Department of the Environment

Archaeological Reports No 11

GRIMES GRAVES, NORFOLK

Excavations 1971–72: Volume II

R J MERCER

The Flint Assemblage

by A SAVILLE

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Summary of the Excavation

by R J Mercer

The two volume format of this excavation report prompted the feeling that a brief summary of the results with two principal plans (Figures 1 and 2) should be appended to this second volume which concerns itself principally with the massive lithic assemblage derived from the site during the course of the project. Clearly for any detailed information cross-reference will be necessary between the volumes but this short condensation may serve quickly to refresh the reader's memory as to salient points as he embarks upon the consideration of the *raison d'être* of the site, at least in its initial phase, the product of the mining activity.

The existence of known mining processes within or alongside the early farming communities of the British Isles has been understood ever since Canon William Greenwell's excavations at Grimes Graves in 1868 – 70 (Greenwell 1870) and those taking place almost simultaneously at Cissbury in Sussex under the direction of Colonel A H Lane-Fox (Lane-Fox 1875). Unfortunately these august beginnings to flint mine research in Britain were not to set a uniformly high standard for work in the future. Both in Sussex and in Norfolk, work in the earlier part of this century was very variable in its quality and sadly, particularly at Grimes Graves, became enmeshed in a controversy over the date and context of the mining (whether the industry was indeed of Neolithic date as Greenwell had clearly shown and stated or whether of Palaeolithic date producing a 'Levallois-Mousteroid' industry of core-tools).

Between the wars work continued at Grimes Graves in almost every season under the auspices of the Prehistoric Society of East Anglia and under the direction of Leslie Armstrong (Armstrong 1926). During this long period of work many aspects of interest regarding the nature of this vast site were retrieved. Armstrong saw the industry of the site as taking place in three phases characterised by three distinct mining processes. The earliest of these (the chronology being based purely on this typology) was the 'primitive' phase of small pits up to 6ft deep and exhibiting no gallery construction. Intermediate pits were postulated to follow these with the sequence culminating in the developed mining phase with shafts varying in depth from 25 – 40ft. It was during the excavation of one of these latter shafts (Pit 15) in 1939 that Armstrong encountered the 'ritual' deposits of antlers, chalk balls and a carved chalk 'goddess' which he claimed were associated with a non-productive gallery and were placed in an attempt, possibly, to propitiate whatever spirits were held to control the presence or absence of the much desired flint (Sieveking 1963).

That the flint was much desired can remain in little doubt. Enormous efforts were undertaken by the prehistoric miners to reach the layer of 'floorstone', the only flint of interest to them. All the evidence indicates that other seams of flint ('topstone' and 'wallstone') were discarded almost totally. The 'floorstone' occurs in large tabular nodules with a thick cortex concealing a beautiful lustrous black flint of extremely even fracture. Its very depth below the present surface of the chalk, in which it lies embedded, has preserved it largely from the disruption of its natural lines of fracture by permafrost conditions linked with the repeated glaciation of East Anglia during the Pleistocene. This same glacial activity led to the deposition of a layer of sandy glacial till over the surface of the chalk—up to a metre in depth—which forms the present day natural soil on the site. During the late 1930s the site of Grimes Graves was taken into the guardianship of the then Office of Works, and an area of some 21 acres containing the saucer-like depressions marking the tops of some 360 filled mining shafts were maintained outwith the surrounding coniferous forest developed by the Forestry Commission.

It was into this setting that the writer moved in early 1971 to plan the total excavation of a flint mine shaft and the examination of a large surface area that adjoined it. The choosing of one shaft for excavation from among so many was, of course, no easy task, but was made possible by the nature of the questions with which the excavation team approached the site. Any flint mine shaft which has since its prehistoric evacuation been filled with accumulations of debris and washed deposits will form (a relatively rare phenomenon in British prehistory) a deep stratified site revealing within the depth of its deposits a vertical chronometer, enabling the gauging of long periods of environmental and cultural change throughout prehistory in the locality. This important element is by way of an incidental benefit which excavation could add to the initial objective, which was the examination of the floor of the shaft and surrounding surface areas for information indicating the nature, working and products of the industry. In order to answer these questions a shaft of maximum depth of filling on the edge of the flint mining area where undisturbed surface areas would be available for examination had to be chosen, and a shaft as free as possible from any form of apparent later disturbance. These requirements, in fact, narrowed down the available number of shafts to a very few, and one, the 1971 shaft, was chosen on the north east edge of the site for total excavation.

The first phase of the excavation comprising the stripping of approximately 400m^2 of an area apparently occupied by extensive dumps of chalk overburden left by the prehistoric miners to the east of the 1971 site. The dumps were found on excavation to contain much unweathered block chalk and rejected flint nodules of 'topstone' or 'wallstone' origin. The broken tines of antler picks were also found amongst the dump material together with a restricted amount of flint debitage. The digging of the shaft had naturally involved the initial removal of the sandy glacial till from the top of the shaft, and this had been neatly piled on the forward edge of the dump forming a bank against which the dumping of chalk overburden could take place. Careful examination of the body of the chalk dump revealed a number of tip lines within it which enabled calculations as to its original height to be made. It was clear that originally the overburden dump had reached something like 4m in height. The enormous weight of this now much eroded dump (present day height maximum 0.5m) had resulted in considerable compression of the sandy old land surface that lay beneath it. Further careful examination of the internal structure of the dump revealed possible horizons of weathered chalk within the unweathered matrix of the chalk overburden (see Volume I, Figure 4). One possible interpretation of these internal bands of weathering within the body of the dump would seem to point to intervals of non-working during its construction (and possibly therefore in the digging of the shaft) which may throw some light on the nature of the working process, indicating possibly intermittent working.

Total removal of the area of chalk dump excavated revealed the crushed land surface virtually devoid of any cultural material whatever (see Volume I, Plate X). This negative evidence is in itself of the greatest interest. The 1971 shaft is certainly one of the deepest on the site, and would have appeared on *a priori* grounds to be not of the earliest activity present. Yet when it was dug the overburden taken from it was placed upon a surface devoid of any indication of industrial activity. This situation which we must consider in the light of evidence from the west side of the shaft may well argue for the fairly severe limitation of industrial activity to the close environs of each individual shaft as it was worked.

Relatively small scale clearance took place on the west side of the shaft, removing the small area between the 1971 shaft and the adjacent shafts towards the interior of the complex. Removal of the chalk dump here revealed a protected surface densely scattered with flint debitage in fresh condition, lightly patinated and very obviously *in situ*. This concentration of debris sealed directly beneath chalk blocks presumably thrown directly out of the 1971 shaft must represent flint-working on the site archaeologically contemporary with the working of the shaft. The composition of this assemblage exhibits a character which clearly links it with late Neolithic flint working in Southern Britain and in particular with flint assemblages associated with 'grooved ware' pottery (see Volume I, Chapter 2). The occurrence of densely packed working debris on the west side of the shaft (the side contiguous with the remainder of the mining complex) throws into sharp relief the total absence of debris on the east side (furthest away from previous working), and serves to substantiate the suggestion of strict localisation of working to the immediate area of each shaft.

Moving from a brief consideration of the surface features on the site we may now pass on to deal with the filling of the 1971 shaft as it was extracted. In the uppermost areas of the shaft a thick deposit of humic soil contained a number of bones of horse and other large mammals. This recent deposit concealed a thick group of lenses of chalky washed soil containing multitudinous remains of mollusca and many highly patinated flint implements. The surface of these deposits revealed a loose deposit of flint nodules which covered two crouched inhumations—one placed in position and the other later cut through the first (see Volume I, Figure 7). The initial burial of a woman of 20 – 25 years of age was possibly associated (the burials are of course in derived soil) with a simply and abstractly engraved chalk plaque located by her hip (see Volume I, Plate VII). This burial was superseded and partially destroyed by the introduction of another crouched inhumation of a male 25 – 30 years of age, in this instance clearly associated with two iron ring beads placed close by the neck. The feet of the primary skeleton were associated with a hearth or deposit of charcoal which yielded a radiocarbon determination in the mid sixth century bc. It would appear that in the uppermost filling of the shaft we have two of the very few early Iron Age burials retrieved so far in Britain, which provide a neat *terminus* after which date the filling of the shaft had become relatively stable.

Beneath this seal the lenses of chalky wash contained a number of much patinated flint artefacts and a group of sherds of pottery which were of Middle Bronze Age date. At the base of this broad horizon lay a massive concentration of flint working debris, with very few implements present, but large numbers of nodules with flakes struck from them. One sherd of pottery, fortunately diagnostic of Middle Bronze Age type, was seen to be associated with this mass of material. All the nodules concerned were apparently of 'wallstone' or 'topstone' type, and exhibited patination on previously fractured surfaces. It would seem to be the case that this material bears witness to the extensive working of flint on the site at a date during the Middle Bronze Age—a flint industry which, far from being dependent on mined flint as its source for raw material, relied upon garnered nodules of flint left by miners, already long dead, of Late Neolithic date.

Interdigitating with this body of material and with the washed materials that lie above it was a series of sandy layers which seem to represent collapses of extinct turf lines into the top of the shaft. The content of these layers reflected very closely those elements which have already been observed on the old land surface beneath the chalk dump to the west of the shaft. Within these bands of collapsed old land surface four axes were retrieved in very fresh condition and although their context can hardly be regarded as secure it would seem that they relate to the primary phase of the site—the Late Neolithic mining and working phase.

Beneath this concentration of flint working debris of Middle Bronze Age date the filling of the shaft changes its nature quite sharply. From the chalky washed material with an element of humic inclusion which fairly obviously was the result of long periods of exposure and erosion the filling changes to steeply angled *laminae* of often alternating chalky and sand deposits which would seem to represent rapid slips of material into the shaft, movements again produced by weathering. At no point in the filling of the 1971 shaft was any evidence retrieved which would lead to the suggestion of any prehistoric deliberate backfilling of the shaft from the top.

The alternating *laminae* of rapid silting occupy most of the lower part of the shaft. They are apparently undisturbed and contained very little cultural material, and must bear witness to a long period of desertion of the site with little or no human activity at least in the vicinity of the 1971 shaft.

At the base of the shaft the form of the stratigraphy was reversed, as during the final stages of mining, overburden, instead of being lifted out of the shaft, was simply taken out of the galleries and dumped on the floor. On top of this dump was found a rich deposit of pottery, some flint working debris and some traces of burning. The flint debris is non-diagnostic and seems to be simply the result of the breaking up of nodules. The pottery deposit, present as a mass of very soft sherds almost inextricably mingled in the chalk rubble surface of the dump, consisted of the remains of two bowls with flat bases with complex decoration on their interior surfaces (see Volume I, Figures 22, 23). Both fabric and decoration place these vessels clearly in the 'Grooved Ware' tradition.

The removal of this final dump upon which the Grooved Ware pottery was located revealed the floor of the shaft covered with a thin layer of heavily trampled chalk sometimes almost indistinguishable from the bedrock itself. This layer represents quite simply the effect of the prehistoric miners working for an extended period on the floor. In the centre of the floor was a hearth deposit which, along with a series of samples of charcoal from the galleries, gave an average radiocarbon date *c* 1820 bc. Lying on the floor of the shaft and within the two galleries which lead away on the north side of the shaft base were some ninety broken and discarded antler picks and rakes. Traces of fire were found in the galleries, both as soot stains on roof fragments, and as embers left from, presumably, brands. One 'chalk lamp' was found in the filling of the shaft, but apart from its shape there was no evidence of burning or staining on its surfaces to give any positive indication of its function.

Careful examination of the floor of the shaft enabled the fairly detailed reconstruction of the outlines of the floorstone nodules which had been removed during the mining process. Because of the even thickness of this tabular flint it was possible then to calculate, in approximate terms, the volume and weight of the flint removed from the shaft by the prehistoric miners. Something of the order of 8 tonnes of flint was lifted from the shaft during its working life. The nodules would seem to have been prised up by antler picks and then smashed up into manageable pieces by heavy blows from large flint blocks. Many sporls and chips resulting from this breaking up process lay all over the floor of the mine. The walls and the roof of the galleries had broken down very badly over the period since the abandonment of the mine, and sadly revealed very little in the way of impressions of digging tools. For this reason conclusions as to working processes within the galleries are limited. However it can clearly be shown that one gallery was dug before the other and that this first gallery was backfilled with chalk rubble presumably derived from the second. This might be regarded as evidence for the small number of mining personnel present, at least at this late stage. A few sherds of plain 'ungrooved' Grooved Ware were found within the galleries.

The method of extraction of overburden and the flint raw material from the shaft is a matter of some conjecture. At a point just below the seam of 'wallstone' flint a series of six post sockets were found driven horizontally into the wall of the shaft. Presumably these posts (and there may have been many more which have weathered out of the wall—those retrieved being very truncated) represent some kind of platform erected about 2.5m above the floor of the shaft. It is of course not possible to say whether the platform carried right across the shaft or was limited to the periphery. It is likely that such a platform could have served three purposes—first to protect the miners working beneath from falling debris, secondly as a dumping point for overburden, and thirdly as a stage or landing for a ladder system for carrying material out of the shaft. It is possibly significant that the post sockets occur at precisely the point where ladders set at approximately 45° would reach the head of the shaft in two stages. Such an angle would be ideal for load bearing climbers. Certainly the existence of a platform or structure of any kind within the shaft at this point would have acted as a major obstacle to hauling material out of the shaft with ropes. It should not be thought that evacuation of such a shaft by this means with baskets or bags of rubble being carried up ladders would be massively inefficient. This was the method employed by Greenwell to excavate his shaft in the late 1860s and calculations indicate that it would be both quicker and certainly safer than hauling material out by ropes.

Experience gained during the excavation and available from experimental chalk digging exercises at Overton Down and elsewhere enabled some approximate calculation to be made of the work involved in the digging of the shaft. Of course with a shaft of limited size there must be fairly close limits to the number of miners who could be involved in its digging. Six or seven men would appear, on grounds of experience, to be the maximum number who could work effectively in the body of the shaft. Taking this figure as a basis for calculation, such a work force would require a further six or seven persons to manage the evacuation by porterage of the produced spoil. This total workforce would take thirty two consecutive working days to dig the 1971 shaft at Grimes Graves. The working of the galleries would add a further thirteen days to the task. After the evacuation of 800 – 1000 tonnes of chalk and sand over the period indicated above, 8 tonnes of flint would have been produced—all of it at the very termination of the exercise. The broken up blocks of flint once out of the shaft were worked into a variety of tools notably discoid knives together with some axes. It is quite clear however that the production of the 1971 shaft at Grimes Graves cannot confidently be described as that of an 'axe factory'.

The distribution of the products of the mines at Grimes Graves is at present a topic of which we know very little. The work of the British Museum both on the site and in their programme of flint artefact trace analysis will, it is to be hoped, help to elucidate this problem. One aspect of redistribution involved with this industry can however be examined on the site itself. 95% of all the red deer antler picks found on the site are fabricated from cast antler. It seems fairly certain that this quantity of antler could not be casually collected at will, and perhaps it could be suggested that a service industry for the mining complex may have existed to provide this vital equipment. Cast antlers are by far the toughest antlers most suitable for use as picks and this could explain the degree of selectivity—but the difficulties of obtaining large scale supplies of this commodity may well point to a specialisation which adds a further dimension to the economic sub-complex of the Grimes Graves industry.

If the end of the industrial activity at Grimes Graves saw a period of desertion of the site, resettlement of the area took place at some point during the Middle Bronze Age. This resettlement was represented for us during the 1971 – 72 seasons on the site by a substantial midden of occupation debris encountered quite by chance, filling the top of another flint mine shaft hitherto unknown. Leslie Armstrong working on the site in the mid 1920s found just such a deposit which he termed 'Early Iron Age', in accordance with archaeological thought of the time. He called this deposit, by way of description of its midden content, the 'Black Hole', and the material from it is precisely similar to that from the shaft head excavated in 1972.

The 1972 shaft head was discovered during routine surface clearance during 1971. Beneath a covering of humic accumulation which had totally levelled the shaft so that it was quite undetectable from surface indications, there were three clear horizons of midden debris separated by two layers of washed material which would seem to indicate periodic desertion of the site. All three layers were associated with pottery of cordoned urn type. The three midden deposits were quite clearly tipped into the shaft from three different directions, but at no point on the surface was any trace visible of occupational structures. However it must be emphasised that the sandy glacial till surface was extensively disturbed by animal and root activity, and the tracing of such structures was rendered thus extremely difficult. The broader context of the midden debris was therefore difficult to define in physical terms, but environmental and artefactual evidence from within the deposits of midden debris has enabled the construction of a fairly full picture of the mixed farming economy and the local setting of copses and fields in which this occupation took place (see Volume I, Chapter V). A radiocarbon date of *c*.1130 bc was recovered from the central midden deposit.

The economic activities of this community—other than its farming—are more difficult to appreciate. Many piercing tools both of flint and in the form of bronze awls were found in the midden debris, and perhaps the treatment of leather or wood can be suggested. Textile production would seem to be suggested by the frequent occurrence of what are interpreted as spindle whorls and loom weights. Flintworking also appears to have been a major activity, but seems to have been totally confined to flint collected on the surface of the site amongst the vast quantity left as waste by the Late Neolithic miners. Very frequently it is clear that working has taken place through patinated surfaces induced by exposure. The production of awls and scrapers is one object of this working but equally important is the production of long rods of flint of unknown function which are frequently broken in one or two places—all the elements ending up on the midden. Numerous chalk cups, some very small, were located in the midden debris, and could be interpreted as 'lamps', but the total absence of any demonstrably mined flint from the site and the relative scarcity of red deer antler (although other tool-types could have been used) would seem to militate against the conclusion that there is any link between this occupation and deliberate mining for flint on the site. Only much wider investigation in the area can settle this point, particularly perhaps the re-examination of Armstrong's 'Intermediate' and 'Primitive' pit complexes. Presumably the intensive flintworking witnessed in the midden debris in the head of the 1972 shaft is to be linked with the mass of flaked nodules found in association with one sherd of cordoned urn in the head of the shaft excavated the previous year. It will be remembered that none of this material appeared to be freshly mined flint.

Thus at Grimes Graves during the 1971 – 72 seasons of work on the site the examination of the total filling of one deep flint mine shaft and the total examination of the upper layers of another revealed three successive phases of activity on the site over a period of well over a millennium. Firstly, a mining phase at a date *c* 1800 bc associated with Grooved Ware users whose distinctive ceramic was found both in the galleries and on top of a primary dump on the floor of the shaft. Work by the British Museum on the site in subsequent seasons has succeeded in locating similar wares in association with flint-working floors. The products of the 1971 floor are also readily seen in the context of Grooved Ware production.

After a long period of desertion represented by 6m of laminar filling as a result of weathering, virtually devoid of any cultural material, the site was re-occupied by a semi-mobile population of bronze-using farmers whose settlement structures were not retrieved in 1972, but who deposited large bodies of domestic debris in three successive blocks filling the top of an already silted mine shaft. These people are characterised by their use of cordoned urn pottery and one radiocarbon date would point to their presence on the site *c* 1130 bc.

With the disappearance from the site of these people we appear to see a long interval with no apparent occupation of the site until a point—if we can accept one radiocarbon date—during the mid sixth century bc, when two burials of mature adults were deposited in the shallow depression which then marked the site of the 1971 shaft.

The Flint Assemblage

by A Saville

Chapter I
Introduction

Previous excavations at Grimes Graves, as well as surface collection from the mined area, have resulted in the accumulation of an enormous quantity of flint material, now dispersed throughout England and beyond in museums and private collections. Both because there was a tendency to retain only selected specimens, and because details of provenance are not precise, these flints cannot now be used for any quantitative analysis, though their qualitative potential is still considerable. The publications which relate to this material have concentrated on the discussion of isolated implements or implement types, and on the cross or inter-cultural relationships these were thought to demonstrate, to the exclusion of any analysis of the internal composition of the Grimes Graves industry[1]. With this in mind, every piece of cultural flint disturbed during the 1971 – 72 excavations was as far as possible retained. This policy resulted in a collection of some 6 tonnes (6 tons) of flint, consisting of between 400 000 – 500 000 individual pieces, and the following study is concerned with presenting an analysis and discussion of this assemblage. Every artefact was examined by the writer personally, and the report is therefore dependant upon his individual knowledge and experience, though the inevitable errors of judgement may in part be compensated by some internal consistency.

This report was completed in February 1974 and no account has been taken of comparative literature published since 1973. The writer is indebted to institutions and individuals too numerous to name for help during the preparation of the report, but mention must be made of the help and advice given by Dr Ian Longworth of the British Museum, and the contributions by the DoE Fortress House Drawing Office under the supervision of Mr F J H Gardiner, by Alison Cook of the DoE Publication Section, by Alison McIntyre in Edinburgh, and in particular by Katherine Saville. Final retyping prior to publication was undertaken by Pat Konig. The report could not have been written without Roger Mercer's constant help and encouragement.

Note on the illustrations

For convenience of use as a corpus of material, and in sequence with the order given in the section on typological definitions and in the final discussion, the flint illustrations are arranged typologically. The F number sequence is strictly numerical throughout the figures. A concordance of the flints illustrated is given in Appendix 2 (pp 166 – 76), where the full find number and provenance will be found. All the flint illustrations are reproduced at ⅔ scale, except for thirteen which are ⅓. The exceptions are denoted by a star beside the drawing.

All flake artefacts are illustrated with the bulbar axis parallel to the length of the page and with the bulbar end towards the base of the page, except in the case of the rods, which are aligned longitudinally irrespective of their bulbar axis. Axes and picks are figured with the working end towards the top of the page, while cores and irregular pieces are oriented arbitrarily. Faceted platforms are normally illustrated, as are the break lines on pieces rejoined from fragments. The use of several different draughtspersons has resulted in some unavoidable stylistic variations amongst the flint illustrations.

Raw material

Flint occurs in three main seams in the upper levels of the chalk at Grimes Graves, and these are termed topstone, wallstone and floorstone, the latter being the lowest seam reached by the prehistoric miners. In the area of the 1971 shaft, apart from these seams, which occurred at approximately 5.5, 9.5 and 12m below the surface respectively, flint nodules were fairly numerous, though without any horizontal zoning, in the chalk above the topstone band, and isolated nodules occurred in the chalk between the topstone and wallstone. Between the wallstone and floorstone a continuous band of tile-like nodules only 1 – 2cm thick circled the shaft above the present level of the gallery entrances. In addition to the naturally stratified flint, an appreciable quantity of derived flint occurs in the sand and glaciated chalk levels, often in chunks of a size suggestive of derivation from nodules of comparable size to floorstone.

In form, the topstone and floorstone nodules are distinguishable from each other when complete and *in situ*. The topstone nodules have a thin grey cortex and occur in a wide variety of shapes and sizes, from small pebbles to large nodules, often with convoluted extremities, while the floorstone nodules tend to be regularly rounded and elongated externally, with a tabular flint core surrounded by thick, creamy cortex. In the 1971 shaft the wallstone was found to vary between these two extremes, sometimes resembling topstone, sometimes floorstone. Also the floorstone exhibited a wide variation in thickness and regularity of cortex, sometimes incorporating quite extensive areas, which, often becaue of fossiliferous inclusion, resembled the thin grey cortex of the topstone. The derived flint was readily distinguishable by the weathered aspect of its cortex where present, or by the dense cortication of its exposed surfaces. Spasmodic natural fracturing of the *in situ* flint

1. The approach of previous discussions is best illustrated by a quotation from the late Reginald Smith (1912, 112), which exemplifies the particularist attitude, (the italics have been added): 'the following list gives the *salient points* of *selected* specimens, and *parallels* from other sites *where such are relevant* to the present enquiry'.

was noted right down to the floorstone, and this was no doubt a mixture of actual thermal fracture and shattering along incipient fractures or stress lines after impact during the original excavation of the shaft. This occurrence requires more specialist investigation, but it is presumably possible for permafrost conditions during the Pleistocene to have affected the floorstone[2]. The tabular nature of the floorstone is usually overstressed, to judge from the evidence of the 1971 shaft, though it is conceivable that this factor is variable across the mined area. The only portions of floorstone usually seen *in situ* are the truncated extremities left behind at the edge of the shafts and galleries after the miners have removed the bulk of the nodule. However, the depressions left in the floor of the shaft and galleries indicate that the underside of the floorstone nodules had a very curved, almost semi-circular form, and that the nodules were discrete and not continuous.

Despite external differences in cortex and shape, the flint inside the nodules, irrespective of seam, is indistinguishable to the naked eye, being predominantly black and clear, occasionally grey, and with fossil and chalky inclusions relatively common. Therefore, once a nodule is broken up, and removed from its natural horizon, its origin becomes difficult to recognise. If a large area of cortex remains, then it is relatively easy to tell a piece of floorstone from a piece of topstone and vice versa, but when the area of cortex is small this sort of identification becomes extremely unreliable, especially if the cortex is weathered. Since it is of obvious importance to know the range of implements produced from the different flint seams, some attempt is made in the following analyses to discriminate between artefacts of floorstone and non-floorstone origin, but macroscopic guesswork can only provide a very rough and ready guide, and cannot suggest the origin of non-cortical pieces.

To pre-empt the results of these analyses, they emphasise a basic contrast in the raw material exploited by the Late Neolithic and Middle Bronze Age assemblages. Only the Late Neolithic assemblage used fresh floorstone, a distinction most economically explained by the Bronze Age knappers not having access to newly mined flint, and therefore not being miners. The enormous quantity of nodules (mostly topstone) which remain today on the surface and amongst the chalk dumps and shaft fills testifies to the relative unconcern of the Late Neolithic miners and knappers for flint other than floorstone. It is these discarded nodules, together with suitable pieces of previously struck flint (cf Smith 1965, 86), which the Middle Bronze Age knappers exploited.

Precisely why the Late Neolithic knappers discriminated in favour of floorstone is unclear. Nodule size alone may not be the reason, since on the one hand topstone and wallstone nodules of sufficient size to manufacture the largest tools in the present collection frequently occur, though floorstone nodules are on average much larger, and on the other hand floorstone was used by the Late Neolithic knappers for even the smallest implements. Perhaps the overall shape of the floorstone nodules, and the facility with which large flake blanks could be produced from them were more important. Modern flint miners and knappers have referred to the relative 'fineness of grain' or 'hardness' of floorstone, and though this has yet to be demonstrated scientifically, it could be a crucial factor in terms of craftsmanship, however unlikely a difference between the unweathered flint from each seam might appear. If it could be assumed that floorstone had qualities which were readily distinguishable in prehistory, then it would also be feasible for a prestige value to be attached to the mining of it, the use of it, and also to the implements made from it, though this would be an effect, not a cause, of its utilitarian properties.

Cortication and patination

The cortication and patination of flints at Grimes Graves has been discussed before (e.g. Armstrong 1934, 391), and since this is not, *strictu sensu*, a cultural factor, the mechanics of these processes (Shepherd 1972, 114 – 124) will not be considered here[3]. Suffice it to say that they depend upon the micro-context of deposition, but that certain general conditions are likely to apply on any given site. Thus at Grimes Graves, flints exposed on the surface, or in a predominantly humic context, will normally have a dense white colour and rough surface, following cortication, and may often be considerably stained. Flints from a predominantly chalky context have a dense greyish colour, though this may include variegation from white to blue, and flints from a predominantly sandy context have a blue-grey colour, varying from dense to faint. Flints from a buried turf-line often have a 'smokey-blue' colour and a very greasy feel, while those from the sand at the base of the natural soil profile often exhibit a distinct lustre. Frequent disturbance of the topsoil at Grimes Graves has resulted in a jumbling together of flints with various patination and cortication effects, hence the occurrence of all degrees of patina and colour in the spoil of a single mole-hole, but where deposits have been firmly sealed, as in the fill of the 1971 shaft, the variation occurring in different deposits can be readily appreciated. Totally undiscoloured flints, where the flaked surface appears as fresh as if just struck, also occur at Grimes Graves, and in the present collection these derive from the Middle Bronze Age occupation deposits, and the base of the 1971 shaft.

The frequent occurrence at Grimes Graves of completely different colouration on the rejoined halves of implements broken in antiquity, especially amongst the rods, quite plainly demonstrates that different discolouration need be no guide to chronology, but can simply, as in this case, reflect variation in the localised depositional circumstances. This also explains the occurrence of differential discolouration on individual pieces of flint e.g. the axe F113 (Figure 44) has a grey-white bulbar surface and an uncorticated black dorsal surface, because of its position: bulbar face upwards upon sand at the base of chalky/humic levels.

Nevertheless, patination and cortication do provide evidence for the re-use of cultural flint when re-chipping through an old surface has taken place. This phenomenon is common in the deposits associated with the Bronze Age occupation, where the latest phase of flaking can remain totally uncorticated, in sharp contrast to the white, grey or

2. Dr J G Evans suggested this possibility during a visit to Grimes Graves in the 1971 excavation season.

3. Previous usage (including that of the present writer) has failed to distinguish rigorously between cortication and patination. Archaeologically speaking, this is normally of little consequence, since the term patination is used rather euphemistically to denote a complicated phenomenon with which archaeologists are entirely familiar in a general sense. However, since in the present instance this phenomenon will be shown to carry some cultural implications, it must be more strictly defined, and therefore the terms patination and cortication are used separately, in the sense described by Shepherd (1972).

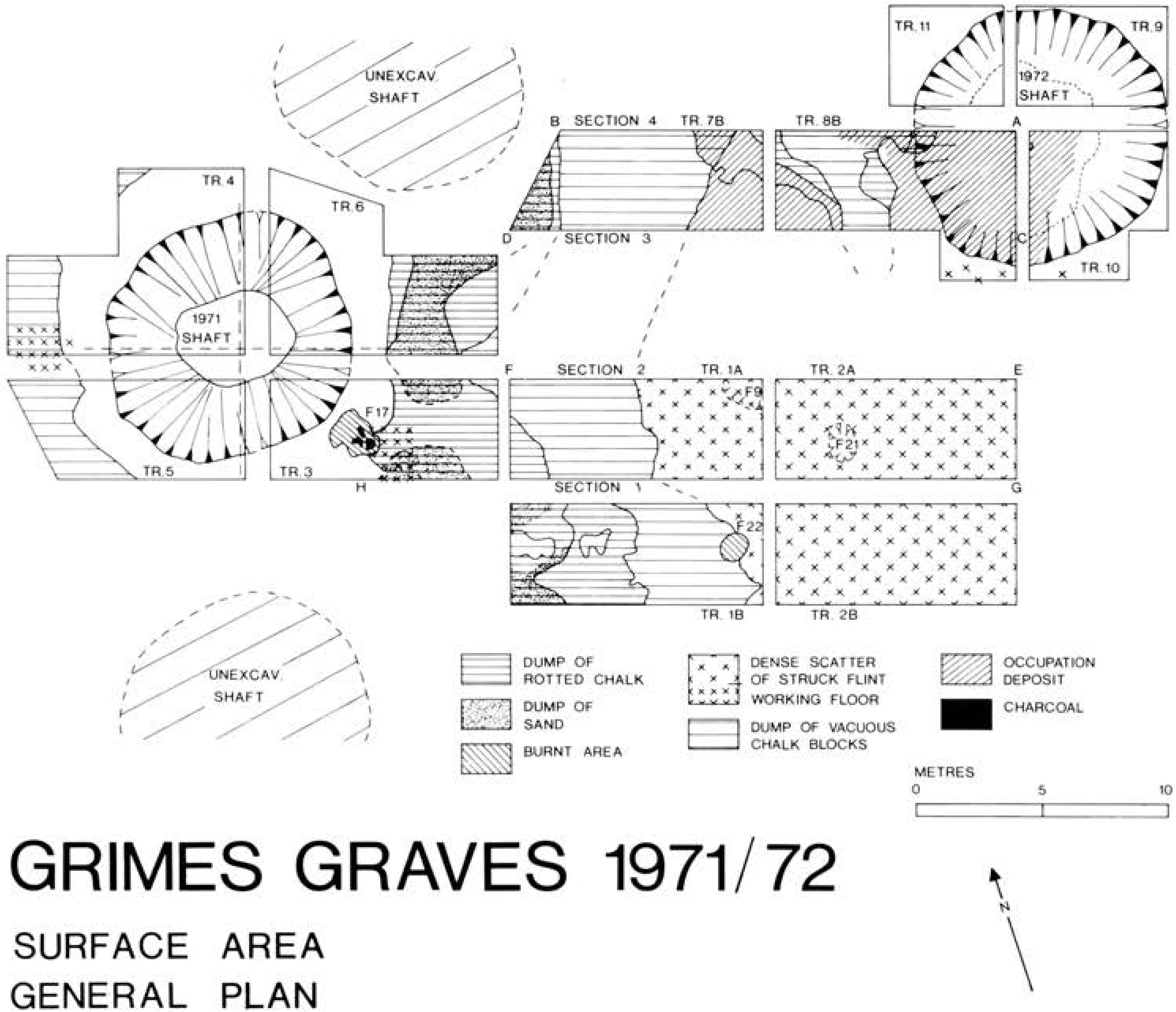


Figure 1 Surface Area excavated 1971–72—General Plan (reprinted from Volume I, Figure 2)

blue colour of the primary surface, but is less easy to distinguish when long exposure has also resulted in the cortication of the secondarily flaked surface. Similarly, if the original surface is completely removed during re-flaking, there will be no evidence of secondary usage. Artefacts which exhibit what can conveniently be termed two-phase cortication are numerous at Grimes Graves, and they attest what must have been the common practice of re-using flint discarded by previous knappers, whether in the form of cores, flakes, or implements. Although two-phase cortication has a relative chronological significance, it can, of course, give no guide to the absolute time-factor involved.

Calcined Flint (For locations see Figures 1 and 2)
Burnt and calcined flints (Shepherd 1972, 38) were not a common feature amongst the 1971 – 72 assemblage, and were restricted to localised occurrences. For example, in the hearths in the upper fill of the 1971 shaft, and in the area of burning in Trench 3, heat had affected the flints which immediately surrounded or underlaid them. The presence of calcined flint was not recorded in detail over the site as a whole, but the quantity of calcined flint was negligible except in the deposits associated with the Middle Bronze Age occupation. The calcined flint from the fill of the 1972 shaft and from Trench 8B was retained, and can best be quantified by weight.

The occupational deposit in the south-west corner of Trench 8B produced a total of 6.36kg of calcined and heavily burnt flint from an area of only 4.5sq m. The eastern section of Trench 8B excavated in 1971 (actually part of the 1972 shaft fill) produced 24.1kg of calcined flint, and the excavation of the 1972 shaft yielded a further 387.235kg. Altogether therefore, over 400kg (or 8cwt) of calcined flint can be related to the Bronze Age occupation. The calcined flint in the 1972 shaft fill came primarily from the grouped horizons (see Volume 1, p. 36):

	Weight in kg	%
Grouped Horizons	308.335	80
Ungrouped Horizons	78.9	20
Total	387.235	

showing a greater percentage concentration in the grouped horizons by weight than the cultural flint (67.2%). It is clear that the calcined flint is a characteristic feature of the Bronze Age cultural assemblage on the site, but it is less clear how this should be interpreted. A horizontal plot of the calcined flint recovered from the south-west corner of Trench 8B showed no particular pattern and simply suggested a general scatter.

There are only two explanations known to the writer for the presence of calcined flint on prehistoric sites: (a) as the incidental product of the use of flint in some heating process such as cooking, or (b) as an intentional product for use as a tempering agent in pottery manufacture. The Middle Bronze Age pottery from Grimes Graves does contain flint temper, but the other tempering agents suggest that the pottery was not manufactured on site. The excavation did not, therefore, provide any specific indication of the origin or function of the calcined flint.

Flaking tools (Figure 15)
Although it may be assumed that at Grimes Graves implements of various materials were used in the flaking process (cf Smith 1965, 86), the only ones which can now be identified are hammers of flint and stone. The absence of antler tools with obvious signs of use for knapping flint may be important negative evidence in view of the large numbers of well-preserved antlers recovered during the excavation, at least in suggesting that antler hammers were not used, though more delicate tools such as punches would not be so readily identifiable.

The flint and stone hammers can be divided into three groups according to the raw material employed: (a) Stone, almost exclusively quartzitic pebbles (e.g. F2, Figure 15, though the abrasion is usually less marked). (b) Fresh flint, in any form, nodules, broken nodules, lumps, cores or prepared hammers, but utilising mined flint, or at least flint with surfaces freshly exposed in prehistory, as opposed to those in group c (e.g. F1 and F3, Figure 15). (c) Derived flint, in the form of gravel pebbles, thermal lumps, etc. (e.g. F4, Figure 15, which shows an unusually smooth gravel pebble with cortex retained virtually intact).

The stone hammers are always on rounded pebbles, while the flint hammers are more variable in form, ranging from the *ad hoc* usage of any convenient piece, to the carefully prepared spherical or sub-spherical types with abrasion over virtually the whole circumference. A group of six hammers of the latter type were found close to each other in the upper 1A/1B levels of Quadrant 5 of the 1971 shaft, and may constitute an associated group. The illustrated example F1 is from this context.

An approximate quantification of the occurrence of hammerstones in the area of the 1971 – 72 excavations is given in Table 1.

The total of 152 complete hammers was analysed according to their weight and maximum dimension to see if any consistent pattern emerged. The values for the small sample of derived flint hammers matched those for the fresh flint series and these are therefore combined and then contrasted with the stone hammers which produced distinctive values despite the small sample. The values are presented in histogram form (Figure 3).

The histograms demonstrate a clear difference between the two raw material groups. The flint hammers cluster between 100 – 500g in weight, with a peak between 200 – 300g, while the stone hammers cluster markedly

Table 1. Hammerstone quantification

	Stone		Flint-derived		Flint-fresh		Totals	
	Complete	Broken	Complete	Broken	Complete	Broken	Complete	Broken
1971 Shaft	10	12	10	3	35	14	55	29
1972 Shaft	15	27	3	—	17	14	35	41
Surface Area	22	14+	16	6+	24	24+	62	44+
Totals	47	53+	29	9+	76	52+	152	114+

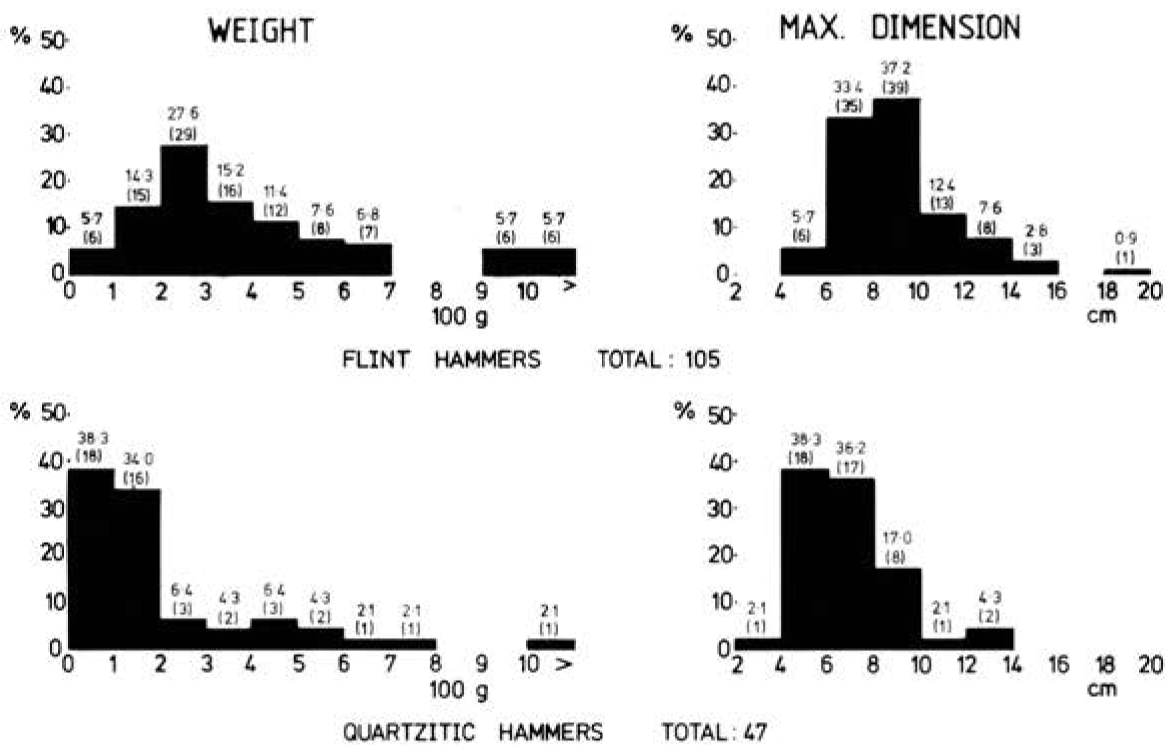


Figure 3 Hammerstone histograms

between 0 – 200g. In size the flint hammers cluster between 6 – 10cm, the stone hammers between 4 – 8cm. 40.4% of the stone hammers are shorter than 6cm, as opposed to only 5.7% of the flint hammers.

The size range of the quartzitic hammers is conditioned by the small average size of the pebbles locally available, but since it would have easily been possible to select flint hammers of a similar size, it seems valid to draw the general conclusion that flint hammers are by preference larger and heavier. This difference may perhaps be meaningful in a functional sense, with the flint hammers predominantly used for heavy flaking, and the stone hammers for lighter flaking and retouching.

The number of hammers listed here is liable to be an under-estimate since only hefty or repeated use will produce the characteristic abrasion which allows them to be identified. Bias is particularly likely in the case of larger nodules or lumps of flint which exhibit no obvious flaking, as they will have been discarded during excavation without a rigorous examination. Also cores with signs of hammering which form part of measured core series have not been included in these totals.

In many instances it is difficult to say whether a core was used as a hammer before or after flaking, and the hammering itself can result in the detachment of flakes as well as a crushing effect. It is clear (e.g. F1 and F3, Figure 15) that hammers were sometimes carefully prepared in shape by flaking, but in examples where the abrasion is less extensive it is impossible to say whether the flaking is specifically to produce a hammer, or is incidental in that a suitably shaped core has been utilised.

It should be noted that quartzitic pebbles were frequently encountered during the excavation (cf Greenwell 1870, 13), usually showing no sign of abrasion or use. Fragmentary pebbles which may or may not have originally been part of hammers were also common, especially in the fill of the 1972 shaft, where they were sometimes burnt. In all some 93 complete pebbles (weighing 3.99kg), and 853 pebble fragments (weighing 24.07kg) were recovered from the 1972 shaft, none of which was categorizable as a hammer. Sixty-six complete pebbles (2.99kg), and 672 fragments (19.84kg) came from the Grouped horizons, that is to say from the deposits assumed to be deliberately dumped. This concentration of quartzitic material in the Middle Bronze Age rubbish would seem to be greater than could be expected to occur naturally, though accurate figures for the occurrence of these pebbles were not obtained from elsewhere on the site. It would appear, therefore, that quartzitic pebbles were collected and put to some use other than as hammers during the Bronze Age occupation of the site.

Typological definitions

Before presenting analyses of the artefacts from Grimes Graves it is necessary to qualify the terminology and typological subdivisions employed. Some of the implement categories, such as arrowheads and microliths, do not require further explanation, but where familiar terms are used with slightly different implications than usual, or where non-standard terms are introduced, this is vital, and this section provides an essential prologue to the analyses which follow.

Waste flakes

All struck flint which is not retouched or obviously utilised is categorised as waste material, with a major subdivision recognised between parent and product, i.e. normally between core and flake. While waste flakes are mainly assumed to originate in the core-working process, the parent may equally be an implement or an irregular lump, and waste flakes are produced incidentally in any flint handling operation. No discrimination amongst the waste flake population according to size was purposefully practised during the 1971 – 72 excavations, but there is an inevitable bias against the recovery of small waste flakes during excavation, and, in deposits which were not given special recovery attention, they are considerably under-represented in the resulting collection. Any histogram of waste flake dimensions should theoretically show a unimodal fall-off from a peak at the lowest dimension recognised, since small flakes inevitably predominate in a waste flake population (cf. Newcomer 1971). It is a measure of the successful recovery treatment given to specific areas at Grimes Graves that all the large waste flake samples analysed in this report peak between 1 – 2cm in length and breadth, but the low representation in the 0 – 1cm range is indicative of the retrieval problems with such small flakes.

Waste flakes may be subdivided according to the amount of cortex they retain into four groups: cortex, primary, secondary and tertiary. Cortex flakes are composed wholly of cortex (e.g. F543, Figure 98), and are only likely to be found in any number at sites likes Grimes Graves where raw material is available with a very thick cortex which can be flaked separately from the enclosed flint. Such flakes can normally be assumed to derive from the flaking of floorstone. Primary flakes are those struck from the outside of a nodule in a place not previously flaked, so that the dorsal flake surface and the striking platform are wholly cortical. Cortex and primary flakes are usually treated together because they are numerically rather insignificant and are both from the exterior of the nodule. Secondary flakes are those which retain some cortex on the dorsal surface, and tertiary flakes those which retain no trace of cortex. Secondary flakes are on average larger and heavier than tertiary flakes, and will tend to be less common given a fairly large nodule size and well-worked cores. In this respect, however, it should be noted that in all the core analyses undertaken on the Grimes Graves material, cores which retain cortex outnumber those which are non-cortical.

A further sub-category of waste flakes is the core rejuvenation flake. This is an artefact, very subjectively defined, which is assumed to have the function of removing all or part of the striking platform on a core once it has become unusable, in order to provide a new platform, or to remove other obstructions or irregularities on the surface of a core in order to facilitate further flaking. However, for a core to be systematically worked down, as is the case with many Grimes Graves cores, it is by no means essential for any rejuvenation which will produce a characteristic by-product to have taken place. At Grimes Graves it would appear that core rejuvenation flakes are relatively uncommon, and this is presumably to be accounted for by the abundance of raw material which made the unusable platform expendable.

It is usual practice to designate flakes as blades when they have a breadth:length ratio of 2:5 or less, but a blade in more general terms is a narrow flake with approximately parallel-sided, lateral edges. True blades are rare at Grimes Graves (e.g. F5, Figure 16), at least as complete examples, but blade-like flakes, in the sense that they approach the parallel-sided form, are reasonably common, and in view of the predominantly broad flake type at Grimes Graves, it was sometimes found convenient to use a breadth:length ratio of 1:2 to isolate blade-like forms which were visually distinct from the normal flake type.

When examined metrically, waste flakes are described by their length, breadth, and breadth:length ratio (abbreviated as B:L ratio hereafter). Length is the maximum length along the bulbar axis at right angles to the striking platform, and breadth is the maximum breadth at right angles to the bulbar axis. The B:L ratio is calculated in a 1:5, 2:5 etc. progression, with, for example, a flake grouped as between 4:5 and 5:5 when its breadth is greater than four-fifths of the length, but less than or equal to the total length. In view of the broad nature of flakes at Grimes Graves the values for ratios of 6:5 and greater are given separately. No metrical analyses of bulbar angles were undertaken, but as has been commented on before (e.g. Armstrong 1934, 386), obtuse angles are very common, and this can be seen from the side view illustrations of many of the bulbar implements figured in the report.

A faceted-butt flake is simply one which has evidence of more than one negative flake scar on its striking platform, as opposed to the platform being plain with no ridging. Often the faceting of the platform results from deliberate preparation on the parent object of the edge from which the flake is to be struck, in order to obtain a suitable angle and surface for detaching exactly the sort of flake required, either with a view to shaping the parent, or producing a functional flake. In this case the butt may be said to be faceted *strictu sensu*, and the platform will exhibit a series of negative bulbs along its dorsal edge, with negative flake scars proceeding across to the ventral edge where they are truncated by the action of detaching the flake. In a less specific sense it should be obvious that faceting may occur in as many ways as it is possible for the platform of the parent object to acquire retouch. For example, when a core is flaked using a previous flake-producing surface as a platform, the resulting flakes are likely to have faceted butts. The term faceting is only applied to retouch which is prior to the striking of the flake involved, and not to the post-detachment trimming of platforms which sometimes occurs, presumably as part of a process of thinning the bulbar area. When faceted platforms are referred to in the present report, these will always be faceted *strictu sensu* unless otherwise specified. The shape of faceted flakes will be discussed later, but it is worth noting that flakes of any size may exhibit faceting.

Levallois technique basically refers to the flaking of a core or other parent in such a way as to predetermine the morphology of the flakes produced, by preparing the area of the core which will constitute the exterior surface of the flake. Preparation of the core often involves preparing the striking platform from which flakes are to be struck, but a faceted butt is not an essential trait of a Levallois flake, the most diagnostic feature being the intersecting flake ridges on the dorsal surface which attest multi-directional flaking. Levallois technique was used by flint knappers throughout prehistory after its appearance in the Lower/Middle Palaeolithic, but its usage varies considerably in frequency from period to period, culture to culture, and site to site, the fluctuation presumably conditioned by the type of flakes (and therefore implements) required, and by intangible factors such as competence and fashion. There is some evidence that Levallois technique is more likely to be practised in situations where there are abundant supplies of large-sized raw material. In any case Levallois technique is probably always secondary in importance to simple core-flaking techniques in whatever context it occurs.

Since the term Levalloisian does, however, have some restricted connotations deriving from its usage in a Late Acheulian context, where cores were apparently prepared for the production of a single, large, oval Levallois flake, it is perhaps preferable to speak of Levalloisoid techniques and products in other contexts. Certainly at Grimes Graves there is little evidence for this mono-product Levallois technique, the usual practice being the production of several Levalloisoid flakes from prepared discoidal cores. In fact, the Levalloisoid flakes and cores from Grimes Graves distinctly resemble those familiar from Mousterian assemblages, especially the abundant assemblages from south-west France, descriptions of which usually use the terms Levallois and Levalloisian. Nevertheless, without prejudice to the Mousteroid qualities of the Grimes Graves material, it is proposed to use the term Levalloisoid uniformly throughout this report. It is, of course, precisely these Mousteroid qualities which fed former controversies (see Volume I, pp. 3–7) about the date of flint-mining at Grimes Graves (cf. Smith 1915, 164), and so it is emphasised that Levalloisoid is used here entirely without extrinsic overtones, as a technological phenomenon, while not denying that the presence of Levalloisoid technique in any given assemblage can have cultural significance[4].

Levalloisoid flakes at Grimes Graves are normally relatively thin and regularly-shaped, but without such specifically recurrent traits as would justify the isolation of a 'typical' form (e.g. F8 and F9, Figure 16). On the other hand, forms which can be categorised as atypical, such as Levalloisoid blades (F7, Figure 16), do occasionally appear. It is important to note that the careful preparation of Levalloisoid cores was not undertaken to produce waste flakes, and Levalloisoid waste flakes should often be regarded as either rejects which were unusable (or at least on which use is undetectable), or incidental products, for example as might be occasioned during the shaping of an axe (cf. Warren 1921, 174–6). That Levalloisoid flakes were intended to function as particular implement types will be evident when knives, points and cutting flakes come to be discussed.

Finally, there is the question of the frequency with which waste flakes may function as unretouched implements. The present writer is of the opinion that reliable criteria for the macroscopic recognition of utilisation have yet to be established, and that only particular classes of flakes where the overall form is distinctive (i.e. cutting flakes and utilised blades q.v.) can be isolated as probably utilised. However, in each analysis of waste flake samples some attempt is made to quantify the occurrence of the probably utilised flakes included, since it is considered almost inevitable that any sample will include some utilised forms. The values given should be regarded merely as a guide to the possible figures. The flakes classed as utilised in this way are simply sharp-edged flakes with some degree of edge-damage arbitrarily considered not to be fortuitous.

Cores

Cores are the parent material, whether nodules, segments or flakes, from which flakes are produced. At Grimes Graves cores are usually purely waste forms, in the sense that they are rarely prepared for secondary usage as implements, such as scrapers, though they may frequently be used as hammers.

Within the general category of core forms, three subdivisions are made of complete cores, fragmentary cores and flaked lumps. Fragmentary cores need no further explanation, (F594, Figure 106, shows two fragments which it was possible to re-unite to form a complete core), but the distinction between cores and flaked lumps is not so easy to define. These lumps show signs of involvement in the cultural flint-knapping process, but are not very regularly flaked. They may vary from a nodule with one terminal struck off, through a flint block produced by flaking or smashing but with no distinct negative flake scars or positive bulbs of percussion, to a piece with a few small chips or flakes removed. To a large extent the distinction between these two types is arbitrary, especially when cores with platforms producing single flakes are considered. Also, it is axiomatic that no accurate figures can be given for the occurrence of flaked lumps, because it would be almost impossible to retain or record every nodule or piece of flint which showed some sign of cultural alteration. Accordingly, when waste material is analysed in detail, the main purpose of distinguishing flaked lumps and fragmentary cores is to isolate the complete cores which can then be analysed further, but also to provide a more meaningful picture, particularly in terms of weight, of the composition of the assemblage as a whole.

Complete cores are classified according to the number and type of their striking platforms, following the scheme adopted by Clark and Higgs (Clark *et al* 1960, 216) which is customarily used for Neolithic assemblages.

Class A. One platform
1. flakes removed all round
2. flakes removed part of the way round

Class B. Two platforms
1. parallel platforms
2. one platform at oblique angle
3. platforms at right-angles

Class C. Three or more platforms

Class D. Keeled: flakes struck from two directions

Class E. Keeled, but with one or more platforms

This classificatory scheme is mostly self-explanatory, but two points can be made more explicit. Firstly, the class B2 cores include all two-platform cores on which the platforms are not actually parallel or at right angles, and secondly, those cores designated class E are keeled, but have an ordinary platform, or platforms, in addition to the keel elsewhere on the core. To facilitate comparison, it is convenient to telescope the above scheme into the four main core classes of A, B, C and D/E.

In addition, cores are individually weighed and measured, with the results presented in histogram form, in a manner devised by the present writer (Saville 1972–73, 10). The measurement taken is always the maximum dimension of a core in any plane. Several other details were recorded during the analysis of a sample of cores, including the presence of prepared platforms, the presence of evidence for previous flaking prior to the remaining platforms, the type of product (which at Grimes Graves is almost exclusively flakes as opposed to blades), and an assessment where feasible of the form of parent material (in particular whether or not the core is on a flake). Also, when a core retained cortex an estimate was made wherever possible of the probability of this being of floorstone type or not.

Retouched and utilised artefacts

Implements are distinguished by the presence of retouch and/or utilisation. Retouch may be defined as the modification of an artefact by the removal of flakes designed to

4. It is possible that other East Anglian flint artefacts have in the past wrongly been indentified as Palaeolithic simply because of their Levalloisoid qualities, and the re-evaluation of surface finds in particular is required (e.g. Burkitt 1953, 39–40 and Figure 20).

provide a working edge or to provide ancillary shaping contributory to the function of a working edge. The concept of a working edge, (which can be of various forms, straight, pointed, concave, or convex, and of varying adaptation), is crucial and definitive, and can be contrasted with implements which have a working surface, such as hammerstones, which are not included in the analyses of implements though they may well have shaping retouch. A special exception is made in the case of 'fabricators' in view of the uncertainty surrounding their precise type and mode of function. The recognition of retouch is not without its pitfalls, and some pieces will inevitably be included as retouched when the flake scars they exhibit are entirely fortuitous, or where the retouch in fact relates to core preparation or some other incidental process. Nevertheless, it is assumed that all the artefacts which have been isolated as retouched or utilised are implements, or broken parts thereof.

Picks

Picks are 'heavy' implements with a pointed working end, though the nature of the point may vary from sharply pointed, through rounded to almost straight. Picks may be bifacially flaked, of elongated shape, and generally of 'fine' symmetrical appearance, but in fact the overall morphology is extremely variable, and the 'fine' form is not regarded as defining the type. Picks are distinguished from points in most cases by their larger size and thickness, and by their shape, but some overlap, especially with the 'heavy points', is inevitable. Generally speaking, the distinction between picks and points is related to the functional assumption that picks are used by being struck against the material being worked, whereas points are applied to the material using pressure not blows, and therefore the working end of a pick must be more substantial and resilient. As with axes and other 'heavy' tools, the definitions given here are not concerned with whether or not these implements are also distinctive in being hafted as opposed to hand-held, since there is no conclusive evidence to demonstrate this, though it may often be a reasonable inference. The only subcategory of picks which has been isolated in the present report is the chisel-pick, which generally has bifacial retouch, a smooth profile, a sub-lenticular cross-section, and a near parallel-sided form. Tools such as these are sometimes simply termed chisels, but since the terminals tend to be rounded points rather than straight edges, and since they are presumed to function in a similar fashion to a pick, chisel-pick seems a preferable usage.

Axes

Axes are 'heavy' tools with transverse cutting edges, and the usage here follows the customary definition of the type. Implements which may in fact be adzes, (i.e. they have an assymmetrical longitudinal cross-section) and which would therefore be hafted with the blade at right-angles to the shaft and not parallel to it as in the case of axes, are not included as a separate category. Ethnographic evidence has demonstrated that adzes are often used for exactly similar functions as axes, so in the absence of definite prehistoric evidence for regular usage in a different manner, for instance as hoes, it would seem unnecessary to make a rigorous typological distinction. When discussing axe forms, the term *tranchet* is used in exactly the same sense as with a *tranchet* arrowhead, and does not refer to the technique of resharpening the cutting edge of axes with a transverse blow (i.e. a *coup de tranchet*), often observed in Mesolithic contexts. A *tranchet* axe is formed on a flake, with a straight cutting edge produced by the intersection of the two flake surfaces representing part of a lateral edge of the parent flake.

Roughouts

This is a subjective categorisation intended to describe unfinished forms thought to relate to implements of axe (and perhaps pick) type. It is impossible to define these forms with any accuracy, the only yardstick being the general impression they present. Some of the implements classed as axes are strictly speaking unfinished insofar as their cutting edges are not sharp, but since these are undoubtedly axes it would be perverse not to label them as such. On the other hand, some possible roughouts have been included in the miscellaneous category, and others have probably been wrongly interpreted as cores. It should be obvious that a roughout need not actually be a fossil stage in the preparation of the implement, since it is more likely to be a piece discarded as unsuitable, rather than a piece lost during manufacture. The precise point at which a blank becomes a roughout is also incapable of definition. Past use of the term has always been imprecise, sometimes being reserved for virtually finished examples, or even applied to finished axes which have not been polished. In view of the problems surrounding the use of this term it has been restricted in the present report to only five examples. Roughouts, in common with picks and axes, are measured by orienting the implement on its longitudinal axis.

Burins

Burins are implements with a chisel-like edge formed by the intersecting angle between the bulbar end of a negative flake scar (or scars) and its platform (which may or may not be prepared or formed by a similar flake scar). The supposed function of these tools is implied by the alternative name of graver, and they seem to be associated in particular with the working of bone and antler, but preeminently in Upper Palaeolithic contexts. When burin-like forms appear in small numbers in post-Mesolithic contexts it is always problematic as to whether they are intentional forms or whether the burin facets are fortuitous. This is indeed the case with the present collection and none of the specimens included as burins can be regarded as indubitably intended as such.

Knives

Knives are implements with a sharp, retouched edge or edges, where the edge is assumed to function for cutting. The actual shape of the implement and the curvature of the cutting edge may vary enormously. The distinction between a knife and a cutting flake is based upon the presence of fairly elaborate retouch in the former, and its absence in the latter. Since a natural flake edge will always be sharper than a retouched one, it must be assumed that knives fulfilled some special function for which natural flakes were not suitable. A special function undoubtedly applies to the subcategory of discoidal knives recognised here. These are implements with a sub-circular outline, bifacially retouched to provide a curved cutting edge around all, or part of, the circumference. While these are often found partially or wholly polished, this is not the case at Grimes Graves, and it seems best to regard the polished forms as a variant.

Scrapers

Implements described as scrapers normally have convex areas of unifacial, dulling retouch, the retouch being effected from the bulbar surface and forming an angle with this surface in the 20 – 90° range. Variations upon this definition are allowable, so that the profile of the scraping edge may be straight or even concave, or the working edge may be formed by inverse retouch. Scrapers do exhibit a characteristic wear pattern (Rosenfeld 1971), but are normally identified intuitively by a consideration of the overall morphology of the implement, the properties of the retouch (such as angle and smoothness of profile), and by the position of the retouch in relation to the shape of the blank. Subdivisions of the scraper class usually reflect the shape of the blank and the extent of the retouch. In the present report the scraper definition is extended to include examples on which the amount of retouch is minimal (and often along a dorsally cortical edge), but which have an otherwise 'scraper-like' form, and which recur in sufficient numbers for these to be seen as a common variant. Also included are implements which have an undulating working edge, with indentations formed by the removal of deep or broad flakes at intervals without retouch of the intervening ridges, but which are otherwise 'scraper-like' in all respects. These forms are designated denticulate scrapers, and are thus intuitively distinguished from other artefacts which have similar denticulate retouch but which lack a 'scraper-like' appearance. Six basic subdivisions of scrapers were employed in the present report, and these are defined as follows.

a. End scrapers. Flake scrapers where the scraping edge is formed approximately at right angles to the bulbar axis. Usually the retouch is at the distal end of the flake, but it may also be at the proximal end.

b. Side scrapers. Flake scrapers where the scraping edge is approximately parallel to the bulbar axis, normally on one lateral edge only, but occasionally bilaterally.

c. End-and-side scrapers. Flake scrapers where the scraping edge is both parallel and at right angles to the bulbar axis. In its most common form this type has a single scraping edge extended from the distal end of the flake down one or both of the lateral edges. When the blanks involved are small and broad, without a definite break in alignment between the distal and lateral edges it is perhaps best to use the term extended end scraper, but on the large Grimes Graves flakes this is not the case. The few examples which approach the 'disc' form (a potentially misleading term since the scrapers often so-called are not discoidal but penannular, retaining an unretouched platform), are included in this group.

d. Pointed scrapers. Flake scrapers which have a working edge which is distinctly pointed. These really constitute a variant of the end scraper category to which they would otherwise normally belong.

e. Denticulate scrapers. Flake scrapers which have an indented undulating edge as described above, and which may otherwise resemble either categories a, b, or c.

f. Unclassified scrapers. All scrapers which do not fit into the preceding categories. These include scrapers on thermal flakes. Sometimes scrapers in this group can be recognised as a distinct type, as in the case of plane-scrapers which are thick flakes with steep bilateral retouch for shaping, and a steep, convex, distal scraping edge.

The length, breadth, and B:L ratio of scrapers are calculated as for waste flakes, though non-bulbar scrapers may be included in the measured series if the platform has been removed by retouch and the bulbar axis can be determined by the percussion ripples on the bulbar surface. In addition their thickness is measured, this being the greatest dimension between the dorsal and ventral surface taken perpendicular to the bulbar surface. Measurements were taken of the angle of the scraping edge, using the method proposed by Bohmers (1956) or by Movius *et al* (1968) according to suitability, but it was found to be impossible, except in a very few cases, to adequately describe the angle by a single measurement, and an angle range (e.g. 60 – 70°) of variable brackets was used. Accordingly no histograms are given of scraper angles, though some attempt is made to indicate the range involved.

Points

This broad implement class includes all tools with a point which is presumed to be the functional feature, with the exception of picks, which have already been defined, and arrowheads and microliths which are regarded as projectile points as opposed to hand-held implements. Alternative terms which could be used for points are awl, piercer, or borer, but point is preferred since it is less specific as to the precise method of usage though the function is always presumed to be perforation. It was found convenient to isolate four sub-types in the analysis of the 1971 – 72 assemblage.

a. Standard. Numerically dominant were flakes with a sharply pointed distal terminal. These are 'simple' tools in that few exhibit elaborate or extensive retouch, the retouch about the point normally being perfunctory and minimal, or even non-existent, because it was the common practice to employ flakes which were to some extent already pointed. Either the point is natural, being formed by the shape of the flake extremity as it occurred after striking, or it is secondary in some sense, such as being formed by the corner of a truncation. In some respects therefore, these implements are *ad hoc* tools, a suitably shaped flake being picked up when required for an immediate task, perhaps slightly retouched before use, and then discarded. Alternatively, points of this category may be preformed prior to flaking, and thus be intended from the outset for a particular function, such as the Levalloisoid points which occur, usually needing little or no retouch. Although distally formed points do predominate in this category, the point may be formed on a lateral edge in some instances, or occasionally at the butt of a flake.

b. Rounded. Rounded points are a variant of the standard form where the point is rounded or blunt, but on which it is nevertheless thought that the 'pointedness' of the tool is its chief characteristic. Some overlap with pointed scrapers is probably unavoidable.

c. Heavy. These are points on large 'heavy' flakes or lumps, the size and shape of the implement being distinctive. It was not possible to define a metrical cut-off point for the isolation of this type, since relative weight, thickness, and the cross-section of the actual point could be as important as the length and breadth. Also, it would have prevented the grouping of broken examples, which as it will be seen were very frequent amongst the points. Although it is assumed by the inclusion of the heavy points here that they were used by applying pressure rather than by striking, the distinction between some of these and picks is rather arbitrary. Another feature of the heavy points is that, apart from their general robustness, they tend to be completely dissimilar to each other in other aspects such as shape and the peripheral position of the point.

d. Others. Points which for one reason or another do not fall into the above groups are included here. Some elaborately retouched types are included here, as are the special category of Bronze Age tools with heavily retouched and elongated points.

Rods

These implements are eponymously defined by their rod-like appearance and shape. They are elongated, prismatic tools, with characteristic steep lateral retouch. The cross-section can be rectangular, diamond-shaped, triangular or semi-circular, with the thickness often closely comparable to the breadth. The lateral retouch may be unilateral, bilateral, or multilateral, including flaking from the dorsal ridge and across the ventral surface. Although they are flake tools, these implements are often not fabricated on blade-like flakes as their shape would suggest, but are commonly fashioned on transverse segments of large flakes, their longitudinal axis thus being at right-angles to the bulbar axis of the original flake. Accordingly, when rods are measured, the length is taken as the longitudinal axis irrespective of whether this is a bulbar axis. The precise nature and extent of the retouch varies considerably, but it would appear that in most cases it is the lateral edge (or edges) which is to be regarded as functional, rather than the terminal edge. Rods are characteristically found in broken, snapped segments, and because of this, all preliminary totals of rods are based on the number of fragments rather than the number of implements. Certain artefacts which might be described as rod-allied in that they share traits such as steep lateral retouch, but which are otherwise very irregular, have been included in the miscellaneous category. Implements of this type have in the past been referred to as 'prismatic tools' (Smith 1915, 174 – 5), but for conciseness the term rod, which is similarly descriptive of the tool shape, is preferred. Smith (1931, 3 and Figure 10) previously used the term rod to describe a prismatic implement from Icklingham, Suffolk, which may be similar to the rods dealt with here.

Cutting flakes

Cutting flakes are sharp-edged flakes which have retouch, prominent utilisation, or an overall shape, suggestive of the use of the sharp edge for cutting. As such, cutting flakes are presumably only the recognisable extreme variant of the macroscopically unidentifiable utilised flake. Since general morphology is perhaps the chief trait by which cutting flakes are identified, they constitute a subjective grouping whose composition can easily be disputed. Retouch, whether ancillary or along the cutting edge, is usually minimal, and is anyway never elaborate as on a knife. The chief variation which occurs in the cutting edges of these tools is the degree of curvature, but since the curvature is directly related to the shape of the flake, it is not clear whether straight-edged examples can be separated from curved-edge examples in any way which might be meaningful to their selection or function, and so they are treated as a single group. Very occasionally flakes which are strictly speaking blades, in view of their B:L ratio, have been included in this category, on the grounds that they are extremely large and not otherwise 'blade-like'. Because general morphology is important in the definition of cutting flakes, the apparent dominance of carefully produced flakes, as implied by the high incidence of faceting and Levalloisoid flakes, and by the low presence of secondary flakes, must be viewed with some scepticism, since identification will be biased towards the identification of 'fine' flakes.

Utilised blades

Many of the problems involved in the definition of cutting flakes apply here also. The grounds for supposing utilisation are admittedly slender and imprecise but basically involve edge modification of some kind. Many of the pieces included in this category are fragmentary, and there is anyway a distinct danger of inclusion simply because they are blade-like and *ipso facto* visually distinct amongst the general flake population and likely to be given more thorough scrutiny during sorting. There are also blades with retouched points in the points category, so that some fragmentary blades labelled as utilised may be broken points. Artefacts included here do not have any regular edge trimming, unlike for example, Class A utilised flakes at Windmill Hill, Wiltshire (Smith 1965, 92). Blade fragments which do have distinct edge retouch are included in the miscellaneous category, since there are no complete examples of this type to suggest the implements involved. Occasionally, however, blades exhibit some ancillary retouch as well as utilisation, and these are included in this grouping. Utilised blades are usually 'blade-like' rather than being true blades, because many are fragmentary and because amongst those which can be measured a 3:5 B:L ratio predominates.

Bulbar segments

Strictly speaking, these are not in themselves implements, but are regarded as fragments thereof which evidence a distinctive breakage pattern, probably coming from tools of utilised blade or related class. A bulbar segment is the proximal portion of a blade-like flake, with distinct or incipient retouch on one or both lateral edges, which has become detached from the rest of the artefact, the retouch usually being truncated by the break. The character of the remaining retouch often suggests a basal notch, and it is assumed that bulbar segments result from recurrent breakage at just such a point of stress. However, the lack of complete implements, or the corresponding distal segments, present problems of interpretation. Although the bulbar segment superficially resembles a microburin, the breakage pattern is different in that the break is flat and not angled downwards across the bulbar face. Also, in at least one case (F472, Figure 89), the notch remains intact with the break above it, suggesting the notch is functional. There was little difficulty in separating bulbar segments from proximal utilised blade fragments because of the absence of retouch on the latter.

Bifacials

Implements of unknown function grouped together because of the common characteristic of bifacial edge and surface retouch.

Fabricators

Implements which exhibit polar and sometimes lateral abrasion, where the abrasion assumes a characteristic crushed and smoothed appearance, thought to be consistent with continued striking or rubbing. Fabricators come in a wide variety of shapes and sizes, but the only examples recognised from the present collection are of the elongated, prismatic type. They are therefore, 'prismatic tools' as are the rods, and are to be distinguished principally by the presence of the sort of abrasion just described, but also by their lateral smoothness and non-angular profile. There is a possibility of overlap, especially since so many of the rods are fragmentary and could have had terminal abrasion.

Multiple tools
Implements with at least two separate working edges. The definition used here restricts the usage of this term to implements on which the edges differ in character, and thus double-ended scrapers, or double points would not be included.

Miscellaneous retouched
Numerically the most significant category, the miscellaneous retouched pieces comprise those artefacts which exhibit retouch but which do not fall into any of the above categories and which, in the absence of readily appreciable recurrent traits, remain unclassifiable. The majority are fragmentary or damaged pieces, and these may include incomplete implements of common type, but complete tools which resist classification are numerous. Since the inadequacies of typological sorting are not always fully stated, it is worth stressing that the typological cut-off point between miscellaneous and specific implement categories is difficult to define objectively, and may well have nothing to do with actual prehistoric usage. Only with very characteristic implement types such as arrowheads can the numerical count given be said to approximate to the actual representation of artefacts used as arrowheads amongst the total collection. With other implement types such as scrapers, knives, or points, there will exist in reality a gradation from fortuitously occurring flakes with suitably bevelled, sharp or pointed edges appropriate for *ad hoc* usage, through specially prepared flakes with little or no retouch, to the carefully retouched specimens customarily taken to define the type.

Chapter II
The 1971 Shaft

The fill of the 1971 shaft contained 2495.73kg (approximately 2.456 tons) of cultural flint. With the exception of those from the very base of the shaft, all the artefacts contained in the fill owe their position either to the deliberate discarding of flints into the shaft, or to the natural infilling (or dumping) of deposits of chalk, sand and soil, which incorporated artefacts in their make-up. Although it is possible that *in situ* knapping took place on the stabilised horizons with which 'hearths' are associated, this could not be demonstrated during excavation as the resulting debris would be archaeologically indistinguishable from the main mass of derived material. While the position of an artefact within the vertical stratigraphy of the shaft fill is therefore not necessarily a guide to its age, since it is in a secondary context, the particular deposit to which it relates may be of significance, in view of the surface context from which the deposit is derived. Hence the artefacts from the shaft are sub-divided according to the major fill deposits distinguished (see Volume I, pp. 16 – 23), and these can be summarised as follows:

a. Layers 1A etc. The uppermost fill of the shaft. Mixed chalk and sand with a humic content, representing the final major phase of the weathering process. All the artefacts from these layers are corticated, with a colour range from dense white to grey and grey-blue.

b. Layers 1B etc. The central mass of the fill, predominantly chalky with much nodular flint of topstone type. Interpreted as the slipping-in of the chalk dumps surrounding the shaft at the surface. Artefacts are characteristically grey or blue-grey.

c. Layers 1C etc. Sandy lenses, running behind and through the 1B layers almost to the base of the shaft. Interpreted as the collapsed soil from the edge of the shaft at the surface. The artefacts included in this subdivision almost all derive from the third and fourth excavation stages where the sand lenses were thickest. Flints from the sand lenses are in a very fresh condition, often totally uncorticated or with a slight bluish colouration.

d. Fifth to seventh sections. Compacted sand and chalk as in b and c, constituting the primary fill of the shaft. Artefacts from the sand lenses correlate with those from c above. Despite the predominantly chalky matrix, the special conditions pertaining at this depth have left much of the flint undiscoloured, so that, in the absence of explicit details of context for each artefact, those from the sand cannot be separated out with certainty.

e. Base of shaft and galleries. Predominantly chalky deposits made up of mined chalk never removed from the shaft but heaped up at the base and backfilled into the galleries. Includes the material lying on the shaft floor. The flint is in fresh condition and undiscoloured by cortication, though a streaky orange-red staining is frequent. Identical staining occurred on the exposed surfaces of the *in situ* floorstone nodules.

The cultural flint from each of these subdivisions was weighed (Table II). The retouched element was also isolated and contrasted with the total sample, based upon an estimated total of 150 000 artefacts. Table III provides a typological classification of the 460 retouched artefacts, and Table IV is a key to the illustrated examples.

Almost half of the cultural flint recovered from the 1971 shaft fill, including 65% of the retouched forms, can be ascribed to the chalky 1B layers of subdivision b. Given the evidence of the 1972 shaft, the implements from this subdivision clearly include Bronze Age examples such as the rods, but in contrast to the 1972 shaft situation there is no way in which a Bronze Age assemblage can be isolated. The absence of compacted organic lenses of dumped material largely precluded the conditions which inhibit cortication. The flint from the 1B layers, apart from the deposit described below, was therefore a mixture of chronologically disparate material, which although it probably does contain a high proportion of Bronze Age pieces, cannot reliably be subdivided, any more than can that from the superficial 1A layers. This is particularly unfortunate in view of some of the implement types included, especially the axes.

It was noted during the sorting of this material that the waste component was predominantly composed of large flakes without the masses of very small flakes and chips

Table II. 1971 Shaft flint quantification

Subdivision	Total wt. in kg	Total no. retouched	Retouched expressed as a percentage of the estimated numerical total
a	313.05	81	0.4
b	1167.26	303	0.4
c	207.04	35	0.3
d	464.89	36	0.1
e	343.49	5	0.02
Totals	2495.73	460	0.3

Table III. Implements from the 1971 shaft

Implement type	Subdivisions a	b	c	d	e	Totals	%
Arrowhead		1				1	0.2
Picks		7	2			9	2.0
Axes		6	4	2		12	2.6
Roughouts		2	2	1		5	1.1
Burin		1				1	0.2
Scrapers	8	37	3	1		49	10.7
Points	17	56	1	8		82	17.8
Rods		14				14	3.0
Cutting flakes	2	26	6	5		39	8.5
Utilised blades	3	14	2			19	4.1
Bulbar segment		1				1	0.2
Bifacials		3				3	0.7
Fabricator		1				1	0.2
Miscellaneous retouched	51	134	15	19	5	224	48.7
Totals	81	303	35	36	5	460	

Table IV. Key to illustrated implements from the 1971 shaft

Implement type	Subdivisions a	b	c	d	e
Arrowhead		F72			
Picks		F76, 83, 84, 93, 94, 97, 101	F75, 81		
Axes		F104, 106, 109, 111, 115, 117	F107, 112, 114, 118	F103, 105	
Roughouts		F121, 122	F120, 123	F119	
Burin		F128			
Scrapers	F188, 209	F178, 179, 181, 187, 191, 195, 205, 206, 215, 217, 218, 236, 237	F243	F197	
Points	F247, 260, 327, 336	F273, 287, 301, 304, 308, 324, 329, 331, 340, 358, 359		F284	
Rods		F384, 385, 387, 389, 410			
Cutting flakes		F430, 439, 448	F445	F428	
Utilised blades		F455	F450		
Bifacials		F489, 491, 493			
Fabricator		F498			
Miscellaneous retouched	F591	F503, 506, 516, 517, 521, 535, 538, 544, 547, 559, 566, 578, 587, 600	F580	F523, 540, 586, 588	F573

noted elsewhere. In part the absence of small flakes may be accounted for by the constraints of the excavation method applied to the shaft fill, so that no direct comparison can be made with the trowelled areas on the surface, but it was felt that a metrical analysis might provide useful comparative data. Accordingly a sample of waste flakes was selected from the total available by extracting all the complete flakes from finds bags of quadrant 5 material until a total of 200 was reached. 47.46kg of material had to be searched to obtain the 200 complete flakes (excluding retouched artefacts).

