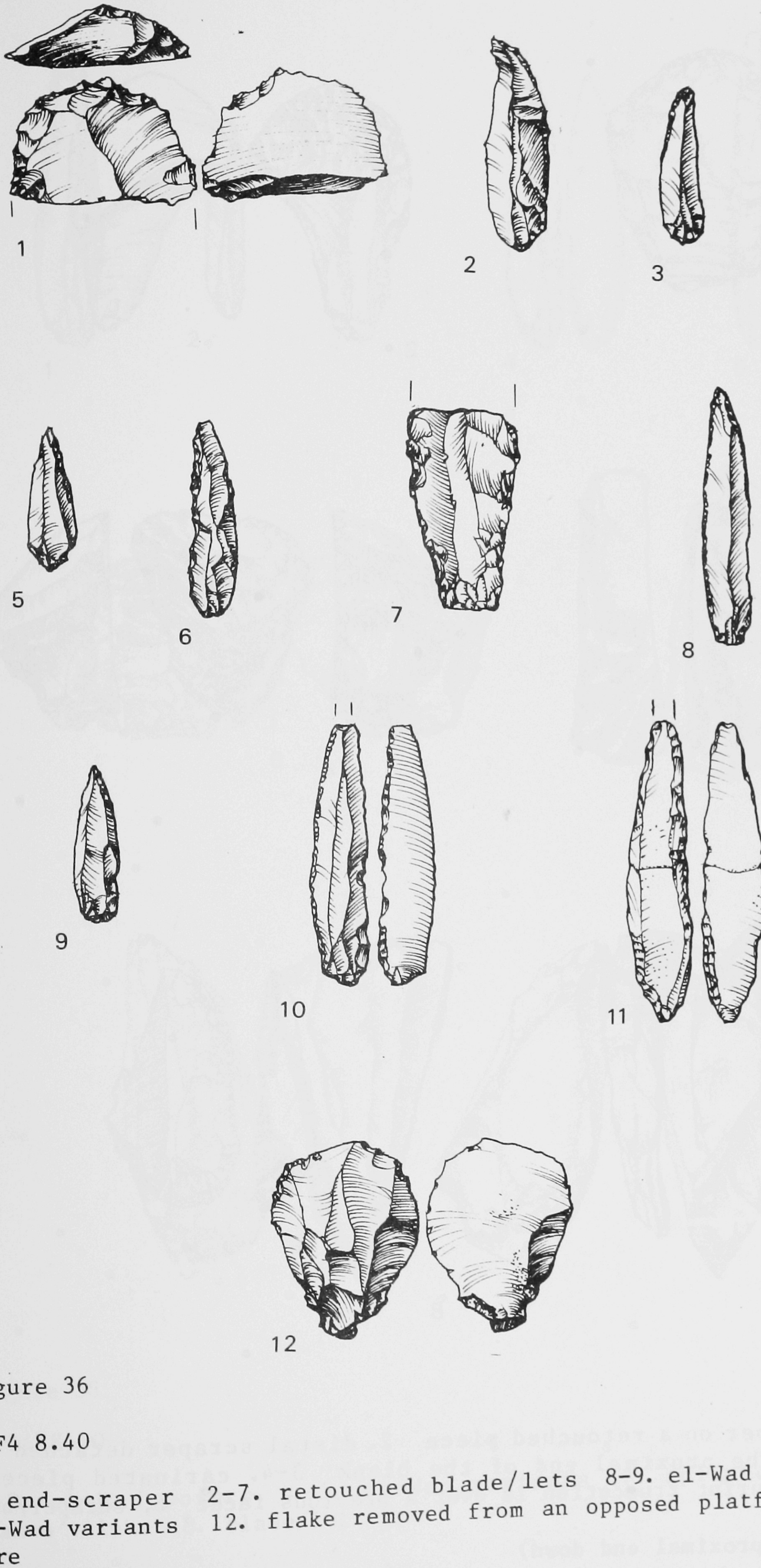


Figure 36

X F4 8.40

1. end-scraper 2-7. retouched blade/lets 8-9. el-Wad points 10-11. el-Wad variants 12. flake removed from an opposed platform blade/let core

(scale 1:1; proximal end down)

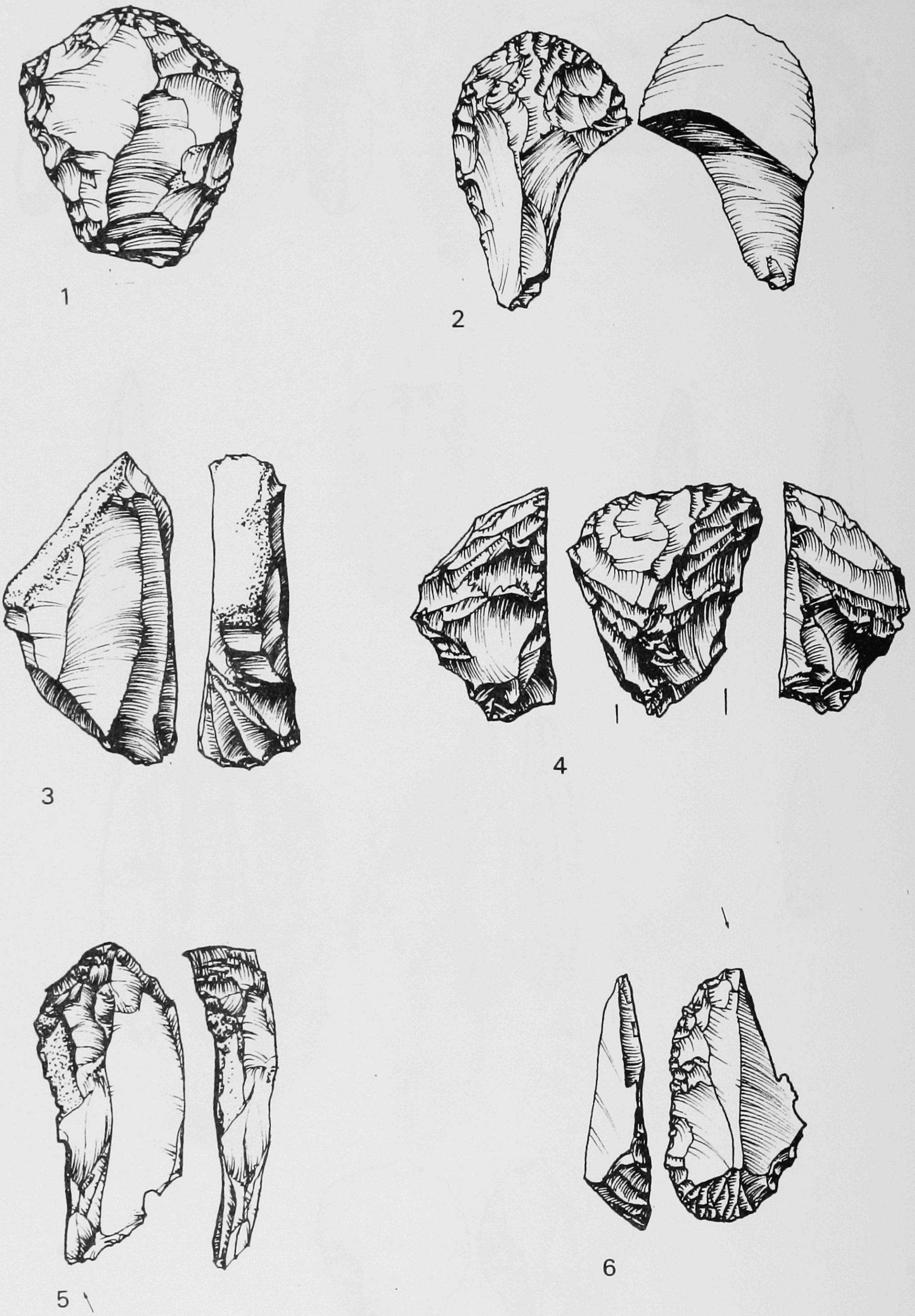


Figure 37

X E4 8.10

1. end-scraper on a retouched piece 2. distal scraper detached by a blow from the proximal end of the blank 3-4. carinated pieces 5. truncation burin; truncation is over a previous facet 6. scraper/burin

(scale 1:1; proximal end down)

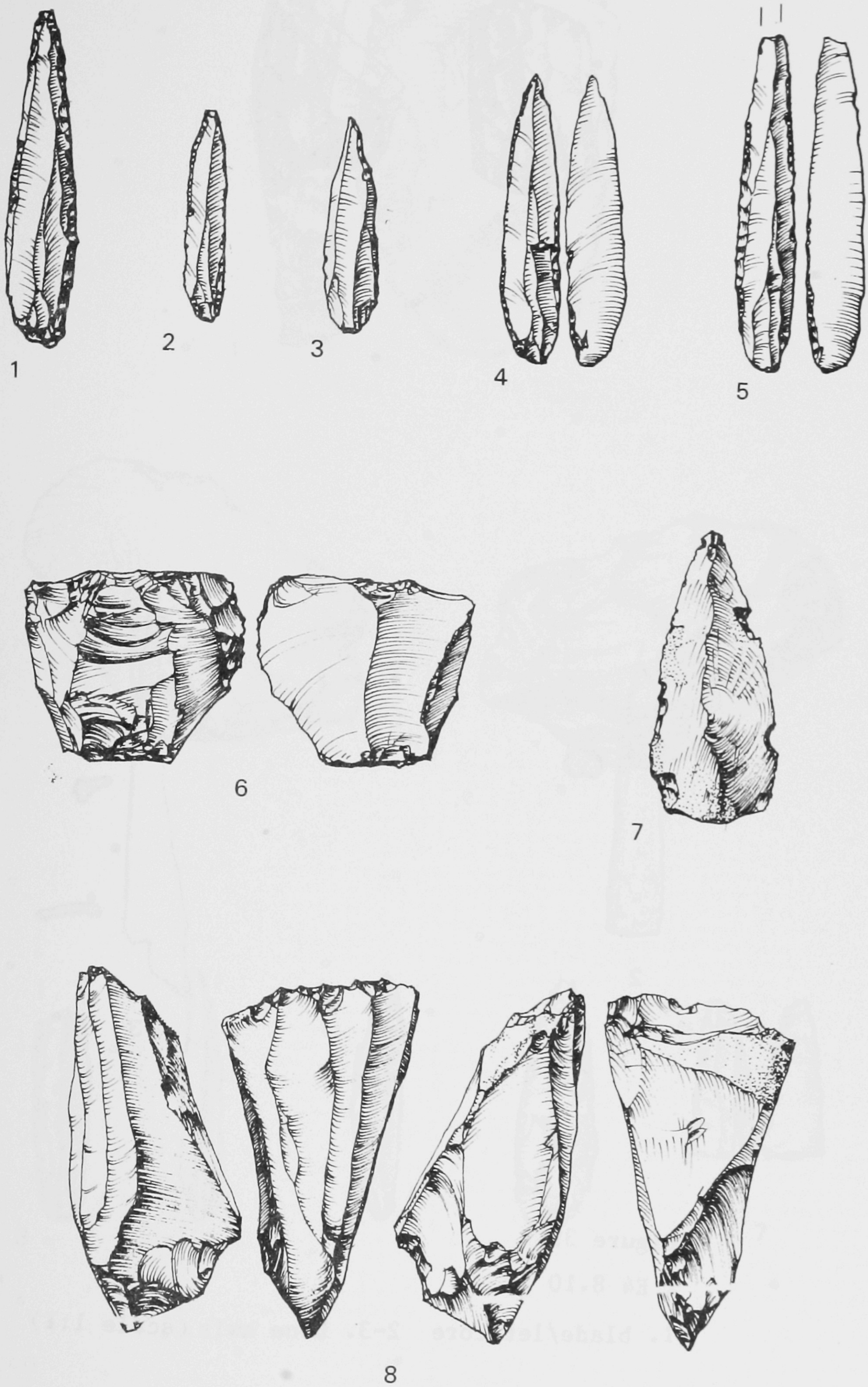


Figure 38

X E4 8.10

1-3. el-Wad points 4-5. el-Wad variants 6. splintered piece 7. 'Janus' flake 8. blade/let core

(scale 1:1; proximal end down)

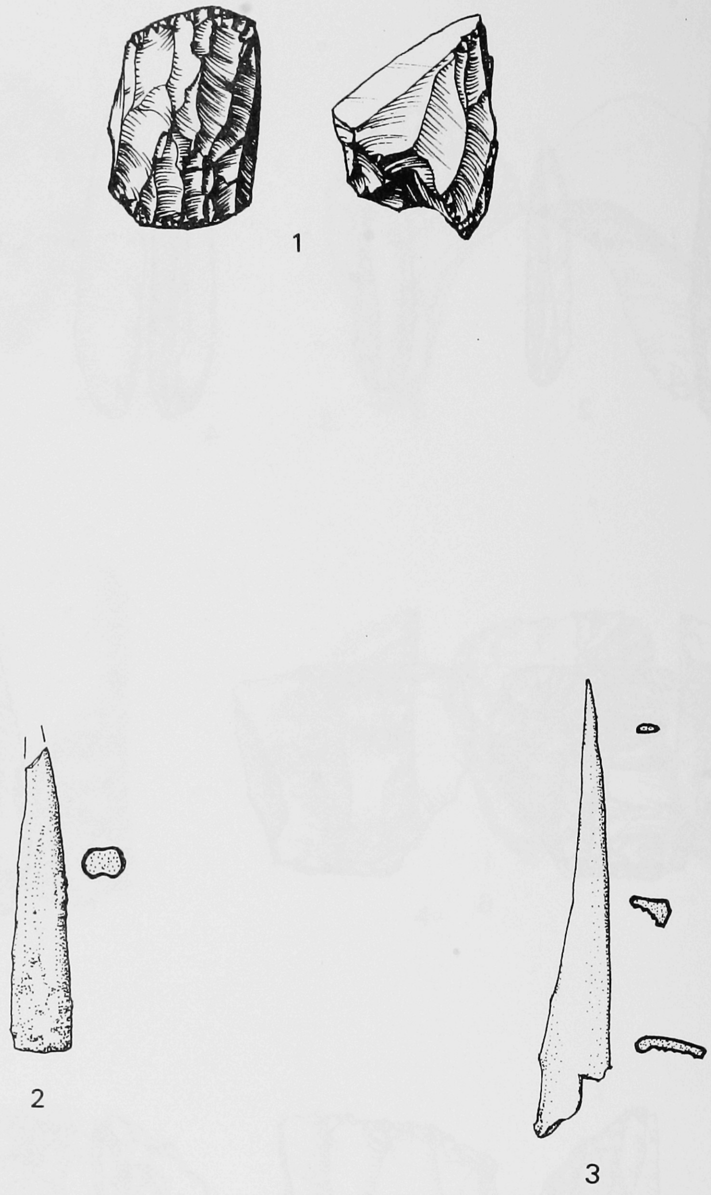


Figure 39

X E4 8.10

1. blade/let core 2-3. bone awls (scale 1:1)

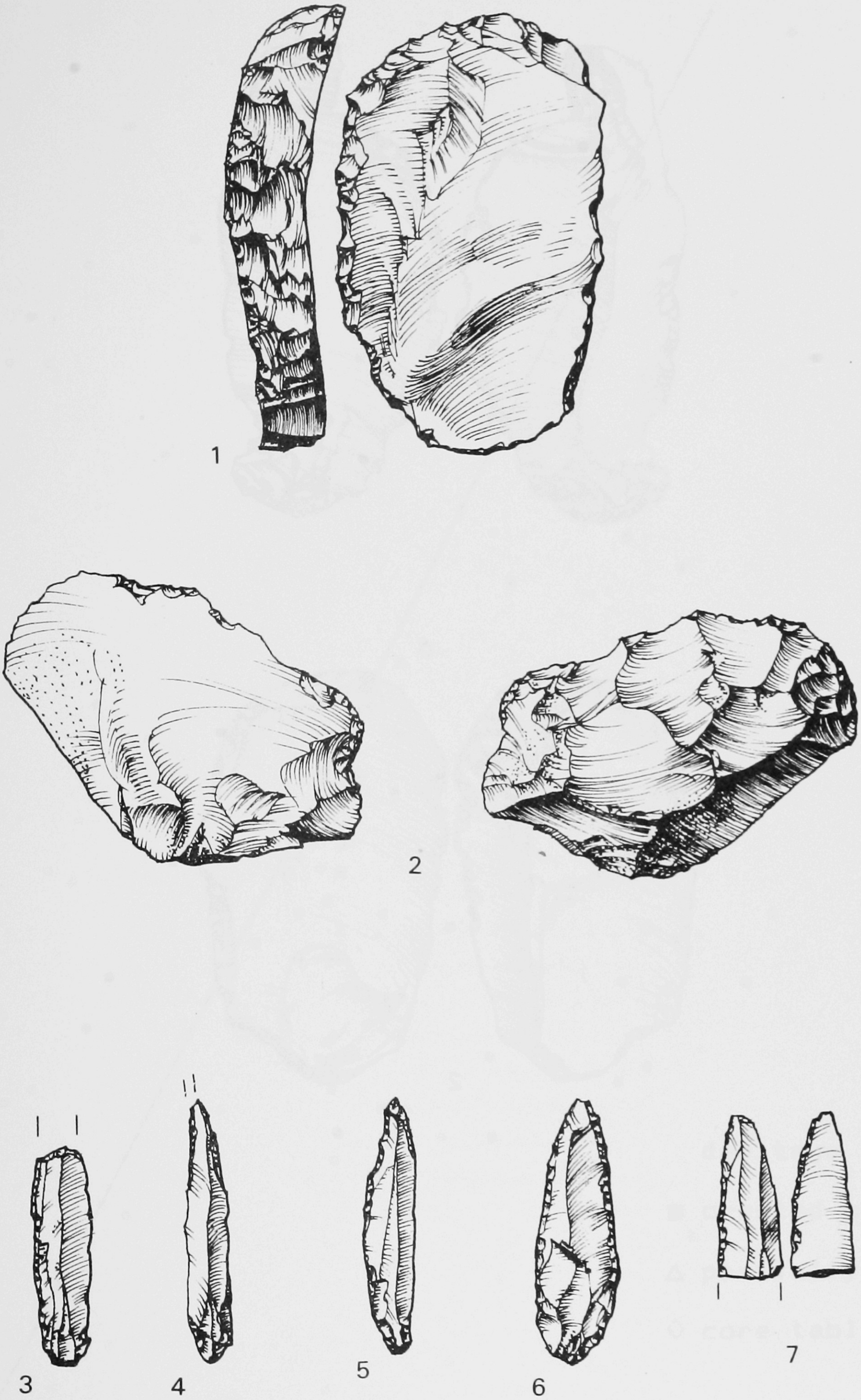
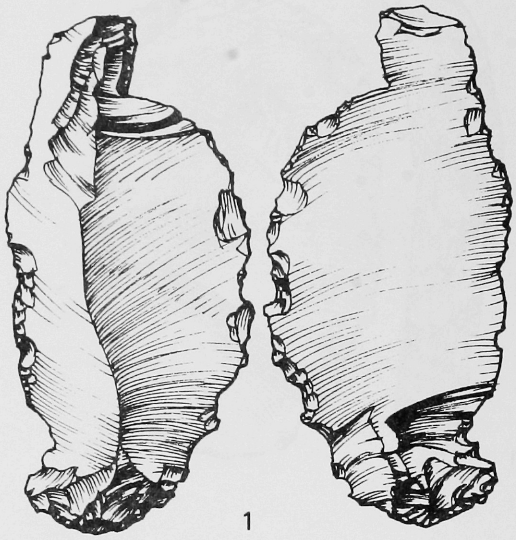


Figure 40

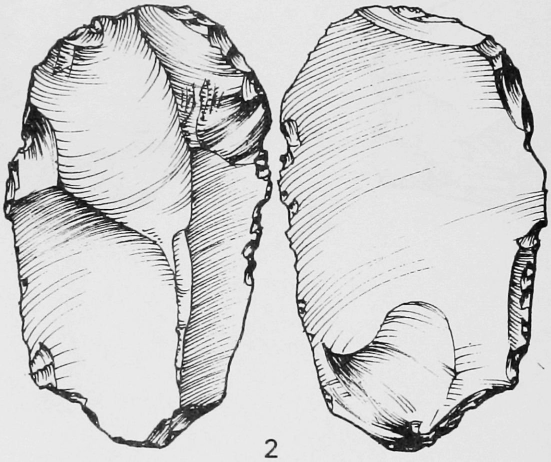
X F4 8.10

1. end-scraper on a core tablet 2. scraper on a lateral edge 3. retouched bladelet 4-6. el-Wad points 7. broken el-Wad variant (?)

(scale 1:1; proximal end down)



1



2

Figure 41

X F4 8.10

1. splintered piece 2. truncated/faceted piece

(scale 1:1; proximal end down)

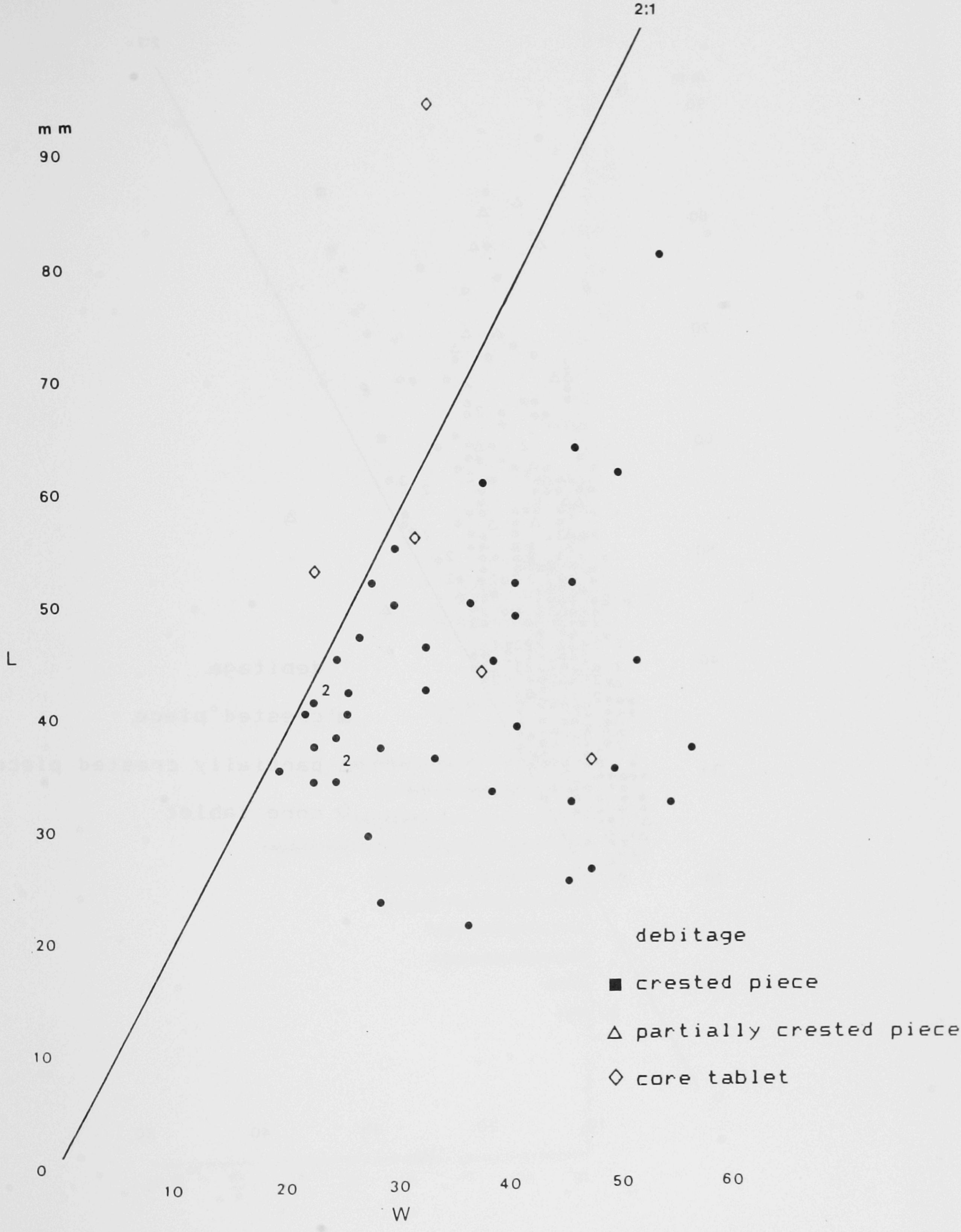


Figure 42

X E4 8.65

L/W scatter diagram for flakes and core tablets.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

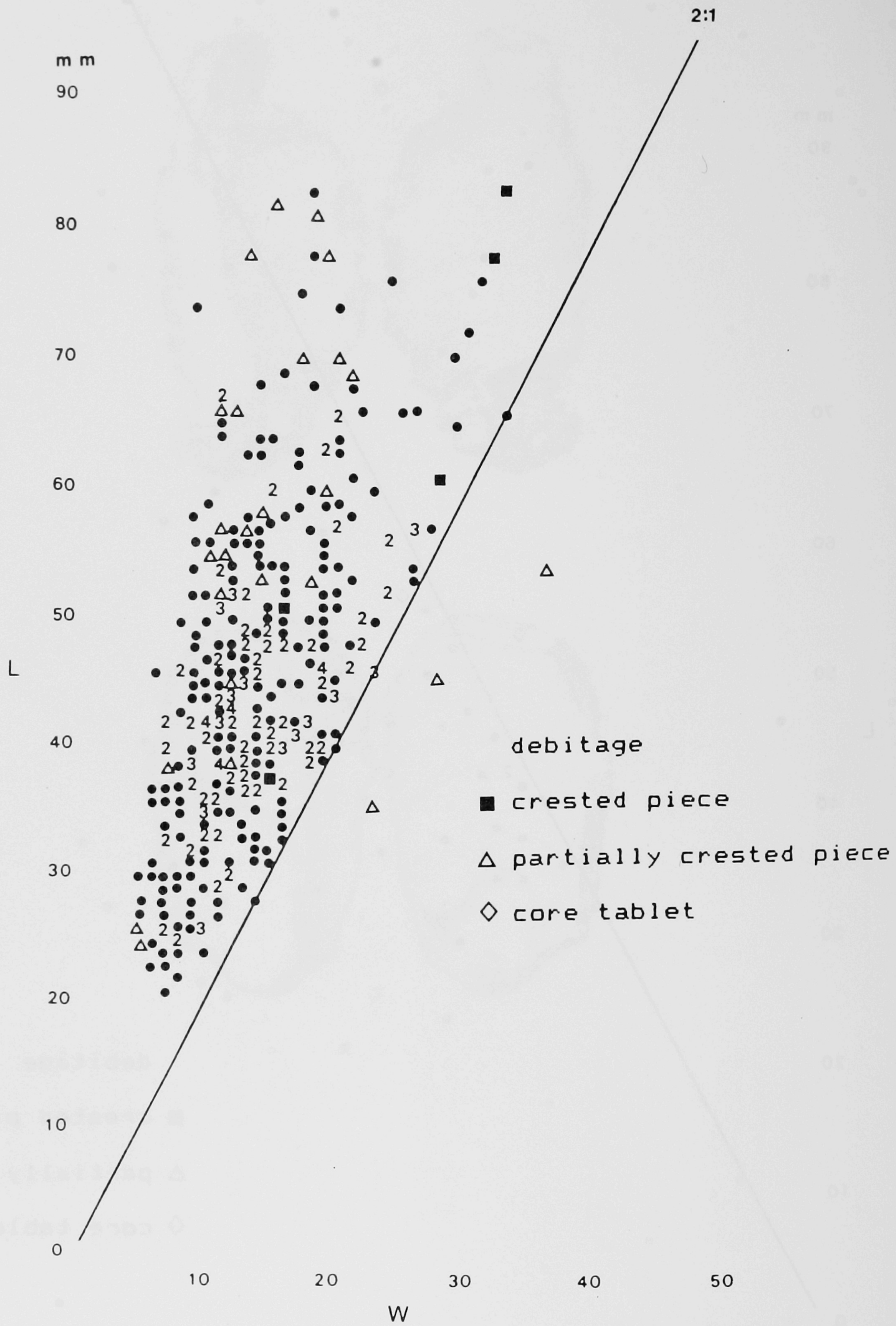


Figure 43

X E4 8.65

L/W scatter diagram for blade/lets and crested pieces.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

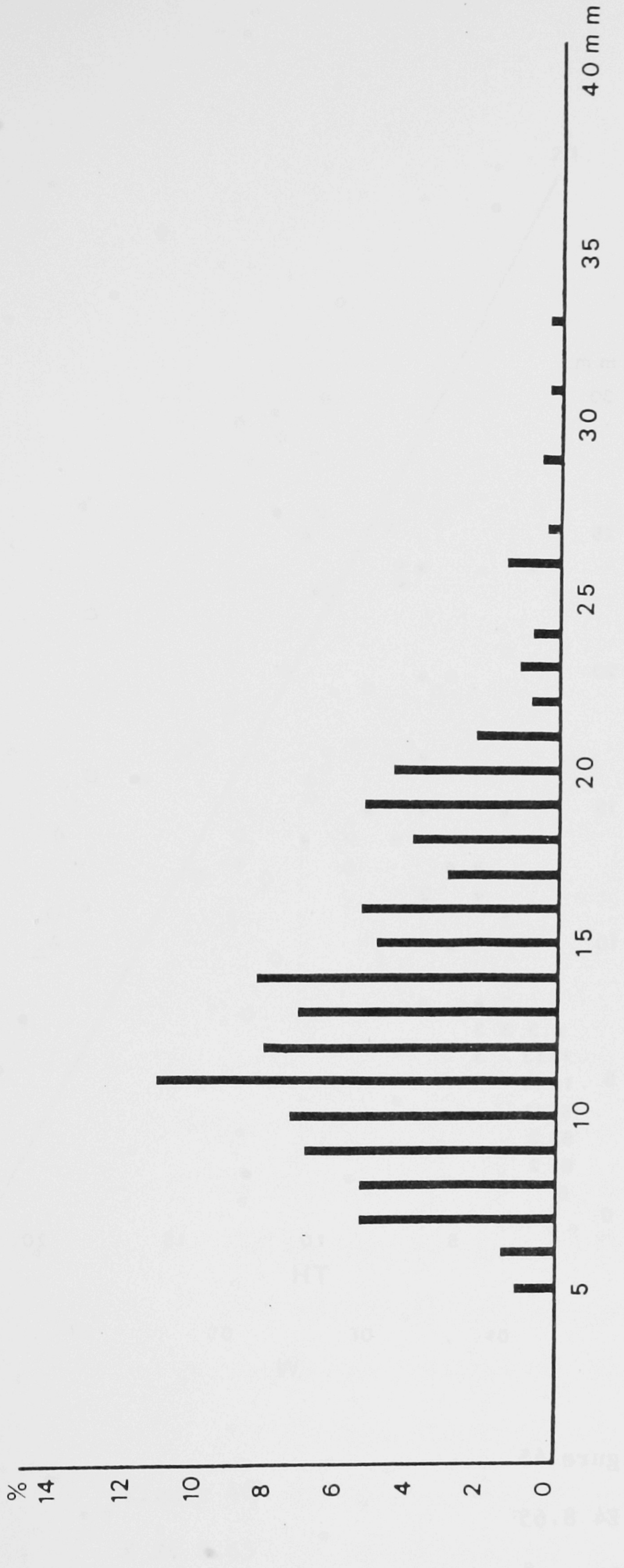


Figure 44

X E4 8.65

Bar graph of blade/let widths.

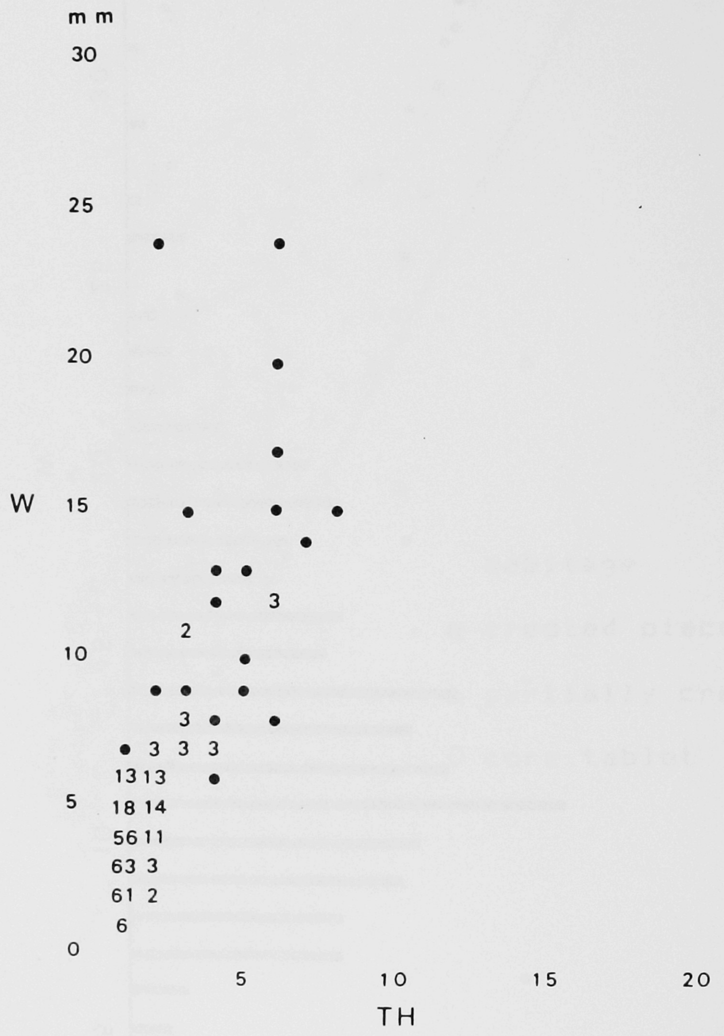


Figure 45

X E4 8.65

W/TH scatter diagram for blade/let butts.

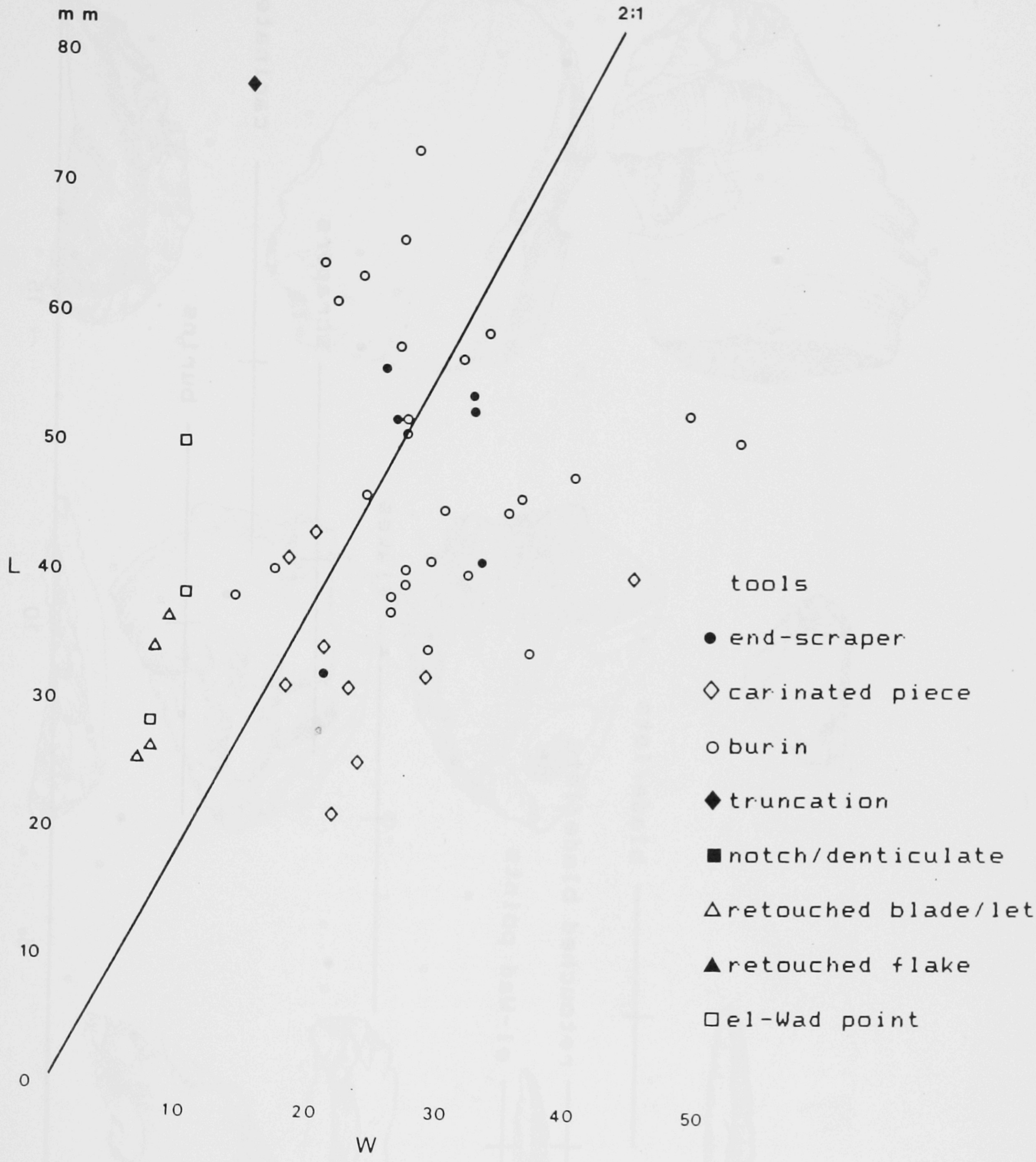


Figure 46

X E4 8.65

L/W scatter diagram for tools.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

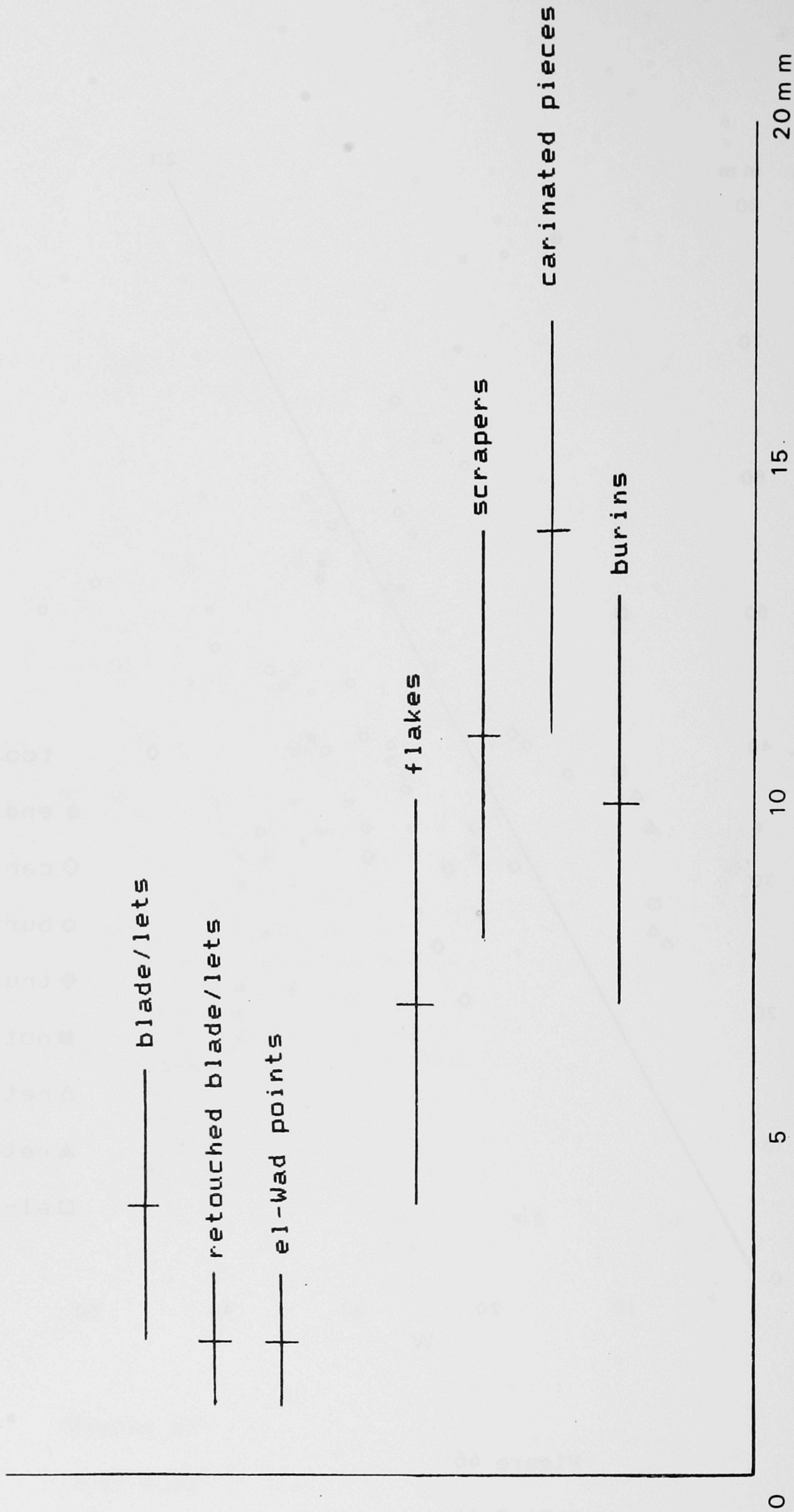


Figure 47

X E4 8.65

Graph of mean tool and blank thicknesses.