The details of the sample can be summarised as follows:

	No.	%	Wt.
Primary flakes	4	2	11.35kg
Secondary flakes	136	68	
Tertiary flakes	60	30	

The average flake weight is 56.75g. The sample included twelve flakes with faceted platforms, and five blades using a 1:2 B:L ratio. Also included are one core rejuvenation flake, three flakes with possible utilisation, one Levalloisoid flake with a plain platform, and one possible cutting flake. Non-floorstone predominates amongst the cortical flakes. The accompanying histograms (Figure 4) indicate a clustering in the 3 – 7cm range (69%) in length, with only 4% shorter than 3cm, and a significant 27% longer than 7cm, a similar clustering between 3 – 7cm in breadth (75.5%), and a B:L ratio which peaks between 3:5 and 4:5, but has 56.5% broader than this. Thus the population of this sample can be regarded as typically large broad flakes.

Below the 1B deposits in the third excavation stage through the shaft fill, and mainly contained within quadrant 6, was an almost pit-like horizon composed largely of cultural flint (see Volume I, pp. 19 – 20). The compactness

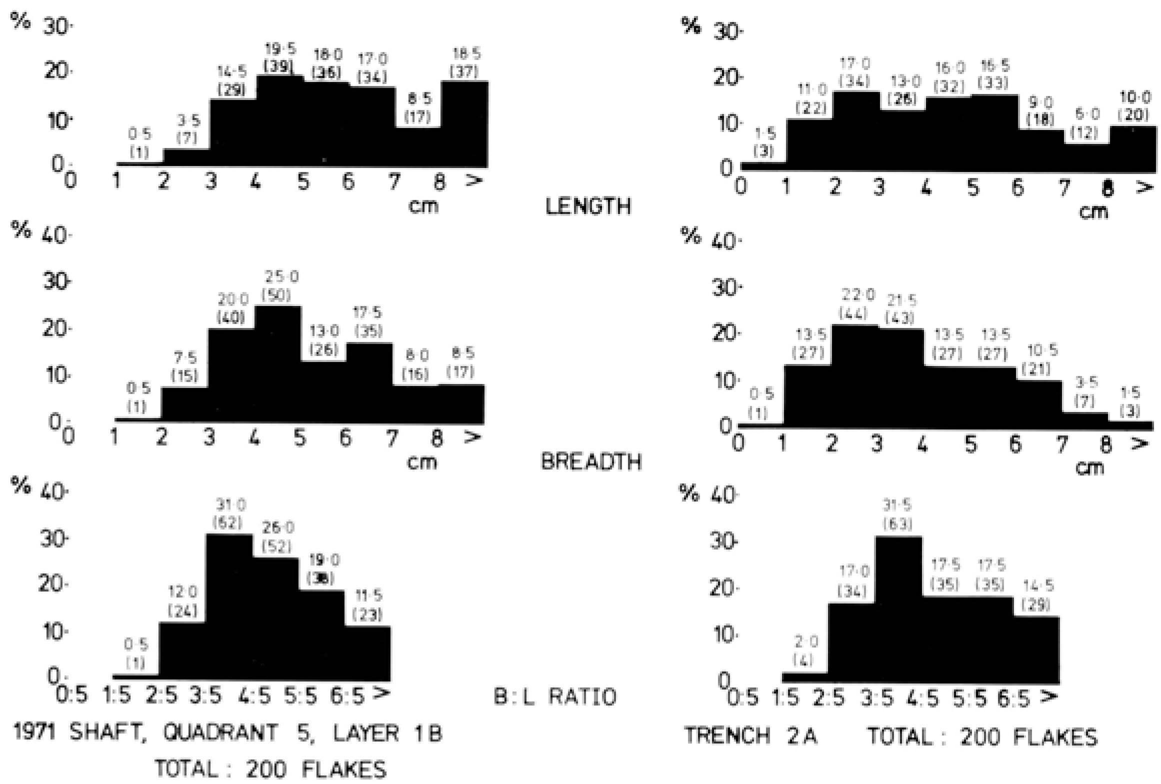


Figure 4 Waste flake histograms from the 1971 shaft and trench 2A

and similar condition of the artefacts suggested homogeneity. For the general totals the artefacts from this deposit have been included with the rest of the 1B material, but since they were separated out during excavation, they can be analysed further as a distinct assemblage. The main components are as follows:

	No.	Weight in kg
Waste flakes	x }	110.93
Retouched pieces	13 }	
Cores	171	86.03
Core fragments	29	12.35
		209.31 total weight

This shows the atypical nature of the assemblage, since the core pieces constitute 47% of the total weight. The retouched artefacts comprise one axe fragment, two scrapers, one point, three rods and six miscellaneous forms. The imbalance between the representation of retouched artefacts and cores is further evidence of the atypicality of the assemblage. The 171 complete cores are analysed further into classes:

Core class	No.	Illustration	Main core class	No.	%
A1	—	—	A	64	37.4
A2	64	F23, F57, F65	B	50	29.3
B1	—	—	C	52	30.4
B2	47	—	D/E	5	2.9
B3	3	—			
C	52	F39, F61			
D	3				
E	2				

This shows a high percentage with three or more platforms, and a low percentage of cores with keeled flaking. The average core weight of 503g (maximum 4.35kg; minimum 80g) is inflated by the presence of several very heavy cores, so that the histograms for maximum dimension and weight (Figure 5) bring out the proportions of the cores more clearly. From the histograms it can be seen that in weight there is a clustering in the 100 – 400g range, and a pronounced clustering (78.9%) between 8 – 14cm in maximum dimension. There is a progressive trend towards a larger size according to the number of platforms, and this is reflected by the average core class weight: A:407.6g; B:485.2g; and C:646.1g. Of the total 158 (92.4%) retained some cortex, and it is possible to estimate that 101 (64%) are of non-floorstone parentage, and only 8 (5%) probably from floorstone, reinforcing the general impression that this is primarily a non-floorstone deposit. Twenty-six (15.2%) of the cores have two-phase cortication, indicating the re-use of previously flaked material. Eleven of the cores are formed on thermal lumps. Prepared platforms are present on only eleven (6.4%) cores, a low figure in accord with the small number of class D/E cores. All of the cores produced flakes as opposed to blades. Seventy-three (43%) retain signs of previous flaking from platforms now obliterated. Excluding the thermal cores, it is estimated that at least fifty-five (32.2%) are on nodules as opposed to twenty-eight (16.4%) on flakes, but a further seventy-seven are difficult to classify in this way. Three cores show signs of abrasion resulting from use as hammers, in one case the abrasion precedes the use as a core, while on the other two examples the abrasion is post-flaking, and on one of these the flaking may have been intended to shape the hammer rather than produce flakes. Apart from these only one other core has possible secondary usage.

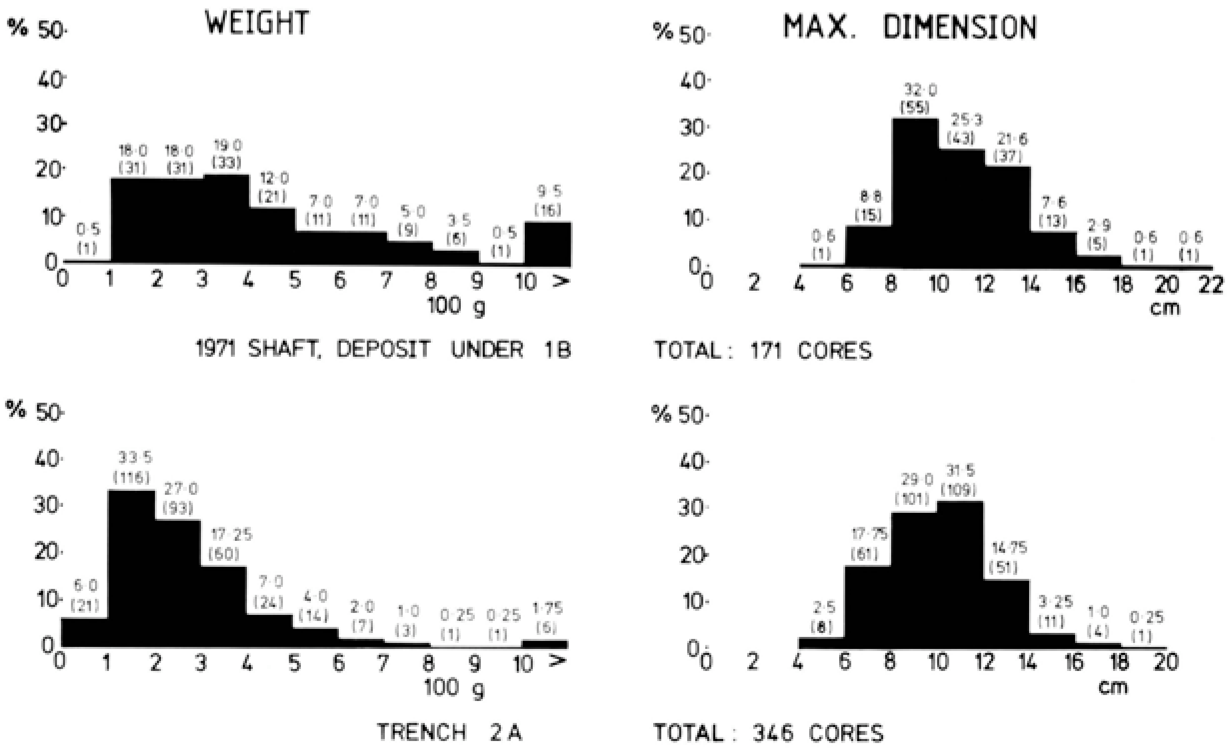


Figure 5 Core histograms from the 1971 shaft and trench 2A

The artefacts in this deposit are closely comparable with those of the Middle Bronze Age assemblage from the 1972 shaft, and appear to represent an unmixed, contemporary sample. In this respect the presence of a possible axe fragment (F106, Figure 41), which has two-phase cortication and is not residual, is of interest. Unfortunately this implement is rather imprecise morphologically, and its status as an axe not certain.

The significance of the artefacts from the 1C layers is that the sand lenses in which they are contained represent the collapsed ground surface from the shaft edges, where knapping approximately contemporary with the opening of the shaft took place (see below—trench 4). The intensity of this knapping was confirmed by one particularly artefactiferous sand lense in the fourth excavation stage which contained a mass of tiny flakes amongst a total of 20.78kg of flaked floorstone, including in close association two probable picks (F75, Figure 31, F81, Figure 33) and an axe fragment (F118, Figure 46).

The cultural flint from subdivision d is mostly of floorstone origin, and in the sixth to seventh sections includes a substantial amount of shattered flint of the type to be described below. Unfortunately it was not possible to ascertain the exact relationship of flints to the chalk dump at the base of the shaft, and it is therefore not possible to accurately distinguish flint which has slipped in from flint included in the chalk not removed from the shaft. Nevertheless, it can be presumed that the shattered flint of floorstone type was not removed from the shaft.

A feature of this horizon was the presence of a number of very large cores. In all thirty-six complete cores were recorded (all except one were from the fifth-sixth stages), of which twelve were definitely from sand lenses. The total weight of these was in excess of 46.5kg, giving an average core weight of over 1.2kg. Despite the small size of the sample, these cores are analysed in the usual way:

Core class	No.	Illustrations	Main core class	No.
A1	—	—	A	4
A2	4	—	B	7
B1	—	—	C	19
B2	6	—	D/E	6
B3	1	—		
C	19	F13, 40		
D	4	F15, 33, 34		
E	2	—		

Of the nineteen class C cores, nine have three platforms, seven four platforms, and three five platforms. The predominance of class C cores in this sample is a reflection of the fact that cores of very large size are likely to be multi-platform and vice versa. The size and weight range of the cores is as follows:—

Weight in g	No.	Maximum dimension in cm	No.
200–300	2	8–10	3
300–400	—	10–12	5
400–500	2	12–14	7
500–600	3	14–16	8
600–700	3	16–18	5
700–800	2	18–20	2
800–900	2	20–22	2
900–1000	2	22–24	2
1000–2000	9	24–26	1
2000–3000	3	26–28	1
3000–4000	2		
4000–5000	1		
5000–6000	3		
6000–7000	2		

The values revealed by this table are in marked contrast to all the other core analyses in this report, being far higher than usual. In this respect the raw material used is undoubtedly significant, since of the thirty-three cores which retain cortex, thirty-two are of floorstone origin. The cores have all produced flakes rather than blades, and only one has a prepared platform. Fifteen cores show signs of previous flaking prior to the fossilisation of the present platforms. Only two of the cores are definitely formed on flakes as opposed to nodules or parts thereof. None has any evidence of secondary usage.

Associated with this group of cores were other large artefacts which posed problems of classification, since they had some similarities with cores, but also resembled roughouts, or blanks intended for further flaking. For example, F523 (Figure 94) is a large floorstone flake with peripheral retouch from the bulbar surface, reminiscent of core preparation for flaking across the bulbar surface, while F586 (Figure 105) is a more elongated flake, flaked down one of the lateral edges, and with incipient flaking from this edge across the bulbar surface. Whatever the precise interpretation of these two pieces, they illustrate the size of flake which could be produced from floorstone nodules.

As already mentioned, twelve of the cores came from sand lenses, and of the rest, twelve are recorded as coming from mixed chalk and sand, ten from loose chalk, and two unspecified. However, irrespective of whether or not these cores can all be correlated with collapsed topsoil, it is important to note that they are all from deposits which constitute the primary silt of the shaft, and represent the flaking of freshly mined floorstone at a time which must be roughly contemporary with the 1971 shaft being open, though the floorstone need not necessarily have been mined from this shaft. This fact permits certain important inferences to be drawn. Firstly, it is evident that some freshly mined flint was used for cores, apparently to produce flakes very similar to those produced from non-floorstone cores from this site. This in turn suggests that floorstone could have a mundane usage at the hands of the original miners, and was not specifically reserved for some other function. Secondly, the large cores are usually on split segments of a nodule, while the smaller cores are in some cases worked down from larger pieces, but in others a small lump of floorstone has been selected. Therefore, given a situation where very large, good quality parent material was available, cores can still assume various shapes and sizes. It was not necessary to select a large blank on which to form a core, nor was it necessary to consistently work down a large blank.

Implements definitely from sand lenses include the axe F103 (Figure 40), and the 'smokey blue' colouration of this piece is shared by the axe F105 (Figure 41) and roughout F119 (Figure 46), whose exact stratigraphic context within subdivision d is not recorded. Also definitely from sand lenses are three apparently unretouched and non-utilised blades, F5, F6 and F7 (Figure 16). The latter is the only example recognised amongst the 1971–72 collection of a particular type of Levalloisoid blade which can be produced during the trimming of the longitudinal spine of an axe or similar tool (cf. Warren 1921, Figure 6, 70).

The 343.49kg of flint recovered from the base of the shaft and the galleries are almost certainly all of floorstone origin. Flints in this deposit frequently exhibit a matt black surface, possibly relating to natural cracking of the nodules, which is resistent to cortication, so that on similar pieces found at other horizons in the fill, or on the surface, it is possible to have white corticated negative flake scars across a matt black exterior. Since this phenomenon was only noted to occur in connexion with floorstone it provides an additional method of identifying floorstone macroscopically.

While the material from this level did include normal struck artefacts, for the most part it consisted of shattered flint which was non-bulbar, as though the extraction procedure had involved the smashing up of nodules. The floorstone nodules did contain some thermal flaws, and the cortex often had an irregular formation where it permeated the flint rather than forming a uniform exterior shell, and these factors would tend towards a polymorphic shattering of the nodule when struck. The only cultural flint which can be regarded as absolutely *in situ* on the floor of the shaft, are the small pieces of smashed flint which occurred in patches, often in large quantities, lying in the depressions from which nodules had been removed. This smashed flint, usually including a high proportion of cortex, is undoubtedly the result of the nodules being battered with a heavy object, probably as part of some sort of 'quartering' process to facilitate the initial removal of the nodules. Occasionally parts of the underside cortex came away as a shell or crust and remained as a lining in the hollows from which nodules had been extracted.

It is difficult to be precise about the methods used in removing the floorstone, or about what, if anything, was done in the way of preliminary processing on the shaft floor, because of the lack of clear-cut evidence. Even circumstantial evidence is scarce, only one quartzitic hammerstone being found in this horizon, a pebble 400g in weight and 9.3cm in maximum dimension, from the rear chamber of gallery 1, and this has scanty abrasion consistent with normal flaking rather than heavy pounding. Two fragments of large sandstone (?) objects (one weighing 850g) were found in gallery 2, and these have rounded and abraded surfaces which may reflect use as pounders. More convincing is a single example from gallery 2 of a large fragment (weight 1.8kg) of a floorstone nodule with heavy abrasion on an exposed surface, suggesting that the nodule, or part-nodule, from which it came could have been used as a pounder. It is possible that this abrasion results from being struck with a hammer rather than the reverse, in which case it would provide negative evidence for the use of a hefty hammer, but it can be paralleled by a large (3.7kg) block of floorstone found in the sixth excavation stage which was heavily abraded at both poles suggesting use as a heavy hammer or pounder. Other fragments were noted from the basal horizon where there was heavy abrasion on the exterior of the cortex, and in the absence of more explicit evidence it would seem best to conclude that the extraction of the nodules and their initial subdivision was achieved by the *ad hoc* usage of large blocks of floorstone as pounders and hammers. Additional information was provided by the discovery towards the base of the seventh excavation stage of a large, sub-spherical floorstone nodule, well over 40cm in diameter, which had been partially split up by the removal of a crescentic portion. This nodule had obviously been rejected, and presumably not removed from the shaft but merely pushed to one side[5]

5. This nodule was examined on site by Dr M H Newcomer, who, though he was able to obtain several very large flakes from the exterior of the nodule for use in experimental flaking, thought the central portion to be of poor quality, flawed flint, which was not suitable for use. It is of interest to note that the prehistoric miners did not bother to make use of the exterior flint. The estimated weight of the nodule was in the region of 40kg.

(see Volume I, p. 23). Nevertheless, the size of this nodule demonstrates that it was possible to move nodules from their original positions without breaking them up completely.

The only other common artefact from the base of the shaft was the antler pick. The available evidence points towards the use of antler picks solely as implements for excavating chalk, and none has the abrasion or flint impregnation which would result from their use in flint working.

Among the waste material were several large, roughly prismoidal blocks of flint (500g–2kg weight range), sometimes with bulbs of percussion, which could possibly be interpreted as some sort of production blank, though to substantiate this view the examples actually found would have to be regarded as rejects. Whether or not these were produced at the base of the shaft is also problematic, though on balance, considering some came from the fill of the galleries, this would appear to be the case. Apart from the cores discussed in the previous section, this is perhaps the only light which can be shed on the precise fate of floorstone nodules. Whatever these possible blanks may function as, they do illustrate the propensity of floorstone nodules to break down into tabular segments.

The small amount of evidence for definite flaking amongst the material from this horizon, such as the presence of four cores in the galleries, is inconclusive since, like the flakes (occasionally including fine forms such as a blade from gallery 2 and several enormous flakes), these are incorporated in the backfill. Of the five retouched specimens, three came from the galleries. Only one of these, F573 (Figure 102) is at all distinctive and is probably a damaged scraper. The extremely small percentage of retouched pieces amongst the artefacts from this horizon, estimated as 0.02%, is a clear indication that it was not the practise to manufacture and/or use flint implements at the base of the shaft.

Chapter III
The 1972 Shaft

42 157 artefacts, weighing 729.57kg, were recovered from the upper fill of the 1972 shaft during the 1972 excavation season. The much smaller quantity excavated at the end of the 1971 season from one quadrant of this shaft is described separately below. A detailed account of the stratigraphy of the upper fill of the shaft is given in Volume I pp. 36–38 and it need only be recalled here that four horizons of richly artefactiferous deposits were distinguished from the predominantly chalky-humic matrix. These four horizons, described as Groups 0, 1, 2, and 3, were interpreted as resulting from the dumping of domestic rubbish from a near-by Middle Bronze Age occupation area into the top of a silted-up shaft. As the flint assemblage they contained presented the opportunity of isolating a Bronze Age industry in contrast to the earlier Grimes Graves industries, it was necessary to quantify the stratigraphic distribution of the flint artefacts in detail (Table V).

Table V. 1972 shaft flint quantification

Horizon	No.	Wt. in kg
Above Groups	5714	124.20
Group 0	1597	39.61
Between Groups 0–1	1439	38.21
Group 1	12 369	216.44
Between Groups 1–2	200	2.80
Group 2	7199	80.74
Between Groups 1–3	2727	54.05
Between Groups 2–3	874	3.02
Group 3	9221	152.93
Remainder	817	17.57
Totals	42 157	729.57

The artefacts from the dumped horizons can be designated Grouped, and contrasted with all the other artefacts which are Ungrouped, as follows:

	No.	%	Wt. in kg	%
Grouped	30 386	72.0	489.72	67.2
Ungrouped	11 771	28.0	239.85	32.8

This shows that the majority of the artefacts are Grouped, and therefore are directly incorporated in the Bronze Age rubbish deposits. However, it must be stressed that there is no one-to-one correlation between stratigraphic horizon and cultural context, because the Grouped material is not wholly Bronze Age, nor the Ungrouped material wholly non-Bronze Age. This results from the problem of residual survivals, there being so much discarded flint on the site prior to the Bronze Age occupation that admixture is inevitable (cf. the pottery report, Volume I, chapter III). The stratigraphic data alone are therefore insufficient for isolating a Bronze Age flint component. However, the flints in the Grouped horizons exhibited a wide variety of cortication and included examples which were completely fresh and undiscoloured. The micro-context produced by the dumped rubbish was conducive to the preservation of flint artefacts in a fresh condition, which means that those flints from the Groups which are undiscoloured must almost certainly be contemporary with the rubbish, and therefore Bronze Age. In corollary, the corticated artefacts in the Grouped horizons must pre-date the fresh flints, and can therefore be isolated as non-Bronze Age. In order to exploit this phenomenon, a scheme of five cortication categories in which the 1972 shaft flints could be placed was devised. The categories were: a. undiscoloured, completely fresh flint with unaltered surfaces; b. undiscoloured through discoloured, flints with retouch which remained fresh through a former corticated surface; c. discoloured through discoloured, flints with re-corticated retouch through a former corticated surface; d. lightly discoloured, generally bluish, blue-grey or blue-white colour; e. densely discoloured, grey or white. This scheme is, of course, only suitable for retouched artefacts and cores. The undiscoloured artefacts which fall into categories a and b were combined to provide a sample of definitely Bronze Age material, while the discoloured flints in categories c, d and e were combined as the remainder. Since it is clearly possible for Bronze Age artefacts not included from the outset in the rubbish matrix to have acquired discolouration, and also for undiscoloured artefacts to exist in the Ungrouped deposits, there can be no direct contrast between the discoloured and undiscoloured groupings. Other factors such as post-depositional animal disturbance might also complicate the picture, and it is anyway clear from the evidence of the joining rod fragments (see below), which include one instance of joining fragments from Group O and Group 3 horizons respectively, that the various horizons in the 1972 shaft fill should be regarded as approximately homogeneous and contemporary. The only firm statement which can be made is that it is extremely unlikely for the completely fresh artefacts to include non-Bronze Age examples, and therefore the isolation of a Bronze Age component along these lines is valid.

If both the stratigraphic and cortication factors are considered together, then certain patterns emerge. For example, the 354 complete cores subdivide as follows:

	Undiscoloured	Discoloured	Totals
Grouped	169	77	246
Ungrouped	62	46	108
Totals	231	123	354

and the 231 scrapers:

	Undiscoloured	Discoloured	Totals
Grouped	124	38	162
Ungrouped	39	30	69
Totals	163	68	231

These figures demonstrate a marked predominance of undiscoloured and therefore Bronze Age artefacts in the Grouped context. Not all the artefact categories give the same results, however, for example the 527 points:

	Undiscoloured	Discoloured	Totals
Grouped	200	183	383
Ungrouped	53	91	144
Totals	253	274	527

Clearly the interpretation is that the cores and scrapers from this assemblage are predominantly Bronze Age, but that the points are fairly evenly divided between Bronze Age and non-Bronze Age tools.

The cores

The 1972 assemblage is composed of the following major artefact groupings:

	No.	%	Wt. in kg	%
Waste flakes etc.	39 450	93.6	481.14	65.9
Cores etc.	551	1.3	161.65	22.2
Retouched	2 156	5.1	86.78	11.9
Totals	42 157		729.57	

The waste flakes are not studied further, but the total core sample is subjected to the normal analyses. The core pieces can initially be subdivided as follows:

	No.	Wt. in kg
Complete cores	354	108.15
Core fragments	145	28.65
Flaked lumps	52	24.85

The 354 cores comprise the following classes:

Core class	No.	Main core class	No.	%
A1	1	A	144	40.7
A2	143	B	110	31.1
B1	5	C	53	15.0
B2	89	D/E	47	13.2
B3	16			
C	53			
D	31			
E	16			

This analysis demonstrates a relatively low percentage presence of cores with three or more platforms, and a relatively high presence of keeled cores. In order to ascertain the validity of these figures for the specifically Bronze Age cores, the cores are divided by main core class according to the cortication categories described earlier:

Main core class	Undiscoloured		
	No.	%	Illustrations
A	93	40.3	F21, 31, 41, F44, 46
B	74	32.0	F17, 30, 50
C	37	16.0	F26, 58, 63
D/E	27	11.7	F55
Total	231		

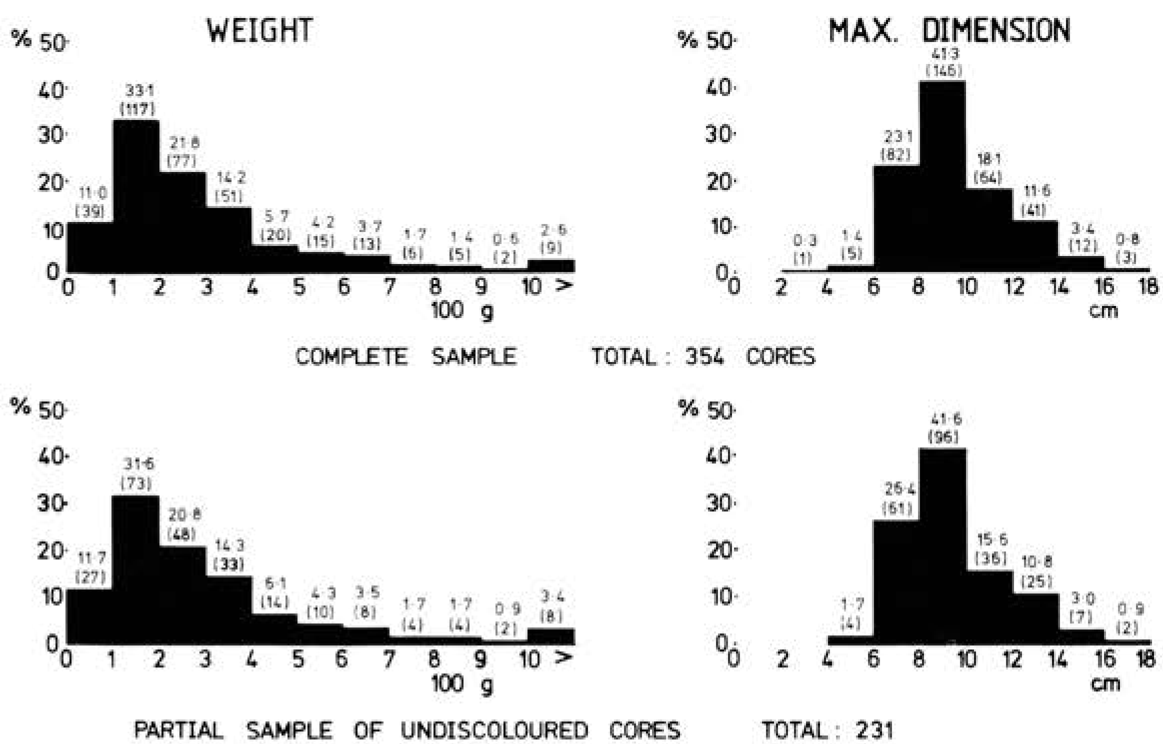


Figure 6 Core histograms from the 1972 shaft

Main core class	Discoloured		
	No.	%	Illustrations
A	51	41.6	F38
B	36	29.2	—
C	16	13.0	—
D/E	20	16.2	F37
Total	123		

This shows the two groups to be remarkably similar by core class, which might imply that many cores which are strictly speaking Bronze Age have become discoloured.

The analyses of the weight and maximum dimension of the cores are presented in two groups of histograms, firstly for the total sample of 354, and then for the 231 undiscoloured cores (Figure 6). Again no marked divergence between the discoloured and undiscoloured groups is apparent, so that it is considered valid to treat the total sample as representative. The average core weight is 305.5g (maximum 3.09kg; minimum 30g). The histograms show a clustering in size between 6–14cm (94.1%), with a peak between 8–10cm (41.3%), and in weight between 0–400g (80.1%), with a peak at 100–200g (33.1%). There is a significant proportion of small cores, with 11% weighing less than 100g, and 24.8% under 8cm in maximum dimension. Of the total cores 328 (93%) retain some cortex, and of these it is estimated that only 16 (5%) are floorstone, while 252 (77%) are probably not floorstone. Only twenty-seven (7%) of the total cores have two-phase cortication, but it is possible that some previously corticated pieces have been re-worked sufficiently to remove all trace of the former exterior. Sixty (17%) of the cores have one or more prepared platforms. Only twenty of these cores are undiscoloured, so that the distribution of prepared platforms between the cortication classes is in inverse ratio to the total number of cores in these classes, and is likely to indicate that platform preparation is less common on the Bronze Age cores. At least 9 (2%) of the cores are on thermally produced lumps, and 136 (38%) are formed on flakes. Previous flaking prior to the present platforms exists on 157 (44%) of the cores. Four cores have produced blades as well as flakes, and a further three cores may have produced only blades. Six of the cores are possibly retouched for some secondary function, and three have abrasion from use as hammers, in one case definitely prior to the use as a core.

The implements

The total retouched component from the 1972 shaft can be subdivided into the following typological categories (Table VI).

Table VI. Implements from the 1972 shaft

Implement type	No.	%
Arrowhead	1	0.05
Picks	7	0.32
Axe	1	0.05
Burins	5	0.23
Knives	2	0.09
Scrapers	231	10.71
Points	527	24.44
Rods	89	4.13
Cutting flakes	122	5.66
Utilised blades	188	8.72
Bulbar segments	41	1.90
Bifacial	1	0.05
Miscellaneous retouched	941	43.65
Total	2156	

The implements can be further divided into two groups on the basis of their cortication (Table VII). In this table the total number of rods is reduced to take account of the joining fragments, and only the complete pieces in the miscellaneous retouched category are included, with the exception of two tools composed wholly of cortex. Table VIII which follows provides a key to the illustrated implements from these two groups.

Table VII. Implements from the 1972 shaft subdivided according to cortication

Implement type	Undiscoloured		Discoloured		Total	
	No.	%	No.	%	No.	%
Arrowhead	—	—	1	0.1	1	0.1
Picks	4	0.5	3	0.4	7	0.5
Axe	—	—	1	0.1	1	0.1
Burins	4	0.5	1	0.1	5	0.3
Knives	2	0.3	—	—	2	0.1
Scrapers	163	21.8	68	·9.3	231	15.7
Points	253	34.0	274	38.0	527	35.6
Rods	72	9.7	13	1.8	85	5.8
Cutting flakes	68	9.1	54	7.5	122	8.3
Utilised blades	27	3.6	161	22.2	188	12.8
Bulbar segments	5	0.7	36	5.0	41	2.8
Bifacial	—	—	1	0.1	1	0.1
Miscellaneous retouched, complete	148	19.8	113	15.6	261	17.8
Totals	746		726		1472	

Table VIII. Key to illustrated implements from the 1972 shaft

Implement type	Undiscoloured	Discoloured
Arrowhead		F70
Picks	F87, 88, 100	F96, 98
Axe		F116
Burins	F125, 126	F127
Knives	F131, 132	
Scrapers	F133–148, 151–162, 164–166, 170, 172, 173, 175–177, 202, 203, 223, 225, 226, 231	F149, 171, 174, 189, 192, 213, 239
Points	F244, 245, 248–250, 252–258, 262–265, 272, 274, 281, 285, 289, 290, 293, 300, 305, 307, 313, 316, 318, 320, 325, 330, 332, 335, 337	F266, 267, 269, 270, 277, 279, 298, 299, 306, 309, 310, 311, 314, 317, 321, 338, 344, 348, 350, 355, 357, 360
Rods	F362, 365, 367, 373, 375, 380, 388, 391, 394, 395, 397, 398, 399, 402, 422, 423, 424	
Cutting flakes	F426, 434–436, 438, 441, 443, 446, 447	F425, 432
Utilised blades		F449, 456, 458, 459, 466, 468, 470
Bulbar segments	F475	F471, 473, 476, 478, 482, 483
Bifacial		F488
Miscellaneous retouched	F502, 504, 507, 518, 524, 549, 552, 553, 558, 563, 567, 568, 571, 572, 574–576, 593	F515, 528, 529, 536, 546, 548, 556, 562, 565, 577

It must be stressed that the figures given in Table VII do not provide a clear-cut distinction between a Bronze Age and non-Bronze Age implement assemblage, since Bronze Age implements must frequently have become corticated. However, the undiscoloured implements are wholly Bronze Age, and can therefore be used to define Bronze Age types.

The *petit tranchet* derivative arrowhead, and the unclassified bifacial implement are both corticated, though from a Group 3 context, and are best regarded as residual survivals. The *tranchet* axe is densely discoloured, but comes from an Above Group context, so that the cortication evidence is inconclusive and a Bronze Age association not precluded. The three discoloured picks are from Group contexts and so probably residual, while the four undiscoloured picks are also from Group contexts, and indicate that a rather rough-and-ready type of pick was being manufactured by the Bronze Age occupants. At least four of the five burins exhibit edge damage at the burin facet subsequent to the detachment of the spall, which may justify their identification as burins, while the same four have ancilliary retouch which may be blunting to facilitate handling. The cortication evidence suggests that three of these four are Bronze Age. Both the knives are Bronze Age, which is particularly significant in the case of F131 (Figure 51), a flat sub-rectangular form manufactured transversely from a broad flake, with a continuous peripheral cutting edge.

The 231 scrapers can be sub-divided typologically and assigned to cortication categories as in Table IX.

The high proportion of undiscoloured scrapers indicates the dominance of Bronze Age implements in this category. Although the denticulate scrapers are few in number, the fact that they are all undiscoloured suggests they are a distinctively Bronze Age type.

Of the total 231 scrapers, 179 are complete and on bulbar flakes, and these were measured for length, thickness, and B:L ratio (Figure 7). In view of the cortication evidence, the 130 complete undiscoloured examples are presented as a separate Bronze Age sample, while the values for the complete sample are given in Figure 8. In fact both sets of scraper histograms exhibit the same trends, the Bronze Age sample being slightly more compact, with a clustering

Table IX. Scrapers from the 1972 shaft

Type	Undiscoloured		Discoloured		Total	
	No.	%	No.	%	No.	%
a. End	93	57.1	47	69.1	140	60.6
b. Side	15	9.2	5	7.4	20	8.7
c. End-and-side	17	10.4	4	5.9	21	9.1
d. Pointed	6	3.7	3	4.4	9	3.9
e. Denticulate	7	4.3	—	—	7	3.0
f. Unclassified	25	15.3	9	13.2	34	14.7
Totals	163	(70.6)	68	(29.4)	231	

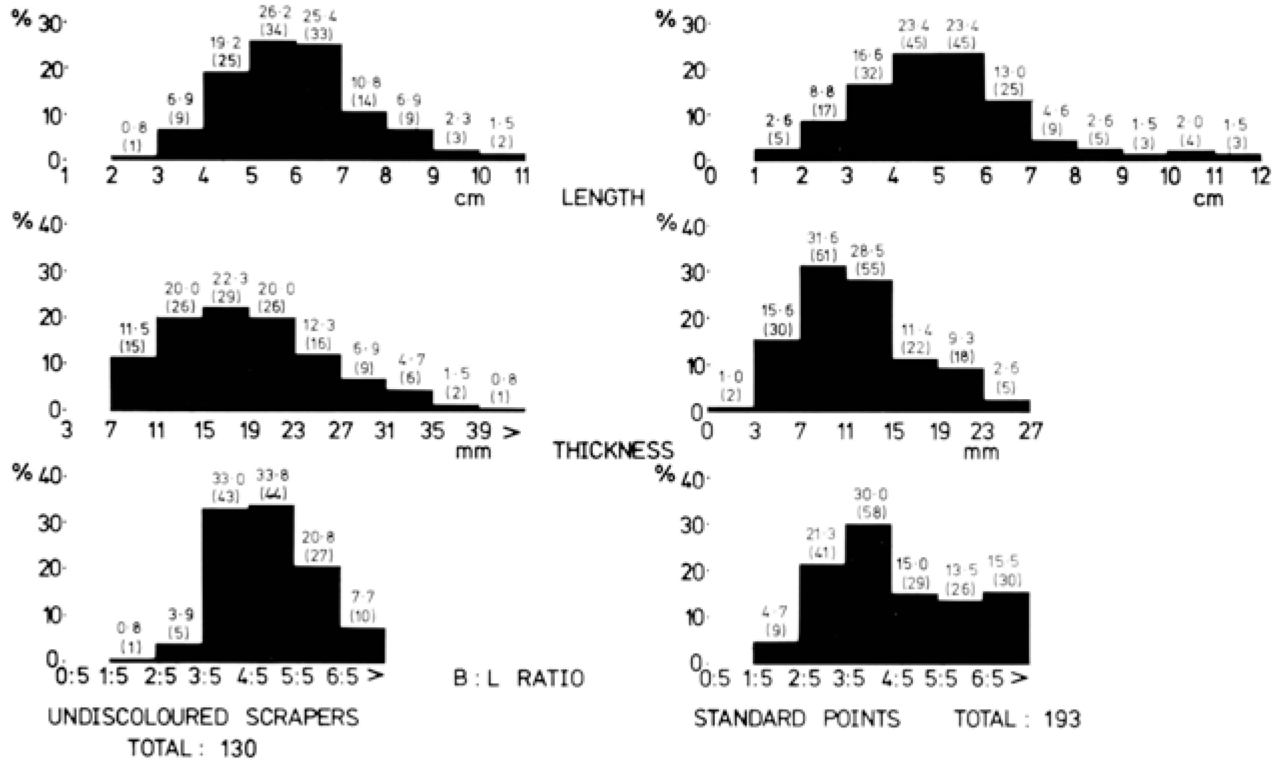


Figure 7 Scrapers and points from the 1972 shaft

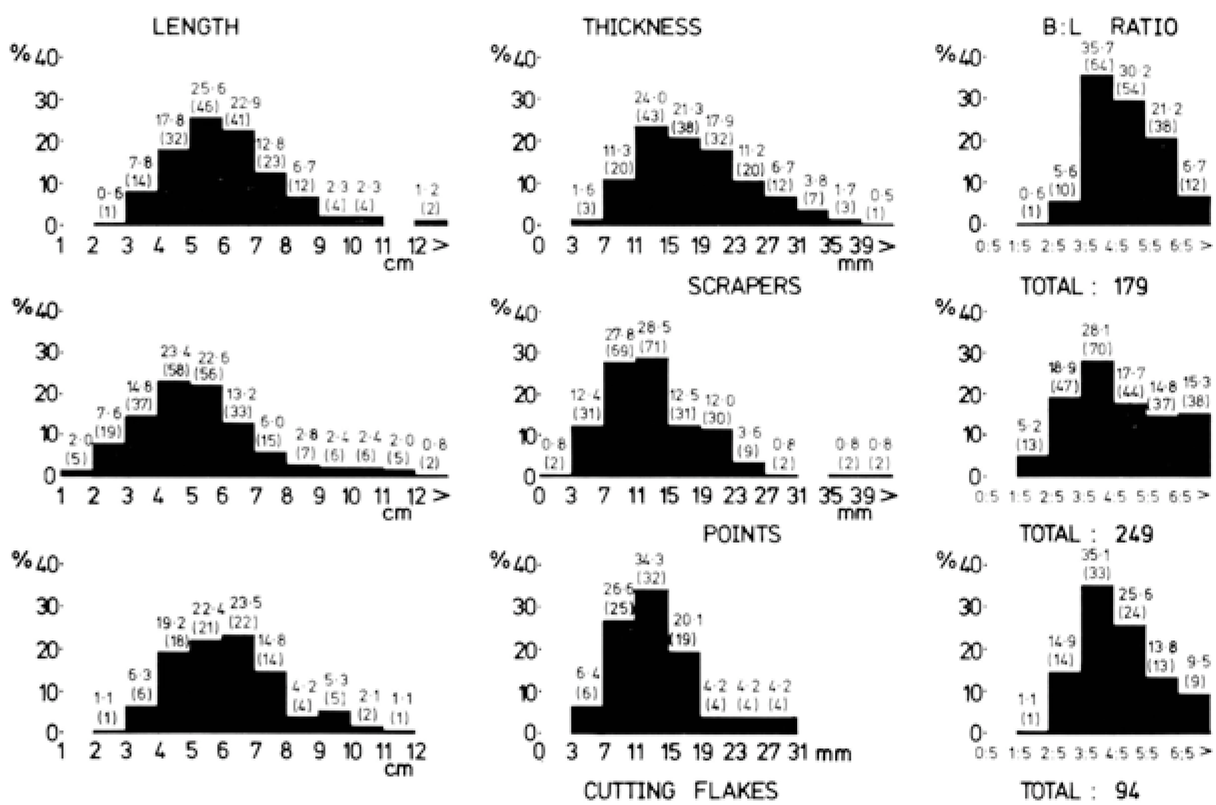


Figure 8 Scrapers, points and cutting flakes from the 1972 shaft

Table X. Points from the 1972 shaft

Type	Undiscoloured		Discoloured		Total	
	No.	%	No.	%	No.	%
a. Standard	173	68.4	234	85.4	407	77.2
b. Rounded	26	10.3	15	5.5	41	7.8
c. Heavy	9	3.5	9	3.3	18	3.4
d. Others	45	17.8	16	5.8	61	11.6
Totals	253	(48)	274	(52)	527	

between 4–7cm in length (70.8%), between 11–23mm (62.3%) in thickness, and between 3:5–5:5 in B:L ratio (66.8%).

It was possible to calculate an angle range for the scraping edge on 165 scrapers (121 undiscoloured). The data may be summarised as follows:—

Range in degrees	No.	%
40–80	139	84
50–75	97	59
60–75	40	24
50–60	25	15

Nineteen scrapers have angles which overlap at one end of the standard range of 40°–80°, but only five fall completely outside it, three being shallower than 40°. Of the seventeen scrapers with angles not exceeding 50°, fourteen are undiscoloured, so shallow angles may be a Bronze Age trait in this context.

The points, which, apart from the miscellaneous retouched forms, constitute by far the largest implement category amongst the 1972 shaft assemblage, can be subdivided and assigned to cortication categories as in Table X.

The points are almost equally divided between those which can be related to the Bronze Age occupation, and the discoloured examples which probably include a high proportion of residual tools. The only major distinction between the two samples occurs in type d, where the undiscoloured total is inflated by the presence of a series of distinctive forms, which are best described as implements with elaborately retouched, elongated points of relatively thick type. The stratigraphic occurrence and cortication evidence of this small group are summarised in Table XI. This particular type of point can be regarded as a specifically Middle Bronze Age implement at Grimes Graves.

The high incidence of breakage and damage amongst the points has left only 249 complete enough to be measured. Of these 132 are undiscoloured, but since they include 61 examples which re-use old flakes, it is not possible to isolate a significantly large sample of specifically Bronze Age points. The total sample was therefore measured for length, thickness and B:L ratio (Figure 8). In length there is a clustering between 3–7cm (74%), with a peak between 4–6cm (46%). In thickness there is a peak between 7–15mm (56.3%), and in B:L ratio between 3:5–4:5 (28.1%). Possible distortion of the histograms by the different sub-types of points included in this sample (i.e. a. 193; b. 28; c. 6; d. 22) could only be checked for the numerically dominant standard types, and separate histograms for these are given in Figure 7 showing a general though not marked, tendency for the standard points to be at the shorter, thinner and narrower end of the size and shape range.

Of the eighty-nine rod pieces, only nine are complete or nearly complete, but six joining fragments (including a fragment from the 1971 excavation, F373) provide a further three nearly complete examples. Two further joins could be made amongst the fragments, as well as between two of the 1972 fragments and two fragments excavated in 1971. A maximum total of eighty-five separate implements is therefore represented, and the cortication evidence for these is as follows:—

Wholly undiscoloured 18
Undiscoloured retouch through a discoloured surface 54
Differentially discoloured retouch through a discoloured surface 8
Single phase slight discolouration 1
Single phase dense discolouration 1
Burnt 3

Table XI. Sub-group of elaborate/elongated points from the 1972 shaft

Horizon	Undiscoloured	Illustrations	Undiscoloured through discoloured	Illustrations	Slightly discoloured	Illustrations
Above Groups	1	F256	1	F257	1	F245
Group 0	2	F254, 258	—		—	
Between 0–1	2	F252, 262	—		—	
Group 1	4	F244, 248, 250, 264	3	F249, 253, 263	—	
Group 3	1	F255	—		—	
Totals	10		4		1	

Apart from confirming the Bronze Age association of this tool type (sixty-five of the eighty-nine pieces derive from Grouped horizons), these figures also emphasise the high proportion (at least 73%) of re-used flakes employed in their manufacture.

The 122 cutting flakes comprise 54 undiscoloured, 54 discoloured, and 14 with apparently undiscoloured retouch or use damage on discoloured flakes. As with the points, therefore, there is probably a fairly even split between Bronze Age tools and residual survivals. Typologically it is of interest to note the presence of three undiscoloured Levalloisoid flakes (F434–436) (Figure 86) in the Bronze Age sample. Since only ninety-four of the cutting flakes were complete enough for measurement (comprising forty-six undiscoloured, thirty-seven discoloured and eleven probably re-used), they have been treated as a single sample (Figure 6). The histograms show a clustering between 4–8 cm (79.9%) in length, 7–19mm (81%) in thickness, and 3:5–5:5 (60.7%) in B:L ratio.

Of the utilised blades 161 (86%) are densely discoloured, despite the fact that 150 are from Grouped contexts, so it can be assumed that these implements are for the most part residual survivals in the Bronze Age assemblage. Only 25 of the total are absolutely complete, and the metrical data obtained from these can be tabulated as follows:

Length in cm	No.	Thickness in mm	No.	B:L ratio	No.
3–4	4	3–5	9	2:5	5
4–5	5	5–7	7	3:5	18
5–6	9	7–9	7	4:5	2
6–7	3	9–11	—		
7–8	1	11–13	1		
8–9	1	13–15	—		
9–10	2	15–17	1		

While essentially blade-like, these examples tend to be rather broad in relation to their length, or to have a skewed axis, though using a 1:2 B:L ratio, twenty of the twenty-five would be blades. The few blades which were specifically produced and used by the Bronze Age occupants are rather irregular in form, but the residual survivals are testimony of a distinctive blade product on the site at some time prior to the Bronze Age occupation. The bulbar segments appear as part of the same tradition. Thirty-six segments are densely discoloured, though thirty-nine come from Grouped contexts. Of the five undiscoloured examples, three have retouch and break undiscoloured on otherwise discoloured pieces, emphasising their almost exclusive pre-Bronze Age association.

The 263 complete artefacts amongst the miscellaneous retouched pieces include a sufficiently high proportion of undiscoloured examples to indicate that this type is appropriate in a Bronze Age assemblage. This category includes a number of 'rod-allied' forms (e.g. F507, 515, 568) which have steep lateral retouch and often two-phase cortication, but which are too irregular to be classed as rods, as well as some more regular tools with similarities to rods, though they are less prismatic and only represented by proximal segments (F518, 558, 563, 567 and 593).

To summarise,the dominant implement types of the Middle Bronze Age assemblage from the 1972 shaft are points, scrapers, rods and cutting flakes. An assessment of the type of blank used for the flake tools is provided by the histograms in Figures 7 and 8. There are few major disparities between the three different tool types, though there are general trends for the points to be on short and broad flakes, and the scrapers to be on thick flakes. The latter trend is linked to the preference for secondary flakes as scraper blanks. Of the total scrapers, 77% are cortical as compared with 51.5% of the cutting flakes, and 46.5% of the points. The distinctiveness of the scraper blanks is further illustrated by an examination of the faceted platform index amongst the implement types (Table XII).

The data in Table XII also appear to indicate that faceting is not a common trait of the specifically Bronze Age assemblage, since its occurrence on undiscoloured implements is generally out of proportion to their number (cf. Table VII). This phenomenon is confirmed by the core analyses (above), which showed that core platform preparation is less common amongst the Bronze Age sample.

The origin of the raw material used for some of the major implement categories from the 1972 shaft is assessed in Table XIII.

Table XIII, in line with the evidence from the cores, suggests that floorstone was hardly exploited at all for the 1972 shaft implements. The implication is that the Bronze Age knappers were not mining floorstone, but were acquiring their raw material from the discarded flint lying on the surface and in the chalk dumps, which would inevitably include a small proportion of floorstone. The second-hand acquisition of raw material is confirmed by

Table XII. Occurrence of faceted platforms on implements from the 1972 shaft

Implement type	Total No.	No. with intact platform	No. of faceted platforms	% of faceted platforms	No. of faceted flakes undiscoloured	No. of faceted flakes discoloured
Scrapers	231	199	12	6.0	1	11
Points	527	386	74	19.2	8	66
Cutting flakes	122	117	31	26.5	13	18
Utilised blades	188	100	37	37.0	4	33
Bulbar segments	41	40	24	60.0	2	22
Miscellaneous (complete)	263	226	38	16.8	3	34*
Totals	1372	1068	216	(20.2)	31 (14.3%)	184 (85.2%)

*one faceted platform flake composed wholly of cortex is omitted.

Table XIII. Cortex type assessment for certain implement categories from the 1972 shaft

Implement type	Total No.	No. cortical	Probably floorstone	Not floorstone	Not assessed
Scrapers	231	178	7	119	52
Points	527	245	9	125	111
Rods	85	43	5	8	30
Cutting flakes	122	63	6	28	29
Utilised blades	188	36	3	9	24
Miscellaneous (complete)	263	162	5	109	48
Totals	1416	727	35 (4.8%)	398 (54.8%)	294 (40.4%)

the occurrence of implements amongst the 1972 shaft assemblage which are clearly manufactured on previously struck or flaked pieces of flint (Table XIV).

Table XIV. Incidence of two-phase cortication amongst certain implement categories from the 1972 shaft

Implement type	Total No.	No. with two-phase cortication	%
Picks	7	4	—
Scrapers	231	29	12.6
Points	527	127	24.1
Rods	85	62	72.9
Cutting flakes	122	14	11.5
Miscellaneous (complete)	263	74	28.1
Totals	1235	310	25.1

The combined total percentage of 25% for these categories clearly shows the importance of re-used material. The extremely high percentage amongst the rods must constitute a characteristic feature of these tools. Table XIII suggests that floorstone might be proportionally more commonly exploited for rods than for other implements. If so this would explain the two-phase cortication because of the flaked and exposed nature of previously discarded floorstone. A possible reason for the selective use of floorstone for rods might be the need for very large, broad flakes, especially to manufacture those which are fashioned transversely (e.g. F395, F422; Figures 81, 85).

The 1971 sample

At the end of the 1971 season a number of flints were excavated from a 'black' deposit at the east end of surface trench 8B. It was subsequently recognised that this deposit was part of the fill of the 1972 shaft, probably equating with the Group 3 horizon. While the excavation of trench 8B obviously recovered other flints which in fact came from the 1972 shaft, only those from this deposit were recorded in sufficient detail for them to be confidently included with the 1972 shaft assemblage.

Altogether a total of 3011 artefacts are involved, and they can initially be subdivided as follows:—

	No.	%	Wt. in kg	%
Waste flakes	2795	92.8	43.86	72.8
Core pieces	44	1.5	10.57	17.6
Retouched	172	5.7	5.79	9.6
Totals	3011		60.22	

Only the retouched pieces are examined further, and the implement categories represented are listed in Table XV.

Table XV. Implements from trench 8B east, 'black' deposit

Type	No.	%	Illustrations
Burin	1	0.6	F124
Scrapers	16	9.3	F163, 214
Points	27	15.7	F246, 251, 334
Rods	4	2.3	—
Cutting flakes	14	8.1	—
Utilised blades	26	15.1	—
Bulbar segments	5	2.9	—
Multiple tools	1	0.6	F496
Miscellaneous retouched	78	45.4	F501, 561
Total	172		

The range and relative frequency of the implement types is broadly consistent with the main 1972 shaft sample (Table VI), except for the higher proportion here of cutting flakes and utilised blades. An implement type not previously represented is the multiple tool, in this case a combined scraper and point. This tool is undiscoloured, and is linked by the form of its point to the sub-group of elaborate Bronze Age points already established. The cortication and typology of all the other illustrated tools from this deposit suggests they are part of the Bronze Age assemblage, with the exception of the possible burin which is densely discoloured.

Chapter IV
The Surface Area

The flint artefacts from the surface excavation have been divided for analysis and discussion into the following major groupings, which will best be understood by referring back to the general site plan (Figure 1).

A. Trenches 7B and 8B
B. Trenches 1A, 1B, 2A and 2B
C. Trenches 3, 4, 5 and 6

These groupings simply reflect the trench layout of the 1971 excavation, but it was possible to make various subdivisions which isolated significant samples for detailed analyses, and these are listed below in the order in which they appear in this section:

A1 Trench 8B, south-west corner
A2 Trenches 7B and 8B, remainder
B1 Trench 2A
B2 Trenches 1A, 1B and 2B
C1 Trench 4, layer 3
C2 Trench 3, layer 3
C3 Trenches 3, 4, 5 and 6, layer 3 remainder
C4 Trenches 3, 4, 5 and 6, above layer 3

A1 Trench 8B, south-west corner

The excavation of the surface area between the 1971 and 1972 shafts revealed an occupation deposit to the east of the chalk dump in trench 7B. The finds which the deposit contained made it clear that it resulted principally from the Bronze Age occupation of the site. The precise extent of this occupation area was not defined, but one section of it, in the south-west corner of trench 8B, was selected as providing a suitable sample for the examination of the flint industry involved. This section was 5sq m in extent, bounded on the south and west by the limit of excavation, and on the north and east by a small chalk dump, up against which the deposit petered out. Although the occupation could be shown to post-date the chalk dump, it was not itself sealed in any way, and cannot be regarded as uncontaminated, either by flint debris on the spot prior to the occupation, or by subsequent admixture and depletion by human or animal agencies. Also, though the flint is in a fairly fresh condition, it displays a wide variety of discolouration, and cannot be subdivided like the artefacts from the 1972 shaft fill on the basis of cortication. Nevertheless, there were grounds for considering the material from this deposit as homogeneous to a degree, especially in the section under discussion, where particular attention was paid during the excavation to the isolation of the minimum vertical spread of this horizon at the base of the stratigraphy overlying the sand. The flints were often found compacted and interleaved, leaving little room for vertical movement, and the old land surface below the adjacent dumps was virtually sterile of cultural remains, so that the possibilities of admixture were reduced.

In all, 5321 flint artefacts, weighing 46.63kg, were recovered from the occupation horizon in this area, and the basic distribution can be summarised by a diagram, Figure 9, which records the distribution by the half metre squares used as the unit of excavation. Two squares which overlapped considerably with the chalk dump contained virtually no flint (0.4% of the total by number, 0.6% by weight), so that the effective density is best judged by the remaining 4.5sq m, which contained 5293 artefacts, giving an average of 1176 artefacts per sq m. The distribution was not regular, however, and a marked concentration is apparent in two adjacent squares, which contained 1321 artefacts between them. No definite conclusions can be drawn from this distribution since the extent of the total deposit is not known, except insofar as it reflects the density of knapping debris. The presence of an additional 6.3kg of calcined flint from this area has already been mentioned.

The 5321 artefacts are initially subdivided as follows:

	No.	%	Wt. in kg	%
Waste flakes	4991	93.8	28.12	60.3
Core pieces	55	1.0	11.10	23.8
Retouched	275	5.2	7.41	15.9
Totals	5321		46.63	

Waste flakes

The total of 4991 waste flakes is further subdivided to isolate the complete flakes:

	No.	%	Wt. in kg	%
Complete flakes	1594	31.9	13.92	49.5
Broken flakes with intact platforms	1010	20.3	4.95	17.6
Non-bulbar fragments	2347	47.0	8.40	29.9
Core rejuvenation flakes	40	0.8	0.85	3.0
Totals	4991		28.12	

The complete flakes can be allocated to cortex groups as follows:

	No.	%	Wt. in kg	%
Tertiary	857	53.8	2.85	20.5
Secondary	711	44.6	9.89	71.0
Primary and cortex	26	1.6	1.18	8.5
Totals	1594		13.92	

Thus the average flake weight of this sample is 8.7g, with tertiary flakes averaging 3.3g, and secondary flakes 13.9g.

N

TOTAL OF 5321 ARTEFACTS WEIGHING 46.63KG

No. = Total number of artefacts per 0.5m square, with percentage in brackets.

Wt. = Total weight of artefacts per 0.5m square in kg, with percentage in brackets.

C. = Cores, complete examples only.

P. = Points

R. = Rods

S. = Scrapers

No. 316 (5.9) Wt. 2.45 (5.3) C. 1 P. 3 R. 2 S. 0	No. 22 (0.3) Wt. 0.25 (0.5) C. 0 P. 0 R. 0 S. 0			
No. 318 (5.9) Wt. 2.97 (6.4) C. 1 P. 10 R. 2 S. 1	No. 141 (2.7) Wt. 2.05 (4.3) C. 1 P. 2 R. 1 S. 1	No. 122 (2.3) Wt. 1.71 (3.6) C. 1 P. 1 R. 1 S. 0		
No. 122 (2.3) Wt. 1.62 (3.4) C. 2 P. 0 R. 4 S. 2	No. 512 (9.7) Wt. 3.87 (8.3) C. 2 P. 4 R. 2 S. 4	No. 223 (4.2) Wt. 2.17 (4.7) C. 1 P. 2 R. 1 S. 1	No. 109 (2.0) Wt. 1.88 (4.0) C. 1 P. 5 R. 0 S. 2	No. 6 (0.1) Wt. 0.09 (0.1) C. 0 P. 0 R. 0 S. 1
No. 292 (5.5) Wt. 2.52 (5.5) C. 1 P. 1 R. 0 S. 1	No. 349 (6.5) Wt. 2.65 (5.7) C. 1 P. 7 R. 0 S. 2	No. 309 (5.8) Wt. 3.46 (7.5) C. 3 P. 2 R. 0 S. 2	No. 274 (5.2) Wt. 2.99 (6.5) C. 1 P. 3 R. 0 S. 1	No. 141 (2.7) Wt. 1.25 (2.6) C. 1 P. 1 R. 0 S. 0
No. 194 (3.7) Wt. 1.25 (2.6) C. 1 P. 1 R. 0 S. 0	No. 323 (6.0) Wt. 3.62 (7.8) C. 2 P. 4 R. 0 S. 0	No. 522 (9.9) Wt. 2.74 (5.9) C. 0 P. 5 R. 1 S. 0	No. 799 (15.0) Wt. 4.94 (10.6) C. 5 P. 7 R. 0 S. 2	No. 227 (4.3) Wt. 2.15 (4.7) C. 2 P. 2 R. 1 S. 0

Figure 9 Bronze Age occupation in south-west corner of trench 8B: flint distribution diagram

The 1594 complete flakes were measured for length, breadth, and B:L ratio, and the resulting values are presented in histogram form (Figure 10). The histograms for the total sample of complete flakes indicate a population of predominantly small, broad flakes, with 67% shorter than 3cm, and 64% broader than 4:5. The large numbers of small flakes may in part relate to secondary retouching processes, but the production of small flakes during core flaking should not be underestimated, especially if platforms are prepared. Since it might be argued that small flakes have a natural tendency to be broad, or at least to appear broad when the B:L ratio is calculated, separate histograms were prepared for the 900 flakes which were over 2cm long. The values obtained do show a slight percentage increase in the number of thin flakes, but since 57.4% are still broader than 4:5, it can be concluded that a tendency to broadness is a dominant trait. Even on a B:L ratio of 1:2, only 43 (2.7%) of the total 1594 flakes can be described as blades. Possible utilisation occurs on 180 flakes (11.2%).

The total number of waste flakes with an intact striking platform (not including core rejuvenation flakes), is 2604, of which 262 (10%) are faceted, though only 169 (6.5%) are faceted *strictu sensu*. The complete flakes with faceted

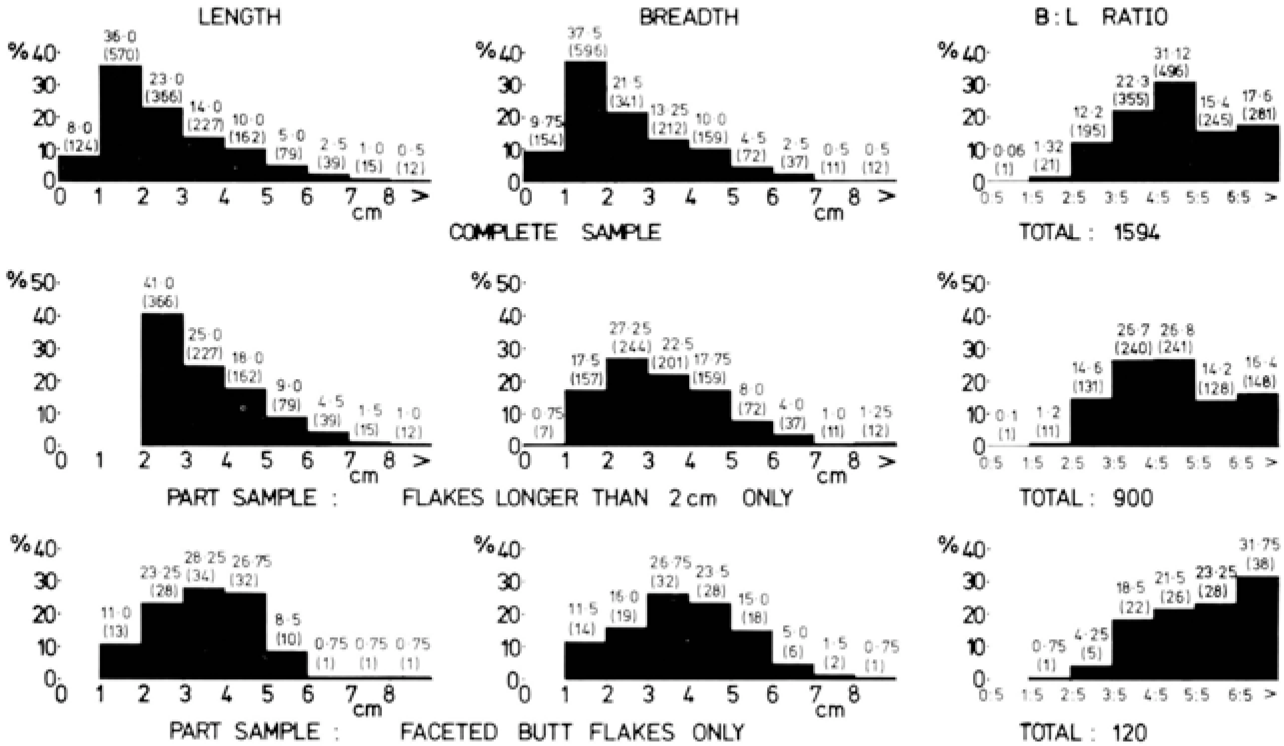


Figure 10 Waste flakes from occupation deposit in south-west corner of trench 8B

platforms can be isolated as follows:

	No.	%	Wt. in kg	%
Plain platforms	1474	92.5	12.24	88
Faceted platforms	120	7.5	1.68	12
Totals	1594		13.92	

demonstrating the tendency for faceted flakes to be slightly heavier on average. Although only 71 of the 120 complete examples are faceted *strictu sensu,* they are considered metrically for comparison with the general body of waste flakes. The histograms show that faceted flakes tend to be both longer and wider than the average flake, though they cover exactly the same range (except that none are smaller than 1cm). In length the flakes cluster in the 2–5cm range, which is really middle to low, since there is only a 1.75% increase over the total sample in flakes exceeding 5cm in length. In the B:L ratio, however, the faceted flakes do show a tendency to broadness, with 31.75% broader than 6:5, as opposed to 17.5% in the total sample.

The forty core rejuvenation flakes recognised include twenty-five complete examples, weighing 700g. These can be subdivided typologically as follows:

a. Struck from an existing platform down the surface of the core 3
b. Struck from an existing platform and partly keeled 1
c. Struck from the same plane as the platform 1
d. Struck from the base of the core 3
e. Triangular sectioned flakes struck obliquely to the platform from the side of the core 13
f. As (e) but struck from the rear of the platform edge 2
g. Struck across a keeled platform 2

This analysis suggests that partial rejuvenation of the edge of a striking platform is the most common technique. The core rejuvenation flakes are distinguishable from the total sample by their weight:

	No.	%	Wt. in kg	%
Complete flakes	1594	98.5	13.92	95.2
Complete core rejuvenation flakes	25	1.5	0.70	4.8
Totals	1619		14.62	

The average weight of the core rejuvenation flakes is 28g as opposed to 8.7g for the other flakes, though twelve of the twenty-five are secondary flakes. Six of the twenty-five show signs of possible utilisation.

Cores

The fifty-five core pieces include only thirty-two complete cores:

	No.	Wt. in kg
Complete cores	32	8.00
Fragmentary cores	20	2.65
Flaked lumps	3	0.45
Totals	55	11.10

The complete cores are assignable to core classes as follows:

Core class	No.	Main core class	No.
A1	—	A	9
A2	9	B	11
B1	—	C	6
B2	9	D/E	6
B3	2		
C	6		
D	2		
E	4		

Table XVI. Implements from trench 8B, south-west

Type	No.	%	Illustrations
Arrowhead	1	0.4	F71
Scrapers	20	7.3	F190, 221, 224, 232
Points	60	21.8	F280, 296, 319, 341, 347, 351, 354
Rods	15	5.4	F376, 393, 400, 416–418
Cutting flakes	16	5.8	F427, 429, 437, 444
Utilised blades	7	2.5	F452
Bulbar segments	9	3.3	F480, 484
Miscellaneous retouched	147	53.5	F542, 564, 582, 585
Total	275		

The weight and maximum dimension of each core was recorded, but the results are not given in histogram form because of the small size of the sample. The average weight is 250g, (maximum 860g; minimum 50g), and 84.5% are between 6–12cm in dimension. Prepared platforms are present on eight of the thirty-two cores. None of the cortical cores appear to be of floorstone flint. Only one core fragment amongst all the core pieces shows evidence of two-phase cortication. Re-use of cores appears restricted to one example with a possible scraping edge, another with some retouch of unclassifiable type, and a single example with abrasion from use as a hammer, though whether before or after being flaked as a core is unclear. The only example illustrated from this core sample is F68, a flat discoidal core on a flake which is densely discoloured and probably not part of the Bronze Age industry. The keel of this core is battered at one point, and this may reflect secondary usage of some kind. The distribution of complete cores (see Figure 9), showed no significant pattern.

Implements

Cortication does not provide the means for unequivocal chronological or cultural separation of these implements, and identification of Bronze Age examples depends upon correlation with the 1972 shaft assemblage. Of the specifically Bronze Age tool types only rods are present here. The fifteen rod pieces include only one complete example (F418) (Figure 84), though five of the fragments could be rejoined with other fragments from different contexts. Two join with fragments embedded in the basal sand of the south-west corner of trench 8B, a context probably identical with the present one, but recorded separately during excavation, while a third joins with a fragment from a superficial humic level in trench 8B. The remaining two join with fragments from trench 7B, from horizons which again probably correlate with the present context. The distribution of rod pieces (Figure 9) could be seen as representing a pattern of discarding along the northern edge of the area where they cluster, but this would need confirmation from the full extent of the deposit. The *petit tranchet* derivative arrowhead is again anomalous in this context, and its densely discoloured condition is the only support for regarding it as residual.

A2 Trenches 7B and 8B, remainder

The remaining artefacts from other contexts in trench 8B, and those from all contexts in trench 7B are grouped together here. The Bronze Age occupation horizon in trench 7B was not clearly defined stratigraphically so that the Bronze Age artefacts are included in this general sample, which can in any case be expected to incorporate a high proportion of Bronze Age material. No analysis was undertaken of the waste flakes or cores, though four cores (F29, F52, F59, F67) from the large total of cores from trench 7B are illustrated (Figures 21, 25, 27, 30). The

Table XVII. Implements from trenches 7B and 8B, remainder

Type	Trench 7B		Trench 8B, remainder		Total	
	No.	%	No.	%	No.	%
Picks	2	0.8	2	0.4	4	0.5
Axe	1	0.4	—	—	1	0.1
Scrapers	18	7.4	51	9.5	69	8.8
Points	47	19.2	105	19.4	152	19.4
Rods	64	26.1	10	1.9	74	9.5
Cutting flakes	29	11.8	31	5.7	60	7.7
Utilised blades	9	3.7	35	6.5	44	5.6
Bulbar segments	—	—	14	2.6	14	1.8
Miscellaneous retouched	75	30.6	291	54.0	366	46.6
Totals	245		539		784	

Table XVIII. Key to illustrated implements from trenches 7B and 8B, remainder

Type	Trench 7B	Trench 8B remainder
Picks	F79, 86	F92, 99
Axe	F113	—
Scrapers	F182, 212, 233	F180, 184, 194, 196, 200, 227–229
Points	F259, 261, 268, 278, 292	F276, 286, 291, 302, 333
Rods	F364, 368, 372, 376, 378, 383, 388, 396, 401, 405, 407, 414, 416, 419, 421	F373, 393, 400, 413, 417
Cutting flakes	F431	—
Utilised blades	F465	F457, 460, 461, 463, 467
Bulbar segments	—	F481, 486
Miscellaneous retouched	F508, 530, 533, 545, 599	F505, 514, 531, 532, 539, 551, 554, 590

implements from these contexts are listed in Table XVII, and the key to illustrated examples given in Table XVIII.

The smaller number of implements from trench 7B is largely explained by the fact that most of the trench was occupied by sterile chalk dumps. The range and relative representation of the implement types are again similar to those of the 1972 shaft assemblage. The most marked divergence between the two trench samples is in the rods category, where the value of 26% from trench 7B is the highest obtained from any of the assemblage subdivisions. This value is indicative of the way in which the Bronze Age Age occupation deposit dominates the trench 7B flint assemblage, but the concentration of rods in this area, especially when contrasted with the much lower figure from trench 8B south-west, is difficult to explain. The retouch on many of the trench 7B rods remains fresh and undiscoloured, and this is also true of other implements such as the scrapers F182 (Figure 57) and F233 (Figure 64), points F259 (Figure 67) and F292 (Figure 70), and unclassified denticulate F599 (Figure 106), which could typologically be regarded as Bronze Age on the 1972 shaft evidence.

B1 Trench 2A

Trench 2A, 9.5 by 4m in area, was excavated to the top of the sand but was not cleared to 'natural', because it was decided to leave a carpet of waste flakes *in situ,* pressed into the top of the sand, for possible display purposes. Accordingly the artefact totals recorded for this trench are underestimates, though it is thought unlikely that there were many cores left *in situ,* because their bulk would have caused them to be disturbed, and no obvious implements were left amongst the visible flakes.

The situation of the trench, to the east and south of the chalk dumps, and beyond the southern extent of the Bronze Age occupation deposit, means that the contained stratigraphy has no major interruptions. Although the flints tended to concentrate at the base of the humic stratigraphy, there was no archaeological horizon which could be defined and utilised during excavation. The total assemblage of artefacts from the trench is therefore considered as a single entity, though it is recognised that it is unlikely to be culturally homogeneous and is associated with no datable occupation. The chief purpose in studying this assemblage is to isolate a large sample of complete cores for analysis, but, in addition, a small sample of waste flakes is analysed for comparison with the other waste flake samples, and the retouched pieces are classified.

The total assemblage can be subdivided as follows:—

	No.	%	Wt. in kg	%
Waste flakes	42 968	97.6	467.925	76.8
Core pieces	437	1.0	114.840	18.8
Retouched	611	1.4	27.005	4.4
Totals	44 016		609.77	

The total of 44 016 artefacts demonstrates the very dense distribution of knapping debris at Grimes Graves. The average distribution within trench 2A can be expressed by the minimum figure of 1150 flints per sq m.

Waste flakes

A sample of 200 complete waste flakes from the lowest humic levels was obtained in the same way as the sample from quadrant 5, layer 1B, of the 1971 shaft (q.v.). The make up of the sample is as follows:—

	No.	%	Wt. in kg
Primary flakes	1	0.5	5.35
Secondary flakes	76	38.0	
Tertiary flakes	123	61.5	

The average flake weight is thus 26.75g. The sample includes one core rejuvenation flake, one Levalloisoid flake, four possible points, one slightly trimmed flake, and eighteen possibly utilised flakes. The raw material used is mainly non-floorstone. Faceted platforms are present on nineteen flakes, and eleven of the flakes are blades using a 1:2 B:L ratio. Histograms were prepared for the length, breadth and B:L ratio of the sample (Figure 4). In length there is a clustering in the 2–6cm range (62.5%), but no marked peak. The normal length range is 1–8cm (88.5%), but there is a significant 10% longer than 8cm. The breadth measurements do show a slight peak between 2–4cm (43.5%), but the main range is 1–7cm (94.5%). The ratios show a peak between 3:5 and 4:5 (31.5%), with 49.5% broader than this.

Cores

The trench 2A assemblage provides a large core sample which can be taken as a guide to the flaking techniques and core types encountered at Grimes Graves (or at least in this section of the site), in combination with the other core samples analysed. The 437 core pieces comprise 346 complete cores with 91 fragments. Two of the fragments could be joined to form a complete core, so that the subdivision can be given as follows:—

	No.	Wt. in kg
Complete cores	347	98.76
Core fragments	89	16.08

A single core, F49 (Figure 25), was excluded from further analyses since it was clearly a Mesolithic survival fortuitously mixed into the assemblage, and is distinctive for its dense white cortication and its very small size (weight 16g; maximum dimension 3.4cm). The remaining 346 cores can be assigned to core classes as follows:—

Core class	No.	Illustrations	Main core class	No.	%
A1	1	—	A	102	29.5
A2	101	F18,20,32,42,43	B	106	30.6
B1	3	—	C	91	26.3
B2	78	F25,53,62	D/E	47	13.6
B3	25	F66			
C	91	F27			
D	16	F36,56			
E	31	F48			

The average weight of the cores is 285g (maximum 3.4kg; minimum 50g). In weight (Figure 5) there is a clustering between 100–400g (77.75%), with a peak at 100–200g (33.5%), while 6% are lighter than 100g, and 1.75% are heavier than 1kg. Analysis of core weight by core class shows the usual trend from light to heavy, with 48% of the A cores weighing less than 200g, 45% of the B cores weighing less than 200g, and only 32% of the C cores weighing less than 200g. In size a peak is apparent between 8–12cm (60.5%), while 6–14cm covers the main range (93%).