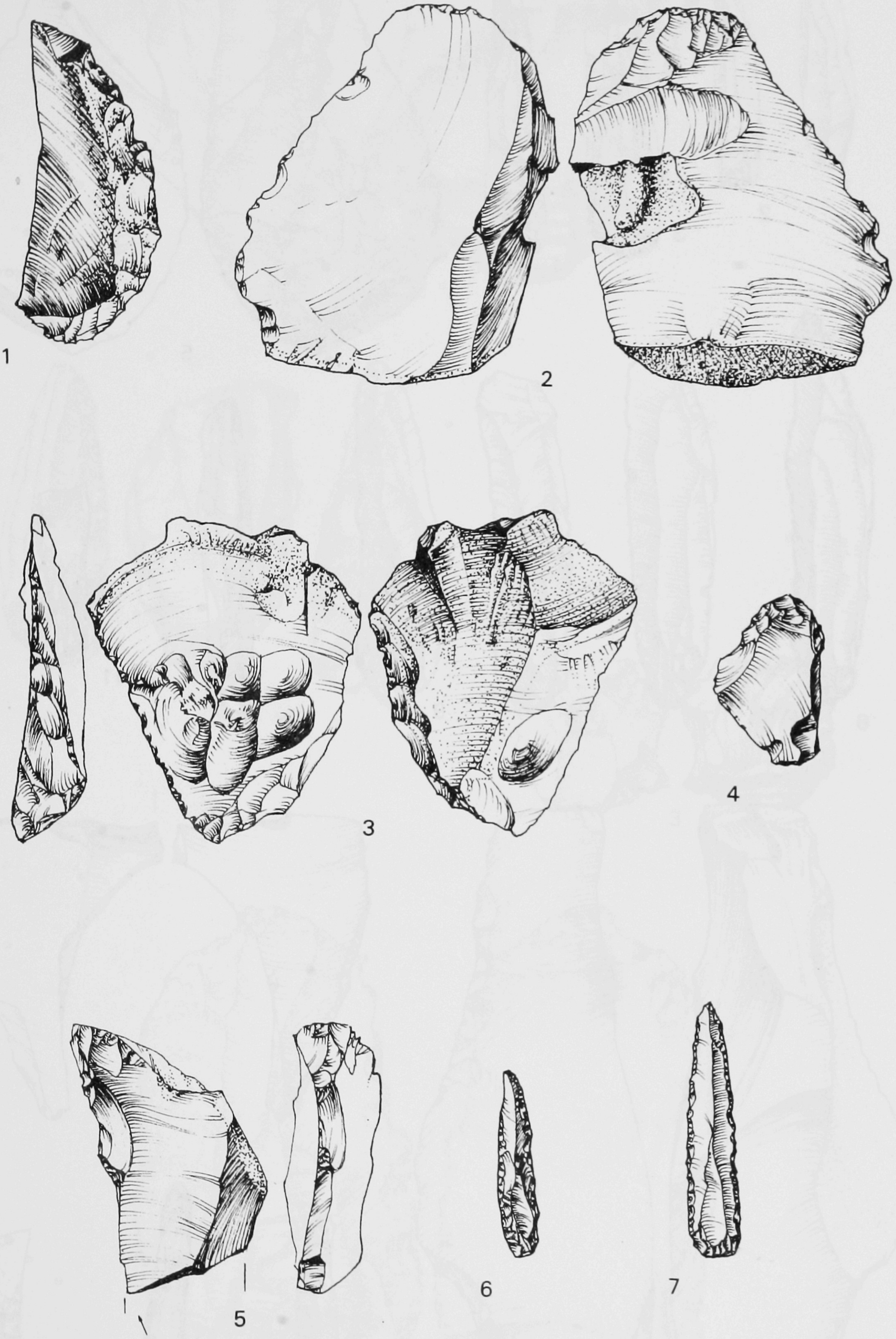


Figure 48

IX F4 7.75

1. end-scraper 2. inverse end-scraper 3. lateral carinated scraper 4. shouldered scraper 5. dihedral burin 6–7. el-Wad points

(scale 1:1; proximal end down)

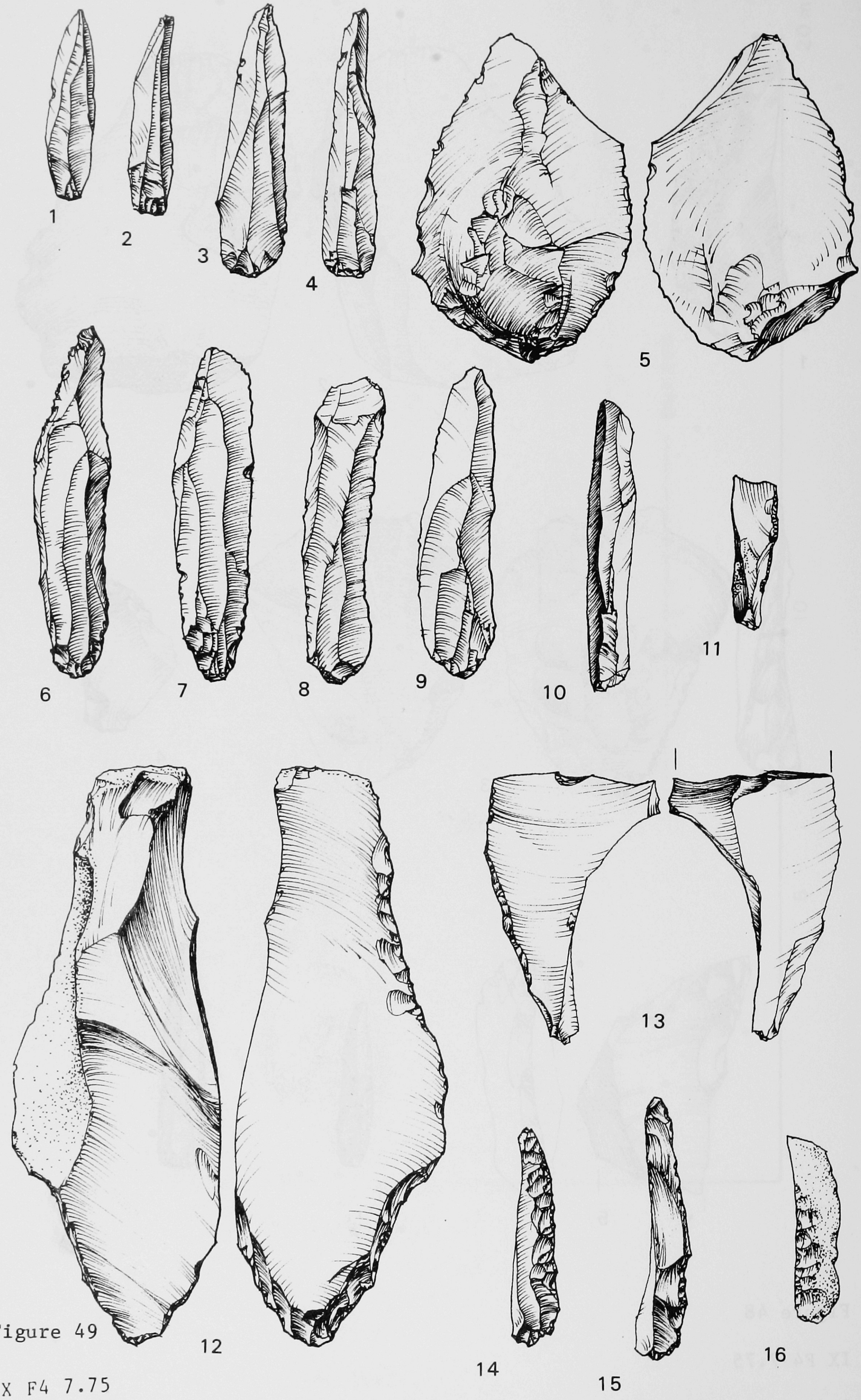


Figure 49

IX F4 7.75

1-4, 6-10. unretouched blade/lets 5. 'Janus' flake 11, 13-16. burin spalls 12. core tablet

(scale 1:1; proximal end down)

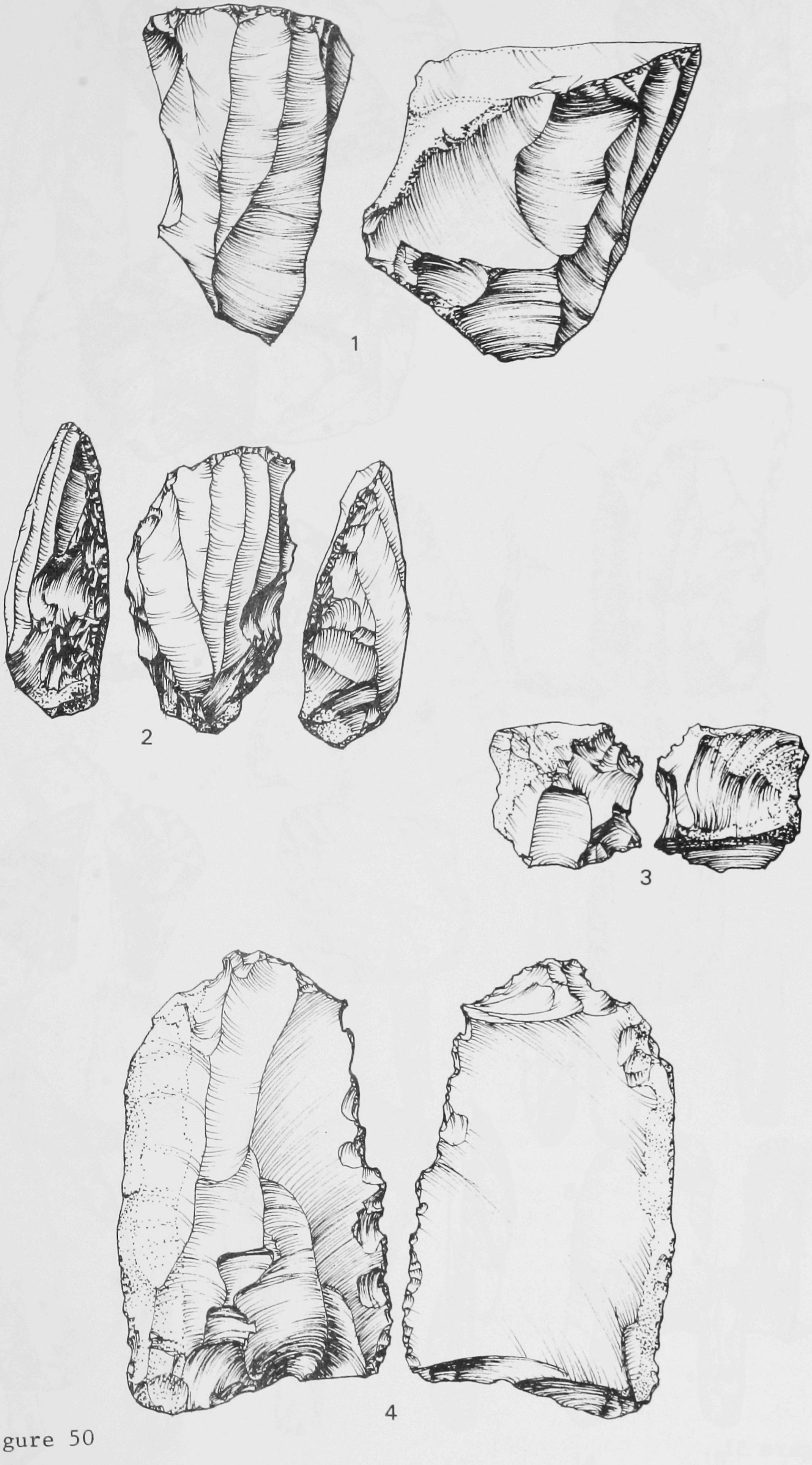


Figure 50

IX F4 7.75

1-2. blade/let cores 3. flake core 4. truncated/faceted piece

(scale 1:1)

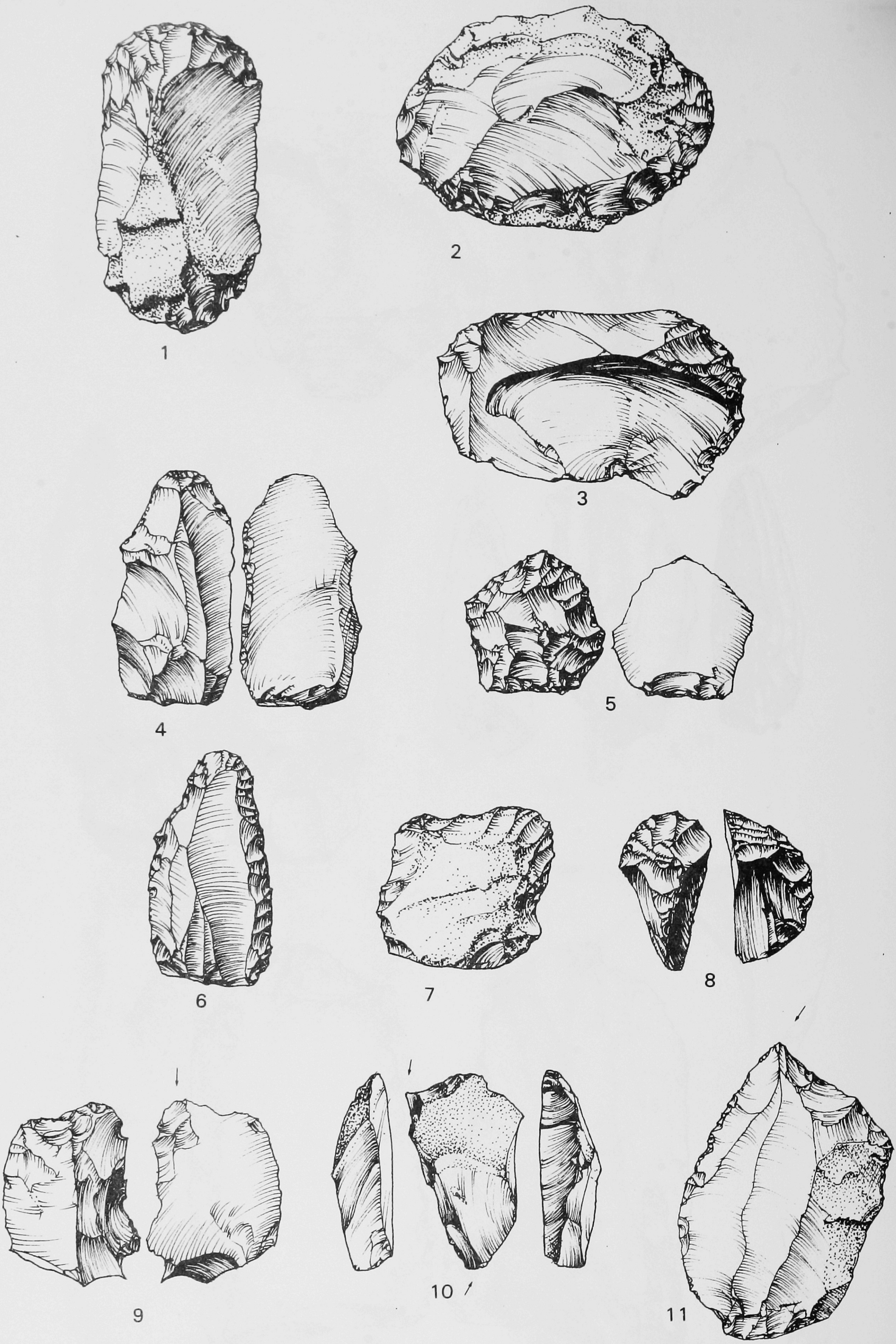


Figure 51

IX E4 7.65

1. end-scraper 2-3. scrapers on lateral edges 4-5. end-scrapers on retouched pieces 6-7. nosed scrapers; 7 is on a lateral edge 8. carinated piece 9, 11. truncation burins 10. multiple mixed burin

(scale 1:1; proximal end down)

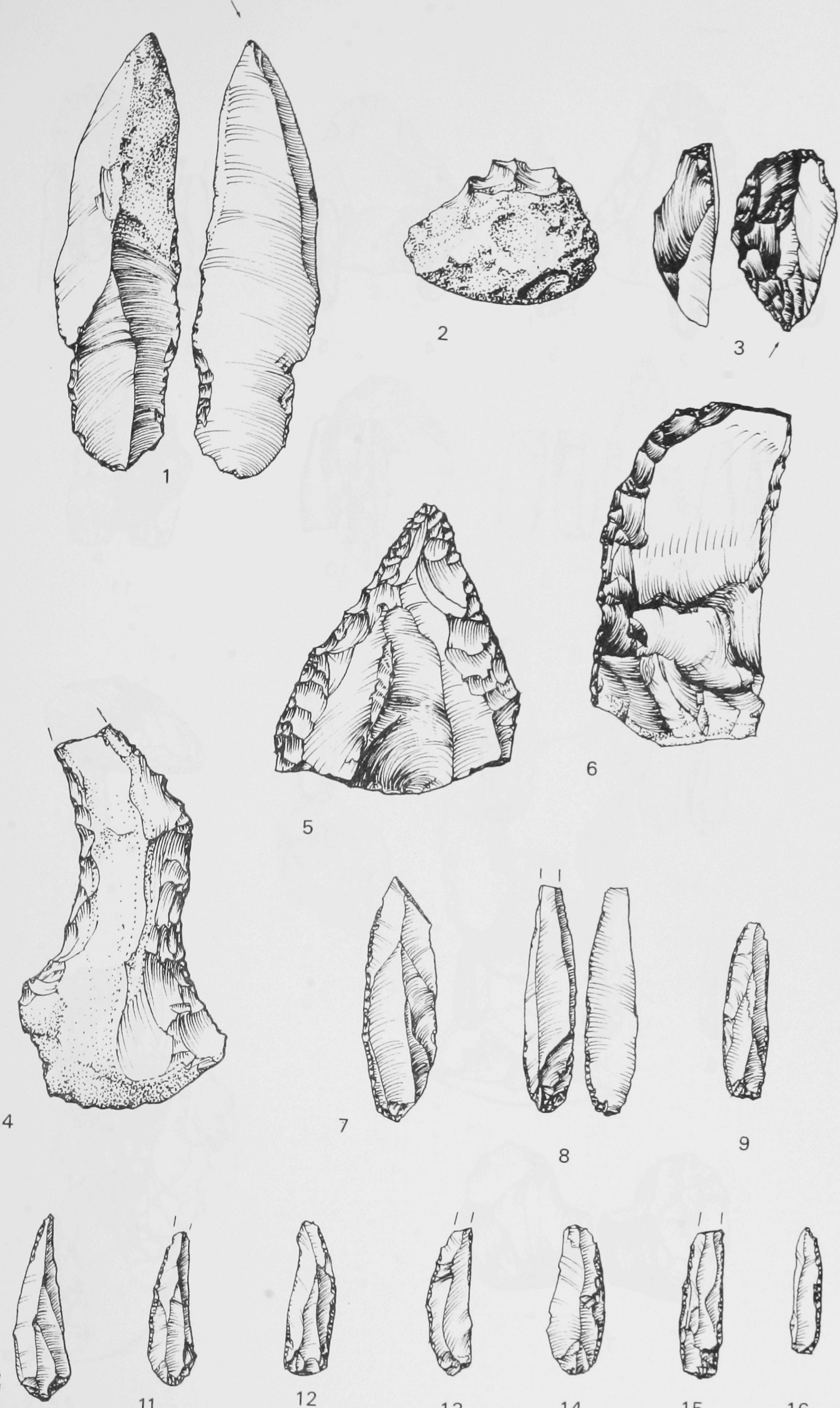


Figure 52

IX E4 7.65

1. truncation burin 2. denticulate 3. burin/scraper 4. strangled blade 5. Mousterian point 6. 'retouched' piece of tabular flint 7-16. retouched blade/lets

(scale 1:1; proximal end down)

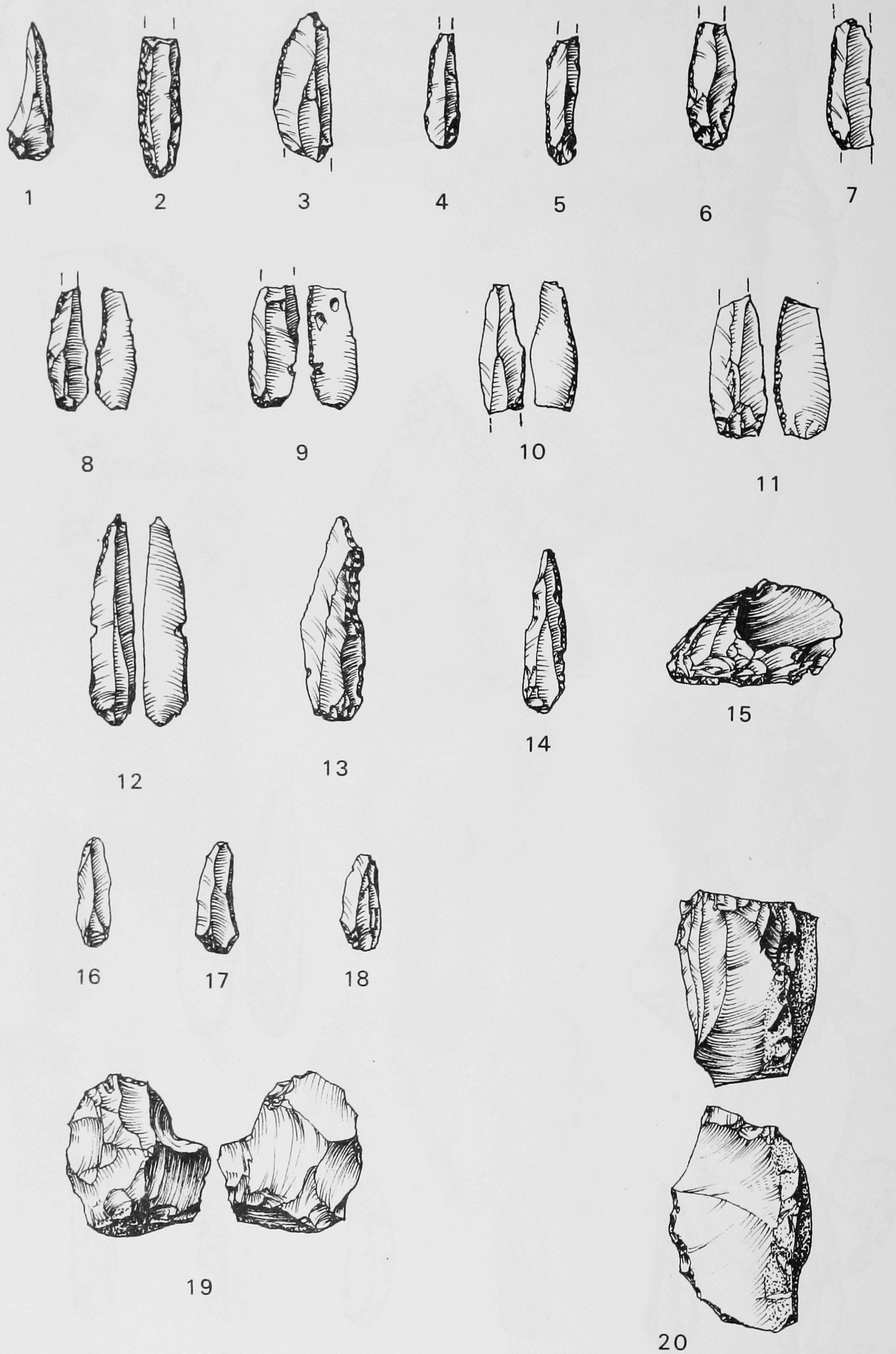


Figure 53

IX E4 7.65

1-11. retouched blade/lets 12-14. el-Wad points 15. flake removed from the side of a scraper 16-18. 'chips' from platform abrasion; these pieces have straight profiles 19-20. blade/let cores

(scale 1:1; proximal end down)

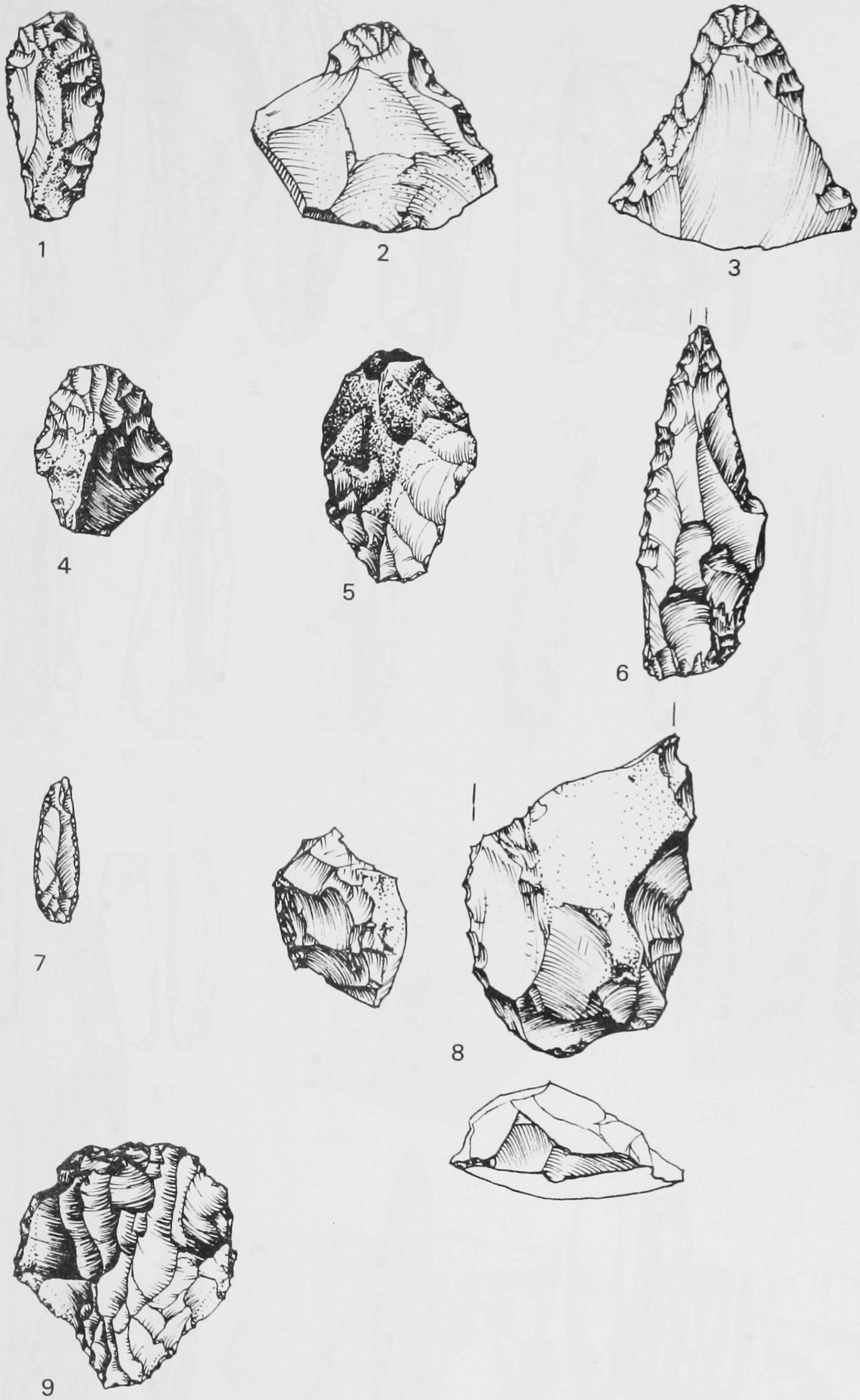


Figure 54

IX E4 7.55

1-3. end-scrapers on retouched pieces 4-5. carinated pieces 6. piercer (?) 7. retouched bladelet 8. retouched flake 9. blade/let core made on a piece of tabular flint

(scale 1:1; proximal end down)

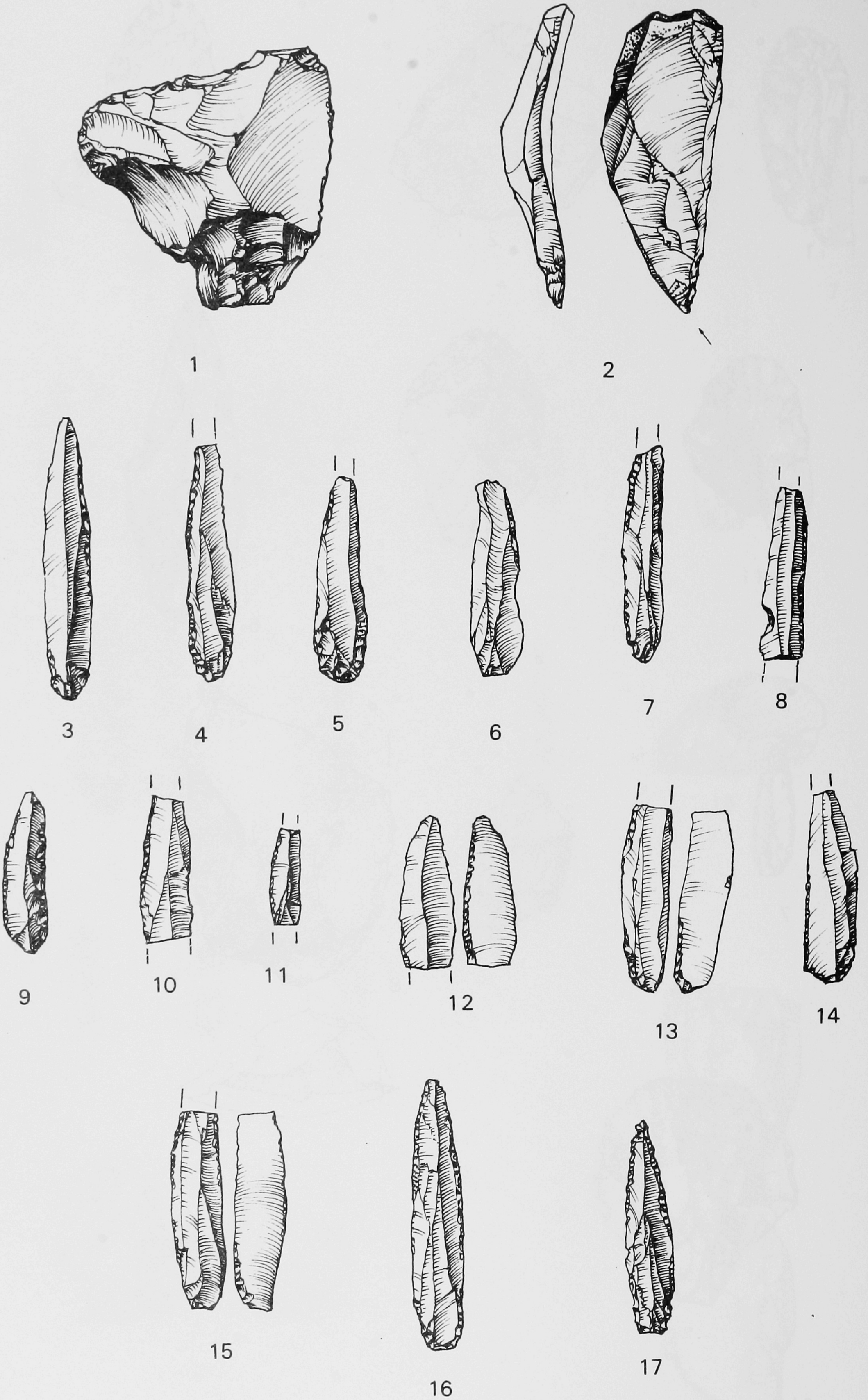


Figure 55

IX F4 7.25

1. scraper made on a lateral edge 2. truncation burin 3-15. retouched blade/lets 16-17. el-Wad points

(scale 1:1; proximal end down)

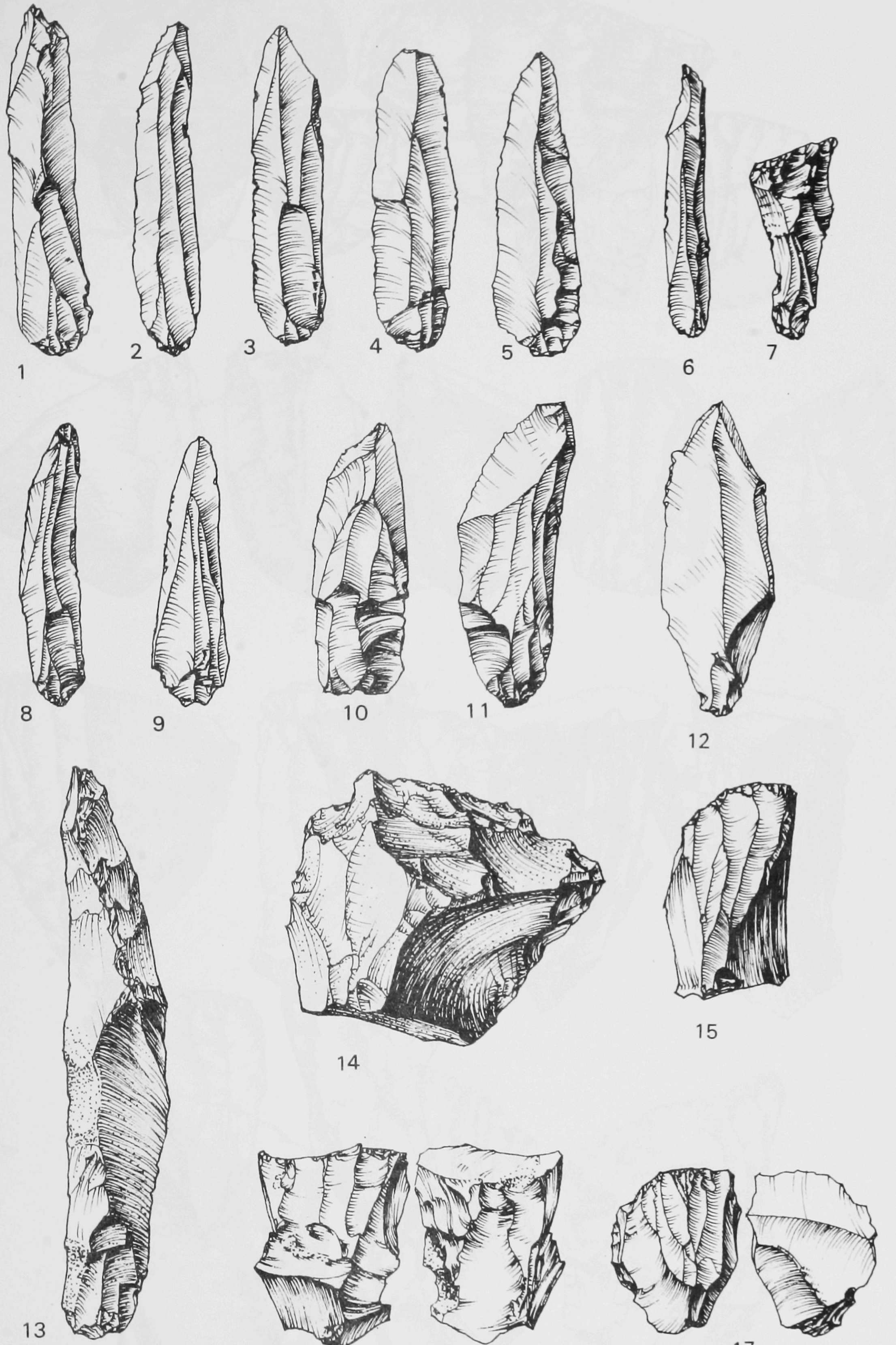


Figure 56

IX F4 7.25

1-12. unretouched blade/lets 13. partially crested blade 14. flake core 15-17. blade/let cores

(scale 1:1; proximal end down)

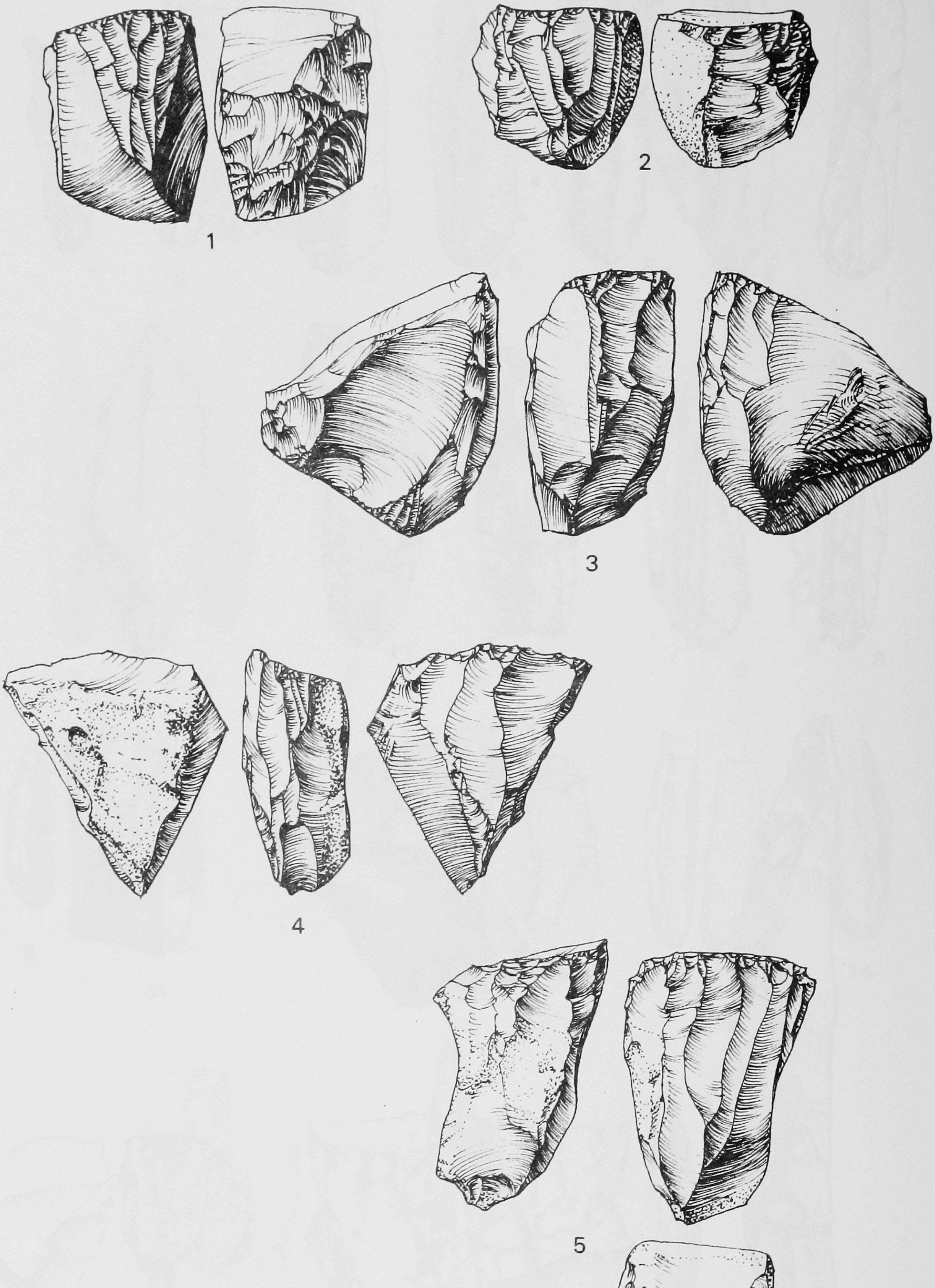


Figure 57

IX F4 7.25

1-5. blade/let cores; 3 is made on a flake

(scale 1:1)

Figure 58

IX F4 7.25

1-4. blade/let cores

(scale 1:1)

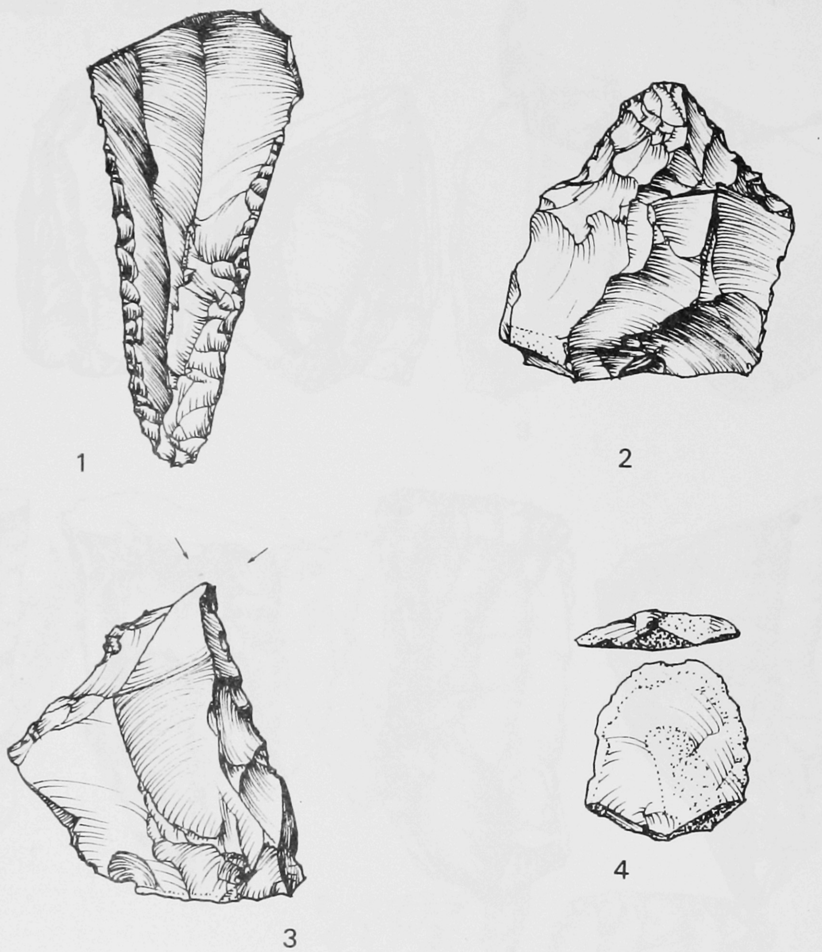


Figure 59

IX E4 7.24

1. end-scraper on a retouched piece 2. nosed scraper 3. dihedral burin 4. 'Janus' flake

(scale 1:1; proximal end down)

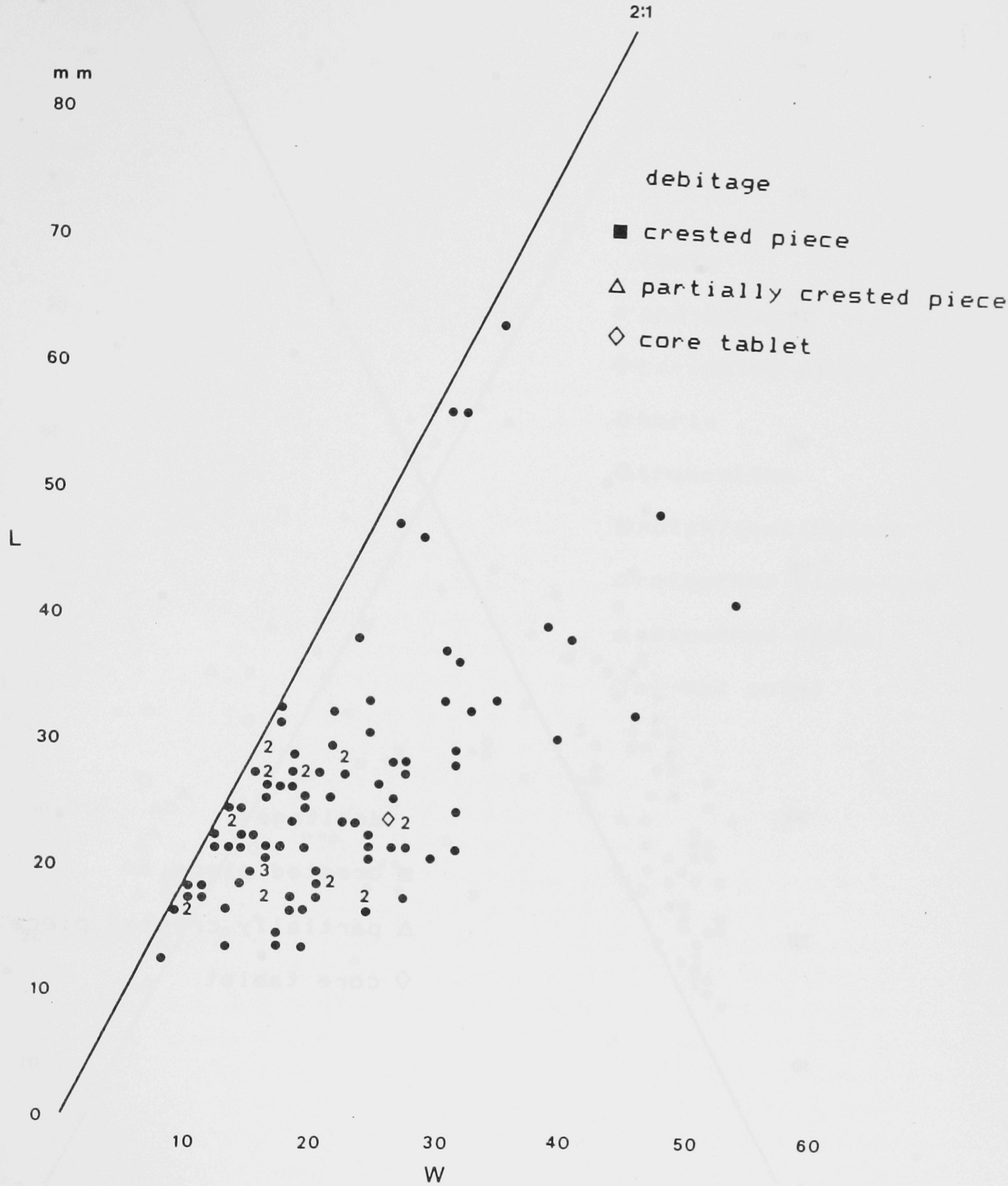


Figure 60

IX E4 7.65

L/W scatter diagram for flakes and core tablets.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

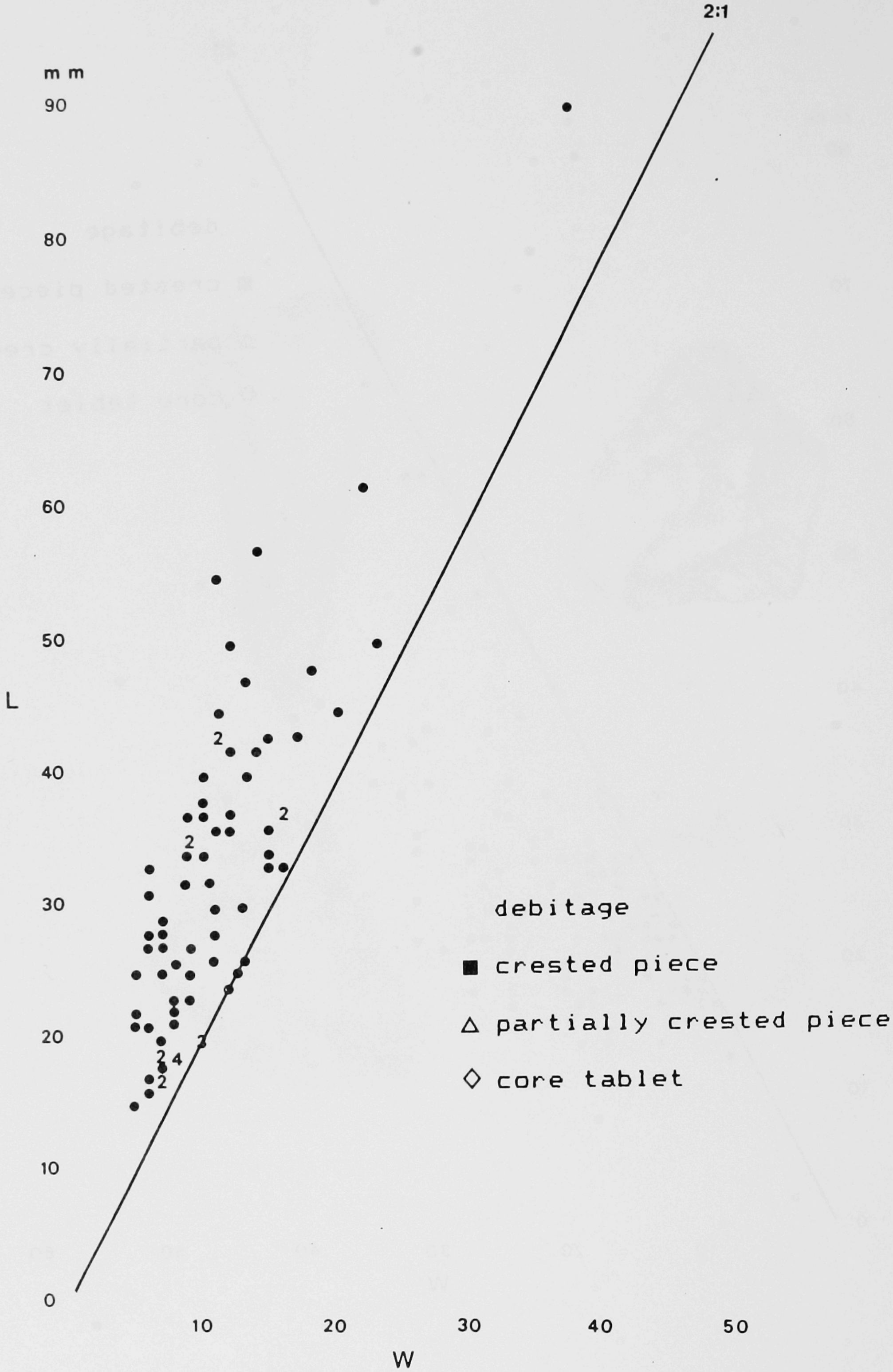


Figure 61

IX E4 7.65

L/W scatter diagram for blade/lets and crested pieces.