Signs of previous flaking are visible on 252 cores (72.8%), involving 52 of the A cores (51%), 86 of the B cores (81%), 83 of the C cores (91%), and 31 (66%) of the D/E cores. Of the total 346 cores, 302 (87.3%) retain some cortex, and it is possible to estimate that some 56 (18.5%) are probably from floorstone, 102 (33.9%) are definitely not from floorstone, while a further 144 (47.6%) could not be assessed. In attempting to document the type of parent piece used for the cores, it is apparent that 141 (41%) of the cores are on flakes, 56 (16%) on nodules or pebbles, and 24 (7%) on thermal lumps, but 125 could not be classified in this way. By far the largest proportion are simple flake cores, but three cores appear to have produced solely blades, while a further forty may have produced some blades in addition to flakes. Thirty-three of the forty-three blade producing cores are from classes A and B. At least fifty-seven cores (16.4%) have one or more prepared platforms.

Secondary usage of cores amongst this assemblage is relatively common, three having scraping edges, two having probable points, and twelve others having incidental retouch of unclassifiable type. Thirteen cores have abrasion from use as hammers, but in five cases the cores are actually on flakes from hammerstones, and only two are carefully prepared as hammers.

Implements

Although the implements are undoubtedly a cultural mixture, reflecting the accumulation of debris in this area from the mining phase onwards at least, there is a strong Bronze Age aspect as indicated by the rod fragments and the barbed-and-tanged arrowhead. The presence of an undoubted Mesolithic core raises the possibility of Mesolithic tools as well, but the only possible candidate from this trench is one of the points, F295 (Figure 70), a blade with distal point formed by oblique blunting retouch.

B2 Trenches 1A, 1B and 2B

Trench 1B was occupied for the most part by a chalk dump, and hence produced few artefacts, while trench 2B was only partially excavated. East of the chalk dump in trench 1A the situation was similar to trench 2A, and this is the origin of most of the artefacts in this section, which constitutes an arbitrary amalgam of flints. No analysis of the waste material was undertaken, though some of the cores are illustrated (F14, 22, 24, 35, 51, 54) (Figures 17, 19, 22, 25, 26). The implements are classified in Table XX.

The fifty rod pieces represent forty-two separate implements, of which thirty-eight come from trench 1A. One of the trench 1A rod fragments joins with a fragment from the 1972 shaft fill (F412), and this confirms the link suggested by the number of rods between the debris in this

Table XIX. Implements from trench 2A

Type	No.	%	Illustrations
Arrowhead	1	0.2	F73
Picks	2	0.3	F78, 95
Axes	2	0.3	F102, 108
Scrapers	42	6.9	F183, 198, 200, 204, 207, 216, 222, 240
Points	97	15.9	F275, 282, 294, 295, 297, 303, 315, 322, 342, 343, 349, 353, 356
Rods	33	5.4	F363, 374, 379, 382, 408, 409, 415, 420
Cutting flakes	36	5.9	F440, 442
Utilised blades	32	5.2	F453, 454, 464, 469
Bulbar segments	22	3.6	F472, 474, 477
Bifacial	1	0.2	F487
Miscellaneous retouched	343	56.1	F525, 534, 537, 555, 570
Total	611		

Table XX. Implements from trenches 1A, 1B and 2B

Type	Trench 1A		Trench 1B		Trench 2B		Total	
	No.	Illustration	No.	Illustration	No.	Illustration	No.	%
Picks	2	F82, 89	—	—	—	—	2	0.6
Scrapers	19	F193, 199, 201, 234, 238	1	—	16	F150, 186, 208, 219, 242	36	10.4
Points	19	F339, 345, 346	—	—	21	F271, 288, 312, 323, 328, 352, 595	40	11.6
Rods	43	F361, 366, 369–371, 377, 386, 390, 403, 404, 406, 411, 412	—	—	7	F379, 381, 392	50	14.4
Cutting flakes	7	—	—	—	4	—	11	3.2
Utilised blades	5	F596	—	—	3	F597, 598	8	2.3
Bulbar segments	7	F485	—	—	—	—	7	2.0
Bifacial	—	—	—	—	1	F495	1	0.3
Multiple tools	1	F494	—	—	1	F492	2	0.6
Miscellaneous retouched	116	F509, 541, 583, 584	3	F569	70	F519, 520, 522, 526, 550	189	54.6
Totals	219		4		123		346	

trench and the Bronze Age occupation. Cultural mixture is reflected, however, by more specifically Neolithic types such as F150 (Figure 53) and F495 (Figure 90), both from trench 2B.

C1 Trench 4, Layer 3

The deep cutting on the west side of the 1971 shaft, for the foundation of the scaffolding gantry, involved the removal of part of the substantial chalk dump in trench 4 and in the baulk between trenches 4 and 5. This cutting encountered a considerable volume of flaking debris stratified in the buried soil below the chalk dump. Altogether some 4.25sq m of this deposit were sampled archaeologically, and the flints recovered can be treated as an homogeneous assemblage of pre-dump date. This deposit is seen as identical to the sand lenses in the lower fill of the 1971 shaft, which are regarded as eroded soil from around the mouth of the shaft. Although it cannot be positively established whether the chalk dump in trench 4 is derived wholly or even in part from the 1971 shaft, or from any of the surrounding shafts, it would seem reasonable to accept the flints from below the dump as roughly contemporary with the 1971 shaft. It is possible that the knapping debris from below the dump actually predates the 1971 shaft, which could have been dug through a topsoil containing the debris, or alternatively that the debris is contemporary with the usage of the 1971 shaft, or immediately post-dates it. Whatever the finer details, close chronological association between this assemblage and the digging of the 1971 shaft can be postulated, and by extension the assemblage is therefore associated with the use of Grooved Ware on the site, and is certainly previous to, and separate from, the Bronze Age assemblage associated with the 1972 shaft.

As with the material from trench 8B south-west, this deposit was excavated in half-metre squares. No calcined flint was noted, though a small quantity of burnt flint suggests the presence of nearby hearths in the manner of that encountered in trench 3. Figure 11 shows the distribution of the 7861 flint artefacts recovered from this small area. The uneven distribution by number, with one half-metre square containing 27% of the total, is somewhat off-set when the distribution by weight is considered, showing that the presence of numerous tiny flakes distort the picture, but even so three adjacent squares in trench 4 account for 61.5% of the total number, and 37.9% of the total weight. By reference to the general site plan (Figure 1), it will be apparent that the easternmost squares are towards the lip of the weathering cone of the 1971 shaft, and this explains the fall off in numbers on that side, but on the north side there is no obvious explanation for the sudden drop in density. As always the flint totals given should be regarded as minima, because of the inevitable removal of some of the deposit before detailed recording commenced (e.g. F90). It is unfortunate that, as was the case with the Bronze Age deposit in trench 8B, no conclusions are possible about horizontal stratigraphy because of the small size of the excavated area. Nevertheless, the density of debris is remarkable, with over 5000 artefacts from a single square metre, especially as the maximum depth of the deposit was only 15cm. The flints themselves are preserved in a fairly fresh condition, with a broad range of discolouration, from virtually undiscoloured, through bluish-grey, to grey, but not including the dense white and creamy colour of flints from the upper humic or chalky-humic layers. Very often the discolouration has a variegated effect and is of 'smokey-blue' type, with the flints having a distinctly 'greasy' feel owing to the patination which seems particularly associated with the old-land surfaces.

The total assemblage of 7861 artefacts can be initially sub-divided as follows:—

	No.	%	Wt. in kg	%
Waste flakes	7749	98.6	29.835	81.5
Core pieces	14	0.2	3.4	9.3
Retouched	98	1.2	3.36	9.2
Totals	7861		36.595	

TOTAL OF 7861 ARTEFACTS WEIGHING 36.595KG

No. = Total number of artefacts per 0.5m square, with percentage in brackets.

Wt. = Total weight in kg of artefacts per 0.5m square with percentage in brackets.

TRENCH 4	No. 12 (0.1) Wt. 0.165 (0.5)	No. 113 (1.5) Wt. 0.935 (2.5)	No. 39 (0.5) Wt. 0.105 (0.3)	
		No. 1055 (13.5) Wt. 4.199 (11.4)	No. 1635 (21.0) Wt. 5.68 (15.4)	
	No. 436 (5.7) Wt. 2.612 (7.2)	No. 277 (3.6) Wt. 3.225 (8.7)	No. 2147 (27.0) Wt. 4.105 (11.1)	No. 23 (0.3) Wt. 0.04 (0.1)
BAULK 4/5	No. 439 (5.7) Wt. 2.685 (7.3)	No. 201 (2.7) Wt. 2.281 (6.3)	No. 299 (3.9) Wt. 2.395 (6.6)	No. 217 (2.2) Wt. 0.44 (1.2)
	No. 508 (6.6) Wt. 2.151 (5.9)	No. 212 (2.8) Wt. 1.95 (5.6)	No. 184 (2.1) Wt. 2.457 (6.7)	No. 64 (0.8) Wt. 1.17 (3.2)

Figure 11 Late Neolithic chipping floor in trench 4 and baulk 4/5: flint distribution diagram

Waste flakes

The 7749 waste flakes include the following forms:

	No.	%	Wt. in kg	%
Complete flakes	1360	17.6	9.515	32.0
Broken flakes with intact platforms	1505	19.4	7.425	24.9
Nun-bulbar fragments	4574	59.0	9.355	31.3
Core rejuvenation flakes	72	0.9	1.915	6.4
Burnt flakes, mainly shattered	238	3.1	1.625	5.4
Totals	7749		29.835	

The complete flakes can be further subdivided according to cortex groups:

	No.	%	Wt. in kg	%
Tertiary	962	70.7	4.035	42.5
Secondary	358	26.3	5.045	53.0
Primary and cortex	40	3.0	0.435	4.5
Totals	1360		9.515	

Thus the average flake weight of this sample is 6.9g, with tertiary flakes averaging 4.1g, and secondary flakes 14g. Histograms were prepared for the length, breadth and B:L ratio of the 1360 complete flakes (Figure 12). These indicate a population of predominantly short, broad flakes, with 69% shorter than 3cm, 72.75% narrower than 3cm, and 58% broader than 4:5. Separate calculations were made for the 781 flakes over 2cm in length. As the B:L ratio histogram for this group shows, the small flakes in the assemblage do inject a bias, since only 46.6% of the larger flakes are broader than 4:5, compared with 58% in the total sample. This implies a tendency for the larger flakes to be relatively slim in this assemblage.

The total number of waste flakes with an intact striking platform is 2865 (not including core rejuvenation flakes), of which 536 (18.7%) are faceted, though only 135 (4.7%) are faceted *strictu sensu*. The number of faceted flakes amongst the complete flakes can be isolated as follows:

	No.	%	Wt. in kg	%
Plain platforms	1110	81.6	6.865	72.1
Faceted platforms	250	18.4	2.650	27.9
Totals	1360		9.515	

This shows that the faceted flakes tend to be larger than average, though only 67 (4.9%) of these are faceted *strictu sensu*. The histograms prepared for these 250 faceted flakes show that despite being larger than the average flakes, they cluster between 1–4cm in length and 1–4cm in breadth, and with 60.8% broader than 4:5 they are only slightly broader than the flakes in the total sample. Taking a B:L ratio of 1:2, only 71 (5.2%) of the total 1360 flakes could be described as blades. Possible utilisation was noted in 177 (13%) instances. As an example of the waste flakes in this assemblage F8 and F9 (Figure 16) are flakes struck from multiplatform cores, and F10–12 (Figure 16) are representative of proximal flake segments which come from a type of large, fine flake not present in the measured sample because none are complete. These segments can be compared with the illustrated proximal segments with lateral retouch from amongst the miscellaneous retouched pieces elsewhere on the site.

Of the seventy-two core rejuvenation flakes forty-three are complete. The complete examples can be contrasted with the general sample of waste flakes as follows:

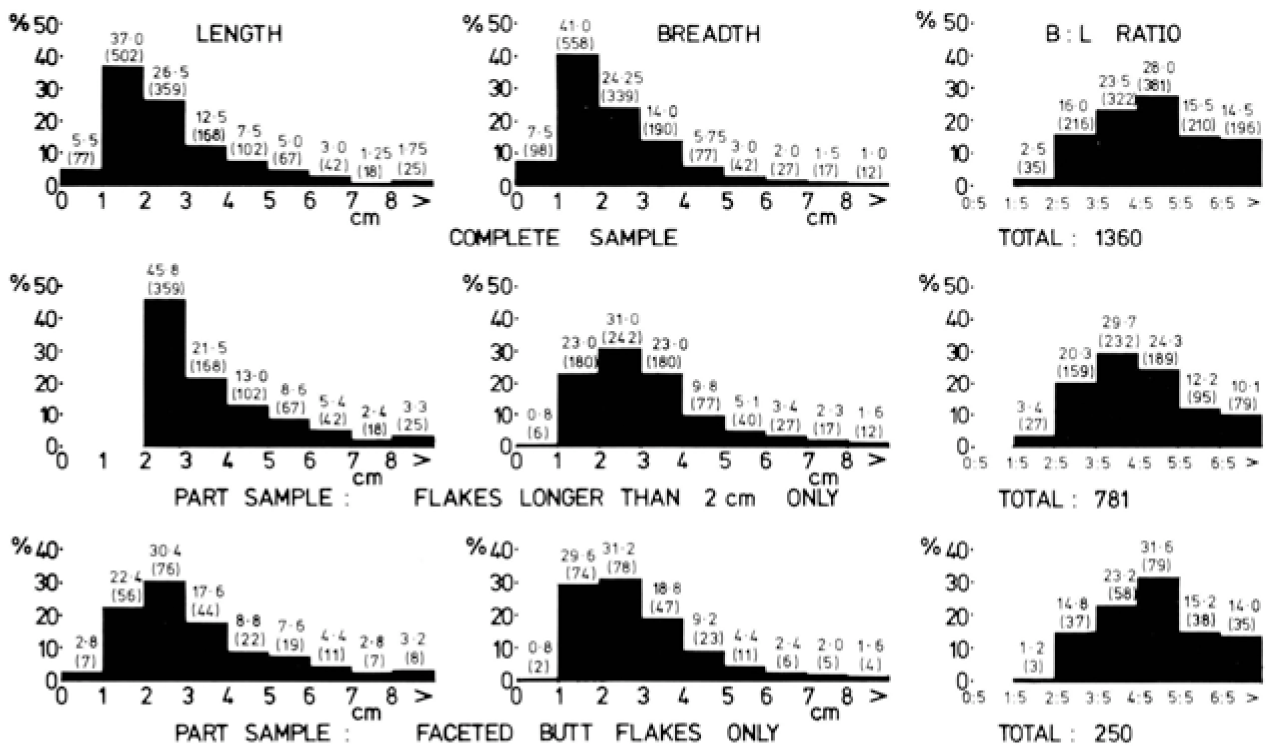


Figure 12 Waste flakes from layer 3 in trench 4 and baulk 4/5

	No.	%	Wt. in kg	%
Complete flakes	1360	96.9	9.515	88.4
Complete core rejuvenation flakes	43	3.1	1.245	11.6
Totals	1403		10.760	

This demonstrates that the core rejuvenation flakes, with an average weight of 28.1g, tend to be much larger than the average flake population. Only eleven of the forty-three complete examples are cortical, and seven are possibly utilised. Typologically, the forty-three complete rejuvenation flakes can be subdivided as follows:

a. Struck from an existing platform down the face of a core 13
b. Struck from an existing platform and partly keeled 3
c. Struck from the same plane as the platform 3
d. Struck from the base of the core 3
e. Triangular sectioned flakes struck obliquely to the platform from the side of the core 17
f. As (e) but from the front or rear of the platform edge 2
h. Unclassified 2

Cores

The small total of fourteen core pieces can be subdivided as follows:

	No.	Wt. in kg	Illustrations
Complete cores	9	2.14	F69, F594
Fragmentary cores	3	0.76	—
Flaked lumps	2	0.50	—
Totals	14	3.40	

The complete cores belong to classes A2 (5), B3 (1), C (2) and E (1). The size range is between 8.2cm minimum, and 13.9cm maximum, and the weight range between 150g minimum and 375g maximum, with an average weight of 237.7g. Two of the cores have prepared platforms. Eight cores retain some cortex, of which six appear to be from floorstone, and one from topstone. Two of the three fragmentary cores are cortical and both of these appear to be from floorstone. None of the cores exhibit any secondary usage.

Implements

Table XXI. Implements from trench 4, layer 3

Type	No.	Illustrations
Arrowhead	1	F74
Pick	1	F77
Scraper	1	F211
Points	10	
Cutting flakes	10	F433
Utilised blades	8	F451, 462
Bulbar segments	3	F479
Microliths	2	F499, 500
Miscellaneous retouched	61	F560, 579
Total	98	

The two microliths from this context are the only such implements in the 1971–72 assemblage. F499 is an edge blunted form, broken at the base, and F500 has atypically narrow oblique blunting (Figure 91). Both are regarded as Mesolithic implements fortuitously mixed with the Late Neolithic assemblage. No other Mesolithic forms are obviously present.

C2 Trench 3, Layer 3

Although the material from trench 4 described in the previous section was the only securely stratified and sealed layer 3 assemblage, it was established during the excavations that the knapping debris of which it formed a part was not restricted to trench 4, but probably continued all around the perimeter of the 1971 shaft, and trenches 3, 5 and 6 and the intervening baulks produced artefacts which could be related to the same assemblage. In trench 3 in particular there was a spread of knapping debris similar in type and density to that in trench 4, lying on the basal sand, and associated with a spread of charcoal from *in situ* burning interpreted as contemporary with the shaft being open. The trench 3 material was partly sealed by a layer of redeposited chalk and sand, derived from the dump pertaining to the 1971 shaft, and can be regarded as a supplement to the trench 4 assemblage. The total of 3595 artefacts recovered can be initially subdivided as follows:

	No.	%	Wt. in kg	%
Waste flakes	3479	96.8	30.875	70.5
Core pieces	24	0.7	9.54	21.8
Retouched	92	2.5	3.4	7.7
Totals	3595		43.815	

Waste flakes

The waste flakes are subdivided as follows:

	No.	%	Wt. in kg	%
Complete flakes	780	22.4	11.525	37.3
Broken flakes with intact platforms	627	18.0	5.825	18.9
Non-bulbar fragments	1710	49.2	8.325	27.0
Core rejuvenation flakes	39	1.1	3.2	10.3
Burnt flakes, mainly shattered	323	9.3	2.0	6.5
Totals	3479		30.875	

The complete flakes can be further subdivided according to cortex groups:

	No.	%	Wt. in kg	%
Tertiary	523	67	4.025	35.0
Secondary	242	31	7.3	63.3
Primary and cortex	15	2	0.2	1.7
Totals	780		11.525	

Thus the average flake weight of this sample is 14.7g with tertiary flakes averaging 7.6g, and secondary flakes 30.1g. The histograms prepared for the length, breadth, and B:L ratio measurements of the 780 complete flakes are shown in Figure 13. A population of small, broad flakes is indicated, with 53% shorter than 3cm, 61.25% narrower than 3cm, and 55% broader than 4:5. Nevertheless, the sample includes a significant number of large flakes (12.75% are longer than 6cm), and narrow flakes (21.5% are less than 3:5). To investigate the divergence between cortical and non-cortical waste flakes, as indicated by the respective average weights, a separate series of histograms was prepared for the cortical flakes. These show the tendency for cortical flakes to be larger, and the implications of this will be discussed below.

The total number of waste flakes with an intact striking platform, excluding core rejuvenation flakes, is 1407, of which 227 (15%) are faceted, though only 69 (4.9%) are faceted *strictu sensu*. The number of faceted flakes amongst the complete flakes can be expressed as follows, though only 32 (4.1%) of these flakes are faceted *strictu sensu*.

	No.	%	Wt. in kg	%
Plain platforms	671	86.0	9.075	78.7
Faceted platforms	109	14.0	2.45	21.3
Totals	780		11.525	

There are fifty flakes (6.4%) which can be defined as blades using a 1:2 B:L ratio. Of the complete flakes 154 (19.7%) show signs of possible utilisation.

Amongst the thirty-nine core rejuvenation flakes are twenty-one complete examples which can be contrasted with the other waste flakes as follows:

	No.	%	Wt. in kg	%
Complete flakes	780	97.4	11.525	83.8
Complete core rejuvenation flakes	21	2.6	2.225	16.2
Totals	801		13.750	

The rejuvenation flakes, with an average weight of 106g, tend to be far larger than the average flake. Nine of the complete rejuvenation flakes are cortical, and none shows any sign of utilisation. The typology of the twenty-one complete examples is as follows:

a. Struck from an existing platform down the face of a core 9
c. Struck from the same plane as the platform 5
d. Struck from the base of a core 1
e. Triangular sectioned flakes struck obliquely to the platform from the side of the core 6

Cores

The twenty-four core pieces are subdivided as follows:

	No.	Wt. in kg	Illustrations
Complete cores	16	7.18	F19, F64
Fragmentary cores	8	2.36	F45

The complete examples include a single-platform battered microcore, dense white in colour, weighing 23g, and with a maximum dimension of 3.4cm. This core can be compared with F49 (Figure 25) from trench 2A, and is regarded as Mesolithic. The fifteen remaining cores can be assigned to the following classes: A2 (4), B2 (3), B3 (1), C (2), D (3), and E (2). The size range is between 6.4cm minimum, and 17.5cm maximum, with a weight range between 75g minimum, and 1.425kg maximum. The average core weight of 477.1g is inflated by the presence of two cores over 900g. Fourteen of the fifteen cores retain some cortex, and in eleven cases this is judged to be of floorstone type.

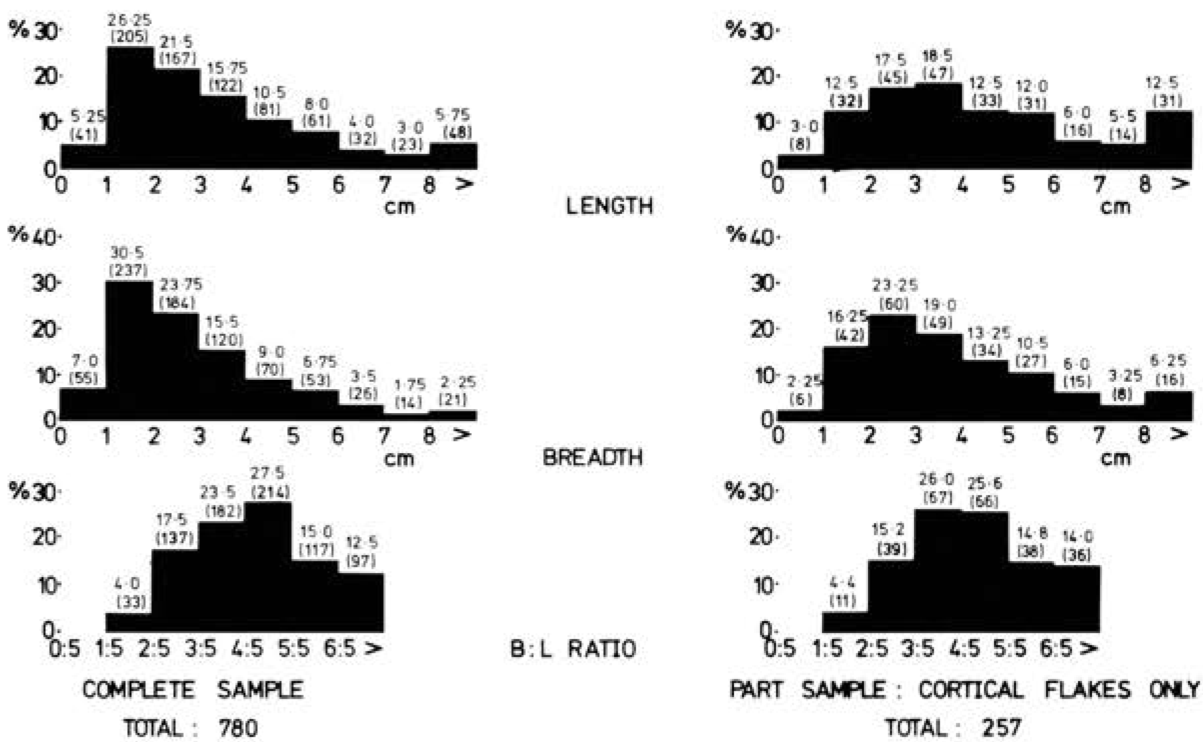


Figure 13 Waste flakes from layer 3 in trench 3

Implements

Table XXII. Implements from trench 3, layer 3

Type	No.	Illustrations
Knife	1	F129
Scrapers	4	F168, 210
Points	7	
Cutting flakes	15	
Utilised blades	16	
Bulbar segments	2	
Miscellaneous retouched	47	F512, 513, 592
Total	92	

This small implement assemblage includes two significant types. F129 (Figure 50) is a discoidal knife with complete bifacial flaking, and F168 (Figure 55) is a plane-scraper form.

C3 Trenches 3, 4, 5 and 6, Layer 3 remainder

In addition to the material described in section C1 and C2, it was also possible to assign other artefacts recovered from trenches and baulks around the edge of the 1971 shaft to the same assemblage, when these were noted during excavation to almost certainly relate to the horizon of the old land surface. These artefacts are not analysed in detail, and are anyway numerically slight, but the implements are included with those from trenches 3 and 4 in Table XXIII.

With the exception of the residual microliths, the implements listed in Table XXIII are regarded as representative of the flint industry roughly contemporary with the exploitation of the 1971 shaft, which is thus of Neolithic date and of Grooved Ware facies. Typologically, there are several significant features about this assemblage. Discoidal knives and plane-scrapers do not occur elsewhere amongst the 1971–72 collection, while on the other hand rods are common on the rest of the site but are completely absent from this assemblage, as are the elongated, elaborate points. The presence of the *petit tranchet* derivative arrowhead, the two picks, including a chisel-pick type and the axe fragment, allows these types to be directly associated with the Late Neolithic assemblage. The percentage representation of scrapers and points is low, though even the cutting flakes and utilised blades which are the predominant types do not have high percentage values.

The overall composition of the assemblage is remarkable for the preponderance of waste flakes (98.6% of the trench 4 sample), and attendant low representation of cores and implements, which must be significant in terms of the activity denoted by this debris, though the meticulous recovery of large numbers of very small flakes from the area in question (especially trench 4), presents a possible bias here.

In terms of raw material there is little doubt that this industry primarily exploited floorstone, and some quantification of this is provided by Table XXIV.

To judge from the lack of weathering of the cortex and the lack of dense cortication on the floorstone implements,

Table XXIII. Implements from layer 3 around the 1971 shaft

Type	Trenches 3 & 4	Trench 5	Trench 6	Baulk 1A/3	Baulk 3/6	Baulk 4/5	Total No.	%	Illustrations additional to Tables XXI–XXII
Arrowhead	1	—	—	—	—	—	1	0.5	—
Picks	1	—	—	—	—	1	2	1.0	F90
Axe	—	1	—	—	—	—	1	0.5	F110
Knives	1	—	1	—	—	—	2	1.0	F130
Scrapers	6	1	—	—	1	—	8	4.0	F167, 230
Points	17	1	—	—	—	—	18	9.0	—
Cutting flakes	25	—	1	—	—	—	26	12.9	—
Utilised blades	24	—	—	—	—	—	24	11.9	—
Bulbar segments	5	—	—	—	—	—	5	2.5	—
Microliths	2	—	—	—	—	—	2	1.0	—
Miscellaneous retouched	108	2	—	1	1	—	112	55.7	F511, 527
Totals	190	5	2	1	2	1	201		

Table XXIV. Cortex type assessment for selected implement categories from trenches 3 and 4, layer 3

Type	Total	Total cortical	Probably floorstone	Not floorstone	Not assessed
Scrapers	6	3	1	1	1
Points	17	7	2	1	4
Cutting flakes	25	12	7	—	5
Utilised blades	24	9	5	—	4
Miscellaneous (complete & proximal)	87	46	24	4	18
Totals	159	77 (48.4%)	39 (50.6%)	6 (7.8%)	32 (41.6%)

and the absence of two-phase cortication, it can also be said that the floorstone being knapped at the surface of the 1971 shaft was almost certainly newly mined.

C4 Trenches 3, 4, 5 and 6, above layer 3

The material from the superficial layers in these trenches is unstratified and liable to be chronologically mixed, though there is some indication, notably the absence of rods and the predominant use of floorstone, to suggest more of a relation to the Late Neolithic activity than that of the Bronze Age. The waste material was not analysed in any detail though four of the cores are illustrated (F16, 28, 47 and 60, Figures 17, 21, 24, 27). F28 is an example of a specific type of Grimes Graves core, where a floorstone flake has its original striking platform prepared prior to flaking down the bulbar surface (cf. F29, 69, Figures 21, 30). This type may represent an early stage in the production of a discoidal core, the penultimate stage of which is shown by F47. With a maximum dimension of 18.7cm, and weighing 1.375kg, this floorstone flake demonstrates the Levalloisoid technique to perfection, except that the final flake, across the bulbar surface, which could be the blank for an axe or discoidal knife, has not been removed. The implements from these layers are listed in Table XXV.

Table XXV. Implements from trenches 3, 4, 5 and 6, above layer 3

Type	No.	Illustrations
Picks	5	F80, 85, 91
Scrapers	19	F169, 185, 235, 241
Points	5	F283, 326
Cutting flakes	2	—
Utilised blades	3	—
Bifacial	1	F490
Miscellaneous retouched	57	F510, 557, 589
Total	92	

The high proportion of picks and scrapers is noteworthy. Fifty-one of the total implements, including all the picks, come from trench 4, and should probably be linked with the Late Neolithic activity.

Chapter V
Collation and Discussion

This chapter summarises the artefact data given in the previous analyses, both to facilitate overall typological comparisons within the collection, and to examine the external comparisons and cultural implications. As an essential preliminary it is necessary to recapitulate the evidence for the cultural/chronological subdivisions which can be made within the collection on the basis of stratigraphy and non-lithic associations.

Firstly, it has been maintained that the artefacts from layer 3 in trenches 3 – 6 around the lip of the 1971 shaft can be equated with the phase of mining to which the 1971 shaft belongs. The 1971 shaft has been dated to approximately 1800 bc on the basis of several radiocarbon determinations (see Vol I, pp. 23, 28), and pottery from the base of the shaft demonstrated a cultural correlation with the Late Neolithic of Grooved Ware facies. In addition to these artefacts from the surface, those from the sand lenses in the 1971 shaft fill, particularly from the fourth excavational section downwards, could by extension be regarded as contemporary, and also the flint material from the base of the shaft and the galleries, as well as most of the flint from the fifth to seventh excavational sections, could be shown to be approximately contemporary with the shaft.

Secondly, there are the artefacts which can be related to the Middle Bronze Age occupation of Grimes Graves as revealed by the rich occupation deposit encountered in trenches 7B and 8B. This deposit cannot be regarded as free from contamination, but a sample assemblage of the flint artefacts from the south-west corner of trench 8B was analysed in detail, and thought to be predominantly contemporary with the occupation. Far more important in this respect are the artefacts from the 1972 shaft, since this shaft served as a rubbish tip during the Middle Bronze Age occupation, and the upper fill can be directly related to the occupation area in trenches 7B and 8B. On the basis of relative cortication, the flints from the 1972 shaft could be subdivided to isolate a pure Middle Bronze Age assemblage, and against this the Middle Bronze Age content of the remaining assemblage from trenches 7B and 8B could be gauged. Radiocarbon determination from the 1972 shaft fill gives an approximate date of 1134 bc for the Middle Bronze Age occupation.

In the following discussions, the two groups of artefacts just described will for convenience be referred to as the Late Neolithic or Grooved Ware, and the Middle Bronze Age or simply Bronze Age assemblages respectively, and these are the only lithic artefacts from the collection whose cultural/chronological referents are strictly definable. The flints from trenches 1A, 1B, 2A, 2B, 3 – 6 (above layer 3), and the upper levels of the 1971 shaft must be regarded as unassociated and heterogeneous, though it is considered that they present a cultural mix which is largely confined within the Late Neolithic-Middle Bronze Age bracket. The presence of flint artefacts of Bronze Age type in the 1B layers of the 1971 shaft fill does provide a *terminus post quem* for the deposition of these layers after the appearance of a Bronze Age industry on the site, but the contained assemblage is mixed, and cannot be accurately subdivided since the 1971 shaft did not serve so extensively as a Middle Bronze Age rubbish tip. The chalk dumps uncovered in the surface trenches presumably all relate to mining activity, and might therefore be expected to provide a seal for Late Neolithic artefacts, but except in the case of trenches 3 – 6 no implements were recovered from the old land surface below the dumps.

The only artefacts at variance with a general Late Neolithic—Middle Bronze Age spectrum are those which can be typologically identified as ill-suited to such a milieu. This is the case with two micro-cores (F49, Figure 25), and two microliths (F499, F500 Figure 91), which can be accepted as Mesolithic. The Mesolithic presence indicated by these artefacts amongst a collection of over 400 000 is of course minimal, but it is nevertheless significant, firstly in indicating some Mesolithic activity in the Grimes Graves area, and secondly in allowing the possibility that some other, less diagnostic, artefacts in the collection could be Mesolithic[6]. This might, for example, apply to the pick F99, and to some of the utilised blades and bulbar segments.

Earlier Neolithic activity is not certainly attested by any artefacts in the 1971 – 72 collection, and such diagnostic types as leaf-arrowheads and serrated flakes are noticeably absent. The bifacial implement F495 (Figure 90) bears some resemblance to tools of laurel-leaf type (Clark *et al* 1960, 223), but is not strictly comparable. This leaves only the somewhat anomalous utilised blades and bulbar segments, which may possibly point to some pre-Late Neolithic presence, or isolated implements within other categories which could possibly be pre-Late Neolithic on typological grounds, such as the end scrapers F149 and F150 (Figure 53).

From the collection as a whole, only the implement component has been considered in its entirety, so that it is not possible to give accurate figures for the composition of the waste flake and core components. On the basis of the estimated total figure of between 400 000 – 500 000 artefacts, the implement component would constitute only 1% of the collection. For the remaining 99% limited sampling

6. Recent work at Grimes Graves by the British Museum has revealed more definite traces of Mesolithic occupation in the form of a hearth associated with an artefact scatter, from which a radiocarbon determination of 6511 ± 310 bc (BM – 989) has been obtained. (Information given by Messrs G de G Sieveking and R Burleigh in lectures to the Prehistoric Society in London on 20 February 1974). This confirms the suggestion that possible Mesolithic contamination of later assemblages has to be seriously considered.

	Numerical %			Weight %		
	Trench 3	Trench 4	Trench 8B	Trench 3	Trench 4	Trench 8B
Complete flakes	22.4	17.6	31.9	37.3	32.0	49.5
Broken flakes with intact platforms	18.0	19.4	20.3	18.9	24.9	17.6
Non-bulbar fragments	49.2	59.0	47.0	27.0	31.3	29.9
Core rejuvenation flakes	1.1	0.9	0.8	10.3	6.4	3.0
Burnt flakes, mainly shattered	9.3	3.1	—	6.5	5.4	—

has had to suffice, and before describing the implements, the waste flakes and cores will be considered in turn.

Waste flakes

Three large samples of waste flakes, comprising altogether 16 219 flakes and fragments, were analysed in detail from trenches 3, 4 and 8B. These samples were not subject to any post-excavational selection, but are in each case the total samples excavated from three areas of *in situ* knapping debris. The internal composition of the three samples is summarised in the table above.

Since only complete flakes can be used for metrical analysis, it is significant that the highest representation for this group is the 49.5% by weight in the trench 8B column, as this demonstrates the degree to which selection has taken place prior to any archaeological sampling, the remaining complete flakes being only a partial sample and guide to the original total range. When the percentage of complete flakes varies considerably between samples, as it does here between trenches 4 and 8B, the possibility of this being a biasing factor on any further analyses should be noted.

When the histograms for length, breadth and B:L ratio which were obtained from the complete flakes in the above samples are compared (Figures 10, 12 and 13), a close agreement is apparent between all three samples, though this agreement is in fact closer between the flakes from trenches 4 and 8B, than between those from trenches 3 and 4 which are assumed to derive from the same deposit of knapping debris. The main trends in each case are for a peak between 1–2cm in length and breadth, with a ratio peak between 4:5 and 5:5. However, it has been shown in the previous analyses that waste flake histograms cannot be directly compared without considering the nature of the flakes involved, since differences in the composition of the sample will affect the metrical values obtained. These differences can be investigated by taking into account such factors as average flake weight, which for the present samples is as follows:

	Average flake weight in g		
	Tertiary only	Secondary only	All types
Trench 3	7.6	30.1	14.7
Trench 4	4.1	14.0	6.9
Trench 8B	3.3	13.9	8.7

The higher average flake weight of the trench 3 flakes should be reflected in the histograms, and this is the case since 31.25% of the trench 3 flakes are longer than 4cm (Figure 13), as opposed to only 18.5% in the trench 4 sample (Figure 12), and 19% in the trench 8B sample (Figure 10). The average flake weight is directly linked to the relative proportion of cortical and non-cortical flakes in a sample, and the effect of this factor on waste flake histograms is demonstrated in Figure 13, where the cortical flakes from trench 3 are contrasted with the total sample. Since this factor is crucial, the composition of the present samples in this respect can be summarised:

	Percentage of complete flakes		
	Tertiary	Secondary	Primary and cortex
Trench 3	67.0	31.0	2.0
Trench 4	70.7	26.3	3.0
Trench 8B	53.8	44.6	1.6

This shows a similarity between the samples from trenches 3 and 4, and a disparity between the trench 4 and trench 8B samples, in direct contrast to the picture obtained from the histograms. Since cortical flakes are, as has been shown, larger on average than tertiary flakes, it is possible to conclude that in the trench 8B sample there is a tendency towards smaller flakes on average than amongst the trench 4 flakes, because the proportion of secondary flakes is much higher, despite the near identity of the histograms. On the other hand, the divergence between the trench 3 and trench 4 histograms can be taken at face value as indicating a population of larger flakes in the trench 3 sample.

Far more significant than the relatively small contrasts amongst the length and breadth measurements are the total size ranges which they document. At Grimes Graves flakes which exceed 20cm in length are not uncommon, and all of the histograms show flakes in excess of 8cm in either length or breadth. This should be viewed in conjunction with the data on implement size (e.g. Figures 8 and 14), and does in itself attest the presence of large cores, and in turn large size raw material.

When the B:L ratio of waste flakes is considered, it has been shown that the histograms are not unduly biased by the presence of many very small flakes, nor by the relative proportions of cortical and non-cortical flakes. Therefore the histograms for the ratio can be directly compared, allowing the conclusion that these waste flakes show an overwhelming tendency towards broadness, with flakes in the ratio 2:5 or under forming an insignificant minority.

In addition to the three large samples, two small samples of 200 complete flakes were analysed from trench 2A, and from the 1B layers of the 1971 shaft fill. The histograms obtained for these flakes (Figure 4), when contrasted with these for the large samples, are very dissimilar, especially in the absence of small flakes. This divergence is in part due to the fact these are not total samples of waste flakes from areas of intensive *in situ* knapping, and to the lower recovery thresholds during the excavation of the deposits from which they derive. This being the case, the most striking feature of the length and breadth histograms is the large size of flakes which they attest. The average flake weight of 26.75g for the flakes from trench 2A, and of

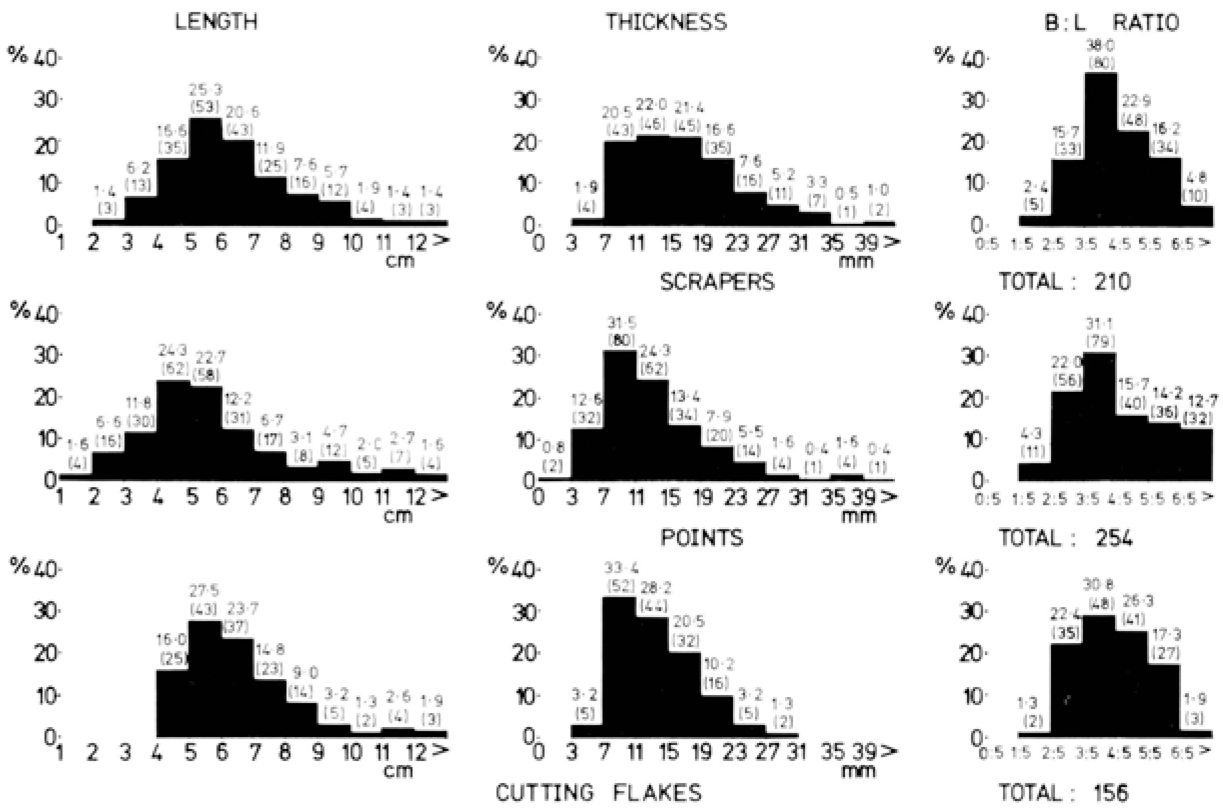


Figure 14 Bulked samples of scrapers, points and cutting flakes from the surface area and the 1971 shaft

56.75g for those from the 1971 shaft contrast with the maximum of 14.7g from the large samples. The B:L ratio for the small samples shows a peak between 3:5 and 4:5, rather than at 4:5 – 5:5 as in the large samples, but in both of the small samples there is a high percentage over 5:5, and the contrast is not thought to be significant beyond the trend for longer flakes to be narrower than short ones, as was documented by the sub-samples of flakes over 2cm long from trenches 4 and 8B (Figures 10 and 12). The differences which are apparent between the histograms for the small samples can again be related to the types of flakes involved by contrasting the presence of cortical to non-cortical flakes.

Percentage of complete flakes

	Tertiary	Secondary	Primary and cortex
Trench 2A	61.5	38.0	0.5
1971 shaft	30.0	68.0	2.0

The trench 2A sample has more tertiary flakes and this is in accord with the higher proportion of small flakes in the corresponding histogram (Figure 4), while the 1971 shaft sample has more cortical flakes and therefore fewer small flakes in the histogram.

Faceted platform flakes were present in the analysed samples in the following percentages: trench 3 (4.1), trench 4 (4.9), trench 8B (4.4), trench 2A (9.5), and the 1971 shaft (6.0). The percentage values for the large samples are remarkably constant, and are also fairly low. Since analyses demonstrated that faceted butt flakes are on average larger than the norm in any sample (Figures 10 and 12), the higher faceting indices obtained from the two small samples can be explained by the large average size of the flakes in those samples, though this obviously does not apply to the trench 3 sample, which despite its relatively large flakes has the lowest faceting percentage. The range between the maximum and minimum percentage values, however, is very small, and it must also be considered that faceted platform flakes, like Levalloisoid flakes, will be under-represented in any sample because of the higher probability of such flakes being used as implements. No record was kept of the total number of Levalloisoid flakes in the large waste flake samples, but the smaller samples from trench 2A and the 1971 shaft both contained only 0.5%.

Core rejuvenation flakes were notably infrequent among the waste flakes. The three large samples included only 89 complete examples of rejuvenation flakes between them, and of these flakes struck from an existing platform to remove irregularities, or triangular sectioned flakes struck obliquely to the platform to rejuvenate the platform edge, were the common types. However, when the rejuvenation flakes are considered in relation to the complete cores recovered from the same deposits, the following ratios for rejuvenation flakes to cores obtain: trench 3 (21:15), trench 4 (43:9), and trench 8B (25:32). This indicates that in trenches 3 and 4 at least, rejuvenation was perhaps more prevalent than the number of rejuvenation flakes suggests. The core rejuvenation flakes were shown during the analyses to be distinctive as a group in being on average much larger than the normal flake. However, as was suggested in the typological introduction, there are difficulties in identifying rejuvenation flakes and it may be that the large flakes are more easily recognised.

The waste flake samples have emphasised the major characteristics of the Grimes Graves flakes, which are a potentially large size and a broad shape. Within the samples there were few variations or similarities which could not be explained by reference to circumstantial rather than cultural/chronological factors. However, it was noted that there was a tendency for the Bronze Age flakes to be proportionately smaller than the Late Neolithic ones, and the most economic explanation for this is that it relates to the predominant use of non-floorstone flint in the Bronze Age industry. The statistics for B:L ratio indicate a substantial agreement in overall flake type between the Late Neolithic and Bronze Age industries, and this is corroborated by the similar percentage of faceted butt flakes in the samples. (The evidence provided by the cores from the 1972 shaft fill did suggest that prepared platform technique was less common in the Bronze Age industry, however, so this may be an instance of bias from contamination). This basic similarity is regarded as being technologically significant, but without necessarily having any cultural overtones in the sense, for example, of continuity.

Chipping floors producing thousands of tiny flakes have frequently been noted at Grimes Graves (e.g. Armstrong 1934, 387; Peake 1916, 272), and the trench 4 and trench 8B samples come from *in situ* deposits of knapping debris of this sort. It must be stressed that there is little reason to regard such floors as unusual in a Neolithic—Bronze Age context, except quantitatively, in the sense both of the large number of such floors at Grimes Graves, and in the amount of debris each contains. This is a direct consequence of the abundant raw material, and only ultimately relates to the nature of the site as a mining area, and hence it does not affect the supposition that qualitatively similar floors are likely to be found on any Neolithic—Bronze Age site at which flint was knapped. The major difference between Grimes Graves and other sites in this respect, apart from quantity, is that the special conditions which pertain at Grimes Graves have led to the preservation of many chipping floors intact. For example, the knapping debris in trench 4 was sealed by a chalk dump, and the debris in trench 8B was sheltered between two dumps, whereas on other sites disturbance of one kind or another is the norm, just as has occurred with the trench 2A and 1971 shaft fill deposits. The implications of this for the interpretation of chipping floors at Grimes Graves and the activities they imply will be considered later, but it is important to stress here that differing histograms will be produced by waste flakes sampled from *in situ* deposits as opposed to disturbed deposits.

With this in mind the metrical evidence obtained from the Grimes Graves waste flakes can be compared with data obtained from other Neolithic sites. The following two tables (Tables XXVI and XXVII) summarise the information on waste flakes from Broome Heath, Norfolk (Wainwright 1972), Durrington Walls, Wiltshire (Wainwright and Longworth 1971), and Windmill Hill and the West Kennet Avenue, Wiltshire (Smith 1965). All the figures given are percentages of the total sample in each case, and while those for Windmill Hill and the West Kennet Avenue have been accurately calculated from published totals, those from Durrington Walls and Broome Heath have been estimated from published histograms.

Table XXVI gives the waste flake length ranges, with the samples arranged according to the total percentage value in excess of 6cm.

Immediately noticeable is the low representation of small flakes (under 2cm) in the comparative samples. As was suggested by the previous discussion, this is undoubtedly partly because these are not homogeneous samples for *in situ* deposits, and partly because of the recovery thresholds which applied in the respective excavations. It may also have to do with the post-excavational processing of the samples, since it is not usually stated how the flakes included in the measured samples were selected from the

Table XXVI. Comparative analysis of waste flake lengths

	Length range in cm divisions										Total in sample
Assemblage	0	1	2	3	4	5	6	7	8	>	
West Kennet Avenue	—	16.2	37.8	28.9	13.0	3.3	0.8	—	—		1383
Windmill Hill (primary levels)	—	8.1	37.5	33.7	15.1	4.3	1.0	0.3	—		1443
Grimes Graves trench 8B	8.0	36.0	23.0	14.0	11.0	5.0	2.5	1.0	0.5		1594
Durrington Walls (Middle Neolithic)	—	2.0	16.0	43.0	25.0	9.0	2.0	1.0	2.0		290
Grimes Graves trench 4	5.5	37.0	26.5	12.5	7.5	5.0	3.0	1.25	1.75		1360
Durrington Walls (Late Neolithic)	—	2.0	21.0	32.0	24.0	14.0	5.0	1.0	1.0		1650
Broome Heath (Pits)	—	—	5.0	37.0	36.0	14.0	5.0	2.0	1.0		528
Broome Heath (Old land surface)	—	—	5.0	37.0	34.5	14.5	6.0	2.0	1.0		1020
Grimes Graves trench 3	5.25	26.25	21.5	15.75	10.5	8.0	4.0	3.0	5.75		780
Grimes Graves trench 2A	1.5	11.0	17.0	13.0	16.0	16.5	9.0	6.0	10.0		200
Grimes Graves 1971 shaft	—	0.5	3.5	14.5	19.5	18.0	17.0	8.5	18.5		200

total apparently available (e.g. at Broome Heath: Wainwright 1972, 50). All the comparative samples are bulked samples, and in this respect they are more directly comparable to the two small Grimes Graves samples. In the case of the Broome Heath samples, for example, it is extremely unlikely that flakes under 2cm long did not exist on the site, so that any consideration of the percentage values for the length ranges given must take this into account. This point should be clear from the analyses of the part samples from trenches 4 and 8B (Figures 10 and 12). It may be significant that the West Kennet Avenue sample has a high percentage under 2cm long, since this is a sample from an occupation surface, as opposed, for example, to the Windmill Hill sample, which was taken from material redeposited in ditches.

Also, when interpreting the data from the comparative samples, all those other factors to which attention was drawn during the analyses of the Grimes Graves samples must be taken into account. For example, in the case of the Windmill Hill and West Kennet Avenue samples, the details of the proportions of cortical and non-cortical flakes are given (Smith 1965, Figure 38), and since these show that the incidence of cortical flakes is in inverse proportion to the incidence of small flakes, it can be concluded that the West Kennet Avenue sample has a much higher proportion of small flakes than that from Windmill Hill, despite Smith's conclusion to the contrary (ibid, 89). The Windmill Hill and West Kennet Avenue samples are thus more suitable for use in comparison with the Grimes Graves statistics than those from Durrington Walls and Broome Heath, which are severely limited in value because no information at all is given of the types of flakes involved in the samples. Wainwright's (1972, 50) conclusion that flakes from Broome Heath are on average larger than those from Windmill Hill cannot be substantiated because it is based upon a straightforward comparison between histograms, which might not be valid if more details were known.

In general it would seem that the only safe conclusion to be drawn from this comparison of waste flake lengths is that the potential for producing large flakes is greater at Grimes Graves than elsewhere, and this is related to the raw material available, and is in no way a cultural/chronological phenomenon. In this respect it is worth noting that Bradley (1970, 347) mentioned the possibility of a chronological correlation between increase in length amongst flakes from the Beaker assemblage at Belle Tout, Sussex. However, since Bradley's chronological sequence is strictly paralleled by the percentage increase of cortical flakes in his samples, and since the samples are so small, this seems unlikely. It remains to be demonstrated that changes in waste flake length relate to anything other than the raw material available, though it is hypothetically feasible that length variation could have cultural significance.

On the other hand, the authors of the reports from which the comparative samples are taken are united in suggesting that the B:L ratio of waste flakes is potentially of direct cultural significance. The Grimes Graves analyses have confirmed that the B:L ratio is relatively constant despite the fluctuation of other variables, making this statistic more suitable for inter-assemblage comparison. Waste flakes inevitably form a spectrum from narrow to broad, and flakes of all proportions can be expected in any assemblage, but a basic distinction can be drawn between predominantly narrow and predominantly broad assemblages. Accordingly, the assemblages in Table XXVII are arranged according to the total percentage narrower than 3:5.

In terms of relative narrowness and broadness, an approximate dividing line can be drawn in Table XXVII between the Durrington Walls Middle Neolithic sample and the Grimes Graves trench 3 sample, the former having 35% narrower than 3:5, the latter only 21.5%. Samples above this line can be classified as assemblages in which blades constitute a significant element, whereas those below are assemblages in which blades are infrequent. It should be noted that the maximum percentage for blade-like forms (i.e. narrower than 3:5) is the 55% in the Broome Heath (pits) sample.

The trend for an increase in average flake broadness during the Neolithic period has often been noted, and is confirmed by the above sequence. Bradley (1972A, 98) has suggested that the trend continues well on into the Bronze Age, and the Grimes Graves Middle Bronze Age sample would seem to be in accord with this. The sequence can equally well be demonstrated (with minor modification) by taking the total percentage of broad flakes in each sample (i.e. over 4:5), and this is done in Table XXVIII which attempts to show the cultural and chronological perspective of the sequence.

Table XXVIII appears to demonstrate the validity of the trend to broad flakes in chronological terms. The total percentage swing in this case is somewhat higher than in the sequence of blade-like forms under 3:5. The Broome Heath

Table XXVII. Comparative analysis of waste flake shapes

	Breadth: Length ratio								Total
Assemblage	0:5	1:5	2:5	3:5	4:5	5:5	6:5	>	in sample
Broome Heath (pits)	—	9.0	46.0	30.0	11.0	4.0	—		528
Broome Heath (old land surface)	—	7.0	40.0	35.0	14.0	4.0	—		1020
Windmill Hill (primary levels)	0.3	10.9	29.4	24.9	21.0	13.5	—		1443
Durrington Walls (Middle Neolithic)	—	6.0	29.0	29.0	23.0	7.0	6.0		290
Grimes Graves trench 3	—	4.0	17.5	23.5	27.5	15.0	12.5		780
West Kennet Avenue	—	3.1	17.4	24.4	25.4	29.7	—		1383
Grimes Graves trench 2A	—	2.0	17.0	31.5	17.5	17.5	14.5		200
Grimes Graves trench 4	—	2.5	16.0	23.5	28.0	15.5	14.5		1360
Grimes Graves trench 8B	—	1.5	12.25	22.25	31.0	15.5	17.5		1594
Grimes Graves 1971 shaft	—	0.5	12.0	31.0	26.0	19.0	11.5		200
Durrington Walls (Late Neolithic)	—	1.0	10.0	21.0	28.0	19.0	21.0		1650

Table XXVIII. Correlation between waste flake broadness and cultural context

Assemblage	Percentage over 4:5	Approximate date bc	Pottery style	Type of site
Broome Heath (pits)	15.0	2600	Grimston	Settlement
Broome Heath (old land surface)	18.0	3400 – 2200	Grimston	Settlement
Windmill Hill (primary levels)	34.5	2900 – 2600	Hembury/Abingdon/ Windmill Hill	Causewayed camp
Durrington Walls (Middle Neolithic)	36.0	2600 – 2400	Windmill Hill	Settlement
Grimes Graves trench 4	48.0	1800	Grooved ware	Flint mine
Grimes Graves trench 2A	49.5	Late Neolithic/ Bronze Age	—	—
Grimes Graves trench 3	55.0	1800	Grooved ware	Flint mine
West Kennet Avenue	55.1	Late Neolithic	Peterborough/Beaker/ Grooved ware	Stone row/occupation
Grimes Graves 1971 shaft	56.5	Late Neolithic/ Bronze Age	—	—
Grimes Graves trench 8B	64.0	1100	Middle Bronze Age urn	Settlement
Durrington Walls (Late Neolithic)	68.0	2000 – 1900	Grooved ware	Henge

samples are quite distinct from all the rest including Windmill Hill in their lack of broad flakes, and it is unfortunate that no other Early Neolithic samples are available for comparison. There is also a wide divergence amongst the predominantly broad samples, with a 20% gap between the Grimes Graves trench 4 sample and that from the Late Neolithic occupation at Durrington Walls.

The phenomenon of increasing flake broadness during the Neolithic seems first to have been referred to in a British context by Case (1952, 10), though he apparently regarded it at the time as a consequence of declining expertise in flint working in the Late Neolithic. This explanation has not been taken up, and subsequent writers have merely noted the trend without seeking to explain it (e.g. Wainwright 1972, 50). The evidence now available from Grimes Graves and other Late Neolithic sites which have produced large flint assemblages, is sufficient to contradict any theories of declining flint technology, since if anything the reverse is true, and other explanations must be sought.

To a certain extent, the trend to broader waste flakes is a natural concomitant of the phasing out of blade tools, and therefore blade cores, during the Neolithic. For example, it has been shown in previous sections how the predominant types of flake tools at Grimes Graves, the points, scrapers and cutting flakes, are all customarily broader than 3:5. Similarly, some of the core types at Grimes Graves, particularly the discoidal D/E type, are specifically suited to the production of broad flakes, and it has been confirmed (Figures 10 and 12), that the prepared platform technique in general produces broad flakes. This leads to the conclusion that broad flakes were the intentional product at Grimes Graves, and that broad flakes were therefore the most suitable for the implements required. The problem is thus to decide what induces the changeover during the Neolithic from implements based predominantly on blade-like flakes, to those based predominantly on broad flakes. As yet there seems insufficient data to even suggest whether the parameters of this changeover are functional, cultural, or purely technological.

Cores (Figures 16 – 30)

The various groups of cores which were analysed are summarised in Table XXIX with reference to the main core classes involved.

The overall percentages from the combined samples indicate a progressive decrease through the classes from the 34.5% for the single platform A cores to 12.2% for the keeled D/E cores. However, the individual core samples show divergences within this overall pattern, for instance the difference in percentage representation of class C cores from the low value of 15.0% for the 1972 shaft sample, to the high value of 30.4% for the 1971 shaft (deposit under 1B) sample, and also the low value of 2.9% for the class D/E cores from the latter sample. In order to be able to assess the substance of such divergences and similarities as revealed by Table XXIX, further information is required on the cores which make up the samples.

With the three largest samples it was possible to provide histograms for the maximum dimension and weight ranges of the cores, and Table XXX summarises the data obtained.

In maximum dimension there is a clustering in the 6 – 14cm range for all three samples, but within this bracket there are potentially significant trends in the high percentage of cores from the 1972 shaft sample which fall between 6 – 10cm, and the contrasting grouping of the other two samples at the opposite end of the range, particularly in the case of the 1971 shaft sample which has 33.3% of its total larger than 12cm.

In weight a similar pattern is indicated by the peak of the 1972 shaft sample between 100 – 200g, the more extended peak of the trench 2A sample between 100 – 300g, and the diffuse clustering of the 1971 shaft sample between 100 – 400g. The cores from the latter sample spread out into the higher weight ranges so that 25.5% of the total are in excess of 600g, as opposed to 10.0% of the 1972 shaft cores, and only 5.25% of the trench 2A cores. At the opposite end of the scale the percentage of cores which weigh less than 100g shows a corresponding variation.

Table XXIX. Cores analysed by main classes

Assemblage	Main core classes								Total
	A		B		C		D/E		
	No.	%	No.	%	No.	%	No.	%	
1971 shaft, deposit under 1B	64	37.4	50	29.3	52	30.4	5	2.9	171
1971 shaft, sections 5 – 7	4	—	7	—	19	—	6	—	36
1972 shaft	144	40.7	110	31.1	53	15.0	47	13.2	354
Trench 8B, south-west	9	—	11	—	6	—	6	—	32
Trench 2A	102	29.5	106	30.6	91	26.3	47	13.6	346
Trenches 3 – 4, layer 3	9	—	5	—	4	—	6	—	24
Totals	332	34.5	289	30.0	225	23.3	117	12.2	963

Table XXX. Cores analysed by size and weight

Maximum dimension in cm	Percentage values			Weight in g	Percentage values		
	1971 shaft	1972 shaft	Trench 2A		1971 shaft	1972 shaft	Trench 2A
0 – 2	—	—	—	0 – 100	0.5	11.0	6.0
2 – 4	—	0.3	—	100 – 200	18.0	33.1	33.5
4 – 6	0.6	1.4	2.5	200 – 300	18.0	21.8	27.0
6 – 8	8.8	23.1	17.75	300 – 400	19.0	14.2	17.25
8 – 10	32.0	41.3	29.0	400 – 500	12.0	5.7	7.0
10 – 12	25.3	18.1	31.5	500 – 600	7.0	4.2	4.0
12 – 14	21.6	11.6	14.75	600 – 700	7.0	3.7	2.0
14 – 16	7.6	3.4	3.25	700 – 800	5.0	1.7	1.0
16 – 18	2.9	0.8	1.0	800 – 900	3.5	1.4	0.25
18 – 20	0.6	—	0.25	900 – 1000	0.5	0.6	0.25
20 +	0.6	—	—	1000 +	9.5	2.6	1.75

When these data on core size are contrasted with the core class sub-divisions, it can be seen that the high percentages of class C cores in the 1971 shaft and trench 2A samples correlate with the high percentages of large and heavy cores in these samples. That this is a meaningful correlation is confirmed by the fact that class C cores are on average heavier than those in the other classes. This pattern is confirmed by the small sample of thirty six cores from the fifth to seventh sections of the 1971 shaft fill, which included nineteen (53%) class C types, amongst which the average size was exceptionally large, with twenty cores weighing over 1kg, and twenty one measuring over 14cm.

Another factor to be taken into account is the raw material used for flaking. Table XXXI summarises the information obtained from an examination of the cortex remaining on the cores.

This table suggests that in the large samples floorstone was not an important element (though the estimate for the trench 2A sample is markedly higher than the others), while the 1971 shaft (sections 5 – 7) sample, and the layer 3 sample from trenches 3 – 4, are predominantly composed of floorstone. This evidence from the cortex points to a correlation between floorstone and large core size in the case of the sample from sections 5 – 7 of the 1971 shaft, in direct contrast to the large size of the cores from the deposit under 1B in the 1971 shaft, since in this case the flint is almost wholly of non-floorstone type. Since the smaller cores from the 1972 shaft sample are also predominantly of non-floorstone flint, it is not possible to make a direct correlation between type of raw material and size of core, though it might be feasible to expect a larger average core size in a floorstone based assemblage.

Further information can be gained from a consideration of the incidence of prepared platform technique amongst the cores, as recorded for the three large samples (Table XXXII).

Table XXXII shows that prepared platforms are not common when the total range of cores is considered, but that this is not the case for each of the core classes. As might be expected, prepared platforms are most frequent on class D/E cores, but it is nevertheless important to note that they are not solely restricted to this class. Levalloisoid cores, or cores which approach this form, will normally be classified as D, or occasionally as E, since they have a curvilinear, circumferential, or partly circumferential keel, formed by flaking which is largely preparatory to the platform (e.g. F35, 36 and F47 Figures 22, 24). In this respect Levalloisoid cores constitute a special sub-type of class D cores of discoidal or similar shape, as opposed to the standard class D form (e.g. F34, F56 Figures 22, 26), which has bifacial flaking about a keeled edge, with ostensibly usable flakes struck off on both sides of the edge. When prepared platforms are present on cores of classes A – C, the flakes which are struck from these

Table XXXI. Cores analysed by cortex type

Assemblage	Total	Total cortical		Probably floorstone		Not floorstone		Not assessed	
		No.	%	No.	%	No.	%	No.	%
1971 shaft, deposit under 1B	171	158	92.4	8	5	101	64	49	31
1971 shaft, sections 5–7	36	33	—	32	—	—	—	1	—
1972 shaft	354	328	93	16	5	252	77	60	18
Trench 8B, south-west	32	29	—	—	—	18	—	11	—
Trench 2A	346	302	87.3	56	18.5	102	33.9	144	47.6
Trenches 3–4, layer 3	24	22	—	17	—	1	—	4	—
Totals	963	872(90%)		129	14.8	474	54.4	269	30.8

Table XXXII. Cores analysed by presence of prepared platforms

Main core class	1971 shaft		1972 shaft		Trench 2A		Grand total	Grand total prepared	%
	Total	Total prepared	Total	Total prepared	Total	Total prepared			
A	64	2	144	21	102	9	310	32	10.3
B	50	4	110	16	106	6	266	26	9.7
C	52	3	53	8	91	17	196	28	14.2
D/E	5	2	47	15	47	25	99	42	42.5
Totals	171	11(6.4%)	354	60(17%)	346	57(16.4%)	871	128	14.7

platforms are not normally Levalloisoid, since the dorsal flake scar pattern on the flakes will be the same as on flakes from plain A–C cores, though in fact, a similar effect can be produced from technically B or C cores when flakes from two or more directions have been struck across the same surface (or even from A cores with previous flaking), or from technically A–C cores where the platform is slightly curved, and in this latter instance such cores could probably be described as semi-Levalloisoid. Only on classes A and D cores does the prepared platform necessarily apply to the flake product as a whole, so that, if the number of prepared platforms were expressed as a percentage of the total platforms rather than of the total cores, a smaller figure would be obtained, because the B and C cores involved rarely have more than one platform prepared. It will be noted that the low percentage of prepared platform cores in the 1971 shaft sample (6.4%), correlates with the low percentage of D/E cores (2.9%), precisely because prepared platforms are most common on D/E cores. This occurrence, which would also mean the virtual absence of faceted butt flakes, cannot be explained, but it is a further pointer to the atypical character of the deposit from which this sample derives.

From the analyses of the three large samples, previous flaking could be shown to be a significant factor, with the cores involved having passed through various stages of flaking before arriving at their present fossilised forms, which can only be classified according to the number and type of platforms which remain. Previous flaking as described here is quite distinct from the re-use of cores which can sometimes be detected from the evidence of two-phase cortication, and simply refers to the method of progressively flaking a core from fresh platforms. In order to assess the true importance of the main core classes, the number of cores with previous flaking must be considered, and Table XXXIII summarises the information for the three large core samples.

Table XXXIII demonstrates that overall, approximately 55% of these cores had signs of previous flaking. Previous flaking was most common on cores of classes B and C, and less common on cores of classes A and D/E. It can be concluded from the table that as many as 59.4% of the A cores could be single platform cores in origin, as opposed to being residual stages of previous flaking, and so on for the other classes, thereby justifying the isolation of the platform classes. The relatively low percentage of cores with previous flaking in class A, can be compared with the relatively high percentage of this class of core overall, to indicate the predominance of this core type. The relatively high percentage of class B cores with previous flaking demonstrated that multi-platform flaking is even more common than the simple division by core classes suggests. The very high percentage of previous flaking amongst the trench 2A sample is anomalous, and does not seem to relate to any of the other core traits defined, except the low percentage of class A cores in this sample.

By recording, wherever possible, the type of blank on which a core was based, it could be shown that cores on flakes were a common occurrence, being present amongst the three large samples in the following percentages: 1971 shaft (16.4%), 1972 shaft (38.0%), trench 2A (41.0%). It should not be imagined that cores fashioned on flakes are necessarily small and thin (though this can be the case, e.g. F44, Figure 23), but rather that the use of flakes as blanks

Table XXXIII. Cores analysed by presence of previous flaking

Main core class	1971 shaft		1972 shaft		Trench 2A		Grand Total	No. with previous flaking	%
	Total	No. with previous flaking	Total	No. with previous flaking	Total	No. with previous flaking			
A	64	25	144	49	102	52	310	126	40.6
B	50	21	110	58	106	86	266	165	62.0
C	52	25	53	37	91	83	196	145	74.0
D/E	5	2	47	13	47	31	99	46	46.5
Totals	171	73(42.8%)	354	157(44.3%)	346	252(72.8%)	871	482	55.3

reflects a situation where the raw material is of a sufficiently large size to make this convenient, so that a nodule might be reduced by flaking to one or more suitable core shapes. Also, as a consequence of the large size raw material, it is possible for the flake blank technique to apply to the re-use or rejuvenation of existing cores, since it is often the case that large flakes are struck off from cores and themselves used as cores, especially by flaking across the resulting bulbar surface, e.g. F25 (Figure 20). A further sub-type of this technique is the quite distinct practice of striking large flakes from the exterior of floorstone nodules and flaking across the bulbar surface, usually from a prepared platform (e.g. F24, F28 and F29, Figure 21), and it is of interest to note that it has sometimes been claimed that the flint closest to the exterior of the nodule is somehow of better quality (Clarke 1935, 49). The Levalloisoid cores are also often on flakes from the exterior of nodules, e.g. F47 (Figure 24), and in this sense there must be substance to the argument for the correlation between the occurrence of Levalloisoid flaking technique and the presence of large size raw material, because only flint comparable in type to floorstone could provide such flakes.

The contrast in the percentage of cores on flakes between the samples is fairly marked. The low percentage amongst the 1971 shaft cores may well relate to the low presence of class D cores, since it was found that in the 1972 shaft sample sixteen of the thirty one D cores, and in the trench 2A sample, nine of the sixteen D cores, were on flakes. It may also be that, despite the high average size and weight of the cores from the 1971 shaft, since the raw material used in the deposit under 1B was topstone nodules of irregular shape (e.g. F23, Figure 19), these were perhaps less conducive to subdivision, though this did not apply to the 1972 shaft sample which also used topstone flint.

Other points which emerge from the analyses are the virtual absence of blade cores, and the extremely low percentage of secondary usage for all purposes except as hammerstones, a factor which can presumably be linked to the abundance of raw material which made the flint contained in abandoned cores expendable.

While the cores from the deposit below the 1B layers in the 1971 shaft, together with those from the fill of the 1972 shaft, represent a Middle Bronze Age sample, there is no large collection of cores which could be used as a Late Neolithic group. Nevertheless, it seems clear that a basic difference is provided by the raw material used, which is almost exclusively floorstone in the Late Neolithic, and predominantly topstone in the Middle Bronze Age. This largely explains the size range difference between Late Neolithic and Bronze Age cores. It is also possible to suggest that the Bronze Age cores include few class D/E forms and have few prepared platforms or 'fancy' types such as Levalloisoid cores, while these were specifically appropriate to the Late Neolithic assemblage.

The large core samples from Grimes Graves are therefore of more interest in providing an overall impression of Bronze Age knapping for external comparison, than for intra-site analysis. Table XXXIV summarises the information on core classes available from various English post-Mesolithic assemblages. The assemblages are listed according to the percentage total of class C cores they contain. At the base of the table are included three further samples which are numerically insufficient for conversion to percentages.

The most obvious contrasts are the high percentage of class C cores in all the Grimes Graves samples, and the high percentages of class D/E cores at Arreton Down, Hurst Fen and Lion Point, but any interpretation of these contrasts is hampered by lack of qualitative information on the cores involved. Only for Windmill Hill (Smith 1965, 87) and Arreton Down (Alexander and Ozanne 1960, 285) are any data on core size available. At Grimes Graves it is suggested that the high presence of class C cores is linked to the large size of raw material available, which permits multi-platform flaking. This contrasts with Durrington Walls where mined flint may also have been available, but where class C cores are absent, though there is no information on core size.

Bradley (1970, 346) has drawn attention to an increase in multi-platform flaking of possible chronological significance (specifically contrasting Windmill Hill and Hurst Fen with West Kennet Avenue) in the light of the Beaker cores from Belle Tout. To a certain extent the Grimes Graves data confirm such a trend, but the trend probably reflects the fact that assemblages in which blades are important, as in the Earlier Neolithic, will have high percentages of blade cores which are more likely to be of single or double-platform type because of the exigencies of blade production.

Amongst the cores from Grimes Graves, one of the most significant characteristics is the presence of prepared platforms, and this feature cuts across the core class divisions. It has been suggested that Levalloisoid cores are likely to occur in situations where raw material is abundant (cf Bordaz 1970, 38), and there is some evidence that prepared platforms and discoidal cores do occur at many of the British flint mine sites, as well as on stone-quarry

Table XXXIV. Comparative analysis of core class composition

Assemblage	Percentage in main core class				Unclass	Total	Source
	A	B	C	D/E			
Grimes Graves 1971 shaft under 1B	37.4	29.3	30.4	2.9	—	171	Present Report
Grimes Graves Trench 2A	29.5	30.5	26.5	13.5	—	346	Present Report
Grimes Graves 1971–72 total bulked sample	34.5	30.0	23.3	12.2	—	963	Present Report
Grimes Graves 1972 shaft	40.7	31.1	15.0	13.2	—	354	Present Report
Windmill Hill (primary levels)	45.7	31.0	8.9	14.4	—	271	Smith 1965
Broome Heath	59.0	15.0	6.0	13.0	7.0	399	Wainwright 1972
Arreton Down (Late Neolithic)	46.5	20.5	5.5	27.5	—	165	Alexander and Ozanne 1960
Hurst Fen (Middle Neolithic)	41.0	21.0	5.0	33.0	—	532	Clark *et al* 1960
Lion Point (Late Neolithic)	24	7	—	22	16	69	Longworth *et al* 1971
Durrington Walls (Late Neolithic)	36	12	—	9	—	57	Wainwright and Longworth 1971
Itford Hill (Middle Bronze Age)	25	14	7	4	—	50	Bradley 1972A

locations (Houlder 1961, 129–130). It is also possible that prepared flaking is a trait which gains in importance during the Neolithic, though it is impossible to document this simply from the core class sub-divisions. Wainwright has drawn attention to the presence of prepared discoidal cores at Lion Point (Longworth *et al.* 1971, 121), a site which is of Grooved Ware cultural facies. At Durrington Walls, another Grooved Ware site, the presence or absence of prepared cores is not mentioned directly, but since 30% of the Durrington Walls scrapers have faceted platforms (Wainwright and Longworth 1971, 168), the presence of prepared cores can be assumed. Similarly at the West Kennet Avenue, 40% of the scrapers had faceted butts (Smith 1965, 95), so prepared cores must have been present there too. Discoidal cores also seem to have been a part of the Arreton Down assemblage (Alexander and Ozanne 1960), though the typology of the bifacial core-tools from that site is problematic. The authors (ibid, 291) say that these are not in fact cores, but the parallels they quote, certainly in the case of Grimes Graves, are often with undoubted discoidal cores. Since faceted platform flakes sporadically occur even in the Mesolithic, it clearly requires more detailed analyses before any trends in the incidence of prepared core flaking can be defined. Hypothetically, however, it would seem possible to relate any such increase in the Late Neolithic to the availability of suitable raw material, and to changes in the implement repertoire.

Implements

Altogether some 5098 artefacts were isolated from the total assemblage as being retouched or utilised implements. Table XXXV summarises the implement types which were recognised, and their distribution throughout the various excavation units.

Arrowheads (Figure 30)

The five arrowheads comprise four *petit tranchet* derivatives and a single barbed-and-tanged type (F73). One of the *petit tranchet* derivatives is a *tranchet* form of Clark's (1934) class B type (F72), the others are lop-sided points, one of which (F70), is close to Clark's class G, with lateral edges approximately equal in length, while the remaining two (F71 and F74) are close to Clark's classes H–I, but not identical because they both have bilateral retouch, whereas Clark's definitive trait (ibid, 33) is the retention of a sharp and unretouched primary flake edge.

In addition to these arrowheads, an artefact classified as miscellaneous (F588, Figure 105) was considered to be a possible arrowhead roughout, and a point (F283, Figure 69), which was atypical within the spectrum of points, was regarded as a possible projectile head, though the absence of elaborate retouch prevented positive identification.

The two arrowhead types from the 1971–72 collection, the *petit tranchet* derivatives, and the barbed-and-tanged, conveniently bracket the periods of occupation attested by the other evidence from this part of the Grimes Graves complex, since they are respectively recognised as Late Neolithic and Bronze Age forms. Only one of the arrowheads (F74), a *petit tranchet* derivative, has a firm stratigraphic context, coming from the Late Neolithic assemblage from the old land surface at the edge of the 1971 shaft. Since this assemblage can be linked to the use of Grooved Ware on the site, the arrowhead is fully in accord with the emerging picture of Grooved Ware lithic associations (Wainwright and Longworth 1971, 257–259), which seem to make those *petit tranchet* derivative types which are close to Clark's classes G–I specifically Grooved Ware in affinity. There is no reason to suppose that the three other *petit tranchet* derivatives from the collection cannot be related to the same context as this stratified find, although positive evidence is lacking. The fact that F70 and F71 both come from what are predominantly Bronze Age loci on the site is irrelevant, since both have dense cortication and can adequately be explained as residual.

The *petit tranchet* derivatives are also in accord with previous arrowhead finds from Grimes Graves. Armstrong (1924, 202 and Figure 10), and Clark (1934, 52 and Figure 12, 47), have both described and figured a *petit tranchet* arrowhead from Floor 85c, which Clark regards as a class G form. Armstrong (1934, 387 and Figure 9) subsequently recovered another arrowhead from Floor F of his Pit 12, which with its extensive retouch is unusual, but can best be regarded as a *petit tranchet* derivative of class G–I which is damaged at the base. Peake (1916, 279–280 and Figure 4c) found an implement in Floor 16 which he regarded as a 'hollow tanged scraper', but which, to judge from the

Table XXXV. Implements subdivided by type and provenance: total component

Implement type	1971 shaft	1972 shaft	Trenches 8B & 7B	Trenches 1A & 1B 2A & 2B	Trenches 3–6 layer 3	Trenches 3–6 above layer 3	Unstratified	Grand Total	%
Arrowheads	1	1	1	1	1	—	—	5	0.10
Picks	9	7	4	4	2	5	—	31	0.61
Axes	12	1	1	2	1	—	—	17	0.33
Roughouts	5	—	—	—	—	—	—	5	0.10
Burins	1	5	1	—	—	—	—	7	0.14
Knives	—	2	—	—	2	—	—	4	0.08
Scrapers	49	231	105	78	8	19	—	490	9.61
Points	82	527	239	137	18	5	—	1008	19.77
Rods	14	89	93	83	—	—	—	279	5.47
Cutting flakes	39	122	90	47	26	2	—	326	6.39
Utilised blades	19	188	77	40	24	3	—	351	6.88
Bulbar segments	1	41	28	29	5	—	—	104	2.04
Bifacials	3	1	—	2	—	1	—	7	0.14
Fabricators	1	—	—	—	—	—	1	2	0.04
Multiple tools	—	—	1	2	—	—	—	3	0.06
Microliths	—	—	—	—	2	—	—	2	0.04
Miscellaneous retouched	224	941	591	532	112	57	—	2457	48.20
Totals	460	2156	1231	957	201	92	1	5098	

illustration, is a *petit tranchet* derivative of class G–I, though the given scale of the illustration would make it unusually long at 7.2cm. Kendall, who also thought that Peake's find was an arrowhead (1925, 64), illustrates a possible *petit-tranchet* derivative he found in Floor 75 (ibid, Figure 1), though from the drawing alone this implement is not at all convincing. Finally, Peake (1916) states that many similar implements had occurred as surface finds at Grimes Graves. None of the above finds come from contexts which can be safely described as Late Neolithic, but they do provide confirmatory circumstantial evidence for the prevalence of this arrowhead type at Grimes Graves, and hence for Late Neolithic activity there.

If it can be accepted that the four *petit tranchet* derivatives from the present collection form a near contemporary group, then they would be of especial interest because of the association of the class B form (F72) with the other three, more specifically Late Neolithic (Grooved Ware) forms. Wainwright and Longworth (1971, 258) list only one other class B derivative in possible association with Grooved Ware, and this is from the surface collection from West Stow in Suffolk. Since, in form, F72 does begin to approach Clark's class C1 as originally defined, it should perhaps be mentioned that Wainwright and Longworth (1971, 258) list nineteen class C forms in association with Grooved Ware, from four separate locations, although the illustrated examples of class C1 from Durrington Walls (Wainwright and Longworth 1971, Figure 73, F33), and from the West Kennet Avenue (Smith 1965, Figure 83, F251) bear little resemblance to the Grimes Graves example.

A contemporary association of the class B form with the G–I forms might have important implications, since despite certain common traits, such as the flat retouch, they are clearly different types of arrowhead. Clark, in his original paper (1934, 33), accepted that his class D–I arrowheads would be mounted obliquely rather than transversely, and it is indeed difficult to conceive of F70, F71 and F74 as anything other than pointed arrowheads. Thus the description of these forms as *petit tranchet* derivatives, or transverse arrowheads, is only pertinent insofar as they can be accepted as a typological development from a true *tranchet* form.

It seems to the present writer that the developmental scheme proposed by Clark (1934) need not be the only one which is typologically viable. The class A arrowhead, the true *tranchet*, has been placed at the beginning of the typological sequence because of its possible chronological precedence, since it may occur in Mesolithic contexts. The rest of the sequence hangs upon the derivation of class B from class A, which is merely supposition, since there is no positive evidence for a link between the 'Mesolithic' class A form, and the Neolithic class B. The few class A arrowheads which are found in Neolithic contexts are usually extremely atypical (e.g. Wainwright and Longworth 1971, Figure 73, F32). Generalisations to the contrary (e.g. 'The *petit tranchet* derivative arrowheads are explicitly Mesolithic in ancestry......' Piggott 1954, 285–6), do not in any way affect the issue.

Technologically, it is important to note that F71 from Grimes Graves is in fact manufactured on a ridged flake, with the longitudinal axis of the arrowhead following the bulbar axis of the original flake. The method is completely atypical for the *petit tranchet* derivative as originally defined but can also be noted amongst the Durrington Walls examples (Wainwright and Longworth 1971, Figure 74, F43). In addition, some of the elaborate class G–H forms from Durrington (ibid, Figures 73–74) have extensive, and sometimes completely bifacial, surface retouch, which conceivably owes more to the leaf-shaped arrowhead than any *tranchet* prototype.

These arguments are difficult to stress, however, on the one hand because of the lack of conclusive associations within the Neolithic for the various classes, and secondly because of uncertainty over the functional significance of the classes involved. While it is clear that a *tranchet* arrowhead is very different typologically from a derivative of class G – I, it is not clear the they are different in function. The simple *tranchet* type has often been regarded as the tip of an arrowhead used in specialised hunting situations where a pointed tip was inappropriate, such as for stunning small game like birds, or even fish, though there would seem to be convincing ethnographic arguments both for and against this, and Clark's (1963, 81–82) description of a transverse flint arrowhead found embedded in a human vertebra indicates that their potential should not be underestimated. Other authorities have suggested that transverse arrowheads could be employed to hunt exactly the same game as leaf arrowheads, possibly using a modified hunting technique whereby the aim is to bleed the animal to death rather than kill it outright[7].

The contemporary usage of forms B and G – I as may be suggested by the Grimes Graves evidence would favour the interpretation of different tasks being performed with the transverse and pointed forms. The transverse arrowhead requires a relatively broad flake as a blank, and the abundance of these at Grimes Graves cannot be disputed. The *tranchet* axes and the rods, as well as occasionally other implements, indicate that the fashioning of implements transversely to the axis of the blank was a common procedure on the site, (though primarily a Bronze Age trait). It therefore seems possible to postulate an origin in the Late Neolithic for class G – I forms as an adaptation of the leaf shaped arrowhead to suit the broad flake blanks. Alongside this the *tranchet* arrowhead proper could have an independent origin in the Late Neolithic, or could possibly derive from the pointed type in response to a specialised need, thus effectively reversing the B to I sequence proposed by Clark. Alternatively, it may be that the G – I and B forms as found at Grimes Graves have no relation to the other derivative forms, and that the search for a typological sequence merely imposes an homogeneity which in reality does not exist.

The barbed-and-tanged arrowhead from trench 2A can only be linked typologically to the Middle Bronze Age occupation. The only other arrowhead of this type from Grimes Graves (Armstrong 1932, 59) is equally unstratified.

Picks (Figures 31–39)

The thirty-one artefacts classified as picks do not, as was explained in the typoligical introduction, constitute a very homogeneous grouping, except in the case of the six artefacts which fall into the sub-category of chisel-picks. Of this group only one, F90 (Figure 36), is actually complete (length: 10.6cm, breadth: 3.4cm, thickness: 2.0cm, weight: 61g), but the characteristics of the chisel-pick type are also apparent from F91 and F93 (Figures 36, 37). F80 and F94 (Figures 33, 37) are both presumed to be proximal fragments of similar implements, while number 182/A (not illustrated) is a small distal fragment. These tools appear to be manufactured on flakes, though the original bulbar surface is usually eradicated by retouch. Three of the chisel-picks retain some cortex, and in two cases this is of floorstone type, in the other case unassessible, but an additional example has matt black patches which probably indicate floorstone.

7. This discussion is indebted to similar points raised by Dr I H Longworth in a lecture he gave to the Quaternary Research Association in London on 9 January 1971.

The remaining twenty five picks are difficult to subdivide in any meaningful fashion, and the intention here is simply to review the forms involved and draw attention to some of the similarities and differences. Only twelve of the twenty five are assumed to be complete, and Table XXXVI lists their dimensions. (Where there is no obvious dorsal and ventral surface, a single maximum thickness measurement is given instead of two for breadth and thickness). In addition the dimensions are given at the end of the Table of four picks which were nearly intact, with only minor terminal damage.

This metrical information does suggest a degree of standardization in size, insofar as all but two of the picks listed are longer than 10cm, and perhaps even more so in weight, with twelve of the sixteen falling between 100–200g. The most symmetrical forms amongst the complete picks are F78 and F99 (Figures 32, 38), despite their marked divergence in size, both having bifacial retouch with diamond-shaped or lenticular cross-sections. F79, F83, F89 and F92 are also standard-looking pick forms, all with approximately triangular sections (Figures 33, 34, 36, 37). F83 and F89 have heavily flaked ventral surfaces, and F92 is, (like F100) fashioned on a flake which retains its bulb of percussion and striking platform, while in overall shape these three share a relatively broad butt from which the sides taper towards the point.

F76, F84, F96 and F98 are also readily recognisable as picks, though each has different characteristics (Figures 31, 34, 38). F98 is a triangular sectioned type on a thermal piece of coarse flint, and it is uncertain whether the implement is complete or damaged at the tip, which is also the case with F96, again a triangular sectioned type. F76 is bifacially retouched with an irregular outline and profile, and could perhaps be a roughout rather than a finished form. F84 is atypical within the pick series because it is fashioned on a transverse segment from a broad flake, in exactly the same manner as some of the rods and the *tranchet* axe.

F86 and F88 (Figure 35) are comparable in having thick, stubby butts, but whereas F86 is a fairly light form with an elongated, tapering point, and rather careful retouch, F88 is heavy, with a short, broad point and minimal retouch. The point of F88 is abraded, and may originally have been slightly longer.

The four remaining complete specimens are even more irregular in form, and are not so obviously of pick type. F95 (Figure 37) is simply a large pointed flake with very minimal retouch, and F100 (Figure 39) is also formed on a large flake, though in this case the retouch is heavier, and is secondary to the original cortication of the flake. There is a marked curvature to F100, but this need not detract from a pick-like function, which seems to be confirmed by the abrasion at the tip. F87 (Figure 35) is fashioned on a flake from the exterior of a flawed nodule, so that a large area of inclusion appears on the ventral surface. As with F100, this would appear to be a re-used flake, though practically all the retouch must relate to its present form. The tip is slightly damaged but apparently re-used.

The nine fragmentary picks include two segments, F75 and F77 (Figures 31, 32), from large implements with extensive bifacial flaking and lenticular sections, though in the latter case some doubt must be expressed as to whether this is not rather the pointed butt of an axe than the distal end of a pick. Doubt as to the precise nature of the implement involved is also the case with F81 (Figure 33), which is a butt segment, as is F101 (Figure 39) and presumably F97 (Figure 38). F85 (Figure 34) is on the other hand a distal

Table XXXVI. Picks analysed by size and weight

Illustration	Dimensions in cm				Wt. in g
	Length	Breadth	Thickness	Max. thickness	
F78	15.5	4.5	3.15	—	184
F100	15.3	5.5	2.55	—	148
F96	14.5	5.0	3.2	—	180
F98	14.1	—	—	4.2	190
F95	12.6	5.6	2.4	—	114
F83	12.4	4.2	2.6	—	100
F89	12.0	3.8	2.45	—	80
F86	11.6	—	—	5.5	150
F88	10.5	—	—	7.1	330
F87	10.1	—	—	2.75	110
no. 1358/F (not illustrated)	9.2	—	—	4.2	116
F99	8.3	3.4	2.05	—	50
F79	17.5	—	—	3.7	200
F76	16.1	6.4	3.45	—	320
F92	11.5	4.4	2.8	—	125
F84	10.3	4.5	2.6	—	110

segment, and is therefore undoubtedly of pick type. F82 (Figure 33) has been taken as a pick form, though it does have similarities with rods.

In general, therefore, apart from a few finely flaked forms, and the chisel-picks, the picks are of a rather irregular aspect. In four cases thermal flakes appear to have been used as blanks, and at least two have two-phase cortication. A preference for floorstone was suggested from the evidence of the chisel-picks, and this is possibly confirmed by the other twenty-five picks, eighteen of which retained some cortex, which was thought to be floorstone in five cases, not floorstone in four cases, and unassessible in nine cases, though one of the latter had the matt black surface patches which probably attest floorstone.

Other, more dubious pick-like implements were present in the collection, and there is an undoubted overlap with the heavy points sub-type. F555 (Figure 100) from trench 2A must suffice as a representative of the possible picks which have been excluded from this classification.

In terms of associations, F77 (Figure 32) and F90 (Figure 36) from the layer 3 horizon in trenches 3–6 and F75 and F81 from the 1C layers of the 1971 shaft fill, can be linked with the Neolithic activity on the site. This may imply that the chisel-picks, and some of the more carefully flaked types, are specifically Late Neolithic. Possible confirmation of this in the case of the chisel-picks is suggested by the clustering of the other five examples in the immediate area of the 1971 shaft, and their absence elsewhere on the site.

On the basis of context and cortication, at least four picks, F87, F88, F100 (Figures 35, 39) and number 1358/F (not illustrated), all rather rough-and-ready types, could be linked directly to the Middle Bronze Age occupation. By extension this might also include F79 (Figure 33) from trench 7B, and also F84 from the 1971 shaft on account of its technique. Since none of the more irregular forms can be directly related to the Late Neolithic assemblage, this may indicate a definite contrast between the Late Neolithic and Middle Bronze Age tool-kits. Virtually all of the picks could comfortably be accommodated within a Late Neolithic-Bronze Age time bracket on general typological considerations, with the possible exception of F99 (Figure 38), which stands out because of its small size and distinctive form, and its generally Mesolithic appearance. It cannot be positively classed as Mesolithic, but in view of the presence of Mesolithic cores and microliths the possibility remains open. This pick has an inconclusive stratigraphic context (trench 8B, layer 1A), but its dense white colouration, and rather cherty flint type could confirm a Mesolithic ascription.

Picks are apparently rare on British Neolithic and Bronze Age sites in general, though their occurrence on flint-mine sites has often been noted, even if actual examples are infrequently illustrated. Smith (1912, Plate 24, No. 2) published a pick from Cissbury which might provide a parallel for the Grimes Graves chisel-picks, though its length is somewhat greater.

The presence of picks at Grimes Graves and other mining sites may have specific functional implications, especially as, in the case of the Middle Bronze Age at least, there seems little doubt that they were actually used on site. There is, as has been shown, no reason to link the Middle Bronze Age occupation with mining, and therefore no reason to interpret the picks as mining tools. In the case of the chisel-picks, which may well relate specifically to a mining phase, there is similarly no reason to suppose these were used in mining. On the contrary, their rarity when contrasted with the number of antler-picks recovered, and their absence from the lower levels of the 1971 shaft fill and galleries, is strong circumstantial evidence that neither chisel-picks nor any other types were used in the mining process.

This evidence is in marked contrast to the situation now known to exist in certain continental flint-mines, for example at Ryckholt-St. Geertruid in Holland, where a variety of axe-, adze-, and pick-like flint tools were used for mining, and have been recovered from the shafts in thousands (Felder and Rademakers 1971).

Axes and roughouts (Figures 39–49)

The seventeen implements classified as axes, though forming a more homogeneous grouping than the picks, do include some borderline types, especially amongst the fragments. The ten axes which are complete are described metrically in the same manner as the picks (Table XXXVII).

Table XXXVII. Axes analysed by size and weight

Illustration	Dimensions in cm			Wt. in g
	Length	Breadth	Thickness	
F111	22.0	9.1	3.9	760
F103	15.1	6.5	3.2	280
F104	14.7	6.6	3.1	250
F112	14.0	5.5	2.8	170
F105	13.4	5.3	2.4	160
F116	12.5	5.0	2.75	150
F115	11.4	5.0	2.2	110
F113	10.3	5.1	2.0	90
F114	8.0	4.1	1.8	50
F108	7.6	4.25	1.6	50

As with the picks, 10–15cm is the normal length range, though in view of the small size of this sample, and the inclusion of one axe which is 22cm long, this may be an underestimate. Only in the case of the two smallest axes does the B:L ratio exceed 1:2. It is of interest to note the progressive correspondence between the length and weight values, which is a consequence of the regular and recurrent overall form of an axe, in contrast to the picture obtained from the picks.

Only two pairs of axes are closely comparable in type, and these are the only indication from the present collection that standardised axe types might exist at Grimes Graves. F113 and F115 (Figures 44, 45) are both small axes, fashioned on flakes and extensively retouched dorsally, with more restricted retouch on the ventral surfaces. Both have pointed butts, and 'domed' side profiles which make them properly speaking adziform, and could possibly have been produced from Levalloisoid flake blanks. F104 and F116 (Figures 40, 45) on the other hand, are *tranchet* axes with straight, tansverse cutting edges. On F104 the method of manufacture is clear, the blank being the transverse segment of a broad flake which is then retouched from the lateral breaks. The cutting edge is formed by the unretouched lateral edge of the original flake. Although this axe is a dense white colour all over, careful examination shows that there is two-phase cortication, the retouch being differentially corticated to the original flake. It can be noted that this method of manufacture is identical to that used for many of the rods. F116 is not identical, since it has more extensive retouch, and this retouch obscures the precise method of manufacture. Also, the cutting edge on this axe is slightly damaged. It can be postulated that the method of manufacture was similar to F104, however. This axe is heavily corticated, and coupled with the uncertainty about an original flake surface, it is impossible to say whether the retouch could be secondary or not in this instance. Both the *tranchet* axes have distinctly tapered butts.

F111 (Figure 43), rejoined from two fragments, stands out from the other axes because of its large size. The cutting edge on this axe is not sharp and was presumably unfinished, the break possibly occurring during manufacture. F103 (Figure 40) has a rounded cutting edge which is carefully trimmed, and the tapering butt has been obliquely truncated at the base. F105 (Figure 41) is a narrow, parallel-sided type, only tapering slightly at the butt. The cutting edge is trimmed from the ventral surface only, in the manner of a scraper. The profile of this implement is adziform. F112 (Figure 44) has a somewhat skewed axis, and is slightly damaged on one lateral edge and at the cutting edge, but there seems no reason to suppose that it is not a finished axe. The method of manufacture in the case of all these axes seems to involve the working down of a large flake, using a combination of temporary lateral platforms and keeled flaking.

All the above axes can be described as typologically conventional, but two of the axes in the complete series must be considered unusual or atypical, if indeed they are accepted as axes at all. F108 (Figure 42) which is only 7.5cm long, is the distal terminal of a broad flake which has been retouched from the break on the right-hand side, and trimmed at the top to give a sharp, convex cutting edge. The lateral retouch is plainly intended to reduce the thickness of the flake at that point, and to produce a symmetrical outline with a tapered butt. Typologically, therefore, this is a *tranchet* axe, though the cutting edge has been retouched. There seems no good reason to suppose that this was not a hafted implement, and the same is true for F114 (Figure 44), which is marginally longer, and more extensively retouched, but less regular in form. This implement is somewhat adziform in profile, and its atypical nature is heightened by the fact that the presumed butt end is wider than the cutting edge.

The seven axe fragments display a similar disparity of form, and none can be directly compared with any of the complete examples. Six of the fragments appear to be the butt ends of axes, though it is feasible that F107 (Figure 41) at least, may be from a pick rather than an axe. The exception is F106 (Figure 41), which is possibly a blade-end fragment, though if so the cutting edge must be regarded as unfinished because it still has a zig-zag edge following the negative percussion bulbs. F102 (Figure 39) has been retouched slightly from the break as though some secondary use of the fragment was envisaged. F110 (Figure 42) is the large butt of an axe which was fashioned on a sizeable faceted platform flake. This implement is significant in being the only clear example from the present collection of the prefabrication of axe blanks in the form of faceted platform flakes which required only minimal post-flake retouch. F118 (Figure 46) is comparable to the last example in size, but is not so regular and there is no sign of an original flake surface. This piece could come from a rough-out rather than a finished tool. F109 and F117 (Figures 42, 45) are both manufactured on thermal flakes, and should perhaps be regarded as only possibly axe fragments. F109 has broken after impact from the edge, leaving a bulb on the left-hand side of the break, possibly pointing to a misdirected blow during manufacture.

Four of the complete axes, and three of the fragments, retain some cortex, and of these only one (F107, Figure 41) can definitely be identified as floorstone, the others being unassessible. The large axe, F111, (Figure 43) is of particular interest in this respect because the small patch of remaining cortex could conceivably be of topstone type. Three of the axes, F103, F106 and F112 (Figures 40, 41, 44) have small areas of matt black surface as is particularly found on floorstone, and F110 can almost certainly be regarded as floorstone in view of its size, type, cortication and context, which by extension could be used to include F103. F102 on the other hand is emphatically not from floorstone, and the very coarse flint from which it is made leads to the suspicion that it is not actually of Grime Graves flint. F109 and F117 are presumably also not of floorstone derivation (Figures 42, 45).

In addition to the artefacts classified as axes, there were several other pieces in the collection which were tentatively thought to be axe- or adze-like implements. Two such artefacts from trench 2A, classified as miscellaneous retouched, have been illustrated: F525 (Figure 94) on a very broad flake, and F570 (Figure 102) a rough-and-ready chopper tool type. F505 (Figure 92) from trench 8B is a thermal, wedge-shaped piece of flint which appears to have been adapted for use as an adze-like implement. Also somewhat adziform in type, are the rather more elaborately retouched implements F583 and F584 (Figure 104) from trench 1A, though the function of this sort of tool is more doubtful.

The identification of artefacts which belong to the roughout category posed such problems that it was finally decided to restrict the classification to five pieces from the fill of the 1971 shaft. These were measured in the same way as the axes (Table XXXVIII).

Table XXXVIII. Roughouts analysed by size and weight

Illustration	Dimensions in cm			Wt. in g
	Length	Breadth	Thickness	
F123	18.6	7.5	2.2	320
F120	17.6	5.4	2.4	200
F122	17.4	10.1	5.7	1000
F119	14.3	7.1	3.5	410
F121	14.0	7.9	3.6	390

The metrical details suggest in a very crude sense the potential for producing axes from these artefacts, though the thinness of two examples (2.4 and 2.2cm) is problematic. As can be seen from the illustrations however, the two thinnest roughouts F120 and F123, as well as F121 (Figures 47, 49), are bifacially flaked forms which distinctly resemble axes. F121 has obvious butt and working ends, but the cutting edge is still jagged without any retouching of the ridges remaining between the negative flake scars. The ventral surface has been used as a platform for flaking the dorsal surface, leaving the edges unifacially flaked, except for some slight bifacial keeling on the right-hand side. F120 has been rejoined from two segments, and in some respects, for example the bilateral edge trimming on the upper segment, resembles a finished tool, but if so it would have to be regarded as some kind of pick variant rather than an axe, since it does not have a cutting edge. On the other hand, a roughout stage is suggested by the twisted profile. F123 has been bifacially flaked, but again it lacks any fine edge trimming. The blank is a large flake which must have been thin originally.

The other two artefacts in this category, F119 and F122 (Figures 46, 48), are completely different, and must be representative of a much earlier stage of the manufacturing process, if indeed they are roughouts at all. F122 is a heavy thermal flake, with bilateral retouch producing the present sub-oval form, and a naturally sharp and symmetrical cutting edge. The excessive width of this piece suggests that there would be difficulty in attempting further reduction to an axe shape, so it is possible that any resemblance to an axe is fortuitous and that it is in reality a core variant (cf. F33, Figure 22). F119 may also be a rather unsuccessful core, since it has no suggestion of a working edge, but the retouch is bifacial, and the blank is of interest for its similarity to the lumps of floorstone recovered from the base of the 1971 shaft which it was suggested might be some kind of production blank. Apart from the evidence of pieces like this, it would seem that the standard method of axe manufacture was to use large, relatively thin, flakes as the blanks.

Other artefacts which could be possible roughouts were noted amongst the collection, particularly in the material from the fill of the 1971 shaft, where suitably sized pieces were more common (e.g. F586, Figure 105). Otherwise, possible roughouts have been classified as cores or as miscellaneous retouched if such categories seem more appropriate. For example, F27 (Figure 20) from trench 2A has been treated as a core, despite its superficial resemblance to an axe shape, because there is no suggestion of a cutting edge. F530 (Figure 96) from trench 7B, with only limited retouch, is regarded as a miscellaneous piece, though it is clearly unfinished, and to judge from the size of the flake blank could be a roughout.

Seven of the axes in the present collection, F103, F105, F107, F110, F112, F114 and F118 are thought to be roughly contemporary with the Late Neolithic activity on the site, to judge from their stratigraphic context, although one of these, F114 has dense blue-white discolouration which might be more appropriate to the 1B layers of the 1971 shaft fill, and is thus potentially out of place in this group. Of the other six axes, at least four can be regarded as knapped from floorstone, and would thus be in keeping with the Late Neolithic floorstone based assemblage from the old surface in trenches 3–6.

Distributionally, the fact that twelve axes come from the fill of 1971 shaft, and one from the edge of the shaft, compared with only three from the remaining areas excavated, and a single axe from a superficial position in the 1972 shaft, might suggest a specific link between axes and the Late Neolithic occupation. Certainly no axes are definitely associated with the Middle Bronze Age occupation, though there is a possible link with the *tranchet* axe type.

The roughouts all come from the fill of the 1971 shaft and are in agreement with a Late Neolithic context, since three can be related to the Late Neolithic activity on the basis of stratigraphy, and since at least two are of floorstone. The possible preference for the use of floorstone in manufacturing axes (and chisel-picks etc.) may be somewhat illusory if these implements are to be specifically related to the Late Neolithic occupation, since it has been shown that the industry from the old land surface at the edge of the 1971 shaft is almost exclusively floorstone based. Alternatively, it could be argued that a preference for making axes from floorstone is in keeping with this being the purpose behind the mining of floorstone, and that the other uses to which floorstone are put are coincidental.

Technologically, the normal method of axe manufacture in evidence here involves working from a flake blank, though the possibility of prismatic blanks from nodule segments has been considered. The flake blank technique presents some problems of terminology, since the Grimes Graves axes are of the type which would otherwise be called 'core' axes, in contradistinction to 'flake' axes (such as the *tranchets*), which retain basic elements of their parent form. This difficulty arises simply because of the large size of raw material at Grimes Graves, which permits the 'core' blank to be in effect a flake, just as in the case of those cores on flakes already noted.

Neither of the two typological forms, the small, pointed-butt axe, and the *tranchet* axe, which could be recurrent and therefore characteristic types had a firm stratigraphic context relatable to the identifiable occupations. It is possible to suggest a Late Neolithic association for the pointed-butt axe F113 (Figure 44), since it came from the old land surface in trench 7B, and a Middle Bronze Age association for the *tranchet* F104 (Figure 40) because of its position in the fill of the 1971 shaft, together with rods, to which it is technologically comparable, and because of its two-phase cortication, but these associations must be seen as possibilities rather than probabilities.

A close parallel to the small, pointed-butt form with an adziform profile, is provided by an axe from Floor 46 at Grimes Graves (Richardson 1920, 245 and Figure 57, 1), which is also metrically very similar to the two examples in the 1971–72 collection. The damaged axe figured by Smith (1915, 153–4 and Figure 26) would also appear to be of the same type, but although the stated scale of the illustration would make it comparable metrically, in the text the axe is described as 19cm in length. There may be grounds for regarding the small pointed-butt axe as a characteristic Grimes Graves type, in which case its method of manufacture and relatively small size are of interest, especially when compared with the potential for large axes at Grimes Graves, as exemplified by F111 (Figure 43).

The large axe, F111, is certainly atypical within the range of axes from the 1971–72 collection, but it is not necessarily unusual when viewed in a wider context. Annable and Simpson (1964, Figure 17) illustrate an unpolished flint axe from Bohun Down, Wiltshire, which is 26.3cm long, and Smith (1931, Figure 328) illustrates a similar axe from Chichester, Sussex, which is approximately 29.2cm long. The axe found by Armstrong (1926, 135 and Figure 34) in Floor 85B at Grimes Graves was 23.2cm long, and is considerably more reduced by flaking than F111. Armstrong's description of this axe as a 'typical celt of the latest mining phase' is, of course, apocryphal, since no such thing as a typical Grimes Graves axe type has been quantitatively verified, and the available illustrations do not suggest such an entity. Nevertheless, it has been customary in the past to identify axes as being of 'flint-mine type' (e.g. Bruce-Mitford 1938), and definitions of them have been proposed, for example, 'The typical Cissbury axe is a thin, narrow implement, tapering towards its butt, and with a thick, white patina . . .' (Curwen *et al.* 1924, 109), but in such general terms as to be meaningless. It is to be hoped that the current research programme involving Neolithic flint axes (Sieveking *et al.* 1972) will allow some definitive metrical quantification of axe shapes.

Tranchet axes appear to be uncommon at Grimes Graves outside the present collection, and the example described by Peake (1919, 79–81 and Figure 14, H) seems to be the only other illustrated *tranchet* axe from the site. Isolated examples occur at other mining sites, for example at Easton Down, Wiltshire (Stone 1931, 359 and Figure 15), at Stoke Down, Sussex (Wade 1923, Figure 4), and at what is most probably a mining site at Great Melton, Suffolk (Clarke and Halls 1917, 376 and Figure 74, c). Otherwise *tranchet* axes are rare in British contexts, the only published examples known to the present writer being the two implements from Bolton's Brickyard, Ipswich, Suffolk (Moir 1926, 244 and Figure 7, A–B), the four implements from the surface collection from King Barrow Ridge, Wiltshire (Laidler and Young 1938, 159 and Plate III, 39, 40, 41 and 43), and the single examples from Lower Halstow, Kent (Burchell 1925, Figure 6, far right; British Museum 1968, Plate IX, 1), Stourpaine, Dorset (Piggott 1954, Figure 44, 1), and Thetford, Norfolk (Evans 1897, 68–69 and Figure 14).

It is difficult to discuss these implements using the published illustrations, which often show only one view, but a definite size grouping can be suggested, since seven of the examples cited fall between 8–9cm in length (i.e. axes from Easton Down, Great Melton, Grimes Graves, two from King Barrow Ridge, Lower Halstow and Stourpaine). The two *tranchet* axes from the present collection would, therefore, appear to be somewhat larger than is normal, although F108 which even though atypical, is still a *tranchet*, is smaller. All of the axes cited seem to be *tranchet* axes in the same sense as the Grimes Graves examples, that is to say with cutting edges formed by the natural lateral flake edge of the flake blank on which the axe is fashioned transversely, despite descriptions to the contrary in some of the original publications (e.g. Laidler and Young 1938, 159).

Although the *tranchet* axes from the present collection are not strictly speaking contexted, they are unlikely to be pre-Late Neolithic, and this would be in accord with Piggott's (1954, 279) use of the *tranchet* axe as a definitive type in his Secondary Neolithic flint industries, and also with his inclusion of this implement type as a characteristic flint-mine tool type (ibid, 281). However, Piggott's reference to the *tranchet* axe as a specifically Mesolithic implement (ibid, 281), and hence the recognition of '. . . a considerable element of Mesolithic ancestry in the flint mines . . .' (ibid, 282), must be called into question.

The crucial factor to be considered here is the confusion arising from the failure to distinguish rigorously between those core-axe/picks which are sharpened by a transverse, or *coup de tranchet* blow, and the *tranchet* flake axes as defined in the present report. *Tranchet*-blow axes are a characteristic tool-type of the British Mesolithic, but not *tranchet* flake axes, which occur in Britain in Late Neolithic or later contexts. Since neither type is found associated with the earlier Neolithic cultures, there is no reason to link the two, which are anyway far apart typologically. Confusion was, however, compounded by the identification of the amorphous assemblage of artefacts found at Lower Halstow, Kent, as the representative in Britain of the Danish Mesolithic Ertebolle culture (Burchell 1925; Clark 1936). The climate for making such a comparison had existed much earlier (e.g. Evans 1897, 69), as a result of the profound impression which the nineteenth century finds from the Danish *kjokkenmoddings* had had upon European prehistorians, but a British counterpart had proved stubbornly recalcitrant. The claims made for Lower Halstow were welcomed, therefore, even though the parallel offered was inexact. There is only one published tranchet flake axe from the site (Burchell 1925, Figure 6, far right), and this is not very similar to the Ertebolle flake tranchets, even if those examples published by Clark himself (1936, Figure 36, 13; Figure 37, 7) are considered. Moreover, the Lower Halstow assemblage is mixed, and entirely unsuitable for use in such comparisons, while as Piggott was forced to conclude (1954, 284), its Mesolithic status is dubious.

Nevertheless, it was the overtones of this parallel, in view of the extension of the Ertebolle into the Neolithic, coupled with the confusion over *tranchet* (i.e. *tranchet*-blow) axes, which led to the interpretation of the *tranchet* flake axe of the type which occurred at flint-mine sites as evidence of a Mesolithic continuum, and which incidentally helped to lay the foundations for the Secondary Neolithic hypothesis. A more rational explanation for the occurrence of *tranchet* flake axes in the British Late Neolithic would now seem to be that they are an independent invention facilitated by the use of large size raw material which permitted the production of the prerequisite large flake blanks. The close morphological resemblance of *tranchet* flake axes to the contemporary copper and bronze axes may also be a relevant factor in their design and production.

On the continent, *tranchet* flake axes often occur in a similar milieu to those in Britain, for example at the mining site of Spiennes in Belgium (Verheyleweghen 1963, Figure 9) and as a type-fossil of the French Campignien (Nougier 1950). However, the Belgian and French viewpoint that '. . . *le tranchet est généralement reconnu comme l'ancêtre de la hache*' (Cauvin 1971, 157), is at variance with the interpretation suggested here, and also with the Scandinavian sequence based upon the development during the Mesolithic from the Maglemosian core axe to the Ertebolle flake axe (e.g. Troels-Smith 1938, Table 1). It is worth noting that some of the data used to substantiate the French sequence, such as Verheyleweghen's Spiennes sequence (1963, Figure 13), are extremely equivocal. The various continental schemes for classifying *tranchet* axes (cf. Brézillon 1968), would distinguish between the primarily lateral retouch of F104 and F116 (Figures 40, 45), and the more extensive bifacial retouch of F108 (Figure 42), but this seems to have little significance other than purely typologically.

The degree to which any of the axes in the present collection is a finished product is problematic. Certain pieces, such as F106 and F111, have unfinished cutting edges, and could perhaps have broken during manufacture, while others, such as F103, F104, F105, F113, F115 and F116 are to all appearances finished. The presence of complete and finished axes on the site inevitably fosters the hypothesis that they could be a part of the domestic tool kit, being manufactured and used by the occupants of Grimes Graves, who no doubt had woodworking tasks as did any other contemporary community. In the case of F116, which has edge damage, there is every reason to suppose it has been used, though in this case it might have been used by the Middle Bronze Age occupants rather than by the Late Neolithic miners. F102, in view of the unusual appearance of the flint used, offers the interesting possibility of flint axes being imported to Grimes Graves, though the two Cornish stone axes from the site would provide an obvious parallel.

There is no evidence for polishing amongst the present collection, nor from previous excavations at Grimes Graves, but it is not, of course, necessary for an axe to be polished to be finished. Evidence for polishing is, however, available from three other mining sites in Britain. At Harrow Hill, Sussex, a fragment of a partly polished axe was found in a superficial horizon in Shaft I (Holleyman 1937, 242 and Figure 9), at Easton Down, Wiltshire, a fragment of a polished flint chisel was found on a working floor (Stone 1935, 68–70 and Plate I, 2), and at Cissbury, Sussex, a fragment of a polished axe was recovered from a superficial position inside the hillfort (Lane-Fox 1868, 63 and Plate 8, 15), while Smith (1912, 119) mentions the possibility of two more polished implements from this site. None of these finds could be positively associated with the mining phase at the respective locations, and they suggest that, quantitatively, polishing of implements is not a regular characteristic of flint-mine sites. Many authorities have sought to explain this absence of polishing by the suggestion that polishing is a time-consuming task which is not appropriate to a factory-site, especially since polishing occasions no great weight loss such as could offset time expenditure against transportation efficiency, always assuming an export situation. Insofar as this hypothesis goes it is quite probably correct, but Stone (1931, 364) has proposed the rather more attractive theory that the fashion of polishing was in decline by the time flint mines were at their most productive. The main purpose of polishing an axe is presumably to make it more efficient, and it may achieve this by giving the axe a longer life, rather than by improving its cutting power, since the sharpness of a natural flake edge cannot be improved upon by retouch or polishing. If this is the case, it is possible that this expedient was no longer necessary once large-scale mining operations made flint cheaper and more expendable. Moreover, the practice of polishing axes may be primarily a regional variable, since it can be suggested it would be more likely to occur in non-flint areas where the raw material was at a premium.

The small number of axes from the 1971–72 collection might seem to be paradoxical if Grimes Graves is thought of as in essence an axe-factory. This need not necessarily be the case, since very little *in situ* late Neolithic occupation was in fact sampled during the present excavation, and also since it can be hypothesised that if axes were intended for export, then to find them at Grimes Graves would be the exception rather than the rule. Similar arguments can be used to explain the lack of roughouts, by supposing that axe manufacture was restricted to specified areas which were not encountered by the excavation, and since only abandoned or lost examples would remain anyway. Alternatively it can be proposed that the axes were for on-site use, in which case their relative scarcity would be fully in accord with assemblages from other Neolithic occupation sites. The low incidence of axes does, however, seem to have been a recurrent feature of excavations at Grimes Graves, so that Richardson, after finding about twelve axes on his Floor 46, was able to comment that 'It is curious that previously celts had been quite rare from this site' (1920, 258). This picture is strongly at variance with the situation encountered at the Graig Lwyd stone quarry site by Warren, who recorded that 'I have now, I think, had nearly three tons of stone axes from the site before me for detailed study . . .' (1921, 199). In the light of this, it is difficult to rationalise many of the generalisations which have in the past been made about axe-manufacture at Grimes Graves, for example, when Piggott speaks of '. . . the skill and accomplished techniques displayed in the economical mass-production of axes . . .' (1954, 93), and it is clear that the identification of Grimes Graves as an axe factory is in itself a generalisation, which is based more upon hypothetical correlation with the Neolithic stone quarry sites than upon actual evidence from Grimes Graves itself.

Burins (Figures 49, 50)

None of the seven implements included in this category can indisputably be said to be intentional burins, though it is thought that all of them may have had a burin-like function. Those with wider burin facets, i.e. F124, F125 and F126 (Figure 49) are perhaps more convincing than the others on which the facet is narrow. Typologically these are all very simple forms, the types most likely to occur fortuitously. At least three could be directly related to the Middle Bronze Age assemblage (e.g. F125 and F126), while none were closely associated with the Late Neolithic occupation.

A burin in a Late Neolithic context has been noted by Smith (1965, 242) from the West Kennet Avenue, and Wainwright and Longworth (1971, 260) cite two further examples with possible Grooved Ware associations from Lawford, Essex, and West Stow, Suffolk. Burins in Bronze Age contexts appear to be rarer still, but it is possible that typological prejudice has obstructed their recognition.

It is of interest to note that despite the abundance of antlers at Grimes Graves, antler was not itself exploited as a raw material for small artefacts, which would presumably have required burin-like tools, so that some other usage for these tools must be imagined.

Knives (Figures 50, 51)

Only four cutting implements were thought sufficiently distinctive for inclusion in this category. F129 and F130 (Figure 50) are bifacially retouched discoidal knives, neither of them polished. The latest stages of retouch obscure the form of the original blanks, but large Levalloisoid flakes were probably employed. F131 (Figure 51), on the other hand, has been manufactured transversely from a broad flake. This again is a bifacial knife form, but has a sub-rectangular shape. In complete contrast to the previous three, F132 is a unifacial blade knife with extensive bilateral retouch. Other implements which lie on the borderline of the knife category are F512 (Figure 93), a blade form, classified as miscellaneous because of doubt as to the precise nature of the broken distal end, and F441 (Figure 87), classed as a cutting flake, which has bifacial edge retouch. The indeterminate form F569 (Figure 101) has perhaps the nearest resemblance in the collection to the sort of scale-flaked edge which occurs on plano-convex knives, while F544 (Figure 98) is morphologically very close to a plano-convex knife, but its broken and burnt condition hampers identification.

Both the discoidal knives are from the layer 3 deposit at the edge of the 1971 shaft and are thus to be seen as Late Neolithic and Grooved Ware by association. The sub-rectangular knife is directly relatable to the Middle Bronze Age assemblage, and so is the blade knife, though the retouch is in this case shown by the relative cortication to belong to a subsequent phase to the blade blank.

Wainwright and Longworth (1971, 260) mention a polished discoidal knife and a roughout for a similar knife in association with Grooved Ware from Lawford, Essex, which might provide a parallel to the Grimes Graves examples, but otherwise these knives have not been regarded as a Grooved Ware tool-type. The bifacially worked knife with traces of polish found in association with Grooved Ware at Lion Point, Essex (Longworth *et al.* 1971, 120 and Plate 39, 10) appears from its near parallel edges and plano-convex cross-section to be a rather different type of implement, as does the unpolished discoidal knife from Arreton Down, Isle of Wight (Alexander and Ozanne 1960, 291 and Figure 9, F30). However, a close parallel, though slightly smaller, was found during the 1914 excavations at Grimes Graves (Clarke 1917, 465 and Figure 97), and probably came from Shaft 2.

There would seem to be no reason to disassociate the unpolished discoidal knives from Grimes Graves from the polished series, though there is equally no need to regard the unpolished examples as roughouts or unfinished. Clark, in his definitive paper on the polished discoidal knife (1929), was able to present little in the way of positive dating evidence for these implements, but thought a Late Neolithic/Early Bronze Age setting was indicated by postulated Beaker associations. Piggott thought polished discoidal knives should probably be included in his Secondary Neolithic light flint industry (1954, 285), though positive evidence was lacking. Clarke (1970), in his review of Beaker associations does not include a single case of direct association between Beakers and polished discoidal knives. If it is correct to link the unpolished and the polished examples, then the Grimes Graves evidence confirms a Late Neolithic dating, and offers a Grooved Ware context.

Although the sub-rectangular knife is distinguishable from the discoidal knives in size, shape and manufacturing technique, it does belong to the same general class of bifacial implements which are thus shown to be equally appropriate to a Middle Bronze Age context. The sub-rectangular polished flint knife found by Peake (1917, 432 and Figure 88) at Botany Bay just to the west of Grimes Graves is possibly relevant here, and does at least show that polished knives were not altogether foreign to the immediate vicinity.

The two discoidal knives are also of technological interest insofar as they contradict Clark's suggested derivation of the polished series from scrapers (1929, 44–45). If the validity of the relationship between the polished and unpolished examples is accepted then clearly it is the cutting edge, not the act of polishing, which is the important factor, and this cutting edge is altogether different from the working edge of a scraper. The polished edge scrapers to which Clark refers seem to involve two distinct forms, firstly the smooth-edged scraper which has become polished through use, and secondly the scraper-type with deliberate polishing. The same subdivision may be applicable to the polished-edge knife implement category, and many of the so-called scrapers which have bifacial edge polish should probably be seen as knives. Where the edge polish is deliberate on scrapers and knives, it must be supposed that this somehow makes the implement more resilient or gives it more precision, since the area of polishing is usually too restricted and irregular for aesthetic factors to be of importance. On the other hand, the often extensive polishing applied to knives of the polished series suggests that in their case aesthetic considerations may be very much to the fore.

The unifacial blade knife (F132, Figure 51) is a much more generalised type for which comparisons are accordingly more difficult. The blade form does make this implement unusual in both Late Neolithic and Bronze Age contexts at Grimes Graves.

Scrapers (Figures 51–65)

The 490 scrapers constitute 9.6% of the total implement component from the present collection, and are therefore the second most frequent tool type. Table XXXIX summarises the scraper sub-types recognised, and outlines their distribution according to the major excavation units.

As this table shows, the end scraper is the most dominant type, followed by the side scrapers, end-and-side scrapers, pointed scrapers, and denticulate scrapers in descending order of importance, though fluctuations among the minor types are apparent from assemblage to assemblage. Details of the typology are best understood by reference to the illustrations, but attention may be drawn to what are

Table XXXIX. Scrapers subdivided by type and provenance

Assemblage	Scraper sub-types a. end	b. side	c. end & side	d. pointed	e. denticulate	f. unclassified	totals
1971 shaft	29	3	3	3	1	10	49
1972 shaft	140	20	21	9	7	34	231
Trenches 7B and 8B	89	7	1	3	1	4	105
Trenches 1A–2B	53	5	2	5	2	11	78
Trenches 3–6, layer 3	5	—	—	—	—	3	8
Trenches 3–6, above 3	14	—	1	—	1	3	19
Totals	330	35	28	20	12	65	490
Totals (percentage)	67.4	7.1	5.7	4.1	2.4	13.3	100%
Totals, excluding the 1972 shaft	190	15	7	11	5	31	259
Totals (percentage)	73.4	5.8	2.7	4.2	1.9	12.0	100%
Totals, 1972 shaft only (percentage)	60.6	8.7	9.1	3.9	3.0	14.7	100%

termed perfunctory scrapers, that is those with minimal retouch on suitable blanks, which can occur within any sub-type (e.g. F143, 145, 204, 209, 215, 225), to the denticulate scrapers (F160, 162, 163, 164, 175, 235, 236 and 240), and to the plane scrapers (F167, 168).

The only assemblage which provided a sufficient quantity of complete scrapers for metrical analysis was the 1972 shaft (Figures 7 and 8). To provide a check on the 1972 shaft scrapers, the 259 scrapers from the other excavational units were combined as a bulked sample. Of these 210 are complete and suitable for measurement, and they comprise the following sub-types:

Type	Number
a. End	158 (75%)
b. Side	15
c. End-and-side	7
d. Pointed	10
e. Denticulate	4
f. Unclassified	16
Total	210

The histograms obtained from this bulked sample are given in Figure 14, from which it can be seen that there is a clustering between 4–7cm in length (62.5%), between 7–23mm in thickness (80.5%), and between 3:5 and 4:5 in B:L ratio (38%). These values are in close agreement with those from the 1972 shaft scrapers (Figure 8), except that the bulked sample has more thinner scrapers, with 22.4% thinner than 11mm, as opposed to only 12.9% in the 1972 shaft sample, and 11.5% in the sub-sample (Figure 7). There is also a divergence in ratio, the scrapers in the bulked sample being somewhat narrower, with only 43.9% broader than 4:5, while in the 1972 shaft this applies to 58.1%, or as much as 62.3% in the sub-sample. Basic facts which emerge from the metrical examination of the scrapers are the potential for thick scrapers, 23.9% and 17.6% are thicker than 23mm, and for long scrapers, 25.3% and 29.9% are longer than 7cm.

As a supplement to the data on scraping angles from the 1972 shaft scrapers, measurements were taken of the ninety-seven complete scrapers from the 1971 shaft and trenches 1A, 2A and 2B for which a valid angle range could be obtained. As with the 1972 shaft sample, the total range is between 25–90°, and the following table allows the major trends to be contrasted. It should be noted that there will not be a precise correlation of the figures given within each sample because of the method of recording the angles by ranges.

Table XL. Scraper angle ranges

Angle range in degrees	1971 Shaft & surface Total 97 No.	%	1972 Shaft Total 165 No.	%
less than 40	1	1.3	3	1.8
less than 50	13	13.4	17	10.3
less than 60	27	28	58	35
40–80	85	87.8	139	84
50–60	13	13.4	25	15.2
50–75	47	48.5	97	58.5
60–75	25	25.8	40	24
over 50	75	77	122	74
over 60	51	52.5	61	37
over 75	12	12.4	4	2.4
over 80	2	1.6	2	1.2

A broad similarity in scraping angle between the two samples is indicated with in both cases a dominant angle range of 50–75°. However, there are slightly more scrapers with a shallow angle (less than 60°) in the 1972 shaft sample, and significantly fewer with a steep angle (over 60°).

The 210 complete scrapers in the bulked sample include 175 cortical examples (83.3%), and 205 have intact striking platforms of which 29 (14.1%) are faceted. This confirms the conclusion from the 1972 shaft sample that scrapers are normally fashioned upon cortical flakes, but provides a contrast in the incidence of faceting.

From the cortication evidence it was possible to assign at least 163 of the 231 scrapers from the 1972 shaft directly to the Middle Bronze Age assemblage, and it would seem reasonable to associate a large proportion of the total scraper component, 69% of which came from the 1972 shaft and trenches 7B and 8B, with the Bronze Age occupation of the area. Only four scrapers from the 1971 shaft fill, and a further eight from the old land surface in trenches 3–6 could positively be linked to the Late Neolithic activity.

In the absence of a large Late Neolithic scraper sample with which the Bronze Age scrapers can be compared it is not possible to indicate many typological distinctions. The inclusion of two heavy plane-scraper types in the Late Neolithic group, and their complete absence from the rest of the excavation area, suggests that this form at least may be specifically Late Neolithic. Similarly many of the denticulate scrapers can be related to the Bronze Age occupation. By contrasting the specifically Bronze Age scrapers against the remainder, it can be seen that the side, and end-and-side scraper types are more common in the Bronze Age sample, so that this may be a point of difference. More subjectively, a qualitative difference could be observed amongst the scrapers, which is perhaps best expressed by the fact that the Middle Bronze Age scrapers tended to have more definite and extensive retouch while amongst the other scrapers perfunctory types with minimal retouch were common, often fashioned on heavily cortical flakes with the dorsal surface of the scraping edge left largely cortical. The occasional scrapers with exceptional retouch, such as the 'disc' F200 (Figure 59), or the *racloir* F217 (Figure 62), are unfortunately without close associations. It is tempting to view the numerical concentration of scrapers in the Bronze Age deposits as indicative of a direct contrast between the Late Neolithic and Bronze Age activities on the site, and to associate the numerical unimportance of scrapers in the Late Neolithic occupation with the trait of stylistic perfunctoriness, although as scrapers like F211 (Figure 61) are among those directly relatable to the Late Neolithic occupation this would not be entirely justified.

Attempting to draw precise external parallels with individual scraper types is probably misleading except where readily distinguishable forms are involved. Thus the Late Neolithic plane-scrapers F167 and F168 (Figure 55) can be compared with a large Bronze Age scraper from Itford Hill, Sussex (Bradley 1972A, Figure 5, 4), which appears from the illustration to share the abrasion on the dorsal crown. Isolated examples which resemble the denticulate scrapers have occasionally been published, for example from the Bishops Waltham, Hampshire assemblage (Ashbee 1957, Figure 11, 19). That many precise parallels for the latter type are available from French Mousterian assemblages (e.g. Bordes 1972) is of considerable interest in view of the other technological similarities between the two industries.

The overwhelming predominance of end scrapers is totally characteristic of British Neolithic and Bronze Age flint assemblages, and too much stress cannot be placed upon minor variations in percentage presence of the other sub-types, especially in view of recurrent terminological imprecision. Nevertheless, a potentially significant divergence is suggested by the high percentage of side scrapers in a Late Neolithic context at Durrington Walls (23%, Wainwright and Longworth 1971, 164), and their very low presence on earlier Neolithic sites, for example, at Broome Heath (0%, Wainwright 1972, 52), at Hurst Fen, (3%, Clark *et al.* 1960, 217), and at Windmill Hill, (6.8%, Smith 1965, 95). However, the low representation of side scrapers at Grimes Graves, and also at the West Kennet Avenue, (2.3%, Smith 1965, 241), makes Durrington Walls completely atypical in this respect at present.

The high percentage of cortical scrapers at Grimes Graves may also be a significant characteristic, though comparable data are not available. It is unclear whether the preference for cortical flakes indicates the special aptitude of such flakes for scraping, either from the point of view of retouching or usage (many writers have suggested cortex patches on scrapers served as finger rests), or because flakes from the outer nodule are more likely to be of the correct shape for blanks, or alternatively is simply a reflection of the unsuitability of cortical flakes for other tasks. The use of cortical flakes for scrapers appears to have been a characteristic feature of the flint assemblage from the Bronze Age settlement site at Itford Hill (Burstow and Holleyman 1957, Figure 27), and Bradley (1972A, 98) has discussed the occurrence of this trait on other Bronze Age sites.

When analysed metrically (Figures 7, 8 and 14) a substantial degree of homogeneity was noted amongst the total Grimes Graves sample of scrapers. However, there was a tendency for the Bronze Age group to be broader, thicker and shallower angled, and this trend may be more pronounced than the histograms suggest because of the inevitable inclusion of some Bronze Age scrapers in the bulked sample. There is also a tendency for the Middle Bronze Age scrapers to be smaller, and this may correlate with other trends to smallness in the Bronze Age assemblage which can perhaps be linked to the raw material used, which was not floorstone.

To assess the external relationships of their metrical characteristics, the percentage values within the length and thickness ranges for the three Grimes Graves scraper samples are listed in the following tables, together with the values for Neolithic samples from the sites at Broome Heath, Durrington Walls, Windmill Hill, and the West Kennet Avenue, with in addition values from the Beaker scraper samples from Broome Heath and Windmill Hill.

The length values in Table XLI are arranged according to the total percentage over 6cm long.

In addition to the above assemblages, Clark *et al.* (1960, 219) published data for two Early Bronze Age scraper samples from Peacock's Farm and Plantation Farm, Cambridgeshire, both of which peaked between 2.5 and 3.5cm in length, with very low percentages above 6cm, and for two Neolithic scraper samples from Abingdon, Berkshire and Hurst Fen, Suffolk, both of which peaked between 3.5 and 4.5cm in length, and again had low percentages above 6cm. Clark *et al.* drew attention to the tendency for Beaker/Early Bronze Age scrapers to be smaller than Neolithic scapers even given the same raw material, and this is certainly confirmed by the two Beaker samples from Broome Heath and Windmill Hill in Table XLI. At Belle Tout, Sussex (Bradley 1970, 357) the picture was somewhat different, but since the Beaker scrapers there are compared with those from the West Kennet Avenue they can still be regarded as relatively small. Wainwright (1972, 52) has indicated that there are difficulties in deriving any straightforward cultural/chronological conclusions from variations in scraper length within the Neolithic, and this is substantiated by the table, though there can be absolutely no doubt that the large size of the Grimes Graves scrapers is a reflection of the abundant raw material there, and this may indicate an important link with

Table XLI. Comparative analysis of scraper lengths

Assemblage	Length range in cm divisions									Total in sample
	1	2	3	4	5	6	7	8	>	
Windmill Hill (Beaker)	4.6	37.1	33.8	21.2	3.3	—	—	—		151
Broome Heath (Beaker)	1.0	29.5	40.0	23.5	5.0	1.0	—	—		250
West Kennet Avenue	0.5	8.1	30.0	42.1	16.0	2.8	0.5	—		430
Windmill Hill (primary)	—	2.6	23.6	49.7	15.4	5.6	3.1	—		195
Broome Heath[8]	—	2.0	12.0	35.5	37.0	7.5	6.0	—		218
Durrington Walls	—	4.0	13.0	30.0	24.0	17.0	8.0	4.0		200
Grimes Graves (Bronze Age)	—	0.8	6.9	19.2	26.2	25.4	10.8	10.7		130
Grimes Graves 1972 shaft	—	0.6	7.8	17.8	25.6	22.9	12.8	12.5		179
Grimes Graves (bulked)	—	1.4	6.2	16.6	25.3	20.6	11.9	18.0		210

the Durrington Walls scrapers, in view of the possibility of mined flint being used at that site. An additional dimension is provided by Verheyleweghen's data (1963, Figure 10) on the scrapers from the mining site of Spiennes in Belgium, where the majority are longer than 6cm.

In Table XLII the percentage thickness values for scrapers are arranged according to the total percentage over 19mm thick in each assemblage.

The Beaker scrapers from Windmill Hill and Broome Heath are again distinct from the other assemblages, this time because of the thinness of the scrapers, which is also a characteristic of the Belle Tout Beaker series (Bradley 1970, 357). That thickness is not necessarily a strict co-variable of length is demonstrated by the Grimes Graves samples, where although the Bronze Age scrapers are the smallest, they are also the thickest, and by the Durrington Walls scrapers, which although large are relatively thin. The divergences in thickness between the Neolithic scrapers from Broome Heath, Durrington Walls and Windmill Hill are extremely slight, however, compared with the different lengths. The trend to thinner scrapers during the Neolithic and Bronze Age noted by Bradley (1970, 357) is noticeably contradicted by the Grimes Graves scrapers. Smith (1965, 95) and Wainwright (Wainwright and Longworth 1971, 168) have proposed a link between the relative thinness of scrapers and high percentages of faceted platforms. The Grimes Graves scrapers seem to support this, since they are both thick and predominantly unfaceted, and also because the Middle Bronze Age scrapers which are the thickest, have the lowest faceting index. Moreover, the evidence from the comparisons between the thicknesses of the scrapers, points and cutting flakes at Grimes Graves, the last two implement categories having far higher faceting indices than the scrapers, does suggest that a correlation between relative thinness and faceting may be expected. However, the thickness of the Grimes Graves scrapers may have more to do with the high incidence of cortical flakes, which tend to be thicker than non-cortical flakes, and which are less likely to be faceted. It is worth noting that the Spiennes scrapers (Verheyleweghen 1963, Figure 10), which are relatively thin despite their extremely large size, have a much higher faceting index than the Grimes Graves scrapers.

Considering the two tables together, it may be concluded that on the available evidence, scraper length and thickness measurements are unlikely to suggest meaningful cultural distinctions independently of the raw material exploited, except in the case of the small Beaker scrapers, though even here it might be expected that if data were available from Mesolithic scraper assemblages some overlapping would be apparent.

In terms of overall shape, Bradley (1970, 350 and 358) has emphasised the inadequacies of using length and breadth formulae, but it is to be hoped that the recurrent trends evident from the B:L ratio histograms for the Grimes Graves scrapers offer a sounder basis than usual for external comparison. Comparisons with other assemblages must be approximate because normal procedure has been to give only the figures pertaining to the 2:3 B:L: ratio which defines the division between long and short scrapers (Clark *et al.* 1960, 217). Short, broad scrapers are always the most common form in Neolithic and Bronze Age assemblages, but potentially significant variations are apparent from the changes in the percentage presence of long scrapers during the Neolithic from the 15% at Windmill Hill and the West Kennet Avenue (Smith 1965, 95 and 241), to 24.5% at Durrington Walls (Wainwright and Longworth 1971, 164), 26% at Broome Heath (Wainwright 1972, 52–57), and 31.6% at Hurst Fen (Clark *et al.* 1960, 217). Assuming that the 3:5 B:L ratio is approximately similar to the long-short borderline it is interesting to note that only in the bulked sample from Grimes Graves does the percentage of narrow scrapers (18.1%) come into the same range as on these other sites, while those for the Bronze Age sample are very low, as is the case with the Beaker samples.

A tendency for the scraping angle to become shallower through the Neolithic has sometimes been noted (e.g. Bradley 1970, 357–8). The Grimes Graves scrapers are partially in accord with this, insofar as the angle of the Middle Bronze Age scrapers tends to be marginally less on average than the remainder, but as a whole the Grimes Graves scrapers have relatively steep angles, and this seems likely to be a co-variable of their thickness. Similarly, this must be the case with the Beaker scrapers, where, as a correlate of their thinness, and in accord with their scale-flaking, the scraping angle can be anticipated as shallow. Thus at Windmill Hill (Smith 1965, Figure 41), 52.3% of

8. Dr G J Wainwright has kindly confirmed, in a personal communication (1974), that a printer's error occurred in the publication of the Broome Heath scraper histograms (Wainwright 1972, Figure 36, top left-hand side), which makes his text appear to contradict the histogram with regard to the lengths of the sample, whereas the data given in the text are, in fact, correct.

Table XLII. Comparative analysis of scraper thicknesses

Assemblage	Thickness range in 4mm divisions 3	7	11	15	19	23	27	31	35	>	Total in sample
Windmill Hill (Beaker)	19.2	53.6	21.9	4.6	0.7	—	—	—	—		151
Broome Heath (Beaker)	13.0	48.5	28.0	8.0	1.5	1.0	—	—	—		250
West Kennet Avenue	3.7	46.3	35.2	11.8	3.0	—	—	—	—		430
Durrington Walls	3.0	24.0	42.0	21.0	10.0	—	—	—	—		200
Broome Heath	5.0	29.0	36.0	19.0	10.0	1.0	—	—	—		218
Windmill Hill (primary)	2.6	26.7	33.9	23.6	13.2	—	—	—	—		195
Grimes Graves (bulked)	1.9	20.5	22.0	21.4	16.6	7.6	5.2	3.3	1.5		210
Grimes Graves 1972 shaft	1.6	11.3	24.0	21.3	17.9	11.2	6.7	3.8	2.2		179
Grimes Graves (Bronze Age)	—	11.5	20.0	22.3	20.0	12.3	6.9	4.7	2.3		130

the Beaker scrapers are said to have angles shallower than 60°. As far as Neolithic scrapers are concerned, it seems unlikely, in view of the problems involved in calculating scraper angles, that sufficient precision will be possible to allow culturally meaningful implications to be deduced from such measurements.

Finally, the comparatively low occurrence of scrapers as opposed to other implement types at Grimes Graves must be considered. Crude figures for the presence of scrapers in some other Neolithic assemblages can be given as follows:

Assemblage	Scrapers as a percentage of the total implements
Windmill Hill, Wiltshire	28
Arreton Down, Isle of Wight	43
West Kennet Avenue, Wiltshire	49
Durrington Walls, Wiltshire	62
Broome Heath, Norfolk	83

(Sources: Smith 1965, 91; Alexander and Ozanne 1960, 290; Smith 1965, 237; Wainwright and Longworth 1971, 164–180; Wainwright 1972, 67.)

Such percentages are not strictly comparable, because of the inclusion of differing ranges of implement types from each assemblage, but it is probably safe to conclude that a wide variation in the presence of scrapers is possible, and that the overall values from Grimes Graves appear to be unusually low. The 'bulked' presence of scrapers at Grimes Graves is misleading, because it obscures the importance of scrapers in the Middle Bronze Age assemblage, but even so this is clearly a feature of the Grimes Graves assemblage which distinguishes it from those obtained from other Neolithic sites, and may relate to the different sorts of activities relevant to life on a mining site. As yet the activity-oriented analysis of flint assemblages from British post-Mesolithic sites is in its infancy, though the ubiquity of scrapers makes them eminently suitable for this kind of research. Bradley (1972B, 197) has offered the suggestion that high percentages of scrapers are perhaps more likely to be encountered on temporarily occupied sites associated with stock raising, as opposed to more permanent village sites. The scrapers from the Broome Heath settlement site would seem to be at odds with this, as would the Grimes Graves data which introduce the new variable of scrapers not being the dominant tool-type.

Points (Figures 65–76)

The 1008 points form 19.8% of the total implement component and represent by far the most common tool type amongst the 1971–1972 collection. The subdivisions of this category and their distribution are summarised in Table XLIII, which demonstrates the predominance of the simple, standard point type, which by itself would form 15.6% of the total implement component.

As with the scrapers, only the 1972 shaft assemblage provided sufficient complete points for metrical analysis (Figures 7 and 8), so the same procedure has been adopted of combining the points from the 1971 shaft and the surface trenches to achieve a comparable sample. Of the total of 481 points in this bulked sample, only 254 are complete and on bulbar flakes suitable for measurement. The sample comprised the following sub-types:

Type	Number
a. Standard	201 (79%)
b. Rounded	23
c. Heavy	12
d. Others	18
Total	254

The histograms prepared from the bulked sample (Figure 12), show a clustering in length between 4–6cm (47%), between 7–15mm (55.8%) in thickness, and between 3:5 and 4:5 in ratio (31.1%), though apart from these clusters there is a wide spread across the ranges involved. These values are in complete agreement with the points from the 1972 shaft (Figure 8), though, as the analysis of the standard points from the 1972 shaft showed (Figure 7), a more compact grouping might be expected if only this subtype were considered.

In the bulked sample, 136 (53.6%) of the total of 254 complete points are cortical, somewhat more than the 41% of the 1972 shaft sample, and 245 have intact platforms, of which 32 (13.1%) are faceted, in contrast to 19% in the 1972 shaft sample. There is perhaps a straightforward correlation between the values obtained for these two traits, in view of the tendency which has previously been noted for a higher percentage of faceting amongst non-cortical flakes.

Table XLIII. Points subdivided by type and provenance

Assemblage	a) standard	b) rounded	c) heavy	d) others	totals
1971 shaft	64	6	5	7	82
1972 shaft	407	41	18	61	527
Trenches 7B and 8B	207	9	11	12	239
Trenches 1A, 1B, 2A and 2B	92	14	11	20	137
Trenches 3–6, layer 3	15	1	1	1	18
Trenches 3–6, above layer 3	4	—	—	1	5
Totals	789	71	46	102	1008
Totals (percentage)	78.3	7.0	4.6	10.1	100%
Totals, excluding 1972 shaft	382	30	28	41	481
(percentage)	79.4	6.2	5.8	8.6	100%
Totals, 1972 shaft only					
(percentage)	77.2	7.8	3.4	11.6	100%

Distributionally, 76% of the points came from the 1972 shaft and trenches 7B and 8B, but when analysed on the basis of cortication there seemed to be a fairly even split between those points which relate to the Bronze Age occupation and those which were survivals in a Bronze Age context, implying that points were an equally important feature of pre-Middle Bronze Age activity on the site. Because of the high rate of breakage amongst points, and because of the re-use of old flakes for points, it was not possible to isolate a large Bronze Age sample for metrical analysis, and both the point assemblages for which histograms are given (Figures 8 and 14), are in fact bulked samples. Nevertheless, it is possible to suggest from the histograms that the Bronze Age points may have been slightly smaller, as was the case with the scrapers, while the overall similarity of the histograms may reflect the high proportion of pre-Bronze Age points in each sample. Only twenty-seven points from layer 3 at the edge of the 1971 shaft and from the lower fill of the 1971 shaft can be directly linked with the Late Neolithic occupation.

Typologically, it was possible to demonstrate that the series of elaborately retouched, often elongated, and relatively thick points, are specifically Middle Bronze Age in type in the context of the present collection. No other types can be assigned in this way, though the preformed point type (e.g. F284, Figure 69) may be more appropriate to the pre-Middle Bronze Age occupation.

As with the scrapers, it is not proposed to seek out parallels for each of the multitude of point forms represented in the collection, but some comparisons can be made. For example, the elaborately retouched and elongated Bronze Age points can be paralleled in a Beaker context from Cambridgeshire (Clark 1933, Figure 6, 79 and 81), and in a Bronze Age context from the settlement site at Itford Hill, (Burstow and Holleyman 1957, Figure 27, 14). Smith (1965, 108) related similar implements from Windmill Hill to a Late Neolithic context, as with the comparable examples from the West Kennet Avenue (Smith ibid, 239). The trend for these point types to appear in the Late Neolithic and continue into the Bronze Age seems to be established, but its significance is unclear since the functional role of these types remains unknown.

Those points on which the point is short, and fashioned medially at the distal end of the flake, like F327 and F329, have previously been noted at Grimes Graves, and Smith (1915, 177 and Figure 52) described them as spurred implements. Grimes (1960, 213 and Figure 89, 123) noted a parallel from Charmy Down, Somerset, and Smith records examples from Windmill Hill (1965, 105 and Figure 48, F153–4), and the West Kennet Avenue (ibid, 239 and Figure 81, F215). Confusion over the classification of this point type may often arise in cases where the point is damaged, because of the superficially scraper-like appearance of the accompanying retouch.

F302 (Figure 71), the finely retouched point on a cortical flake which is exceptional within the present collection, finds a parallel in an implement from Lower Halstow, Kent, which Burchell described as 'a point of Mousterian form' (1927, 217 and Plate II, 6).

In more general terms, the presence of points at the stone quarry of Mynydd Rhiw, Caernarvonshire (Houlder 1961), is potentially of significance, since, although no quantitative data are available, they appear to be common, and perhaps equally as common as scrapers.

The fact that points are so prolific at Grimes Graves, and outnumber scrapers by a considerable margin, appears to distinguish this assemblage from those at other Neolithic sites, and is potentially of major importance in assessing the activities taking place on the site. However, two qualifications need to be made. Firstly, the percentage presence of points in relation to scrapers or other tools is not directly comparable. The total of 1008 points included only 503 complete examples, and in many cases it was the point which was actually damaged. Points are more fragile and susceptible to breakage than scrapers, and are therefore more likely to be *ad hoc* implements, geared to an immediate function and not necessarily intended for re-use, whereas scrapers would presumably remain usable for a substantial period. The minimal retouch on many of the points is in keeping with this hypothesis. Thus the absolute totals of scrapers and points do not automatically reflect the relative importance of the activities of scraping and piercing, and some sort of correction would need to be applied to bring these two tool types into alignment. Secondly, when other British Neolithic or Bronze Age assemblages are considered, the high percentage of points at Grimes Graves can be seen to be completely atypical. The following list gives very approximate figures for tools of point type from the same sites quoted in the preceding section on scrapers.

Assemblage	Points as a percentage of the total implements
Broome Heath	0.6
Windmill Hill	1.9
Durrington Walls	2.8
Arreton Down	5.5
West Kennet Avenue	7.0

But it must be remembered that many of the Grimes Graves points have only minimal retouch and are easy to overlook. Experimental resorting of random samples from the Grimes Graves collection suggested that points were the tool category most likely to be under-represented in the final implement totals. With this in mind there seems a distinct possibility that previous flint analyses have tended to isolate only the most obvious points, and the writer's own experience would suggest that points ought to be more common in Neolithic and Bronze Age assemblages than is apparently the case.

Rods (Figures 76–85)

The total figure of 279 rod pieces is somewhat misleading, because this refers to the number of pieces found, rather than to the total number of individual implements represented. Taking into account those fragments which could be rejoined, the maximum number of rods in the collection is 249, and these relate to the excavational units as follows:

Assemblage	Total number of pieces	Total number of implements
1971 shaft	14	13
1972 shaft	89	85
Trenches 7B and 8B	93	78
Trenches 1A, 2A and 2B	83	73
Totals	279	249

Any attempt to collate the rods as a whole is severely hampered by the fact that only twenty-nine rods (i.e. 11% of the total number) are complete. It was nevertheless decided to make some assessment of the metrical attributes of rods by measuring these twenty-nine, taking the longest axis, irrespective of the presence of a bulb or striking platform, as the length axis. The results obtained were sufficiently in agreement to suggest some standardisation, and so can perhaps be seen as representative of the rod class as a whole. The values for length, thickness, and B:L ratio are give in Table XLIV.

There is a clustering in length in the 8–9cm bracket, and thirteen are longer than this, so that the rods can be regarded as characteristically longer than 8cm. In thickness there is a clustering between 19–23mm, but the main range is between 11–27mm, which encompasses twenty-six of the total. Obviously, rods will tend to be narrow, and the B:L ratio indicates that twenty-six are narrower than 2:5.

Continuing to use the twenty-nine complete rods as a sample, observations could be made on parent material and cortication. Sixteen retained some cortex, which in seven cases indicated floorstone, in four cases non-floorstone flint, and five were indeterminate. Despite the smallness of the sample this is in line with a trend noted from the fragments for a high percentage use of floorstone for the fabrication of rods, in contrast to all other implement categories except axes. The cortication evidence was as follows:

Table XLIV. Rods analysed by size

Length in cm	No.	Thickness in mm	No.	B:L ratio	No.
5–6	1	7–11	2	0:5–1:5	3
6–7	2	11–15	6	1:5–2:5	23
7–8	3	15–19	5	2:5–3:5	3
8–9	10	19–23	11		
9–10	4	23–27	4		
10–11	2	27–31	—		
11–12	5	31–35	—		
12–13	1	35–39	1		
13–14	1				
Maximum 13.1;		Maximum 36;			
Minimum 5.9		Minimum 7			

single-phase cortication, including totally uncorticated 6
two-phase cortication 22
heavily burnt and unassessible 1

This confirms the trend for rods to be most commonly fabricated upon discarded flint relating to a chronologically previous phase, or phases, of activity at the site.

The typology of rods provides only equivocal and contradictory evidence for their function. In some cases there is the possibility that a retouched terminal edge, whether pointed (F386, Figure 79), or scraper-like (F363, 389, 392, 406, 414, Figures 76, 80, 82, 83), served as a working edge. This interpretation receives some confirmation from those rods which are made upon blanks with a naturally steep lateral edge (F367, 368, 369, 391, 415, 417), thus requiring little or no retouch, since this implies that the lateral retouch is purely for shaping, possibly with a view to hafting. Against this must be set the majority of rods which have no terminal retouch at all (e.g. F361, 362, 365, 370, 378, 385, 395, 405, 407), and on which, if they are assumed to be finished tools, the retouched lateral edges may be functional, though they rarely show any obvious signs of use-damage or wear. On some rods where terminal retouch is present it in fact relates to the original flake blank re-used for the rod, and is differentially corticated to the lateral retouch (e.g. F393, 413, 416, 420). The same may apply to apparent breaks, e.g. F408 (Figure 83), on which both terminals are breaks contemporary with the original flake, predating the bilateral rod retouch. The method of manufacturing a rod transversely on a re-used broad flake is best indicated by F422 (Figure 85), and applies to many other examples (e.g. F368, 416, 420). Occasionally the rod is manufactured axially on a contemporary flake or blade (F362, 375, 385), but similar bulbar alignment on a re-used corticated flake is frequent (F377, 379, 380, 404, 413, 421). Probable re-use after breakage is implied by F421 (Figure 85), and this may explain the lateral irregularity at the rejoined break on F393 (Figure 80). Morphologically there is much variability, though one almost flat face is nearly always present, and is usually a bulbar surface. This may sometimes be curved (F366, 408, Figures 77, 83), or faceted (F371, Figure 77), but complete assymmetry (F370, Figure 77) may suggest a different tool-type. Near lateral parallelism is also standard, with only occasional curvilinearity (F409, 410, Figure 83), while marked lateral assymmetry (F407, Figure 82) may indicate an unfinished form. Few of the rods presented any difficulty of overlap with fabricators, the exception being F384 (Figure 79) which does exhibit 'crushing' but lacks obvious polar abrasion, though its burnt condition hampers exact classification.