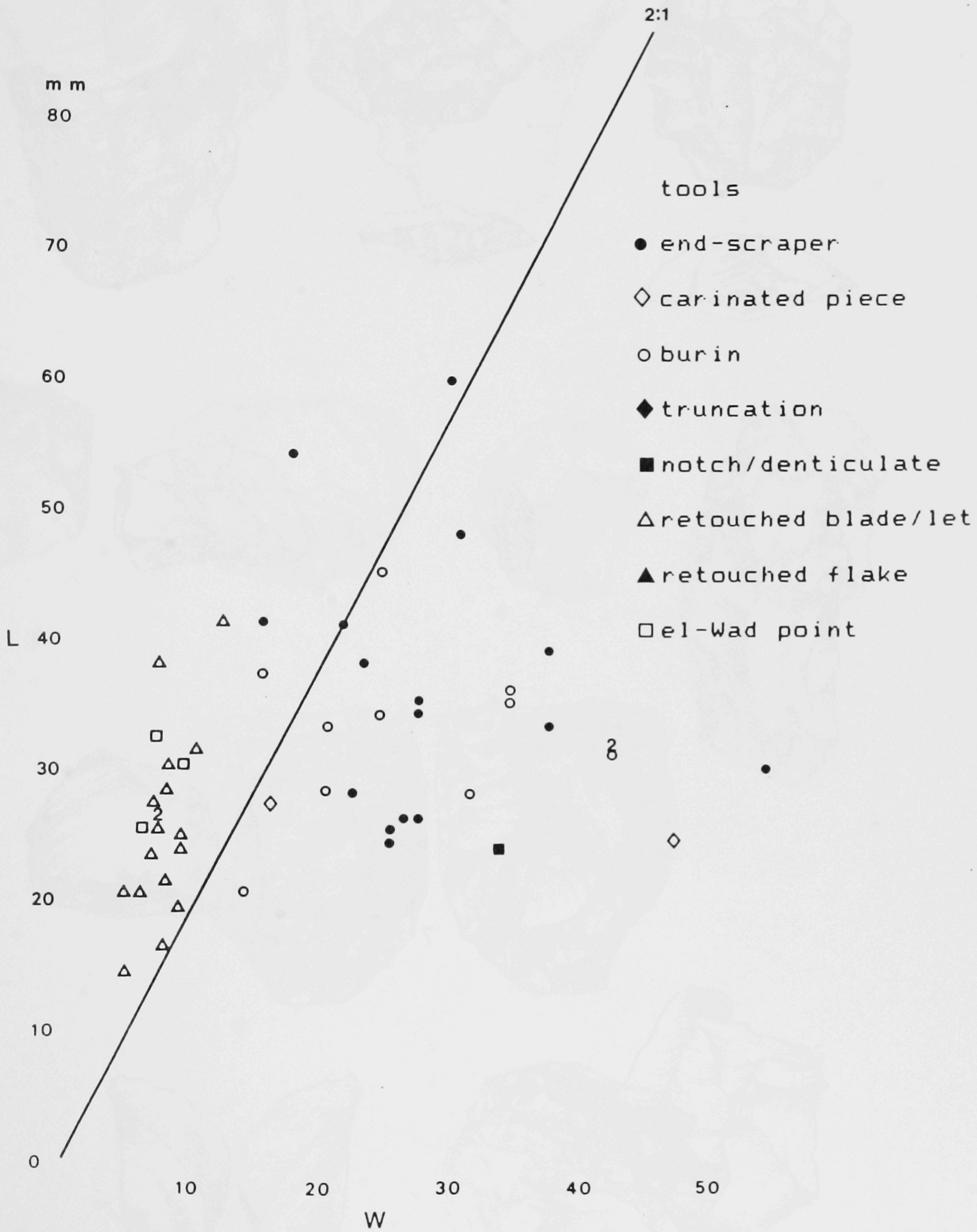


Figure 62

IX E4 7.65

L/W scatter diagram for tools.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

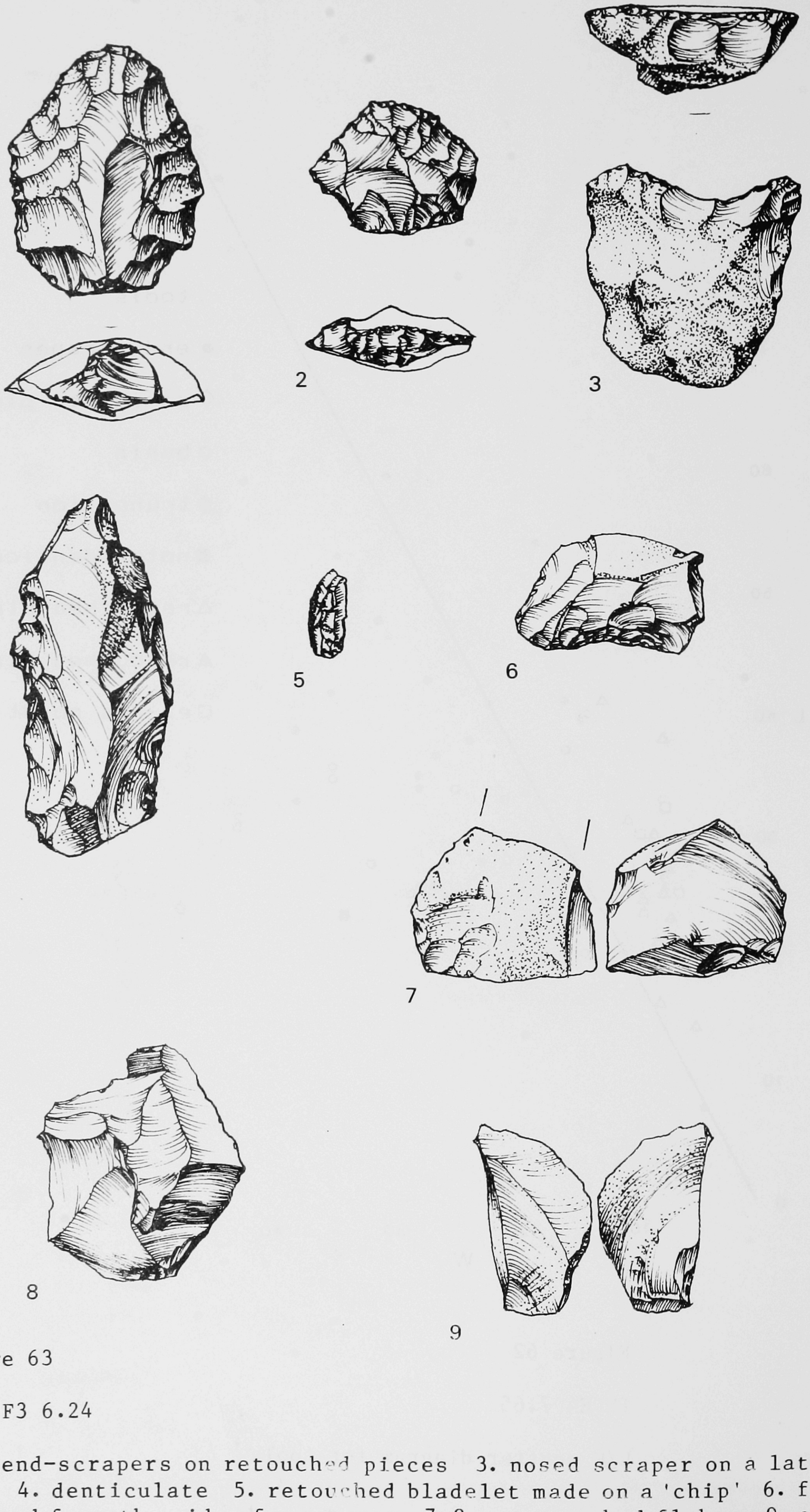


Figure 63

VIII F3 6.24

1-2. end-scrapers on retouched pieces 3. nosed scraper on a lateral edge 4. denticulate 5. retouched bladelet made on a 'chip' 6. flake removed from the side of a scraper 7-8. unretouched flakes 9. accident Siret

(scale 1:1; proximal end down)

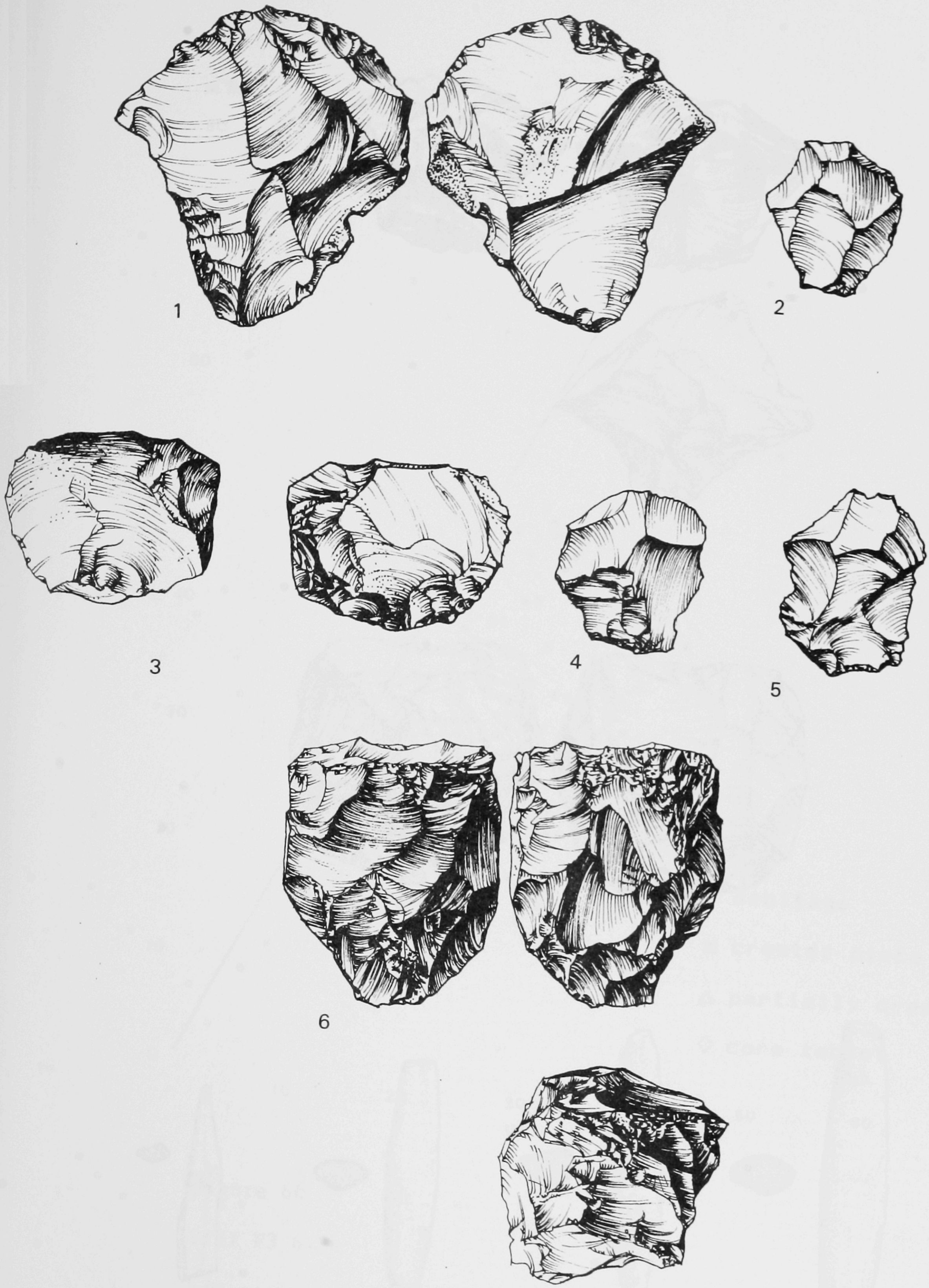


Figure 64

VIII F3 6.24

1. plunging flake 2-5. unretouched flakes; 3 has two points of percussion 6. battered flake core

(scale 1:1; proximal end down)

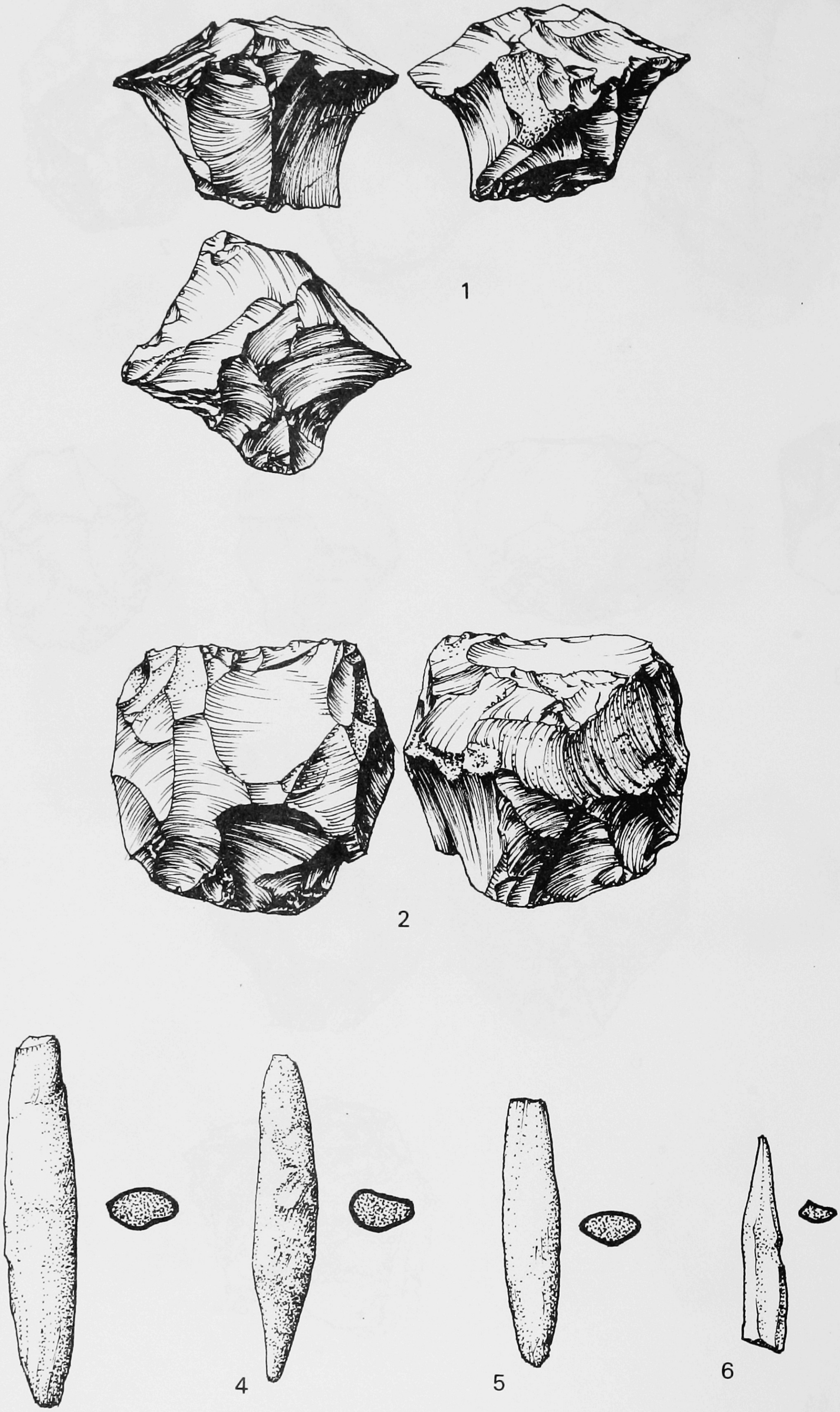


Figure 65

VIII F3 6.24

1-2. multiplatformed flake cores 3-5. bone or antler points 6. bone awl

(scale 1:1)

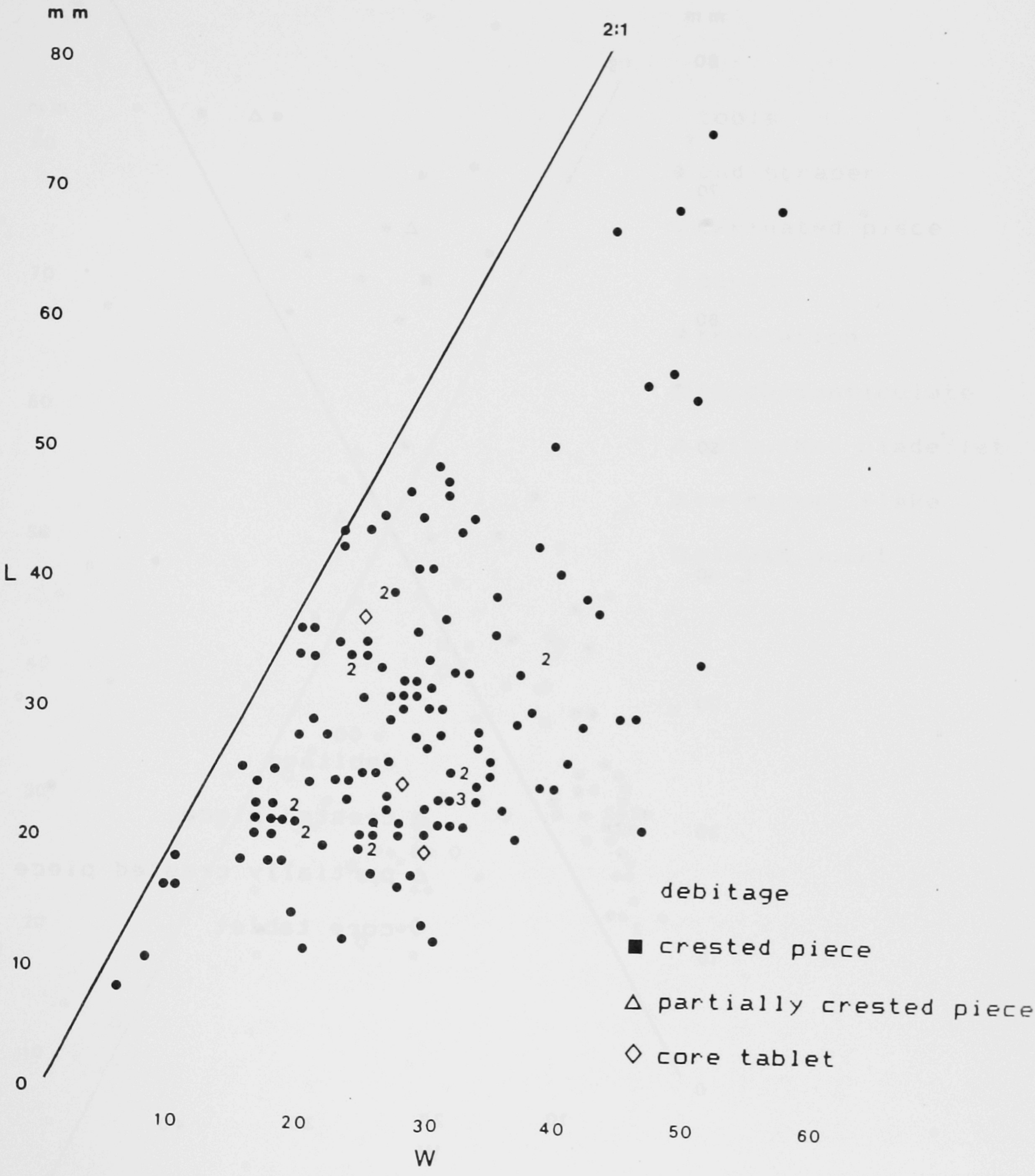


Figure 66

VIII F3 6.24

L/W scatter diagram for flakes and core tablets.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

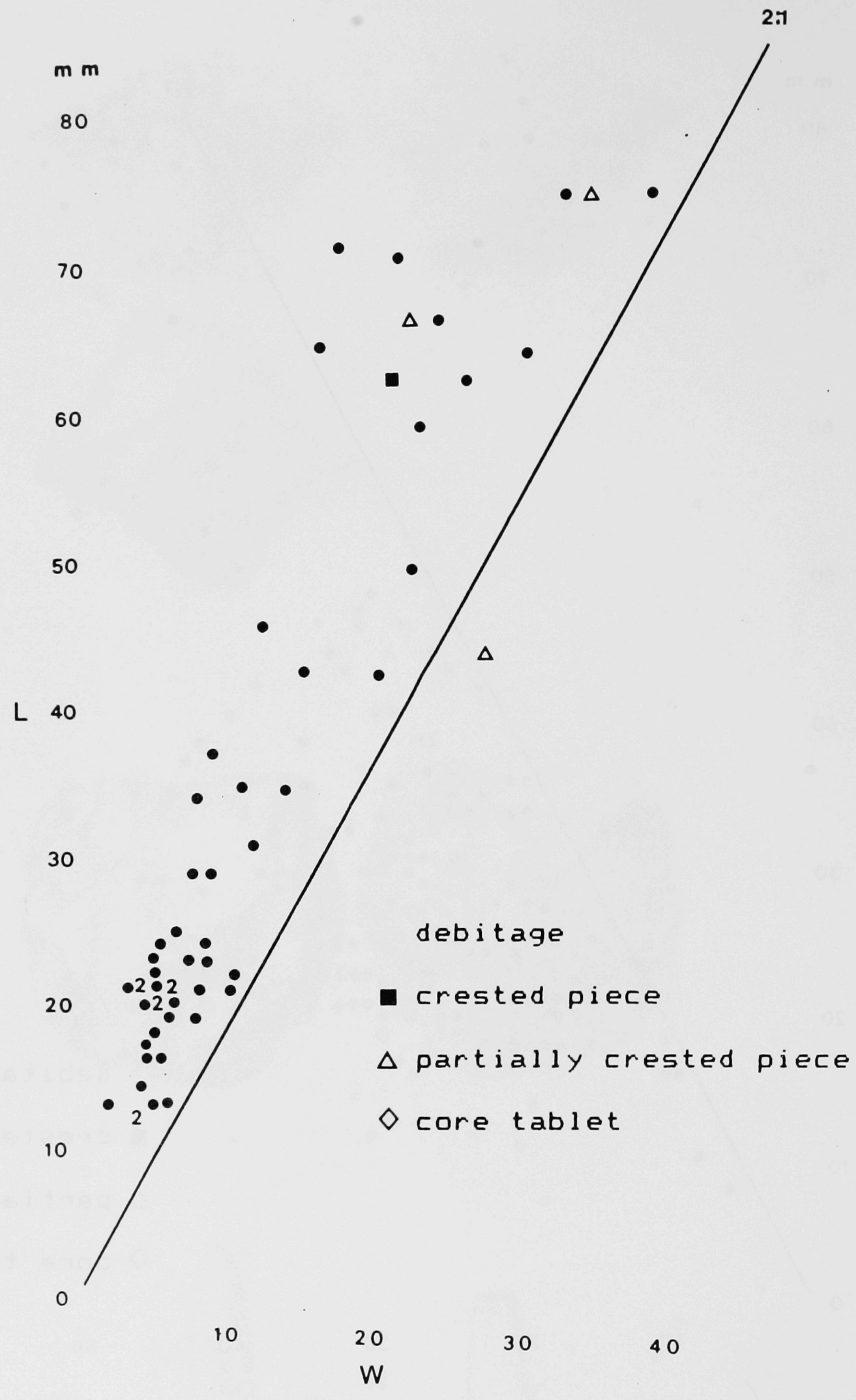


Figure 67

VIII F3 6.24

L/W scatter diagram for blade/lets and crested pieces.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

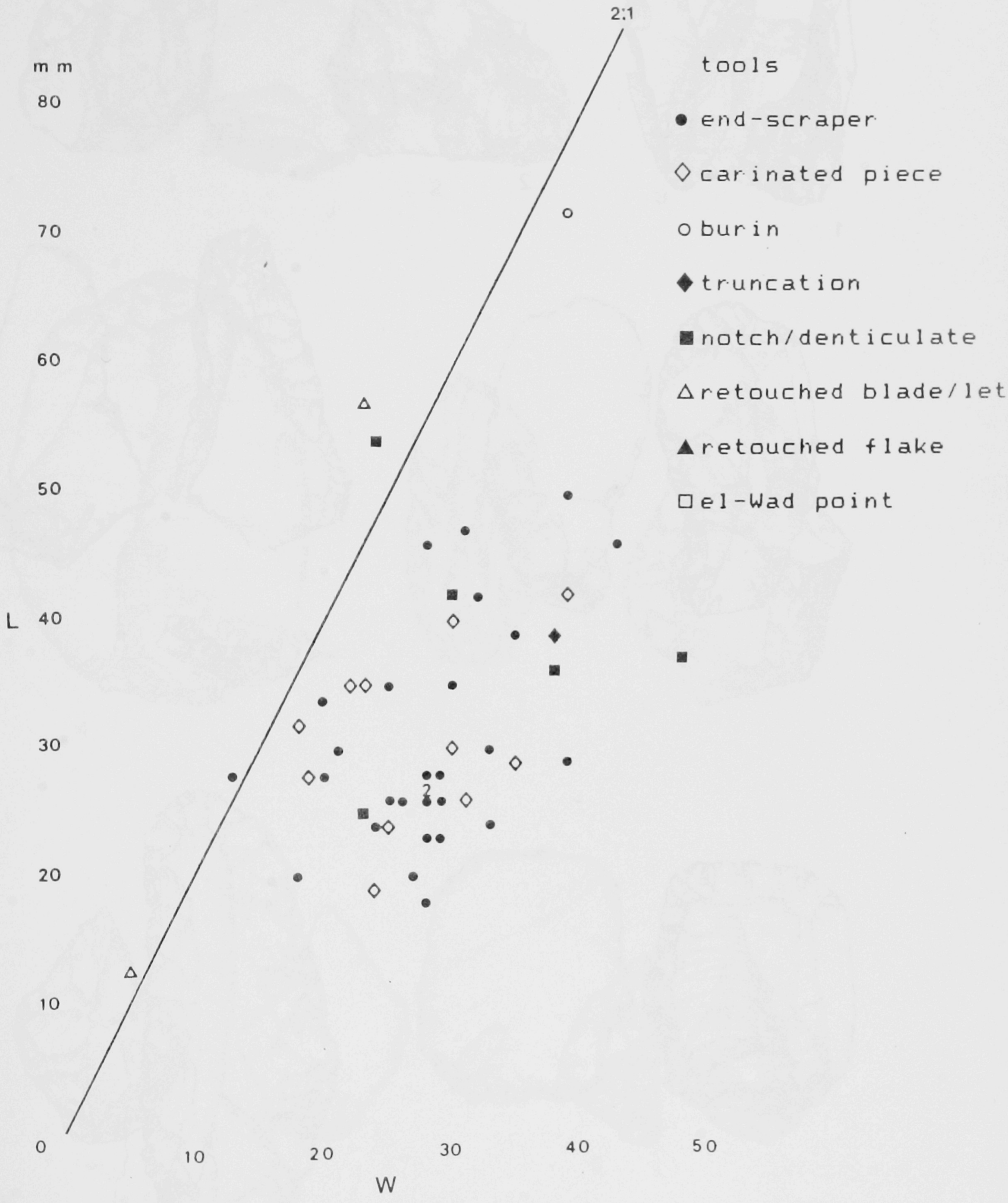


Figure 68

VIII F3 6.24

L/W scatter diagram for tools.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

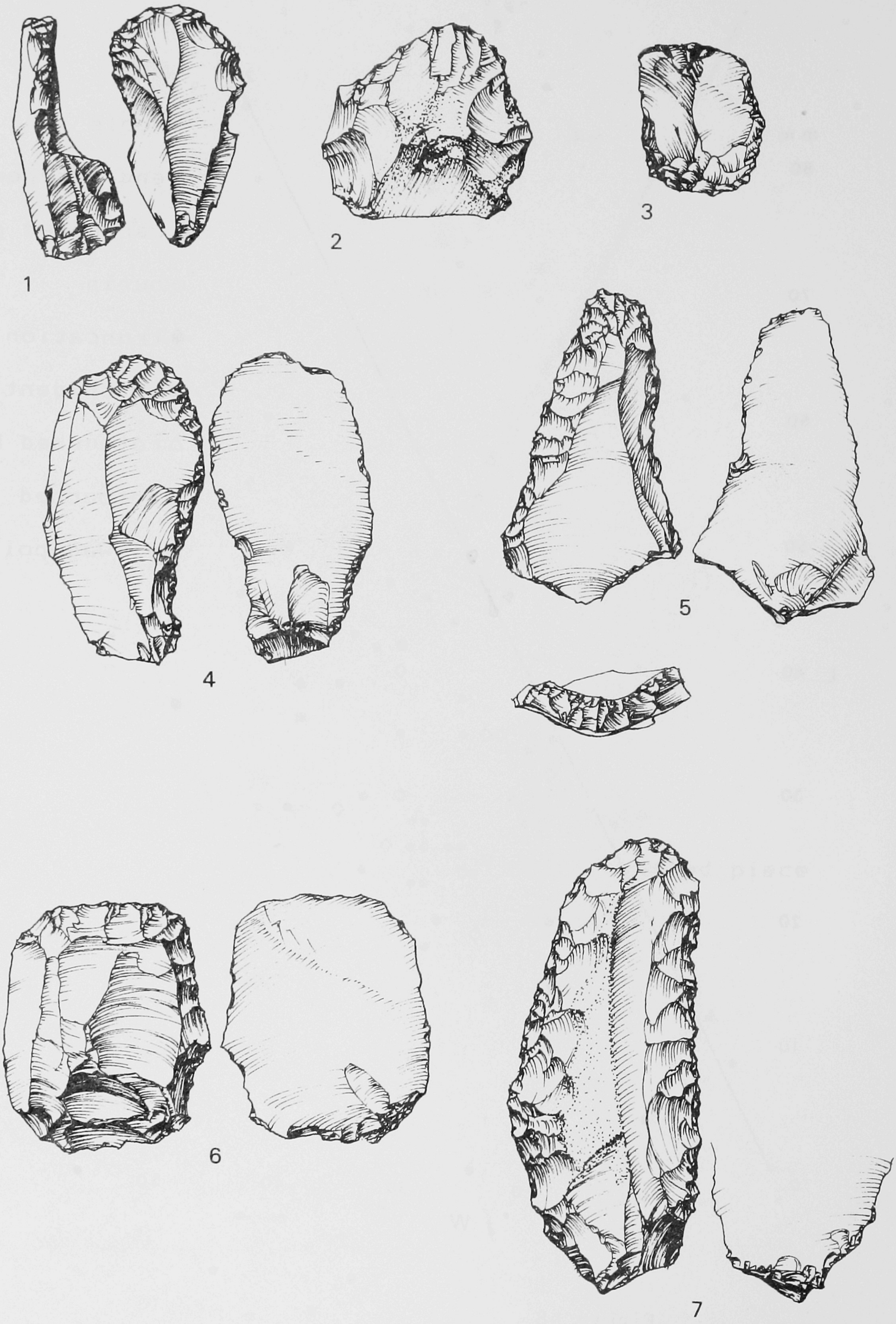


Figure 69

VII F4

1-3. end-scrapers 4-6. end-scrapers on retouched pieces 7. end-scraper on an Aurignacian blade

(scale 1:1; proximal end down)

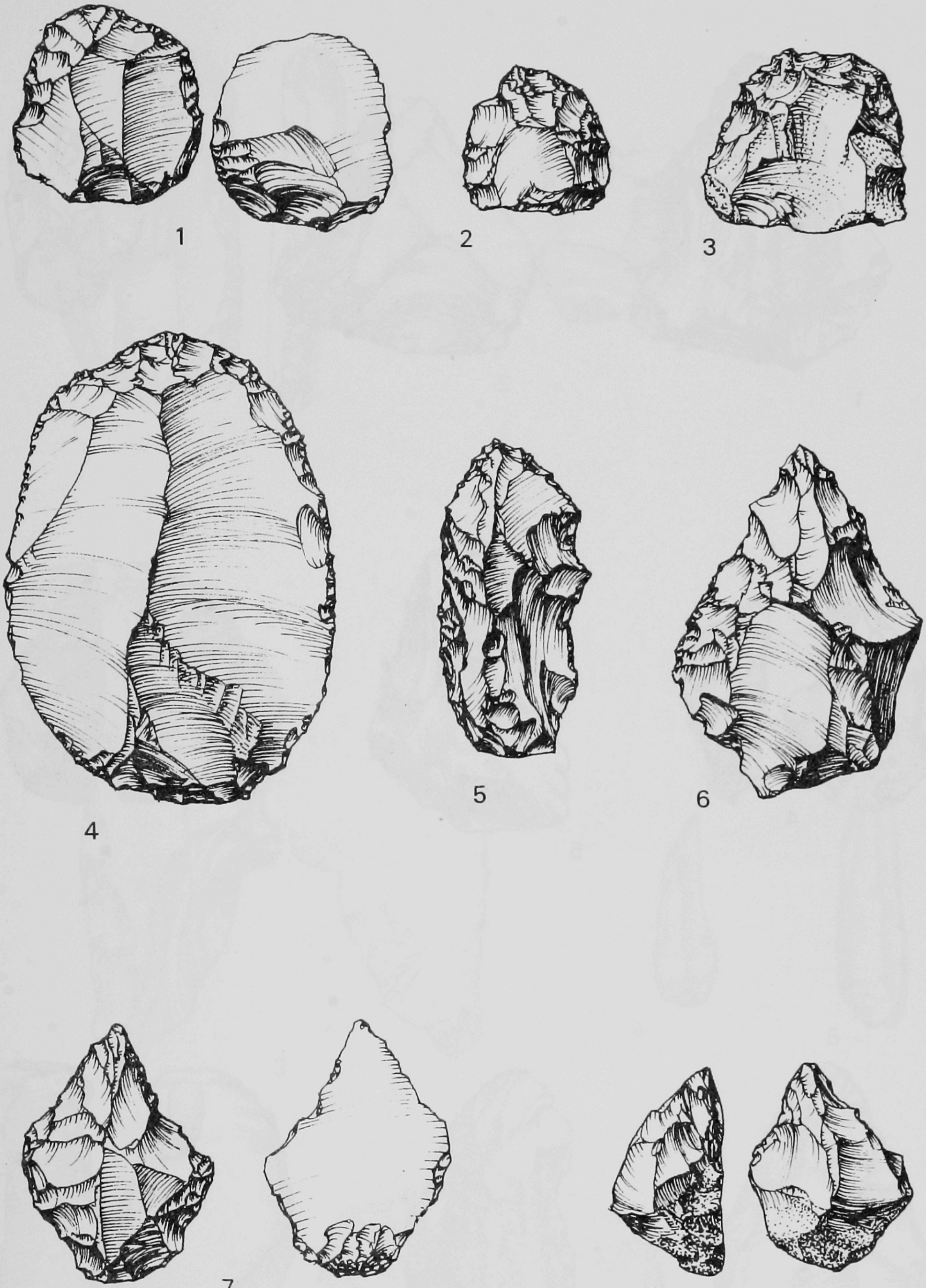


Figure 70

VII F4

1-3, 5. end-scrapers on retouched pieces; 1 has its butt removed by inverse retouch 4. double end-scraper 6-7. 'rostrate' scrapers 8. nosed scraper

(scale 1:1; proximal end down)

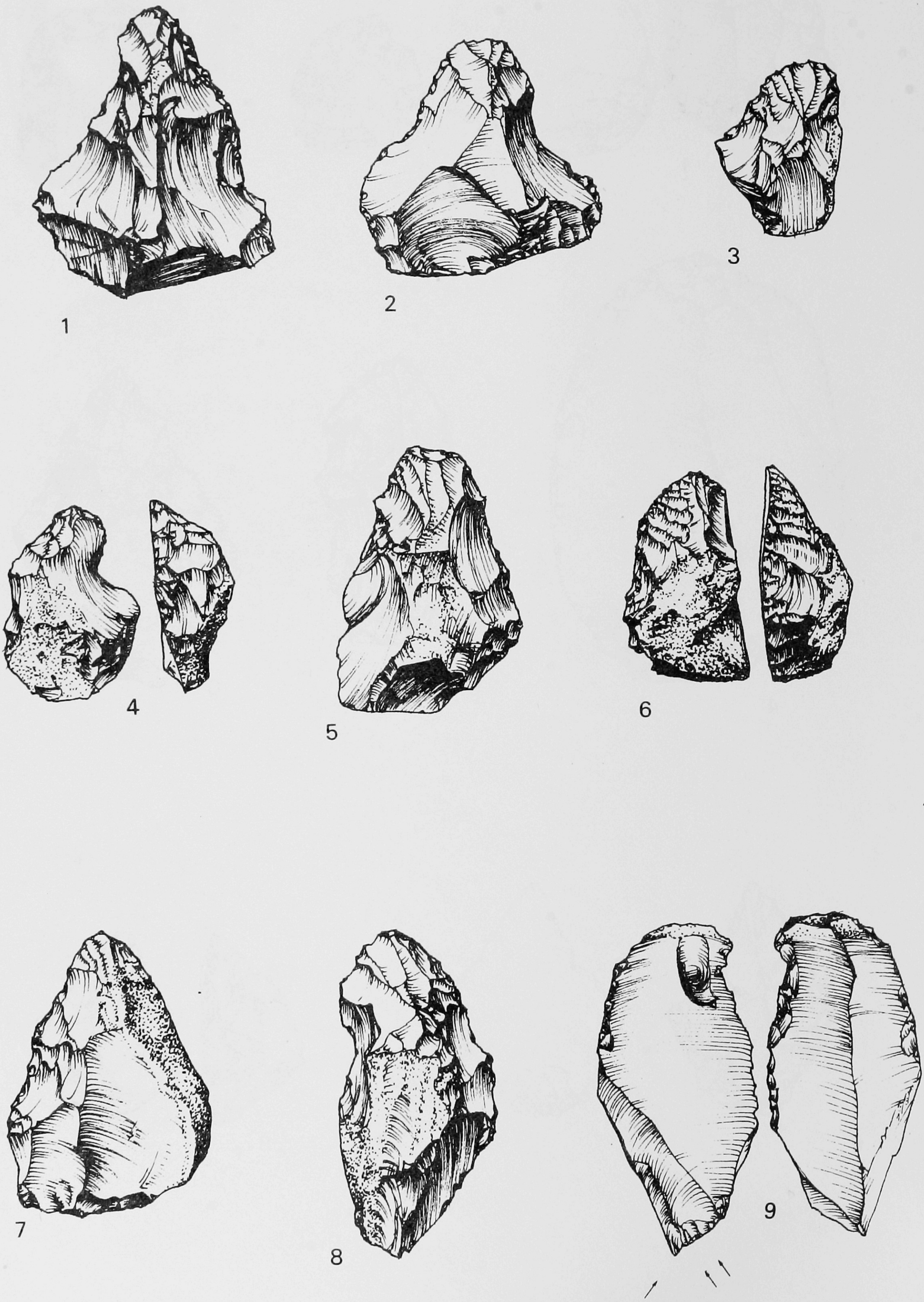


Figure 71

VII F4

1-2, 4. nosed scrapers 3. shouldered scraper 5-8. carinated pieces
9. dihedral burin

(scale 1:1; proximal end down)

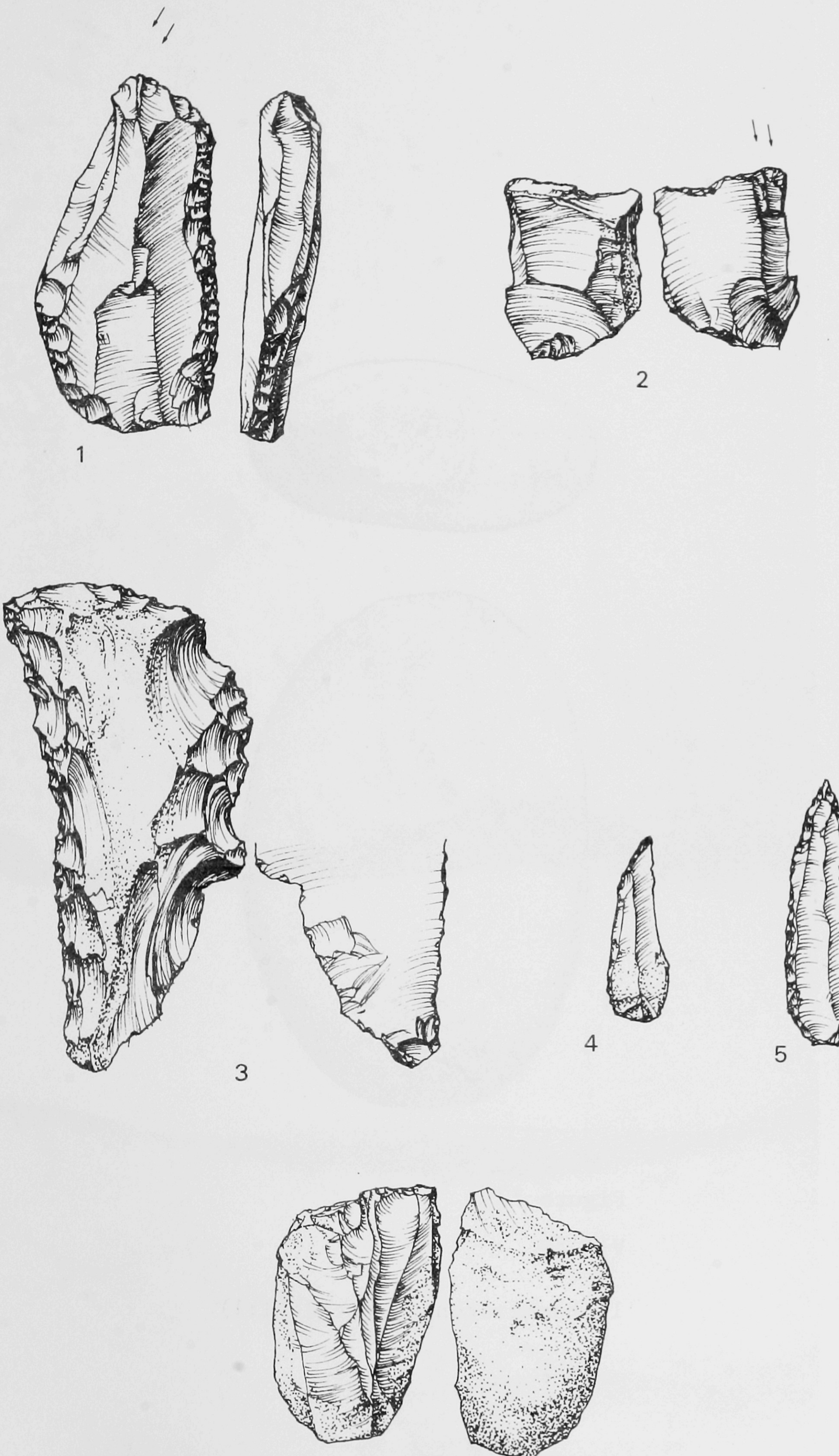
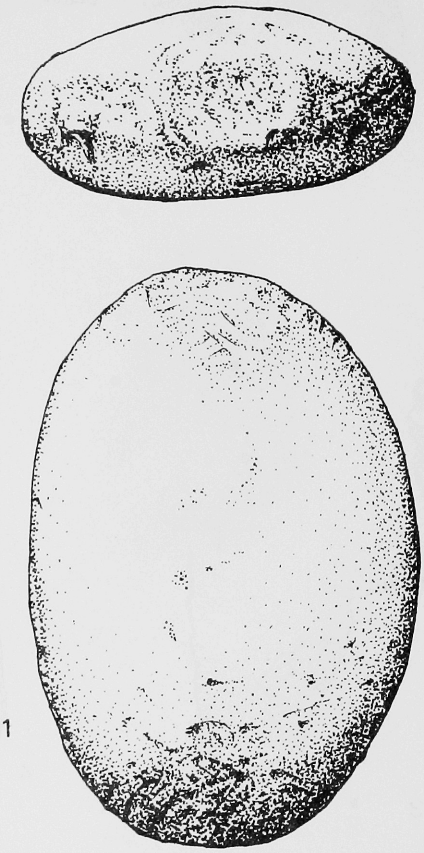


Figure 72

VII F4

1-2. truncation burins 3. backed and denticulated blade 4-5. el-Wad points 6. blade/let core

(scale 1:1; proximal end down)



1

Figure 73

VII F4

1. hammerstone (scale 1:1)

Figure 73a

Ochre grinding slab (scale 1:1) from VII E4. The surface of this piece is flattened and covered with red ochre.

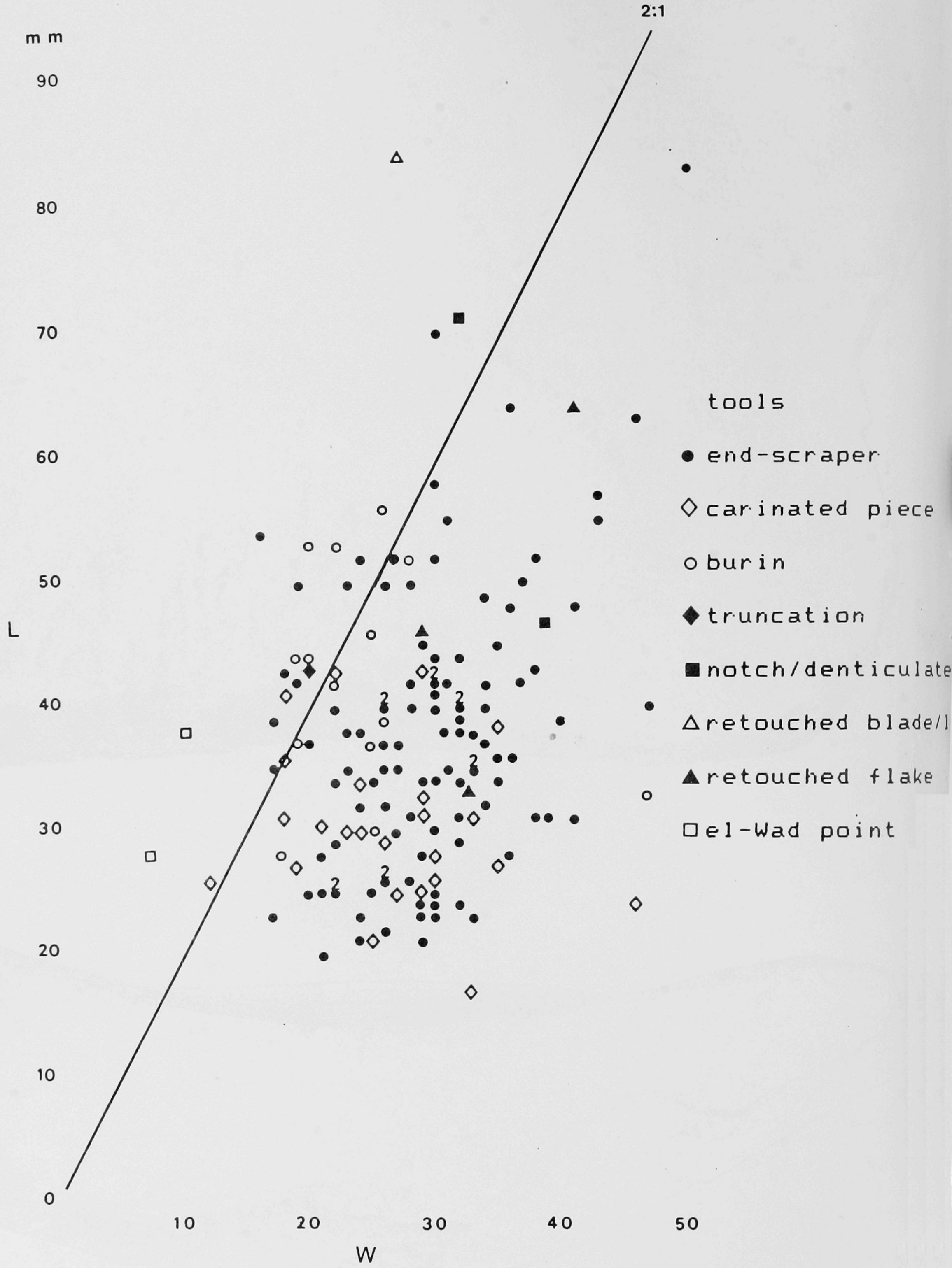


Figure 74

VII F4

L/W scatter diagram for tools.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

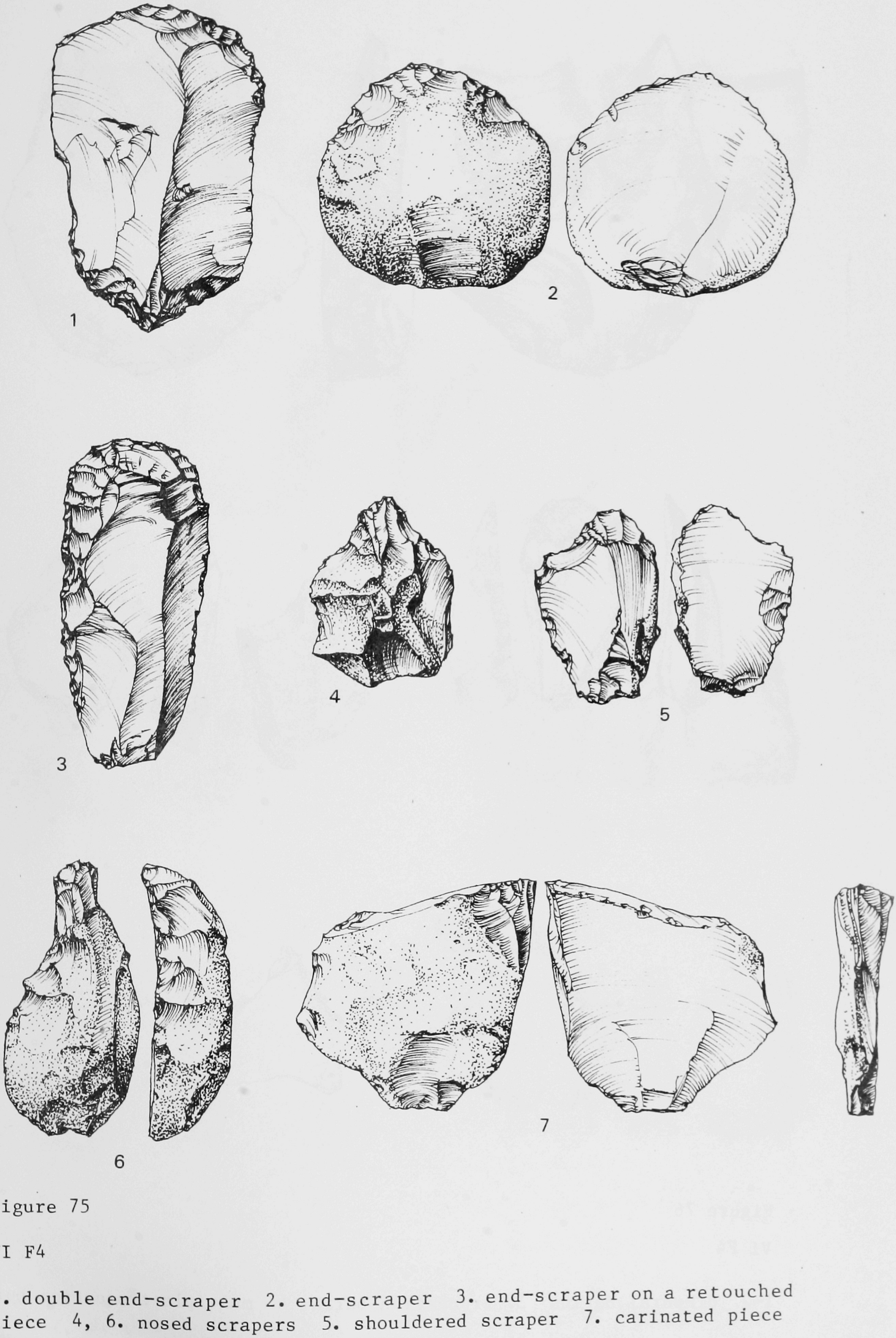


Figure 75

VI F4

1. double end-scraper 2. end-scraper 3. end-scraper on a retouched piece 4, 6. nosed scrapers 5. shouldered scraper 7. carinated piece

(scale 1:1; proximal end down)

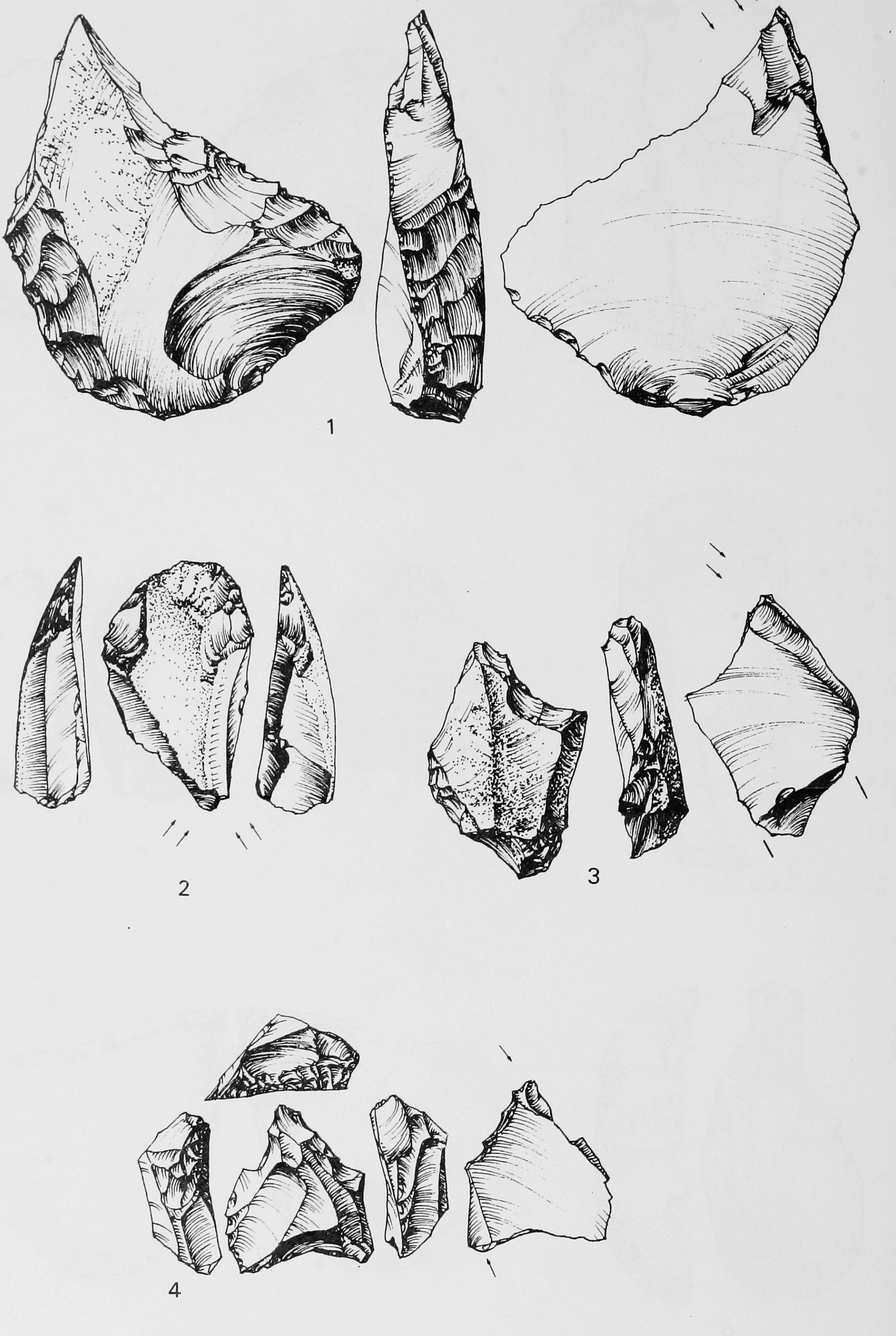


Figure 76

VI F4

1-2. dihedral burins 3. truncation burin 4. multiple truncation burin

(scale 1:1; proximal end down)

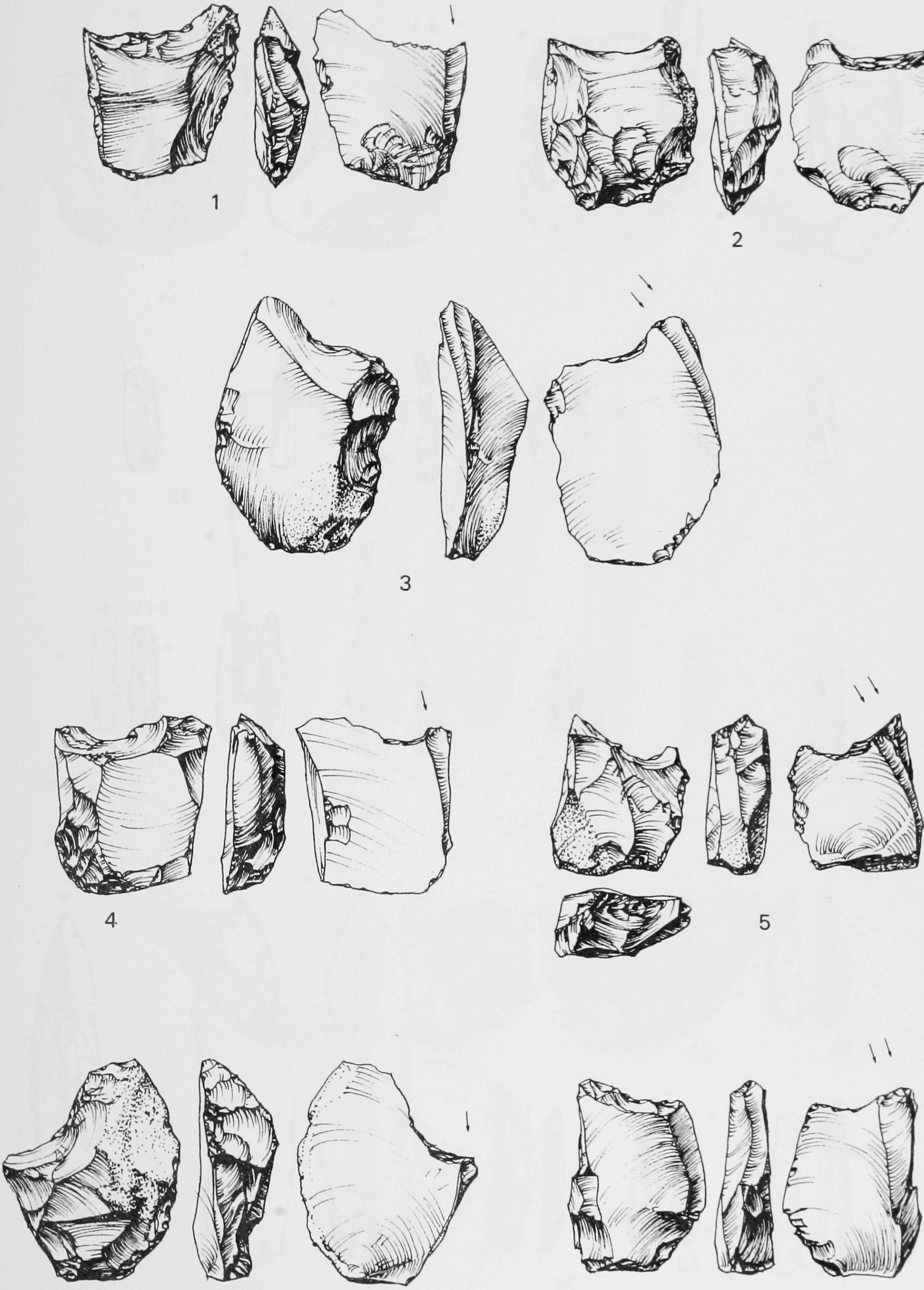


Figure 77

VI F4

1-2, 7. truncation burins   3-6. burins on Clactonian notches

(scale 1:1; proximal end down)

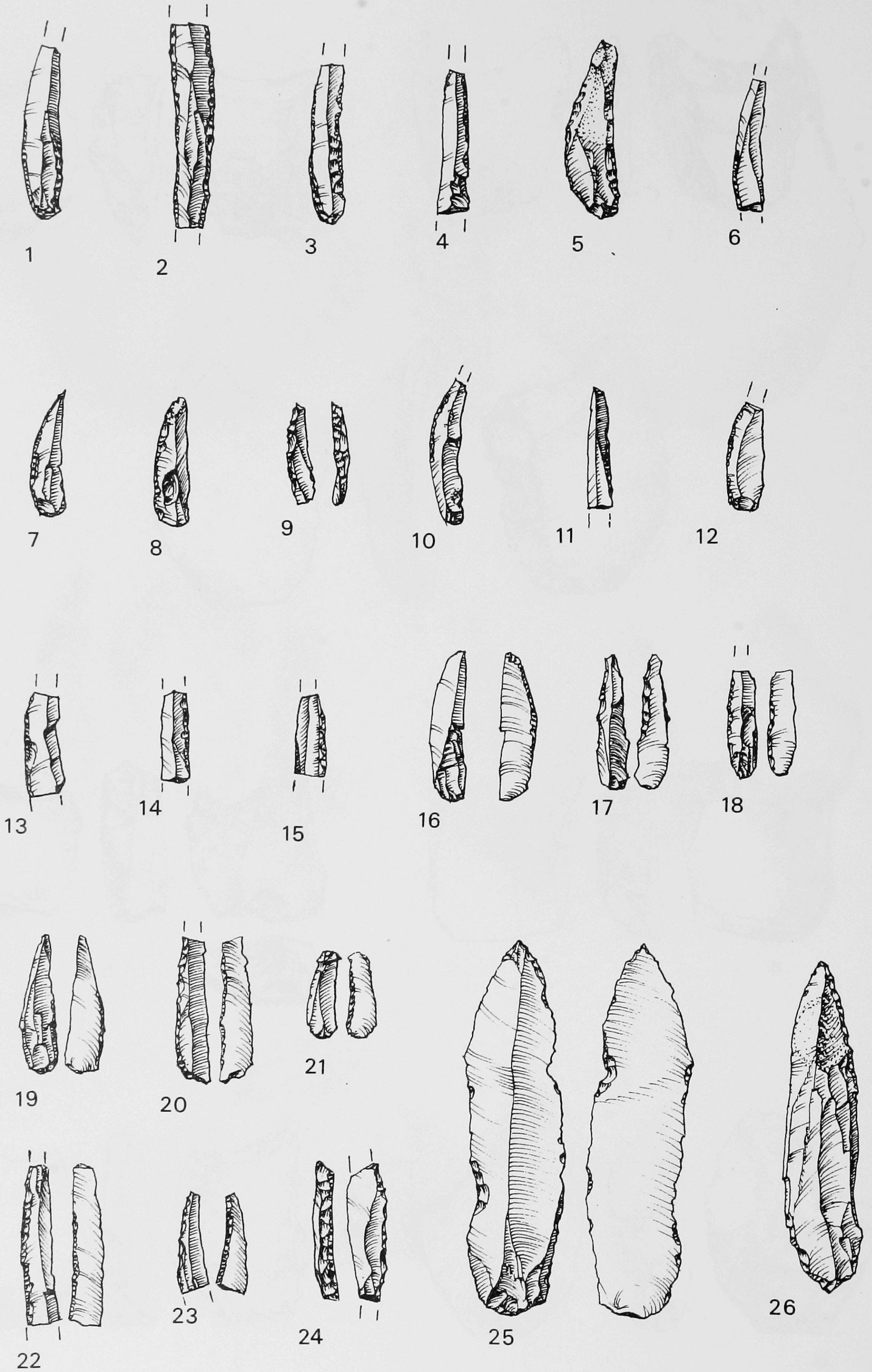


Figure 78

VI F4

1-23. retouched bladelets (microliths and lamelles Dufour) 24. backed bladelet 25-26. el-Wad points

(scale 1:1; proximal end down)

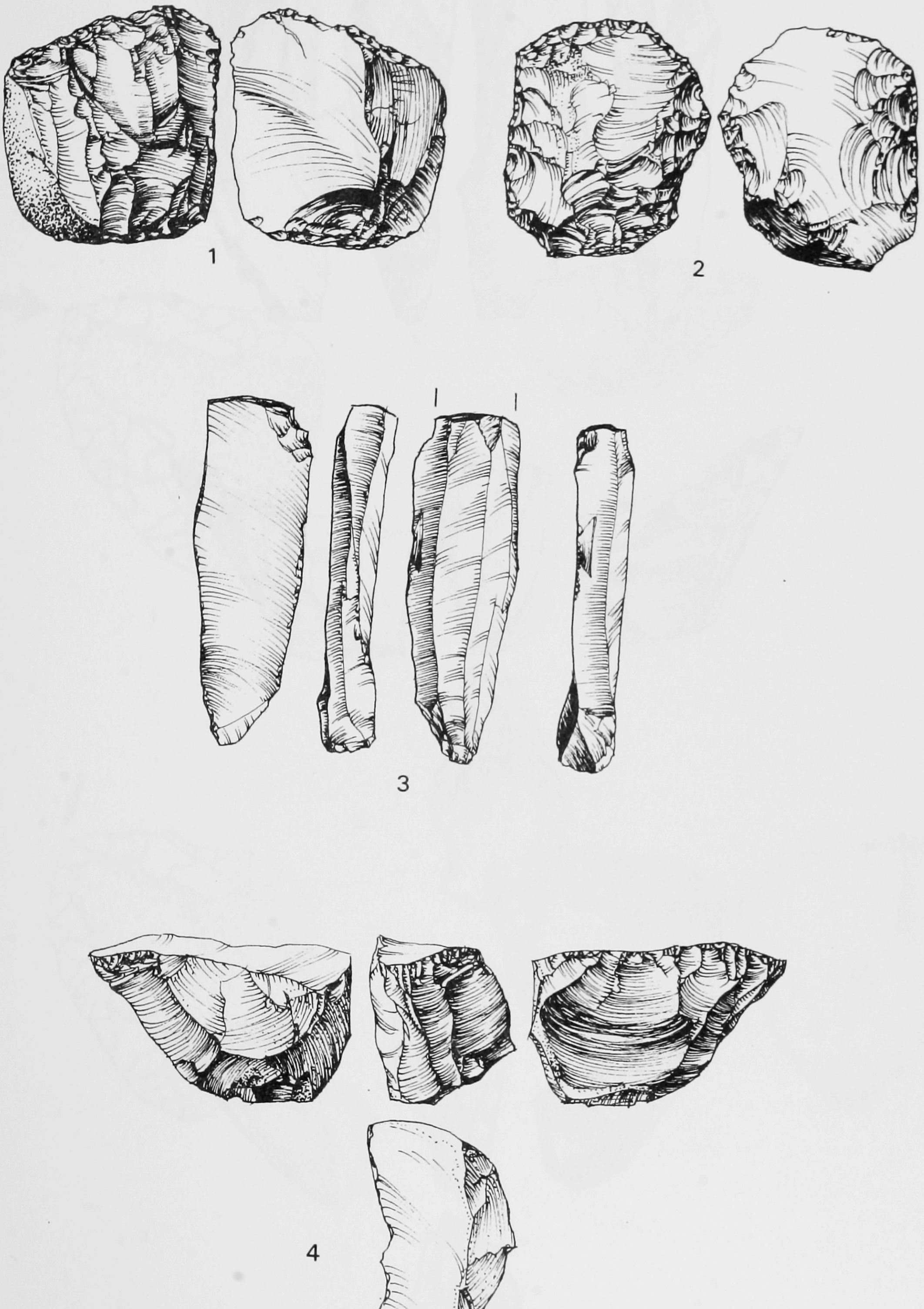
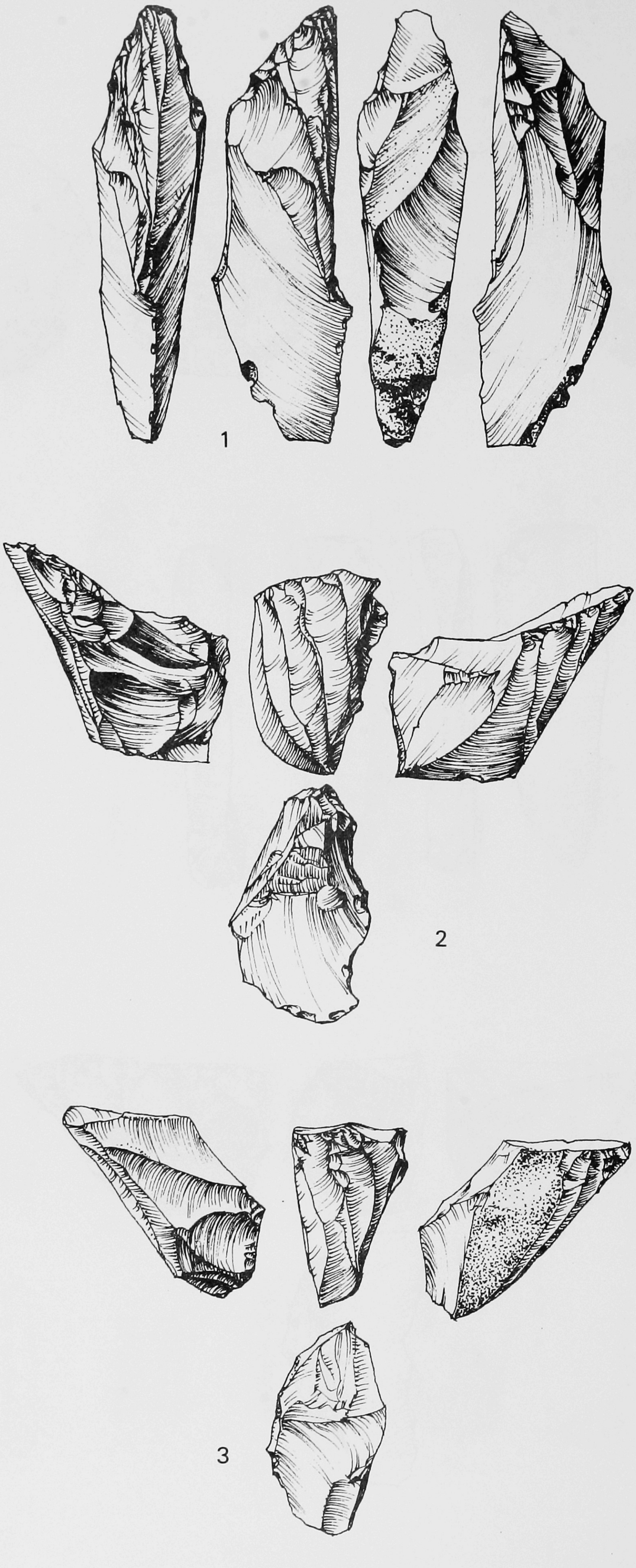


Figure 79

VI F4

1-2. splintered pieces 3. blade with a butt imitating a dihedral burin
4. blade/let core

(scale 1:1; proximal end down)



1

2

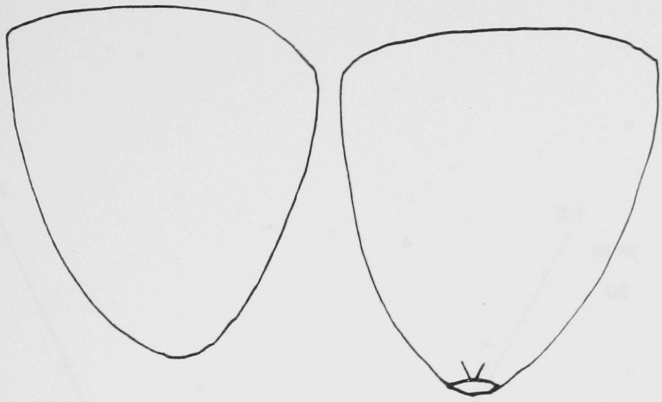
3

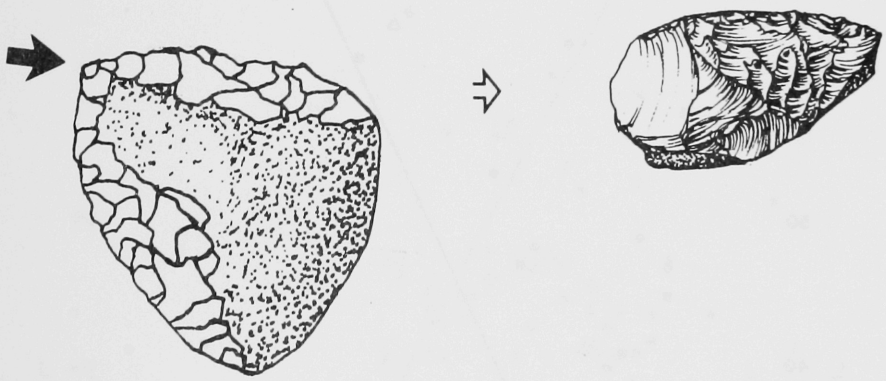
Figure 80

VI F4

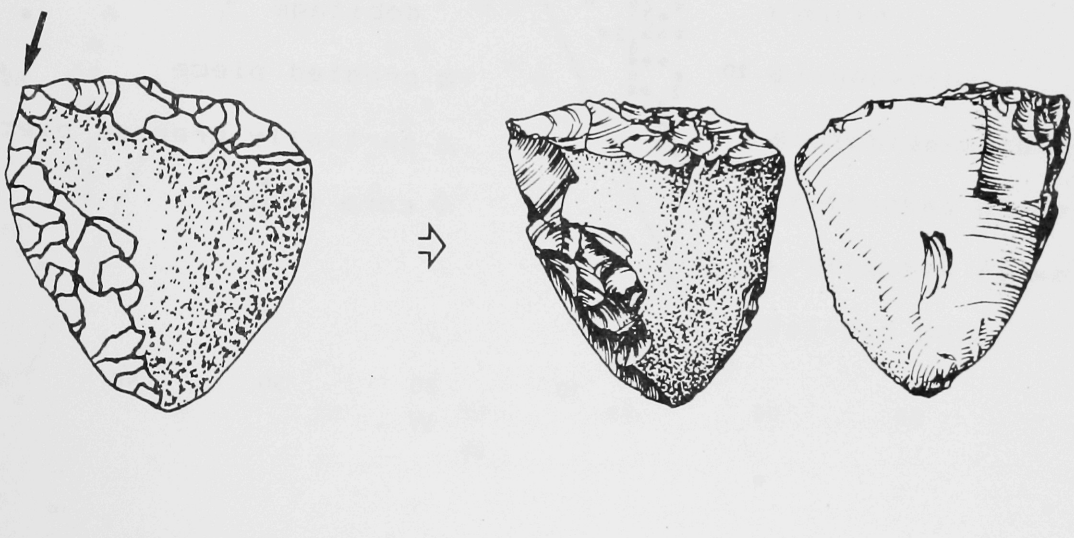
1-3. blade/let cores

(scale 1:1)





1



2

Figure 80a

Schematic drawing of one method used in level VI, as well as other levels in the upper part of the sequence, to prepare a core made on a flake. This method involves retouching the blank along the distal edge and one lateral edge (1). The striking platform is created by a blow at the distal end and debitage proceeds with the removal of a unidirectionally crested blade/let (2). The similarities to the manufacture of burins is obvious and can cause difficulties in classification.

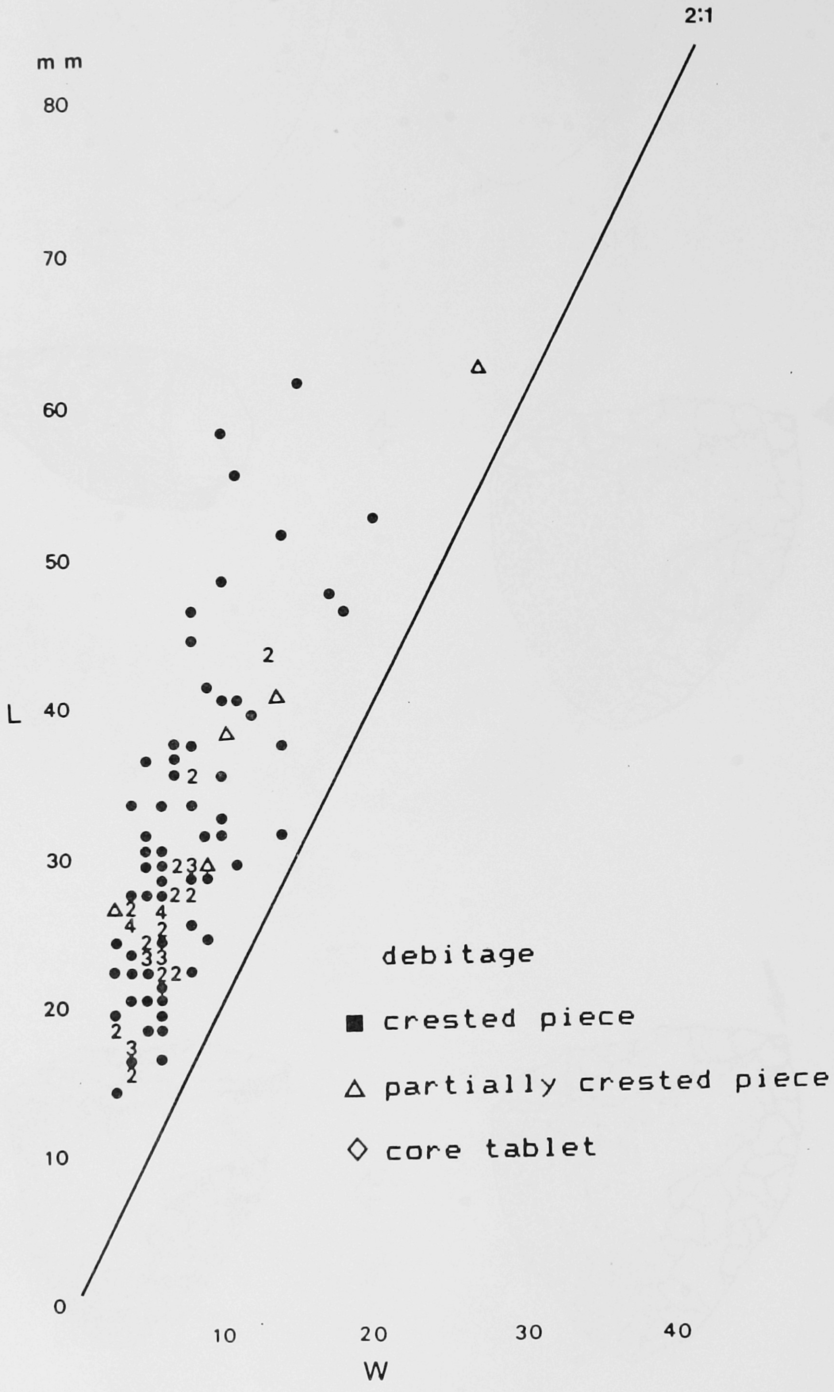


Figure 81

VI F4

L/W scatter diagram for blade/lets and crested pieces.

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

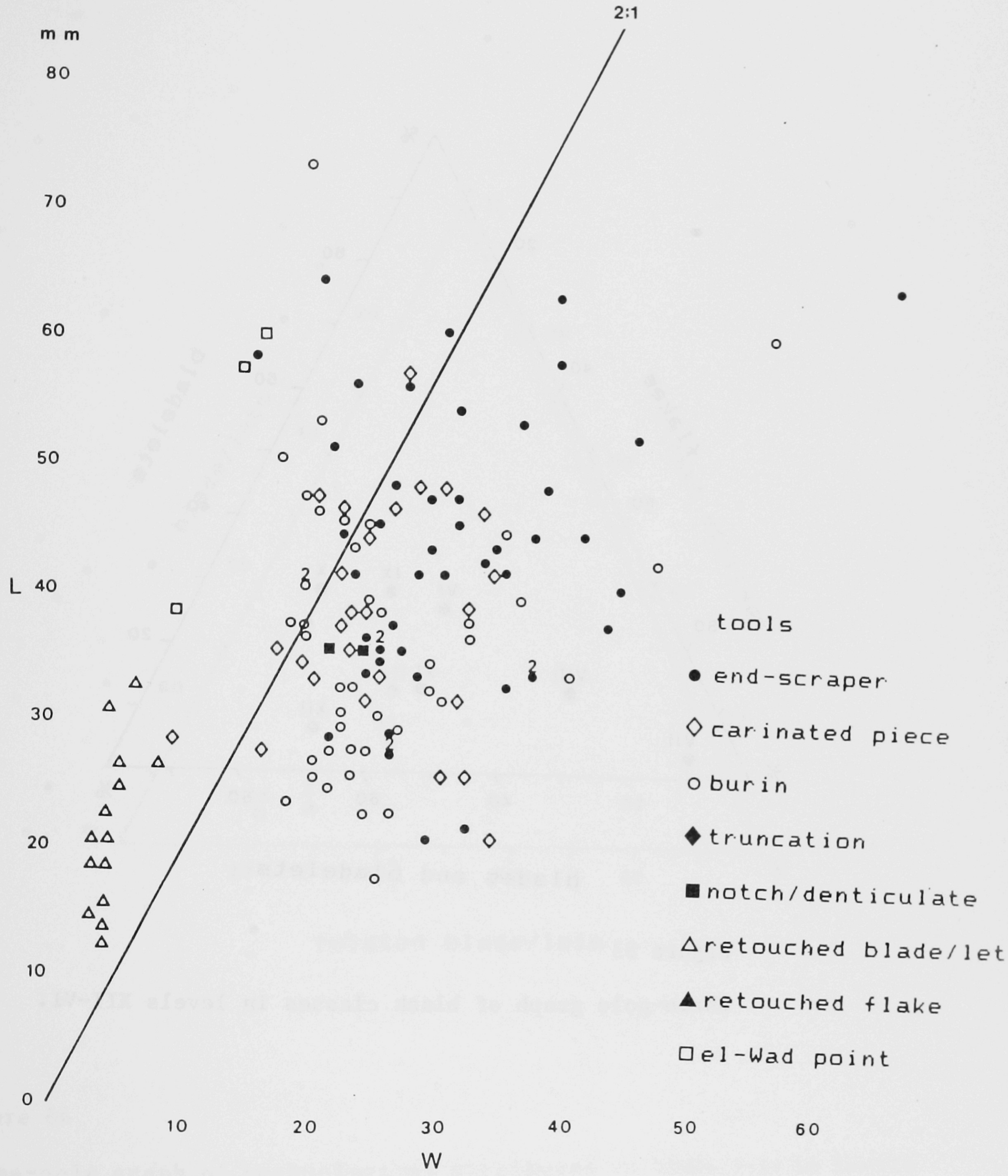


Figure 82

VI F4

L/W scatter diagram for tools

Due to the fact that several classes of artefacts are illustrated on the scatter diagram it was not, in some cases, possible to plot each individual piece.

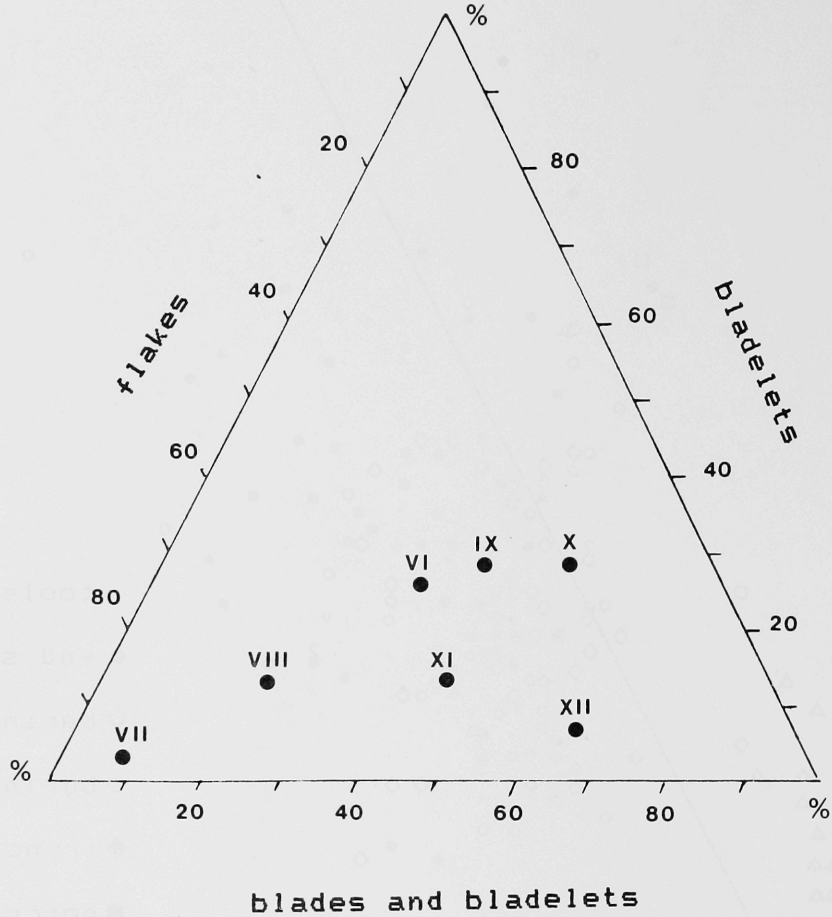


Figure 83

Three-pole graph of blank classes in levels XII-VI.

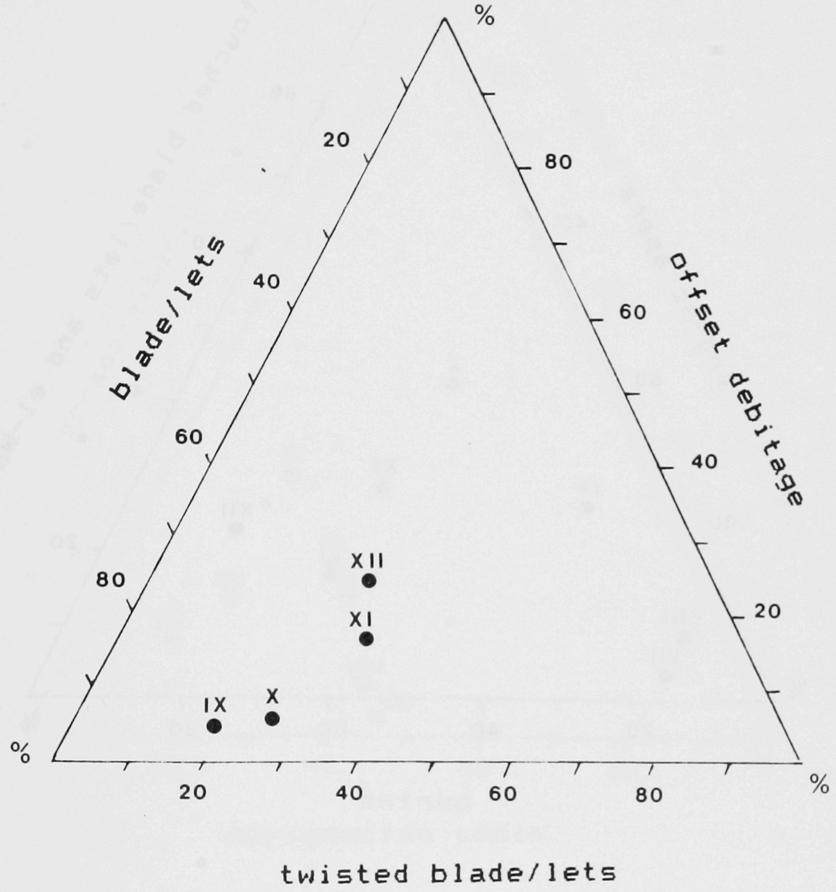


Figure 84

Three-pole graph of technological attributes on blade/lets in levels XII-IX.

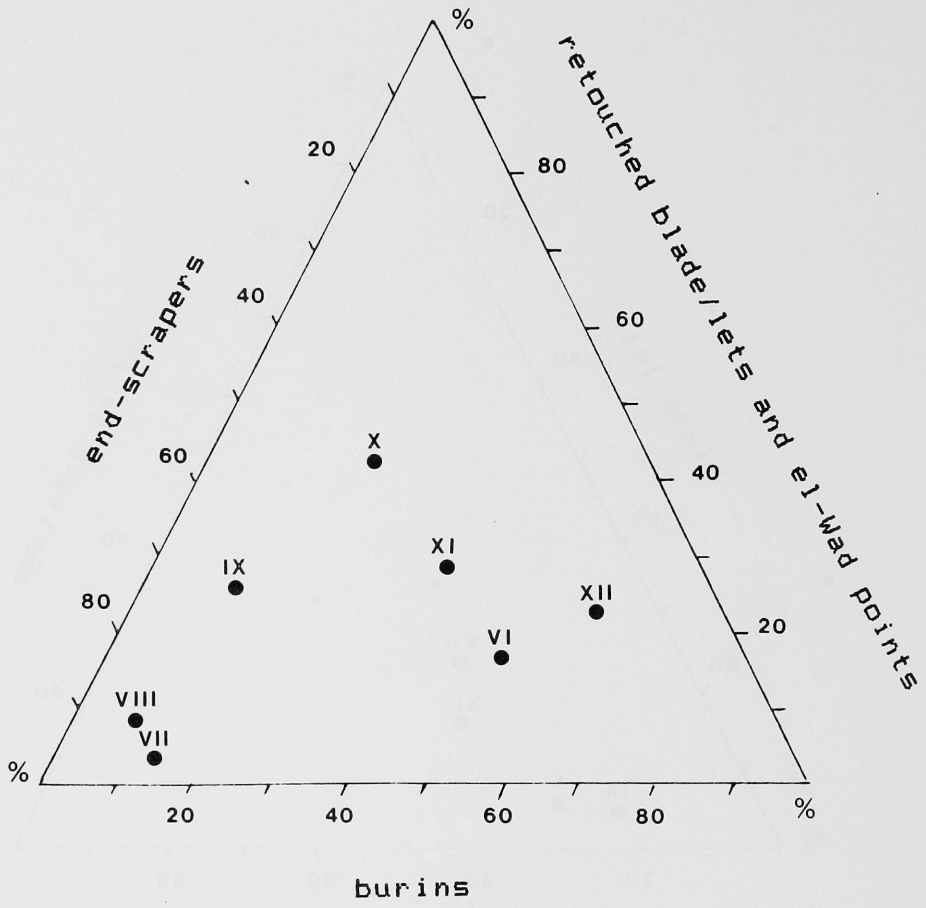


Figure 85

Three-pole graph of tool typology in levels XII-VI.

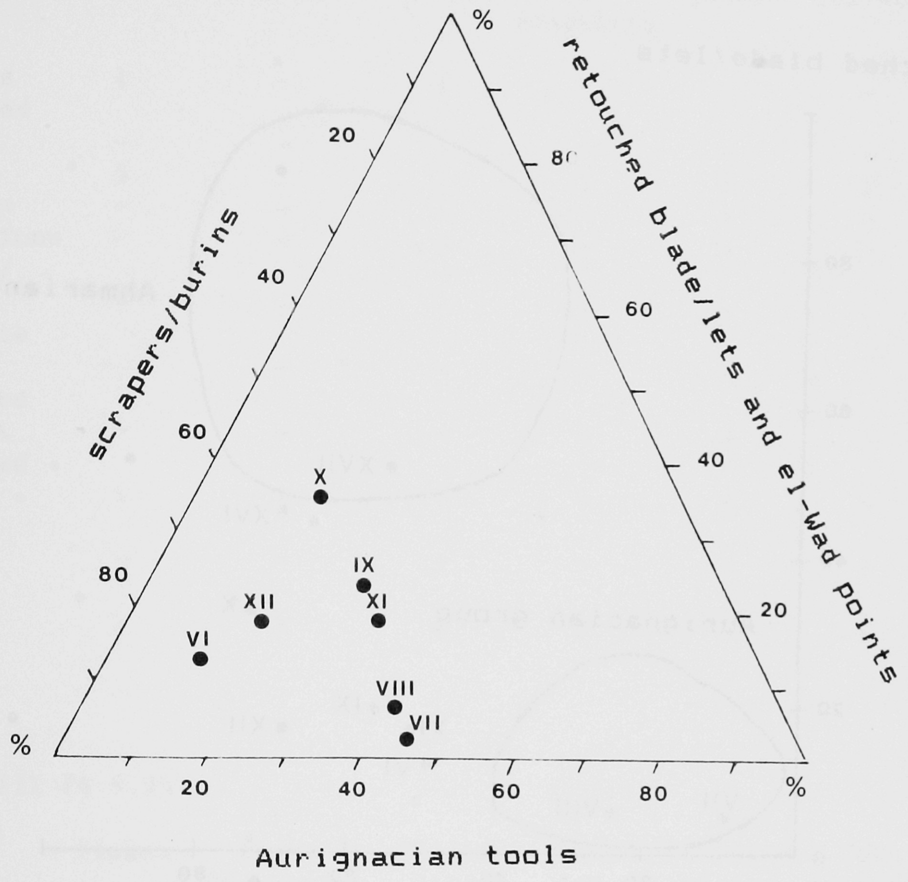


Figure 86

Three-pole graph of tool typology in levels XII-VI.

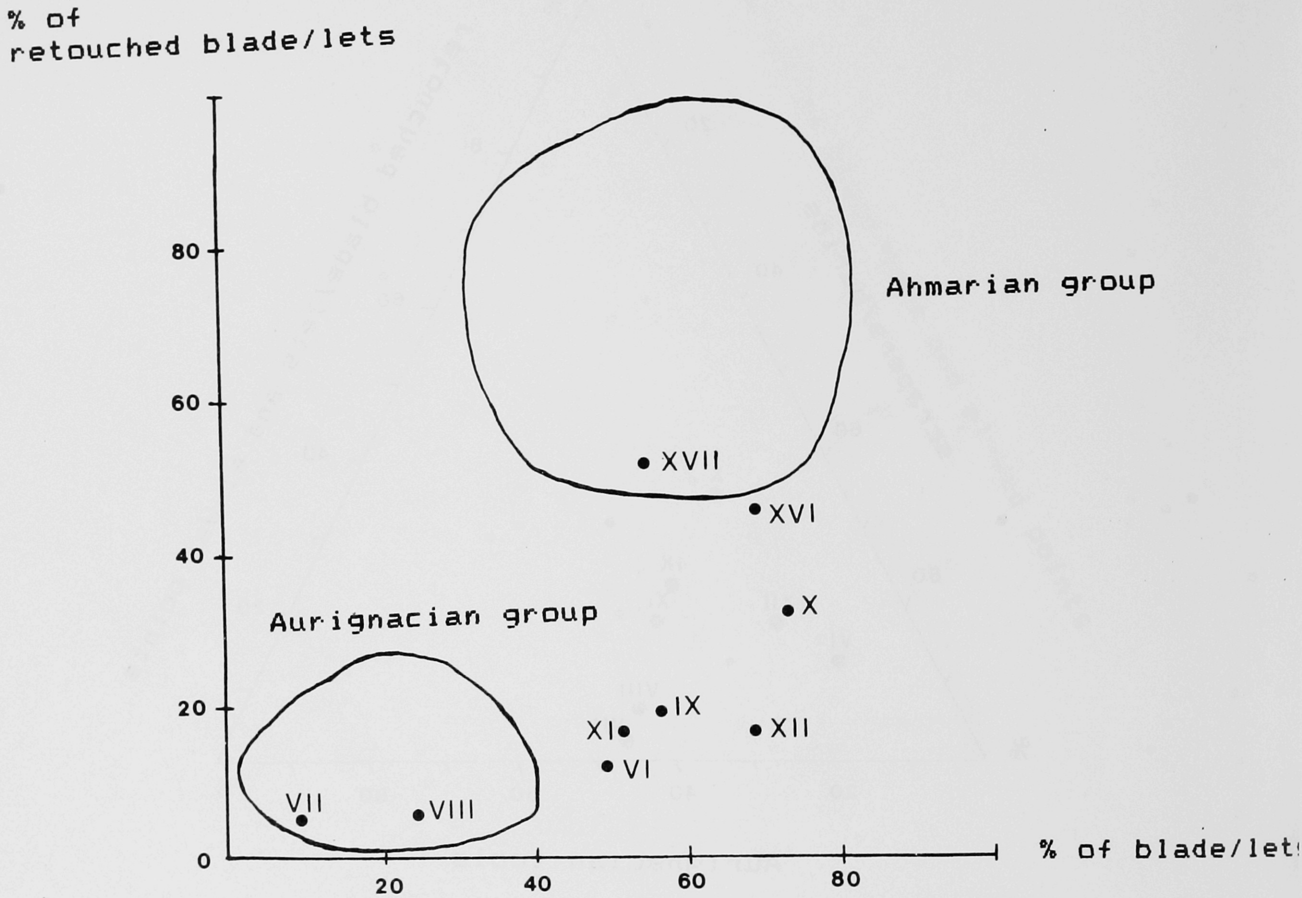


Figure 87

Graph taken from Gilead 1981a figure 7.1 comparing Ksar Akil levels XVII-VI with the southern Ahmarian and Aurignacian.