From the cortication evidence provided by the 1972 shaft assemblage, and from the distributional evidence, with no rods from the lower fill of the 1971 shaft, or from trenches 3–6, it is apparent that rods are a specifically Middle Bronze Age tool-type as far as the present collection is concerned. In fact the rods themselves, by virtue of the rejoined fragments (F373, 388, 412), reinforce the links between the occupation debris in the surface trenches and the deposits of the 1972 shaft fill.

The rods are predominantly fabricated upon re-used flakes, and this fact appears to be related to the preferential use of floorstone. Since it would seem that the Middle Bronze Age occupants were not mining flint, their knappers would only have access to floorstone in the second-hand form in which it lay discarded on the surface. Axes and picks are the main implement types in the collection which share a preferential use of floorstone, and so it is possible to suggest that rods were intended to fulfill a similarly demanding, percussive function, possibly connected with woodworking, for which floorstone was regarded as more suitable, even in a weathered form. The evidence for usage along these lines from the rods themselves is inconclusive, as it is also over the question of hafting, but one explanation which would fit this argument is that rods were blanks for fabricators. There is some evidence to suggest that fabricators may become more common in the Bronze Age, but the only reason for linking rods and fabricators is their similar morphology. While it could be maintained that the rods were taken off site before being used as fabricators, and hence do not exhibit any of the characteristic wear, this does not explain the presence of so many on site. That the rods are commonly found in fragments seems more likely to imply usage on site than massive incompetence in manufacture. In the absence of any obvious signs of extensive or recurrent wear on the rods, therefore, their function and role must be left undecided.

The small proportion of rod fragments which can be rejoined is another problem hindering their interpretation, and this has been noted before at Grimes Graves (Armstrong 1934, 386), but caution is required in the present instance because of the incomplete nature of the excavation of the surface extent of the Middle Bronze Age occupation. Only one rejoined rod (F381) had its constituent fragments precisely pinpointed horizontally during the excavation, and in this case two of the fragments were only 9cm apart, while the third fragment lay at a maximum distance of 93cm from these two. However, the two fragments which form F412 must have been separated by a minimum horizontal distance of 8m, so considerable scattering of fragments can be anticipated.

Although rods are newly defined in the present report, they have been recognised at Grimes Graves for a long time, usually being described as prismatic tools or fabricators. Peake referred to prismatic tools as '. . . now established as one of the types of the industry' (1916, 273), but few of the past finds have been illustrated, perhaps on account of their fragmentary condition. Probable examples include those published by Armstrong (1926, Figure 18); Kendall (1920, Figure 70, D–E, and Figure 73, K and M), Peake (1916, Figure 42, A; 1919, Figure 16, I), Richardson (1920, Figure 62, 26 and Figure 63, 33–34), and Smith (1915, Figure 48). The 'tanged' implement from near Grimes Graves which Smith illustrated (1912, Figure 9), provides a possible parallel for F420. Smith also described one of the Grimes Graves rods as an end scraper (1915, 175), but there does not appear to have been any overall theory as to the function or typology of rods, and confusion with fabricators has been a continual problem in the literature.

Looking beyond Grimes Graves for parallels is difficult without an examination of the implements involved, because it is often impossible to distinguish rods and fabricators using the drawings alone. However, in a flint mine context, one can suggest that the tool from Easton Down, Wiltshire, described by Stone as a prismatic tool (1935, 72 & Plate 3, 11), is a fragmentary rod, as is probably also the case with the *outils arqués et à sections triangulaires* from Sainte-Gertrude, Holland (Hamal-Nandrin and Servais 1923, 474–475 & Figure 128). In other English contexts, possible parallels are provided by two implements from King Barrow Ridge, Wiltshire (Laidler and Young 1938, Plate 5, 61 & 64), and by another from Lower Halstow, Kent (Burchell 1927, Plate II, 3).

It is impossible, given the evidence currently published, to assess whether rods are a widespread implement type or not. The occurrence of prismatic forms, usually broken, which cannot be precisely classified is commonplace (e.g. Saville 1972–73, Figure 4, 70), but without the advantage of high numbers and complete examples as at Grimes Graves these will be difficult to correlate. This is especially unfortunate, because the potential of rods as chronological indicators in surface industries could be considerable if their association with the Middle Bronze Age assemblage as at Grimes Graves proved to be recurrent.

Cutting Flakes (Figures 86–87)

In the same way as the scrapers and points, a bulked sample of cutting flakes from the 1971 shaft and the surface area was used as a comparison for the sample from the 1972 shaft (Figure 8). Of the total of 204, 156 are complete, and these are measured in the usual way (Figure 14). In length there is a clustering between 5–7cm (51.2%), in thickness between 7–15mm (61.6%), and in B:L ratio between 3:5–4:5 (30.8%), though 45.5% are broader than this. These values are similar to those from the 1972 shaft sample, but there are potentially significant variations in the fact that the latter sample includes rather more shorter (26.6% under 5cm as opposed to 16%), and broader examples (only 16% narrower than 3:5 as opposed to 23.7%).

Amongst the complete examples in the bulked sample 70 (44.9%) retain some cortex, as against 51.5% in the 1972 shaft sample. All of the 156 have intact platforms, and in 38 cases (24.3%) these are faceted, as are 26.5% of the 1972 shaft sample, thus confirming the trend for cutting flakes to include high proportions of faceted butt flakes, thereby correlating with the high incidence of non-cortical flakes.

The cutting flakes are implements which are common to both the Late Neolithic and Bronze Age assemblages at Grimes Graves. Since only 37 of the total 326 cutting flakes could be directly related to the Late Neolithic occupation, and only 68 to the Middle Bronze Age deposit, it was not possible to make any metrical comparison between the two assemblages, and for analytical purposes the two samples used (Figures 8 and 14) were both composite ones. Nevertheless, some minor contrasts between the cutting flake histograms may suggest a higher proportion of shorter and broader forms amongst the Bronze Age examples.

The qualifications given in the typological introduction about the definition of this implement type are important, and it must be reiterated here that cutting flakes are regarded as simply the most conspicuous extreme of the utilised flake. This means that various trends such as high faceting indices and low cortex indices which have been noted amongst the cutting flakes may not strictly speaking be meaningful, since these traits assist identification by making the flake distinctive. Moreover, it must also be admitted that there is a problem as to whether cutting flakes were always produced as such, or whether this sort of flake could be an incidental outcome of some flaking process subsequently thought suitable for usage, or even in some cases not used at all. Thus, for example, the preliminary flaking of a Levalloisoid core, or of an axe, may produce fine flakes which are in reality by-products, and it would be possible to mistake some of these for cutting flakes. This is not thought to undermine the validity of the cutting flake as an implement type, but it does mean that the totals given for this category should be thought of as very approximate. As was the case with the points, experimental resorting suggested that cutting flakes were also easy to overlook.

Since the cutting flake is not a tool type which has previously received much attention, parallels at Grimes Graves or elsewhere are not easy to locate. Occasionally, however, artefacts have been illustrated from other sites which have, superficially at least, a close resemblance, such as an implement from the Bishop's Waltham, Hampshire, assemblage (Ashbee, 1957, Figure 11, 10).

Utilised blades and bulbar segments (Figures 88–89)

The total of 351 utilised blades must be regarded as a potential overestimate because so few of the total were complete. The distribution of the 70 (20%) utilised blades which are complete is summarised below.

Assemblage	Total including fragments	Total complete only
1971 shaft	19	6
1972 shaft	188	25
Trenches 7B and 8B	77	21
Trenches 1A, 2A and 2B	40	9
Trenches 3–6, layer 3	24	7
Trenches 3–6, above layer 3	3	2
Totals	351	70

As with the rods, the small number of complete implements inhibits metrical classification, but in order to supplement the sample of twenty-five complete flakes from the 1972 shaft assemblage the twenty-nine complete flakes from the 1971 shaft, trenches 3–6 above layer 3, trenches 7B and 8B remainder, and trench 8B east, were combined to form a bulked sample, and the values obtained are listed below.

Length in cm	No.	Thickness in mm	No.	B:L ratio	No.
3–4	4	3–5	9	1:5–2:5	11
4–5	4	5–7	10	2:5–3:5	18
5–6	10	7–9	7		
6–7	3	9–11	1		
7–8	3	11–13	1		
8–9	3	. . . . .			
9–10	1	19–21	1		
10–11	1				

Length values cluster in the 5–6cm range, and thickness values in the 3–9mm range, exactly as in the 1972 shaft sample. Similarly in B:L ratio, 2:5–3:5 is again the most common bracket, though blades in the 1:5–2:5 bracket are more frequent in this sample than from the 1972 shaft, bearing in mind that only twenty of the twenty-nine would be blades using a 1:2 B:L ratio. All of the twenty-nine blades in the bulked sample had intact platforms, and seven were faceted. Five of the twenty-nine were cortical but none could be assessed as to flint source. The nearest resemblance to a serrated blade is provided by F452, and F454 (Figure 88) (which could be a broken point) has the most extensive retouch/utilisation. Otherwise the presumed utilisation has resulted in only irregular edge damage.

The total sample of 104 bulbar segments does not differ significantly from the 41 from the 1972 shaft. Of the total, 101 retain intact platforms, of which 36 are faceted. None of the bulbar segments resembles microburins, though in many cases the segments result from a snap-break across the basal retouch or notching of the original blade (F471, 473, 474, 475, 477, 478, 479, 481, 482, 484, 485, 486). The models for these may be provided by blades like F464, 597 and 598.

The evidence of cortication amongst the 1972 shaft assemblage, despite the distributional evidence for a concentration in the Bronze Age occupation area, makes it clear that utilised blades are not a Middle Bronze Age tool-type. This is confirmed by the extremely low percentage of complete examples from the Bronze Age occupation area, with only 46 (17%) of the 265 from the 1972 shaft and trenches 7B and 8B intact, which is consistent with their interpretation as residual survivals. Only two blades from the lower fill of the 1971 shaft, and twenty-four from the old land surface in trenches 3–6, can be directly related to the Late Neolithic assemblage, but even here there remains a doubt as to whether, like the microliths, these could not be interpreted in part as survivals. One of the major interpretative problems is the virtual absence of blade cores. While some blades could without doubt be produced incidentally from flake cores, others, such as F451–453 (Figure 88), are difficult to explain in this way. Typologically, some of the utilised blades could be of Mesolithic facies, e.g. F462 (Figure 88), but the majority are not distinctive. Circumstantial evidence from the type of flint used is lacking, because so few blades retain sufficient cortex to permit identification.

Similar problems surround the bulbar segments, which could also be survivals in a Bronze Age context, while only five examples had a direct Late Neolithic association. There seems no reason to separate the bulbar segments from the utilised blades, the former being fragments from specialised forms of the latter, in which case their production is similarly problematic. The apparent absence of blade segments to which the bulbar segments can be matched is confusing, but as is the case with the rod fragments which do not join, not inexplicable. The high percentage of faceted platforms on the bulbar segments does provide a connection with the utilised blades, and may also be a significantly distinctive characteristic in contrast to the other tool-types in the collection.

When examined metrically, it is perhaps curious that the utilised blades tend to be rather short, with clustering in the 5–6cm length range. No definite conclusion can be drawn from this, both because the sample is so small, and because the functional constraints are undefined, but it can be speculated that if floorstone were being used to produce blades these could be expected to have been much longer.

Utilised blades and bulbar segments have not been discussed from Grimes Graves before, and the external parallels for utilised blades lie mostly in the Mesolithic and Early Neolithic assemblages which have blades as characteristic products. This in itself may be of significance in assessing the affiliations of the Grimes Graves examples, since it has already been demonstrated that blades are a rarity amongst the waste products, but caution is necessary because of the fact that utilised blades are identified by their characteristic form, and identification is facilitated by scarcity, suggesting a distinctness which may not be justified within the overall pattern of utilised flakes.

Bifacials (Figures 89–90)

The seven bifacial tools include two very fragmentary pieces, F488 which could be part of a discoidal knife, and F487 which could be from an axe-like implement. The remaining pieces are probably tool-types in their own right, though some may be unfinished. None of the bifacials comes from associated horizons, so the assemblages to which they relate are unknown, though it may be significant that three come from the 1B layers of the 1971 shaft fill.

F495 may be distinguished from the other bifacials by its symmetry and smooth profile. It is discoloured a dense white and is also patinated, with iron staining on the flake ridges. It does resemble a laurel-leaf (e.g. Clark *et al.* 1960, Figure 14), though these are usually scale-flaked and sharp-edged, and of pre-Late Neolithic association.

The other bifacials are even more difficult to parallel. Alexander and Ozanne (1960), when discussing the 'bifacially worked core-tools' from Arreton Down, Isle of Wight, made a review of the occurrences of similar forms which they thought should be regarded as typical Late Neolithic artefacts. They specifically mention Grimes Graves (ibid, 295), which they maintain '. . . has produced bifacially worked core-tools ranging from large pointed specimens like hand-axes, through round "ovates" and "discs" with S-curved chopper edges like the Arreton pieces, to flatter tools like round knives'. While none of the implements from the present collection can be described as bifacial core tools according to the Arreton Down definition (ibid, 291), they do not resemble the cited Grimes Graves parallels either, since most of these would appear to in fact be cores rather than implements. Alexander and Ozanne also refer to parallels from five other flint mine sites (ibid, 295), but again these do not seem relevant to the Grimes Graves bifacials.

Fabricators (Figure 90)

The two fabricators, F497 and F498 are both roughly prismatic and trianglar in section, though F498 is more regular in outline and also more obviously abraded. F497 is possibly manufactured on a thermal flake, and could alternatively be regarded as a small pick. Both pieces are a dense white in colour and the cortication appears to be single-phase. Neither of the fabricators is from a stratified context, though the position of F498 in the 1B layers of the 1971 shaft could suggest a Bronze Age association.

Parallels from other sites of Neolithic and Bronze Age date are numerous and it will suffice here to mention one example from a flint mine context at Easton Down, Wiltshire (Stone 1935, 72 and Plate 3, 10).

Despite their name, as far as the present writer is aware there has never been a clear definition of exactly what the fabricator is supposed to fabricate. It is often implied, however, that the fabricator is a retouching tool, used in the latter stages of manufacture of flint implements. If this were the case, it might reasonably be expected that amongst the 5000 retouched pieces from the present collection fabricators would be more common, and the conclusion to be drawn from their 0.03% presence is that, at Grimes Graves at least, fabricators did not serve as retouching tools.

Multiple tools (Figure 90)

The three multiple tools comprise two combined scrapers and points (F492 and F496), and one combined knife and point (F494). If the working edges are considered separately then they are quite within the range shown by other implements from the collection.

F492 and F494 are from superficial horizons in surface trenches but F496 is associated with the Middle Bronze Age occupation. This confirms the typological ascription of this piece, which would relate it to the Middle Bronze Age series of elongated, elaborate points. On typology alone, F492 and F494 would also seem appropriate in a Bronze Age context.

Miscellaneous retouched (Figures 91–106)

This category involves radically different artefacts which by definition are incapable of stricter classification, and the illustrated sample can only provide a very approximate guide. Some subdivision is possible on the basis of certain recurrent attributes, even if no functional similarity is indicated. For example, there are numerous flakes which have denticulate edges (F519, 520, 522, 524, 531, 554, 566, 571, 572, 574, 575, 578, 599). There is also a group of proximal segments from large, well-formed flakes, some with lateral retouch (F533–538, 546, 547, 549–551, 565, 582). In the absence of complete implements to which these segments can readily be compared their status is problematic. Pieces designated as 'rod-allied' (F507, 509, 513, 515, 541, 552, 558, 568, 591) share certain technological traits with the rods proper, but are too irregular to be classified as such. 'Heavy' tools include pick-like forms (F532, 555), adze-like forms (F505, 525, 570, 583, 584) and roughouts (F530, 580, 586), as well as a possible axe fragment (F577). A group of pieces with similarities to the flat floorstone cores of Levalloisoid and related types (cf F45, 47) have been included with the miscellaneous category because of uncertainty over their classification (F521, 523, 527, 529, 581). They are all floorstone flakes, and share the extensive peripheral trimming of the dorsal face, without any extensive flaking of the bulbar surface. The retouch of cortex is indicated by F543, which is a flake wholly composed of floorstone cortex, while F579 is pure floorstone cortex at the retouched distal end, and F87 the same on the retouched right-hand edge. The size potential of flakes at

Grimes Graves is indicated by F506 and F508, which are 19.5 and 21.5cm long respectively.

The proportion of implements in this category which can be regarded as complete, in the sense that they are not broken or damaged, though unfinished or abandoned forms may be included, is shown below.

Assemblage	Total	Total complete
1971 shaft	224	106
1972 shaft	941	263
Trenches 7B and 8B	591	207
Trenches 1A, 1B, 2A and 2B	532	154
Trenches 3–6, layer 3	112	29
Trenches 3–6, above layer 3	57	20
Totals	2457	779 (32%)

This implies that whereas the broken artefacts might include implements which should properly belong to independant categories such as scrapers or points, there is nevertheless a minimum of 779 tools which cannot be assigned to standard implement categories. Since by themselves these constitute at least 15% of the total implement component, they represent an important element which cannot be ignored when considering the relative percentages of the other implement categories in either the Late Neolithic or Bronze Age assemblages.

It is of interest to note that unclassifiable implements have been recorded by past excavators at Grimes Graves, for example:

'A study of these used pieces causes us considerable surprise, as we are forced to the conclusion that all sorts of unsymmetrical pieces and flakes were used by the people for some special purpose' (Peake 1916, 269).

Peake's surprise was uncalled for, since virtually every flint assemblage will include its complement of retouched pieces which cannot adequately be classified, though these have not always been included in published descriptions.

Chapter VI
Conclusions

Having reviewed the evidence for the individual implement categories, it will now be appropriate to consider the assemblage as a whole. The overall breakdown already given (Table XXXV) is in many ways the most informative possible, since it attempts to give a perspective to the main implement types by the contrast with the utilised and miscellaneous forms. However, this breakdown is for that very reason biased, and it might be objected that unwarranted emphasis is placed upon the admittedly unstable totals of the utilised categories, or that the inclusion of the miscellaneous pieces, which might incorporate standard forms and non-tools, is unjustified. Moreover, this breakdown will not be suitable for immediate comparison with assemblages from other sites. Accordingly, three further breakdowns are provided (Table XLV) which progressively de-escalate the recognition of tool categories in line with previous studies. In column A the figures are the same as Table XXXV except that the maximum total of individual rods is substituted for the total number of fragments, the microliths are excluded, and only the complete miscellaneous pieces are included. In column B all the miscellaneous pieces and the roughouts are excluded, and in column C all the lightly retouched or utilised categories are excluded.

These tables demonstrate the absolute numerical insignificance of all but three of the main retouched categories, the points, scrapers, and rods, as well as emphasising the dominant position of the points. It must be remembered, however, that the above figures relate to an archaeological abstraction, and not to a real prehistoric entity. The total implement component is a bulked sample from a mixed assemblage, and in no way represents the tool-kit of any single group of people who occupied this area of the Grimes Graves site, nor does it reflect any single activity or range of activities. Abstract typological data of this kind can be used in further archaeological analysis, but it must be recognised that the information potential of such breakdowns will always remain at a fairly low level. More precision can be achieved by considering the implement component within the framework of the division recognised between the Late Neolithic Grooved Ware activity and the Middle Bronze Age occupation in the area excavated, since it has been possible to suggest that certain tool-types can be specifically related to these. To recapitulate briefly, it is suggested that *petit-tranchet* derivative arrowheads, chisel-picks, axes, roughouts, and discoidal knives relate to the Late Neolithic activity, while the sub-rectangular bifacial knife, denticulate scrapers and flakes, elaborate, elongated points, rods and possibly *tranchet* axes, and the barbed-and-tanged arrowhead belong to the Middle Bronze Age occupation. Other categories, such as picks, burins, scrapers, points and cutting flakes are common to both occupations, though it is suggested that the Bronze Age picks are all rather irregular types, that the burins and scrapers are more commonly Bronze Age, and that points are perhaps more important in a pre-Bronze Age context. Utilised blades and bulbar seg-

Table XLV. Ranked subdivisions of the implement component

Implement type	A		B		C	
	No.	%	No.	%	No.	%
Arrowheads	5	0.1	5	0.2	5	0.3
Picks	31	0.9	31	1.2	31	1.7
Axes	17	0.5	17	0.6	17	0.9
Roughouts	5	0.1	—	—	—	—
Burins	7	0.2	7	0.3	7	0.4
Knives	4	0.1	4	0.1	4	0.2
Scrapers	490	14.5	490	18.8	490	26.9
Points	1008	29.8	1008	38.7	1008	55.3
Rods	249	7.3	249	9.6	249	13.6
Cutting flakes	326	9.6	326	12.5	—	—
Utilised blades	351	10.4	351	13.5	—	—
Bulbar segments	104	3.1	104	4.0	—	—
Bifacials	7	0.2	7	0.3	7	0.4
Fabricators	2	0.1	2	0.1	2	0.1
Multiple tools	3	0.1	3	0.1	3	0.2
Miscellaneous (complete)	779	23.0	—	—	—	—
Totals	3388		2604		1823	

ments are certainly not Bronze Age, but their relevance to the Late Neolithic context is also in some doubt.

This internal separation of the tool types is of major significance in attempting to come to grips with the nature of the prehistoric activity in different chronological and cultural contexts within the area excavated. It permits certain formulations to be made, such as that axes were produced by the Late Neolithic occupants but not by Bronze Age occupants, and vice versa in the case of rods. But in order to progress beyond such basic contrasts, it is necessary to have homogeneous assemblages from which the relative importance of the implements, and therefore the activities they denote, can be assessed. As the preceding analyses have shown, it is unfortunately the case that only a very small proportion of the total 1971–72 collection can be of use in this respect. Table XLVI contrasts the Late Neolithic assemblage obtained by combining the implements from the old land surface in trenches 3–6 and from units c, d, and e of the lower fill of the 1971 shaft, with the Middle Bronze Age assemblage obtained by the subdivision of the 1972 shaft finds, mainly on the basis of cortication. Microliths and all miscellaneous forms have been excluded from the breakdowns. It must be stressed that these two samples are not ideal, and could be queried on several grounds. The Middle Bronze Age group is from a rubbish deposit which is likely to include implements from many diverse situations, which, although contemporary, need have no clear relationship, while the Late Neolithic group is partly from a very circumscribed area of *in situ* knapping waste, and partly from chance inclusions in the lower shaft fill. Numerically, especially in the Late Neolithic case, the samples are insubstantial, and need not indicate the full range or even average relativity of the implements in use during each occupation.

Table XLVI. Separation of Late Neolithic and Middle Bronze Age implement types

Implement type	Late Neolithic		Middle Bronze Age	
	No.	%	No.	%
Arrowhead	1	0.8	—	—
Picks	4	3.2	4	0.7
Axes	7	5.6	—	—
Roughouts	3	2.4	—	—
Burins	—	—	4	0.7
Knives	2	1.6	2	0.3
Scrapers	12	9.7	163	27.3
Points	27	21.8	253	42.4
Rods	—	—	72	12.0
Cutting flakes	37	29.9	68	11.3
Utilised blades	26	21.0	27	4.5
Bulbar segments	5	4.0	5	0.8
Totals	124		598	

Both these assemblages are at odds with the accepted notion that scrapers are the dominant form in any context (cf. Bradley 1972A, 99), with a predominance of cutting flakes in the Late Neolithic sample, and points in the Bronze Age sample. It has been explained above how the values obtained for both cutting flakes and points are potentially misleading or erroneous, but while this might affect the predominance of these tool-types, it is unlikely to alter the basic relativities, which, taken at face value, suggest an emphasis on activities involving cutting in the Late Neolithic context, and an emphasis on activities involving piercing in the Middle Bronze Age context. On the other hand, in the case of the Late Neolithic sample, if the utilised implements (i.e. cutting flakes and utilised blades which together amount to 50.9%) were left out of account the character of the assemblage would be radically changed, and since utilised blades have a somewhat enigmatic place in the industry, and since the possibility of wrongly identifying cutting flakes might be proportional to the presence of axes, this factor must be borne in mind. With points, a crucial problem is whether or not their high presence at Grimes Graves is peculiar to this site alone, and is therefore a reflection of some activity which distinguishes it from all other sites from which flint assemblages have been studied. It has already been stated that the presence of points is likely to have been underestimated on other sites, but this cannot be the whole explanation. The recurrent importance of this implement in the Late Neolithic and in the Bronze Age, despite major difference of circumstances such as the assumed absence of mining in the Middle Bronze Age, though undoubtedly significant, is also ambiguous because it raises the possibility of locational constraint operating independently of other factors.

The low percentage presence of scrapers at Grimes Graves has been commented on previously, and from Table XLV it can be seen that 26.9% is the highest possible overall value. Table XLVI shows how this figure is conditioned by the Middle Bronze Age assemblage, in which scrapers are far more prolific than is otherwise the case. The 27.3% for the Middle Bronze Age scrapers is directly comparable to values obtained from other sites, such as the figure of 28% already quoted from Windmill Hill, though there the relatively low scraper presence has sometimes been seen as an index of the functional and economic divergence of Windmill Hill from a simple settlement site. Nevertheless, perhaps the most meaningful contrast between the Late Neolithic and Bronze Age assemblages is the 17.6% swing in scraper presence, and this can be viewed against the background of the difference in general character between the deposits from which the assemblages derive.

The Middle Bronze Age assemblage is from a classic occupation deposit with pottery, bone, calcined flint, charcoal, etc[9], whereas the Late Neolithic deposit is fundamentally a chipping floor without non-lithic associations. Though somewhat anomalous, especially in the case of rods, there are no major difficulties involved in accepting the Middle Bronze Age assemblage as consistent with an interpretation of normal domestic activity for the Bronze Age occupation. Further elucidation of the nature of this domestic activity cannot be gained from internal typological analyses of the flint assemblage, partly because of imprecision over the functional implications of each implement type. However, Table XLVI does suggest a qualitative distinction between the Middle Bronze Age and Late Neolithic assemblages, which must have to do with the activities they reflect, and which may justify the assump-

9. The flint implements from this deposit would be eminently suitable for functional study in view of the preservation of associated bone and other material on which the implements were undoubtedly used. The wider implications of a flourishing flint industry at this period within the Bronze Age should also be borne in mind.

tion that the Late Neolithic activity is not of a normal 'domestic' character. The problem is really dependent upon an understanding of the implications of the finds from the Late Neolithic chipping floor, the usefulness of these finds in assessing the role of the chipping floor, and, in general, the hypothetical assumptions about the nature of a chipping floor.

In a previous section it has been postulated that the chipping floors at Grimes Graves should not necessarily be regarded as qualitatively different from floors likely to occur on any other Neolithic or Bronze Age site, except insofar as they are conditioned by the abundance and size of the raw material, and their intact state of preservation. Quantitatively, the high density of flints at Grimes Graves is difficult to demonstrate objectively, because of insufficient comparative data. The minimum average of 880 flints per sq m given above can be contrasted with the average of 40 flints per sq yd from the Neolithic site at Hurst Fen, (Clark *et al.* 1960, 214), with the highest figure of 224 flints per sq m from the Mesolithic site at Morton, Fife (Coles 1971, 291), and with the highest figure of 267 flints (excluding spalls) per sq yd from the Mesolithic site at Star Carr, Yorkshire (Clark 1954, 5, and Figure 3). These values do suggest that the Grimes Graves density is remarkable, but caution must be exercised because there is clear evidence for high densities on other sites, for example the Mesolithic site at Oakhanger, Hampshire (Rankine and Dimbleby 1960), which have not been quantitatively documented. Similarly, the fact that Petersen (1971) records an average density of 322, and a highest figure of 1387, flints per sq m from the Maglemosian occupation site at Svaerdborg II, Denmark, which is interpreted as being one hut occupied by one family for one summer season, suggests that relatively speaking, the highest figure of 5114 flints per sq m recorded from the area of the present excavation need not be so remarkable when the nature of the site is considered.

Qualitatively, the Late Neolithic chipping floor does of course consist largely of waste material. Newcomer's (1971) experimental reproduction of Acheulian handaxes shows that 4000 flakes and chips may be struck off in the manufacture of a single handaxe, and there is no reason to expect the figure to be much less for the Neolithic axe. More pertinent is Newcomer's conclusion (ibid, 93) with regard to Acheulian sites, that '. . . the existence of handaxe making at the site . . . should be obvious from the vast numbers of tiny flint chips.' This could conceivably be the case when dealing with a mono-product industry, if such existed, but could the production of axes within a more diverse industry be identified purely from its waste? This raises two points about the content of the Grimes Graves chipping floors, which have already been shown to fulfill the condition of having large numbers of very small flakes.

Firstly, in no instance is there a basis for demonstrating a mono-product assemblage at Grimes Graves, and axes themselves are never in a majority. Admittedly the manufacture of some implement types, such as points and cutting flakes, would involve the production of few small waste flakes, but this is certainly not true of scrapers, picks, rods and knives, nor with core-flaking in general, especially when prepared platforms are present. It is possible that a detailed investigation of the small flake waste and the techniques involved in producing various implement types, could reveal peculiarities which would allow the association of some waste with specific tool types, but for the purposes of the present study this has not been possible, and the waste flakes are regarded as largely non-specialised. In line with this it is of importance to note that the waste from the Middle Bronze Age assemblage in trench 8B included proportionately as many tiny flakes as did the late Neolithic deposit from trench 4, though no axes can be related to this Bronze Age deposit.

Secondly, the actual number of flakes involved in the Grimes Graves assemblages is not excessive. The absolute maximum of flakes from the trench 4 Late Neolithic assemblage would allow for only two axes assuming an average of 4000 flakes per axe, though the weight of these flakes, the incomplete excavation of the chipping floor, and other constraints, do not suggest much probability for this sort of calculation. More realistically, the flakes can be contrasted with the cores and implements from the same contexts as in Table XLVII, which is based upon the maximum total flakes, the total cores (including core fragments), and the total implements (including all miscellaneous). In each case two sets of ratios are given, one based upon the numbers involved, the other based upon the weights.

Table XLVII. Comparison of waste flake, core and implement presence

Assemblage	Ratio of cores: waste		Ratio of implements: waste	
	No.	Wt.	No.	Wt.
Trench 8B (south-west)	1: 95.9	1: 2.6	1:18.1	1: 3.7
Trench 2A	1: 98.5	1: 4	1:70.3	1:17.3
Trench 3	1:173.9	1: 3.2	1:37.8	1: 9
Trench 4	1:645.7	1:10.2	1:79	1: 8.8

In both ratios there is liable to be a considerable overestimate factor, because the total number of flakes is inflated by the inclusion of fragments, and because the cores and implements are less likely to be randomly distributed. The proportion of implements to waste is highest in the case of the assemblages from trenches 2A and 4, and in the former assemblage this disparity is extremely marked by weight. When the cores are considered, only the trench 4 assemblage shows a serious discrepancy, indicating a very low presence of cores. These ratios may well be consistent with the removal of such parent forms as axes and roughouts from the trench 4 Late Neolithic chipping floor, but they could also be explained by the removal of cores for hammerstones, and a further complication is introduced by the very circumscribed area excavated, which will probably introduce a bias against such rarer artefact types as cores. Moreover, there is the evidence of the floorstone cores from the lower fill of the 1971 shaft, which by their large size suggest the potential production of many more flakes per core than was the case with the Bronze Age cores.

The evidence from the waste material would therefore seem to confirm the distinction drawn between the Middle Bronze Age and Late Neolithic deposits, but to be inconclusive in assessing the nature of this distinction, which could thus be used to support a variety of hypotheses. This leaves the retouched component, as presented in Table XLVI, as the crucial factor for interpretation, and the discussion must now return to the implements.

Houlder (1961, 125–6), when discussing the implements from the stone quarry site at Mynydd Rhiw, Caernarvonshire, drew a distinction between 'factory products' and 'domestic industry' defined very approximately on a size basis, with the former being artefacts which it was thought could only be produced from quarried stone. This distinction is significant, because it has to do with the supposition that, apart from the manufacture of implements intended for removal from the site, the occupation, however transitory, would necessitate the production of some domestic implements for immediate use. Hypothetically, it can be reasoned that this would almost certainly have been the case with the miners at Grimes Graves, but there are important qualifications which need to be stressed. Firstly, at stone quarry sites like Mynydd Rhiw, it is always assumed, primarily because of the locational disadvantages, that occupation is *ad hoc* and purely temporary, whereas no such assumption can be made about Grimes Graves, where it is clear from the Bronze Age evidence that the site was eminently suitable for domestic settlement although perhaps for reasons engendered by the very act of Neolithic flint mining (see Volume I, p 96). Secondly, even in the Late Neolithic assemblage at Grimes Graves, the amount of domestic equipment would appear to outweigh the available evidence for factory products. This would seem to be contrary to Piggott's conclusions (1954, 43) on mining sites in general:

'The abundance of material suitable for making smaller implements would obviously lead to the occasional manufacture at least of scrapers or other tools, and these do occur in the floors, but the vast bulk of the material must be interpreted as axes in the course of manufacture, or the waste from this process'.

Some of the problems of interpreting the importance of axe manufacture from what actually remains on a chipping floor have already been explained, and it should be clear that a pragmatic judgement based upon the overall presence of axes, which varies between 0.33 to 0.9% overall (Tables XXXV and XLV), would have to reject the view that Grimes Graves is an axe factory altogether. It will be convenient here to list approximate values for the presence of axes and adzes amongst the assemblages from those other Neolithic sites, from which the presence of scrapers and points has already been cited.

Assemblage	Axes/adzes as a percentage of the total implements
Broome Heath	0.7
Windmill Hill	0.9
Arreton Down	0.9
West Kennet Avenue	1.4
Durrington Walls	1.7

These values are entirely consistent with those from Grimes Graves, but it is unlikely that anyone would suggest the above sites are axe-factories. Such reasoning would be simplistic, however, and fails to take into account all the limiting factors which this report has attempted to isolate. Even if, as has been maintained, the predictive capacity of the values given in Table XLVI remains fairly low, the values themselves can at least be used as a quantitative check on previous assumptions. In the particular case of axes, the percentage of 5.6 (which rises to 11.2 if picks and roughouts are included) from the Late Neolithic assemblage is noticably high. This percentage is the main evidence from the present collection on which the validity of Grimes Graves as an axe factory must be assessed. By itself, it suggests that the Late Neolithic knappers were producing a higher percentage of axes than is apparent elsewhere on the site, or on contemporary British sites for which data are available, but it does not point to that exclusivity of production which many authorities have maintained.

The present writer would prefer to regard this evidence as compatible with a situation in which knappers were using mined flint to produce implements amongst which axes and probably discoidal knives were important, but no more important than the advantages of the raw material readily allowed, and certainly not important enough to adduce that axe manufacture was the causative factor behind the creation of the Late Neolithic chipping floor. This minimal interpretation is not entirely inconsistent with an assumption that the object of mining was to obtain flint suitable for axes, however, as long as the theoretical confusion resulting from the equation with the stone quarry sites can be overcome. It has already been proposed that the character of occupation at a flint-mine site like Grimes Graves could be entirely distinct from that at a stone quarry like Mynydd Rhiw, and therefore that the mining could be conducted within a completely different socio-economic framework. It is unfortunate that there is so little evidence from the present undertaking for other elements of material culture with which to amplify the picture of Late Neolithic activity on the site, but there is no need to assume that the activity of the miners and knappers at Grimes Graves was purely industrial. Since the specifics of the extent of the mining at any one time, the numbers of people involved, and many other relevant factors remain at the moment so intangible, it is difficult to speculate further, but it can be suggested that flint mining was far more integrated into normal rural life than has previously been considered. The temptation to extrapolate production and marketing values from modern industrialised extractive processes must be resisted, and if this is done, then the need to visualise Grimes Graves in terms of a definitive end-product is diminished, and it is easier to accept the notion that flint was mined for more generalised purposes, with axes being one product among many. Similarly, there is no necessary contradiction in imagining the Late Neolithic knappers to be both specialist miners and peasant farmers, though as with the other, more elaborate sociological edifices which have in the past been constructed upon Grimes Graves, this is speculation.

Basically there have been two theories underpinning the link between flint mining and axe manufacture. The first of these is quantitative, proposing that the numerical demand for axes during the Neolithic reached such proportions that mining was undertaken in order to obtain a sufficient supply of flint to meet the demand. The second is qualitative, proposing that the demand for axes of superior quality flint with a greater tensile strength necessitated mining to reach the appropriate seams (cf. Sieveking *et al.* 1972, 164). While both of these theories have a hypothetic logic, they have not been validated archaeologically. The quantitative argument would seem to be inconsistent with the wastage encountered during the 1971 excavations, and it would anyway appear to make more sense economically to exploit all the flint unearthed during the excavation of one shaft before turning to the next. This would assume that all the flint unearthed was of the same value, and this is patently not the case as the quest for floorstone demonstrates, so that a combination of the qualitative and quantitative theories is more probable, since the amount of floorstone casually discarded is far less than in the case of topstone. However, the qualitative argument does not altogether explain the use of floorstone for implements other than axes, and it also begs the question of whether floorstone is actually a superior flint or not.

As a concomitant of the above two theories there is also the assumption that the axes produced were objects of trade. The dispersal of stone axes from the quarry sites which produced the rock of which they are composed is well-documented within the British Neolithic, and there is no reason to assume that flint axes were not dispersed in a similar fashion, a phenomenon for which objective data are currently being sought by the technique of trace analysis (Sieveking *et al*, 1972). Evidence is now beginning to emerge that flint axes were imported and used right in the heart of stone axe producing areas[10], just as the two Cornish axes found at Grimes Graves demonstrate the reverse (Clough and Green 1972). On the other hand, it must be admitted that there is no evidence whatsoever from Grimes Graves itself to suggest that axe trade was a stimulus for mining, or in fact that the axes produced were for trade rather than personal and/or local use. Cauvin (1971) has discussed similar problems which occur in the closely related context of the French Campignian industries, and when assessing the arguments for and against the production of axes on the *ateliers* being for local use, she concludes that *'seule la proportion des haches dans l'outillage utilisé du faciès domestique peut renseigner sur ce point'* (ibid, 338). If applied to Grimes Graves this would involve the archaeological hypothesis of separate domestic settlements away from the mine which were nevertheless intimately associated with it, and this in turn would involve a whole hierarchy of sociological questions about the organisation and function of flint-mining in the contemporary society. The obvious solution would be the analysis of flint assemblages from Late Neolithic, especially Grooved Ware, settlement sites in the vicinity of Grimes Graves, but these have yet to be identified or adequately recorded. Far-flung evidence, such as the increased demand for tree-felling and wood-working equipment implicit in the erection of large timber buildings by Grooved Ware groups (cf. Wainwright and Longworth 1971, 179), need not be apposite here, and is anyway equivocal in view of the very low presence of axes recorded from sites like Durrington Walls (ibid), and Marden (Wainwright 1971, 216). Somewhat nearer to Grimes Graves, the flaked axe and nine fragments of polished axes from the Grooved Ware occupation site at Lion Point (Longworth *et al.* 1971) amongst a recognised implement total of 88, may be more relevant, but it has to be admitted that British Neolithic sites producing flint assemblages with large axe components are rare[11]. Until British sites can be located to compare with the Campignian *habitat* at Monsagou, Périgord, at which Cauvin (1971, 303) records a 43.5% presence of axes, picks and chisels[12], this problem will be difficult to resolve.

In conclusion, on the basis of study of the flint industry, it is felt safer to leave open the question of axe manufacture at Grimes Graves, both because the 1971–72 collection appears to offer little in the way of positive evidence, and because a solution based upon a collection derived from such an infinitesimally small part of the total mined area would in any event be specious. The foregoing analyses do suggest, however, that many of the generalisations which have been made about Grimes Graves as an axe factory are unjustified, and they underscore the need for more objective data. This problem is one of great importance in the wider context of the application of archaeological inference, and it will be worthwhile quoting at length some previous opinions, for example:

> 'It should first be emphasised that the axe factories at the flint-mining centres differ in no significant way from those associated with surface supplies of flint or stone of special quality and commercial value; each was called into being by similar economic forces and shared the same essential characteristics. The material found on the flaking-floors, whether at the mines, at surface spreads of flint . . . or at exposures of tough but easily worked and keenly sought after stone . . . , comprises in the main the mass of waste and by-products of knapping, together with axes discarded at various stages of manufacture from roughouts resembling palaeolithic "hand-axes" to tools damaged at the point of completion'
>
> (Clark 1952, 180).

> 'It is important to realise that the mines were in reality ancillary to the chipping-floors for which they provided the raw material, and that such well-known sites as Cissbury or Grimes Graves were in reality axe factories on an equal footing with that at Graig Lwyd, and the technique employed at one must be considered in connexion with the others' (Piggott 1954, 37).

Such statements, and many others like them, have been made without any attempt to quantitatively assess the composition of a flint mine industry, and without the benefit of any detailed comparative work between the assemblages from different flint mines, or between flint mine and stone quarry assemblages. Without prejudice to what in actuality is the real nature of a flint mine, it is plain that the equation of flint mines and axe factories is not based upon archaeologically documented data, but is an assumption arrived at by tacit reasoning processes designed to explain the flint mines in terms of the stone quarry sites. Corroboration for such assumptions is sought by making fresh *ex post facto* rationalisations, such as: 'the psuedo-Palaeolithic forms are, of course, the outcome of a chipping process whereby

10. At least two polished flint axes have been recovered from the Early Neolithic settlement site of Carn Brea, Cornwall, a site which is close to greenstone sources and whose inhabitants made extensive use of stone axes. (Unpublished information from Mr R J Mercer).

11. This rarity is, of course, linked to the fact that very few Neolithic settlement sites have been extensively excavated. The apparent paucity of axes on domestic sites and their frequence as isolated finds (cf. Bradley 1972B, 197) also relates to this, and does not imply that axes were rarely used within settlement areas. It can also be mentioned here that hoards of flint axes, which could perhaps be expected as a corollary of large-scale trade, also appear to be rare (Bruce-Mitford 1938), and it is probable that if a flint axe trade did exist, it should be envisaged as a rather different process to the trade in metal implements known from the Bronze Age.

12. This may possibly be misleading, since at another *habitat* at Rotersac, Périgord (Cauvin 1971, 313), axes, etc constituted only 4.15% of the implement total. Cauvin's distinction between *stations-ateliers* and *stations-habitats* is not clearly enough defined, and in many cases the sampling procedures which have produced the assemblages are unsatisfactory, and the samples themselves numerically insufficient. Nevertheless, the character of French Campignian flint production and its products suggest a comparable milieu to that of Grimes Graves, and the Campignian industries present the opportunity for an independent assessment of the traits and trends posited for the Grimes Graves assemblages.

the axe was manufactured from the parent block . . . ' (Piggott 1954, 42). This sort of inflationary inference has unfortunately led to 'historical fact', as exemplified by the following two quotations, the first from an academic work, the second from a popular account:

'The great increase in the demand for axes of the finest quality associated with the need for clearing forest for agriculture, led to an enlargement and intensification of activities concerned with their supply during Neolithic times. One of the most striking manifestations of this was a great development in the mining of flint'

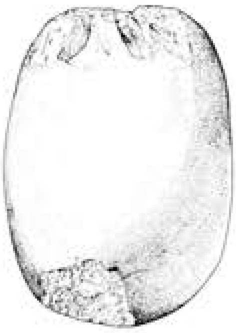
(Clark 1952, 174).

'Like other flint axe-factories, Grimes Graves came into existence in response to the demand of late Neolithic farmers for large numbers of flint axes, as an aid to deforestation in order to bring more land under cultivation'

(R Clarke 1970, 24).

The present writer would prefer, on the basis of currently available evidence, to dispute the supposition that '. . . the production of these (axes) was the purpose of the whole vast enterprise' (R Clarke 1970, 23), and to substitute the notion of Grimes Graves as a specialised occupation site, with axe production as one facet of the occupational activities associated with flint mining, rather than being the central feature to which all else is subsidiary, thereby returning to a less committed position in accord with Greenwell's declaration (1870, 2) '. . . that it was the place where a manufactory of flint implements had been carried on . . .'.

F1



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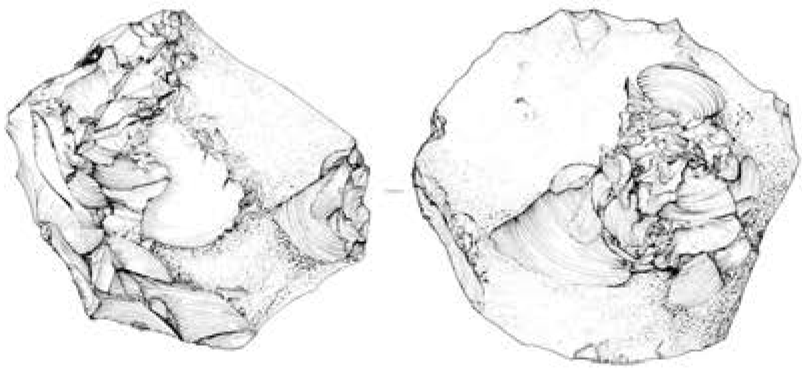

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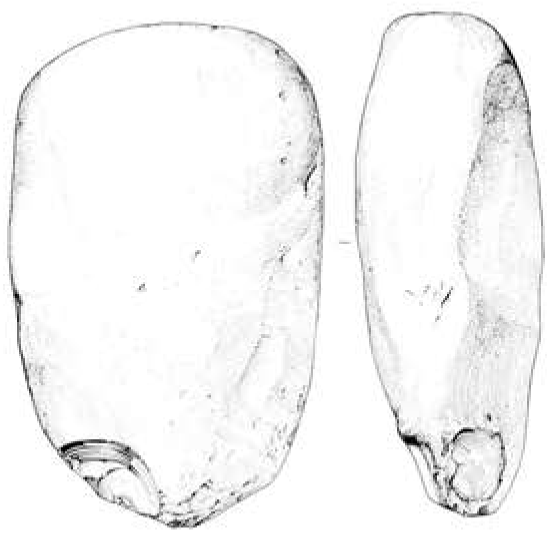


F4

Figure 15 F1–4 (Scale 2/3)

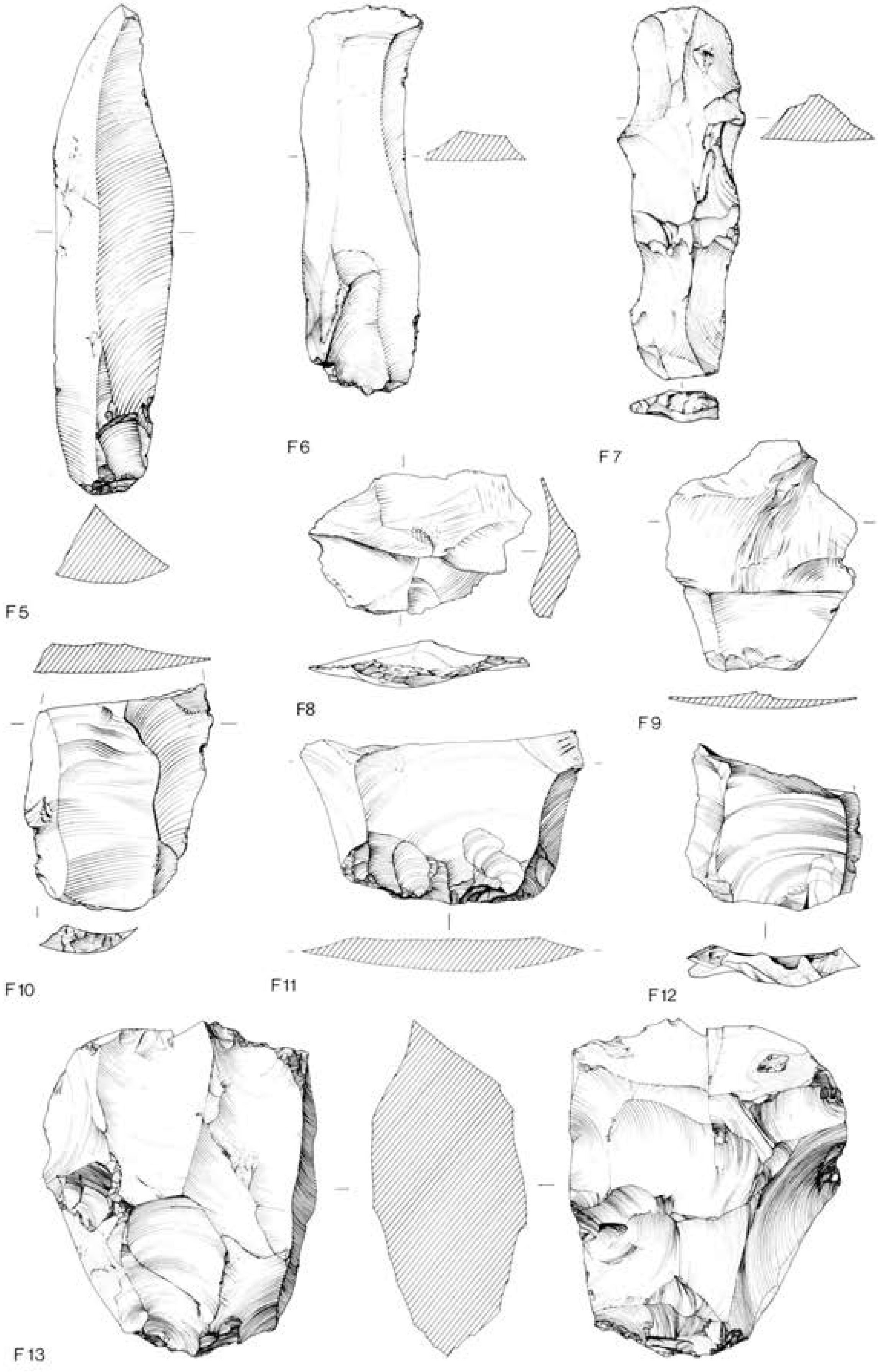
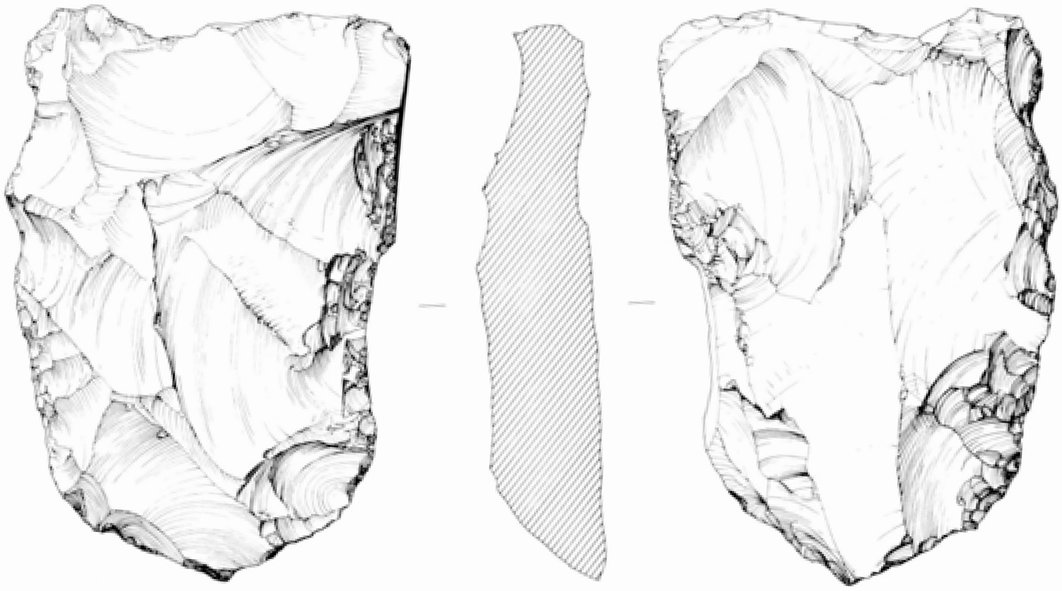


Figure 16 F6–13 (Scale 2/3)



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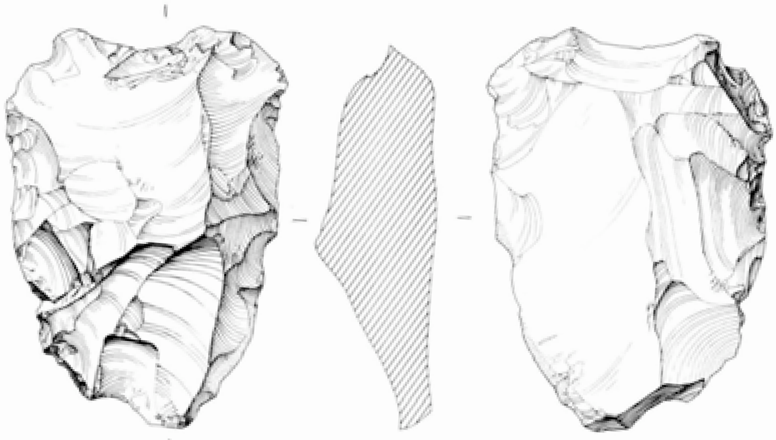

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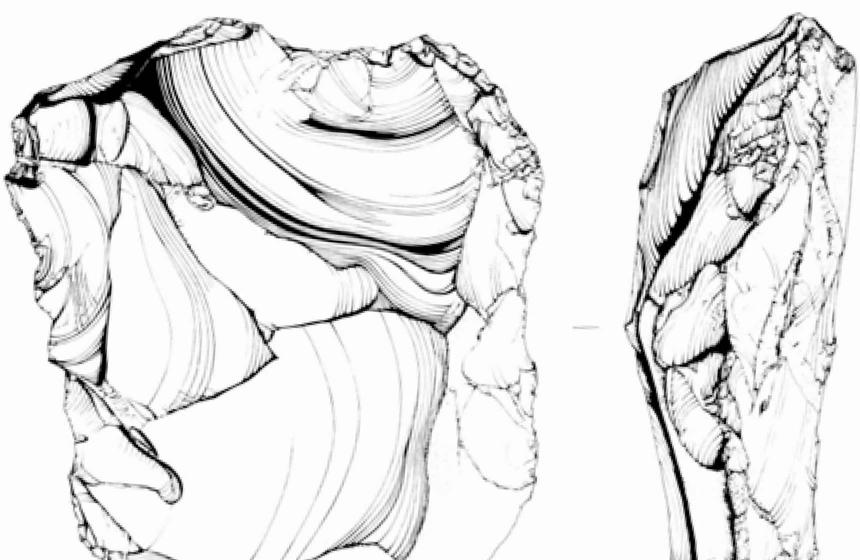


F16

Figure 17 F14–16 (Scale 14, 16:2/3; 15:1/3)

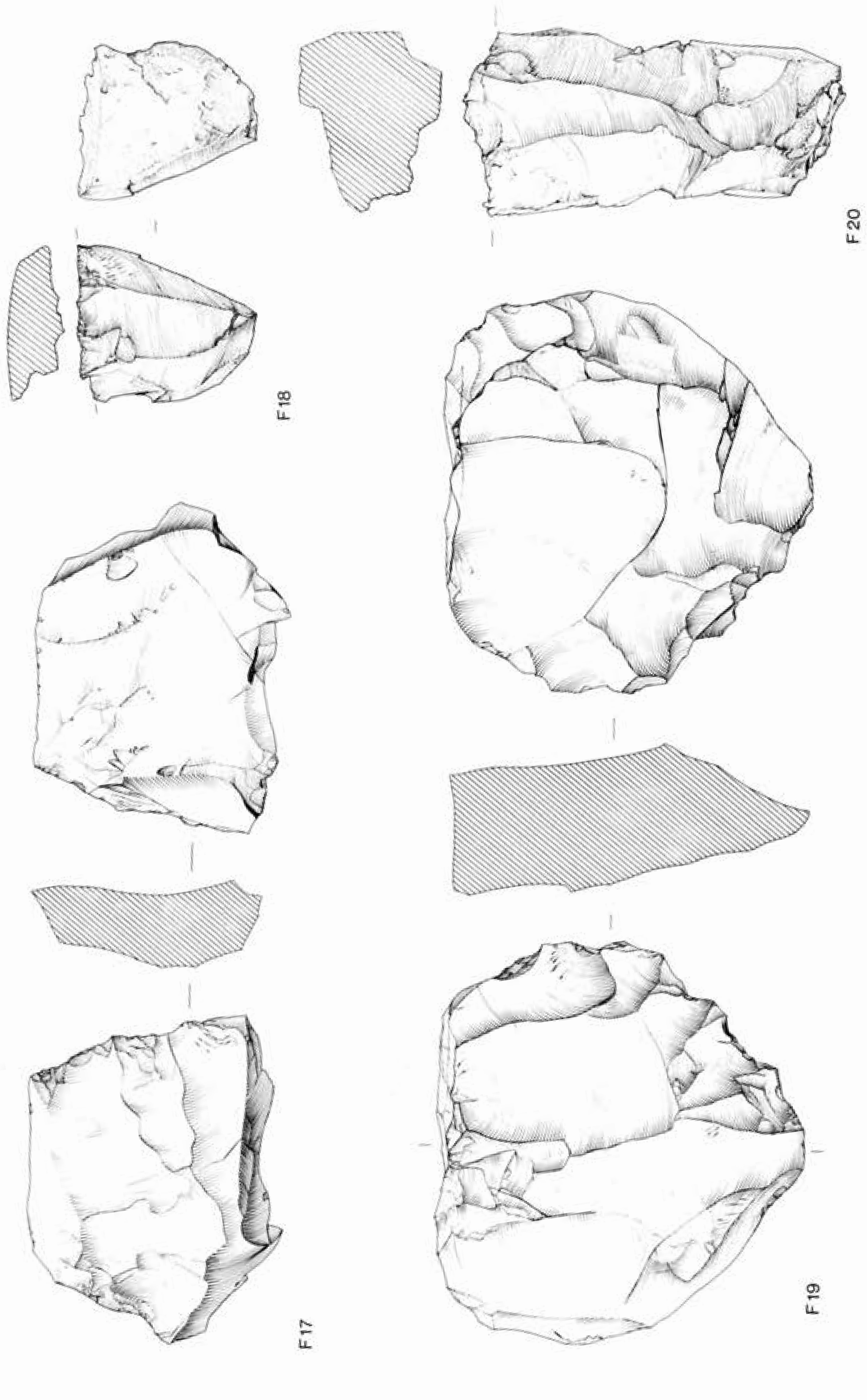
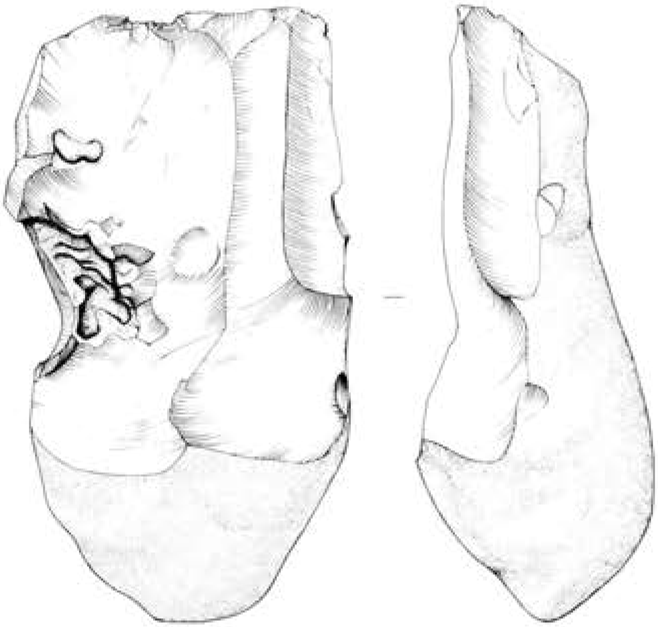
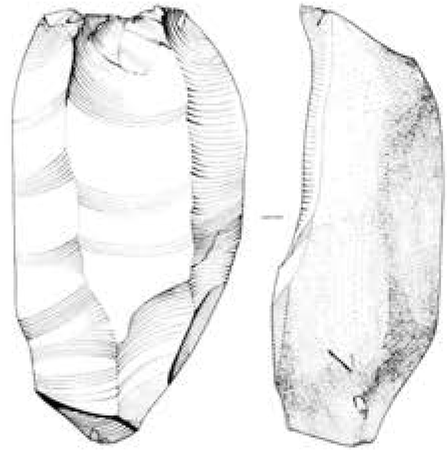


Figure 18 F17–20 (Scale 2/3)





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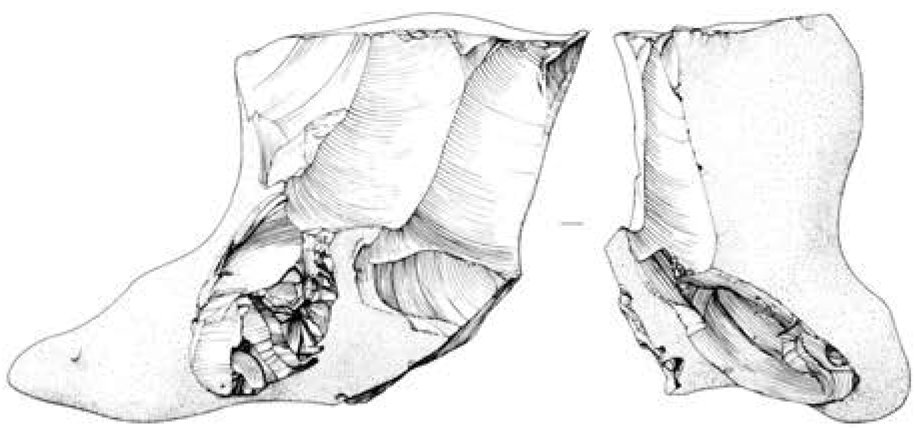

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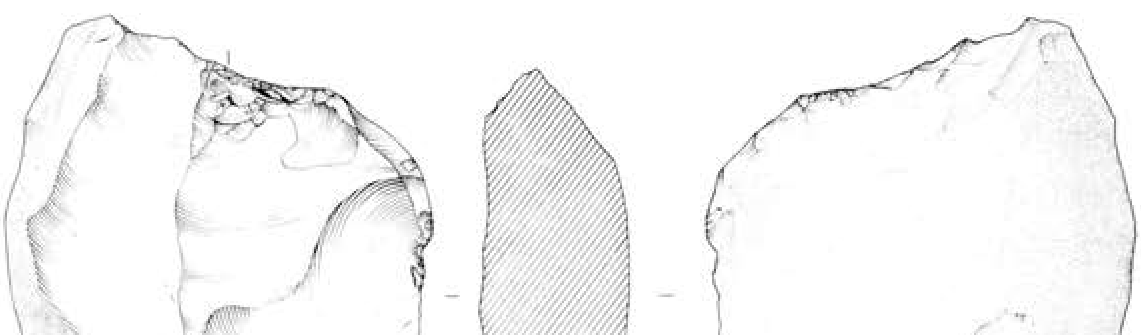

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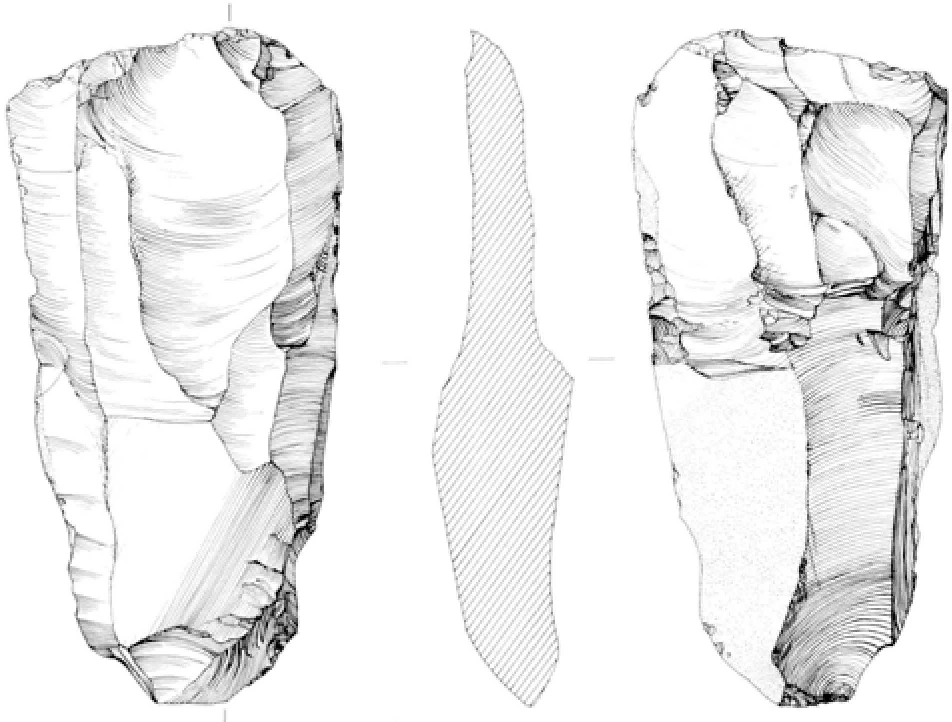
Figure 19 F21–24 (Scale 2/3)



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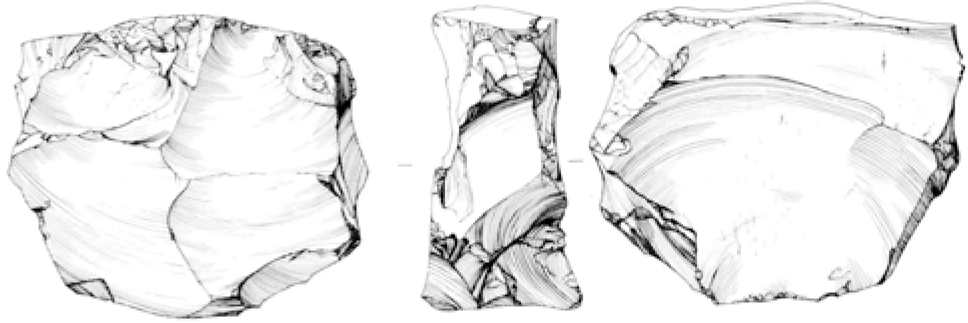

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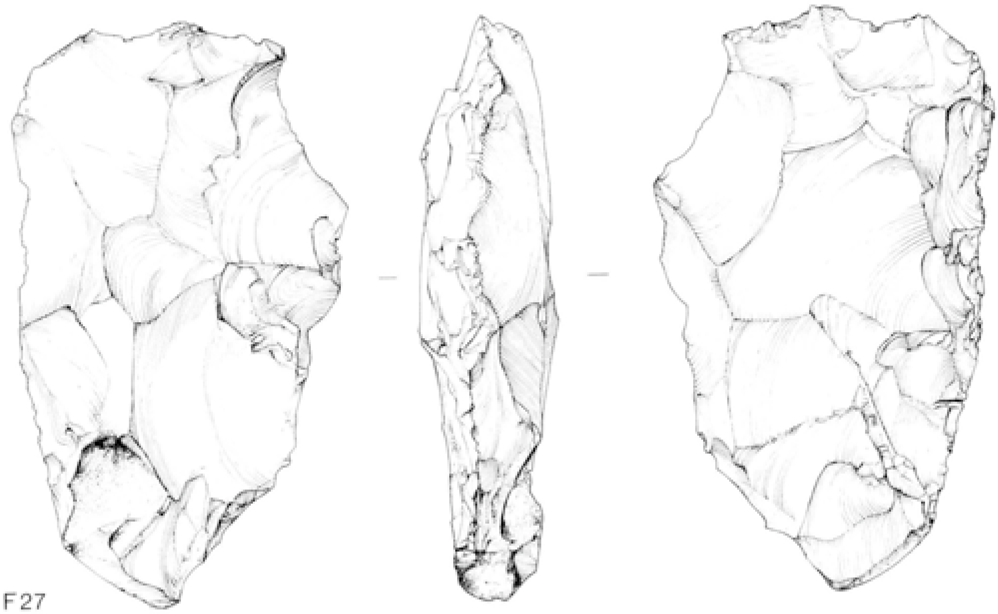

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Figure 20 F25–27 (Scale 2/3)

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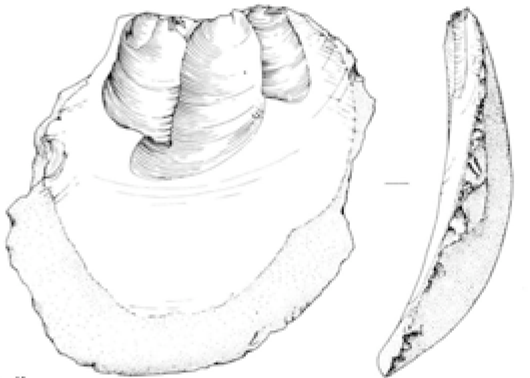

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Figure 21 F28–32 (Scale 28, 31, 32:2/3, 29, 30:1/3)

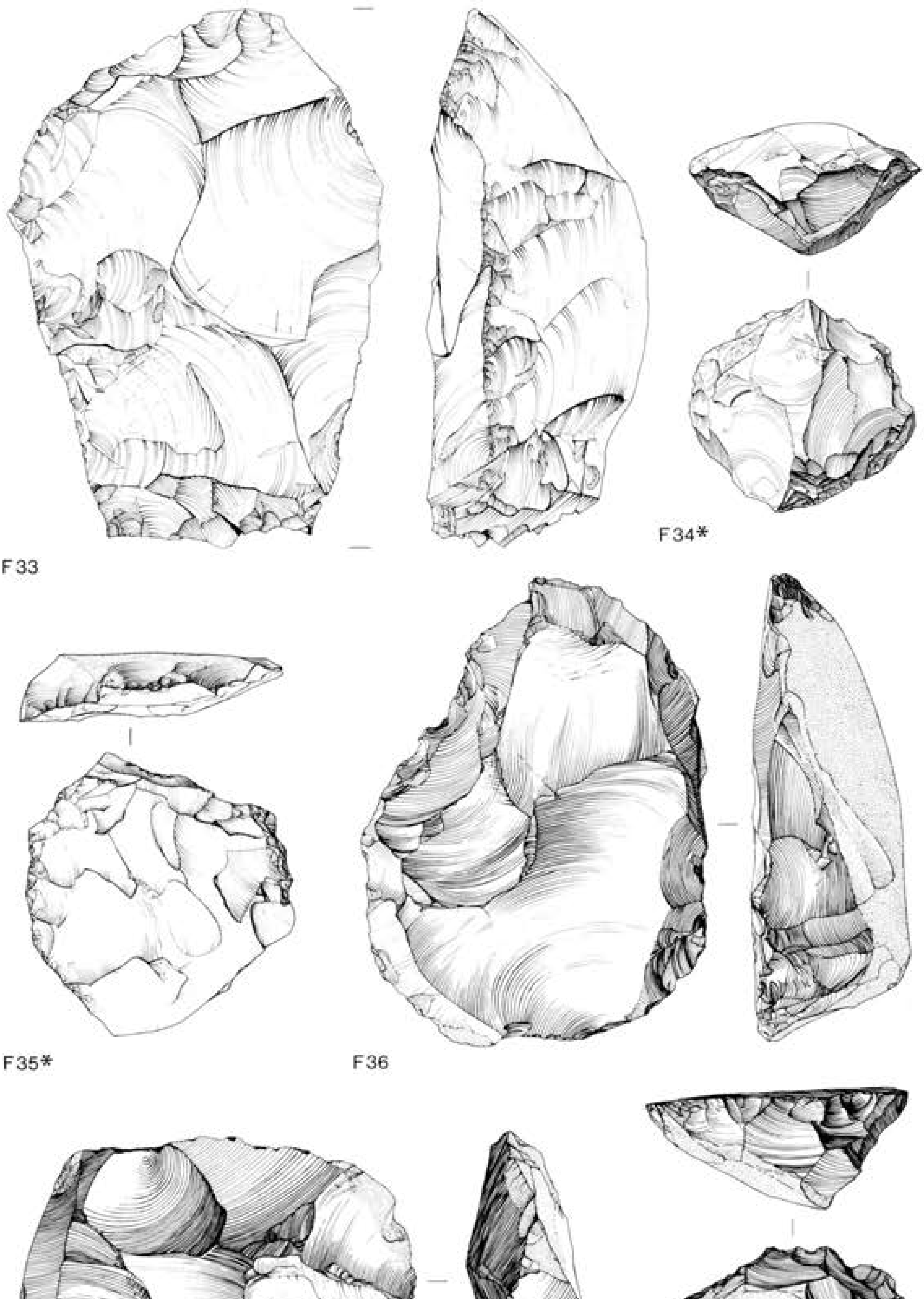
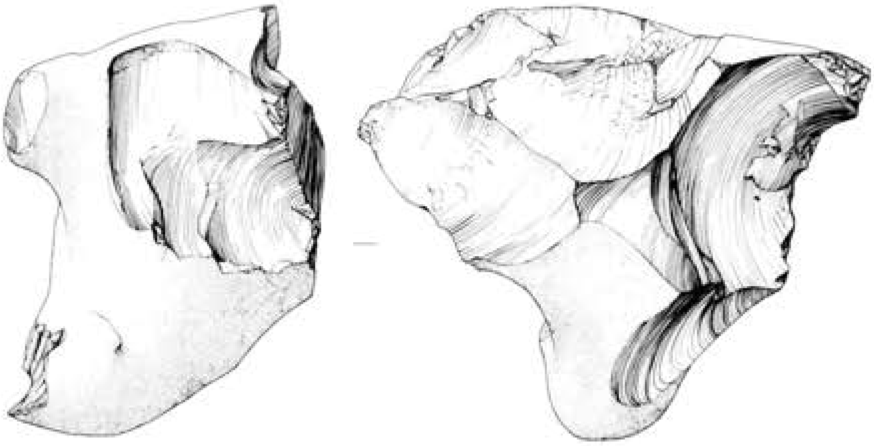


Figure 22 F33–38 (Scale 33, 36–38:2/3; 34, 35:1/3)



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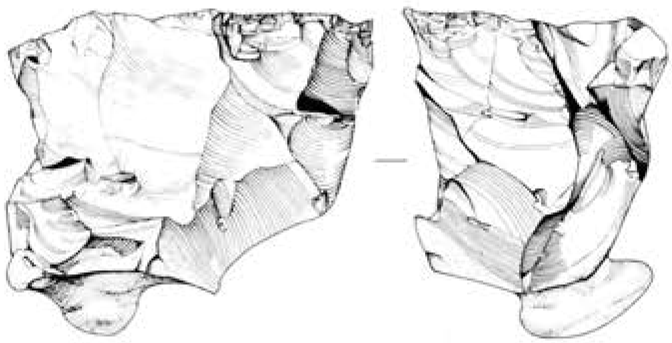

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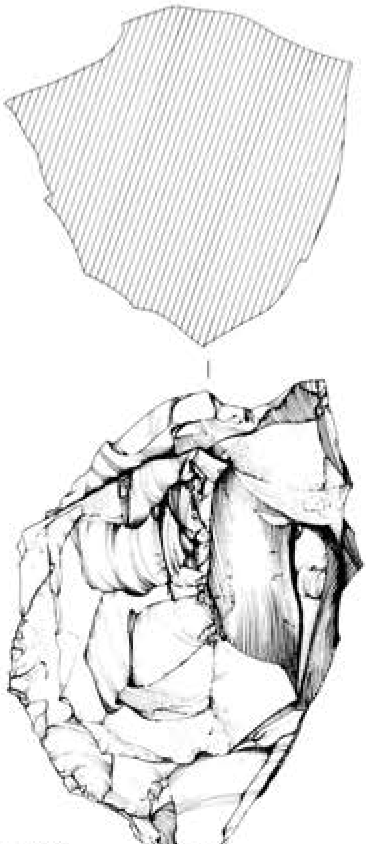

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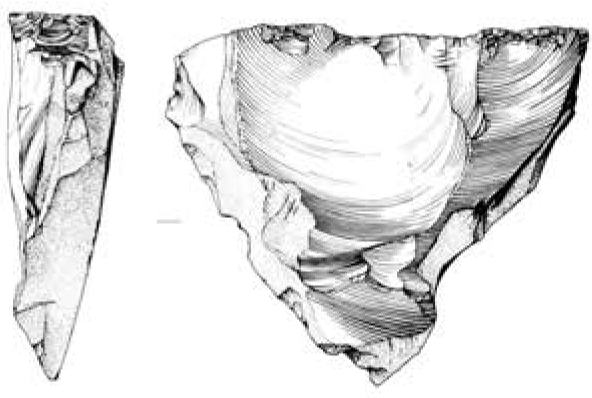

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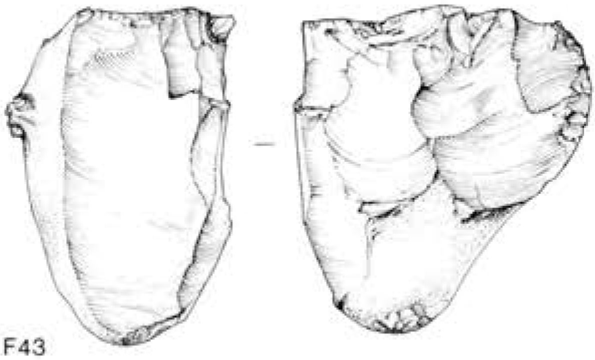

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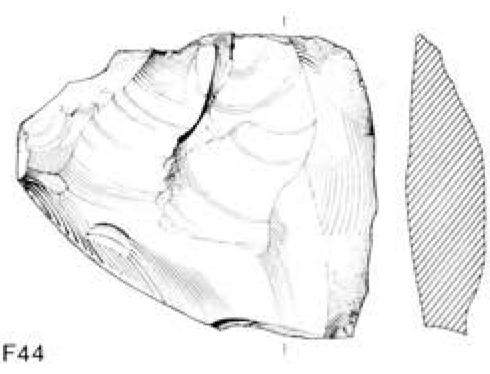

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Figure 23 F39–44 (Scale 39, 41–44:2/3; 40:1/3)

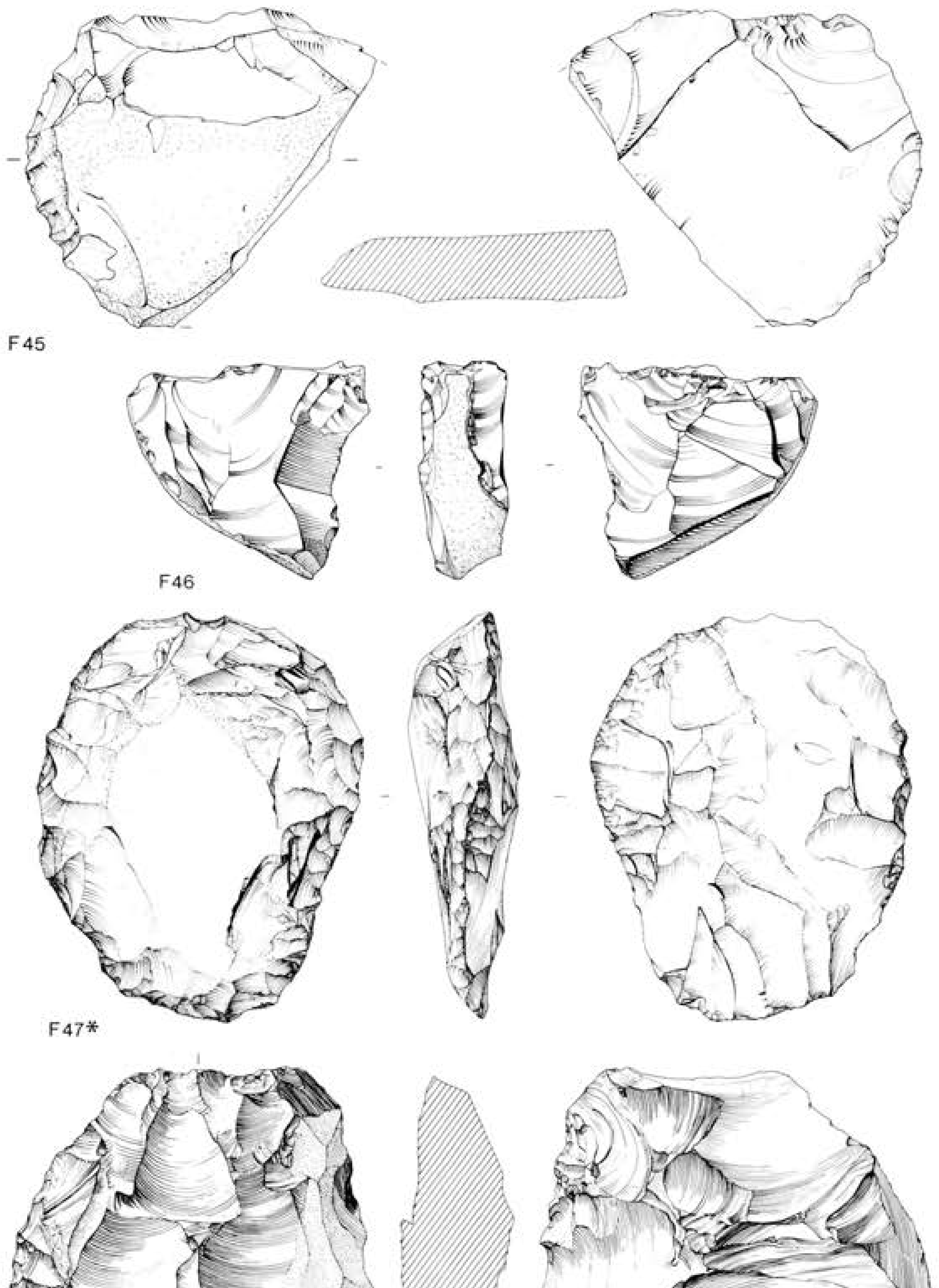


Figure 24 F45–48 (Scale 45, 46, 48:2/3; 47:1/3)

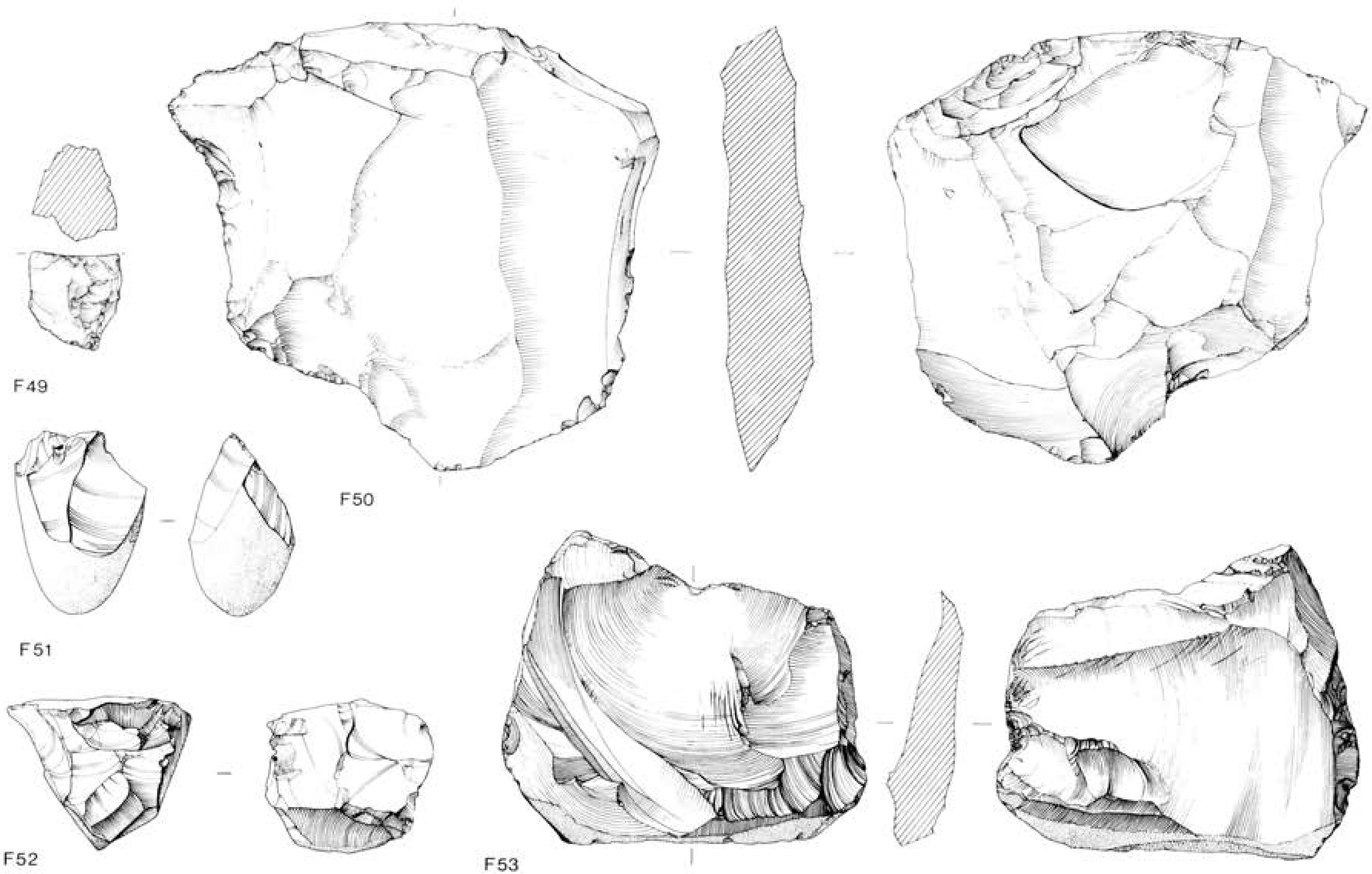


Figure 25 F49–53 (Scale 2/3)

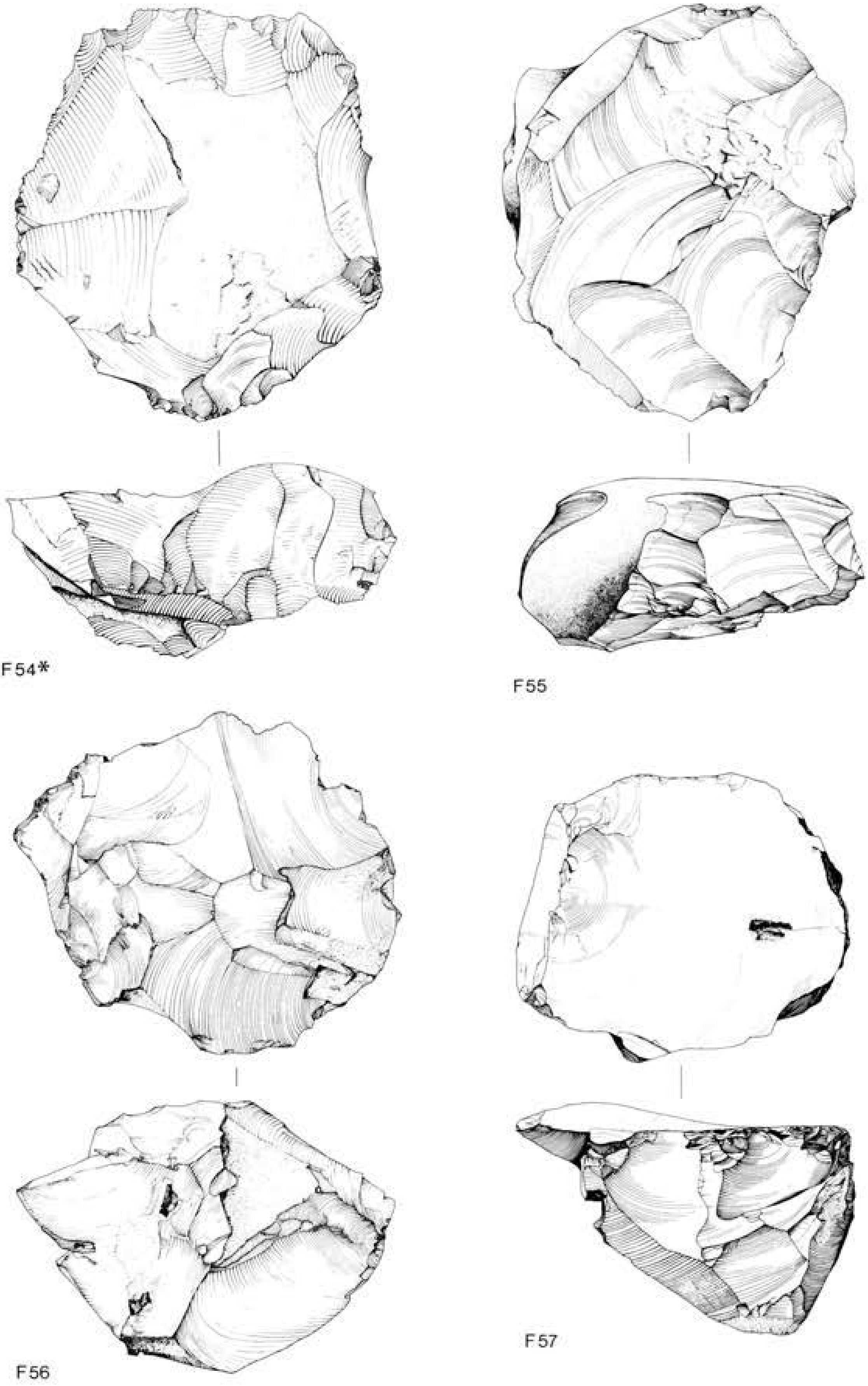


Figure 26 F54–57 (Scale 55–57:2/3; 54:1/3)

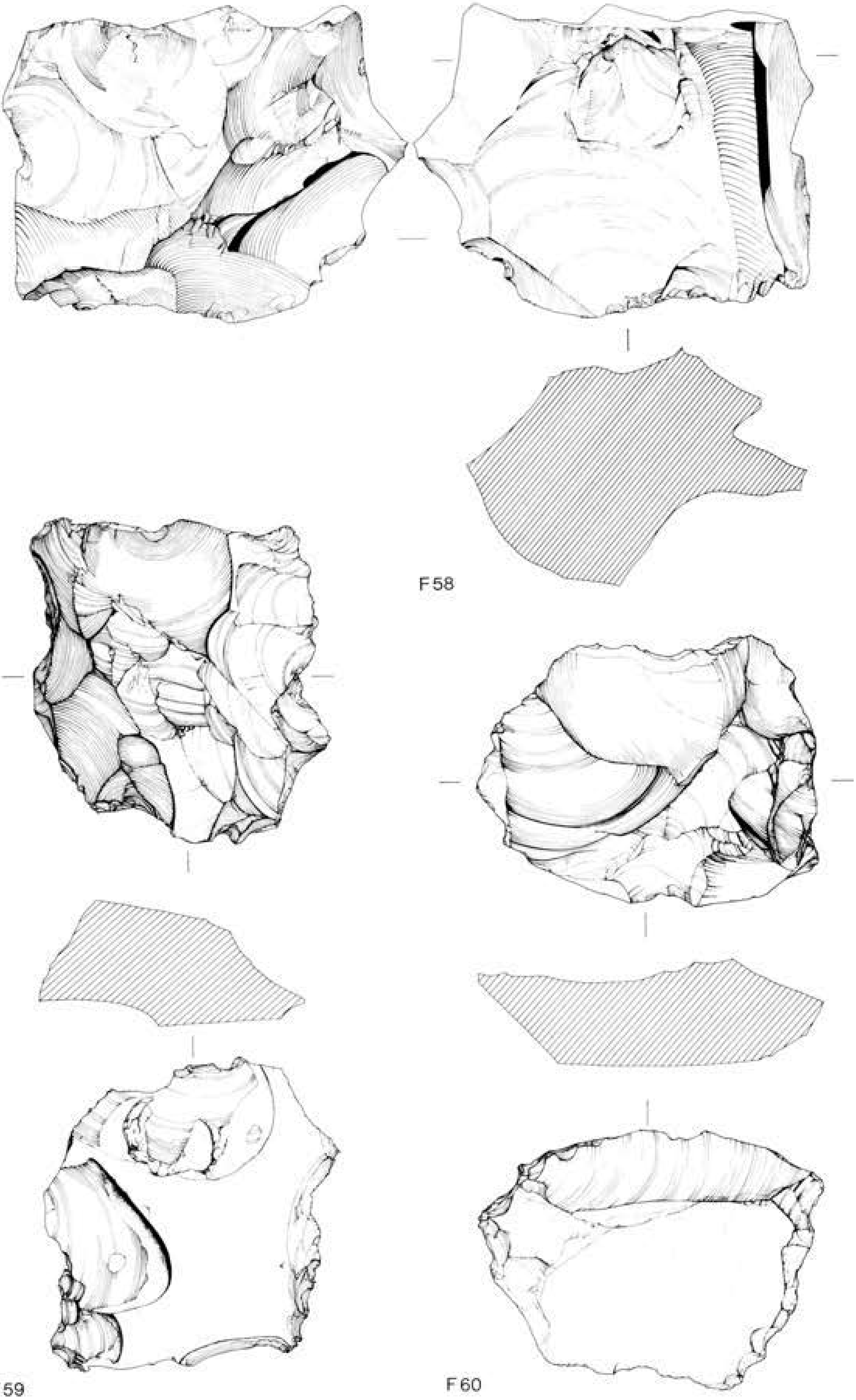
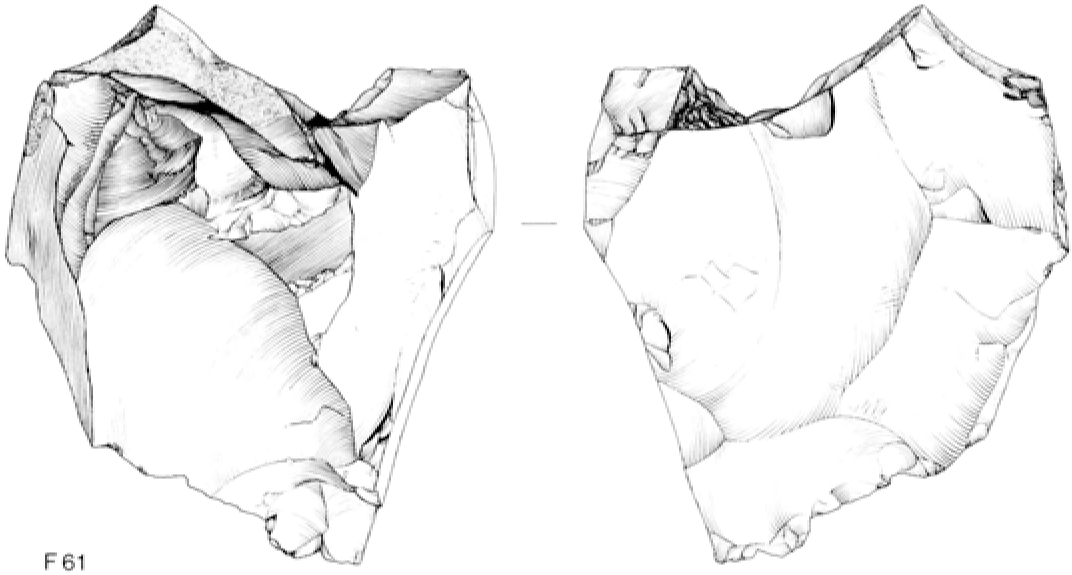
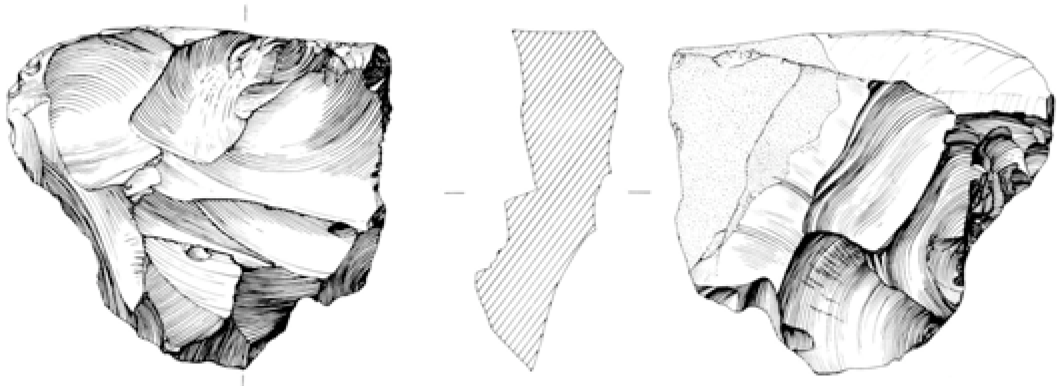


Figure 27 F58–60 (Scale 2/3)



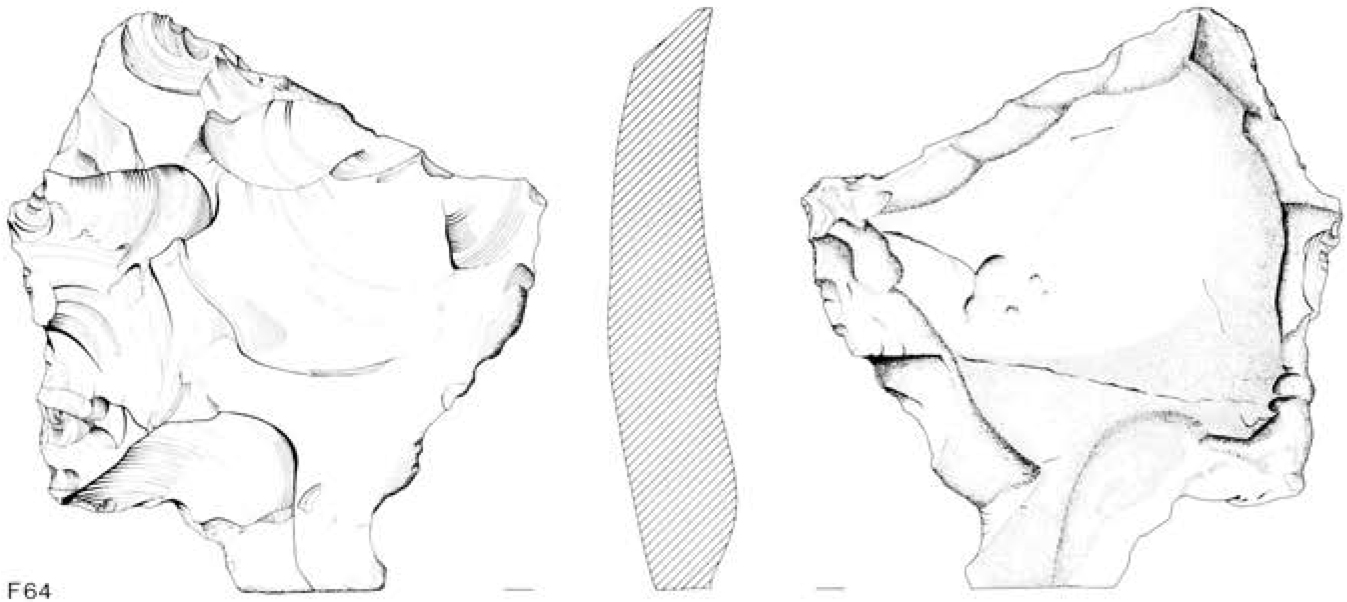
F 61



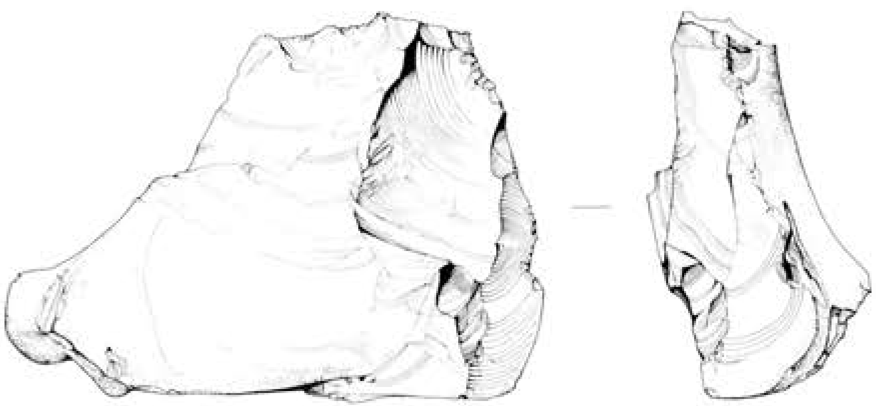
F 62

F63

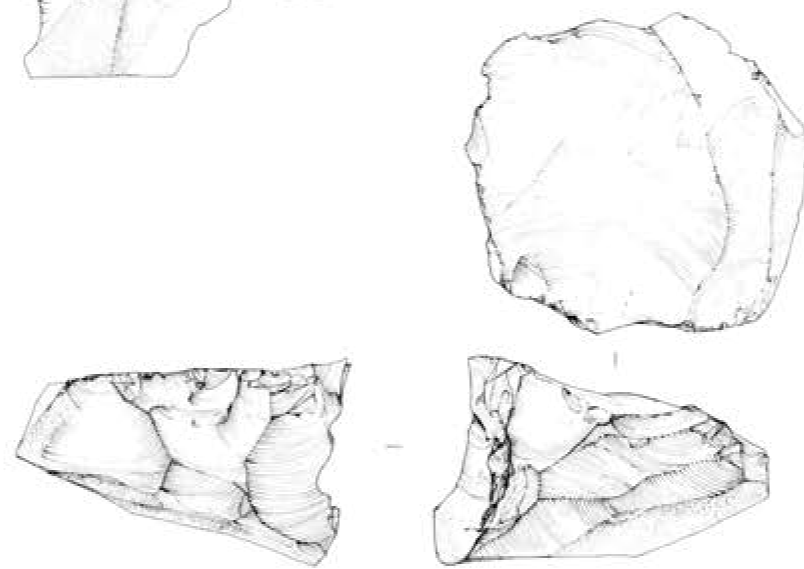
Figure 28 F61–63 (Scale 2/3)



F64



F65



F66

Figure 29 F64–66 (Scale 2/3)

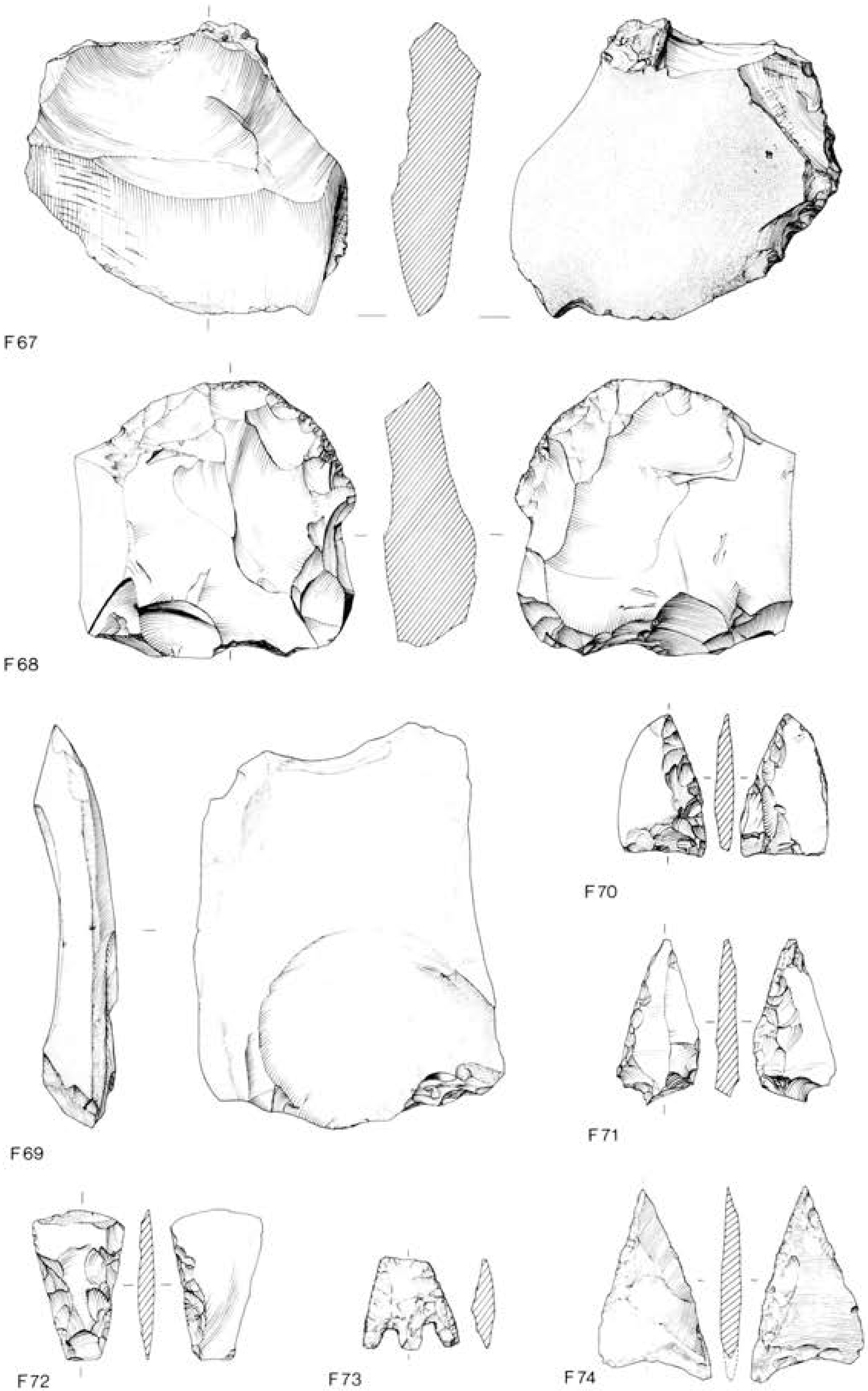
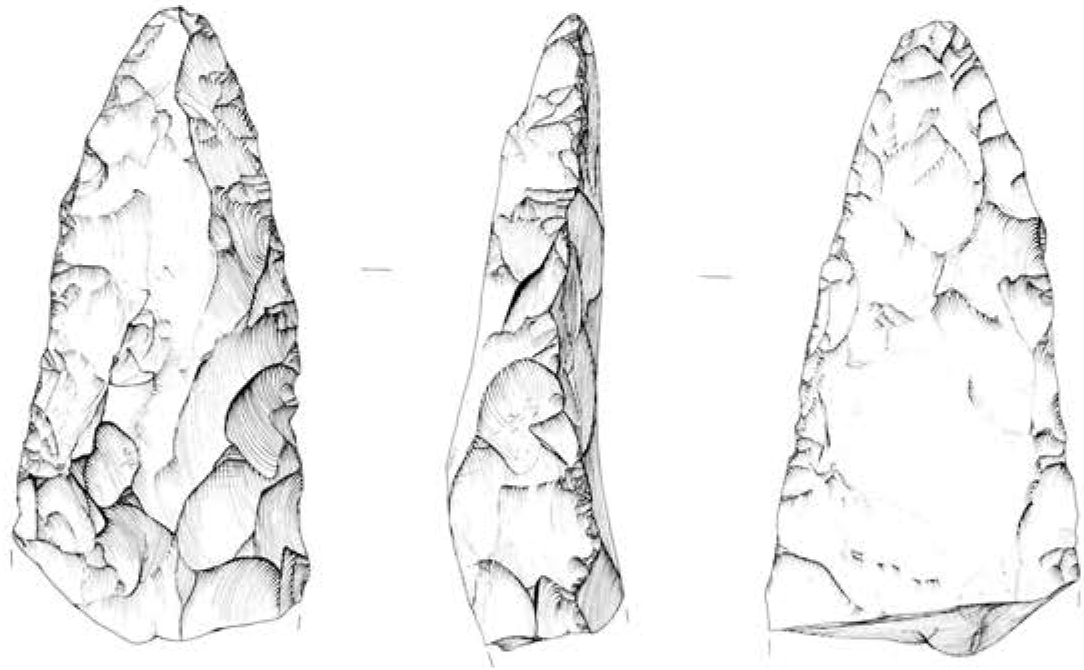
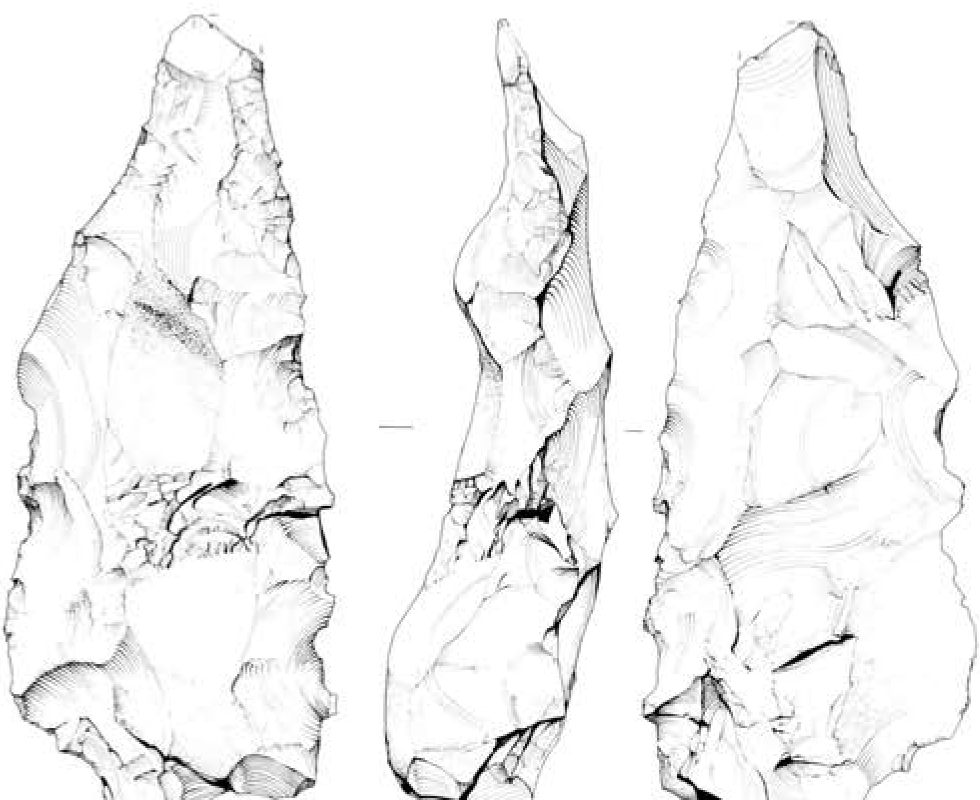


Figure 30 F67–74 (Scale 2/3)

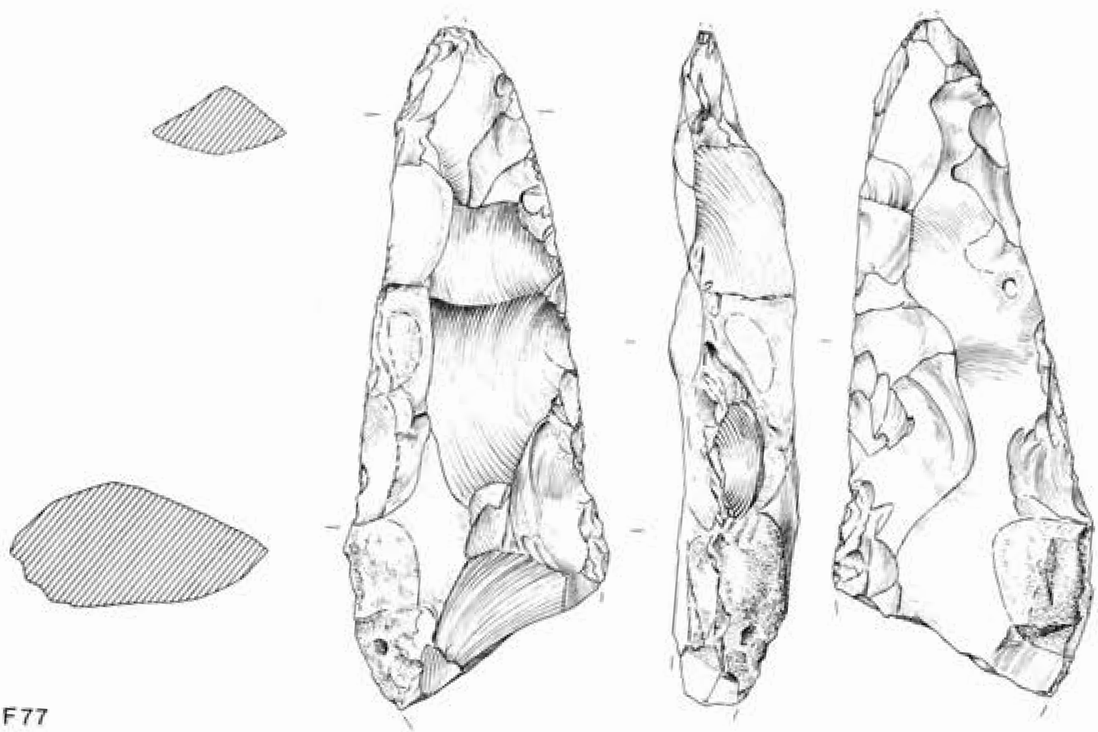


F75

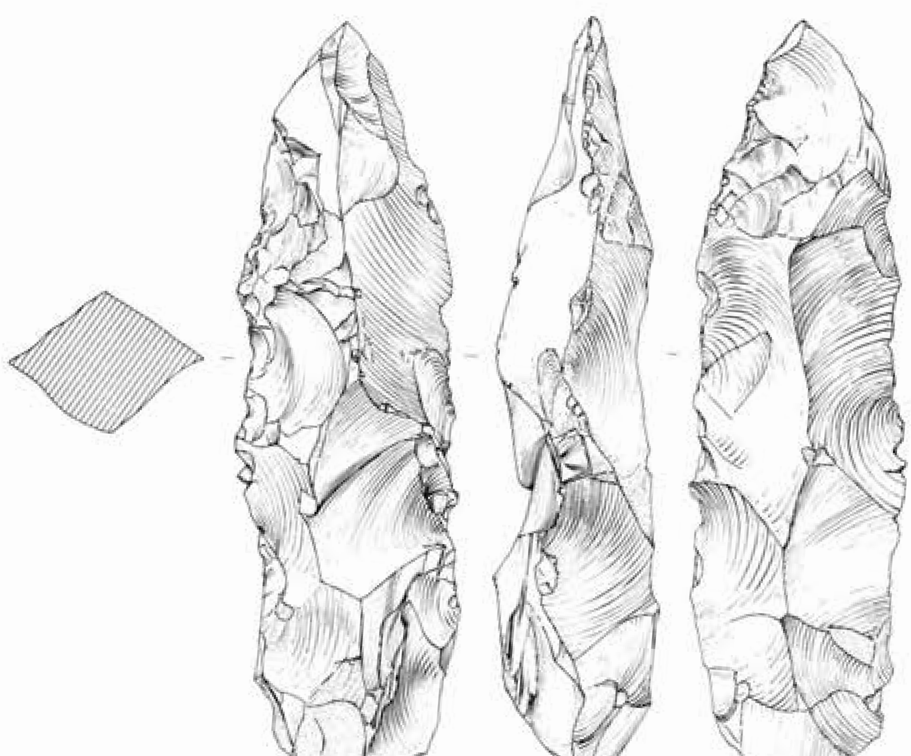


F76

Figure 31 F75–76 (Scale 2/3)

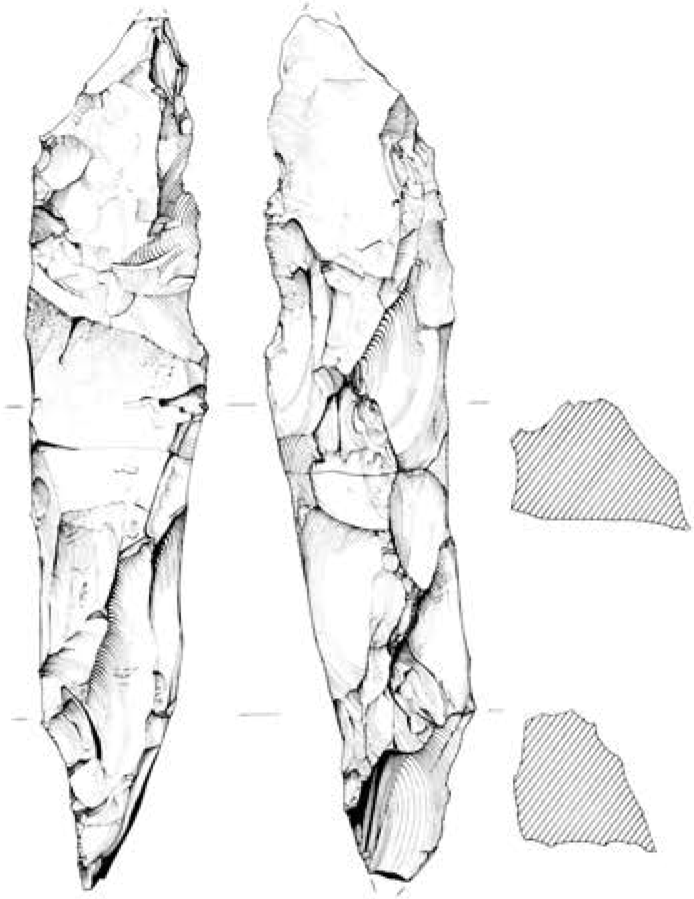


F77

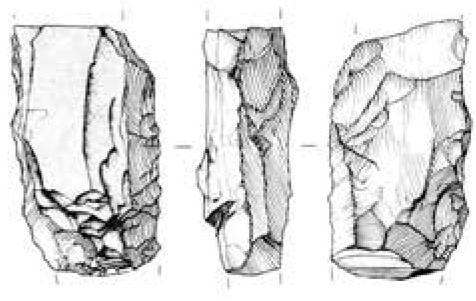


F78

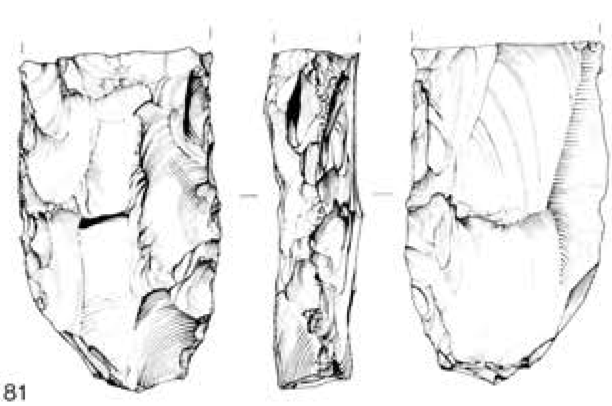
Figure 32 F77–78 (Scale 2/3)



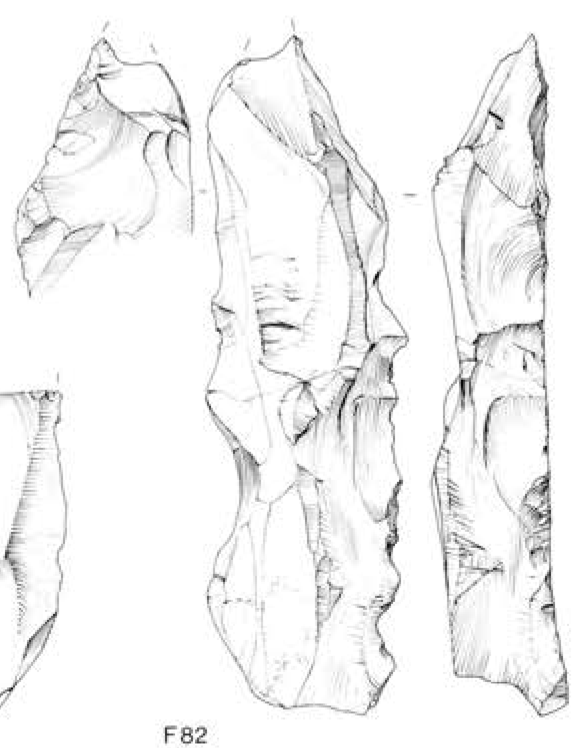
F 79



F 80



F 81



F 82

Figure 33 F79–82 (Scale 2/3)

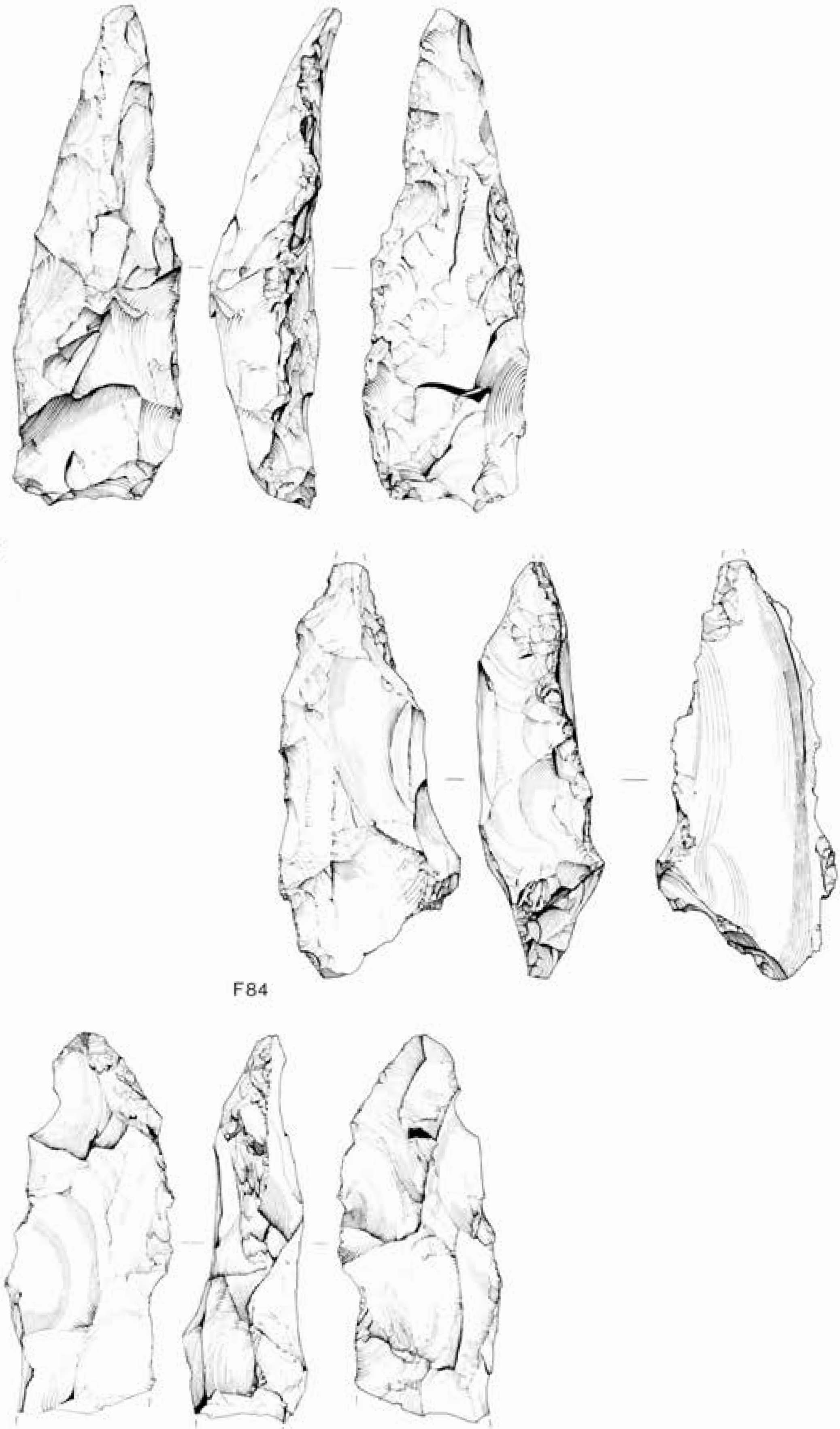
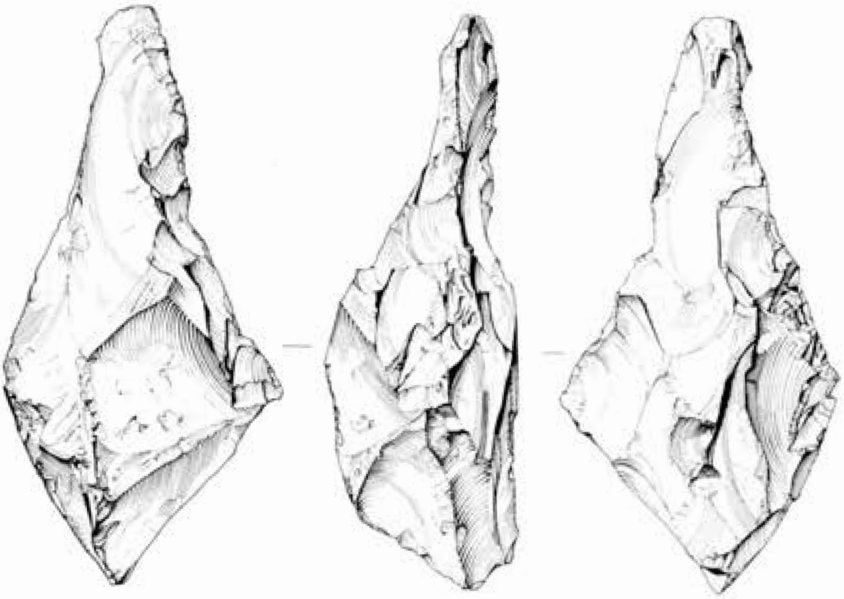
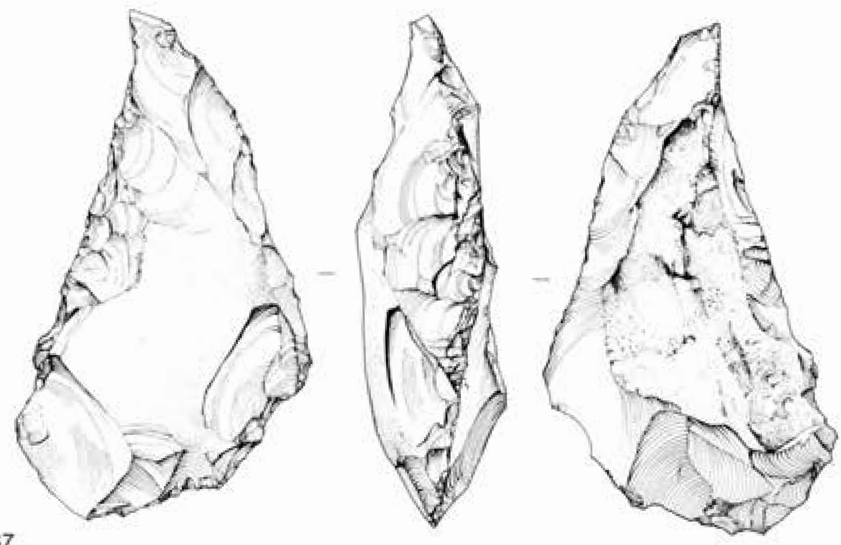


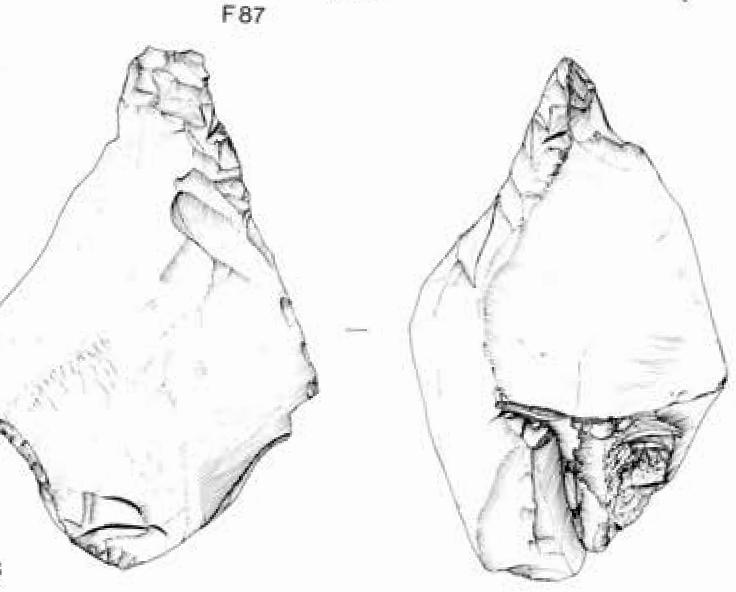
Figure 34 F83–85 (Scale 2/3)



F86

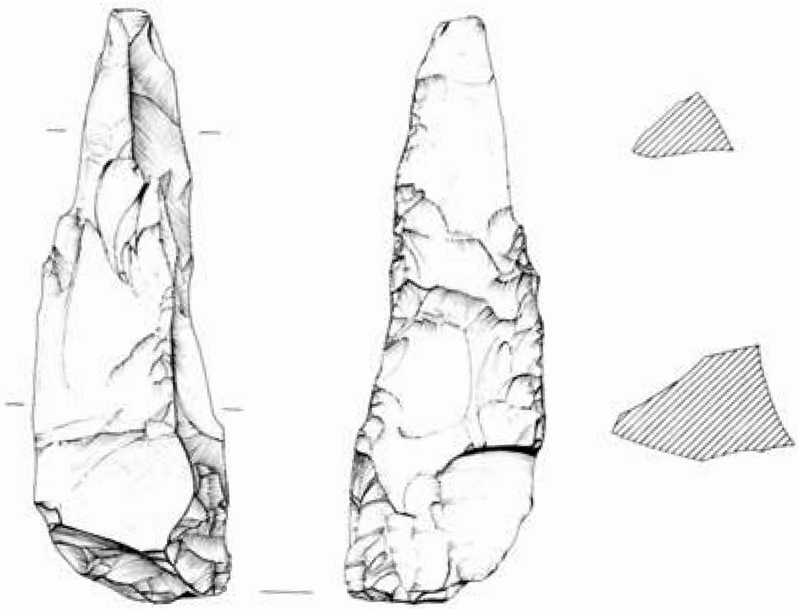


F87

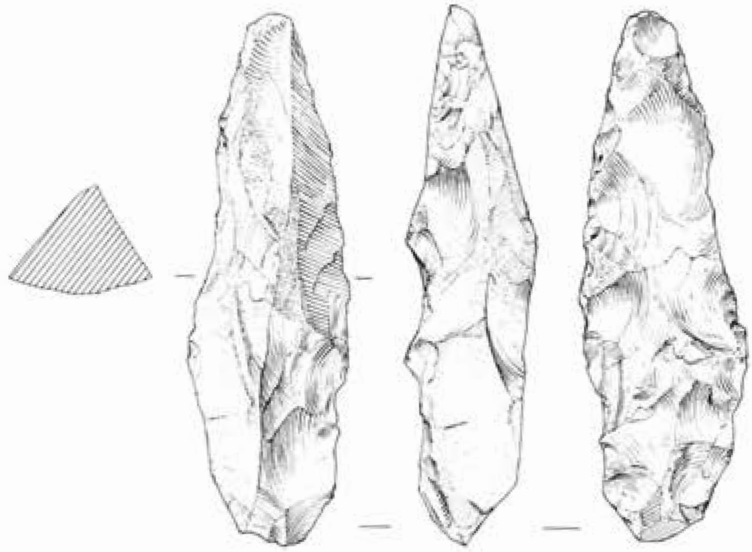


F88

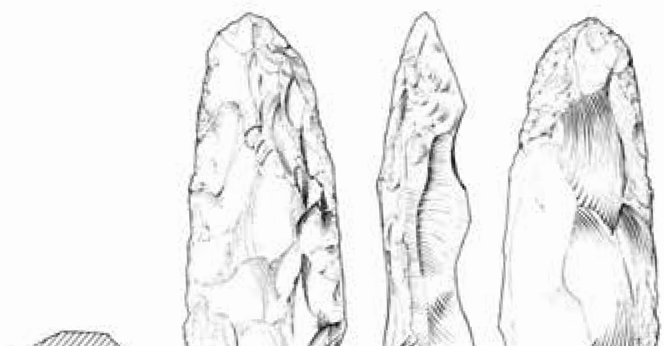
Figure 35 F86–88 (Scale 2/3)



F89

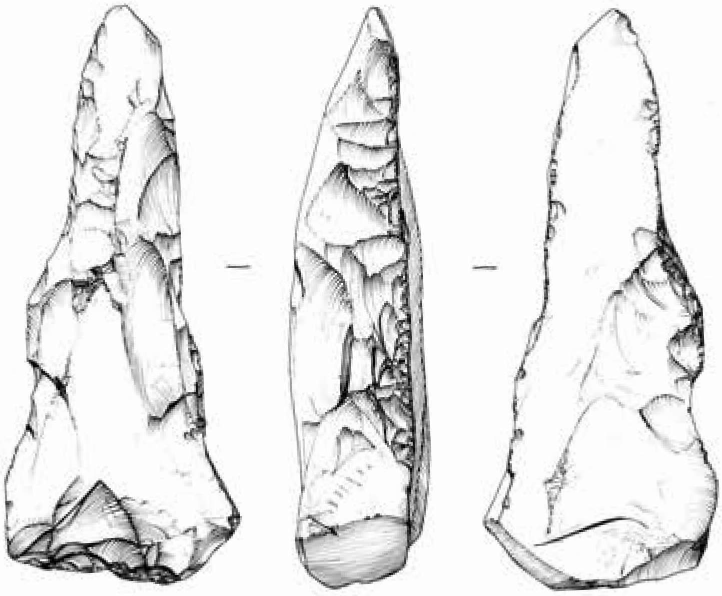


F90

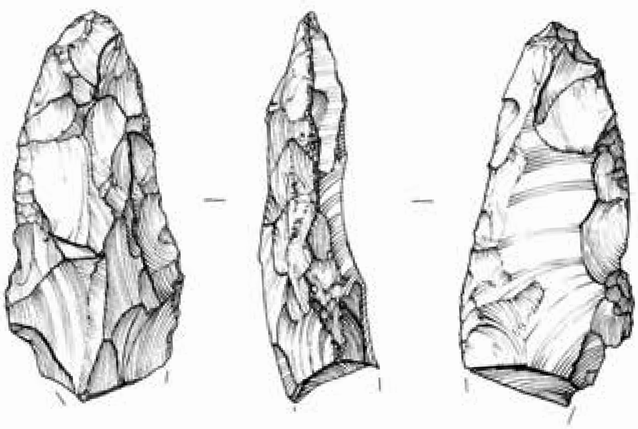


F91

Figure 36 F89–91 (Scale 2/3)



F92



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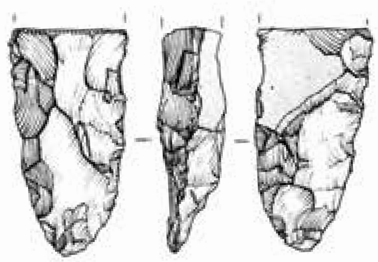
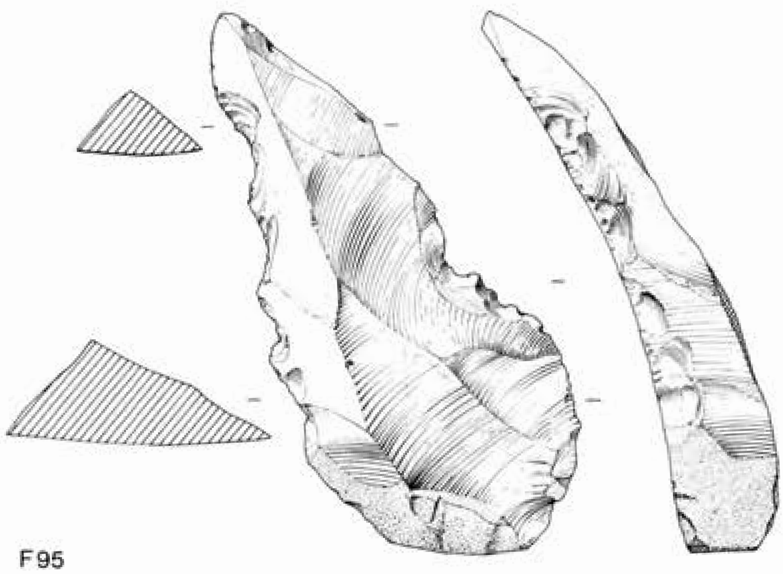
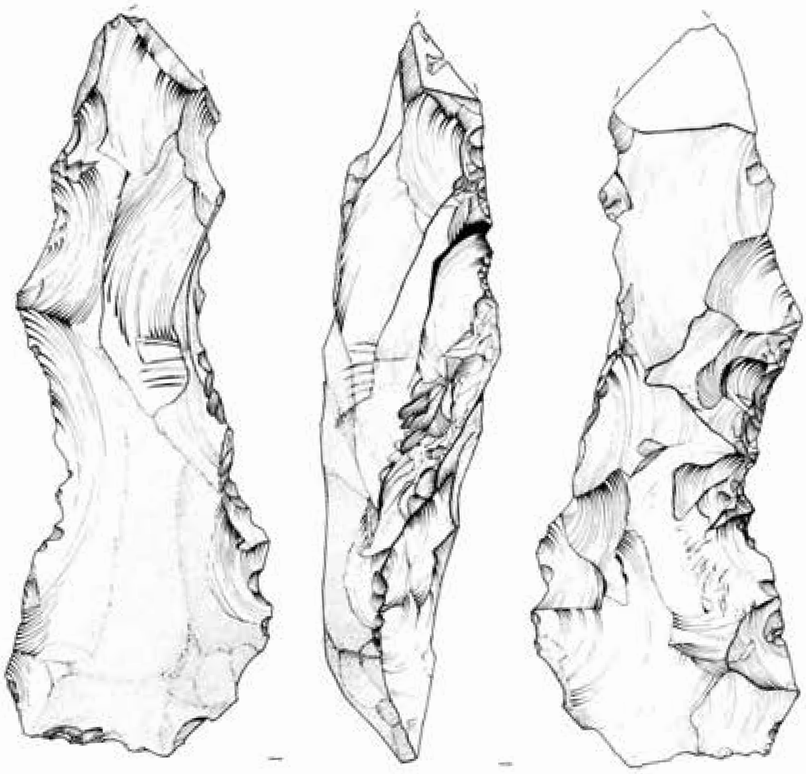


F94

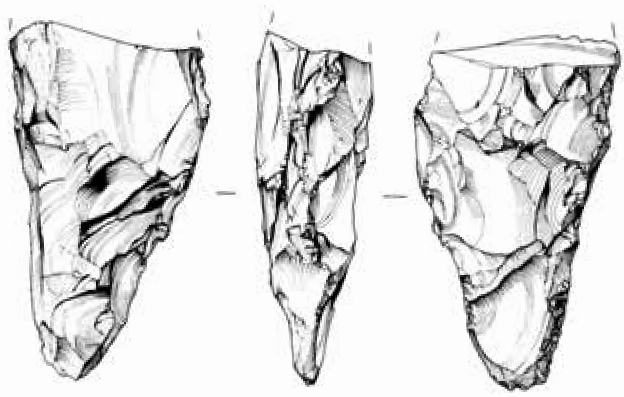


F95

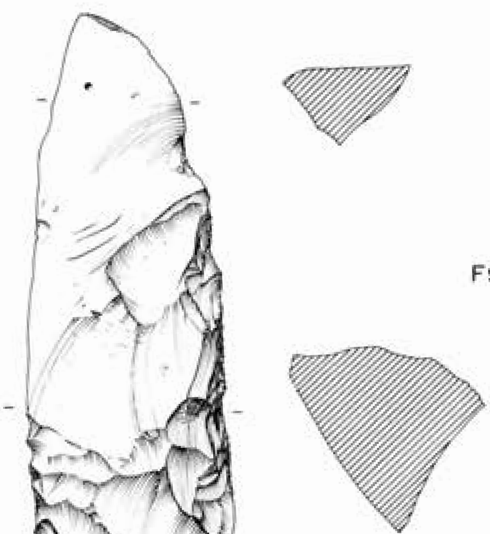
Figure 37 F92–95 (Scale 2/3)



F96



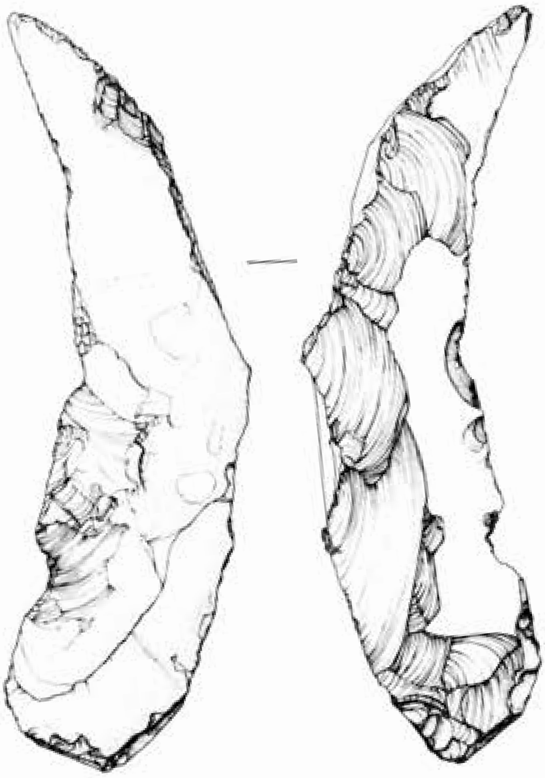
F97



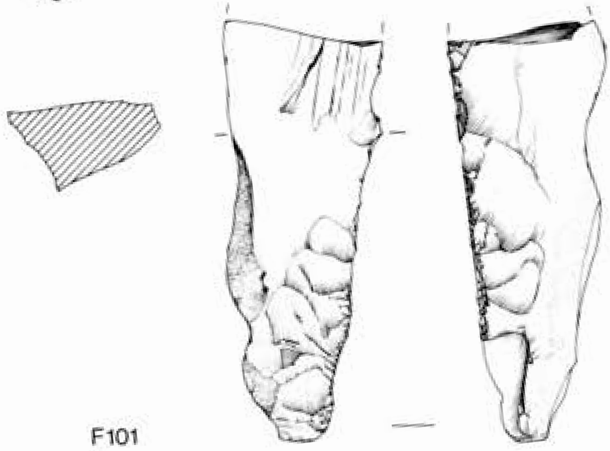
F98

F99

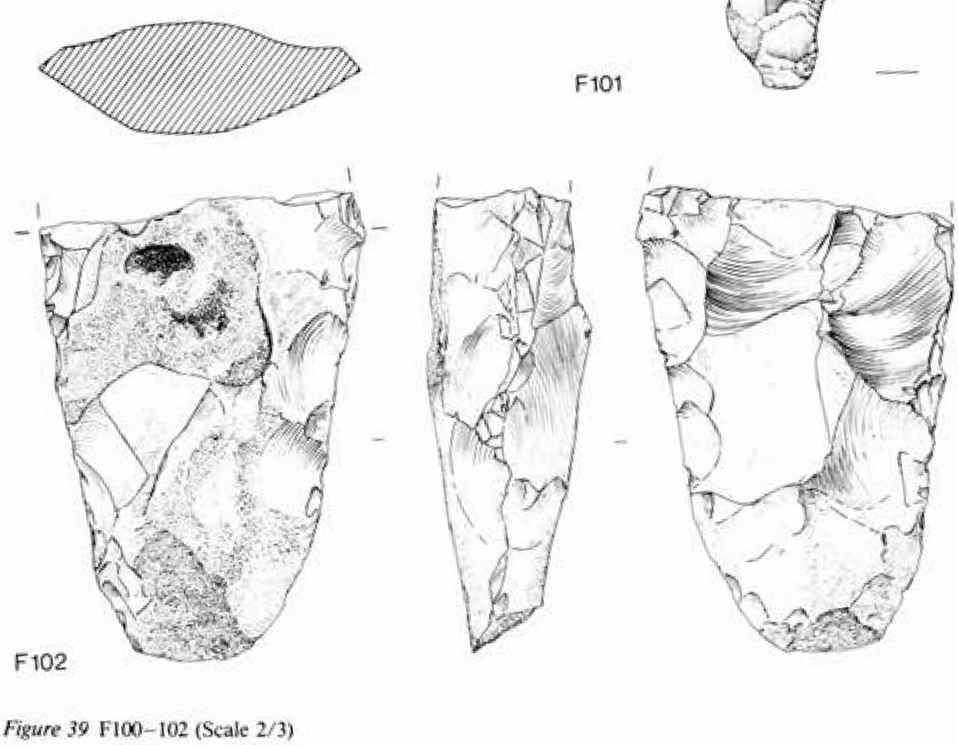
Figure 38 F96–99 (Scale 2/3)



F100

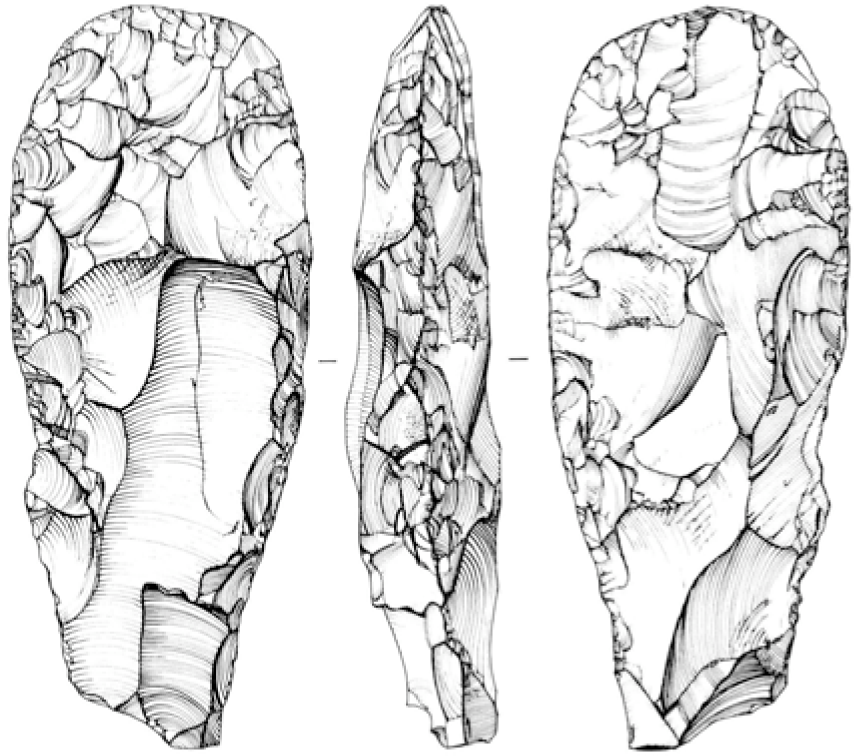


F101

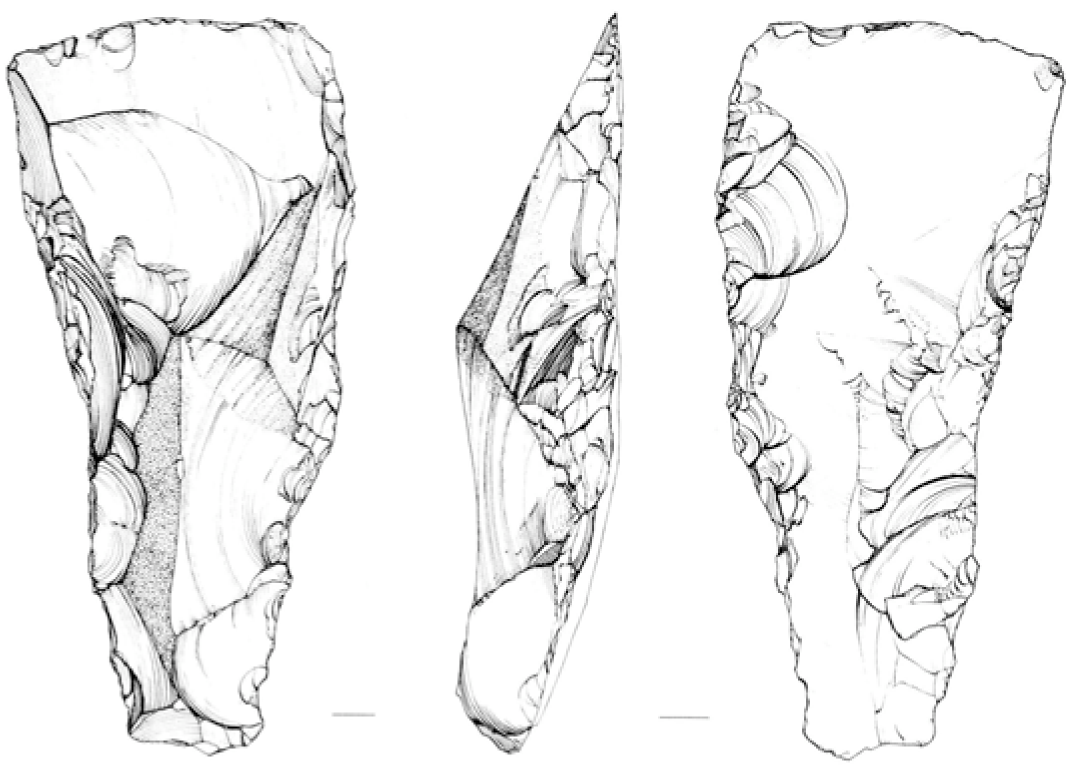


F102

Figure 39 F100–102 (Scale 2/3)

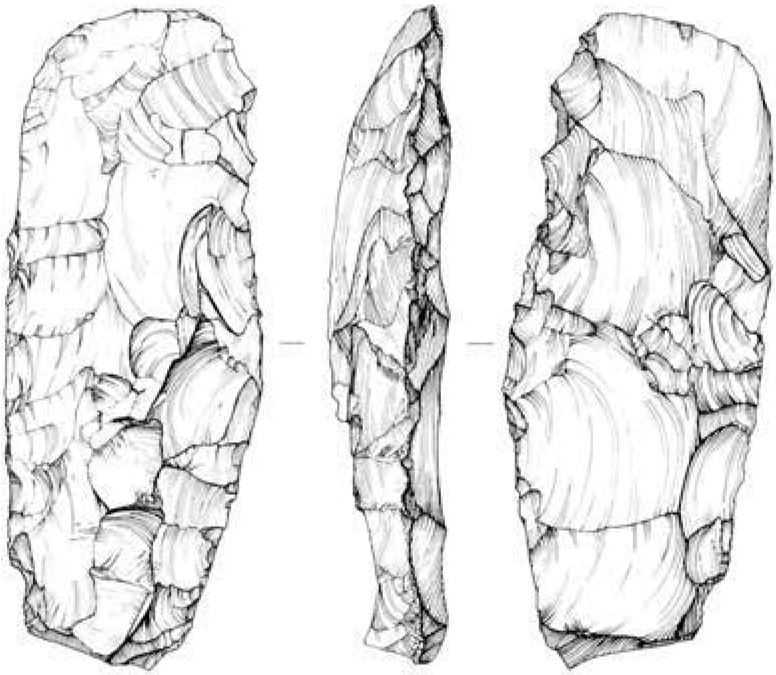


F103

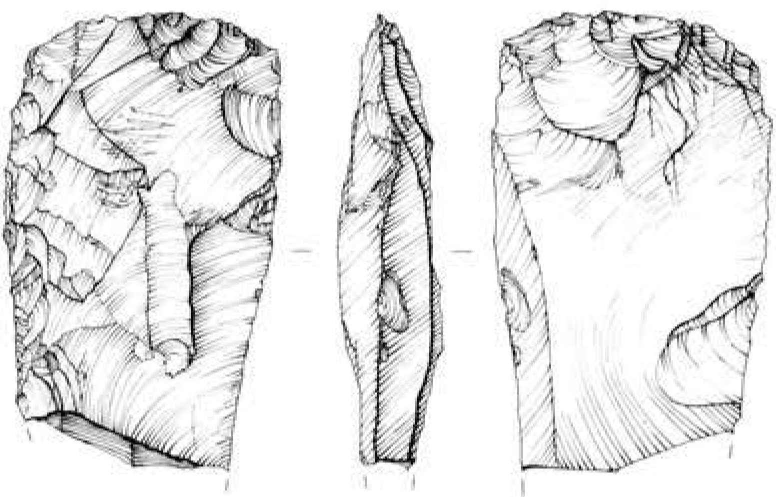


F104

Figure 40 F103–104 (Scale 2/3)