Appendix 1

Level XIII E4 10.45

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	1	–	1	–	–	–	2
carinated pieces	–	–	1	–	–	–	1
burins	5	2	2	1	1	1	12
piercers	–	–	–	–	–	–	–
truncations	–	–	–	–	–	–	–
notches/dent.	–	–	–	–	–	–	–
composite tools	–	–	–	–	–	–	–
retouched bl/lts.	–	–	–	1	–	–	1
retouched flakes	1	1	–	–	–	–	2
el-Wad points	–	–	–	–	–	–	–
total	7	3	4	2	1	1	18

Level XIII F4 9.90

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	1	–	–	–	–	–	1
carinated pieces	–	–	–	–	–	–	–
burins	3	1	5	1	2	–	12
piercers	–	–	–	–	–	–	–
truncations	–	–	1	–	–	–	1
notches/dent.	–	1	2	1	–	–	4
composite tools	1	–	–	–	–	–	1
retouched bl/lts.	–	–	5	2	–	–	7
retouched flakes	1	–	–	–	–	–	1
el-Wad points	–	–	1	–	–	–	1
total	6	2	14	4	2	–	28

Level XIII F3 9.70

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	-	-	-	-	-	-	-
carinated pieces	-	-	1	-	-	-	1
burins	-	-	-	-	-	-	-
piercers	-	-	-	-	-	-	-
truncations	1	-	-	1	-	-	2
notches/ dent.	-	-	-	-	-	-	-
composite tools	-	-	-	-	-	-	-
retouched bl/lts.	-	-	-	-	-	-	-
retouched flakes	2	-	-	-	-	-	2
el-Wad points	-	-	1	-	-	-	1
total	3	-	2	1	-	-	6

Level XII E4 10.00

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	11	3	6	1	-	-	21
carinated pieces	15	6	2	6	1	-	30
burins	48	10	12	10	3	2	85
piercers	-	-	2	-	-	-	2
truncations	2	-	7	6	-	-	15
notches/ dent.	1	2	2	4	-	-	9
composite tools	5	-	4	-	-	-	9
retouched bl/lts.	-	-	8	25	-	-	33
retouched flakes	1	-	-	-	-	-	1
el-Wad points	-	-	9	7	-	-	16
total	83	21	52	59	4	2	221

Level XII F4 9.70

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	9	5	2	–	–	1	17
carinated pieces	4	4	4	2	–	–	14
burins	19	9	17	5	3	–	53
piercers	–	–	–	–	–	–	–
truncations	–	–	8	4	–	–	12
notches/dent.	1	–	1	–	–	–	2
composite tools	–	–	2	–	–	–	2
retouched bl/lts.	–	–	16	22	–	–	38
retouched flakes	1	–	–	–	–	–	1
el-Wad points	–	–	12	9	–	–	21
total	34	18	62	42	3	1	160

Level XI E4 9.65

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	25	11	12	3	2	1	54
carinated pieces	30	12	6	3	3	–	54
burins	13	3	10	1	–	–	27
piercers	–	–	–	1	–	–	1
truncations	–	–	1	–	–	–	1
notches/dent.	1	–	–	–	–	–	1
composite tools	1	–	3	–	–	–	4
retouched bl/lts.	–	–	–	3	–	–	3
retouched flakes	–	–	–	–	–	–	–
el-Wad points	–	–	4	9	–	–	13
total	70	26	36	20	5	1	158

Level XI F4 9.55

Type	Flakes	Flake fragments	Blade/ lets	Blade/ let fragments	Crested pieces	Core tablets	Total
scrapers	–	–	–	–	–	–	–
carinated pieces	6	8	5	1	–	–	20
burins	9	3	6	–	2	1	21
piercers	–	–	1	–	–	–	1
truncations	–	–	–	–	–	–	–
notches/ dent.	–	–	–	–	–	–	–
composite tools	3	–	1	–	–	–	4
retouched bl/lts.	–	–	3	4	–	–	7
retouched flakes	–	–	–	–	–	–	–
el-Wad points	–	–	13	2	–	–	15
total	18	11	29	7	2	1	68

Level XI F4 9.30

Type	Flakes	Flake fragments	Blade/ lets	Blade/ let fragments	Crested pieces	Core tablets	Total
scrapers	7	2	–	–	–	–	9
carinated pieces	10	4	3	1	–	–	18
burins	23	3	6	4	3	–	39
piercers	–	–	1	–	–	–	1
truncations	–	–	2	–	–	–	2
notches/ dent.	–	1	–	–	–	–	1
composite tools	2	–	–	–	–	–	2
retouched bl/lts.	–	–	3	9	–	–	12
retouched flakes	–	–	–	–	–	–	–
el-Wad points	–	–	9	14	–	–	23
total	42	10	24	28	3	–	107

Level XI F4 8.95

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	5	1	5	1	1	-	13
carinated pieces	7	10	1	1	-	-	19
burins	9	8	11	1	1	1	31
piercers	-	-	-	-	-	-	-
truncations	-	-	1	-	-	-	1
notches/ dent.	-	-	-	1	-	-	1
composite tools	-	-	-	-	-	-	-
retouched bl/lts.	-	-	1	1	-	-	2
retouched flakes	-	-	-	-	-	-	-
el-Wad points	-	-	-	-	-	-	-
total	21	19	19	5	2	1	67

Level XI F4 8.85

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	4	3	2	-	-	-	9
carinated pieces	8	2	1	-	1	-	12
burins	4	1	2	2	3	-	12
piercers	-	-	-	-	-	-	-
truncations	-	-	-	-	-	-	-
notches/ dent.	-	1	-	-	-	-	1
composite tools	-	-	-	-	-	-	-
retouched bl/lts.	-	-	3	-	-	-	3
retouched flakes	-	-	-	-	-	-	-
el-Wad points	-	-	3	5	-	-	8
total	16	7	11	7	4	-	45

Level X E4 8.65

Type	Flakes	Flake fragments	Blade/ lets	Blade/ let fragments	Crested pieces	Core tablets	Total
scrapers	3	1	2	–	1	–	7
carinated pieces	7	1	2	1	–	–	11
burins	17	5	8	2	3	1	36
piercers	–	–	1	–	–	–	1
truncations	–	–	1	–	–	–	1
notches/ dent.	–	–	–	–	–	–	–
composite tools	2	–	1	–	–	–	3
retouched bl/lts.	–	–	4	39	–	–	43
retouched flakes	–	–	–	–	–	–	–
el-Wad points	–	–	3	55	1	–	59
total	29	7	22	97	5	1	161

Level X F4 8.40

Type	Flakes	Flake fragments	Blade/ lets	Blade/ let fragments	Crested pieces	Core tablets	Total
scrapers	–	–	–	–	–	–	–
carinated pieces	–	–	–	–	–	–	–
burins	–	–	–	–	–	–	–
piercers	–	–	–	–	–	–	–
truncations	–	–	–	–	–	–	–
notches/ dent.	–	–	–	–	–	–	–
composite tools	–	–	–	–	–	–	–
retouched bl/lts.	–	–	5	18	–	–	23
retouched flakes	–	–	–	–	–	–	–
el-Wad points	–	–	7	15	–	–	22
total	–	–	12	33	–	–	45

Level X E4 8.10

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	52	6	9	-	4	1	72
carinated pieces	1	1	-	1	-	-	3
burins	5	3	1	2	1	1	13
piercers	-	-	-	-	-	-	-
truncations	-	-	-	1	-	-	1
notches/ dent.	-	-	-	-	-	-	-
composite tools	8	-	1	-	-	-	9
retouched bl/lts.	-	-	-	-	-	-	-
retouched flakes	-	-	-	-	-	-	-
el-Wad points	-	-	13	2	-	-	15
total	66	10	24	6	5	2	113

Level X F4 8.10

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	1	-	-	-	-	1	2
carinated pieces	-	-	-	-	-	-	-
burins	-	-	-	-	-	-	-
piercers	-	-	-	-	-	-	-
truncations	-	-	-	-	-	-	-
notches/ dent.	-	-	-	-	-	-	-
composite tools	-	-	-	-	-	-	-
retouched bl/lts.	-	-	2	11	-	-	13
retouched flakes	2	-	-	-	-	-	2
el-Wad points	-	-	2	9	-	-	11
total	3	-	4	20	-	1	28

Level IX F4 7.75

Type	Flakes	Flake fragments	Blade/ lets	Blade/ let fragments	Crested pieces	Core tablets	Total
scrapers	4	-	3	-	-	-	7
carinated pieces	5	-	-	-	-	-	5
burins	5	3	6	-	-	-	14
piercers	-	-	-	-	-	-	-
truncations	-	-	-	-	-	-	-
notches/ dent.	-	-	-	-	-	-	-
composite tools	1	-	-	-	-	-	1
retouched bl/lts.	-	-	-	1	-	-	1
retouched flakes	-	-	-	-	-	-	-
el-Wad points	-	-	2	-	-	-	2
total	15	3	11	1	-	-	30

Level IX E4 7.65

Type	Flakes	Flake fragments	Blade/ lets	Blade/ let fragments	Crested pieces	Core tablets	Total
scrapers	10	8	3	3	1	2	27
carinated pieces	2	5	-	-	-	-	7
burins	10	1	1	-	-	-	12
piercers	-	-	-	-	-	-	-
truncations	-	-	-	-	-	-	-
notches/ dent.	1	1	-	-	-	-	2
composite tools	3	-	-	-	-	-	3
retouched bl/lts.	-	-	18	105	-	-	123
retouched flakes	-	1	-	-	-	-	1
el-Wad points	-	-	3	9	-	-	12
total	26	16	25	117	1	2	187

Level IX E4 7.55

Type	Flakes	Flake fragments	Blade/ lets	Blade/ let fragments	Crested pieces	Core tablets	Total
scrapers	25	11	2	–	–	–	38
carinated pieces	3	2	–	–	–	–	5
burins	5	–	1	–	–	–	6
piercers	–	–	1	–	–	–	1
truncations	1	–	–	1	–	–	2
notches/ dent.	–	–	–	–	–	–	–
composite tools	–	–	1	–	–	–	1
retouched bl/lts.	–	–	2	4	–	–	6
retouched flakes	2	1	–	–	–	–	3
el-Wad points	–	–	–	–	–	–	–
total	36	14	7	5	–	–	62

Level IX F4 7.25

Type	Flakes	Flake fragments	Blade/ lets	Blade/ let fragments	Crested pieces	Core tablets	Total
scrapers	1	3	1	–	–	–	5
carinated pieces	–	1	–	–	–	–	1
burins	5	1	4	1	–	2	13
piercers	–	–	–	–	–	–	–
truncations	–	–	–	–	–	–	–
notches/ dent.	–	–	–	–	–	–	–
composite tools	–	–	1	–	–	–	1
retouched bl/lts.	–	–	5	13	–	–	18
retouched flakes	–	–	–	–	–	–	–
el-Wad points	–	–	2	1	–	–	3
total	6	5	13	15	–	2	41

Level IX E4 7.24

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	15	2	5	1	1	1	25
carinated pieces	2	-	1	-	-	-	3
burins	3	-	-	-	-	-	3
piercers	-	-	-	-	-	-	-
truncations	-	-	-	-	-	-	-
notches/ dent.	-	-	-	-	-	-	-
composite tools	-	-	-	-	-	-	-
retouched bl/lts.	-	-	-	-	-	-	-
retouched flakes	-	-	-	-	-	-	-
el-Wad points	-	-	-	-	-	-	-
total	20	2	6	1	1	1	31

Level VIII F3 6.74

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	-	-	-	1	-	-	1
carinated pieces	-	-	-	-	-	-	-
burins	-	-	-	-	-	-	-
piercers	-	-	-	-	-	-	-
truncations	-	-	-	-	-	-	-
notches/ dent.	1	-	1	-	-	-	2
composite tools	-	-	-	-	-	-	-
retouched bl/lts.	-	-	-	2	-	-	2
retouched flakes	-	2	-	-	-	-	2
el-Wad points	-	-	-	-	-	-	-
total	1	2	1	3	-	-	7

Level VIII F3 6.24

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	27	6	1	-	1	-	35
carinated pieces	11	1	-	-	-	-	12
burins	1	-	-	-	-	-	1
piercers	-	-	-	-	-	-	-
truncations	1	-	-	-	-	-	1
notches/ dent.	4	1	1	-	-	-	6
composite tools	1	-	-	-	-	-	1
retouched bl/lts.	-	-	2	3	-	-	5
retouched flakes	-	10	-	-	-	-	10
el-Wad points	-	-	-	-	-	-	-
total	45	18	4	3	1	-	71

Level VII F4

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	95	13	9	6	-	1	124
carinated pieces	22	1	2	1	-	-	26
burins	10	-	5	-	-	-	15
piercers	5	-	-	-	-	-	5
truncations	-	-	1	-	-	-	1
notches/ dent.	1	-	1	-	-	-	2
composite tools	3	-	-	-	-	-	3
retouched bl/lts.	-	-	1	4	-	-	5
retouched flakes	3	5	-	-	-	-	8
el-Wad points	-	-	2	1	-	-	3
total	139	19	21	12	-	1	192

Level VI F4

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	38	3	7	3	2	1	54
carinated pieces	21	6	5	2	-	-	34
burins	28	5	10	2	-	2	47
piercers	-	-	-	-	-	-	-
truncations	-	-	-	-	-	-	-
notches/ dent.	2	1	-	-	-	-	3
composite tools	7	-	-	-	-	-	7
retouched bl/lts.	-	-	16	55	-	-	71
retouched flakes	-	-	-	-	-	-	-
el-Wad points	-	-	3	1	-	-	4
total	96	15	41	63	2	3	220

Level XIII: E4 10.45, F4 9.90 and F3 9.70

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	2	-	1	-	-	-	3
carinated pieces	-	-	2	-	-	-	2
burins	8	3	7	2	3	1	24
piercers	-	-	-	-	-	-	-
truncations	1	-	2	-	-	-	3
notches/ dent.	-	1	2	1	-	-	4
composite tools	1	-	-	-	-	-	1
total	12	4	14	3	3	1	37

Level XII: E4 10.00 and F4 9.70

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	20	8	8	1	–	1	38
carinated pieces	19	10	6	8	1	–	44
burins	67	19	29	15	6	2	138
piercers	–	–	2	–	–	–	2
truncations	2	–	15	10	–	–	27
notches/ dent.	2	2	3	4	–	–	11
composite tools	5	–	6	–	–	–	11
total	115	39	69	38	7	3	271

Level XI: E4 9.65, F4 9.55, F4 9.30, F4 8.95 and F4 8.85

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	41	17	19	4	3	1	85
carinated pieces	61	36	16	6	4	–	123
burins	58	18	35	8	9	2	130
piercers	–	–	2	1	–	–	3
truncations	–	–	4	–	–	–	4
notches/ dent.	1	2	–	1	–	–	4
composite tools	6	–	4	–	–	–	10
total	167	73	80	20	16	3	359

Level X: E4 8.65, E4 8.10 and F4 8.10

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	56	7	11	-	5	2	81
carinated pieces	8	2	2	2	-	-	14
burins	22	8	9	4	4	2	49
piercers	-	-	1	-	-	-	1
truncations	-	-	1	1	-	-	2
notches/dent.	-	-	-	-	-	-	-
composite tools	10	-	2	-	-	-	12
total	96	17	26	7	9	4	159

Level IX: F4 7.75, E4 7.65, E4 7.55, F4 7.25 and E4 7.24

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	55	24	14	4	2	3	102
carinated pieces	12	8	1	-	-	-	21
burins	28	5	12	1	-	2	48
piercers	-	-	1	-	-	-	1
truncations	1	-	-	1	-	-	2
notches/dent.	1	1	-	-	-	-	2
composite tools	4	-	2	-	-	-	6
total	101	38	30	6	2	5	182

Level VIII: F3 6.74 and F3 6.24

Type	Flakes	Flake fragments	Blade/lets	Blade/let fragments	Crested pieces	Core tablets	Total
scrapers	27	6	2	-	1	-	36
carinated pieces	11	1	-	-	-	-	12
burins	1	-	-	-	-	-	1
piercers	-	-	-	-	-	-	-
truncations	1	-	-	-	-	-	1
notches/ dent.	5	1	2	-	-	-	8
composite tools	1	-	-	-	-	-	1
total	46	8	4	-	1	-	59

Appendix 2

BLADE/LET CORE PLATFORMS

Level			Number of pieces	1 %	2 %	3 %	4 %
XIII	F4	9.90	17	94.12	5.88	-	-
XII	E4	10.00	62	74.19	20.98	-	4.84
XII	F4	9.70	32	84.38	12.51	-	3.13
XI	E4	9.65	30	83.33	16.66	-	-
XI	F4	8.95	31	64.52	25.81	-	9.68
X	E4	8.65	46	91.30	8.69	-	-
X	E4	8.10	42	88.10	11.90	-	-
IX	F4	7.25	52	86.54	9.62	-	3.85

1. one platform
2. two platforms (opposed, unopposed, crossed, alternate)
3. three or more platforms
4. unidentified

Level	Number of pieces	Flakes %	Blades %	Bladelets %
XIII	358	42.46	41.06	16.48
XII	2953	30.44	63.53	6.03
XI	3842	48.54	36.34	15.12
X	9926	26.99	33.77	39.24
IX	31019	42.18	18.52	39.30
VIII	6413	73.34	13.55	13.11
VII	5115	90.24	8.35	1.41
VI	1588	50.63	14.30	35.08

BLANK THICKNESS

Level			Number of pieces	Flakes (mms) $\bar{x}$ TH	Flakes (mms) SD	Blade/lets (mms) $\bar{x}$ TH	Blade/lets (mms) SD
XIII	F4	9.90	124	9	4	5	3
XII	E4	10.00	492	7	4	5	2
XII	F4	9.70	239	7	4	4	2
XI	F4	9.30	361	8	4	5	3
XI	F4	8.95	265	5	3	5	3
X	E4	8.65	453	7	3	4	2
X	F4	8.40	454	6	3	3	1
X	E4	8.10	439	6	2	4	2
IX	F4	7.75	303	9	4	4	2
IX	E4	7.65	199	6	3	3	2
IX	F4	7.25	467	6	3	3	2

BUTT DIMENSIONS

Level			Number of pieces	Flakes (mms) $\bar{x}$ W	SD	$\bar{x}$ TH	SD	Blade/lets (mms) $\bar{x}$ W	SD	$\bar{x}$ TH	SD
XIII	F4	9.90	124	13	8	5	4	6	4	3	2
XII	E4	10.00	492	14	8	5	3	5	4	2	1
XII	F4	9.70	239	15	9	5	4	5	3	2	1
XI	F4	9.30	361	14	9	6	4	5	4	2	1
XI	F4	8.95	265	10	8	3	2	5	4	2	1
X	E4	8.65	453	12	8	4	3	5	3	2	1
X	F4	8.40	454	11	6	4	3	3	2	1	-
X	E4	8.10	439	12	8	4	2	5	3	1	-
IX	F4	7.75	303	14	7	5	3	2	1	1	-
IX	E4	7.65	199	12	7	4	3	3	2	1	-
IX	F4	7.25	467	12	8	5	3	3	1	1	-
VIII	F3	6.24	190	14	9	6	3	3	1	1	-

FLAKE BUTTS

Level			Number of pieces	1 %	2 %	3 %	4 %	5 %	6 %
XIII	F4	9.90	62	67.74	16.13	6.45	4.84	1.61	3.23
XII	E4	10.00	139	48.92	17.27	15.11	5.04	1.44	12.23
XII	F4	9.70	50	72.00	10.00	4.00	8.00	2.00	4.00
XI	F4	9.30	141	65.25	17.02	13.48	4.26	-	-
XI	F4	8.95	183	63.93	16.94	9.84	9.29	-	-
X	E4	8.65	50	58.00	26.00	8.00	4.00	-	4.00
X	F4	8.40	182	71.98	7.69	7.14	13.19	-	-
X	E4	8.10	90	74.44	12.22	4.44	6.67	-	2.22
IX	F4	7.75	65	58.46	10.77	12.31	10.77	-	7.69
IX	E4	7.65	117	73.50	4.27	11.11	5.98	-	5.13
IX	F4	7.25	274	74.09	6.57	6.57	10.58	-	2.19
VIII	F3	6.24	146	77.40	5.48	6.85	2.74	-	7.53

1. plain
2. faceted
3. cortical
4. crushed or broken
5. imitating a dihedral burin
6. unidentified

FLAKES

Level			Number of pieces	Cortex %	Platform abrasion %
XIII	F4	9.90	62	52.23	9.68
XII	E4	10.00	139	39.57	33.09
XII	F4	9.70	50	40.00	32.00
XI	F4	9.30	141	51.77	34.04
XI	F4	8.95	183	38.80	30.06
X	E4	8.65	50	38.00	40.00
X	F4	8.40	182	35.17	37.36
X	E4	8.10	90	26.67	54.44
IX	F4	7.75	65	35.39	30.77
IX	E4	7.65	117	30.77	33.33
IX	F4	7.25	274	38.69	38.69
VIII	F3	6.24	146	36.99	19.18

FLAKE LATERAL EDGES

Level	Number of pieces	1 %	2 %	3 %	4 %
XIII F4 9.90	62	64.52	11.29	16.13	8.07
XII E4 10.00	139	79.14	8.63	7.19	5.04
XII F4 9.70	50	84.00	4.00	8.00	4.00
XI F4 9.30	141	68.79	4.26	26.24	0.71
XI F4 8.95	183	66.12	2.73	26.78	4.37
X E4 8.65	50	80.00	10.00	10.00	-
X F4 8.40	182	74.18	2.75	14.84	8.24
X E4 8.10	90	81.11	7.78	8.89	2.22
IX F4 7.75	65	64.62	15.39	10.74	9.23
IX E4 7.65	117	76.92	4.27	17.95	0.86
IX F4 7.25	274	78.10	0.73	13.87	7.30
VIII F3 6.24	146	73.29	7.53	17.12	2.06

1. parallel
2. converging
3. expanding
4. unidentified

FLAKE DISTAL ENDS

Level	Number of pieces	1 %	2 %	3 %	4 %
XIII F4 9.90	62	12.90	3.23	75.81	8.07
XII E4 10.00	139	13.67	4.32	71.22	10.79
XII F4 9.70	50	16.00	2.00	78.00	4.00
XI F4 9.30	141	21.28	3.55	75.18	-
XI F4 8.95	183	28.96	2.19	68.85	-
X E4 8.65	50	16.00	8.00	76.00	-
X F4 8.40	182	24.73	5.50	69.23	0.55
X E4 8.10	90	12.22	10.00	75.56	2.22
IX F4 7.75	65	10.77	3.08	80.00	6.15
IX E4 7.65		8.55	4.27	70.94	16.24
IX F4 7.25	274	21.17	2.92	74.45	1.46
VIII F3 6.24	146	24.66	0.69	73.97	0.69

1. hinge fracture
2. pointed
3. blunt or cortical
4. unidentified

SCAR PATTERN - FLAKES

Level	Number of pieces	1 %	2 %	3 %	4 %	5 %
XIII F4 9.90	62	43.55	1.61	20.97	17.74	16.13
XII E4 10.00	139	42.45	4.32	21.58	20.86	10.79
XII F4 9.70	50	44.00	8.00	24.00	10.00	14.00
XI F4 9.30	141	39.01	5.67	24.82	17.73	12.77
XI F4 8.95	183	53.01	6.01	20.22	7.10	13.66
X E4 8.65	50	64.00	16.00	16.00	4.00	-
X F4 8.40	182	58.24	6.04	20.88	2.75	12.09
X E4 8.10	90	58.89	5.56	20.00	11.11	4.44
IX F4 7.75	65	44.62	3.08	18.46	10.77	23.08
IX E4 7.65	117	69.23	1.71	13.68	1.71	13.68
IX F4 7.25	274	66.06	5.11	13.14	4.75	10.95
VIII F3 6.24	146	52.06	2.06	13.01	28.08	4.80

1. unidirectional
2. opposed
3. crossed
4. multidirectional
5. unidentified

FLAKE PROFILES

Level	Number of pieces	1 %	2 %	3 %	4 %
XIII F4 9.90	62	40.32	40.32	8.07	11.29
XII E4 10.00	139	25.90	53.24	11.51	9.35
XII F4 9.70	50	6.00	72.00	18.00	4.00
XI F4 9.30	141	14.89	53.19	31.92	-
XI F4 8.95	183	10.93	55.19	33.88	-
X E4 8.65	50	18.00	76.00	6.00	-
X F4 8.40	182	9.89	76.37	13.74	-
X E4 8.10	90	13.33	61.11	23.33	2.22
IX F4 7.75	65	4.62	75.39	13.85	6.15
IX E4 7.65	117	9.40	76.07	10.26	4.27
IX F4 7.25	274	19.34	70.44	8.03	2.19
VIII F3 6.24	146	4.80	85.62	6.16	3.43

1. straight
2. curved
3. twisted
4. unidentified

BLADE/LET BUTTS

Level	Number of pieces	1 %	2 %	3 %	4 %	5 %	6 %
XIII F4 9.90	62	72.58	6.45	8.07	8.07	4.84	-
XII E4 10.00	353	72.52	1.98	3.40	7.65	4.25	10.20
XII F4 9.70	189	74.07	2.12	1.59	11.11	2.12	9.00
XI F4 9.30	220	74.09	5.00	2.73	13.18	1.82	3.18
XI F4 8.95	82	74.39	6.10	3.66	8.54	-	7.32
X E4 8.65	403	81.89	2.98	0.50	12.90	0.25	1.49
X F4 8.40	272	80.88	5.15	4.41	8.82	-	0.74
X E4 8.10	349	87.97	0.57	2.01	9.46	-	-
IX F4 7.75	238	85.29	0.42	1.68	10.08	-	2.52
IX E4 7.65	82	90.24	-	1.22	8.54	-	-
IX F4 7.25	193	90.67	0.52	1.04	7.77	-	-
VI F4	107	99.07	0.94	-	-	-	-

1. plain
2. faceted
3. cortical
4. crushed or broken
5. imitating a dihedral burin
6. unidentified

BLADE/LETS

Level	Number of pieces	Cortex %	Platform abrasion %
XIII F4 9.90	62	25.81	83.87
XII E4 10.00	353	22.10	77.90
XII F4 9.70	189	26.98	77.78
XI F4 9.30	220	27.27	75.00
XI F4 8.95	82	12.20	74.39
X E4 8.65	403	17.37	89.08
X F4 8.40	272	19.12	91.18
X E4 8.10	349	15.76	89.97
IX F4 7.75	238	15.55	94.54
IX E4 7.65	82	8.54	93.90
IX F4 7.25	193	18.65	92.75
VI F4	107	4.67	91.59

BLADE/LET LATERAL EDGES

Level	Number of pieces	1 %	2 %	3 %	4 %
XIII F4 9.90	62	62.90	24.19	9.68	3.23
XII E4 10.00	353	64.87	30.88	3.97	0.28
XII F4 9.70	189	64.55	22.75	11.64	1.06
XI F4 9.30	220	76.36	15.91	7.27	0.46
XI F4 8.95	82	64.63	24.39	7.32	3.66
X E4 8.65	403	60.05	35.98	3.72	0.25
X F4 8.40	272	61.03	30.15	8.09	0.74
X E4 8.10	349	61.89	34.10	3.73	0.29
IX F4 7.75	238	68.91	28.15	2.94	-
IX E4 7.65	82	68.29	31.71	-	-
IX F4 7.25	193	53.89	37.31	7.77	1.04
VI F4	107	65.42	32.71	0.94	0.94

1. parallel
2. converging
3. expanding
4. unidentified

BLADE/LET DISTAL ENDS

Level			Number of pieces	1 %	2 %	3 %	4 %
XIII	F4	9.90	62	14.52	14.52	70.97	-
XII	E4	10.00	353	9.07	26.91	60.91	3.12
XII	F4	9.70	189	12.17	22.22	64.02	1.59
XI	F4	9.30	220	9.09	18.18	71.82	0.91
XI	F4	8.95	82	12.20	21.95	58.54	7.32
X	E4	8.65	403	8.93	31.02	58.07	1.99
X	F4	8.40	272	8.82	33.82	51.10	6.25
X	E4	8.10	349	7.16	30.95	61.03	0.86
IX	F4	7.75	238	6.72	26.05	66.81	0.42
IX	E4	7.65	82	6.10	26.83	67.07	-
IX	F4	7.25	193	6.22	32.12	58.03	3.63
VI	F4		107	1.87	62.62	34.58	0.94

1. hinge fracture
2. pointed
3. blunt or cortical
4. unidentified

SCAR PATTERNS - BLADE/LETS

Level			Number of pieces	1 %	2 %	3 %	4 %	5 %
XIII	F4	9.90	62	91.94	4.84	1.61	-	1.61
XII	E4	10.00	353	76.20	3.97	13.03	1.42	5.38
XII	F4	9.70	189	73.02	1.59	15.34	1.59	8.47
XI	F4	9.30	220	62.72	4.55	20.00	4.55	8.18
XI	F4	8.95	82	67.07	2.44	13.42	-	17.07
X	E4	8.65	403	86.10	1.49	10.92	1.24	0.25
X	F4	8.40	272	88.97	2.57	6.62	0.74	1.10
X	E4	8.10	349	85.10	2.87	8.88	-	3.15
IX	F4	7.75	238	87.82	4.62	6.30	1.26	-
IX	E4	7.65	82	90.24	2.44	7.32	-	-
IX	F4	7.25	193	91.19	1.04	7.77	-	-
VI	F4		107	97.20	-	2.80	-	-

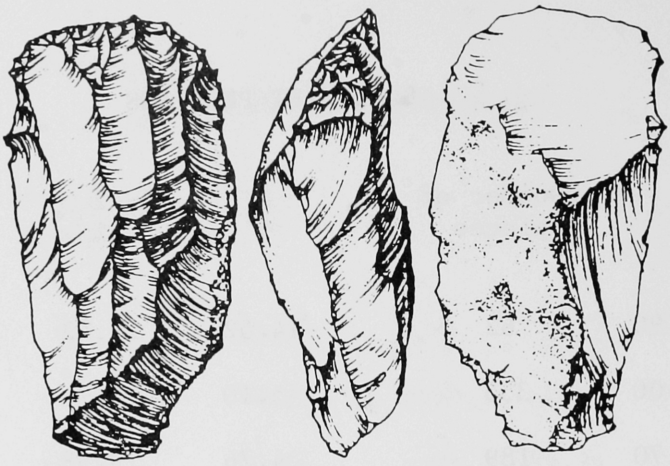
1. unidirectional
2. opposed
3. crossed
4. multidirectional
5. unidentified

BLADE/LET PROFILES

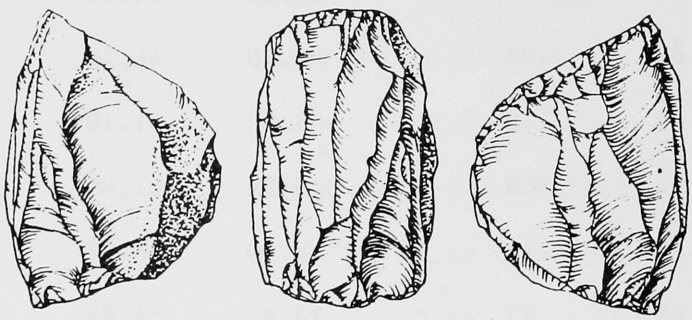
Level	Number of pieces	1 %	2 %	3 %	4 %
XIII F4 9.90	62	14.52	27.42	56.45	1.61
XII E4 10.00	353	5.10	27.76	60.06	7.08
XII F4 9.70	189	4.76	19.58	68.78	6.88
XI F4 9.30	220	5.91	26.82	66.82	0.46
XI F4 8.95	82	10.98	23.17	59.76	6.10
X E4 8.65	403	8.19	46.40	37.97	7.44
X F4 8.40	272	8.82	51.10	38.60	1.47
X E4 8.10	349	9.46	61.89	28.65	-
IX F4 7.75	238	8.40	56.72	29.83	5.04
IX E4 7.65	82	13.42	54.88	31.71	-
IX F4 7.25	193	11.40	69.95	18.14	0.52
VI F4	107	0.94	33.65	62.62	2.80

1. straight
2. curved
3. twisted
4. unidentified

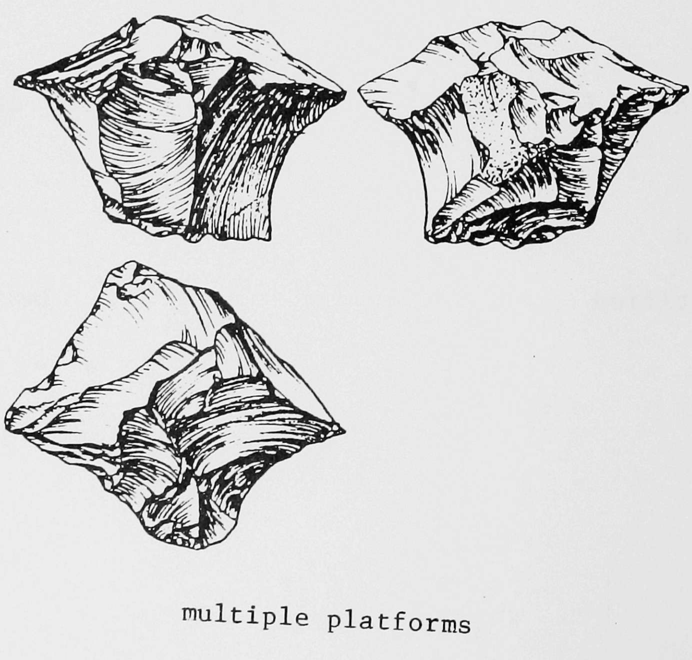
CORE PLATFORMS



single platform



opposed platforms



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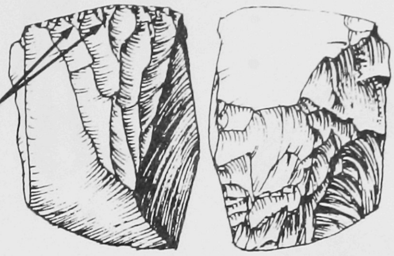
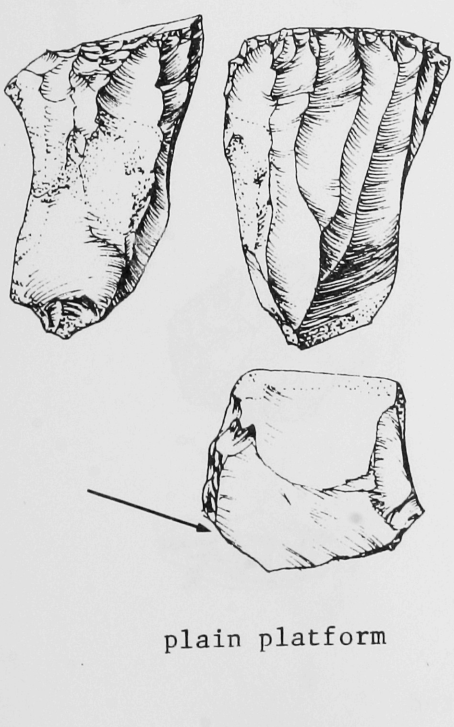
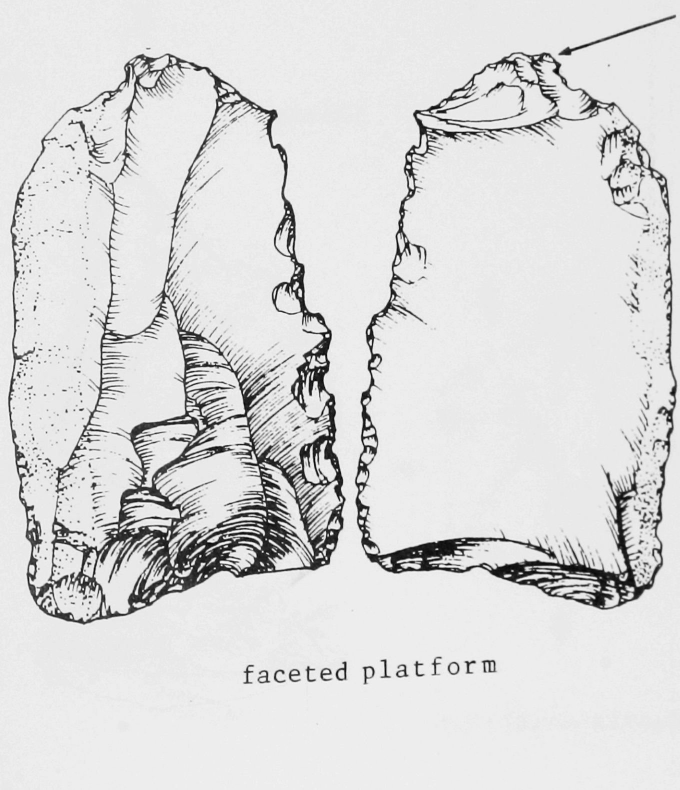


platform abrasion

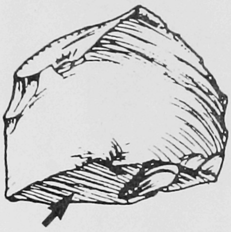
abrasion scars

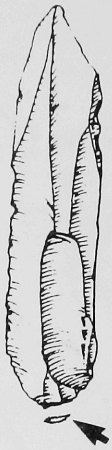


plain platform

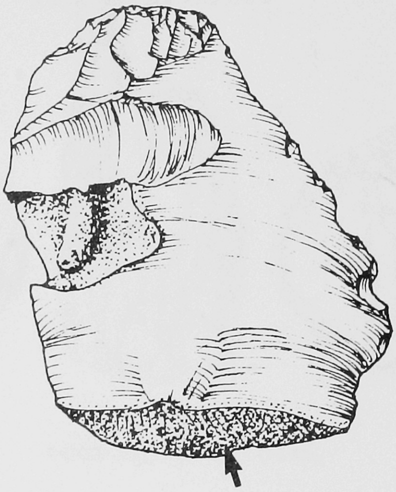


faceted platform

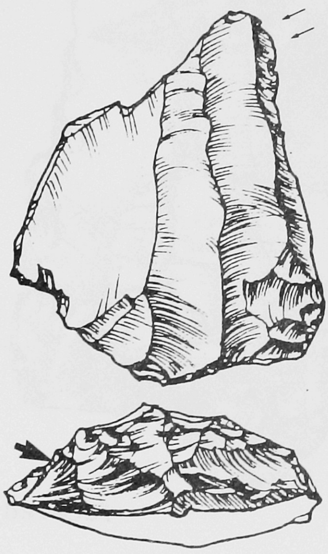


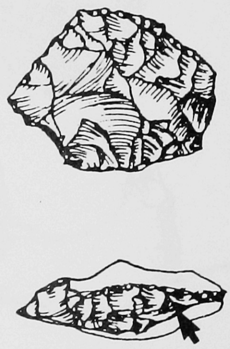


plain



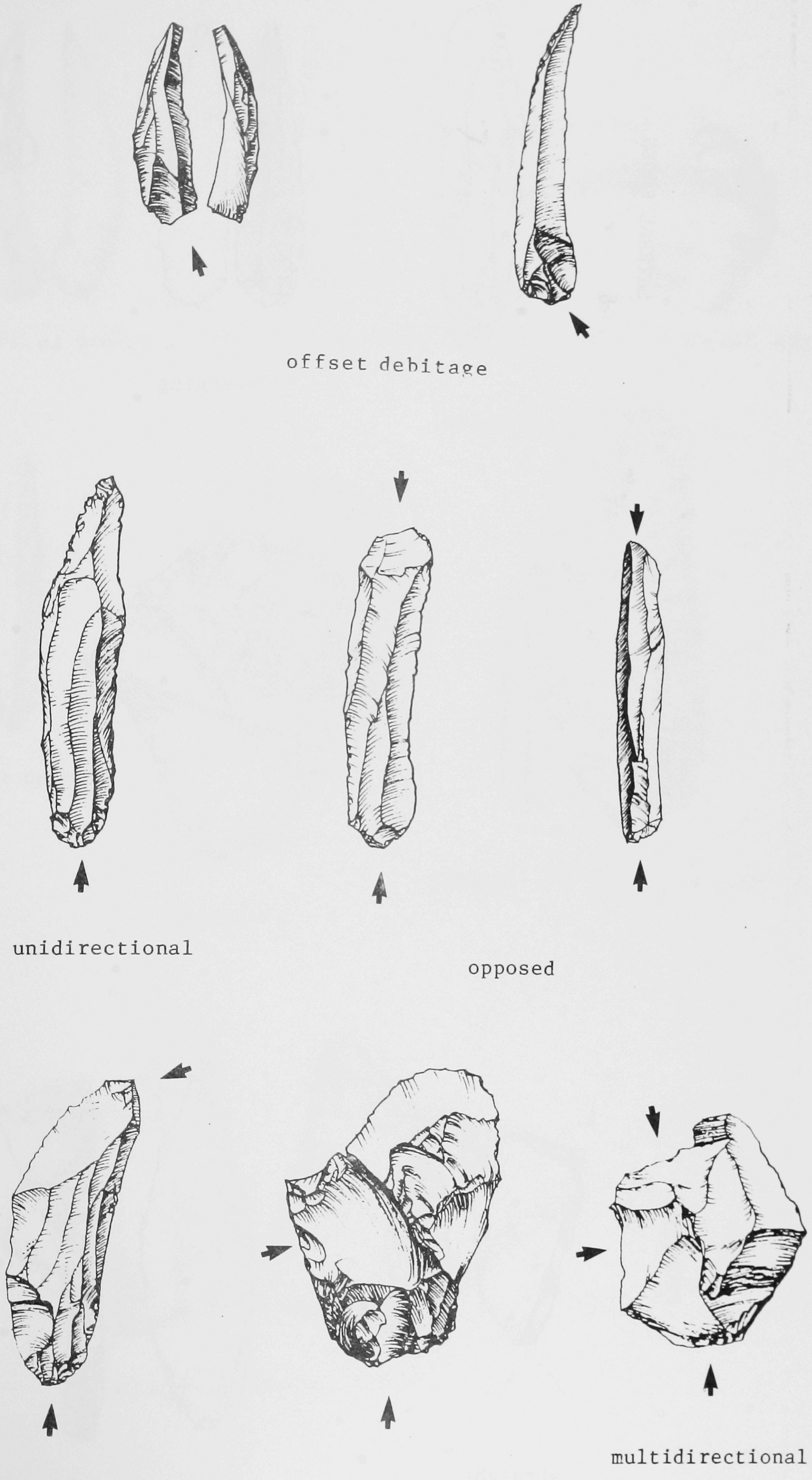
cortical

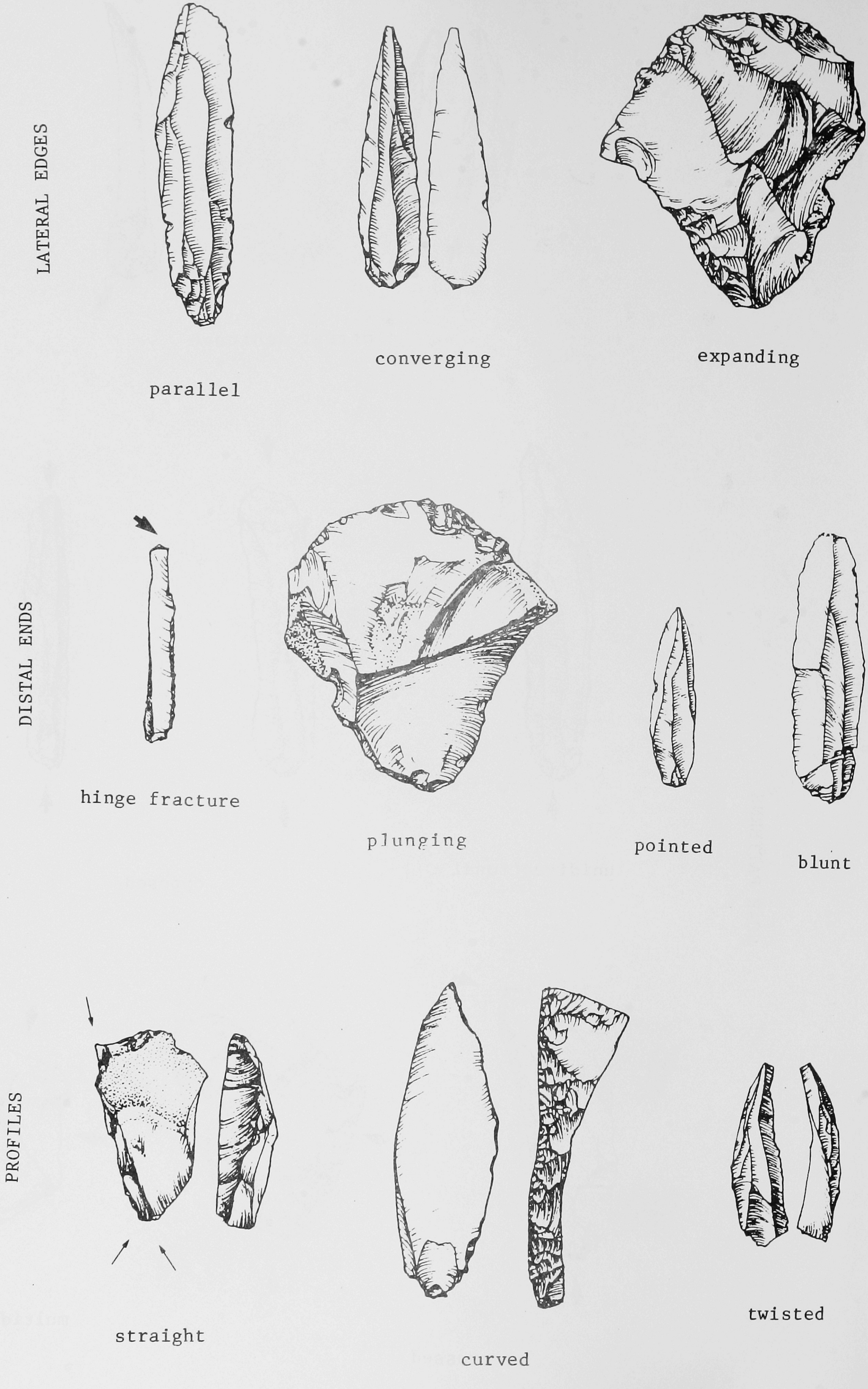


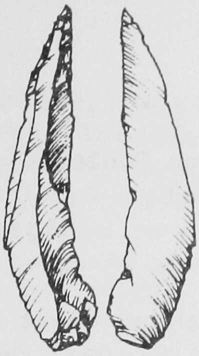


faceted

SCAR PATTERNS




LATERAL EDGES
parallel
converging
expanding
DISTAL ENDS
hinge fracture
plunging
pointed
blunt
PROFILES
straight
curved
twisted



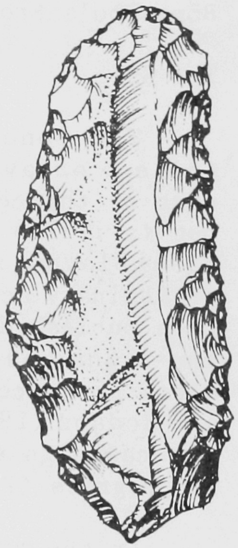
asymmetrical point

symmetrical point

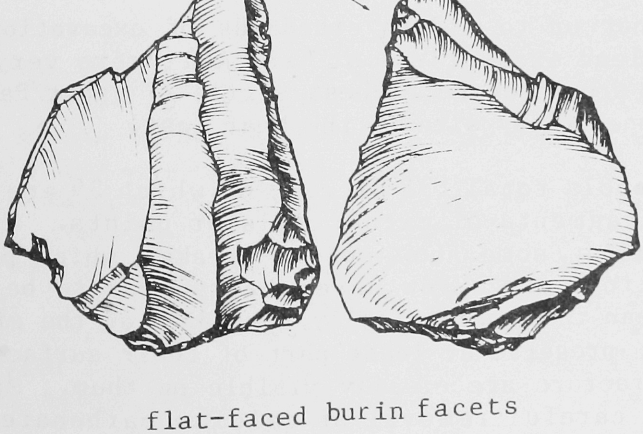
scraper on a lateral edge

short retouch

invasive retouch



stepped and scaled retouch



flat-faced burin facets

Appendix 3

Study and Replication of Bone Tools From Ksar Akil (Lebanon)

Mark Newcomer

This paper is divided into two parts, which treat two separate, but related, aspects of bone tools. The first part deals with the prehistoric bone tools from Ksar Akil; the second describes experiments in making bone tools.

Bone Tools From Ksar Akil

The Site

The bone tools described in this paper come from the Boston College excavations at Ksar Akil,[1] a rock-shelter about 12 km. to the east of the centre of Beirut, Lebanon. These excavations were carried out in 1937-8 and 1947-8. Although full reports on the stone and bone assemblages recovered in these campaigns have not yet appeared, preliminary accounts of the excavation methods and stratigraphy have been published by Murphy (1938; 1939), Ewing (1947), and Wright (1962), the fauna has been studied by Hooijer (1961) and Altena (1962), and notes by Newcomer (1970; 1971), Newcomer and Hodson (1973), and Azoury and Hodson (1973) have dealt with some aspects of the stone tools. A new campaign of excavations was begun by Tixier in 1969, and is still in progress (Tixier 1970).

In the broadest terms, the stratigraphy recorded by the Boston College team comprises 37 'levels' in some 23 m. of deposit, with Mousterian at the bottom (levels 37-26), followed by a long Upper Palaeolithic sequence (levels 25-1) (fig. 1). Charcoal samples from 16 m. below datum (level 26 or 27) have been radiocarbon dated to 43750 +/- 1500 B.P. (GrN-2579), while shells from 6-7.5 m. below datum (level 8, and probably parts of 9 and 7 as well), have been dated to 28840 +/- 380 B.P. (GrN-2195) (Vogel and Waterbolk 1963: 173-4).

Although not up to modern standards of excavation and recording, the Boston College excavations at Ksar Akil were very good for their time, and have provided the richest series of Upper Palaeolithic tools in stone and bone of any site in the Near East.

The bone tools total 131 pieces, of which 39 are awls, 79 points and 13 small fragments of either awls or points. The condition of these tools varies; some show modern breaks, which probably occurred during excavation, and a few have what appear to be scratches from attempts to clean them mechanically, probably at the site. Most of the tools, however, preserve at least part of their surface undamaged, and traces of manufacture are clearly visible on them. Many pieces would benefit from a careful removal of calcium carbonate concretions on their surface, which is planned. Only one tool, an awl, was packed by the excavators without information on its level or depth below datum.

In order to determine whether the Ksar Akil tools were made of bone or antler, they were given to J. P. N. Watson of the Institute of Archaeology, London, who divided them into five groups: bone (39 pieces), probably bone (15 pieces), antler (17 pieces), probably antler (26 pieces) and indeterminate (34 pieces). The relevance of these identifications to the technique of production and form of the Ksar Akil bone tools will be discussed below. Hooijer's report on the fauna from Ksar Akil (1961) suggests that in levels 5-9, where most of the bone tools occur, antler for tool making would have been available from Dama, Capreolus and very rare Cervus, while bones from these genera, plus Capra and Gazelle, would also have furnished raw material for tool making.

Table I shows the numbers of awls, points, and awl or point fragments in each of 9 Upper Palaeolithic levels at Ksar Akil. With

TABLE I

Level	Awls	Points	Awl or point fragments	Totals	Bone tools as a proportion of bone and stone tools (%)
2			1	1	0.1
4		1		1	0.2
5	2	2	1	5	0.3
6	6	7	3	16	1.4
7	10	50	6	66	2.3
8	13	18	1	32	0.8
9	4	1	1	6	0.2
10	2			2	0.1
23	1			1	0.2
Unstratified	1			1	
Totals	39	79	13	131	

the exception of one unstratified awl and an awl from level 23, all of the bone tools are confined to the upper part of the Ksar Akil sequence. Although the stone tools from these upper layers have not been published, they may be roughly characterized as belonging to the Near Eastern Aurignacian, or evolved forms of this Aurignacian. The awl from level 23, discussed below, comes from a layer containing a 'transitional' stone industry, characterized by Mousterian style débitage and Upper Palaeolithic tool forms, especially chamfered pieces (Newcomer 1970; Azoury and Hodson 1973) and burins (Newcomer and Hodson 1973).

Terminology

Before discussing the Ksar Akil material, it is necessary to say a few words about the orientation and naming of the various parts of bone tools. Since the range of bone tool forms studied in this paper is small, it is my intention only to define terms I will use here without recommending their general adoption for all bone tools.

In the discussion that follows, and in the drawings, each bone tool will be oriented with its widest part downwards, and its narrowest part or presumed working end uppermost. The surface shown in the drawings is the outer surface of the bone or antler from which the tool is made, where this is ascertainable.

The names given to the ends of bone tools are similar to those recommended by Prost (1971), while the names of the surfaces are closer to Camps-Fabrer's (1966: 49). The uppermost part is the tip,[2] and the lowermost the base. The surface shown in the drawings is the outer surface, and the surface opposite this which shows traces of the marrow cavity or spongy tissue is the inner surface (fig. 2). If the terms proximal and distal are reserved for anatomical orientation and the orientation of stone tool débitage, and tip and base used for orienting bifacial tools (compare Tixier 1958-9: 119), microliths (Tixier 1963: 26), and for the general functional orientation of stone and bone tools, confusion can be avoided. Thus it is possible to describe a burin made on the proximal end of a blade, whose base is distal, or a bone awl whose base is a distal epiphysis and whose tip is then proximal.

Bone awls from Ksar Akil

Bone awls at Ksar Akil may be defined as bone or antler fragments, with one end (the tip) shaped into a sharp point, the other end (the base) being a bone fragment whose edges and surfaces are unworked. Double-ended awls do not occur in this collection. J. P. N. Watson's study of the awls indicates that most are of bone (31 of 39), while 4 were classed as probably bone, only 1 as probably antler, with 3 pieces indeterminable.

The number of awls in each level at Ksar Akil is shown in table I. The analogous stone tools, piercers or borers (<u>perçoirs</u>) and beaks (<u>becs</u>) are not very numerous in any Upper Palaeolithic levels at Ksar Akil, but the linear correlation coefficient <u>r</u> for these stone piercers or beaks and the bone awls based on levels where they both occur is 0.74.

There seem to be two basic forms of awls at Ksar Akil: awls with a delicate, slender tip whose sides are straight or concave (e.g. fig. 3, no. 1), and awls with a shorter, stouter tip whose sides are often convex (e.g. fig. 3, no. 5). Given a larger sample of unbroken awls, the possibility that these contrasting forms are genuine types could be tested by measuring the width and thickness of the tip at an arbitrarily fixed distance - say 1 cm. - back from its end.

Awls could also be divided into symmetrical (e.g. fig. 3, no. 9) and asymmetrical (e.g. fig. 3, no. 7) forms, but this distinction is possible only on pieces which are not badly broken, and probably reflects nothing more than the original shape of the bone fragment on which the awl was made.

Three awls from level 6 and one each from levels 7 and 8 have tips which are apparently fire-hardened (fig. 3, nos 5, 6). Traces of use on awls are limited to a slight polish on the tips of a few pieces with well-preserved surfaces, but some of the ancient breaks near the tip may also be the result of too heavy use.

The only piece of decorated bone in this collection is a probable awl tip from level 23 with a remaining total of 14 cut marks in 7 groups of 2 around its circumference (fig. 5, no. 11). These cut marks are filled with calcium carbonate and are certainly ancient, but the complete absence of any other worked bone from the early Upper Palaeolithic levels at Ksar Akil makes it conceivable that this piece has fallen down the section or is otherwise intrusive in level 23.

Bone points from Ksar Akil

Bone and antler points from Ksar Akil may be defined as tools made by shaping both ends and most or all of the surfaces of a bone or antler splinter, to form a tool with a tapering tip and a wider base, which may be pointed, blunt or constricted (tanged).

Table I shows the concentration of points and point fragments in level 7, where there are a total of 50 pieces.

Raw materials utilized for point manufacture are rather different from those used for awls, with 15 points of antler, 23 probably antler, and only three bone and 11 probably bone, with 27 indeterminable. Although experiments suggest that the débitage and shaping of antler require more work than does bone, antler's greater resistance to breakage by sudden impact may explain its popularity as raw material for points, assuming that these tools were indeed projectile points.

The typology of Upper Palaeolithic bone points is a difficult and neglected subject. Problems are caused by the usually small numbers and fragmentary nature of bone points, by convergences (Leroi-Gourhan 1968: 271), and by constraints imposed by the raw materials used - primarily their length and thickness. Although Ksar Akil is very rich in bone points compared with other Near Eastern sites, it must be emphasized that only 79 points are present, and many of these are very fragmentary. For this reason, the following study can offer only tentative typological divisions, valid for Ksar Akil only.

Tanged bone points (fig. 4, nos 1-8)

The most obvious type of point in the present collection is a short point with a short axial tang, made by reducing the base of the point on the two lateral edges and on the inner and outer surfaces. On points with flattened cross-sections, the tang is formed mainly by reducing the lateral edges (fig. 4, no. 8), but on points with rounded sections the reduction is more or less equal all around the base (fig. 4, no. 3). Tangs may have straight, slighly concave or slightly convex outlines. Reliable measurements of the length of these tanged points are not possible due to varying amounts of breakage, but they seem clearly shorter than the rest of the Ksar Akil bone points. Equally, it is impossible to tell whether these points ever had acute tips.

Of the total of 13 tanged points, one is in level 5, nine are in level 7, and three are in level 8. Three are of antler, four are probably antler, and six are of indeterminable raw material.

Bone points with rounded and flattened cross-sections

The remaining 46 points without tangs (excluding 20 very small point fragments) were less easy to classify, despite obvious differences among them. Attempts to separate them into groups on the basis of overall form or form of the base (pointed or blunt) were abandoned due to the rarity of complete points. If a larger sample containing more complete points were available, perhaps a system of linear measurements similar to those used for handaxes by Bordes (1961) and Roe (1964) could provide useful typological groups (Hodson 1971), although badly broken pieces would still be impossible to classify.

In dealing with these untanged points, only one criterion, the nature of the cross-section, allowed consistent separation of the points into groups. By examining the cross-section at the thickest and widest part of the point, 31 of the untanged points could be easily grouped into those with rounded cross-sections (14 examples, fig. 4, nos 9-12), and those with flattened cross-sections (27 examples, fig. 5, nos 1-8). This left only 5 relatively complete points unclassifiable (see below), plus the 20 small fragments which might be parts of tanged or untanged points.

In order to see if these differences in cross-section could be verified by measurement, the maximum width and maximum thickness of the 31 points classified by cross-section were measured to the nearest half millimetre using a sliding caliper. All but 2 of the 31 points were complete enough for repeatable measurements to be made. Measurements of these 29 points (10 with rounded sections, 19 with flattened sections) were then converted to a thickness/width ratio to eliminate the effects of absolute size, and the results plotted as histograms (fig. 6).

While this sample of 29 measurable points is certainly too small to permit firm conclusions to be drawn, fig. 6 does suggest that the differences in cross-section seen by eye have a genuine metrical basis, and that two distinct forms of cross-section are represented.

Of the total of 14 rounded-section points, there are 2 in level 6, 11 in level 7, and 1 in level 8. Seven are of bone, and 7 are of indeterminable material.

The 27 flattened-section points are more widely spread in the Ksar Akil stratigraphy, with one in each of levels 4 and 5, 3 in level 6, 15 in level 7, and 7 in level 8. The raw materials used also differ, only 2 being bone and 3 probably bone, while 7 are antler, 12 probably antler, and 3 indeterminable.

The influence of raw material on cross-section shape certainly needs investigation, using larger samples than available from Ksar Akil. The roe and fallow deer antlers available to the inhabitants of Ksar Akil typically have rather thin layers of compact tissue suitable for point manufacture, while long bones from the same animals would provide thicker material, and permit the making of strong points with rounded cross-sections. The makers of these tools would certainly have known the properties of their raw material, and it is possible that they consciously chose bone for making rounded-section points, and antler for points with flattened sections.

Unclassified points (fig. 5, nos 9, 10)

In addition to the 20 points too fragmentary to classify, there are also the 5 relatively complete points mentioned above which share a distinctive feature missing on other points, the presence of a clear angle or 'shoulder' about halfway down the point. Two of these points occur in level 7, and 3 in level 8, 1 being antler, 3 probably antler, and 1 indeterminable. Although too rare and variable to constitute a type, 2 of these points have been drawn here, both for the record and because a similar point was found at Jabrud (Rust 1950: Tafel 86, no. 20).

As with the bone awls, a few (5) bone points from Ksar Akil are blackened either at the tip or base, probably from intentional fire-hardening.

Traces of use on the points seem to be limited to breakage. The tips of several points and the bases of others show the kind of splintering described by Tyzzer (1936), which he duplicated by shooting experimentally made bone points mounted on arrows into gravel.

Assuming that most or all of the Ksar Akil bone points were intended for use as spear or arrow points, several hafting methods would have been possible, for example those suggested by Bordes (1969: 120) for French Aurignacian bone points with similar, unsplit, bases.

Bone Tools From Other Near Eastern Upper Palaeolithic Sites

As mentioned earlier, more bone tools are known from Ksar Akil than from any other Near Eastern Upper Palaeolithic site. The following is a list, certainly incomplete, of other Near Eastern sites with published bone tools:

1. Abou-Halka (Haller 1942-3); 2. Antelias (Copeland and Hours 1971); 3. El Quseir (Perrot 1955); 4. El Wad (Garrod and Bate 1937); 5. Et-Tabban (Neuville 1951); 6. Jabrud (Rust 1950); 7. Kebara (Garrod 1954); 8. Oumm-Naqous (Neuville 1951).

Although most of the publications cited above include few or no illustrations of bone tools, it does appear that Near Eastern Upper Palaeolithic bone tools are confined to simple forms of awls and points as present at Ksar Akil, and that these tools are in general rare. The eyed needles, bevelled base bone points, spear throwers, harpoons, and other special forms of the European Upper Palaeolithic are entirely lacking.

Experimental bone tools

In planning experiments to increase our understanding of the Ksar Akil bone tools, I considered several possible subjects for investigation: (1) possible uses of bone tools implied by their traces of wear, (2) traces of use on stone tools possibly used to make bone tools, and (3) ways of making bone tools.

Because the traces of wear on the Ksar Akil bone tools were limited to a few polished tips on bone awls and shattering at the ends of points, and because the study of traces of use on stone tools is a highly specialized field, it was decided to concentrate on the manufacture of bone tools, and to see how the Ksar Akil tools could be reproduced experimentally (plates 1-3).

The manufacturing sequence for any bone tool must consist of at least two stages: the débitage of the bone or antler to get slabs of material which serve as blanks from which the tools are made, and the shaping of these blanks into tools - awls and points in the present case. Unfortunately, it was not possible to relate experiments in the débitage of bone or antler to the Ksar Akil material, since evidence for well-known techniques like groove and splinter technique is lacking from the Boston College excavations at Ksar Akil (Hooijer in litt. 3 December 1970). Percussion techniques may well have been used, but this possibility must await information from Tixier's new excavations at Ksar Akil.

As a result of this lack of information on techniques of débitage, my experiments focused on the second stage of manufacture, the shaping of a bone or antler blank into a point or awl. Traces of manufacture were visible to the naked eye on every Ksar Akil bone tool with a well-preserved surface, and may be divided into two different kinds of features. The first and most noticeable are score marks or striations which cover most or all of the worked surface and run parallel to the long axis of the point or awl. The second kind of manufacture traces are chattermarks or closely spaced corrugations at right angles to the striations. Like the striations, these chattermarks are present on every bone tool in good condition, and are often especially clear on the edges of the awls or points (plate 3A).

The raw materials used in my attempts to reproduce these striations and chattermarks were cattle and sheep long bones (raw and cooked), red deer antler (water soaked and dry) and also, out of interest, elephant ivory and hippopotamus tooth. Although not exactly duplicating the raw materials available at Ksar Akil, it was thought that the experimental materials at least matched the range of sizes and hardness of the archaeological materials. In fact, except for the different techniques of débitage appropriate to each of my materials and some differences in hardness, it was found that all behaved similarly when shaped into points or awls.

Flaked stone tools used to work these materials were all types found in the same layers as the Ksar Akil bone tools: burins, broken blades, truncated blades, end-scrapers and retouched and unretouched blades. They were made from English, French and Lebanese flint, and American obsidian (plate 1). Another kind of stone tool, a sandstone slab used as a grindstone, was also used, although no tool like this was found at Ksar Akil.

The first experiments to be described concern the use of the flaked stone tools to shape some 20 points and awls. Here the stone tool was held in one hand, the bone blank in the other, and the stone tool scraped over the surface of the bone in as long a sweep as possible, down the long axis of the blank. Every type of flaked stone tool used produced both the longitudinal striations and the chattermarks seen on the Ksar Akil bone tools, whether the stone tool was moved in one direction only, or back and forth (plate 3B).

The striations are made by irregularities in the stone tool's edge, which may be present before the tool is used (through irregular retouch), or may develop as the tool is used and its edge becomes chipped. The chattermarks seem to be caused by the stone tool bouncing over uneven parts of the bone surface and thus failing to maintain contact with the bone throughout its sweep. An analogous situation occurs on unmetalled roads, which inevitably develop ruts, and corrugations perpendicular to these ruts through the failure of passing vehicles' wheels to maintain constant contact with the road surface.

Listed below are notes on the use of each of the various stone tools, the finish they produce, and the traces of wear visible with low magnification (10 x) on the stone tools (plate 1).

1. Burin. The use as a bone scraper of the edge between a burin facet and the dorsal or ventral surface of the blade has been described by Bordes (1965; 1969: 117) and A. Rigaud (1972). On normal burins, these edges are a near right angle and form a very strong scraping edge which becomes use-damaged relatively slowly. If the burin facet is inclined towards the dorsal or ventral surface of the blade, only the acute angled edge between the burin facet and the blade's dorsal or ventral surface is readily usable, and this edge is weaker and breaks down more quickly than that of a normal burin facet.

By sharpening the burin regularly and by turning the bone tool frequently in the hand to avoid the formation of longitudinal facets, a very smooth finish on bone or antler can be obtained, which may at first glance look like a polished surface.

Traces of use on the burin facet consist of tiny, irregular chippings which could not be confused with retouch in most cases. A damaged working edge on a burin facet can of course be easily removed by detaching another burin spall.

2. Broken blade. The edge between the ventral surface and an accidental or intentional break at the end of a flake or blade is often functionally identical to a burin facet, being right-angled and very strong. A broken blade may be used in exactly the same way as a burin facet, and the same traces of manufacture and traces of use are produced. It differs from the burin only in that it is less easy to

sharpen when worn.

3. Truncated blade, end-scraper, retouched blade. These retouched edges differ from each other in their location on the blade, their shape, and their angle formed with the ventral surface of the blade, but all may be used as efficient scraping tools, and are grouped together simply because they are all made by retouch. If the retouch forming the working edge is irregular, striations can be quite deep on the bone surface. Keeping the edges regular by repeated sharpening, however, can result in quite fine finishes. When a tool made by direct retouch is held with the dorsal surface uppermost and pushed down the length of the bone tool, the traces of use often resemble bladly executed retouch, the edges being irregular and weakly denticulated, with the projecting 'teeth' usually forming where the ridges of the retouch scars meet the ventral surface. If the truncation, end-scraper or retouched blade is moved back and forth against the bone, chips are also removed from the ventral surface of the blade.

4. Unretouched edge. The acute-angled unretouched edge of a blade or flake was found the least efficient and least pleasant to use, in that heavy pressure drives off tiny chips from the blade's edge and into the worker's face. Unless light pressure only was used, the finish produced on bone or antler was often rough, since the weak edge was quickly damaged and left deep striations. Traces of use on unretouched blades often resembled fine or 'nibbled' retouch, which may of course be direct, inverse, bifacial etc., depending on how the blade was held and moved over the bone's surface.

The second set of experiments involved the use of a grindstone to shape a bone or antler blank into a tool. Two techniques were tried: rubbing a small piece of sandstone over the bone, and rubbing the bone over a larger block of sandstone.

Both techniques were used on three experimental points and awls. They worked well if rather slowly, but produced striations only and no chattermarks. It was also found difficult to reproduce the concave surfaces found on some points and many awls without rubbing the sandstone perpendicular to the long axis of the point or awl. This of course leaves horizontal striations which are not found on the Ksar Akil material.

Conclusions

The main conclusion of these experiments is that the traces of manufacture on Ksar Akil bone tools are most closely approximated by scraping with a variety of flaked stone tools, and that finishing by grinding does not produce the chattermarks observed on the Ksar Akil tools. Narrowing down the range of stone tools that might have been used to finish the Ksar Akil tools seems at present impossible, since too many variables affect the final finish. Some of these are: the length of time that the stone tool is used before it is sharpened or discarded, the amount of pressure used in scraping, the weight of the stone tool, the length of the scraping stroke, the angle at which the stone tool is held, the softening of the bone or antler by soaking in water etc.

Experiments in bone tool making reported by A. Rigaud (1972) parallel those reported here to a certain extent, but differ in the raw materials used (bone and horn), in the tools used to finish them (burin facet, end-scraper, retouched and unretouched blade, and 'polishing stone' only), and in the conclusions. Rigaud's confidence in attributing traces of manufacture on Palaeolithic bone tools specifically to 'burin facets', 'end-scraper or blade', or 'polisher' seems a little optimistic in light of my own experiments, which only permitted a distinction between scraping with a stone tool and grinding. For example, Rigaud considers the longitudinal faceting on many of his Palaeolithic bone tools as definite evidence of finishing with a burin facet. Although such regular faceting is rare on the Ksar Akil material, my experiments show that it can be duplicated by scraping with a variety of tools with straight edges including burin facets, broken blades, and unretouched blades.

The caution needed when relating experimental results to archaeological evidence is admirably summed up in a recent paper describing experimentally produced tool marks on bronze artefacts, in which the authors state: '... we believe that the technology of much ancient bronzework is likely to present features which will remain uncertain, not because of any complexity, but because their simple ends could be reached with more or less equal ease by several means, between which there is no practical way of deciding' (Lowery, Savage and Wilkins 1971: 168, my emphasis). The same is probably true for bone tools.

Acknowledgements

My thanks are due to Mr J. P. N. Watson for his identification of the raw materials used for bone tools at Ksar Akil, and to the late Judith Newcomer who drew the bone tools. For access to the Ksar Akil material I am indebted to Emir Maurice Chehab and the late Dr J. Waechter.

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References

Altena, C. O. Van Regteren. 1962. Molluscs and Echinoderms from the Palaeolithic deposits in the rock shelter of Ksar 'Akil, Lebanon. Zoologische Mededelingen. 38, 5:87-99.

Azoury, I. and Hodson, F. R. 1973. Comparing Palaeolithic assemblages: Ksar Akil, a case study. World Archaeology. 4, 3:292-306.

Bordes, F. 1961. Typologie du Paléolithique Ancien et Moyen. Bordeaux.

Bordes, F. 1965. Utilisation possible des côtés des burins. Fundberichte aus Schwaben. 17: 3-4.

Bordes, F. 1969. Les chasseurs. In La France au temps des Mammouths, ed. Hachette. 93-131.

Camps-Fabrer, H. 1966. Matière et art mobilier dans la préhistoire Nord-Africaine et Saharienne. Paris.

Copeland, L. and Hours, F. 1971. The late Upper Palaeolithic material from Antelias Cave, Lebanon: Levels IV-I. Berytus. 20: 57-138.

Day, A. E. 1926. The rock shelter of Ksar 'Akil near the cave of Antilyas. Palestine Exploration Fund. 158-60.

Delcourt, L. 1927. Observations sur l'Abri de Ksar Akil (près Antélias [Liban]). Bulletin de la Société Préhistorique Française. 24: 56-61.

Ewing, J. F. 1947. Preliminary note on the excavations at the Palaeolithic site of Ksar 'Akil, Republic of Lebanon. Antiquity. 21: 186-96.

Garrod, D. A. E. 1954. Excavations at the Mugharet el-Kebara, Mount Carmel, 1931: the Aurignacian Industries. Proceedings of the Prehistoric Society 20, 2: 155-92.

Garrod, D. A. E. and Bate, D. M. A. 1937. The Stone Age of Mount Carmel. Vol. I. Oxford.

Haller, J. 1942-3. Notes de préhistoire phénicienne. L'abri de Abou-Halka (Tripoli). Bulletin du Musée de Beyrouth. 6: 1-19.

Hodson, F. R. 1971. Numerical typology and prehistoric archaeology. In Mathematics in the Archaeological and Historical Sciences, eds F. R. Hodson, D. G. Kendall and P. Tautu. Edinburgh. 30-45.

Hooijer, D. A. 1961. The fossil vertebrates of Ksar 'Akil, a Palaeolithic rock shelter in the Lebanon. Zoologische Verhandelingen. 49: 4-67.

Leroi-Gourhan, A. 1968. Tableaux de Morphologie Descriptive. In La Préhistoire, A. Leroi-Gourhan, G. Bailloud, J. Chavaillon and A. Laming-Emperaire, Paris. 245-71.

Lowery, P. R., Savage, R. D. A. and Wilkins, R. L. 1971. Scriber, graver, scorper, tracer: notes on experiments in bronzeworking technique. Proceedings of the Prehistoric Society. 37, 1:167-82.

Murphy, J. W. 1938. The method of pre-historic excavations at Ksar 'Akil. Anthropology Series, Boston College Graduate School. 3, 1: 272-5.

Murphy, J. W. 1939. Ksar 'Akil, Boston College Expedition. Anthropology Series, Boston College Graduate School. 4, 4: 211-17.

Neuville, R. 1951. Le Paléolithique et le Mésolithique du Désert de Judée. Paris.

Newcomer, M. H. 1970. The chamfered pieces from Ksar Akil (Lebanon). Bulletin of the Institute of Archaeology. 8-9: 177-91.

Newcomer, M. H. 1971. Un nouveau type de burin à Ksar Akil (Liban). Bulletin de la Société Préhistorique Française. 68: 267-72.

Newcomer, M. H. and Hodson, F. R. 1973. Constellation analysis of burins from Ksar Akil. In Archaeological Theory and Practice, ed. D. E. Strong, London. 87-104.

Perrot, J. 1955. Le Paléolithique supérieur d'El Quseir et de Masaraq an Na'aj (Palestine). Inventaire de la collection René Neuville I et II. Bulletin de la Société Préhistorique Française. 52: 493-506.

Prost, C. 1971. Première note relative à l'orientation des objets en os. Bulletin de la Société Préhistorique Française. 68: 46-7.

Rigaud, A. 1972. La technologie du burin appliquée au matériel osseux de la Garenne (Indre). Bulletin de la Société Préhistorique Française. 69: 104-8.

Roe, D. A. 1964. The British Lower and Middle Palaeolithic: some problems, methods of study and preliminary results. Proceedings of the Prehistoric Society. 30: 245-67.

Rust, A. 1950. Die Höhlenfunde von Jabrud (Syrien). Neumünster.

Tixier, J. 1958-9. Les industries lithiques d'Aïn Fritissa (Maroc oriental). Bulletin d'Archéologie Marocaine. 3: 107-244.

Tixier, J. 1963. Typologie de l'Epipaléolithique du Maghreb. Paris.

Tixier, J. 1970. L'abri sous roche de Ksar 'Aqil. La campagne de fouilles 1969. Bulletin du Musée de Beyrouth. 23: 173-91.

Tyzzer, E. E. 1936. The 'simple bone point' of the shell-heaps of the northeastern Algonkian area and its probable significance. American Antiquity. 4: 261-79.

Vogel, J. C. and Waterbolk, H. T. 1963. Groningen radiocarbon dates IV. Radiocarbon 5: 163-202.

Wright, H. E. Jr. 1962. Late pleistocene geology of coastal Lebanon. Quaternaria. 6: 525-39.

Abstract

Newcomer, M.

Study and replication of bone tools from Ksar Akil (Lebanon)

The first part of this paper describes a relatively rich series of bone awls and bone points from Upper Palaeolithic layers at Ksar Akil, Lebanon. The raw materials, techniques of manufacture, and formal variation of these bone tools are considered. The second part of the paper concerns experiments in making bone tools, using flint tools similar to those from the relevant layers at Ksar Akil, as well as a grindstone. Traces of manufacture on bone tools and traces of wear on

stone tools are described, and it is concluded that the traces of manufacture observed on the Ksar Akil bone tools can be replicated by scraping with any of a number of flint tools, but not by grinding.

Notes

1. This simplified spelling, first used by Delcourt (1927), has been adopted by the author in preference to 'Ksar 'Akil' (Day 1926), 'Ksar 'Akil' (Murphy 1938), or 'Ksâr 'Akil' (Ewing 1947). A fifth variation, 'Ksar 'Aqil', is now used by Tixier (1970).

2. The shorter Oxford English Dictionary defines 'tip' as 'the slender extremity or top of a thing', while 'apex', recommended by Prost (1971), is defined as, 'the tip, top, or pointed end of anything'. The implication of pointedness is probably best avoided, since bases may be pointed too.

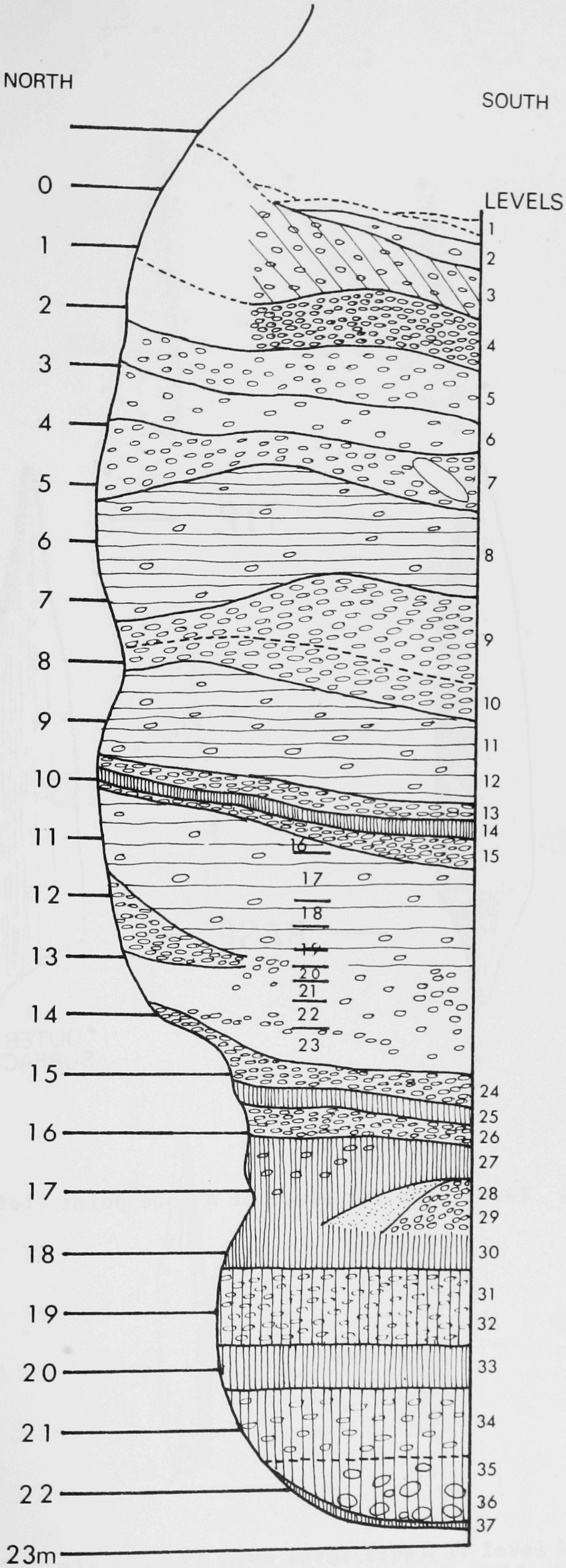


Figure 1. Schematic section of Ksar Akil. (After an unpublished drawing of J. F. Ewing, made available by Dr J. Waechter).

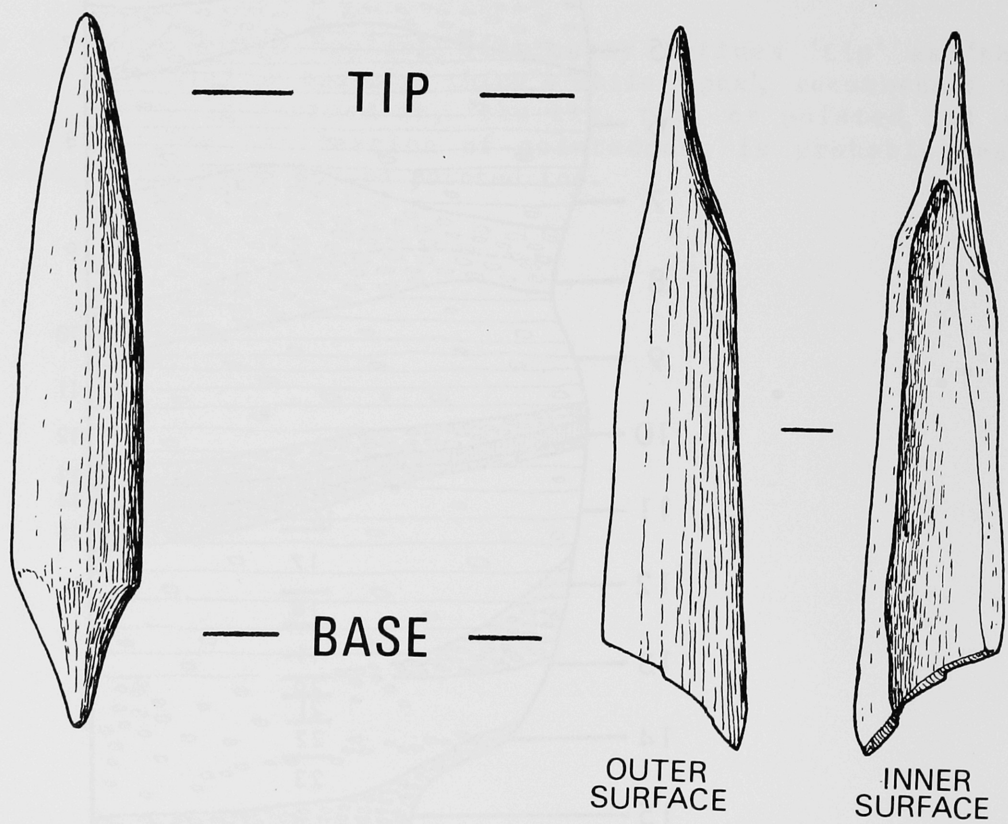


Figure 2. Terms used for parts of a bone point (left) and bone awl (right).

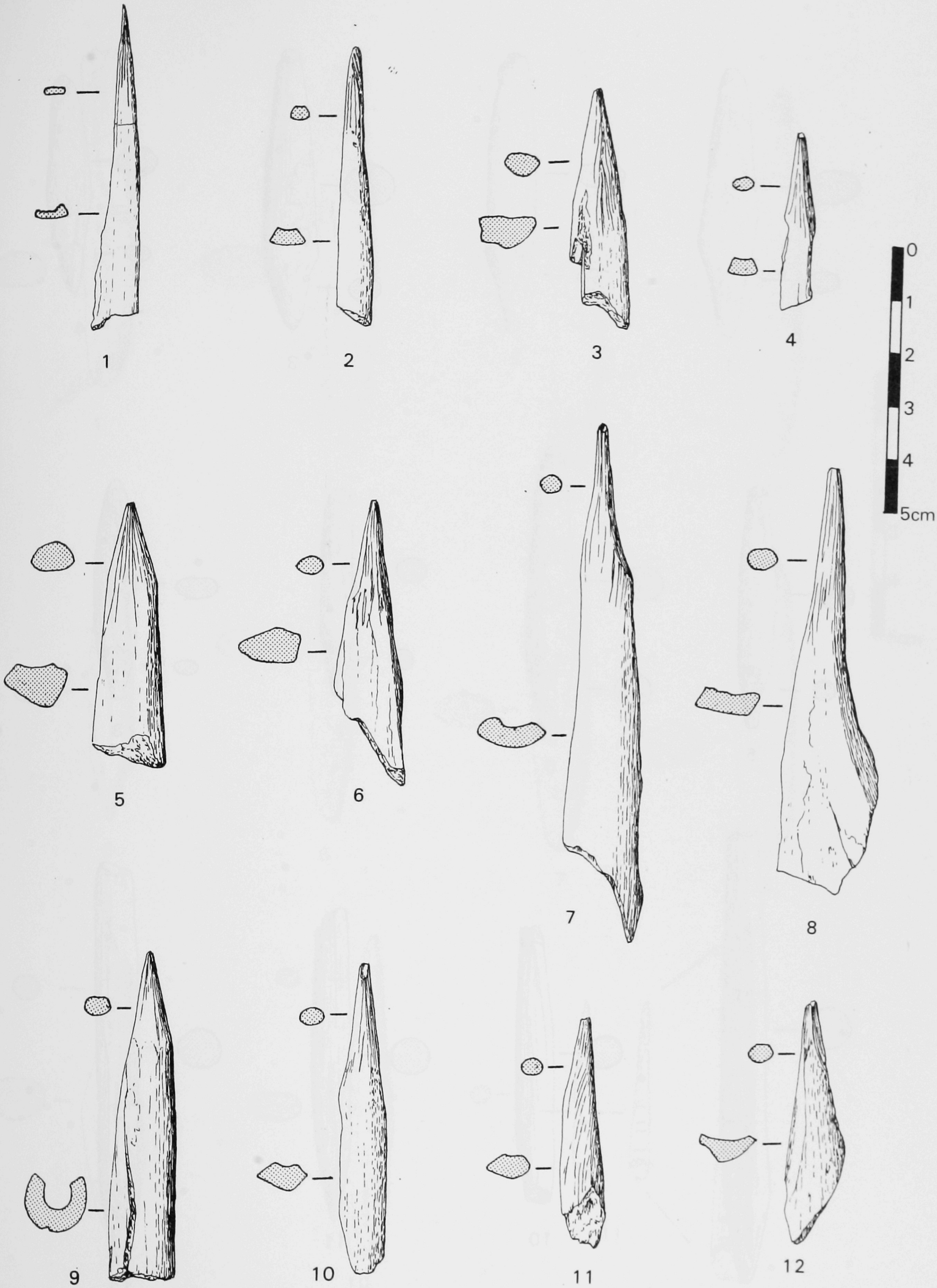


Figure 3. 1-12: awls (5 and 6 have burnt tips). 1: level 10; 2: level 5; 3: level 9; 4,5,7,9,11,12: level 8; 6: level 6; 8,10: level 7. All bone.

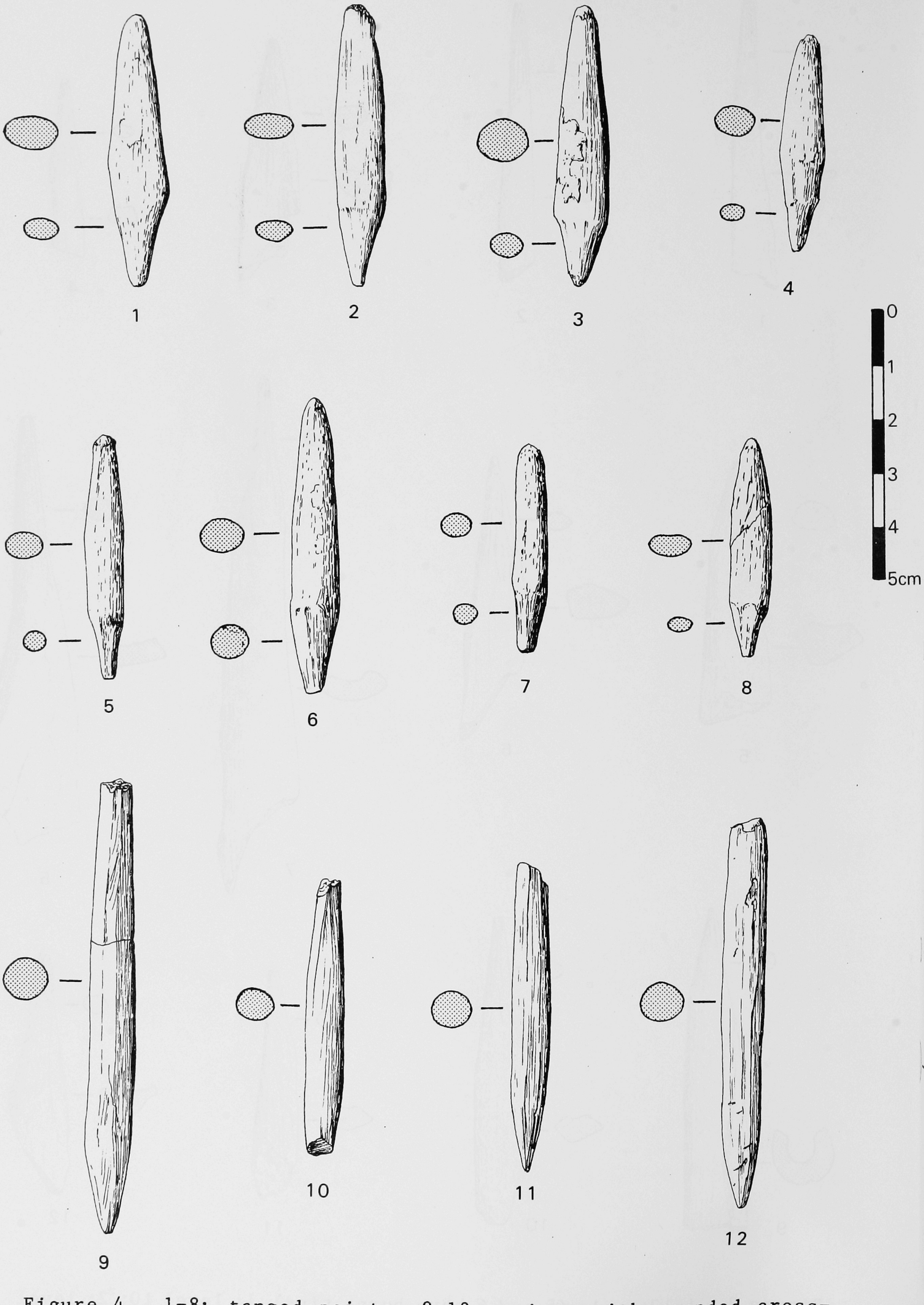


Figure 4. 1-8: tanged points; 9-12: points with rounded cross-sections. 1,2,4-12: level 7; 3: level 8; 4,8: antler; 2,7: probably antler; 9,11,12: probably bone; 1,3,5,6,10: indeterminable.

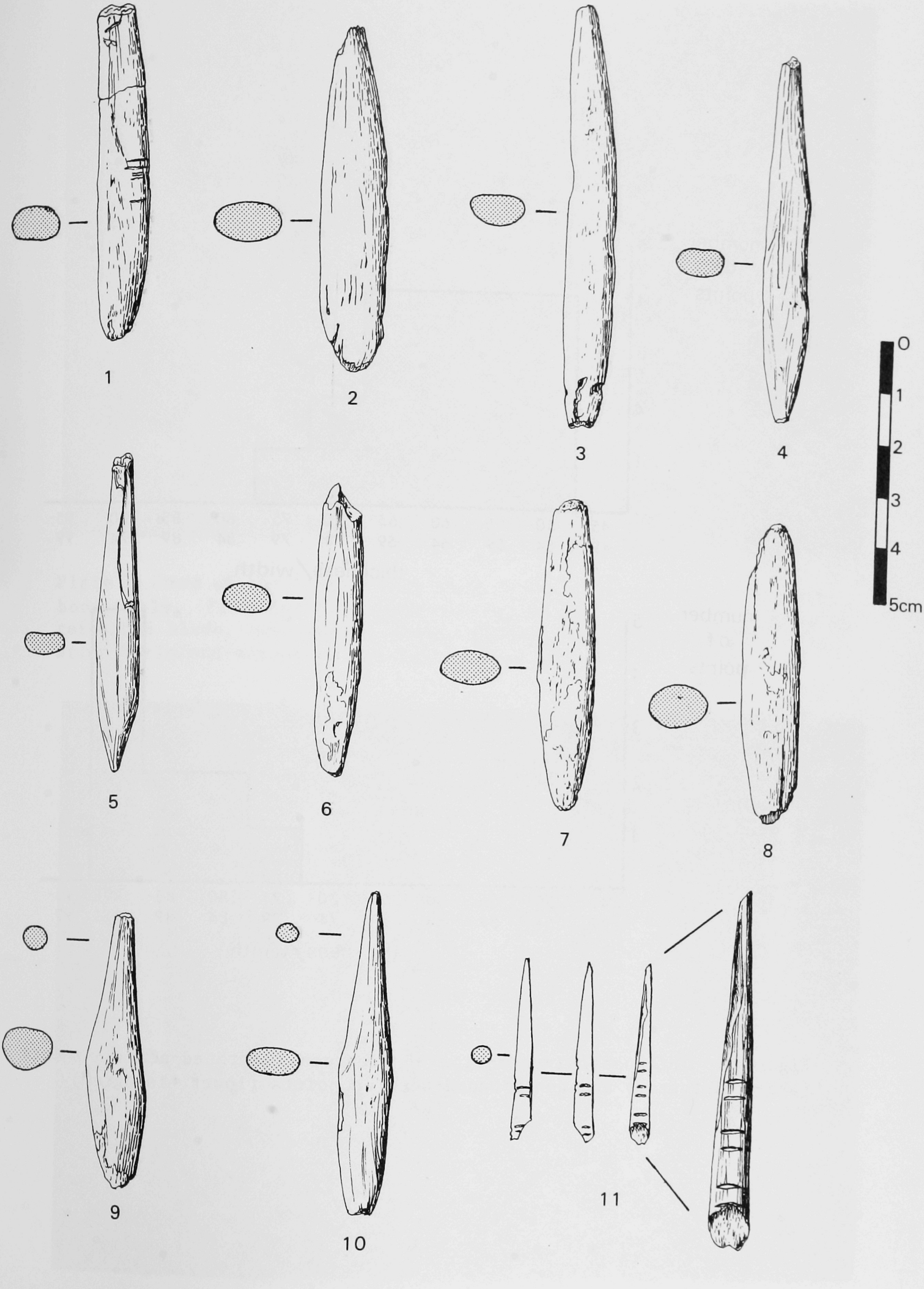


Figure 5. 1-8: points with flattened cross-sections; 9,10: points with lateral shoulders; 11: awl with cut marks. 1-3,7-10: level 8; 4-6: level 7; 11: level 23. 1,2,9: antler; 3,6,7,8: probably antler; 5: bone; 4,11: probably bone; 10: indeterminable.

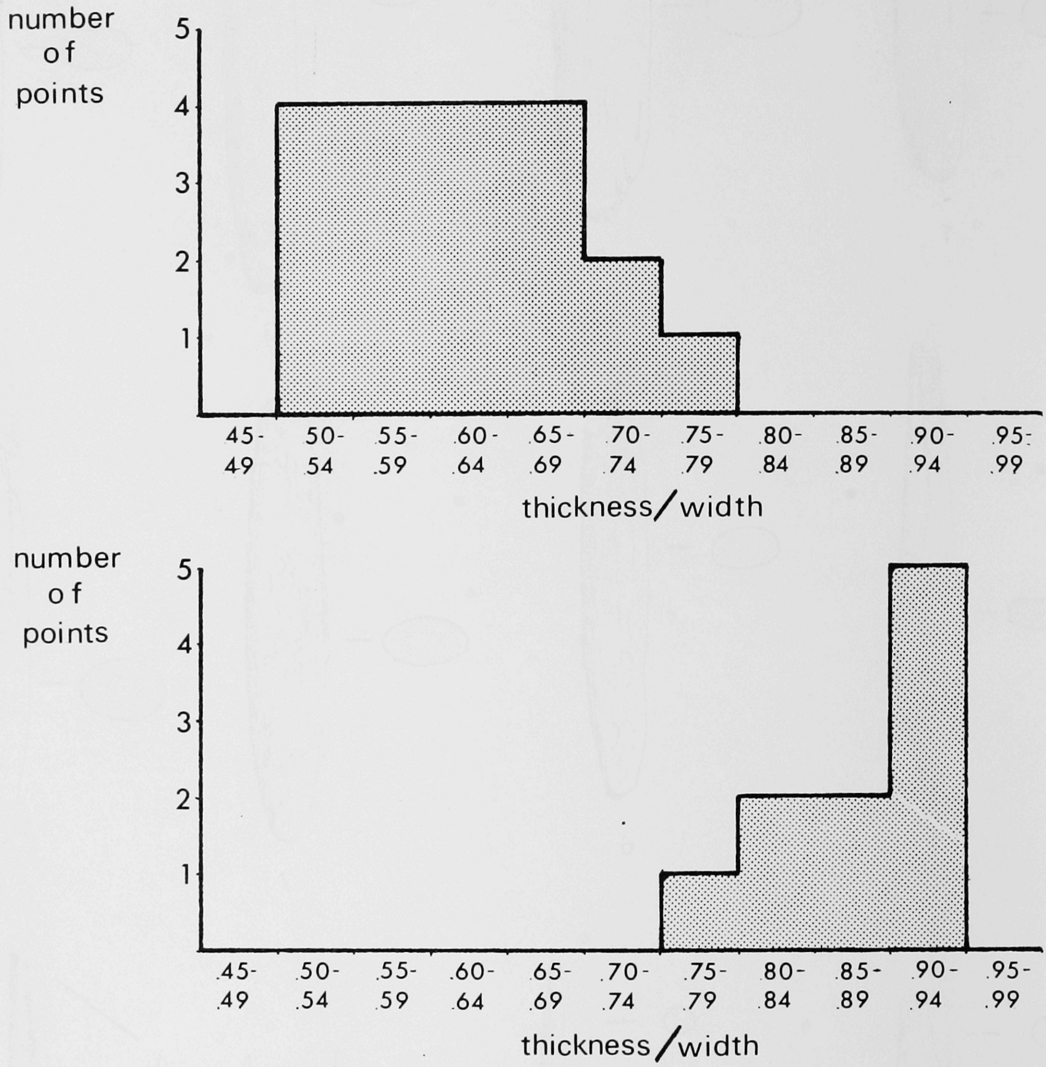


Figure 6. Thickness/width ratios of nineteen flattened-section points (upper histogram) and ten rounded-section points (lower histogram).

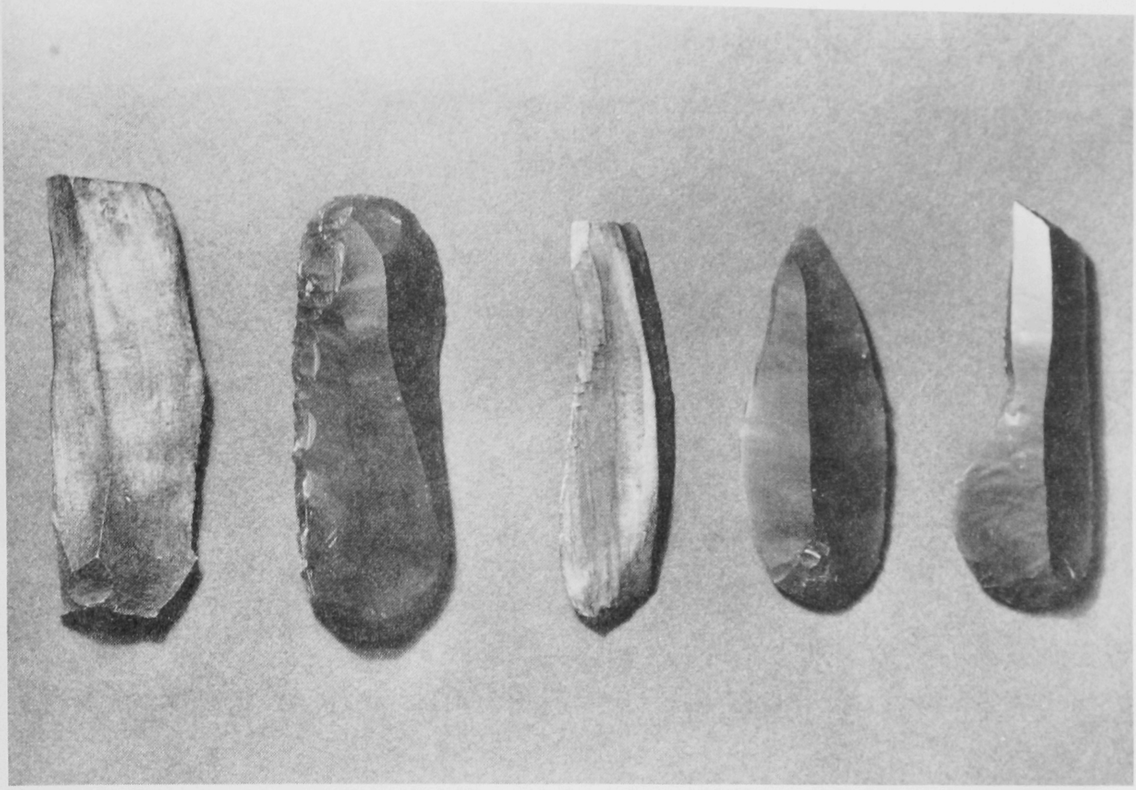


Plate 1. Some of the flint tools used in the experiments in finishing bone tools. From left to right: broken blade, double end-scraper on retouched blade, unretouched blade, dihedral burin/end-scraper, truncation burin/end-scraper. The tool on the left is 8.6 cm. long.