F105



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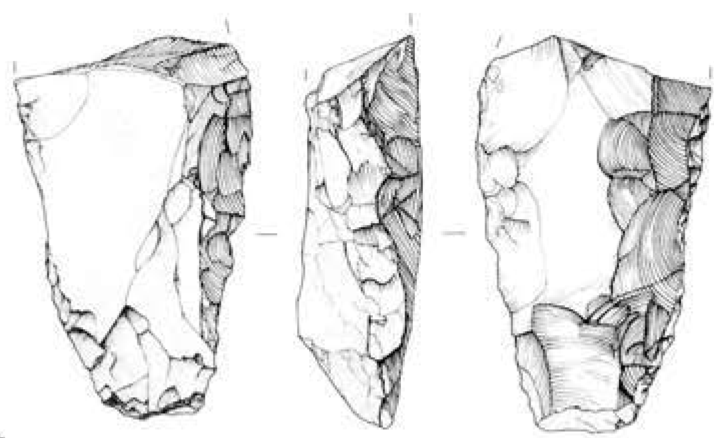
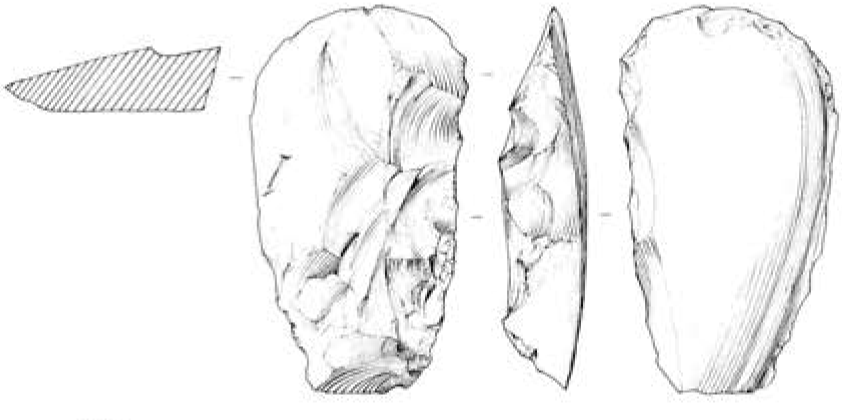
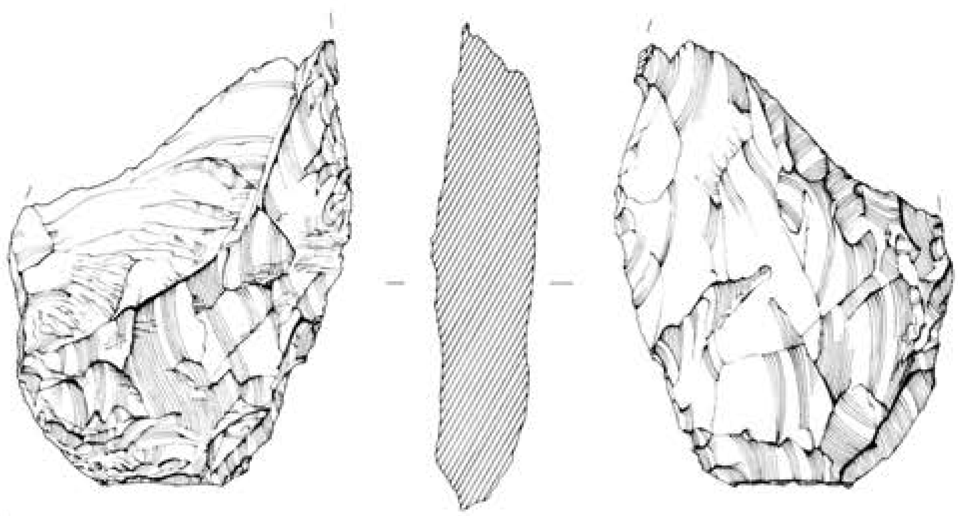


F107

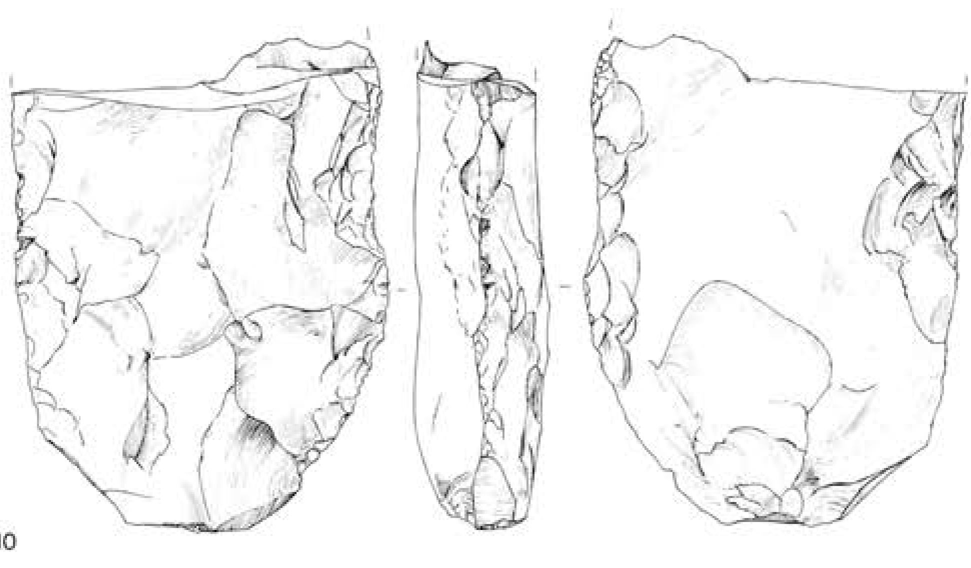
Figure 41 F105–107 (Scale 2/3)



F108

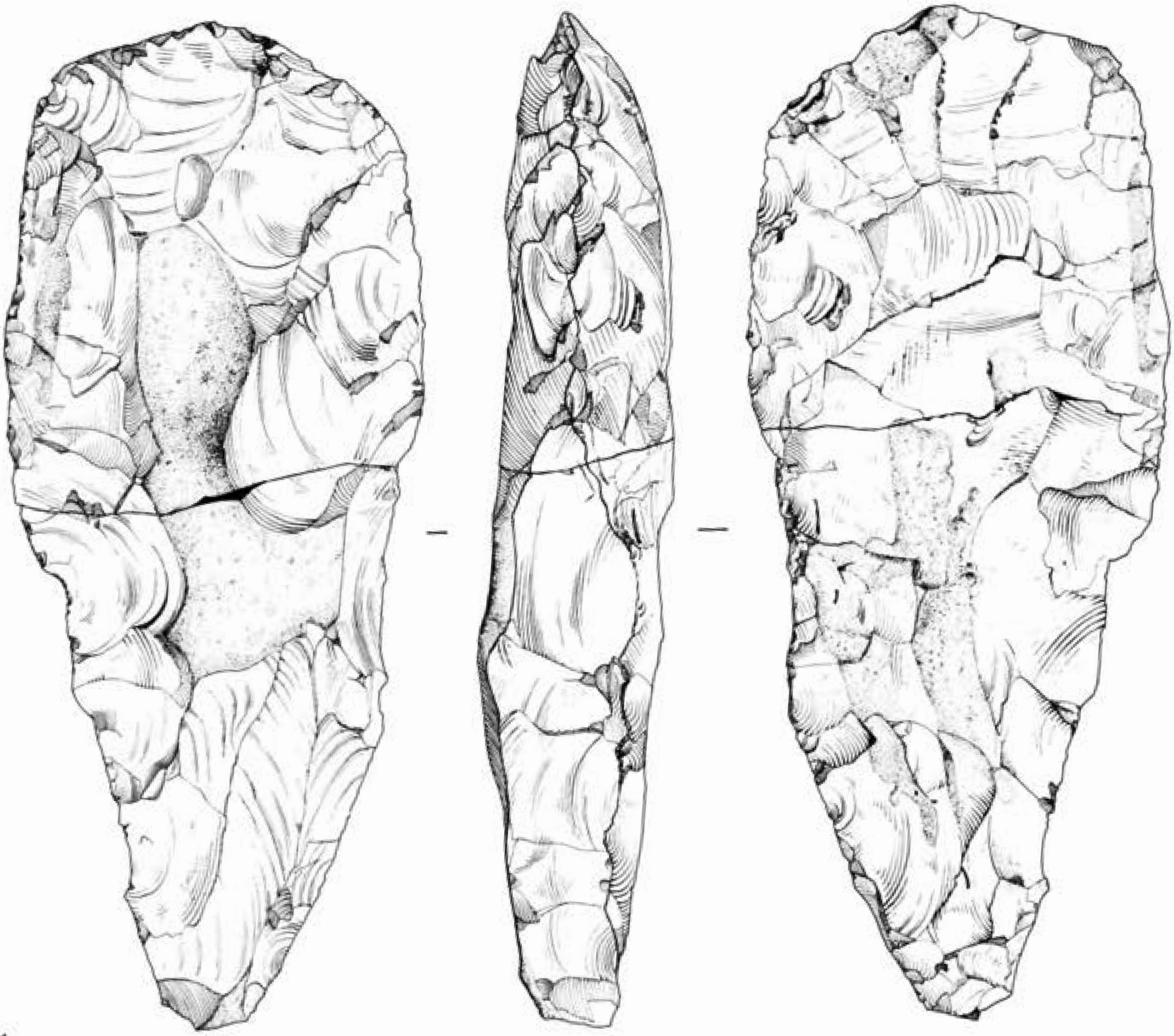


F109



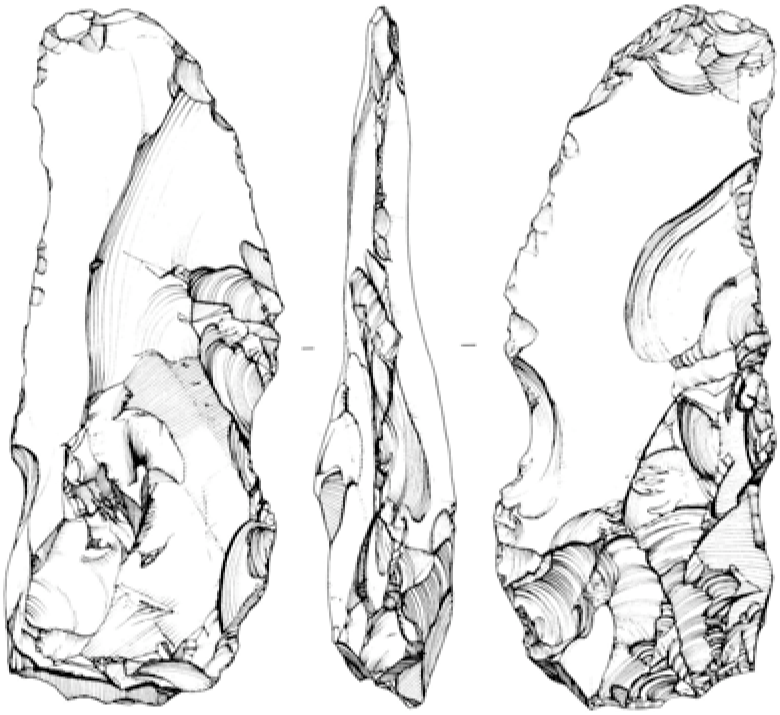
F110

Figure 42 F108–110 (Scale 2/3)

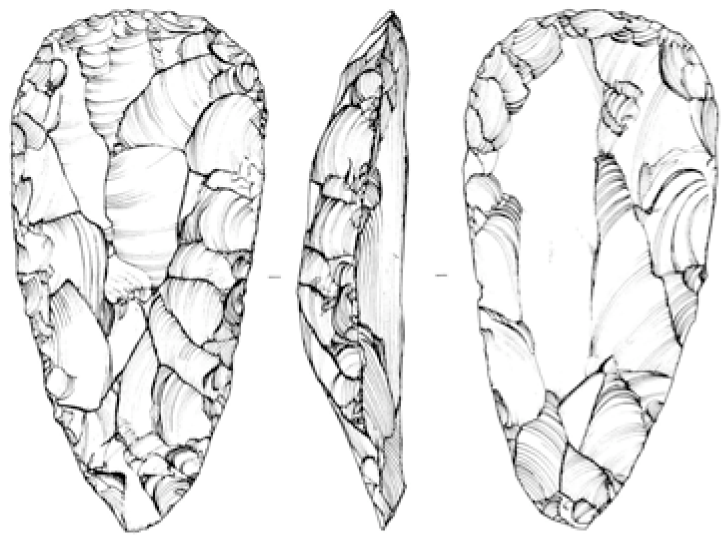


F 111

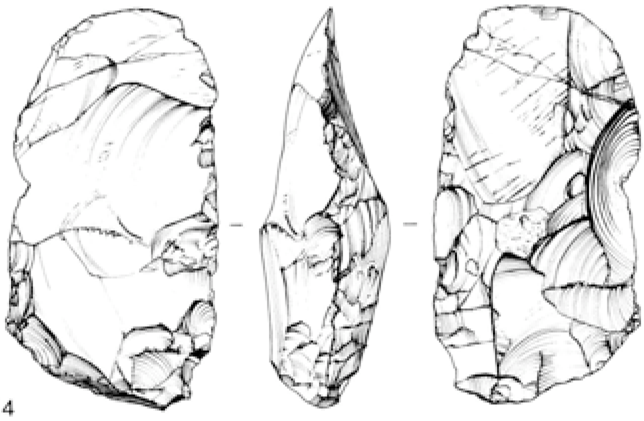
Figure 43 F111 (Scale 2/3)



F 112

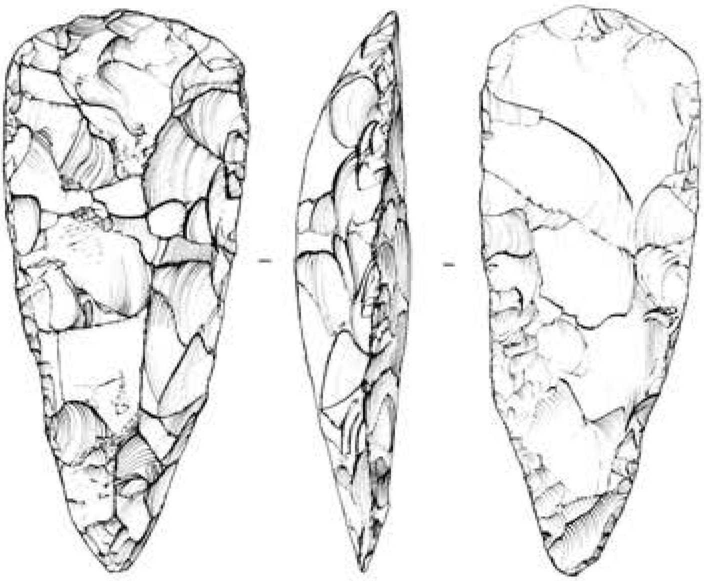


F 113

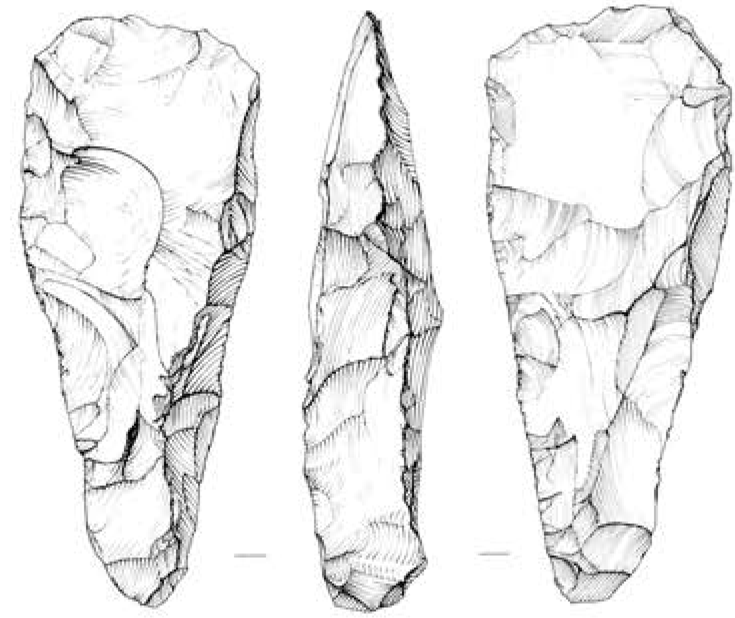


F 114

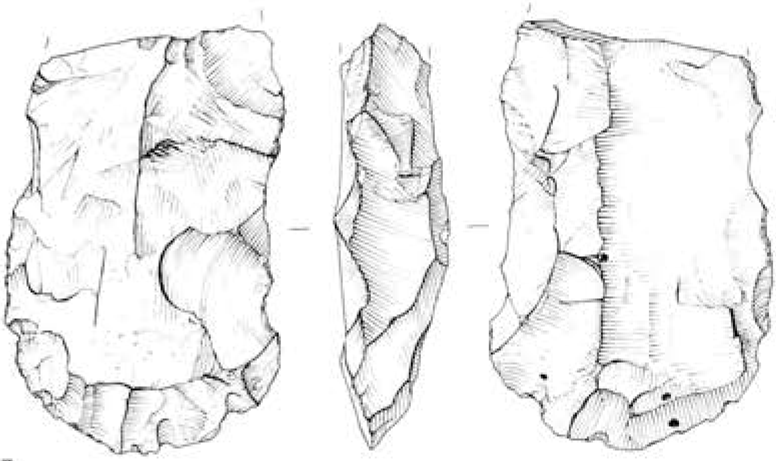
Figure 44 F112–114 (Scale 2/3)



F 115

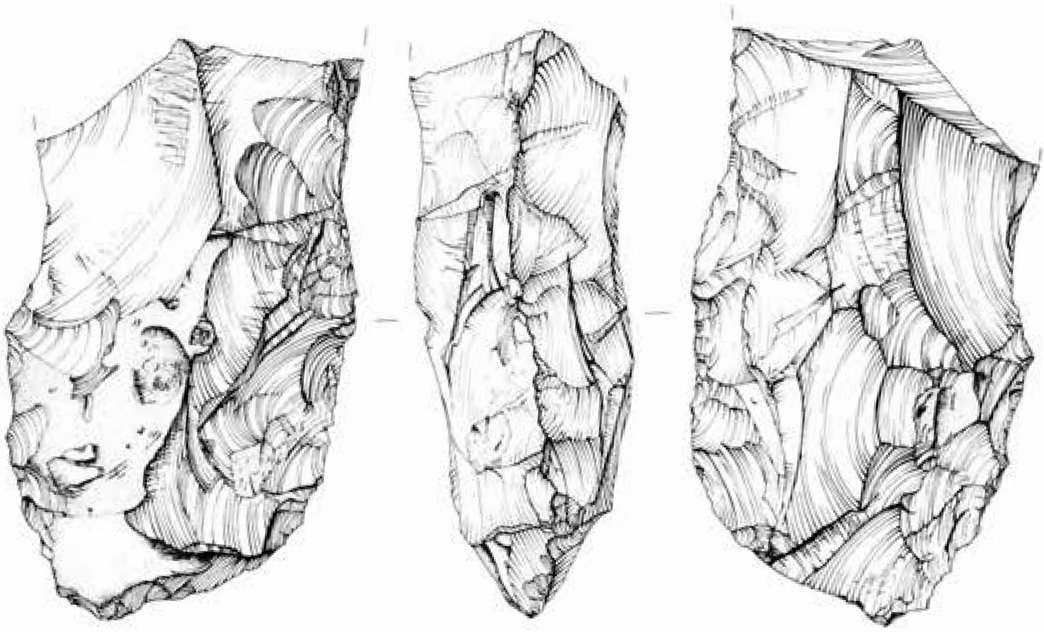


F 116

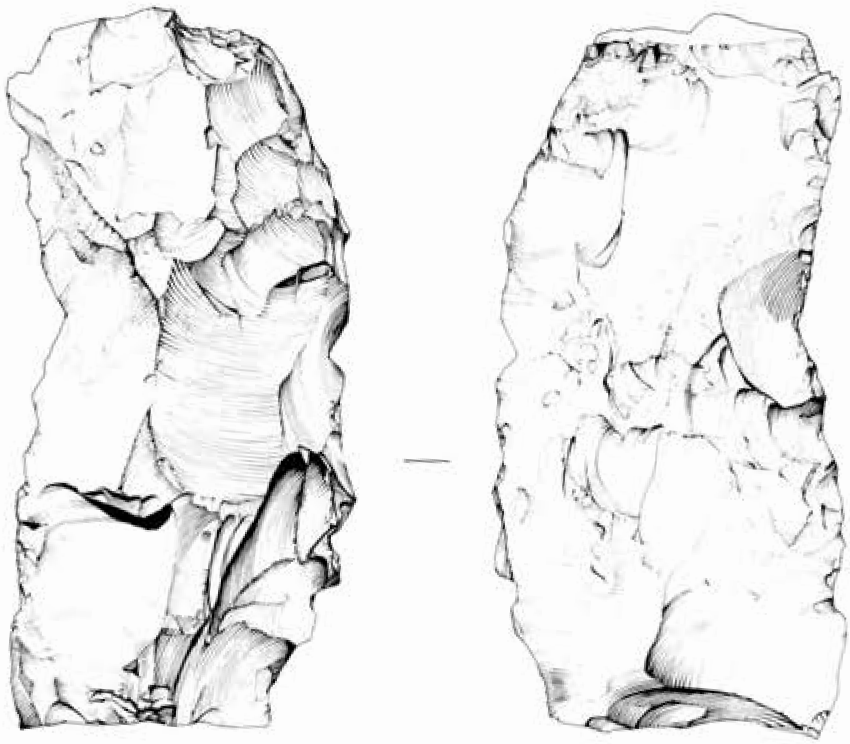


F 117

Figure 45 F115–117 (Scale 2/3)

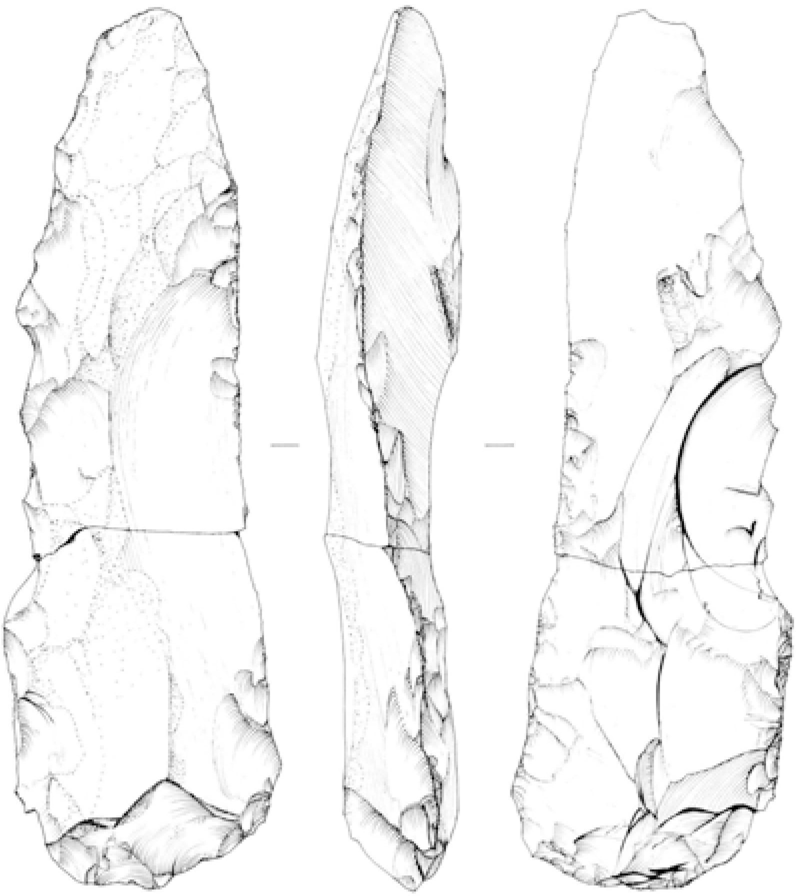


F118



F119

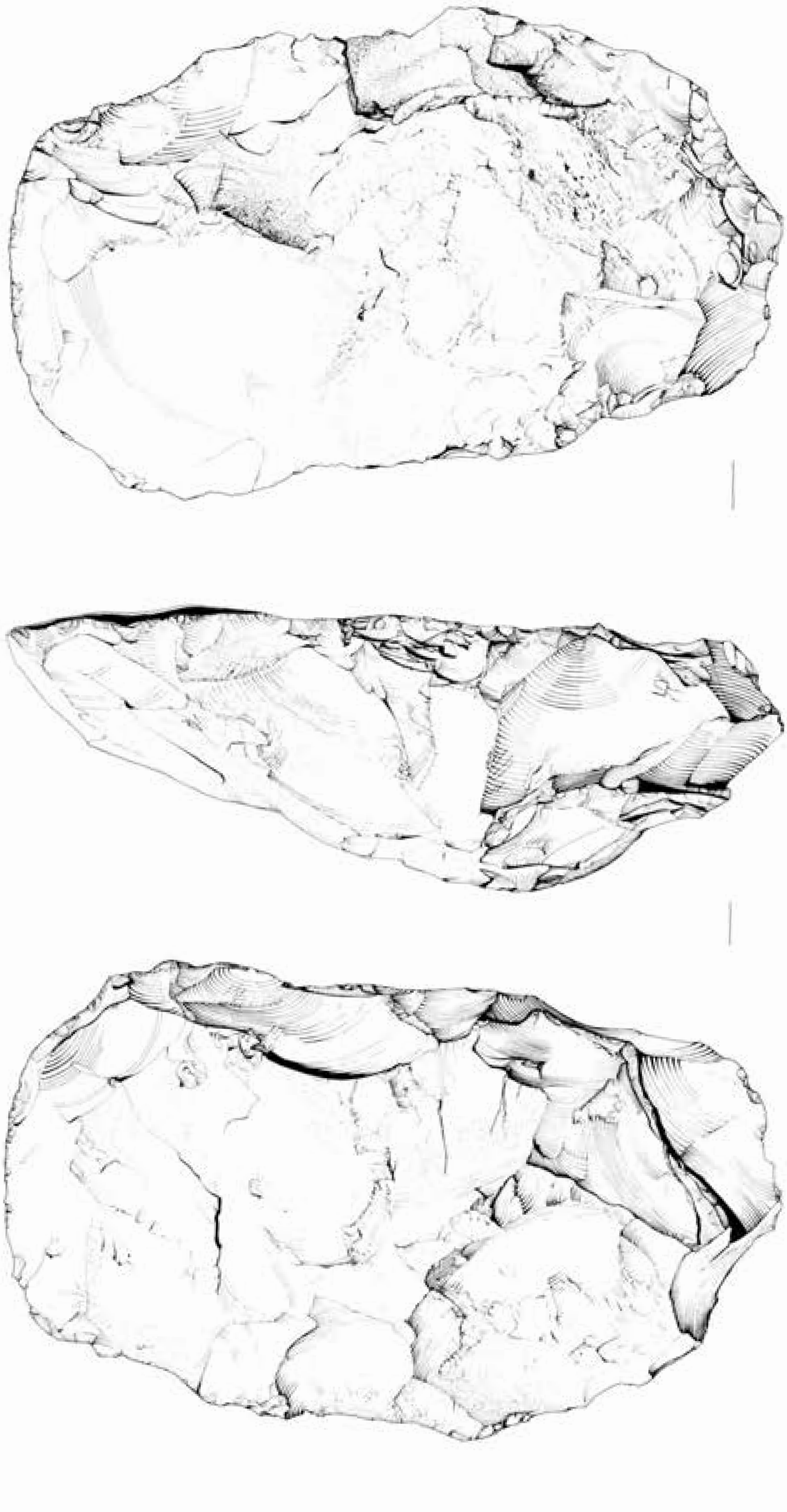
Figure 46 F118–119 (Scale 2/3)



F 120

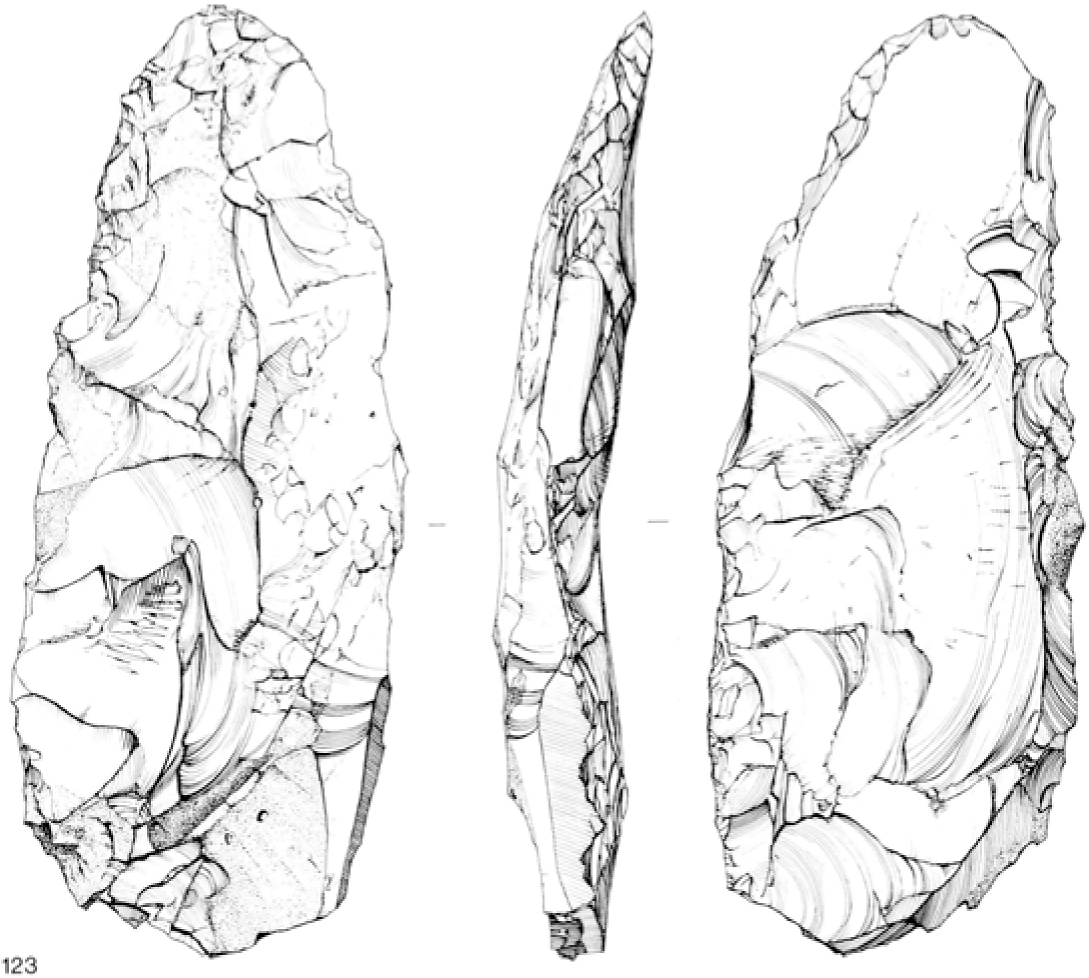
F121

Figure 47 F120–121 (Scale 2/3)

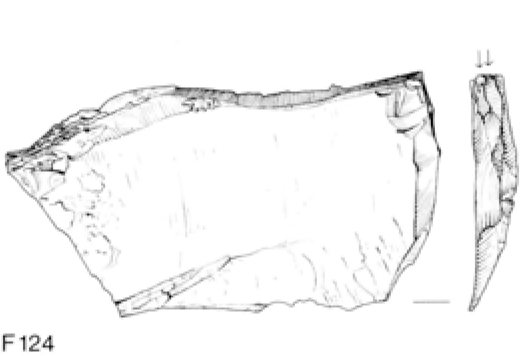


F122

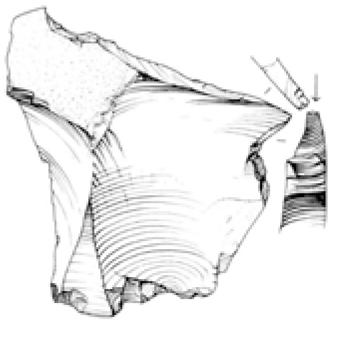
Figure 48 F122 (Scale 2/3)



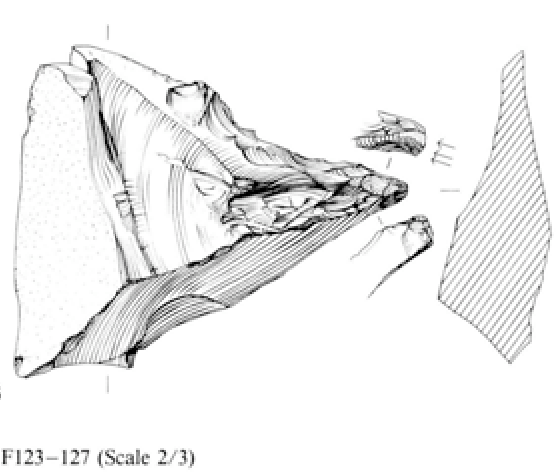
F123



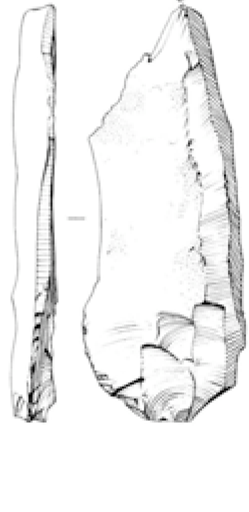
F124



F125

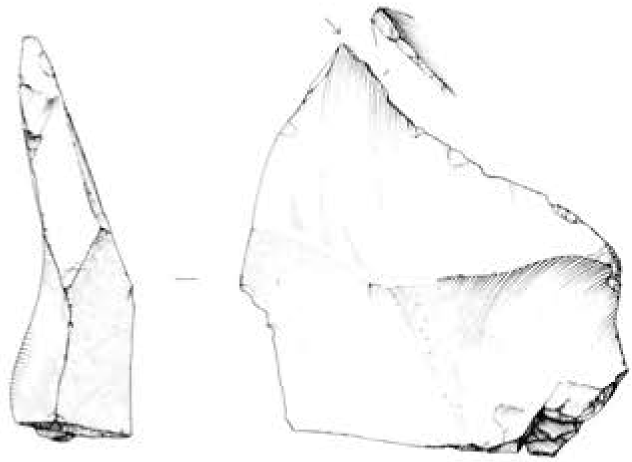


F126

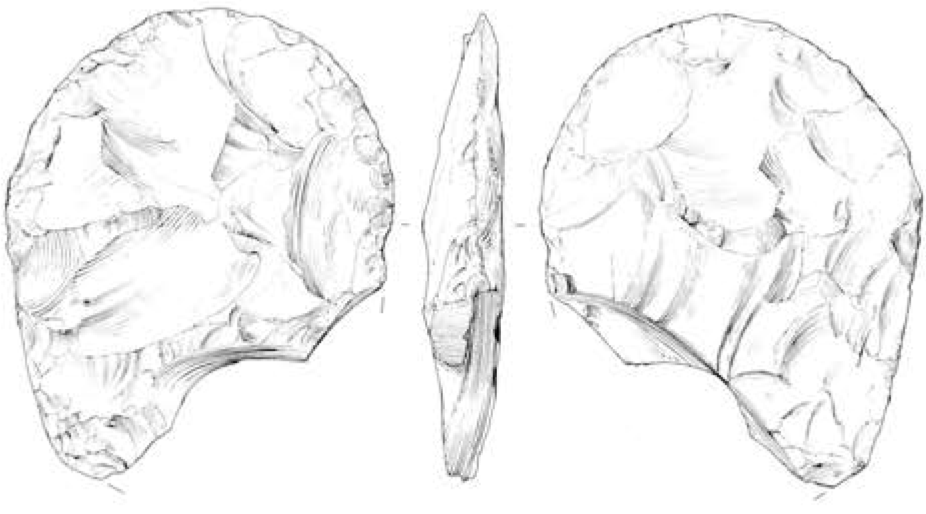


F127

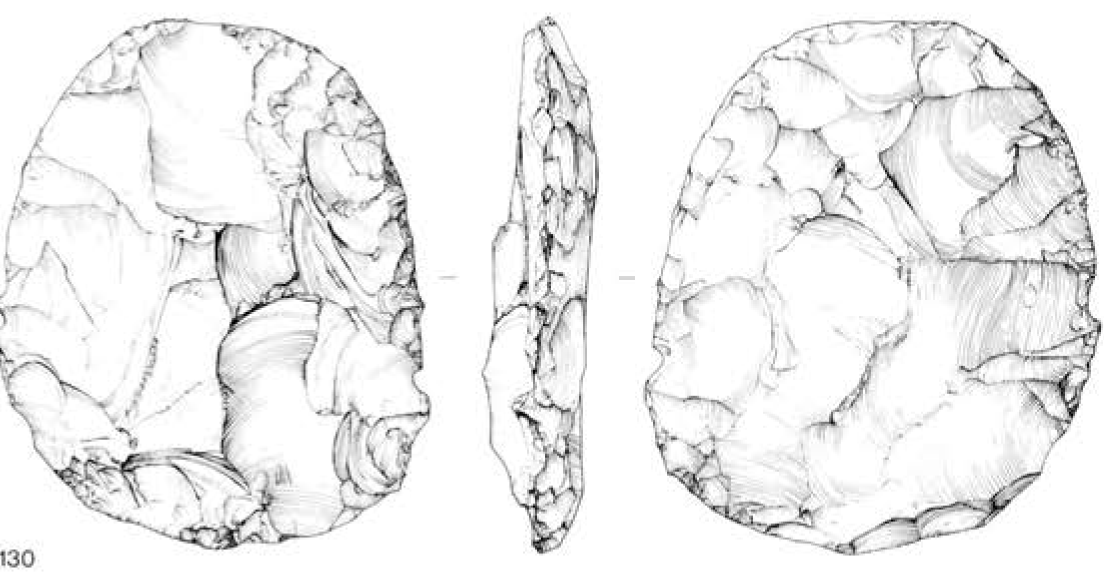
Figure 49 F123–127 (Scale 2/3)



F128

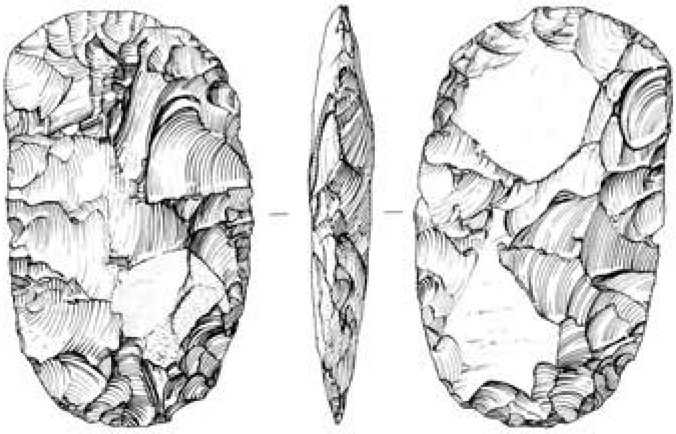


F129

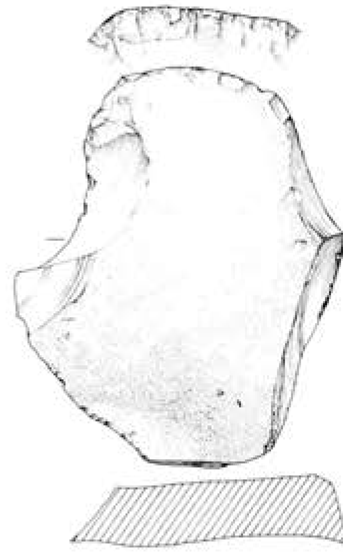


F130

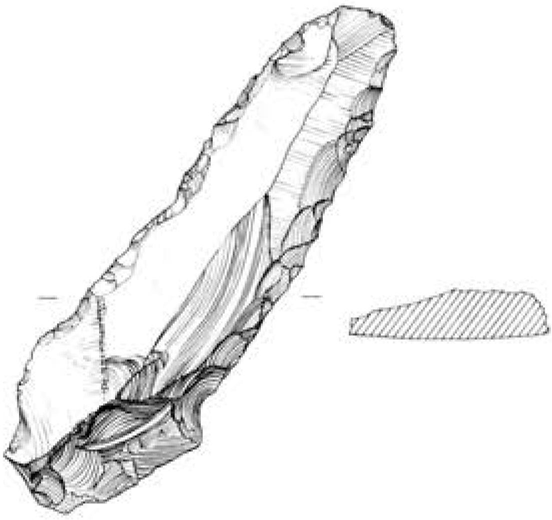
Figure 50 F128 –130 (Scale 2/3)



F131



F133



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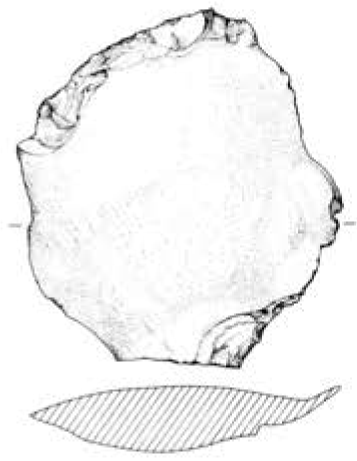
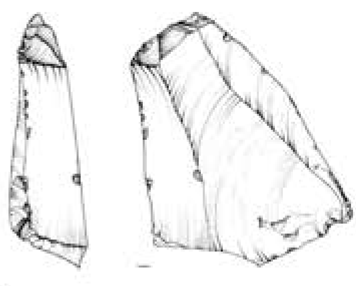
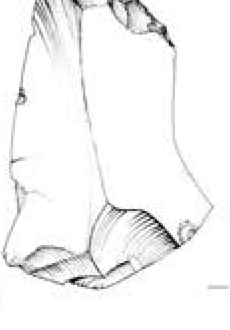


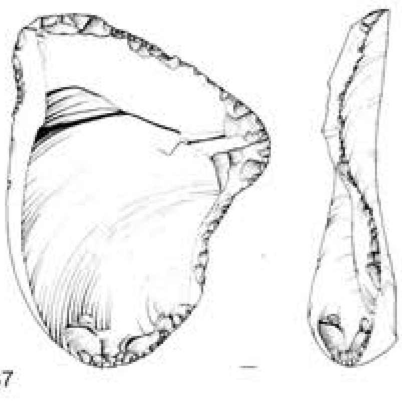
F135



F134

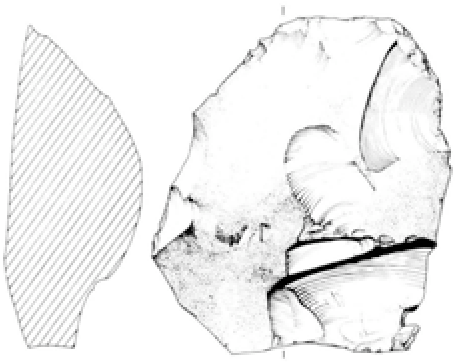


F136

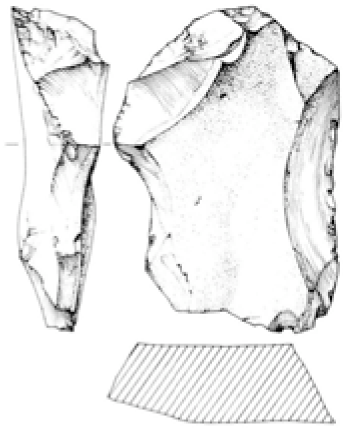


F137

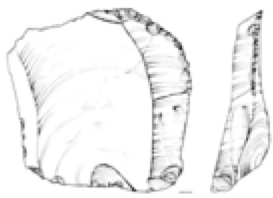
Figure 51 F131–137 (Scale 2/3)



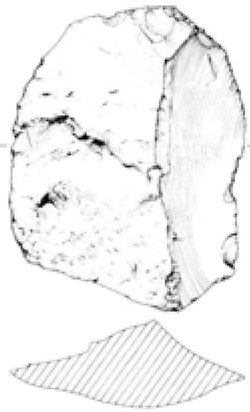
F138



F139

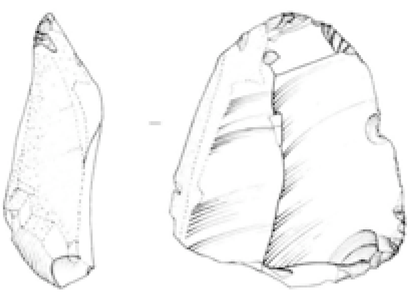


F140



F141

F142



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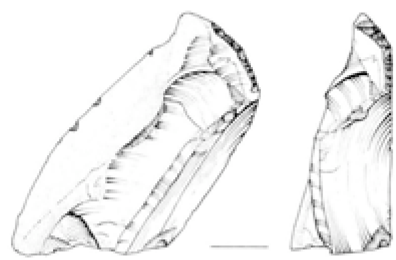
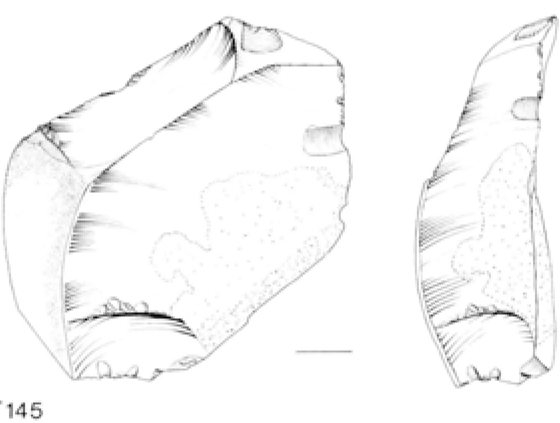


F144



F145

F146

Figure 52 F138–146 (Scale 2/3)

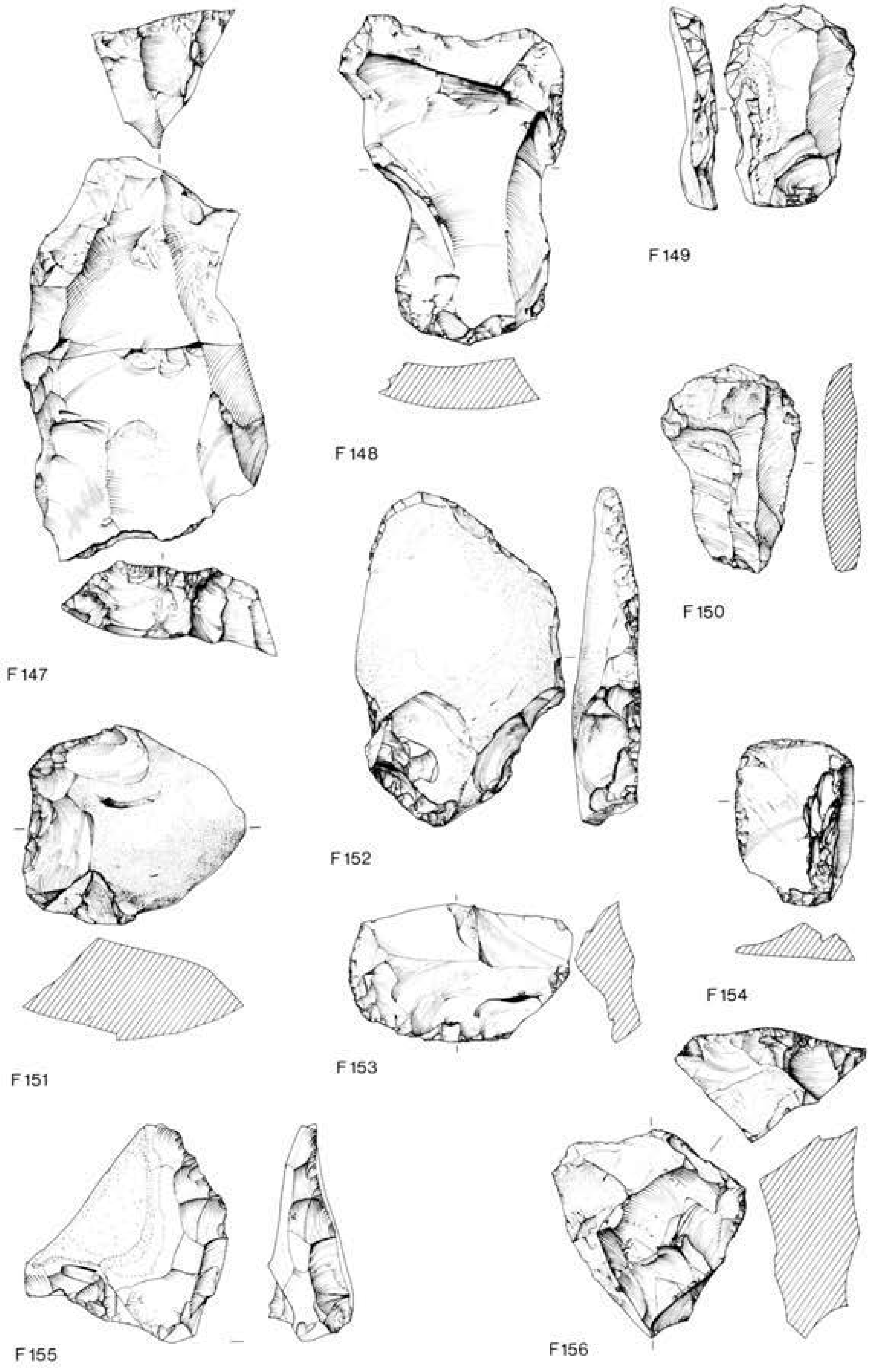


Figure 53 F147–156 (Scale 2/3)

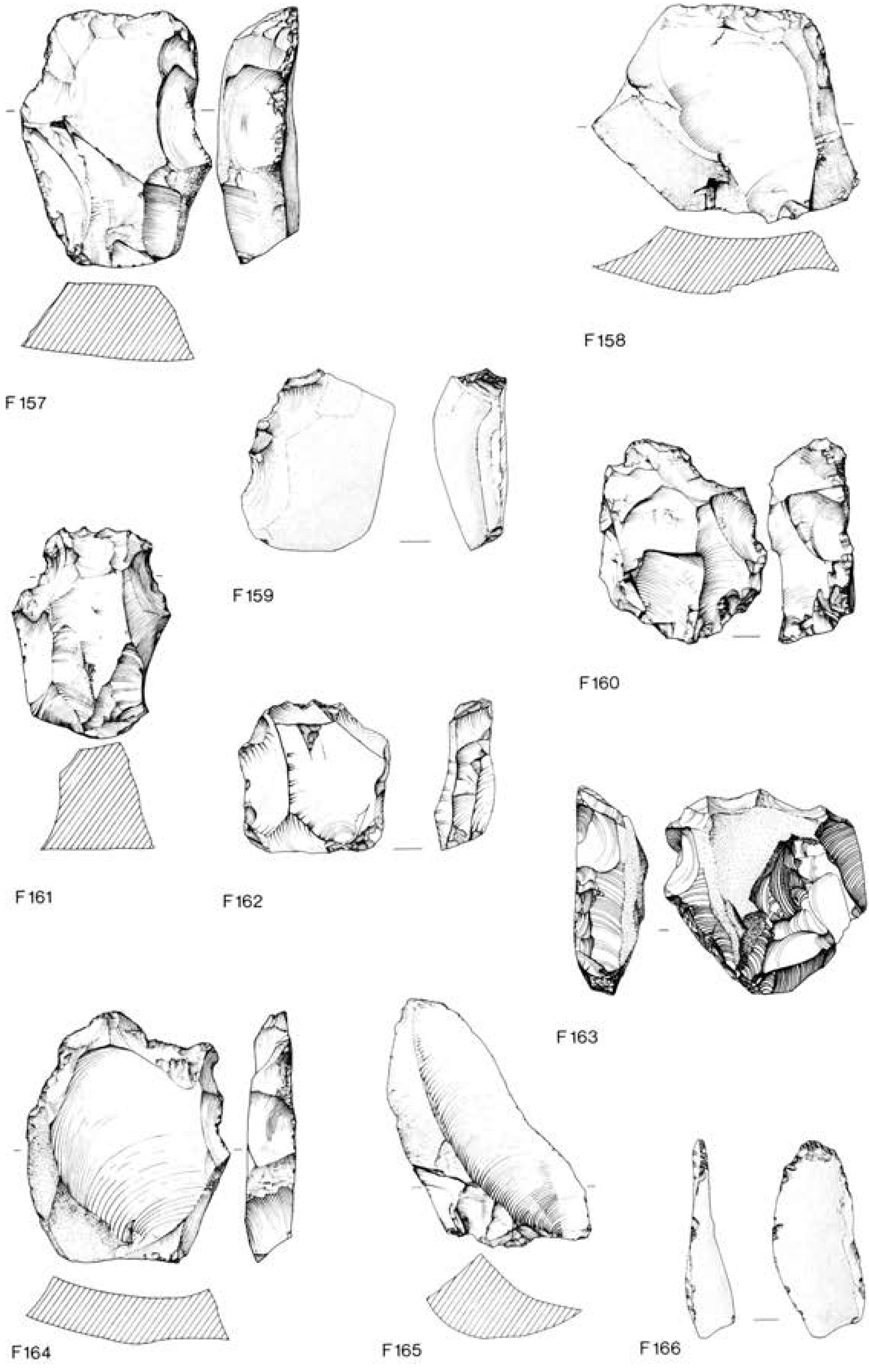
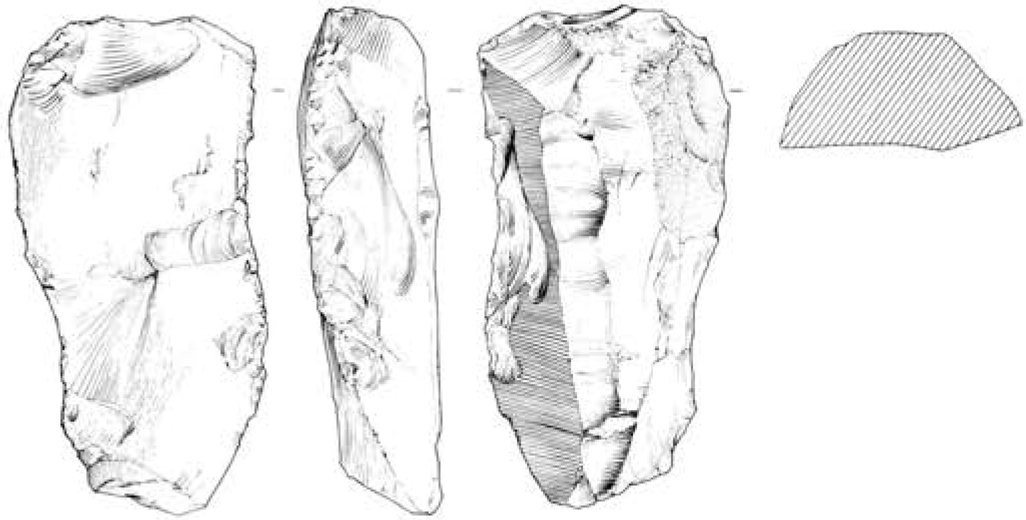
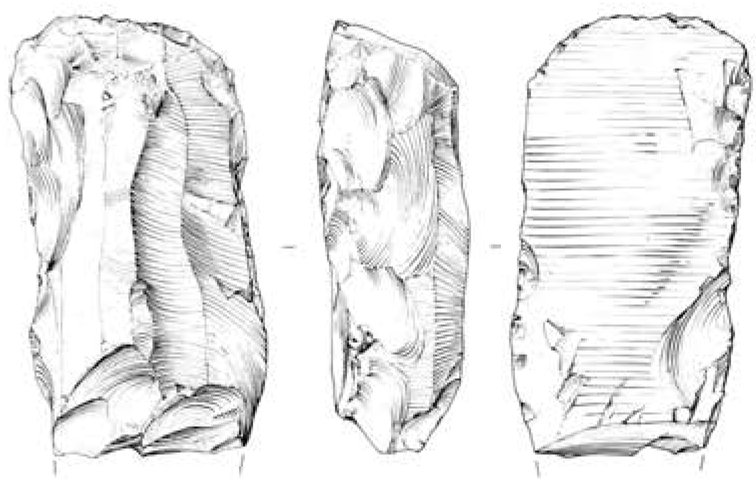


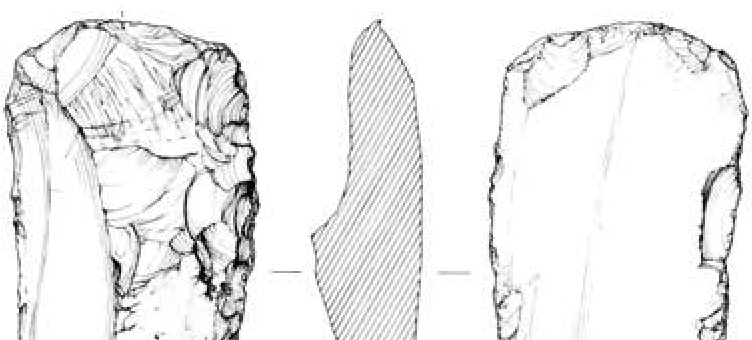
Figure 54 F157–166 (Scale 2/3)



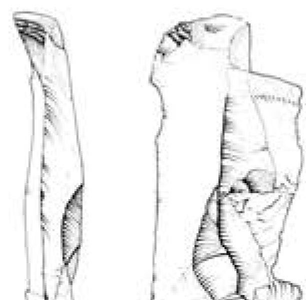
F167



F168

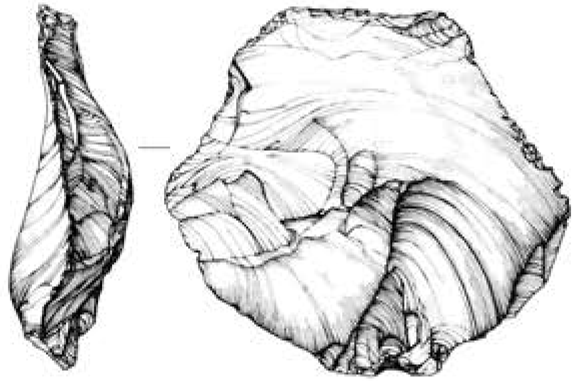


F169

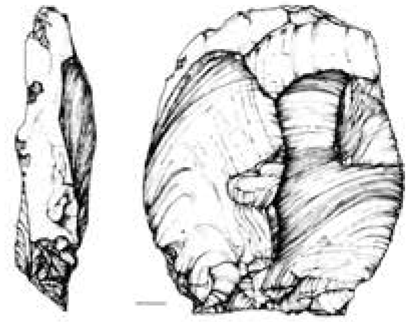


F170

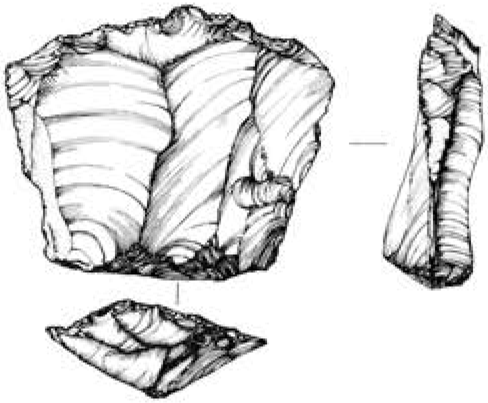
Figure 55 F167–170 (Scale 2/3)



F171



F172



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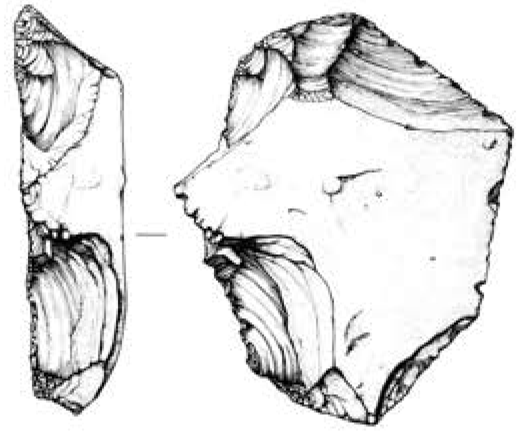

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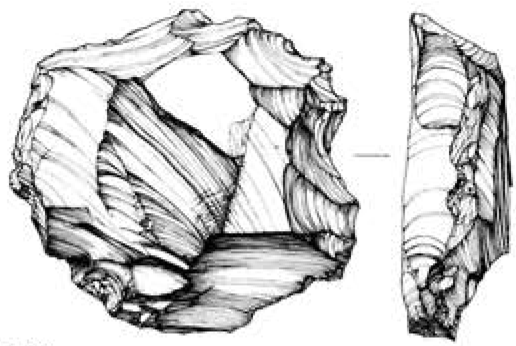

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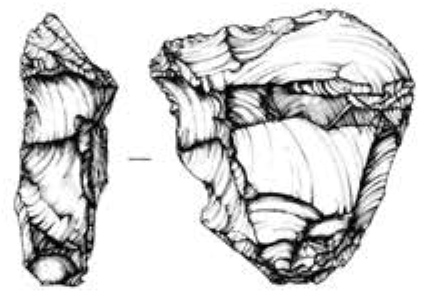
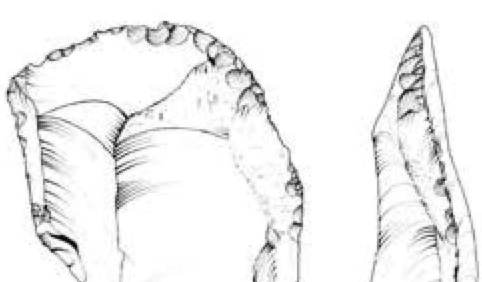


F176



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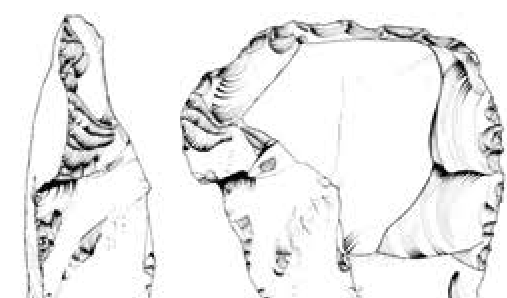
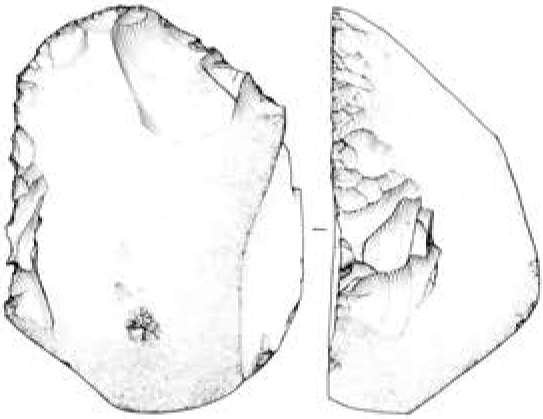
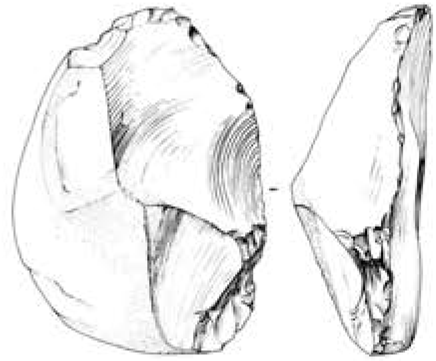


F178

Figure 56 F171–178 (Scale 2/3)



F 179



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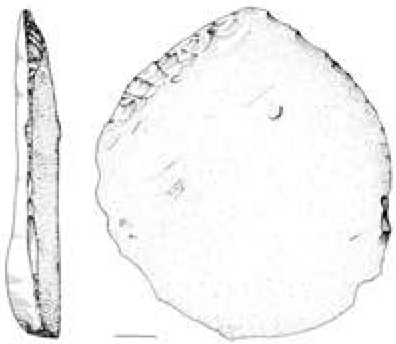

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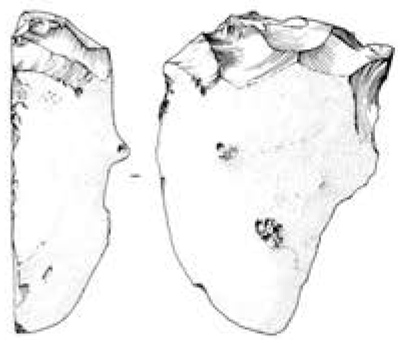

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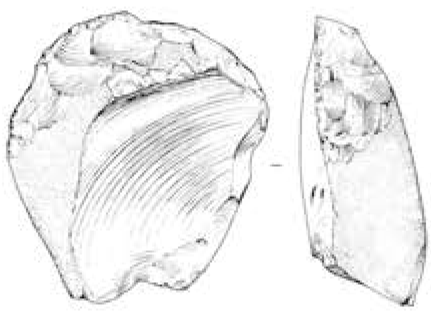
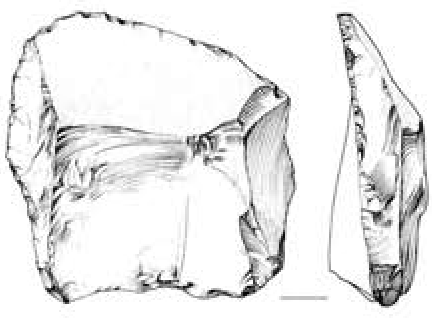
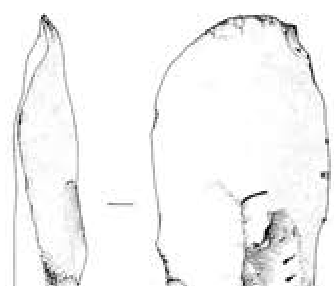


F 183



F 184

F 185



F 186

Figure 57 F179–186 (Scale 2/3)

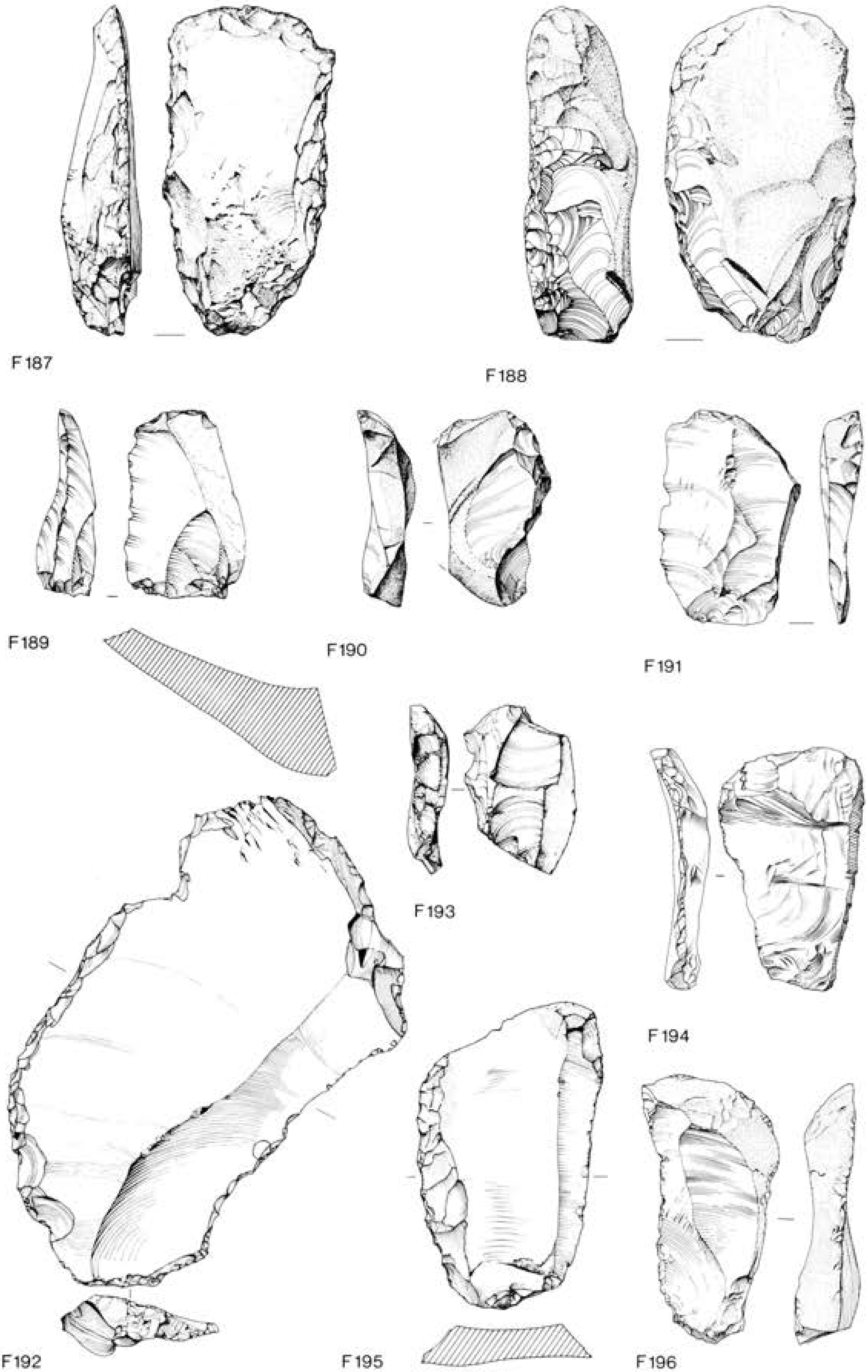


Figure 58 F187–196 (Scale 2/3)

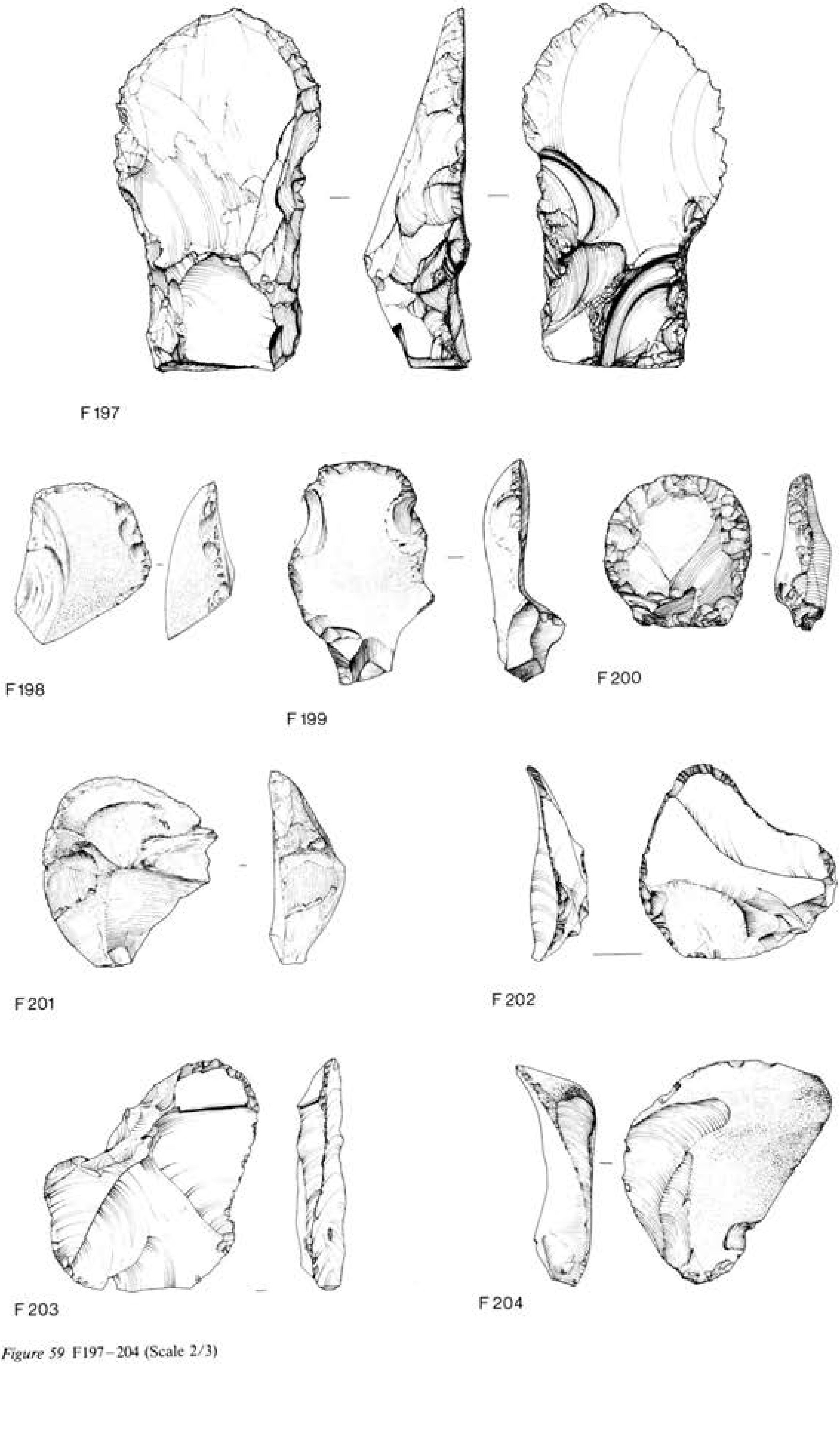
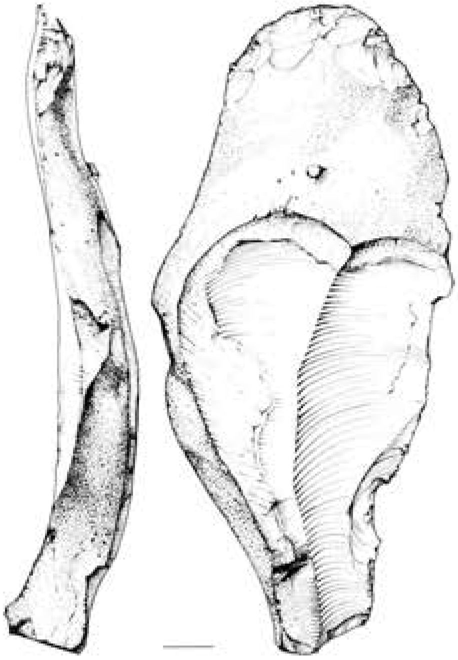
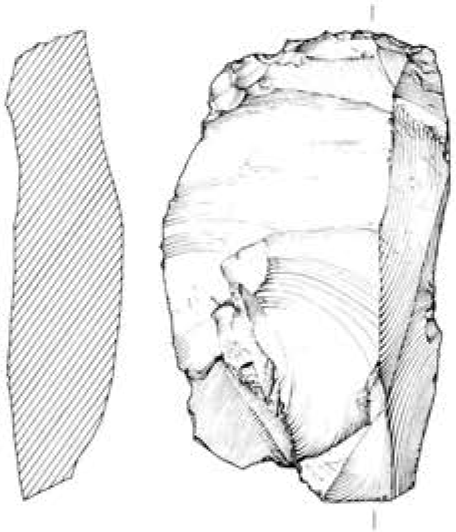


Figure 59 F197–204 (Scale 2/3)



F205



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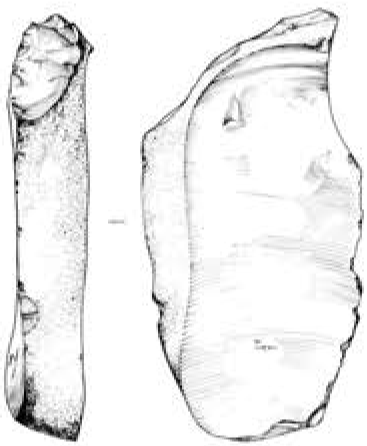