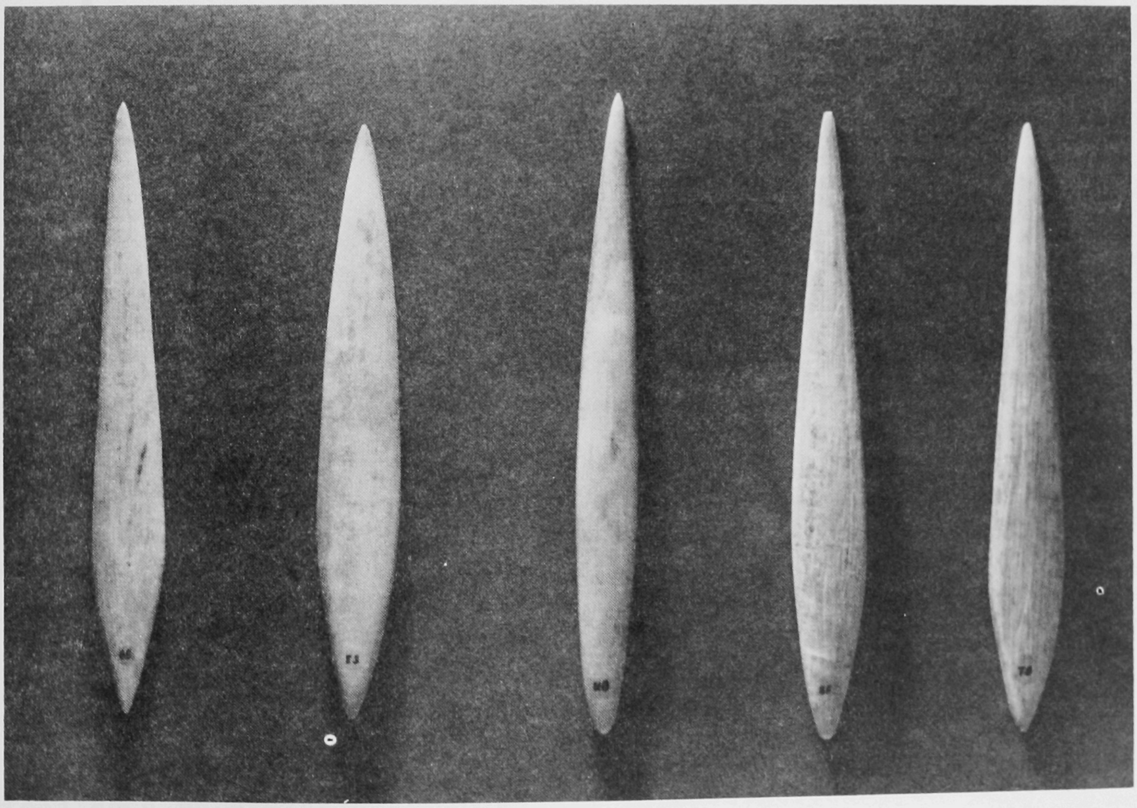
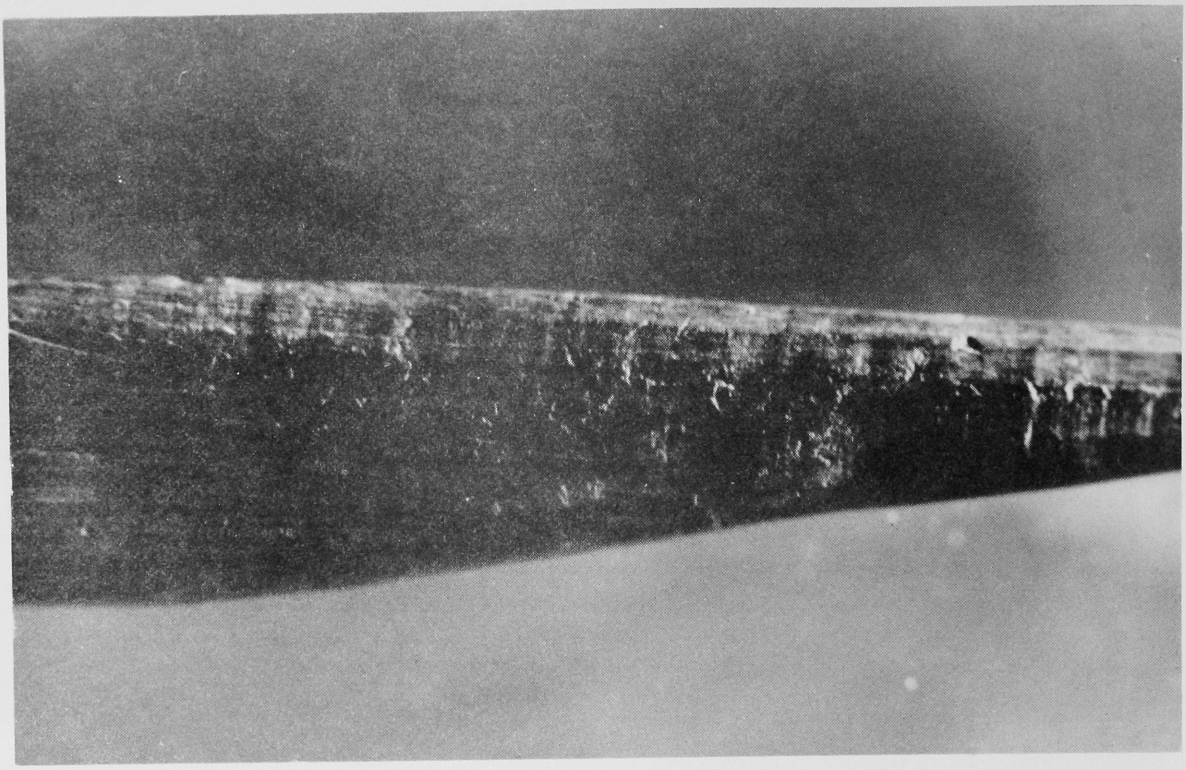


Plate 2. A selection of experimental bone points, all in red deer antler, finished with different stone tools. From left to right, finished by: broken blade, end-scraper, unretouched blade, burin facet, truncated blade. The point on the left is 13.1 cm. long.

3 A



3 B

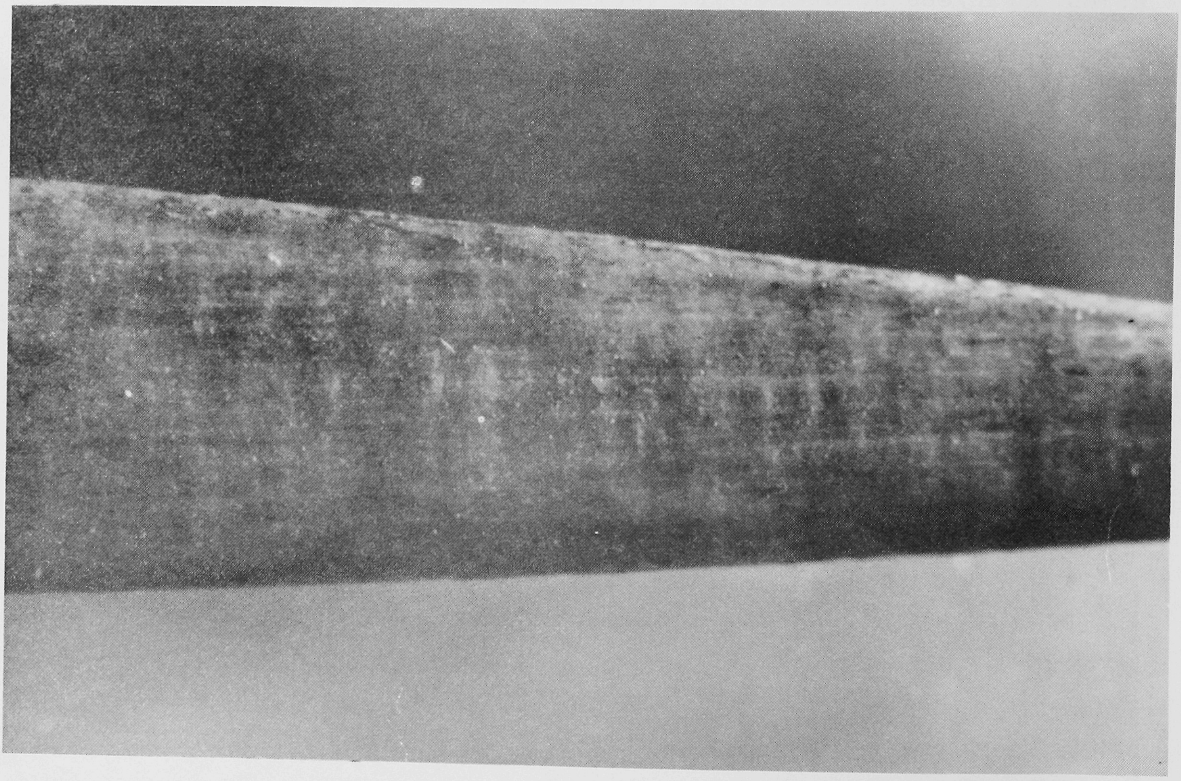


Plate 3. Macrophotographs of traces of manufacture on bone tools. 3A) Bone point from Ksar Akil level 7; 3B) experimental bone point in dry red deer antler, finished with an unretouched blade. Note the presence of striations and chattermarks on both examples. X2

Ksar Akil Bone Tools
Register

M. Newcomer 1974

Registration Number	Level	Square	Depth	Date	Material	Description
1	2	D7	–	6/25	Bone	Awl/Point Fragment
4	5	G4	–	–	Bone	Awl
5	"	"	–	–	"	Awl
6	"	"	–	–	"	Awl/Point Fragment
7	"	"	–	–	Unknown	Point
8	"	"	–	–	Prob.Antler	Point
10	6	D7	–	8/15	Bone	Awl
11	"	"	–	"	Unknown	Point
12	"	"	–	"	"	Point
13	6	F4	–	8/10	Bone	Awl
14	"	"	–	"	"	Awl
15	"	"	–	"	"	Awl
16	"	"	–	"	"	Awl
17	"	"	–	"	Unknown	Awl/Point Fragment
18	"	"	–	"	Bone	Point
19	"	"	–	"	Unknown	Point
20	"	"	–	"	Antler	Point
21	"	"	–	"	Bone	Awl/Point Fragment
23	6	G3	–	8/16	Unknown	Point
24	"	"	–	"	"	Awl/Point Fragment
25	"	"	–	"	"	Point
26	"	"	–	"	"	Awl
28	7B	F4	–	8/27	Prob.Antler	Point
29	"	"	–	"	"	Awl/Point Fragment
30/31	"	"	–	"	"	Point
32	7B	G3	–	8/26	Prob.Antler	Point
33	"	"	–	"	Antler	Point
35	"	"	–	"	Prob.Bone	Point
36	"	"	–	"	Bone	Awl
37	"	"	–	"	Prob.Bone	Awl
38	"	"	–	"		Pierced Shell
39	"	"	–	"		Pierced Shell
40	"	"	–	"		Pierced Shell
41	7B	G3	–	–	Antler	Point
42/67	7B	G4	–	8/25	Unknown	Point
43	7	D6	–	7/26	Prob.Antler	Point
44	"	"	–	"	"	Point
45	"	"	–	"	"	Awl/Point Fragment
46	7	E5	5.30-5.40	8/13	Prob.Bone	Point
47	"	"	"	"	Unknown	Point
48	7	E5	5.40-5.60	8/13	Prob.Antler	Point
49	"	"	"	"	Unknown	Point
50	7	F3	–	8/19	"	Point
51	"	"	–	"	Prob.Antler	Point
52	"	"	–	"	Antler	Point
53	"	"	–	"	Prob.Antler	Point

Registration Number	Level	Square	Depth	Date	Material	Description
55	7	F5	4.70-4.90 at 5.10	8/12	Prob.Bone	Point
56	7	F5	(4.90-5.10)	8/12	Unknown	Point
57	7	F5	5.00-5.30	8/13/47	Prob.Bone	Point
58	7	F5	5.10-5.30	8/13	"	Point
59	7	F5	5.40-5.60	8/14	Bone	Awl
60	7	G2-G4	-	-	Antler	Point
61	"	"	-	-	Prob.Antler	Point
62	"	"	-	-	Unknown	Point
63	"	"	-	-	Antler	Point
64	"	"	-	-	Prob. Antler	Point
65	"	"	-	-	Antler	Point
66	"	"	-	-	Prob. Antler	Point
68	"	"	-	-	Prob. Bone	Point
69	"	"	-	-	Unknown	Point
70/87	"	"	-	-	Prob.Antler	Point
71	"	"	-	-	Bone	Point
72	"	"	-	-	Unknown	Point
73	"	"	-	-	Prob. Antler	Point
74	"	"	-	-	Bone	Awl
75	"	"	-	-	Unknown	Point
77	"	"	-	-	Bone	Awl/Point Fragment
78	"	"	-	-	Antler	Point
79	"	"	-	-	Unknown	Point
80	"	"	-	-	"	Awl/Point Fragment
81	"	"	-	-	Prob. Bone	Point
83	"	"	-	-	Antler	Awl/Point Fragment
84	"	"	-	-	Prob. Bone	Awl
86	"	"	-	-	Antler	Point
88	"	"	-	-	"	Point
89	"	"	-	-	Unknown	Point
90	"	"	-	-	Prob. Antler	Point
91	"	"	-	-	Antler	Point
92	"	"	-	-	Bone	Awl
93	"	"	-	-	"	Awl
94	"	"	-	-	"	Awl
95	"	"	-	-	Antler	Antler Tine with Cut Marks
96	7	G3	-	8/24	Unknown	Awl
97	"	"	-	"	Bone	Awl
98	"	"	-	"	Prob. Antler	Point
99	"	"	-	"	Unknown	Point
100	7	G4	-	8/19	Prob. Bone	Point
101	8	D6	-	8/3	Antler	Point
102	"	"	-	"	Bone	Awl
103	"	"	-	"	"	Awl
104	"	"	-	"	"	Awl
105	"	"	-	"	"	Awl
106	"	"	-	"	"	Awl
107	8	E5	5.60-5.80	-	Prob. Bone	Awl

Registration	Level	Square	Depth	Date	Material	Description
108	8	E5	5.80-6.37	8/14	Bone	Awl
109	"	"	"	"	Unknown	Point
110	"	"	"	"	Prob. Antler	Point
111	"	"	"	"	Antler	Point
112	"	"	"	"	Unknown	Point
113	"	"	"	"	Prob. Antler	Point
114	8	F3	6.24	7/14	Bone	Awl
115	"	"	"	"	Bone	Awl
116	"	"	"	"	Unknown	Awl/Point Fragment
117	"	"	"	"	Prob. Antler	Point
118	"	"	"	"	" "	Point
119	"	"	"	"	" "	Point
120	"	"	"	"	Unknown	Point
121	8	F4	-	-	Prob. Bone	Point
122	"	"	-	-	Unknown	Point
123	8	F5	5.80-6.13	8/16	"	Point
124	8	F5	5.94-6.45	8/16	Prob. Antler	Point
125	"	"	"	"	Antler	Point
126	"	"	"	"	Unknown	Point
127	"	"	"	"	Prob. Antler	Awl
128	"	"	"	"	Bone	Awl
129	8	F5	5.94-6.62	8/16	Antler	Point
130	8	G3	6.75B	-	Bone	Awl
131	"	"	"	-	Bone	Awl
132	"	"	"	-	Unknown	Point
133	9	D5	-	8/5/37	"	Point
134	9	E5	6.83-7.40	8/18	Bone	Awl
135	"	"	"	"	"	Awl
136	"	"	"	"	"	Awl
138	23	F5	14.15-14.40	9/3	Prob. Bone	Awl Tip with Cut Marks
139	4	D5	2.00-2.75	-	Prob. Antler	Point
140	7	E5	4.20-4.40	8/11	Prob. Bone	Point
141	"	"	"	"	Bone	Point
142	"	"	"	"	Prob. Bone	Point
143	"	"	"	"	Unknown	Point
144	"	"	"	"	Bone	Awl/Point Fragment
145	9	G3	7.25	8/2	Prob. Antler	Awl/Point Fragment
146	"	"	"	"	Bone	Awl
147	10	E4	8.10	-	Unknown	Awl
148	"	"	"	-	Bone	Awl
150	-	-	-	-	Bone	Awl

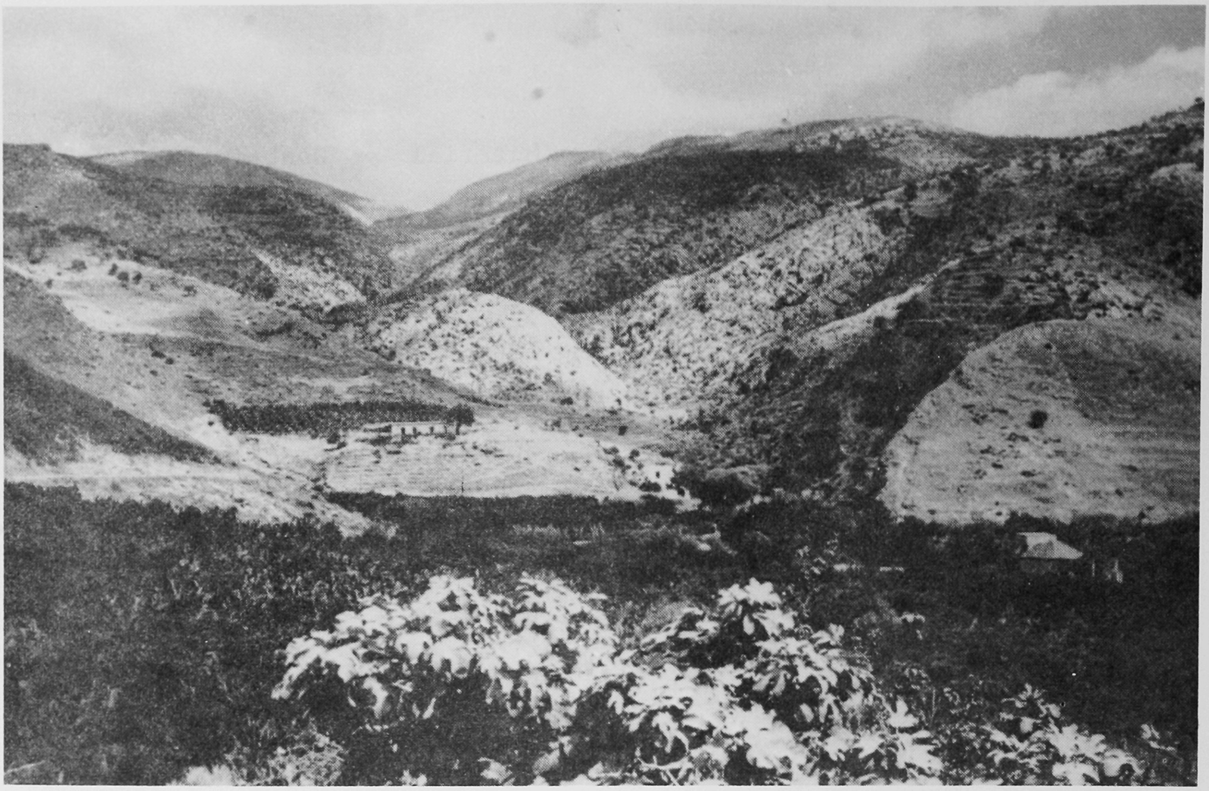


Plate 1 View of the general terrain from the West. Ksâr 'Akil is to the left of the rounded knoll that appears highlighted more or less in the center of the photograph.

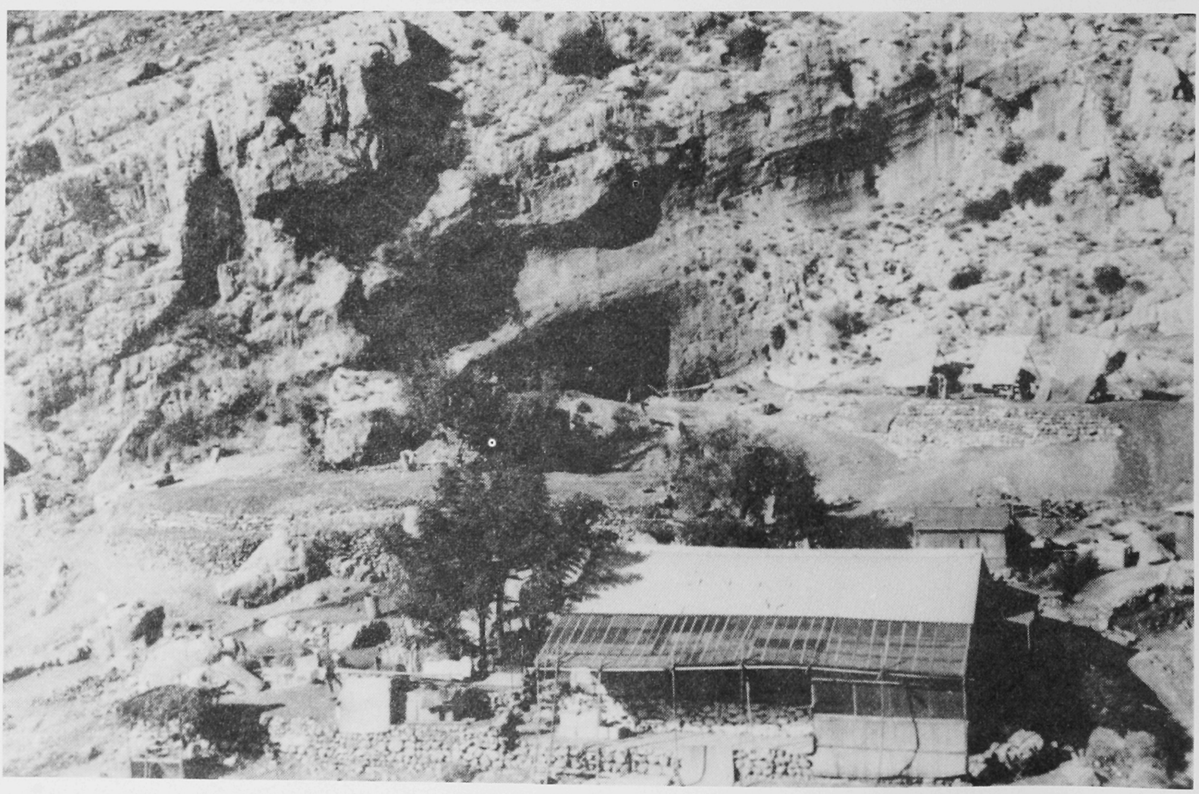


Plate 2 Ksâr 'Akil from the South. The field house is in the foreground. Under the triangular shadow in the cliff is the main excavation. The flat objects to the right are sunshades for the workers at the sieves.

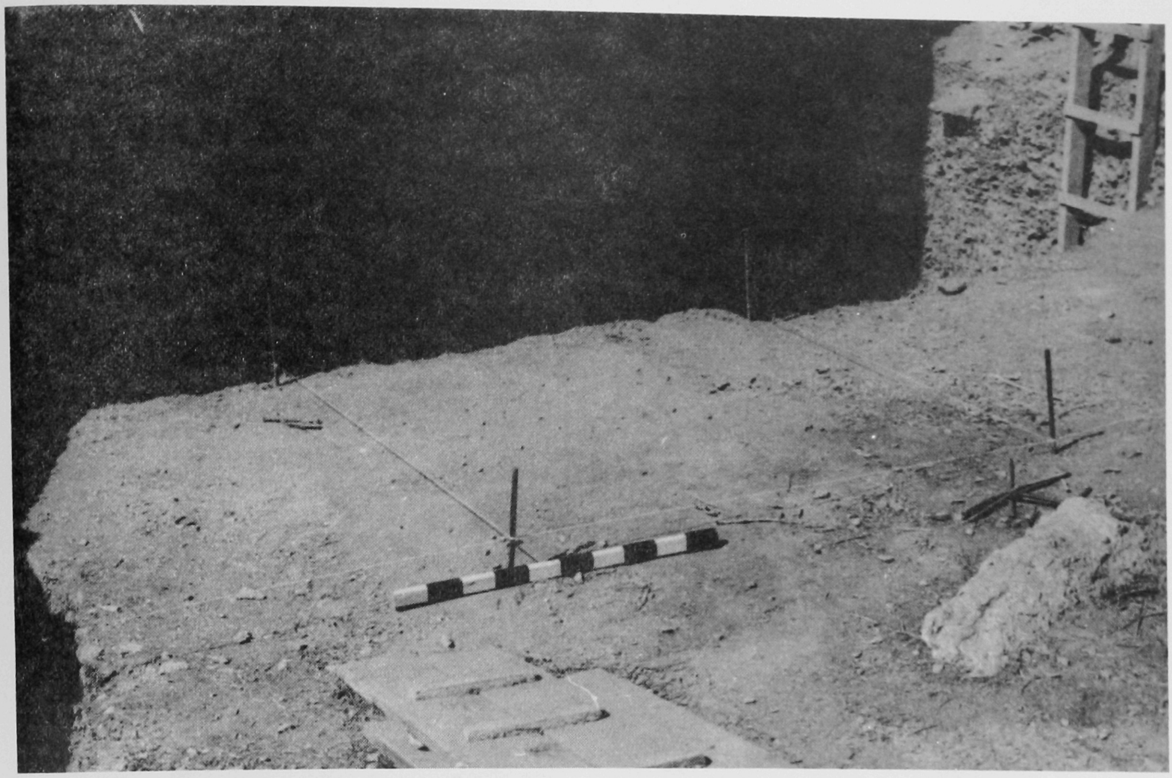


Plate 3 E5 (left) and F5 (right) laid out for the beginning of excavation.

Plate 4 A digger preparing an exceptional find (an almost complete deer antler) for the camera. (F5)

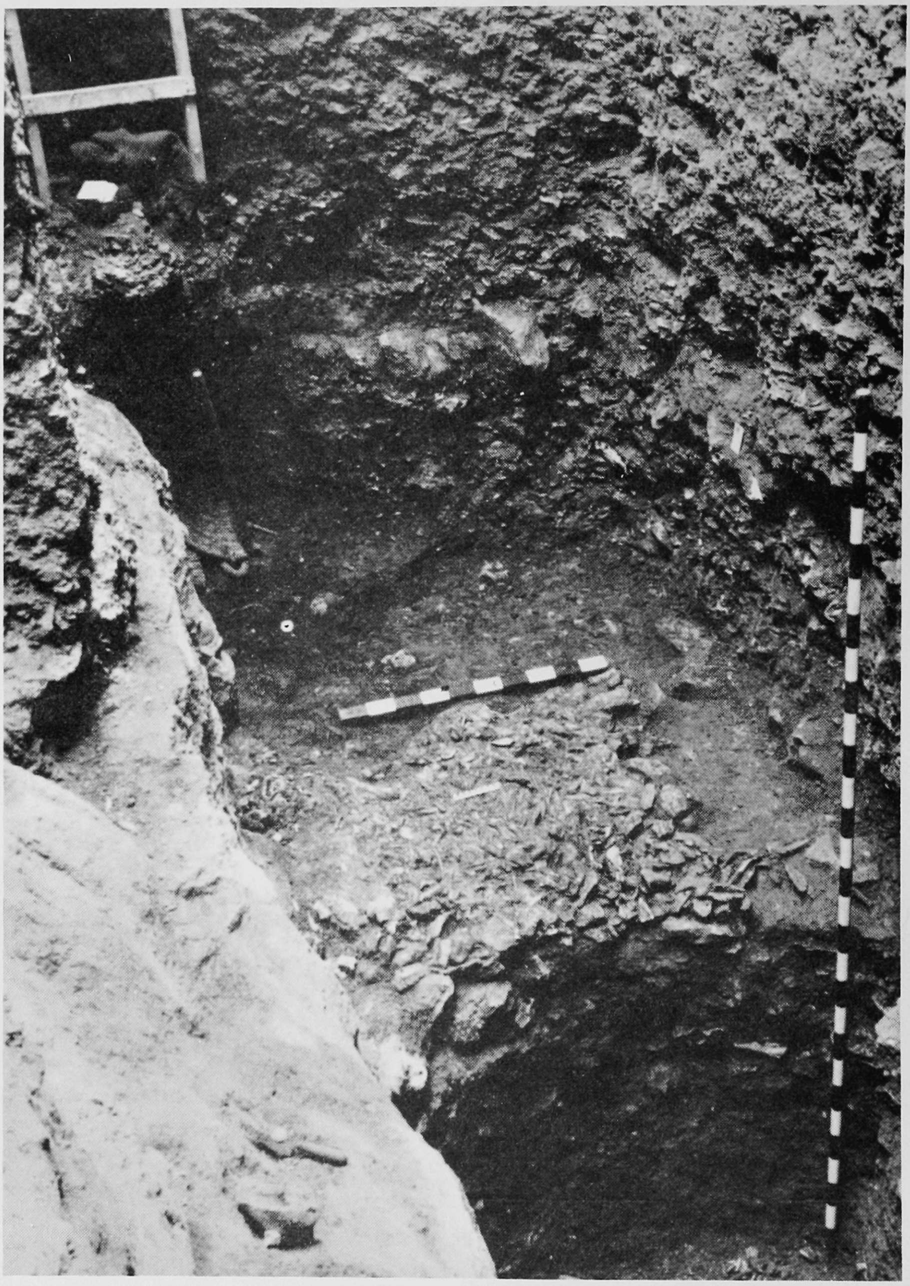


Plate 5 Large bone nest in F4 at 15.95 m. Bones firmly cemented together. Removed in three blocks.

Plate 6 A group of flints in an overturned clump of breccia. Another example of the photographing of unusual finds. (Division on scale- 1 cm.)

Plate 7 The excavation of F5, E5 and F4 proceeding, at between 18 and 19 meters. Taken from G4, the tripod resting on a level 8 meters deep. F3 is at the right, the cement covering protecting the skeleton being just visible.

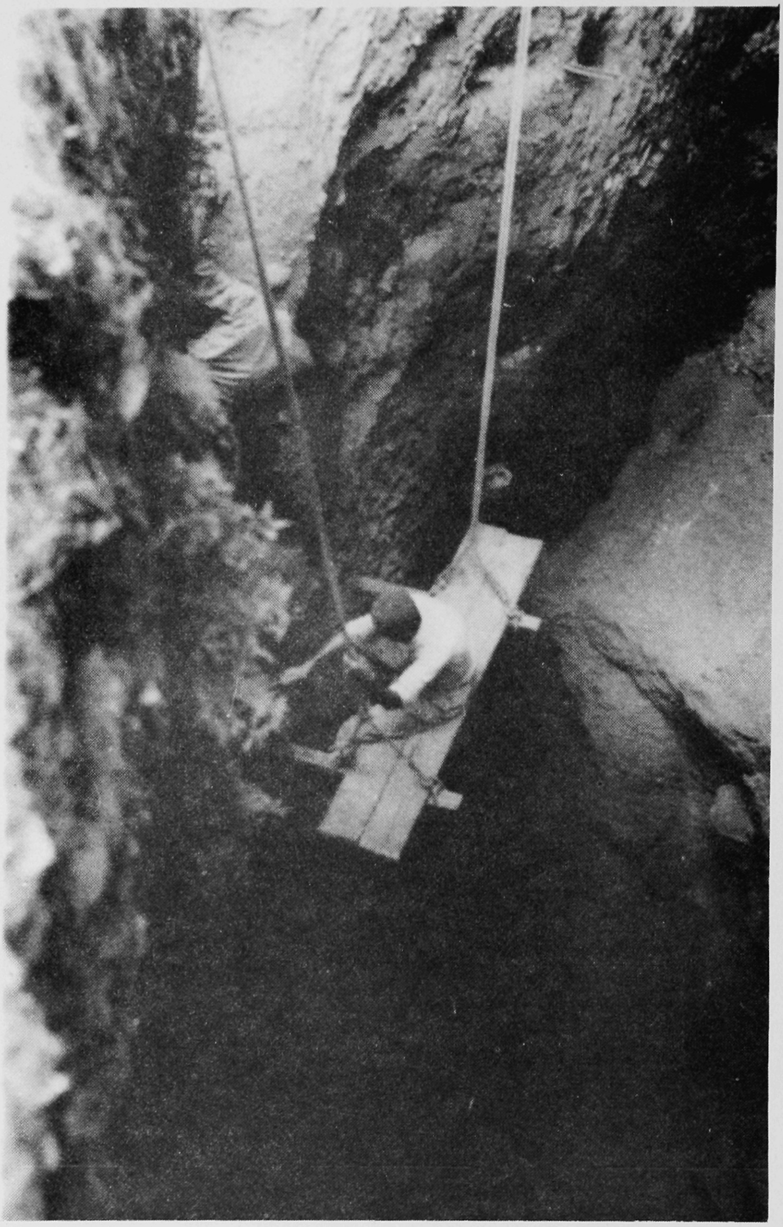


Plate 8 A worker on a stage cleaning down the lower walls.

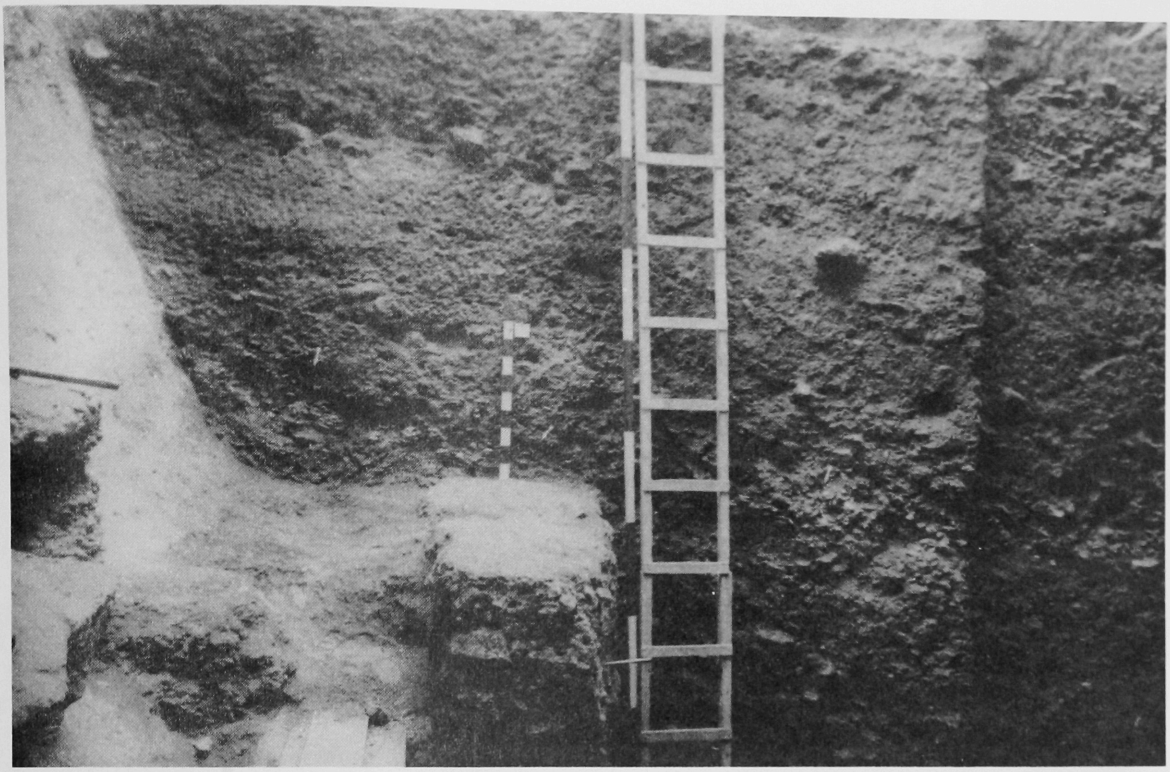


Plate 9 Partial view of the walls of F3, F4 and F5, taken from the West. F3 is in process of excavation. The photograph shows the dip for this section of the excavation. (Division on the meter stave- 10 cm.; on the larger stave- 50 cm.).

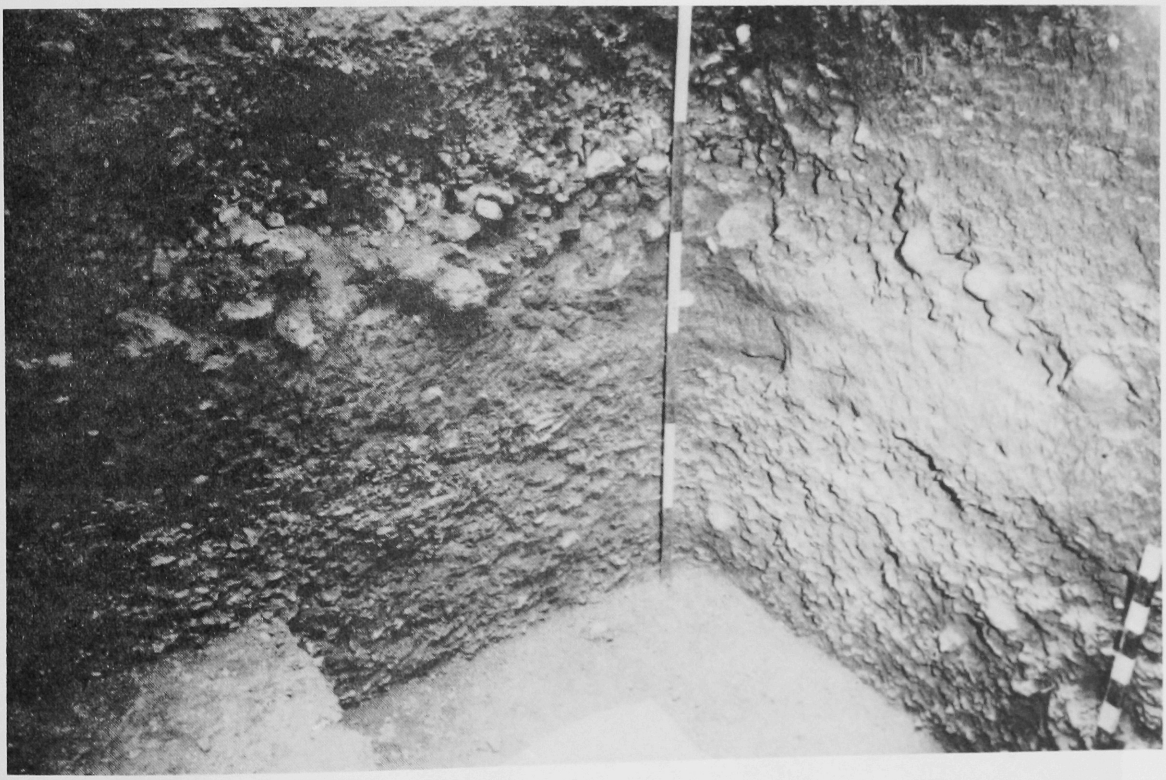


Plate 10 The southwest corner of E5 (taken from F4) showing the fluviatile deposits.

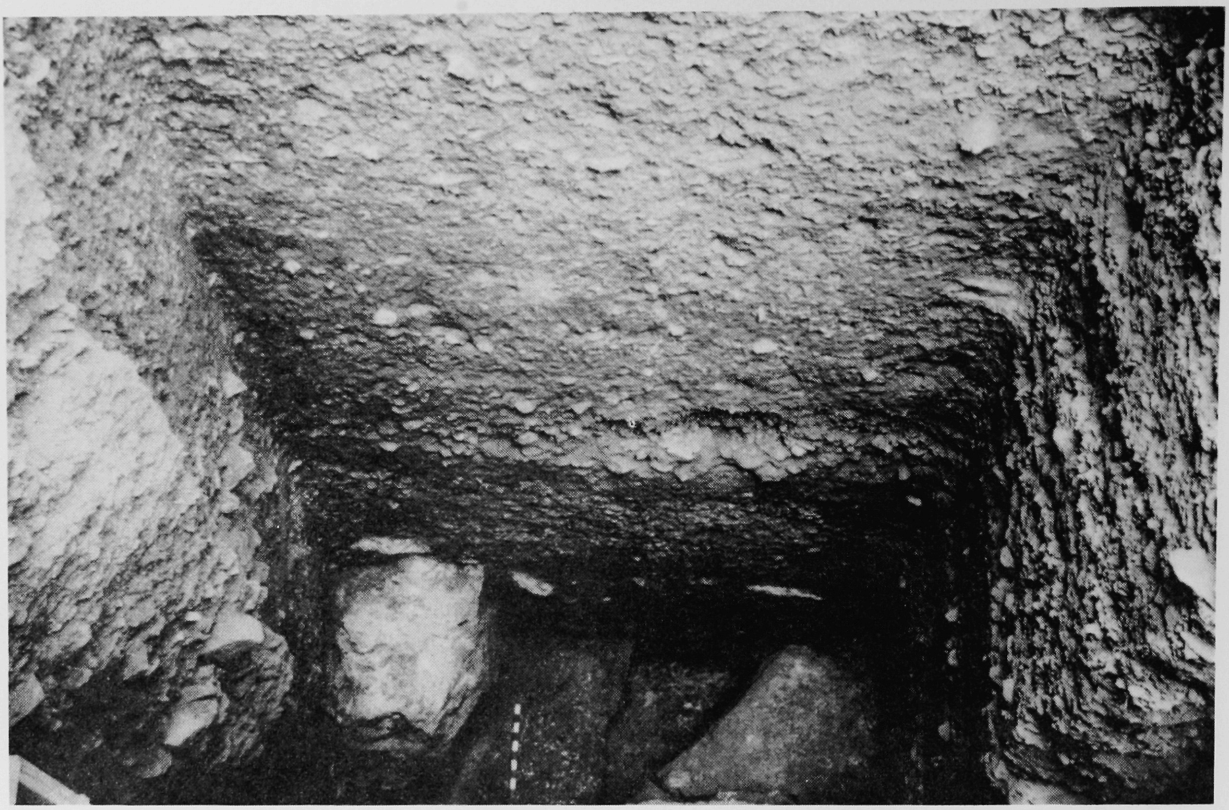


Plate 11 Our first sight of the virgin rock (in the triangular space to the right of the meter stave). (Taken from 11m. depth, F3).

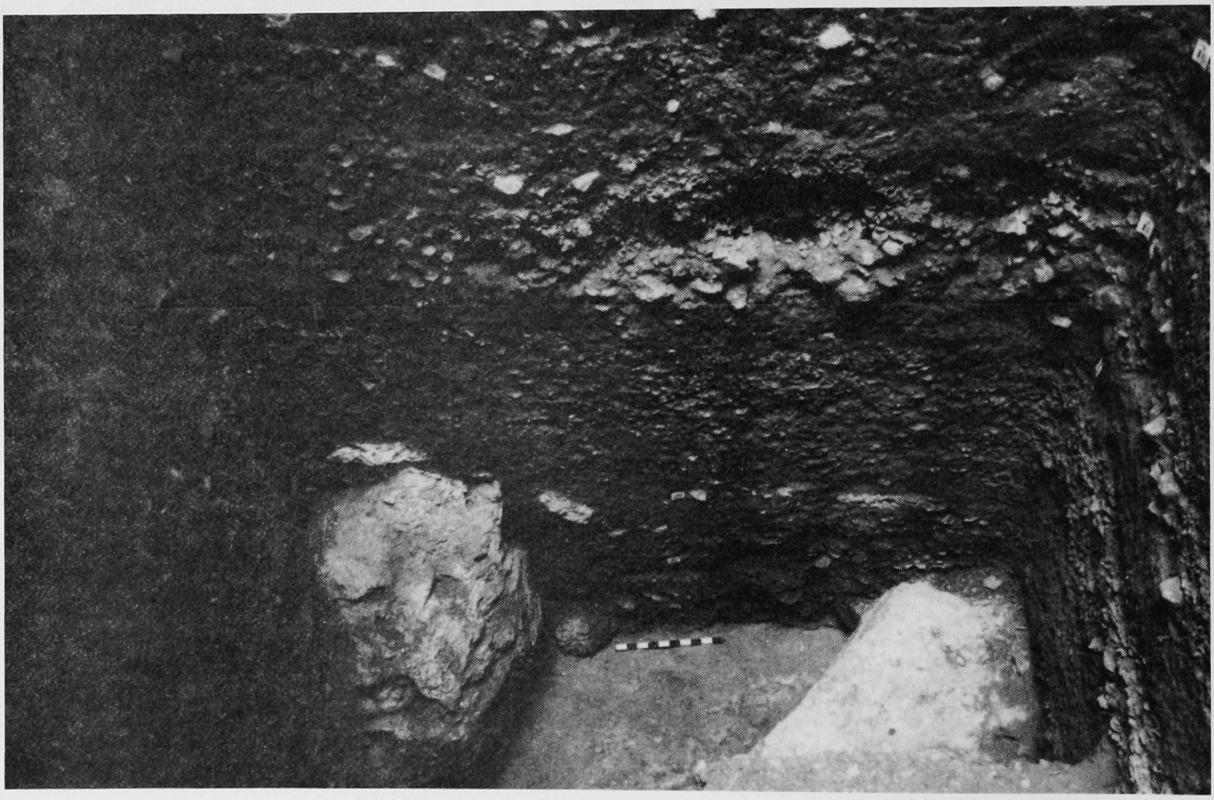


Plate 12 The virgin rock cleared in F5, E5 and F4. (Taken from 14m. depth, F3).

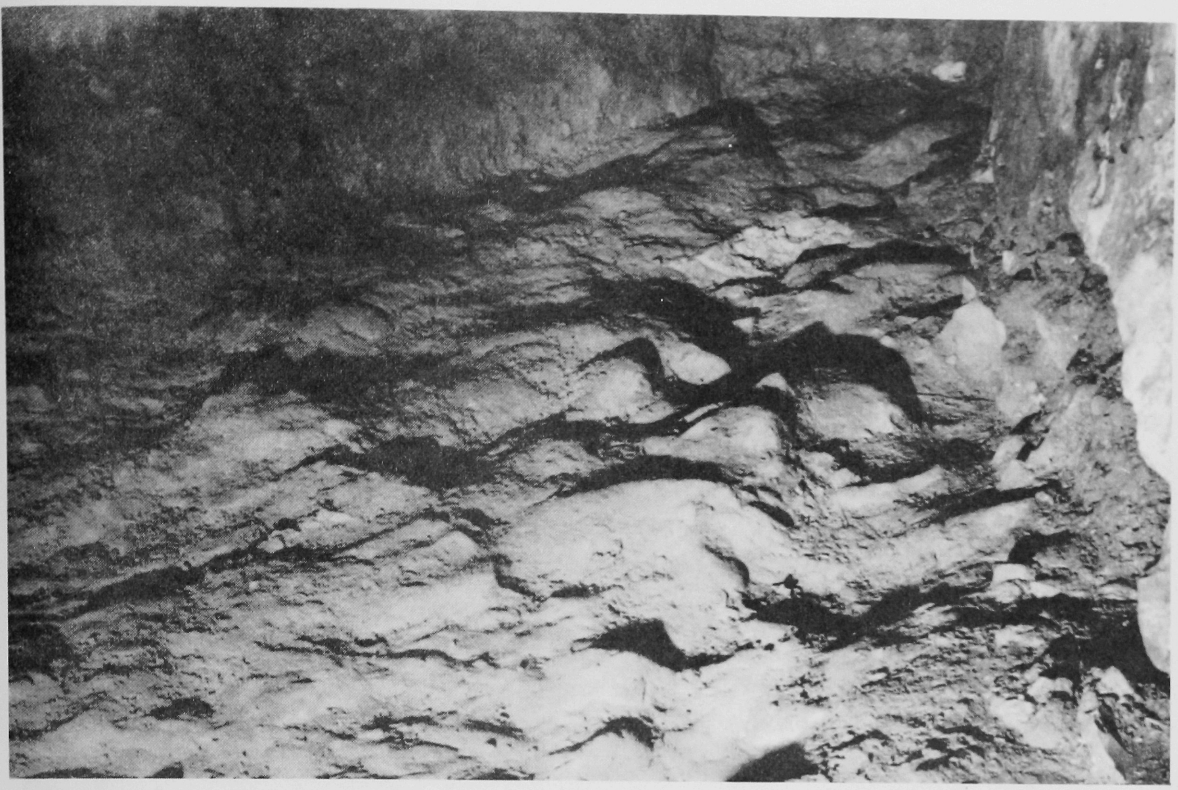


Plate 13 Two closer views of the virgin rock, showing the sloping rock in F4, and the erosion of the rock in E5, exaggerated by side-lighting.

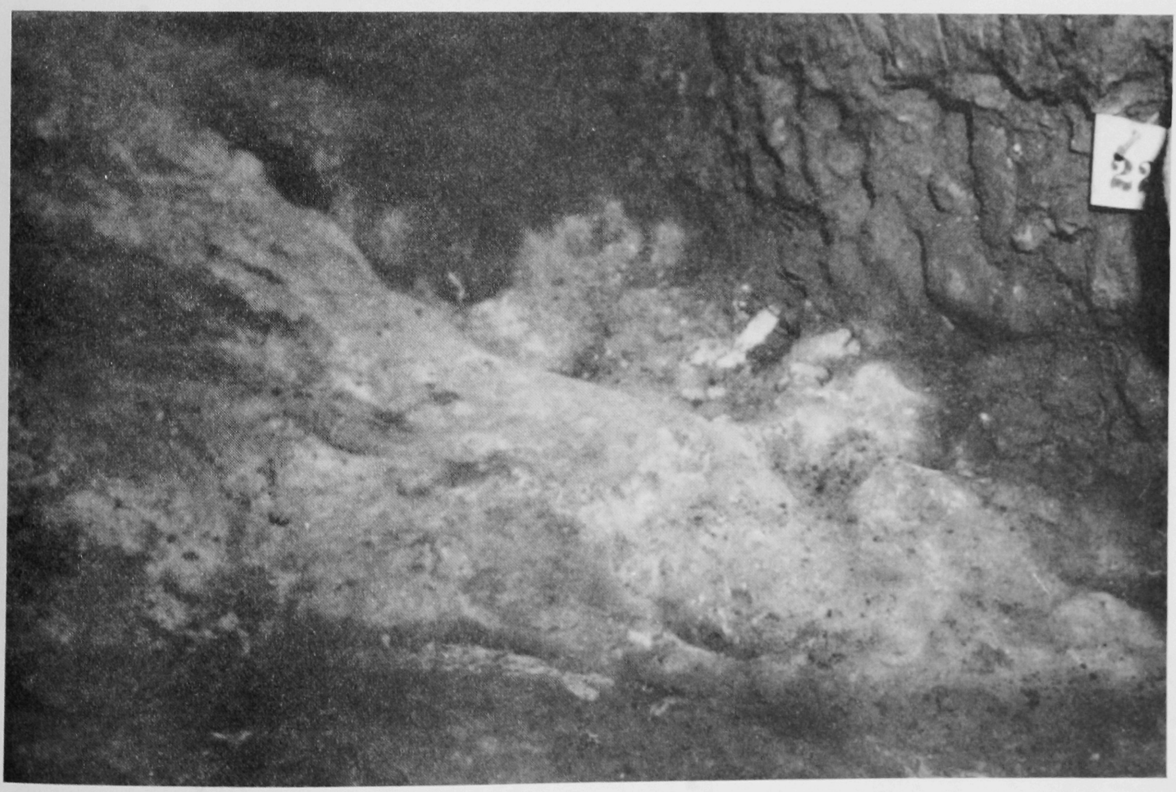


Plate 14 Workers cleaning down the uppermost section of the walls. The ladder's top is visible to the right.

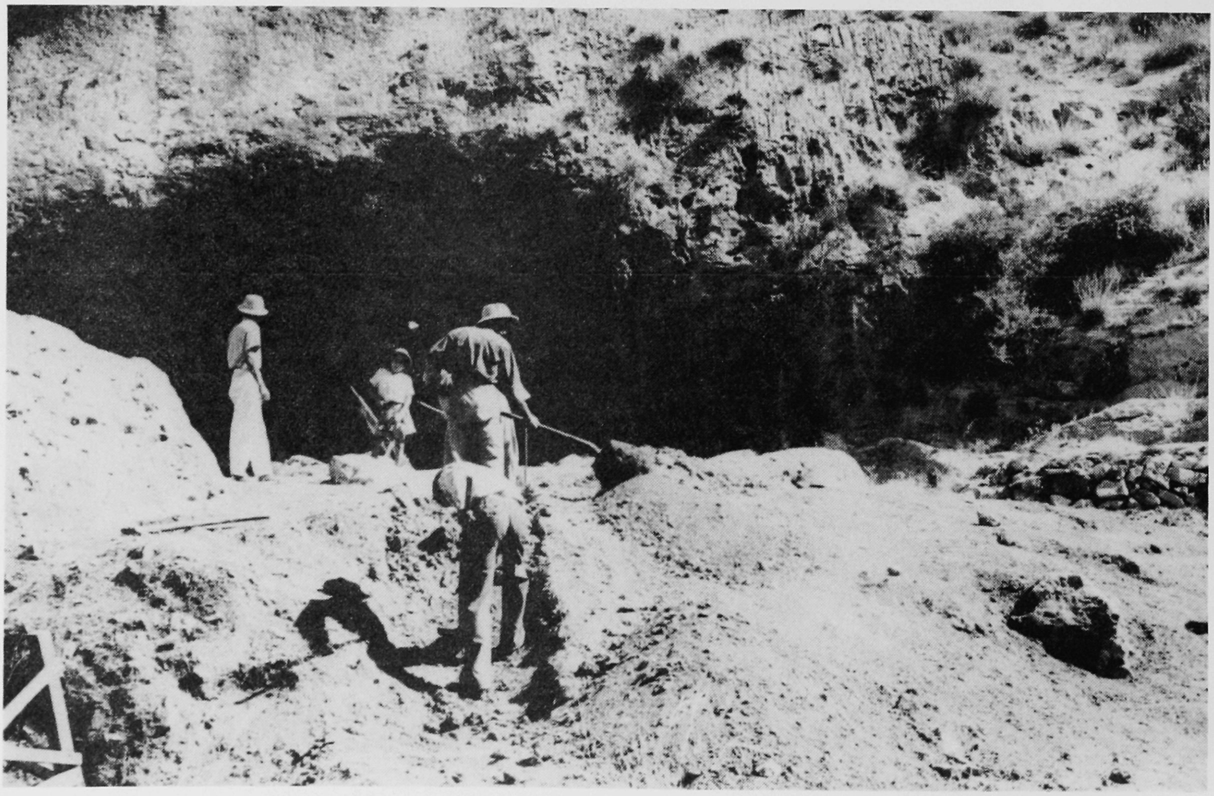


Plate 15 The beginning of the Extension Trench. The main excavation is directly ahead, under the shadow indicating the curve of the rock shelter.

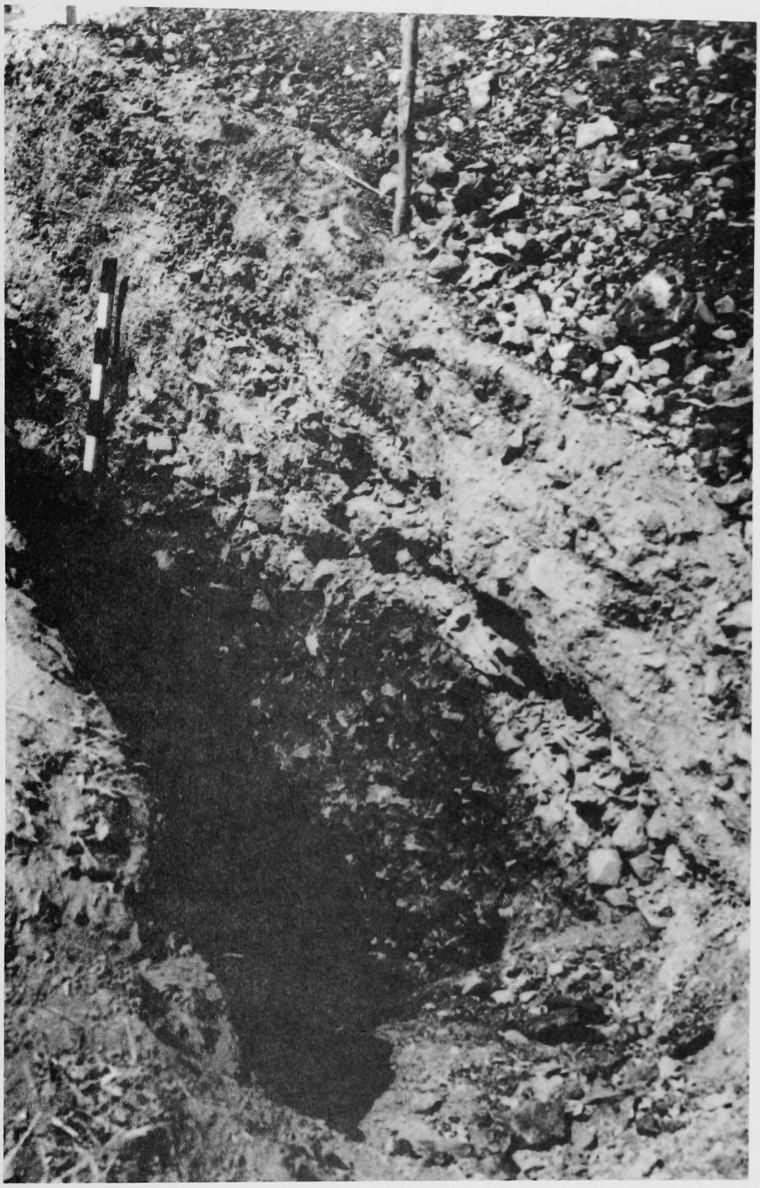


Plate 16 The Extension Trench early showed interesting layers.

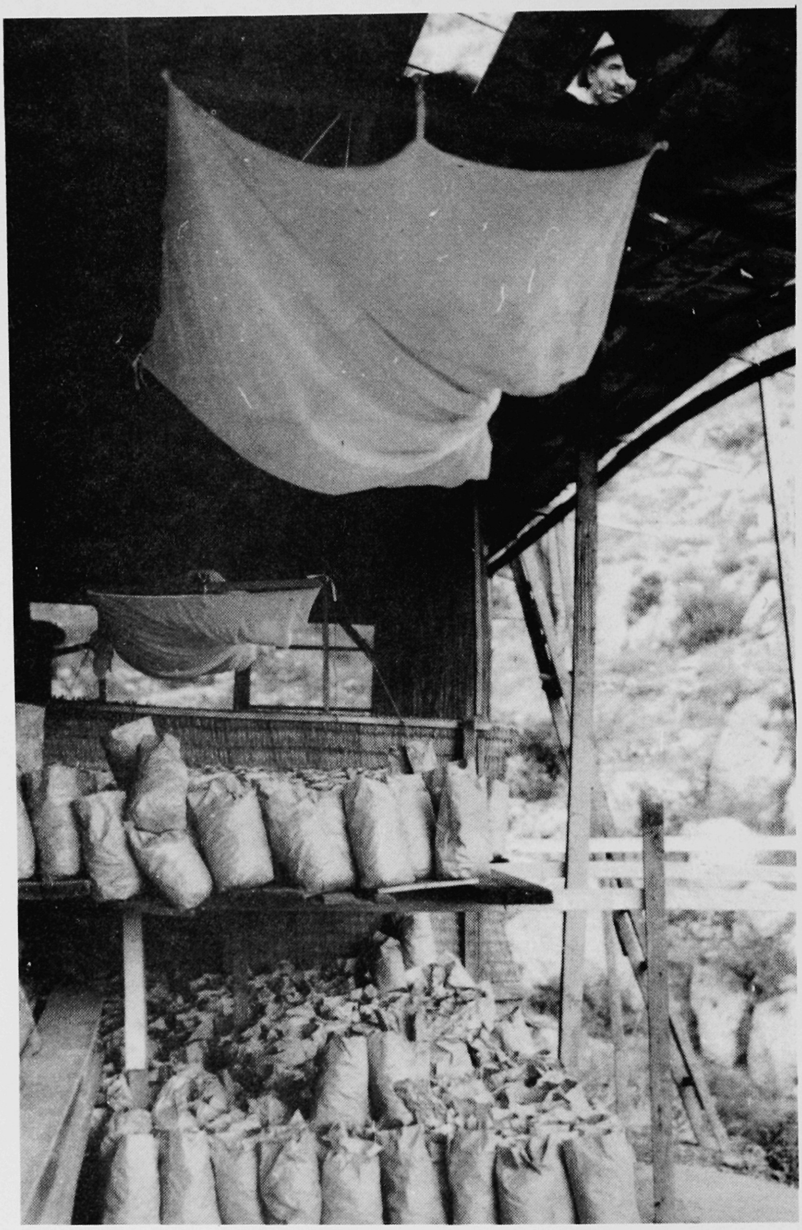


Plate 17 The bags of flints and boxes overflowed the field house, and some were temporarily placed on the terrace porch. The mosquito net remains suspended over a former cot location.

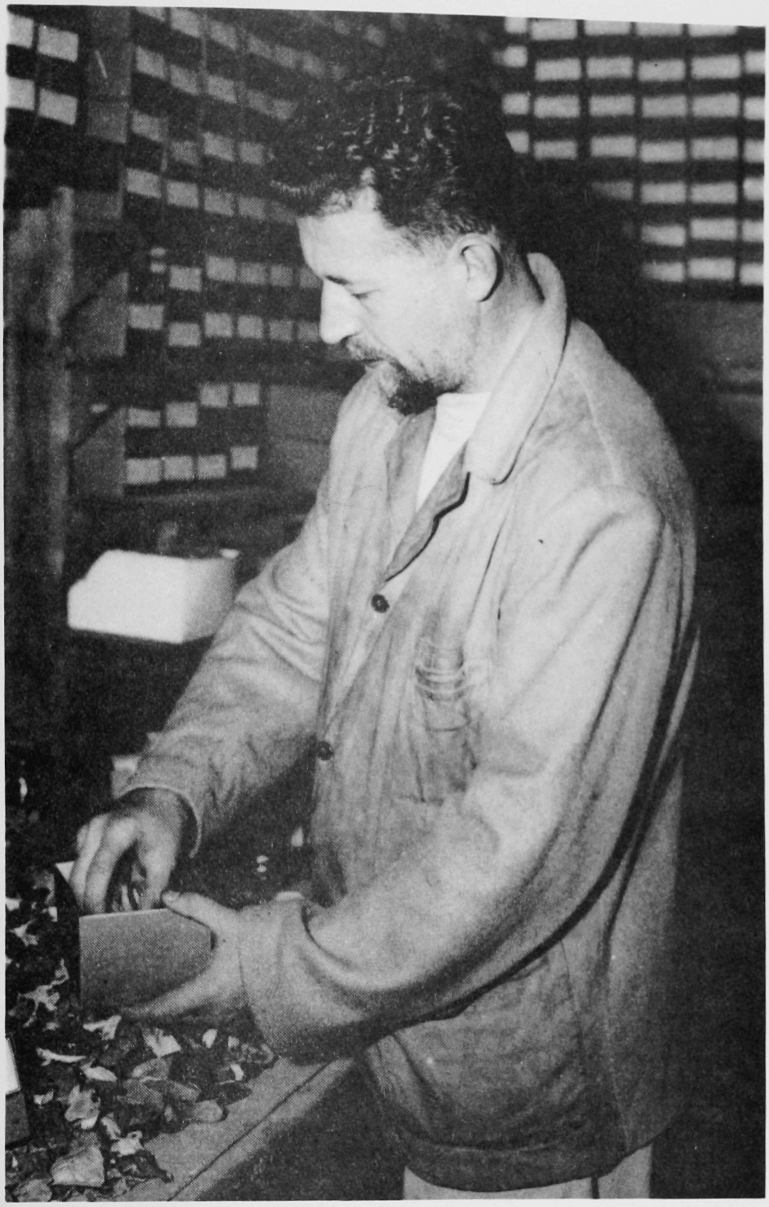
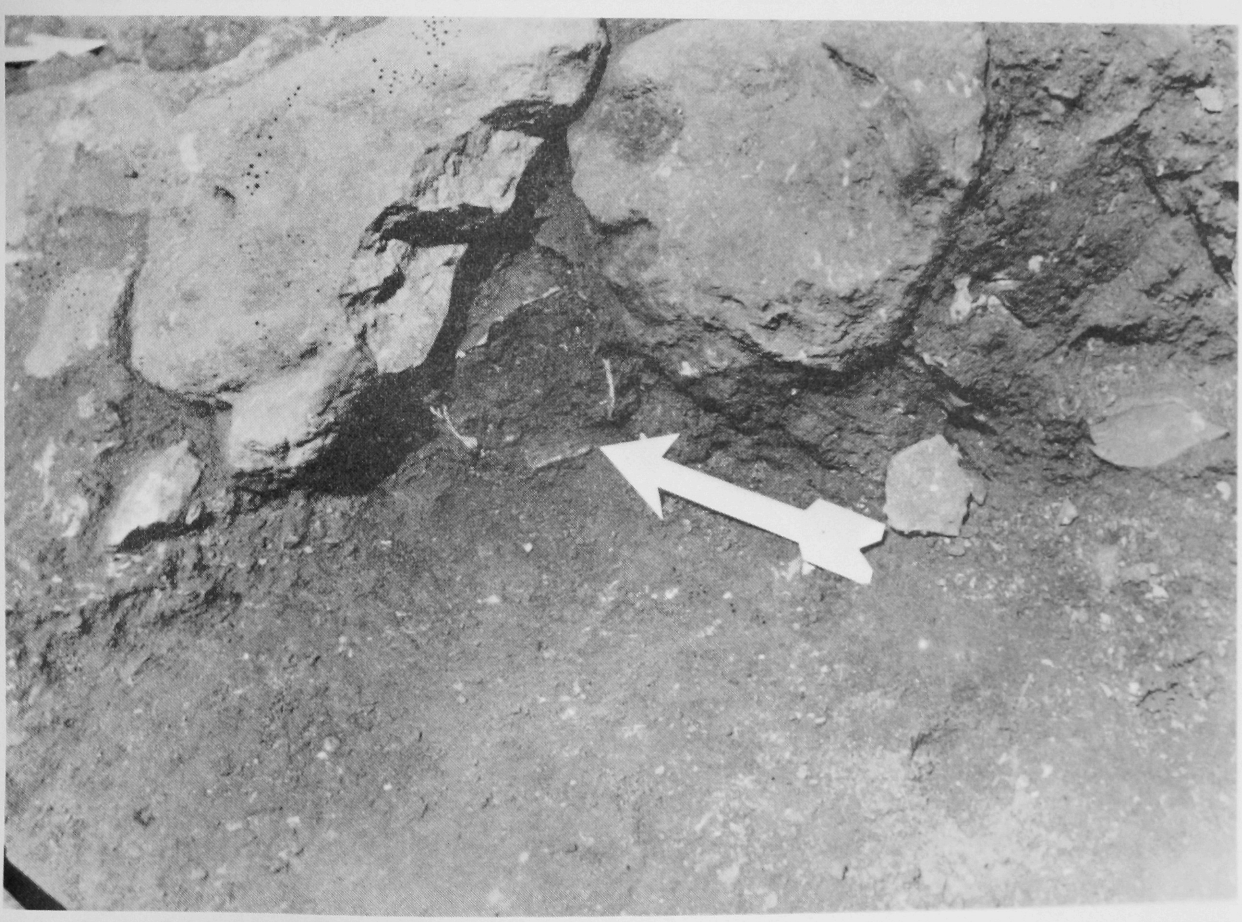


Plate 18 Father Murphy, in working clothes, sorting flints, against a background of boxes of classified artifacts.

Plate 19 Looking down on the site. None of this season's workings (1938) visible in deep shadow beyond hoist - to right of hoist. Note sieves.

Plate 20 Photo showing removal of boulders resting on skull (indicated by arrow) at 11.46 m.



up of skull before removal of two boulders resting on

Plate 22 Looking directly down on skeletal remains. The upper arrow points to the head of a femur. The bottom left arrow points to the skull, while the bottom right arrow points to a row of broken ribs which probably belong to the owner of the second mandible found here.

Plate 23 Egbert (Homo sapiens sapiens) before
left side of face. Mandible, occipital and whole right side of face in

Plate 24 The breccia is chiseled away from beneath the block. (Taken from the West).

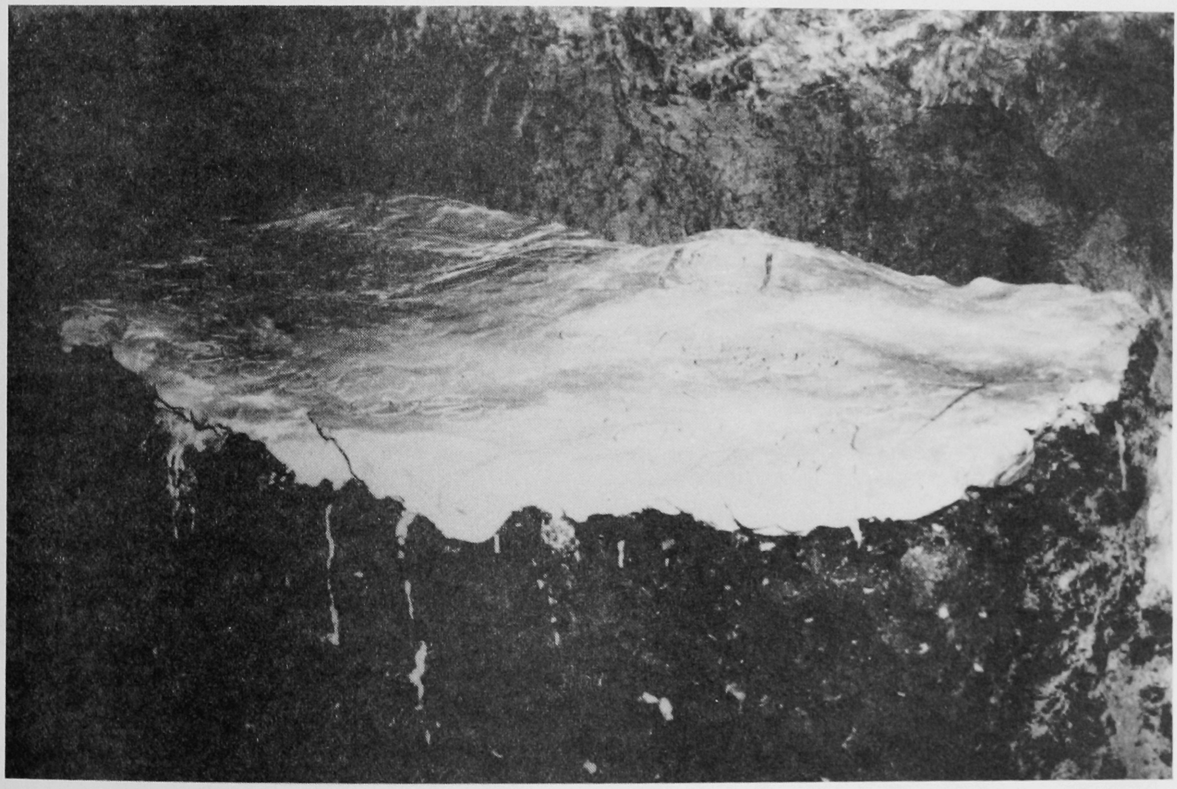


Plate 25 The top of the block is covered with plaster.

Plate 26 The block is marked out. The paraffin and plaster which covered the bones actually visible have been left in place.

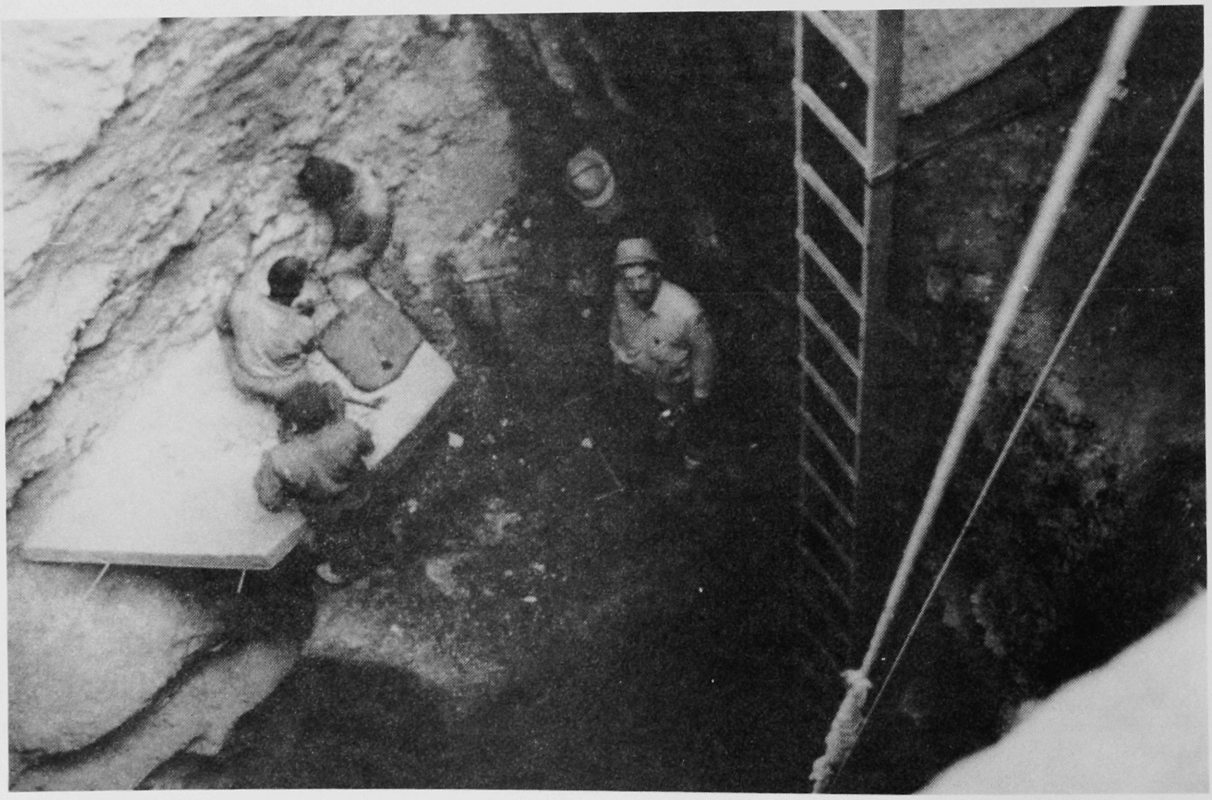


Plate 27 Work begins on the removal of the skeleton. The cement covering which protected it is being chiseled away.

Plate 28 The block ready to be hoisted to the surface.

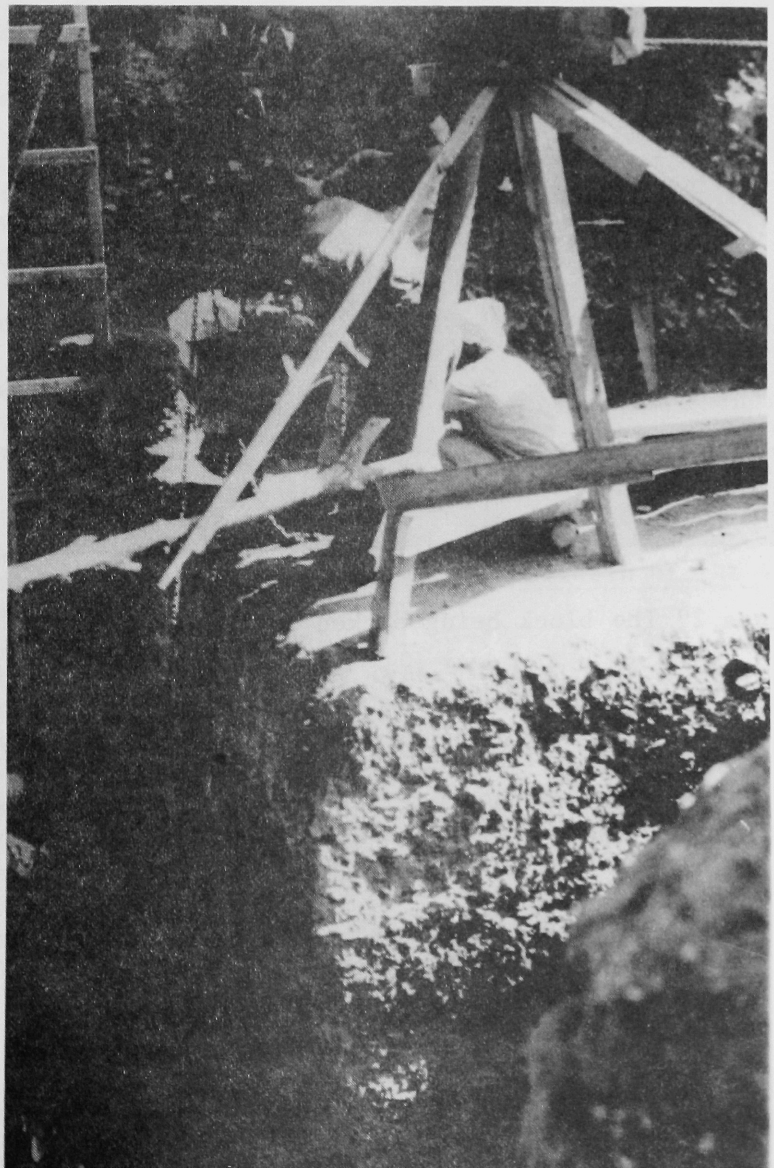


Plate 29 The block being packed in the case.

BIBLIOGRAPHY

Abbreviations

B.S.P.F. Bulletin de la Société Préhistorique Français

UISPP Union Internationale des Sciences Préhistoriques et Protohistoriques

Azoury, I. 1971. A Technological and Typological Analysis of the Transitional and Early Upper Palaeolithic Levels of Ksar Akil and Abu Halka. Ph.D. thesis, University of London.

Azoury, I. 1986. Ksar Akil, Lebanon: A Technological and Typological Analysis of the Transitional and Early Upper Palaeololithic Levels of Ksar Akil and Abu Halka. BAR International Series 289 (i and ii), Oxford.

Bar-Yosef, O. 1970. The Epi-Palaeolithic Cultures of Palestine. unpublished Ph.D. thesis, The Hebrew University, Jerusalem.

Bar-Yosef, O. and E. Tchernov 1966. Archaeological remains and fossil faunas of the Natufian and Microlithic industries at Hayonim Cave (Western Galilee), Israel. Israel Journal of Zoology 15: 104-140.

Bar-Yosef, O. and B. Vandermeersch 1972. The stratigraphical and cultural problems of the passage from Middle to Upper Palaeolithic in the Palestine caves. in F. Bordes (ed.) The Origins of Homo sapiens. UNESCO, Paris: 221-226.

Bar-Yosef, O. and J. Phillips 1977. Prehistoric Investigations in the Gebel Maghara, Northern Sinai. Qedem 7 The Hebrew University, Jerusalem.

Belfer-Cohen, A. and O. Bar-Yosef 1982. The Aurignacian at Hayonim Cave. Paléorient 7: 19-42.

Bells, V. 1938. Removal of a side in the transformation of keeled scrapers at Mount Carmel, Palestine. Bulletin of the American School of Prehistoric Research 14: 55-61.

Bergman, C.A. 1981. Point types in the Upper Palaeolithic Sequence at Ksar Akil, Lebanon. in J. Cauvin and P. Sanlaville (eds.) Préhistoire du Levant. CNRS, Paris: 319-330.

Bergman, C.A. in press. Hafting and use of bone and antler tools from Ksar Akil, Lebanon. in D. Stordeur (ed.) Manches et Emmanchements Préhistoriques Maison de l'Orient Mediteranéen, Lyon.

Bergman, C.A. and M.H. Newcomer 1983. Flint Arrowhead Breakage: Examples from Ksar Akil. Journal of Field Archaeology 10: 238-243.

Bergman, C.A.; R.N.E. Barton; S.N. Collcutt and G. Morris 1983. La Fracture Volontaire dans une industrie du Paléolithique Supérieur Tardif du Sud de l'Angleterre. L'Anthropologie 87: 323-337.

Bergman, C.A. and L. Copeland 1986. Preface. in I. Azoury Ksar Akil, Lebanon: A Technological and Typological Analysis of the Transitional and Early Upper Palaeolithic Levels of Ksar Akil and Abu Halka. BAR International Series 289 (i), Oxford.

Besançon, J.; L. Copeland and F. Hours 1977. Tableaux de Préhistoire Libanaise. Paléorient 3: 5-45.

Bordes, F. 1953. Notules de typologie paléolithique I: Outils moustériennes à fracture volontaire. B.S.P.F. 50: 224-226.

Bordes, F. 1970. Observations typologiques et techniques sur le Périgordien supérieur de Corbiac (Dordogne). B.S.P.F. 67/4: 105-113.

Bordes, F. 1978. Le Protomagdalénian de Laugerie-Haute Est (fouilles F. Bordes). B.S.P.F. 75/11-12: 501-521.

Bordes, F. 1979. Typologie du Paléolithique: ancien et moyen. CNRS, Paris 3rd edition.

Bordes, F. and D. Crabtree 1969. The Corbiac Blade Technique and Other Experiments. Tebiwa 12: 1-21.

Bourlon, M. 1908. Observations sur la technique. I. Mode d'avivage des grattoirs carénés et des grattoirs nucléiformes. Revue Préhistorique 3: 333-335.

Brezillon, M. 1969. Dictionnaire de la Préhistoire. Larousse, Paris.

Brezillon, M. 1977. La Dénomination des Objets de Pierre Taillée. CNRS, Paris 2nd edition.

Copeland, L. 1975. The Middle and Upper Paleolithic of Lebanon and Syria in the Light of Recent Research. in F. Wendorf and A.E. Marks (eds.) Problems in Prehistory: North Africa and the Levant. S.M.U. Press, Dallas: 317-350.

Copeland, L. 1982. The Ksar Akil Scraper: A Late Upper Palaeolithic Tool-Type of the Levant. in Archaeologie au Levant. Recueil R. Saidah Collection de la Maison de l'Orient Mediteranéen 12 Serie Archaeologique 9: 57-67.

Copeland, L. 1983. The Aurignacian of Bezez Cave, Level A. in D. Roe (ed.) Adlun in the Stone Age. BAR International Series 159, Oxford.

Copeland, L. 1986. Introduction to Volume I. in I. Azoury Ksar Akil, Lebanon: A Technological and Typological Analysis of the Transitional and Early Upper Palaeolithic Levels of Ksar Akil and Abu Halka. BAR International Series 289 (i), Oxford.

Copeland, L and J. Waechter 1968. The Stone Industries of Abri Bergy, Lebanon. Bulletin of the Institute of Archaeology, London. 7: 15-36.

Copeland, L. and F. Hours 1971. The Later Upper Paleolithic Material from Antelias Cave, Lebanon: Levels IV-I. Berytus XX: 57-138.

Copeland, L. and F. Hours 1977. Engraved and Plain Bone Tools from Jiita (Lebanon) and their Early Kebaran Context. Proceedings of the Prehistoric Society 43: 295-301.

Day, A.E. 1926a. The Rock Shelter of Ksar 'Akil near the Cave of Antilyas. Palestine Exploration Fund: 158-160.

Day, A.E. 1926b. The Rock Shelter of Ksar 'Akil. Al-Kulliyyah (AUB Issue) 12: 91-97.

Doran, J.E. and F.R. Hodson 1975. Mathematics and Computers in Archaeology. Edinburgh University Press.

Dortch, C. 1970. The Late Aurignacian Industries of Levels 8-6 at Ksar 'Akil, Lebanon. unpublished M.A.thesis, University of London.

Ewing, J.F. 1947. Preliminary Note on the Excavations at the Palaeolithic site of Ksar 'Akil, Republic of Lebanon. Antiquity XXI: 186-196.

Ewing, J.F. 1963. A Probable Neanderthaloid from Ksar 'Akil, Lebanon. American Journal of Physical Anthropology 21-2: 101-104.

Garrod, D.A.E. 1954. Excavations at the Mugharet el-Kebara, Mount Carmel, 1931: the Aurignacian Industries. Proceedings of the Prehistoric Society 20: 155-192.

Garrod, D.A.E. and D.M.A. Bate 1937. The Stone Age of Mount Carmel. Clarendon Press, Oxford.

Gilead, I. 1981a. The Upper Palaeolithic in Sinai and The Negev. unpublished Ph.D.thesis, The Hebrew University, Jerusalem.

Gilead, I. 1981b. Upper Palaeolithic Tool Assemblages from the Negev and Sinai. in J. Cauvin and P. Sanlaville (eds.) Préhistoire du Levant. CNRS, Paris: 331-352.

Goring-Morris, A.N. 1980. Late Quaternary sites in Fazael, Lower Jordan Valley. unpublished M.A.thesis, The Hebrew University, Jerusalem.

Griffiths, D.R.; C.A. Bergman; C.J.Clayton; K. Ohnuma; G.V. Robins and N.J. Seeley in press. Experimental Investigation of the Heat Treatment of Flint. in M.H. Newcomer and G. de G. Sieveking (eds.) The Human Uses of Chert Proceedings of the Fourth International Flint Symposium, Brighton. Cambridge University Press.

Haller, J. 1942-1943. Notes de préhistoire phénicienne: l'Abri de Abou-Halka (Tripoli). Bulletin du Musée de Beyrouth VI: 1-20.

Henry, D.O. and A.F. Servello. 1974. Compendium of Carbon 14 determinations derived from Near Eastern prehistoric deposits. Paléorient 2: 19-44.

Hours, F. 1974. Remarques sur l'utilisation de Listes-Types pour l'étude de Paléolithique Supérieur et de l'Epipaléolithique du Levant. Paléorient 2: 3-18.

Hours, F.; L. Copeland and O. Aurenche 1973. Les Industries Paléolithiques du Proche-Orient, Essai de Correlation. L'Anthropologie 77: 229-280; 437-496.

Inizan, M.-L. and J.-M. Gaillard 1978. Coquillages de Ksar-'Aqil: éléments de parure? Paléorient 4: 295-306.

Jones, M.; A.E. Marks and D. Kaufman 1983. Boker: The Artefacts. in A.E. Marks (ed.) Prehistory and Paleoenvironments in the Central Negev, Israel. Volume III S.M.U. Press, Dallas.

Lenoir, M. 1973. Obtention expérimentale de la retouche de type Quina. B.S.P.F. 70: 10-11.

Marks, A.E. 1976a. Terminology and Chronology of the Levantine Upper Paleolithic as seen from the Central Negev, Israel. Deuxième Colloque sur la Terminologie de la Préhistoire du Proche Orient. UISPP, Nice: 49-76.

Marks, A.E.(ed.) 1976b. Prehistory and Paleoenvironments in the Central Negev, Israel. Volume I S.M.U. Press, Dallas.

Marks, A.E.(ed.) 1977. Prehistory and Paleoenvironments in the Central Negev, Israel. Volume II S.M.U. Press, Dallas.

Marks, A.E. 1981. The Upper Paleolithic of the Negev. in J. Cauvin and P. Sanlaville (eds.) Préhistoire du Levant. CNRS , Paris: 343-352.

Marks, A.E. 1983a. The Middle to Upper Paleolithic Transition in the Levant. in F. Wendorf and A. Close (eds.) Advances in World Archaeology volume 2 Academic Press, New York: 51-92.

Marks, A.E.(ed.) 1983b. Prehistory and Paleoenvironments in the Central Negev, Israel. Volume III S.M.U. Press, Dallas.

Marks, A.E. and P. Volkman in press. The Mousterian of Ksar Akil: Levels XXVIA through XXVIIIB. Paléorient.

Murphy, J.W. 1938. The Method of Pre-historic Excavations at Ksar 'Akil. Anthropology Series, Boston College Graduate School 3-1: 211-275.

Murphy, J.W. 1939. Ksar 'Akil, Boston College Expedition. Anthropology Series, Boston College Graduate School 4-4: 211-217.

Neuville, R. 1934. Le préhistoire de Palestine. Revue Biblique 43: 237-259.

Neuville, R. 1951. Le Paléolithique et le Mesolithique de désert de Judée. Archives de l'Institut de Paléontologie Humaine 24. Paris.

Newcomer, M.H. 1968-1969. The Chamfered Pieces from Ksar Akil(Lebanon). Bulletin of the Institute of Archaeology 8-9: 177-191.

Newcomer, M.H. 1971. Un nouveau type de burin à Ksar Akil (Liban). B.S.P.F. 68: 262-272.

Newcomer, M.H. 1972. An Analysis of a Series of Burins from Ksar Akil, (Lebanon). unpublished Ph.D. thesis, The University of London.

Newcomer, M.H. 1974a. Outils en os du Paléolithique supérieur de Ksar 'Akil. in H. Camps-Fabrer (ed.) Premier colloque international sur l'industrie de l'os dans la préhistoire. Université de Provence: 59-65.

Newcomer, M.H. 1974b. Study and replication of bone tools from Ksar Akil (Lebanon). World Archaeology 6: 138-153.

Newcomer, M.H. 1975. Punch Technique and Upper Palaeolithic Blades. in E. Swanson (ed.) Lithic Technology: Making and Using Stone Tools. Mouton Publishers, The Hague: 97-102.

Newcomer, M.H. 1976. Spontaneous Retouch. Second International Symposium on Flint Staringia Nederlandse Geologische Vereniging, Maastricht: 62-64.

Newcomer, M.H. and F. Hivernel-Guerre 1974. Nucléus sur éclat: technologie et utilisation par differentes cultures préhistoriques. B.S.P.F. 71/4: 119-128.

Newcomer, M.H. and C. Karlin in press. Flint chips from Pincevent. in M.H. Newcomer and G. de G. Sieveking (eds.) The Human Uses of Chert Proceedings of the Fourth International Flint Symposium, Brighton. Cambridge University Press.

Nie, N.H.; C. Hadlai Hull; J.G. Jenkins; K. Steinbrenner and D.H. Bent 1975. SPSS: Statistical Package for the Social Sciences. McGraw Hill, New York 2nd edition.

Nishiaki, Y. 1985. Truncated-faceted flakes from Levantine Mousterian Assemblages. Bulletin of the Department of Archaeology, The University of Tokyo 4: 215-226.

Noy, T. and E. Higgs. 1971. Raquefet Cave. Israel Exploration Journal 21: 225-226.

Ohnuma, K. 1986. A Technological Study of the Upper Palaeolithic material from levels XXV-XIV from Ksar Akil. unpublished Ph.D. thesis, University of London.

Ohnuma, K. and C.A.Bergman 1982. Experimental Studies in the Determination of Flaking Mode. *Bulletin of the Institute of Archaeology, London* 19: 161-170.

Ohnuma, K and C.A. Bergman in press. A Technological Analysis of the Upper Palaeolithic levels (XXV-VI) of Ksar Akil, Lebanon. *Berytus*.

Passemard, E. 1927. Mission en Syrie et au Liban. *B.S.P.F.* 24: 70-72.

Perrot, J. 1955. Le Paléolithique supérieur d'el Quseir et de Masaraq an Na'aj (Palestine). *B.S.P.F.* 52: 493-506.

Ronen, A. 1968. Excavations at the cave of Sefunim (Iraq el-Baroud), Mt. Carmel, preliminary report. *Quartär* 19: 275-288.

Ronen, A. 1976. The Upper Palaeolithic in Northern Israel: Mt. Carmel and Galilee. *Deuxième Colloque sur la Terminologie de la Préhistoire du Proche Orient* UISPP, Nice: 153-186.

Ronen, A. and B. Vandermeersch 1972. The Upper Palaeolithic Sequence in the Cave of Qafza (Israel). *Quaternaria* XVI: 189-202.

Rust, A. 1950. *Die Höhlenfunde von Jabrud (Syrien)*. Karl Wachholtz, Neumunster.

Sala, I. 1982. *Carinated tools or Cores: A Microwear Study of Material from Ksar Akil*. unpublished B.A. thesis, University of London.

Solecki, R. and R. Solecki 1966. New data from Yabroud, Syria. Preliminary report of the Columbia University Archaeological Investigations. *Annales Archéologiques Arabes Syriennes* XVI: 121-154.

Solecki, R. and R. Solecki 1970. A New Secondary Flaking Technique at the Nahr Ibrahim Cave Site, Lebanon. *Bulletin du Musée de Beyrouth* 23: 137-142.

de Sonneville-Bordes, D. 1960. *Le Paléolithique supérieur en Périgord*. Bordeaux.

de Sonneville-Bordes, D. et J. Perrot 1954. Lexique typologique du Paléolithique supérieur. *B.S.P.F.* 51: 327-335.

de Sonneville-Bordes, D. et J. Perrot 1955. Lexique typologique du Paléolithique supérieur. *B.S.P.F.* 52/1-2: 75-79.

de Sonneville-Bordes, D. et J. Perrot 1956a. Lexique typologique du Paléolithique supérieur. *B.S.P.F.* 52/7-8: 408-412.

de Sonneville-Bordes, D. et J. Perrot 1956b. Lexique typologique du Paléolithique supérieur. *B.S.P.F.* 53/9: 547-559.

Stekelis, M. 1955a. Excavations at Kebara Cave. *Revue Biblique* LXII: 84.

Stekelis, M. 1955b. Excavations at Kebara Cave. *Revue Biblique* LIX: 90.

Texier, P.J. 1982. Le débitage par pression pectorale a la béquille: une approche expérimentale au plus pres des parametres a l'origine de la rupture fragile des roches dures. in D. Cahen (ed.) Tailler! pour quoi faire: Préhistoire et technologie lithique II. Musée Royale de l'Afrique Centrale, Tervuren: 57-64.

Tixier, J. 1958. Les burins de Noailles de l'Abri André Ragout Bois-de-Roc, Villhonneur (Charente). B.S.P.F. 55: 628-644.

Tixier, J. 1963. Typologie de l'epipaléolithique de Maghreb. Memoires du Centre de Recherches Anthropologiques, Préhistoriques et Ethnographiques. Paris.

Tixier, J. 1970. L'abri sous roche de Ksar 'Aqil. La campagne de fouilles 1969. Bulletin du Musée de Beyrouth 23: 173-191.

Tixier, J. 1974. Fouille à Ksar 'Aqil, Liban (1969-1974). Paléorient 2: 187-192.

Tixier, J.; M.-L. Inizan and H. Roche 1980. Préhistoire de la Pierre Taillée. 1. terminologie et technologie. CREP , Valbonne.

Tixier, J. and M.-L. Inizan 1981. Ksar 'Aqil, stratigraphie et ensembles lithiques dans le Paléolithique supérieur. Fouilles 1971-1975. in J. Cauvin and P. Sanlaville (eds.) Préhistoire du Levant. CNRS, Paris: 353-367.

Turville-Petre, F. 1932. Excavations in the Mugharet el Kebarah. Journal of the Royal Anthropological Institute 62.

Vogel, J.C. and H.T. Waterbolk 1963. Gröningen Radiocarbon Dates IV. Radiocarbon 5: 163-202.

Waechter, J. 1976. The Sequence at Ksar Akil. (abstract). Ninth International Congress of Pre- and Protohistoric Sciences UISPP, Nice: 180.

Wenner Gren Symposium, London 1969. unpublished transcript of the proceedings.

Wright Jr., H.E. 1951. Geological setting of Ksar Akil, a Palaeolithic site in Lebanon - Preliminary report. Journal of Near Eastern Studies 10: 115-119.

Wright Jr., H.E. 1960. Climate and prehistoric man in the eastern Mediterranean. in R.J. Braidwood and B. Howe (eds.) Prehistoric Investigations in Iraqi Kurdistan. School of Oriental and African Studies, University of Chicago.

Wright Jr., H.E. 1962. Late Pleistocene Geology of Coastal Lebanon. Quaternaria 6: 525-538.

Ziffer, D. 1978a. A re-evaluation of the Upper Palaeolithic industries at Kebara Cave and their place in the Aurignacian culture of the Levant. Paléorient 4: 273-293.

Ziffer, D. 1978b. The use of technological and metric data in the study of four Levantine Aurignacian sites in the Mount Carmel region. Paléorient 4: 71-95.

Ziffer, D. 1981. Yabrud shelter II - A reconsideration of its cultural composition and its relevance to the Upper Palaeolithic of the Levant. Quartär 32: 69-94.