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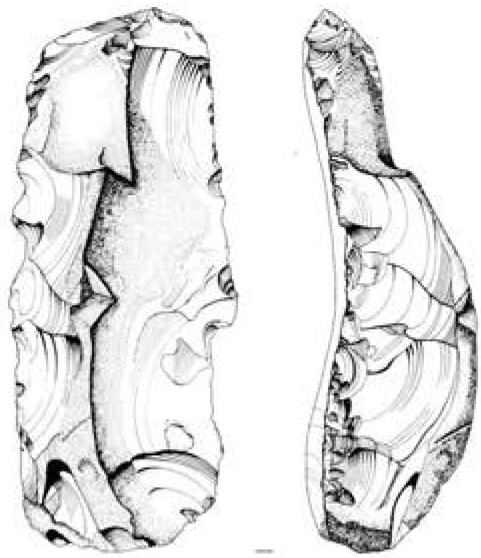

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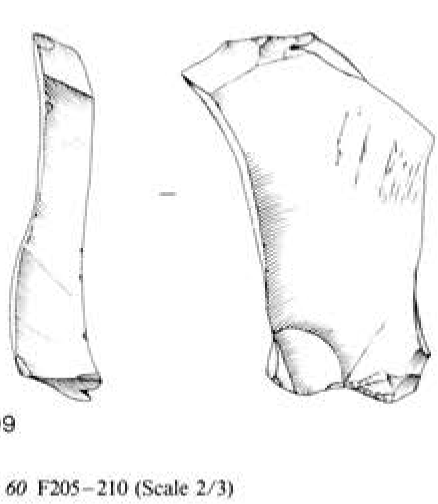
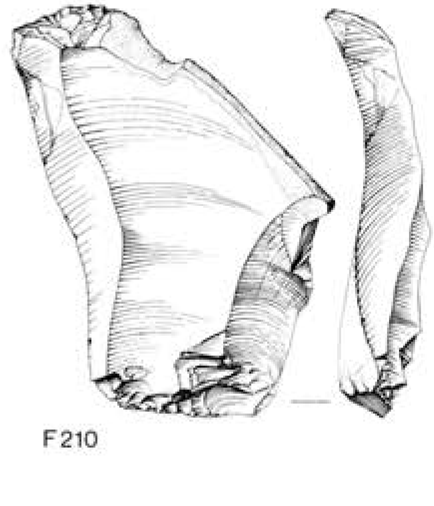
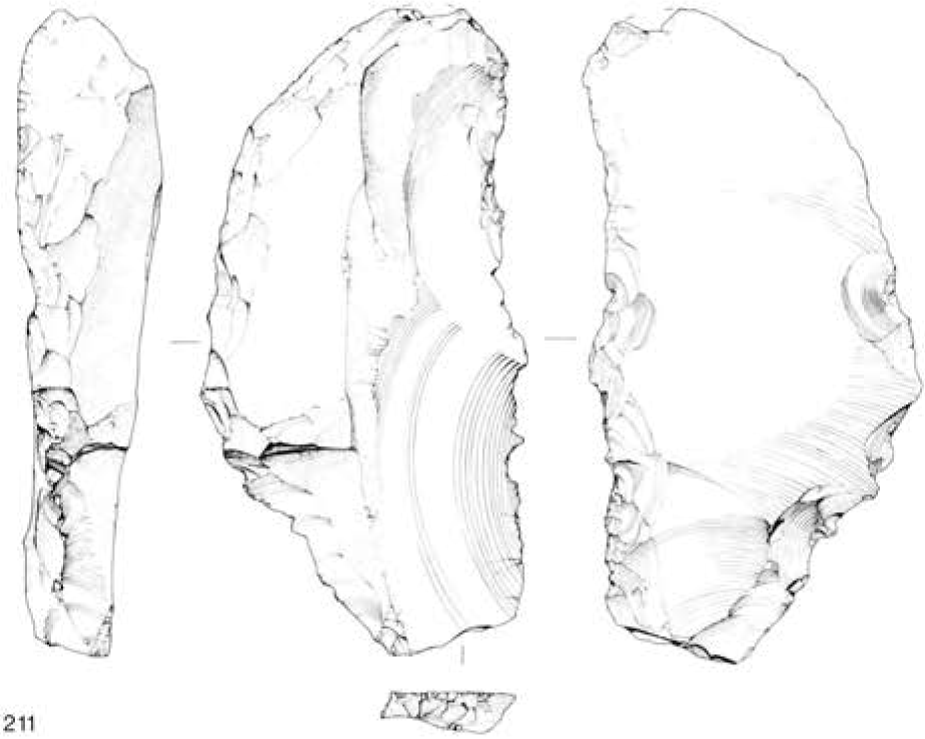


F209



F210

Figure 60 F205–210 (Scale 2/3)



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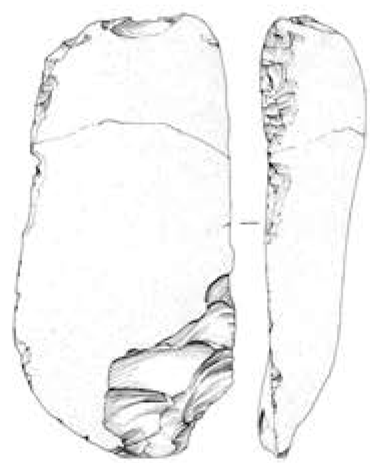

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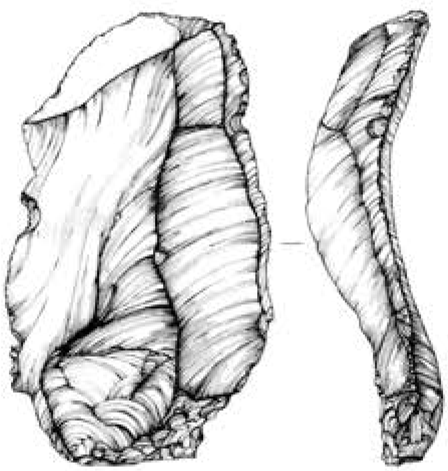
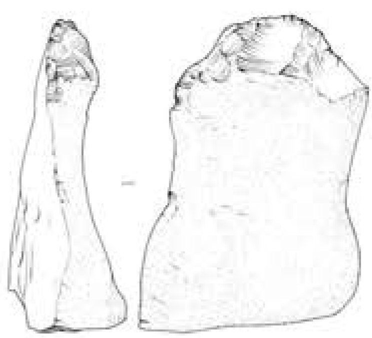


F213



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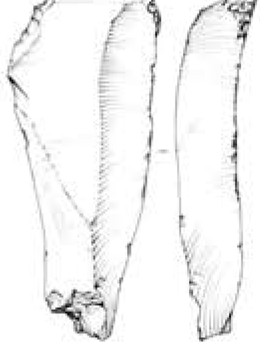

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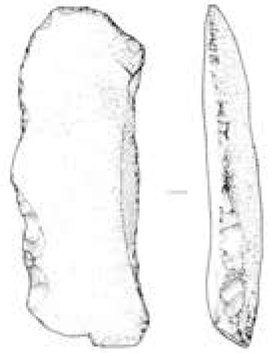


F216

Figure 61 F211–216 (Scale 2/3)

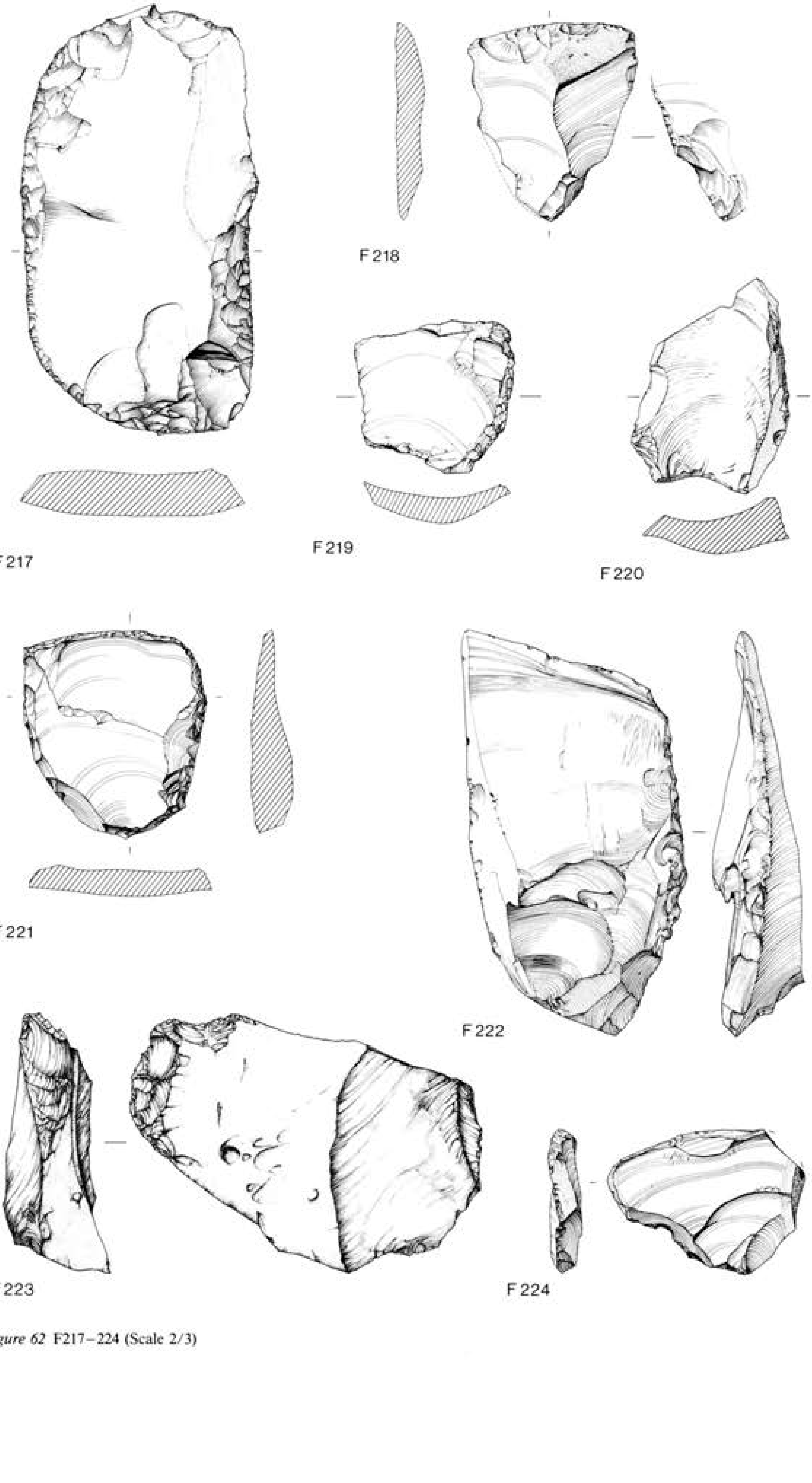
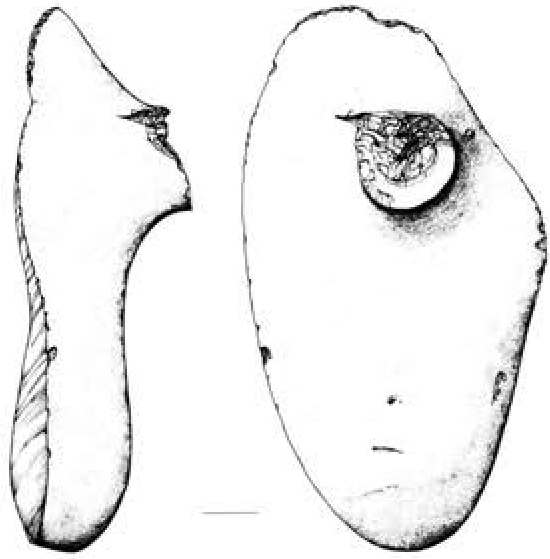


Figure 62 F217–224 (Scale 2/3)



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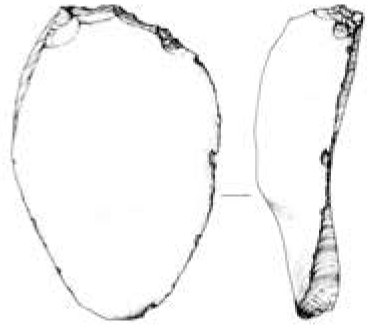

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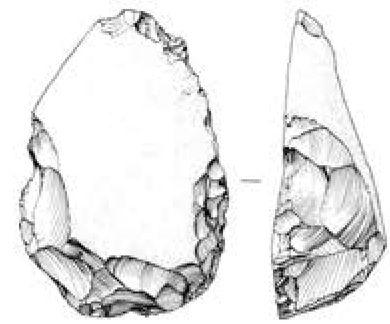

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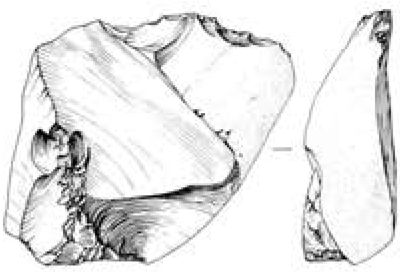

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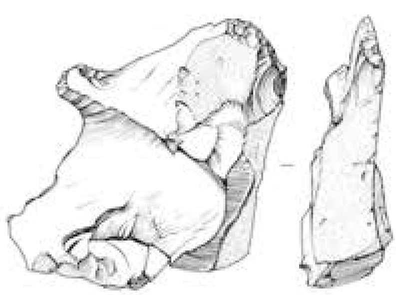

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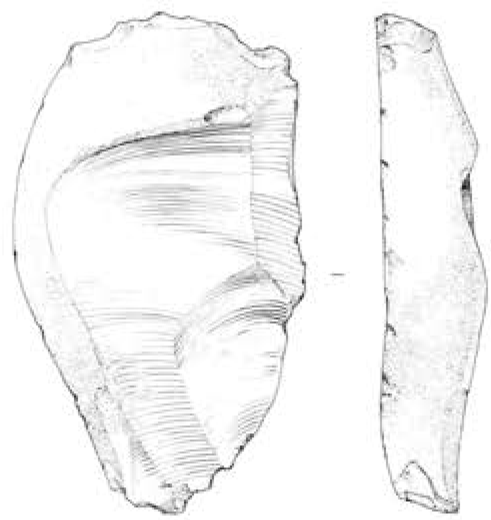

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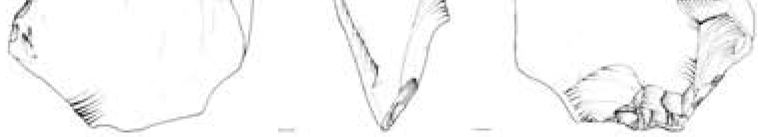

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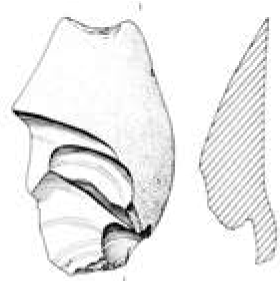


F232

Figure 63 F225–232 (Scale 2/3)

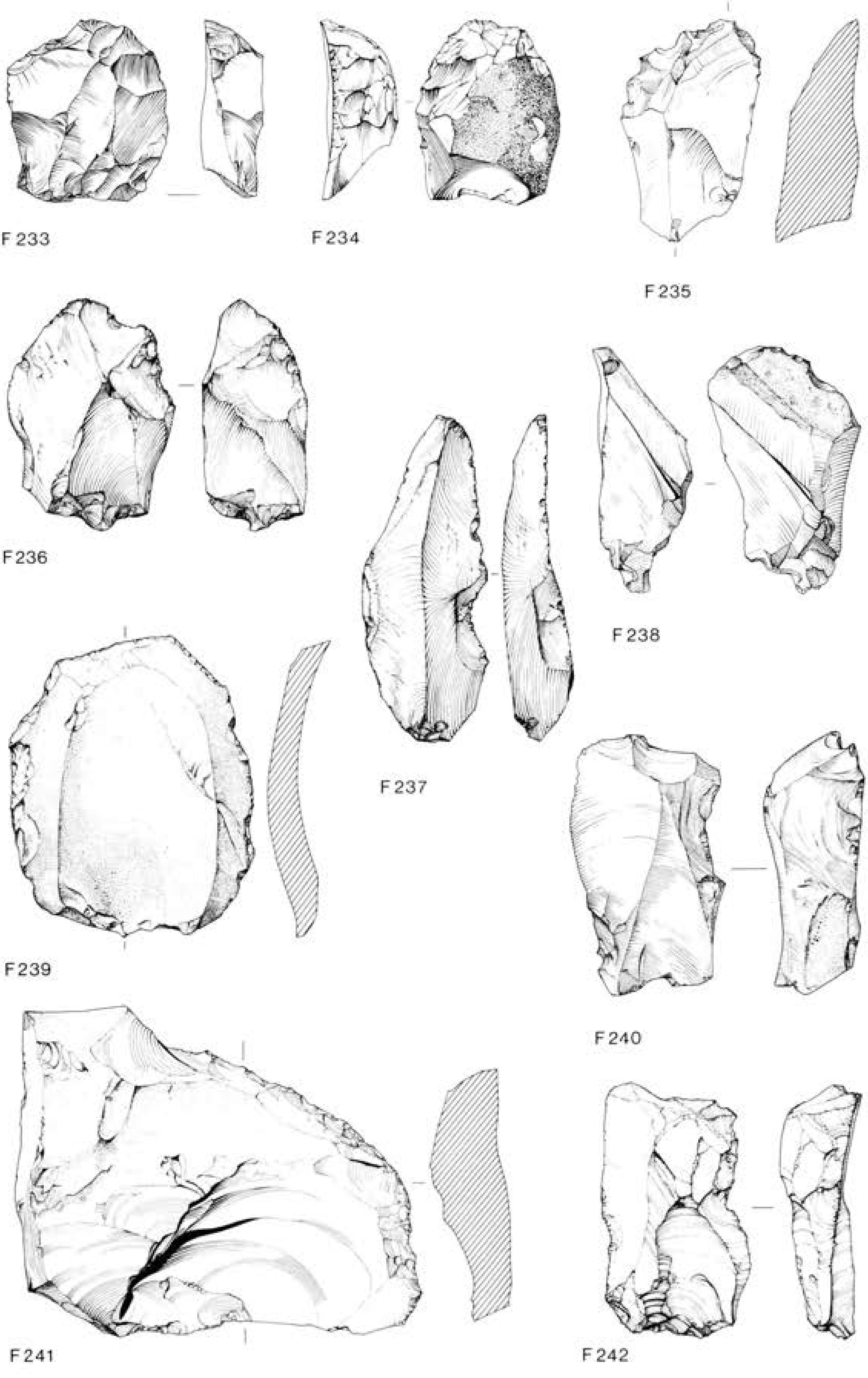


Figure 64 F233–242 (Scale 2/3)

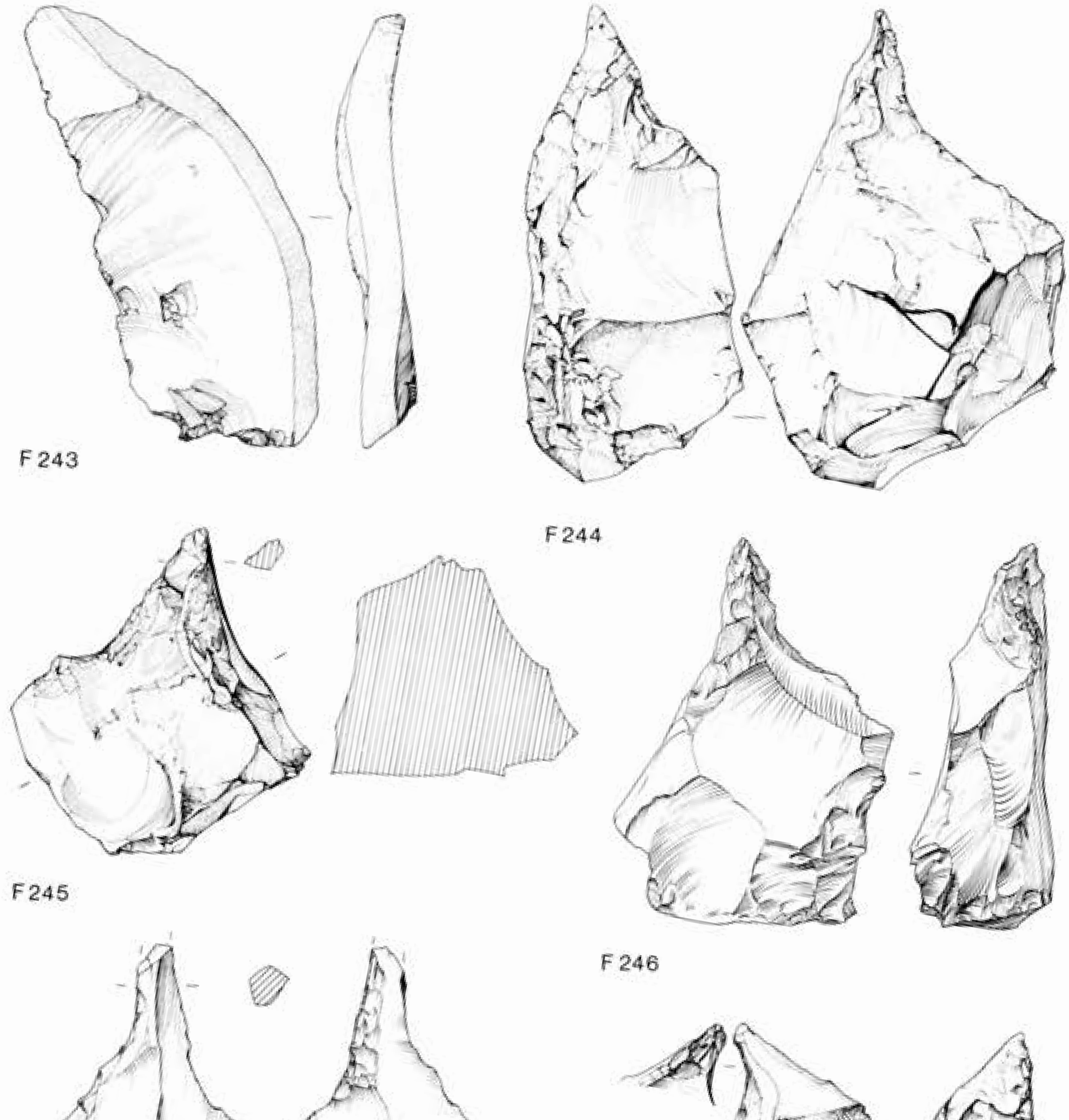


Figure 65 F243–250 (Scale 2/3)

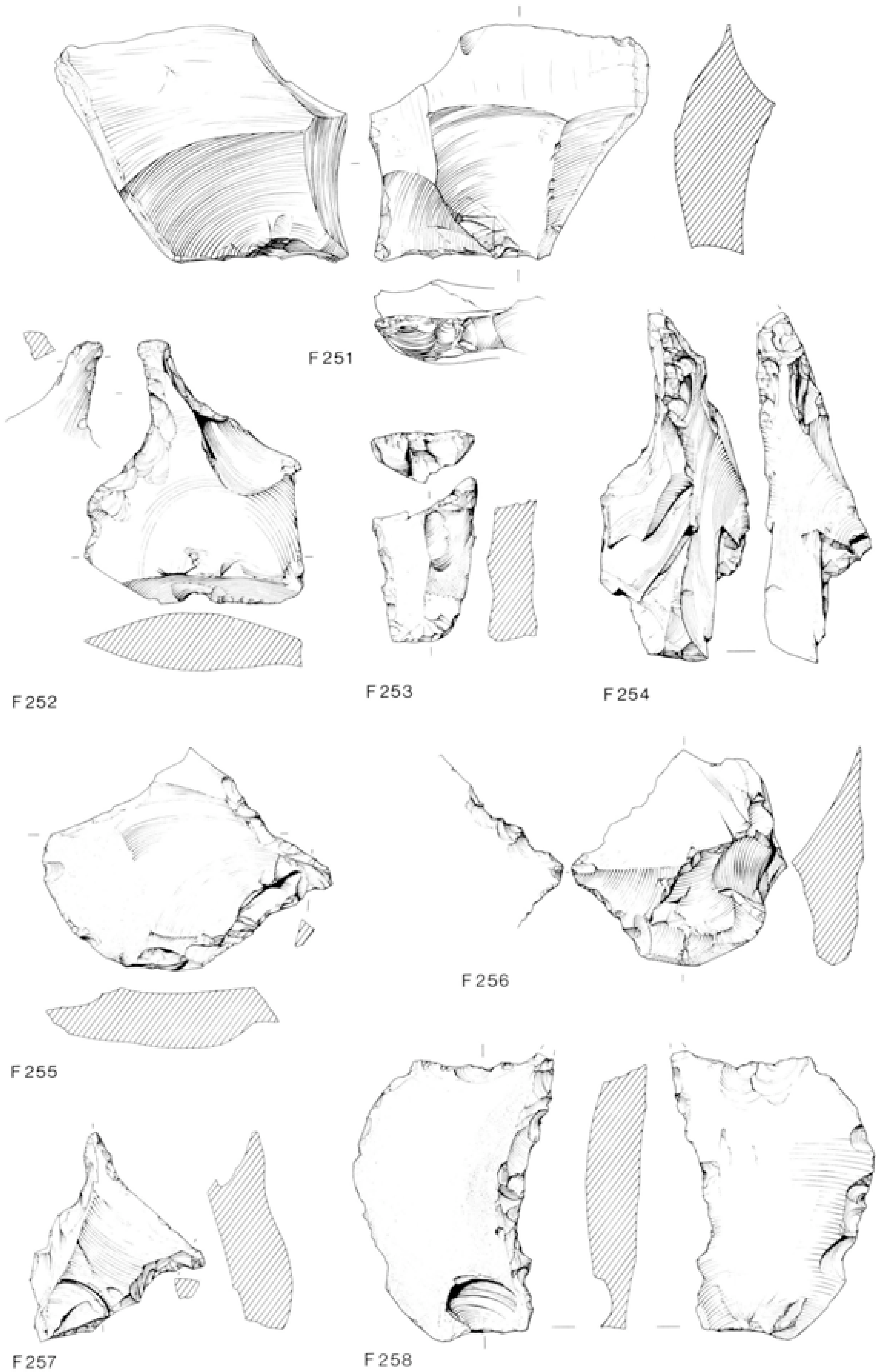


Figure 66 F251–258 (Scale 2/3)

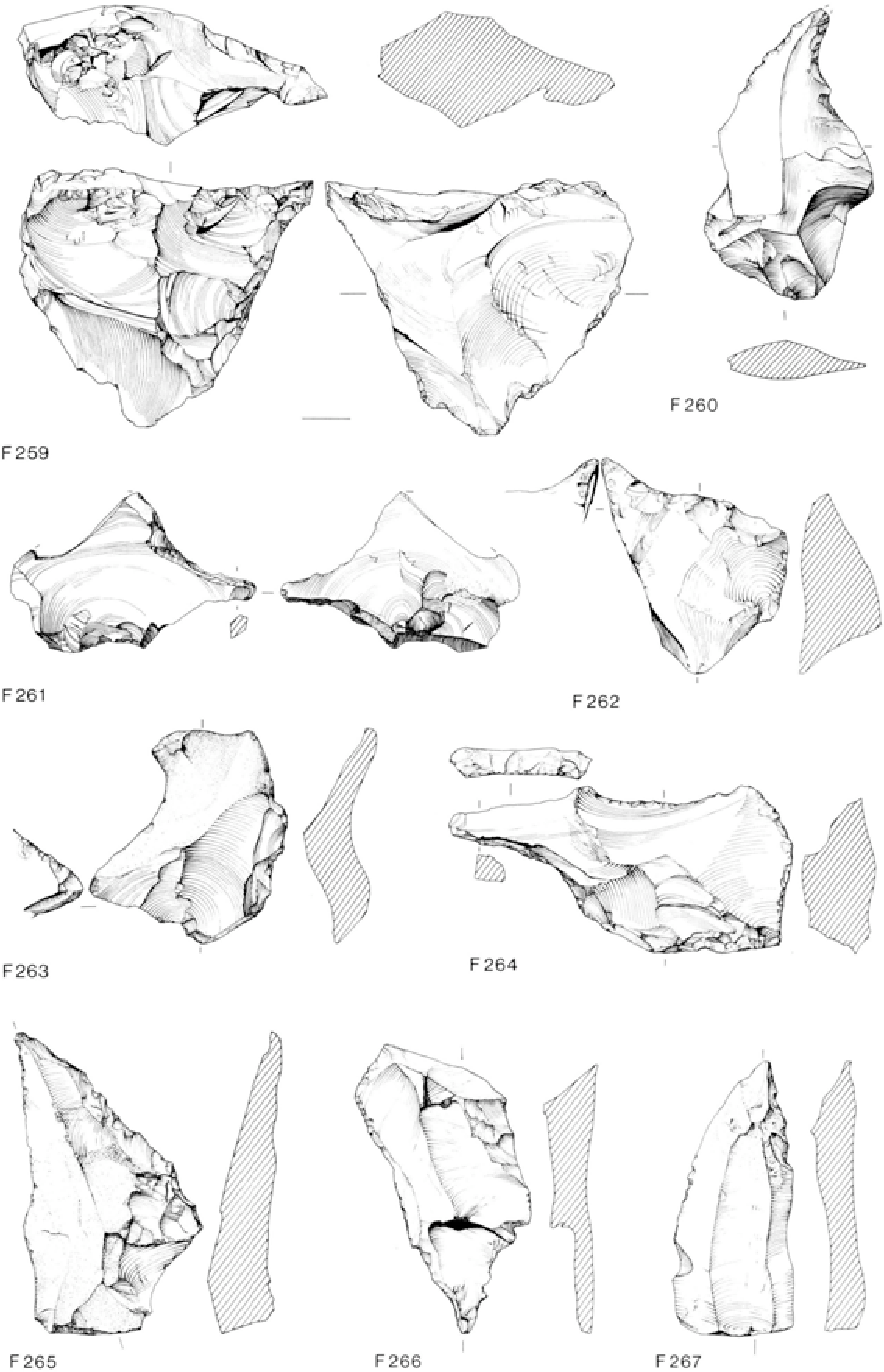


Figure 67 F259–267 (Scale 2/3)

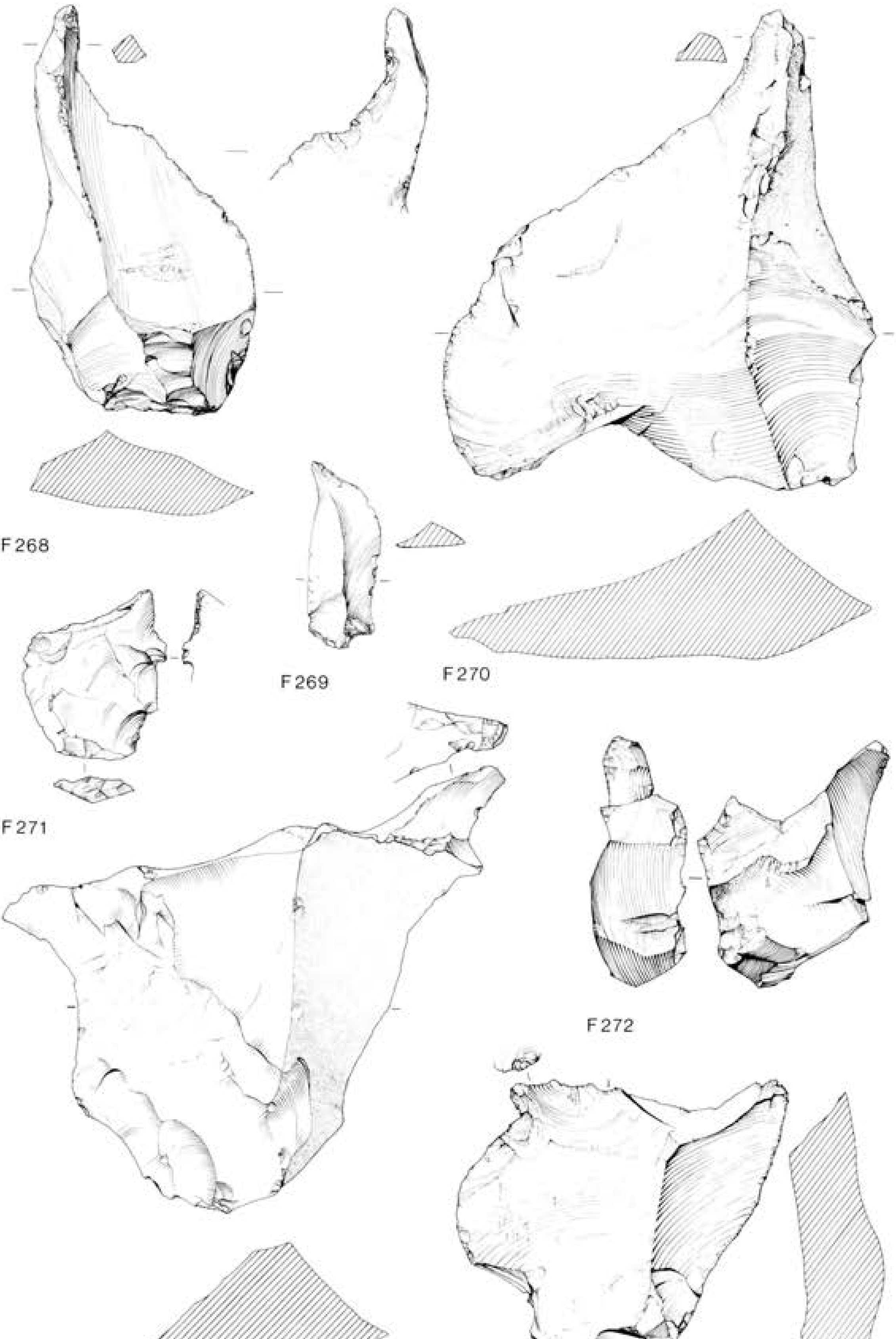


Figure 68 F268–274 (Scale 2/3)

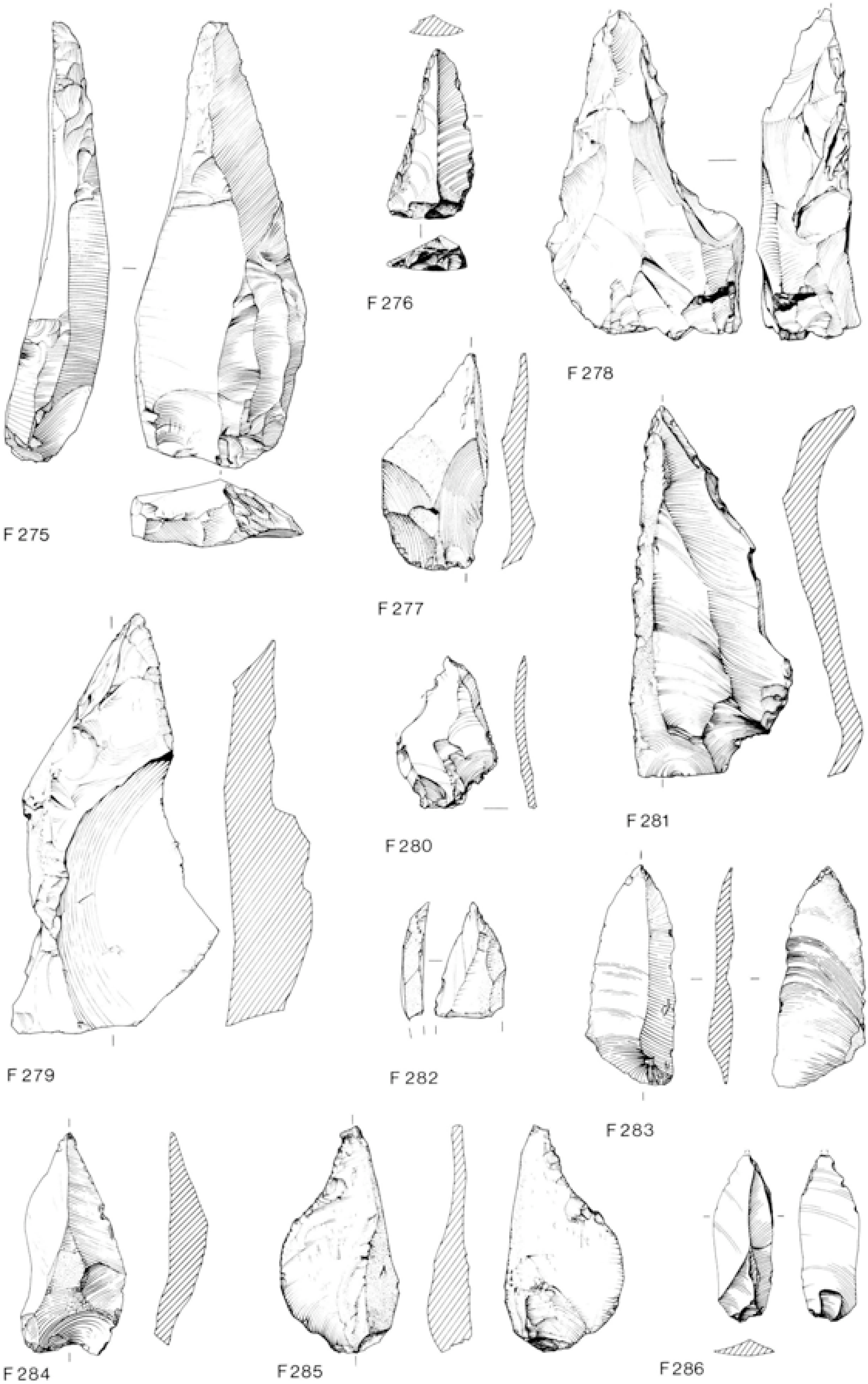


Figure 69 F275–286 (Scale 2/3)

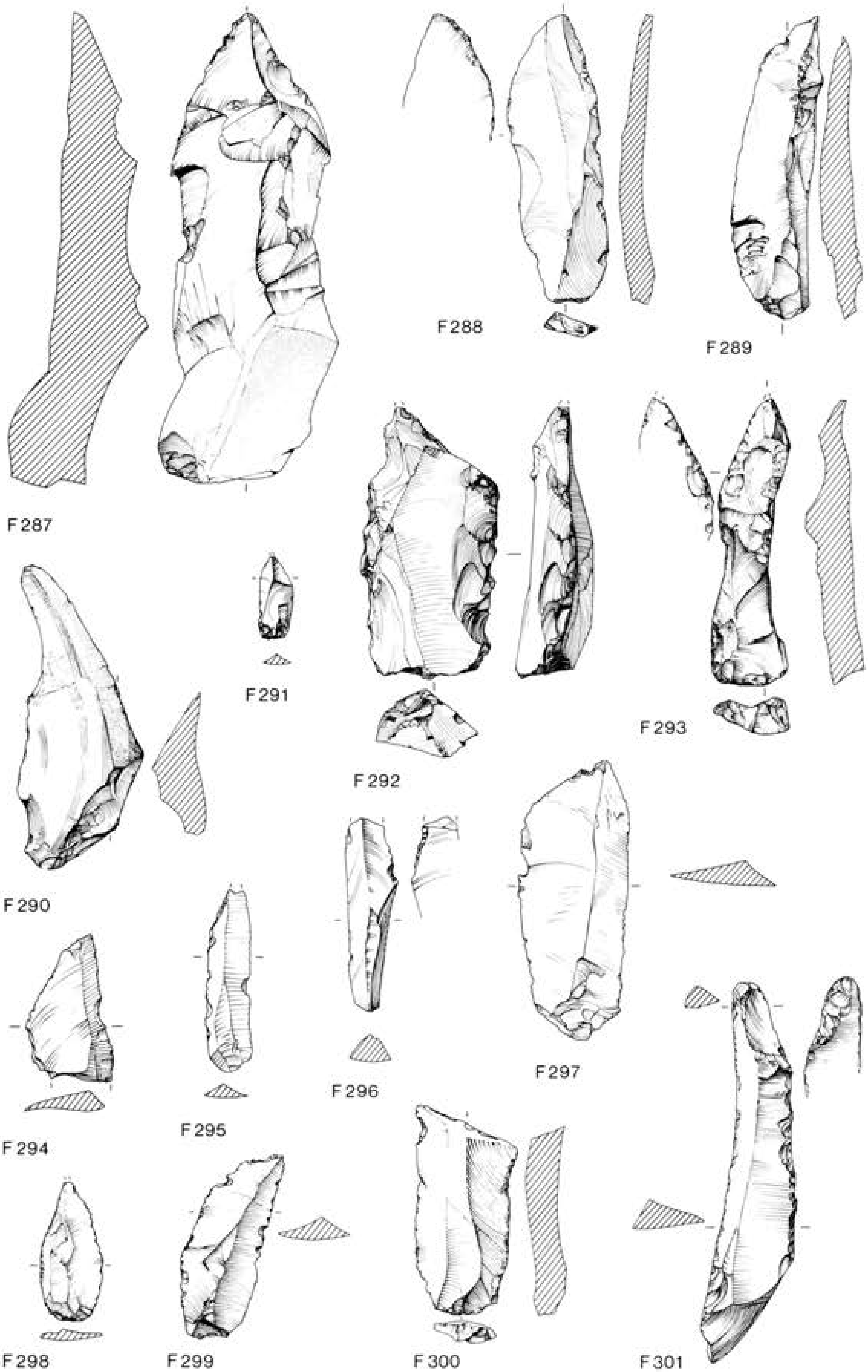


Figure 70 F287–301 (Scale 2/3)

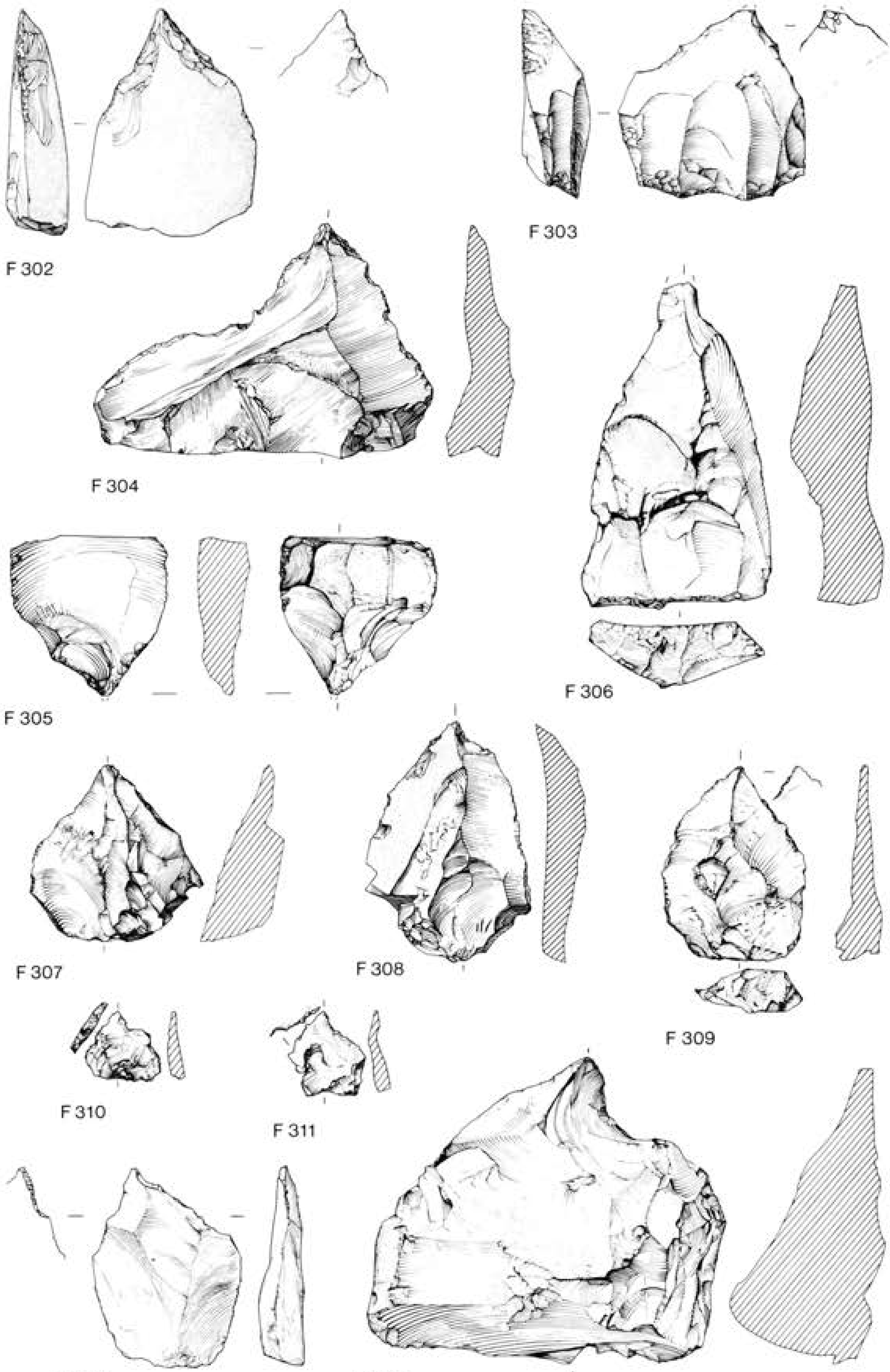


Figure 71 F302–313 (Scale 2/3)

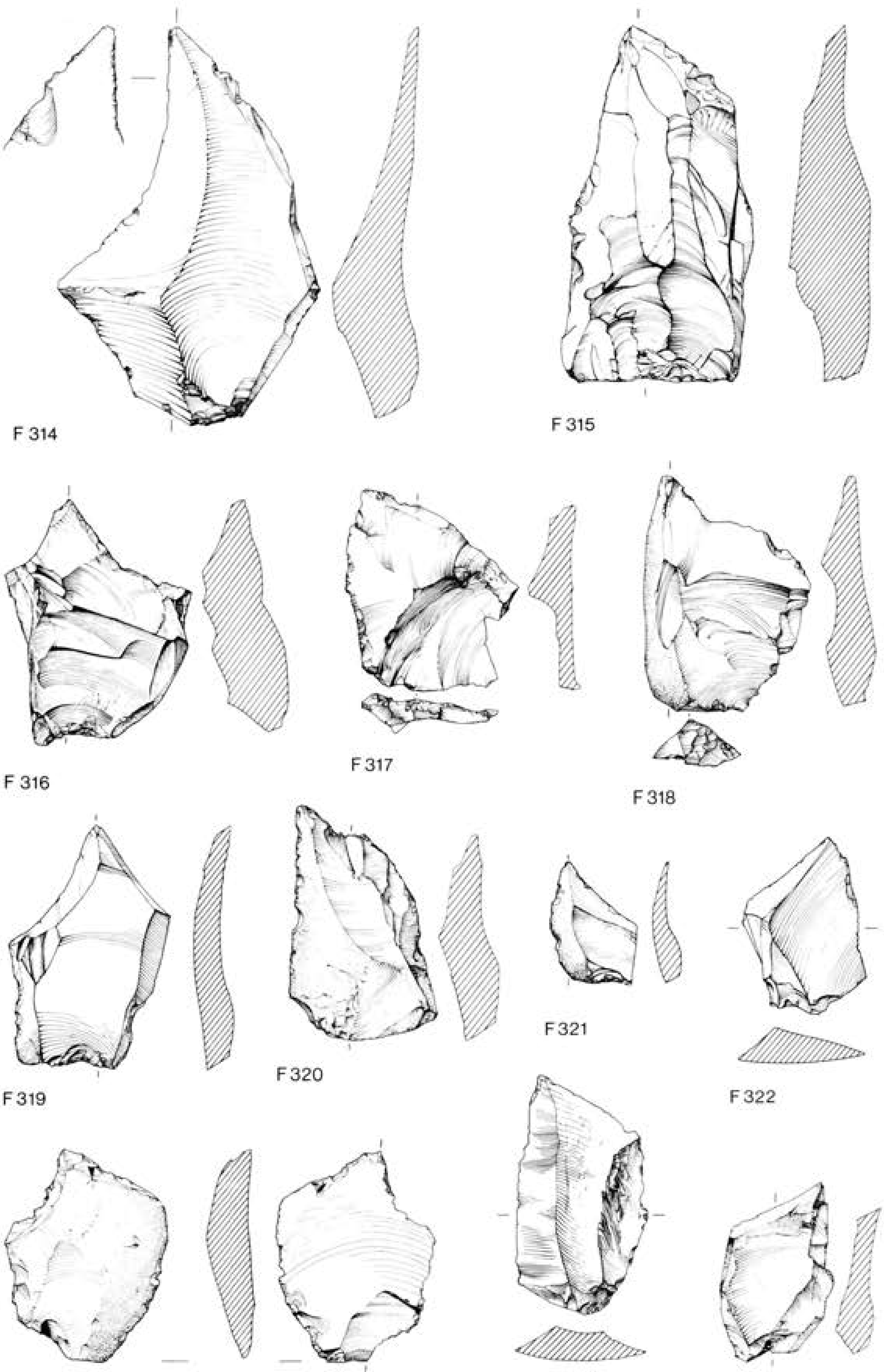


Figure 72 F314–325 (Scale 2/3)

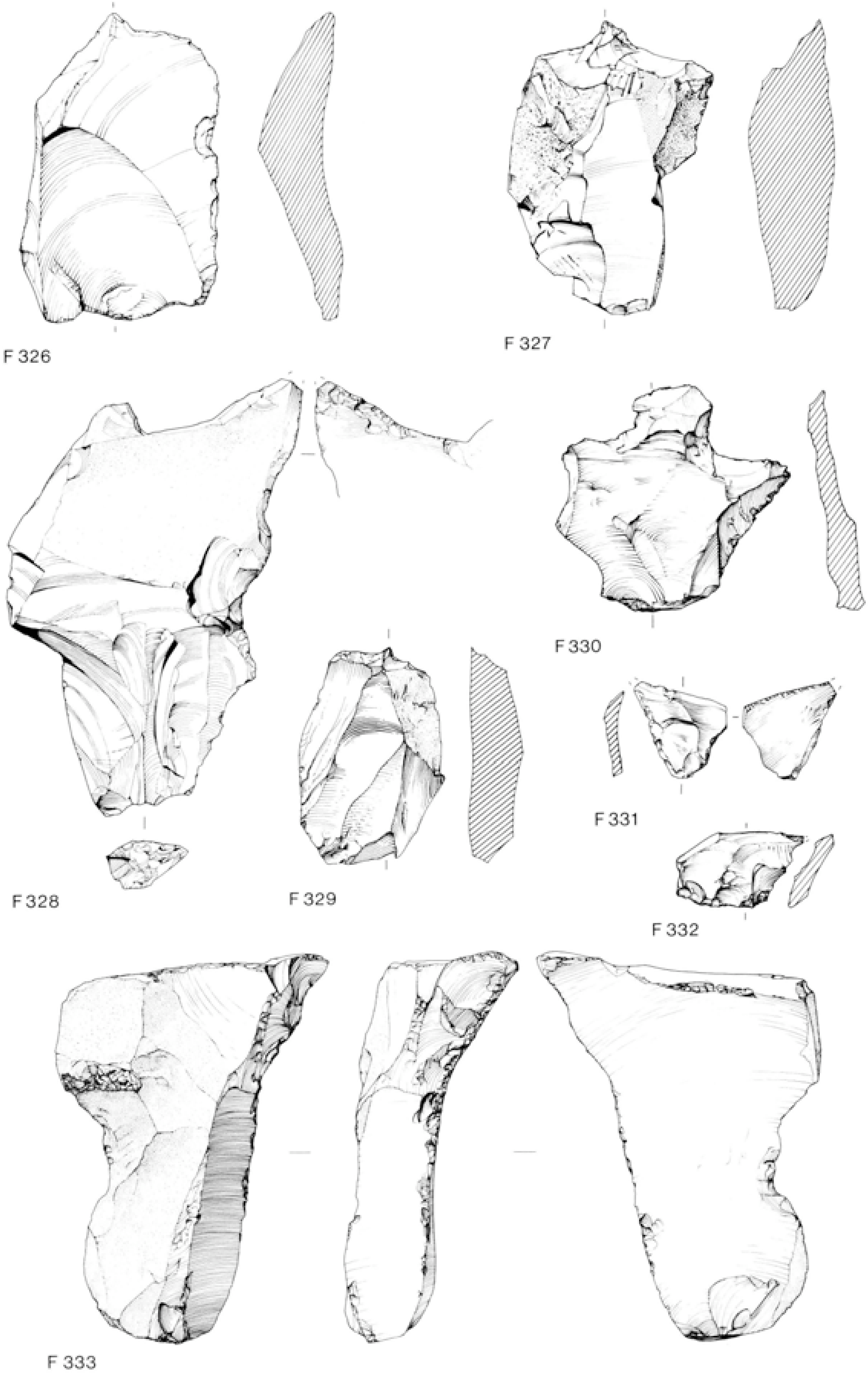


Figure 73 F326–333 (Scale 2/3)

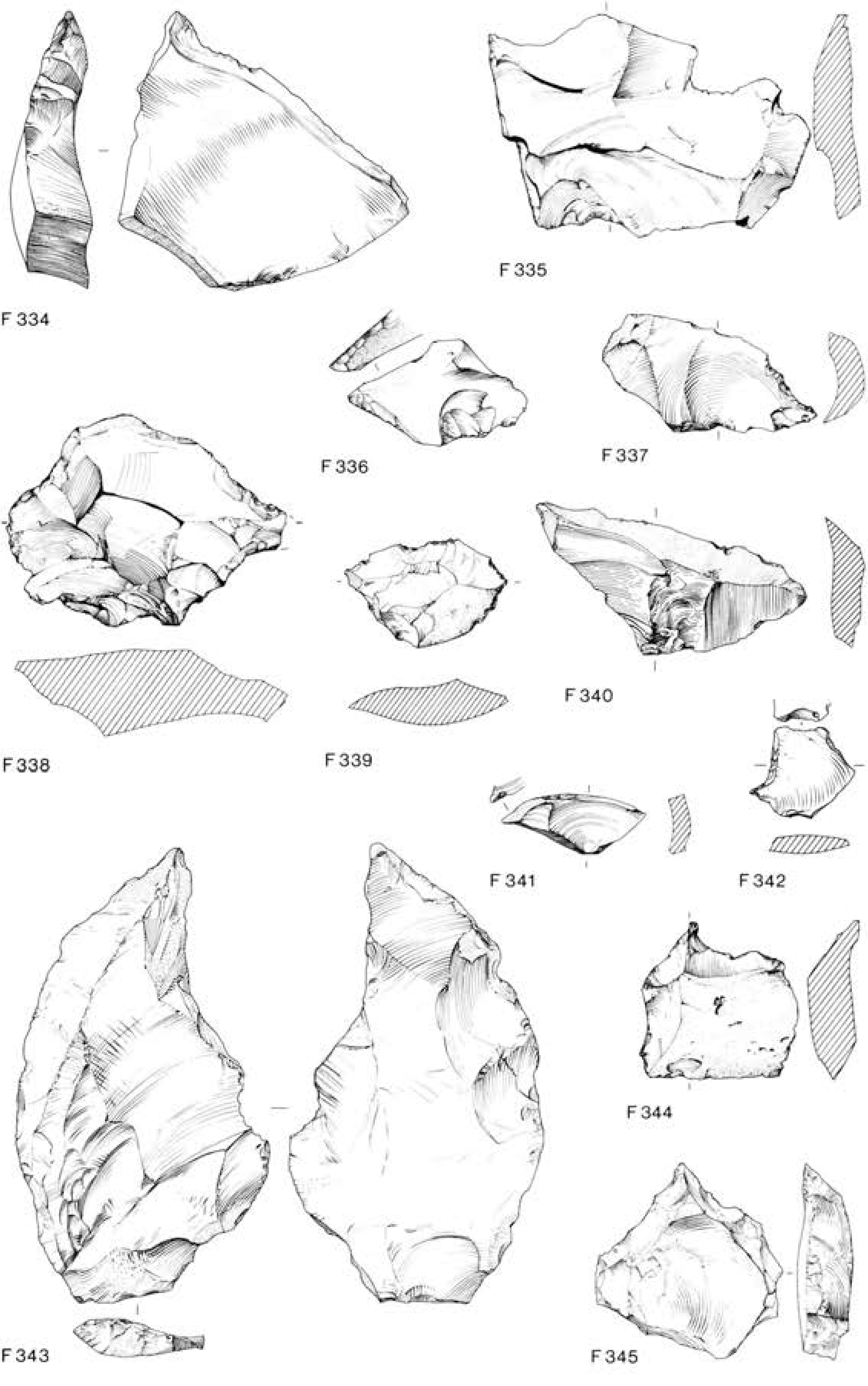


Figure 74 F334–345 (Scale 2/3)

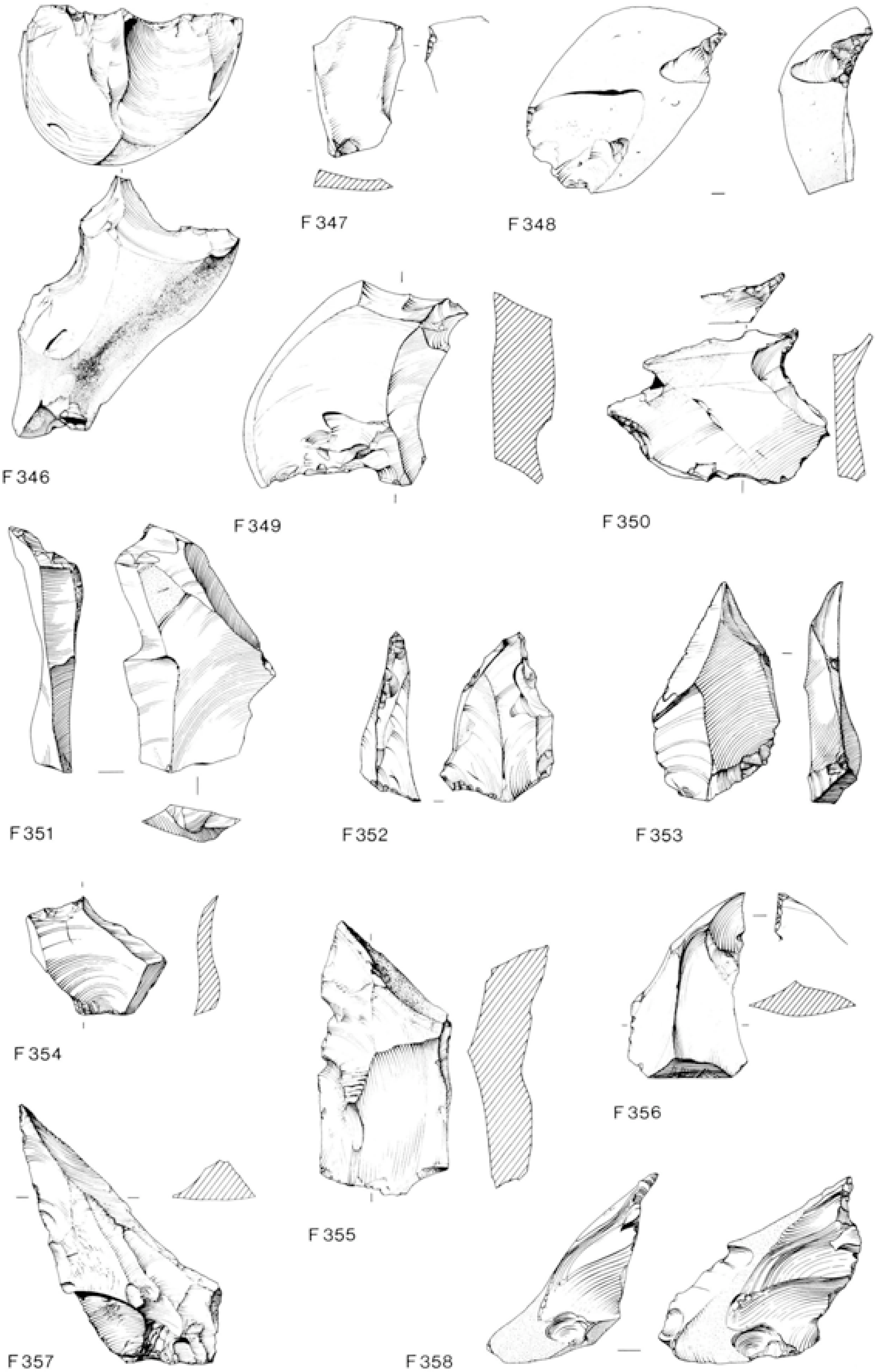


Figure 75 F346–358 (Scale 2/3)

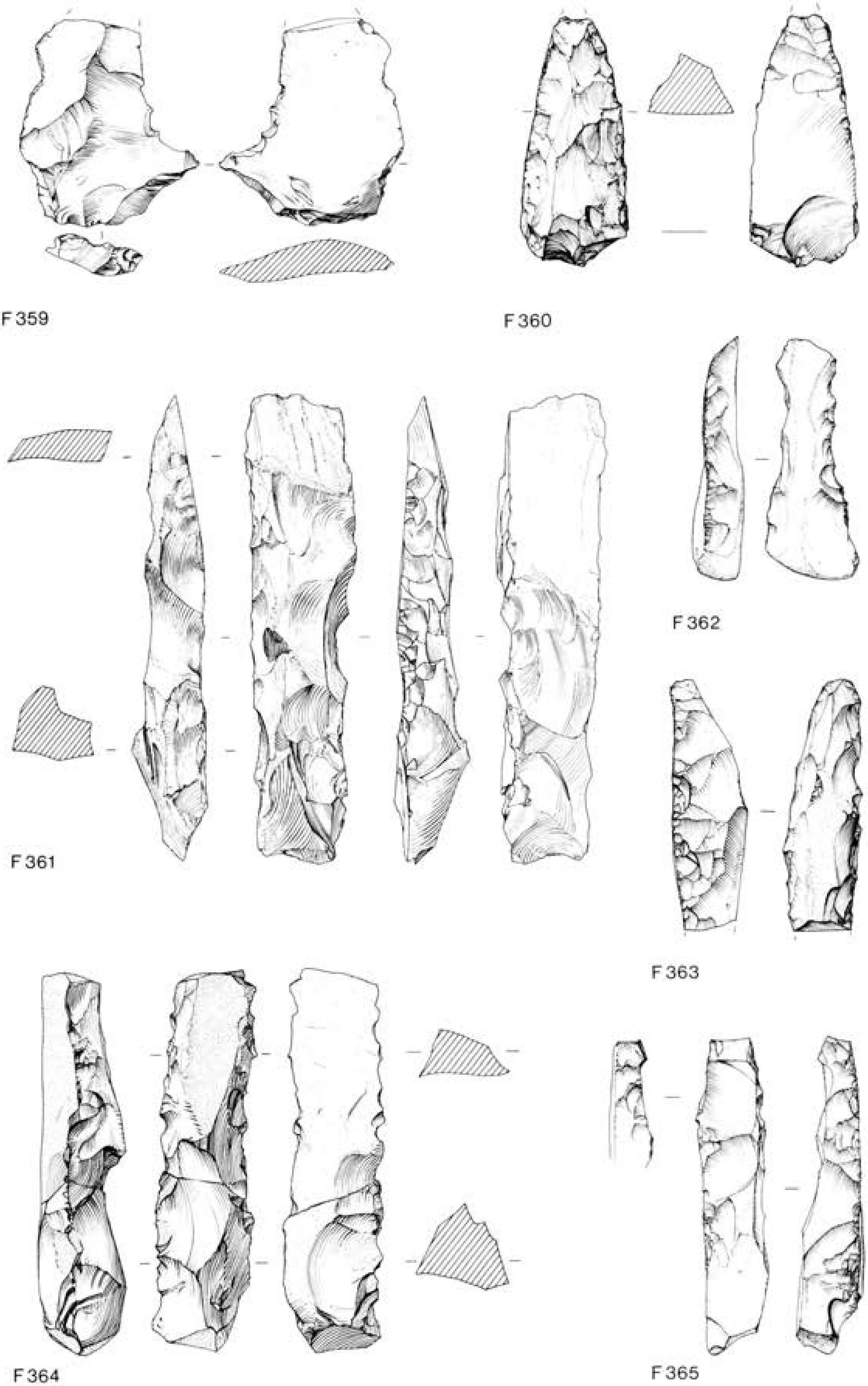
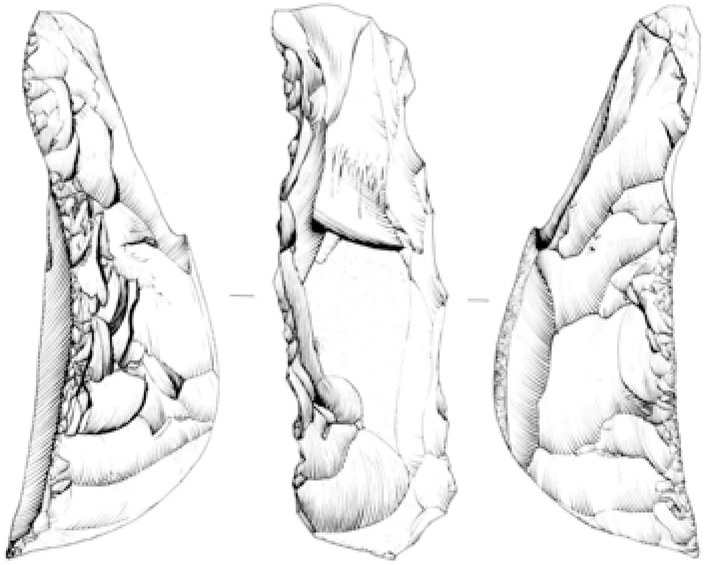
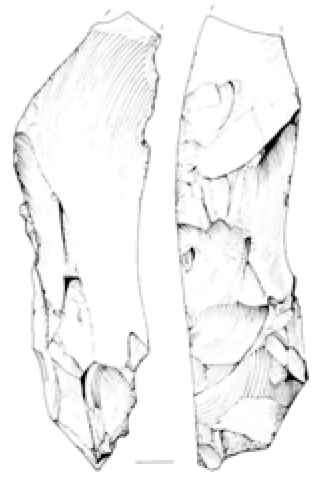


Figure 76 F359–365 (Scale 2/3)



F 366



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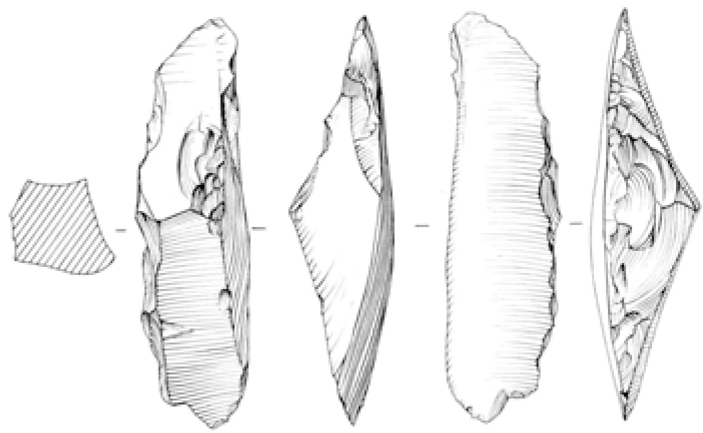

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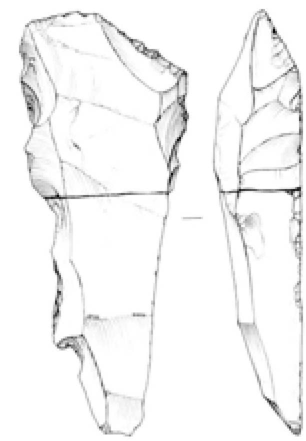

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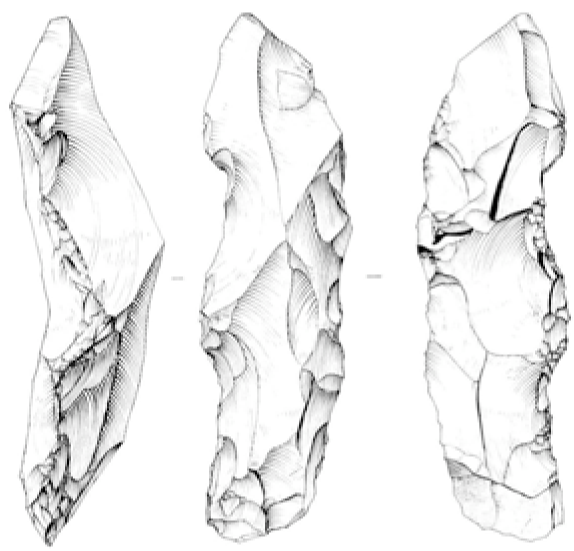

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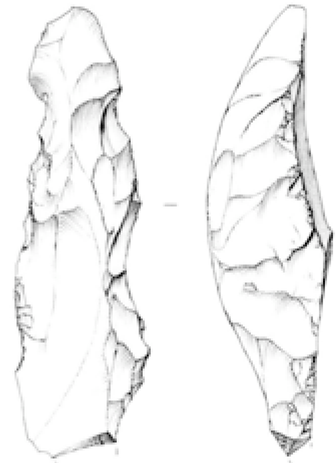


F 371

Figure 77 F366–371 (Scale 2/3)

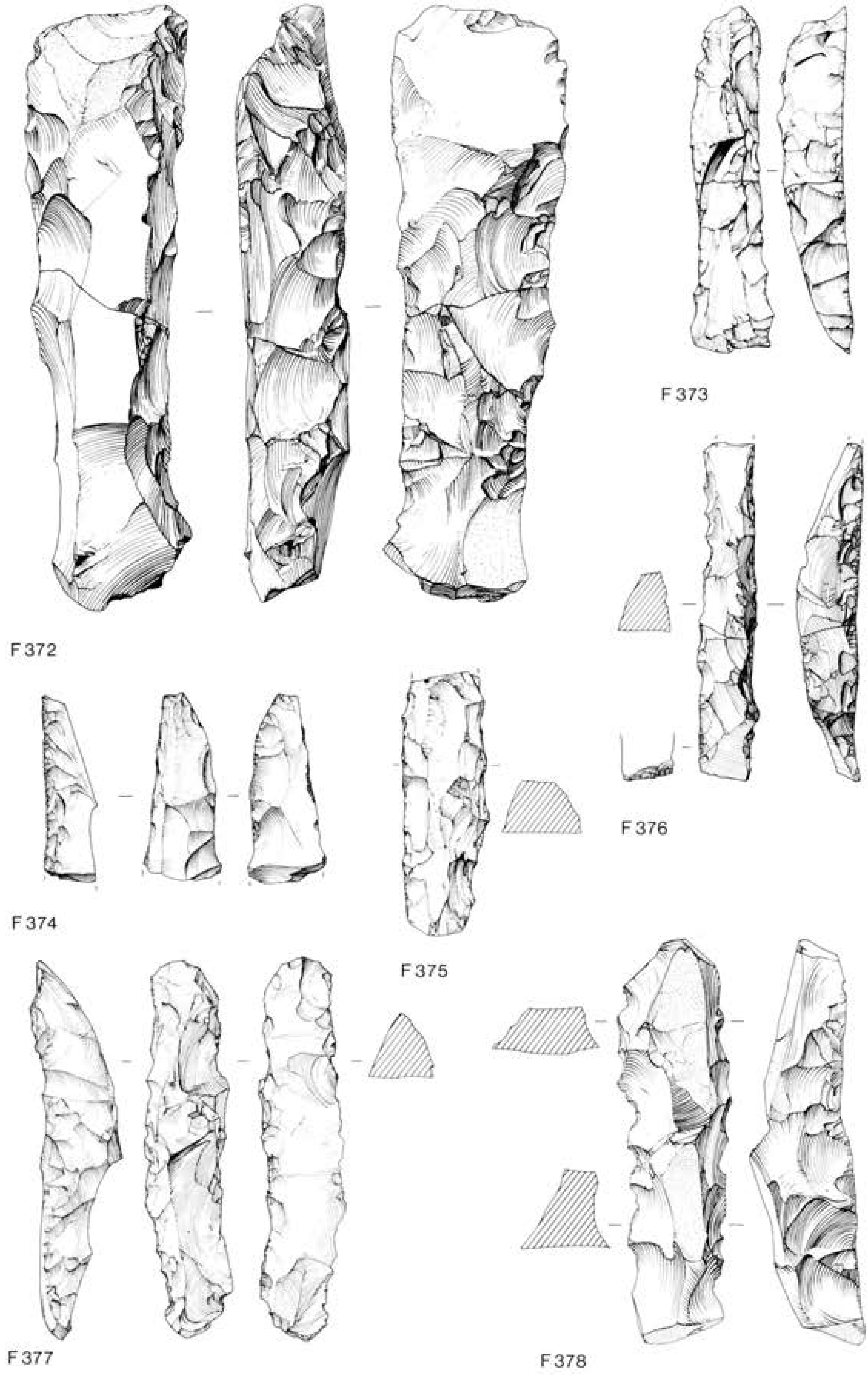
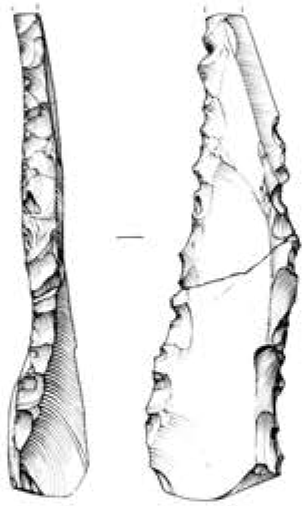
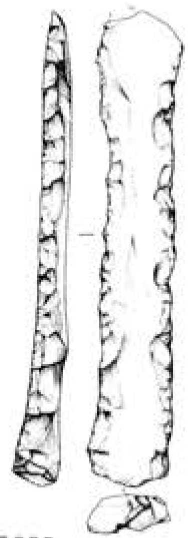


Figure 78 F372–378 (Scale 2/3)



F379



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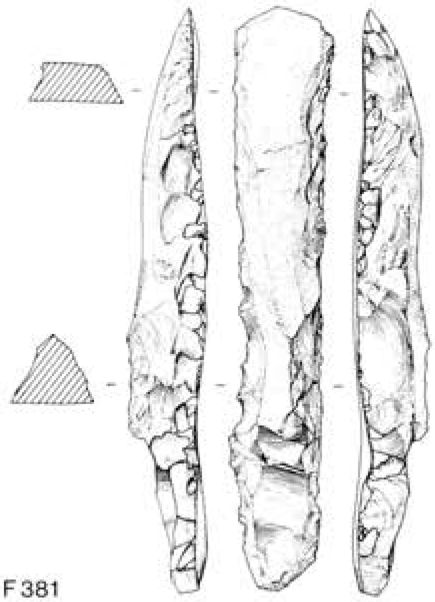

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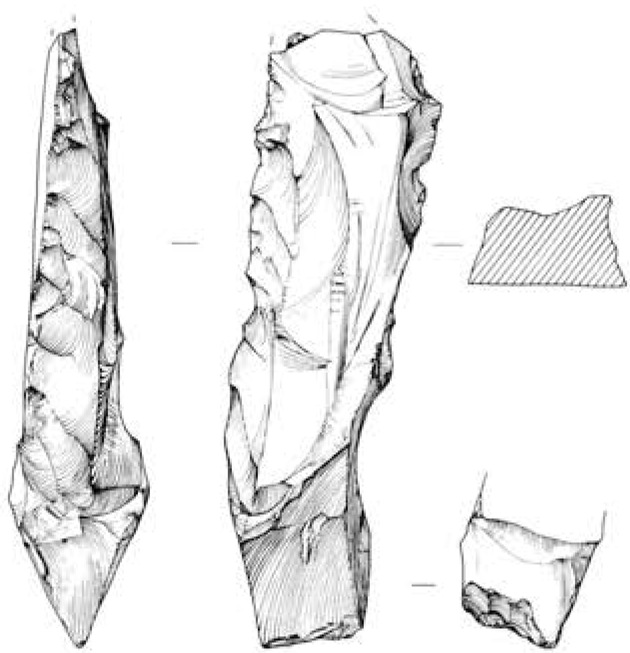

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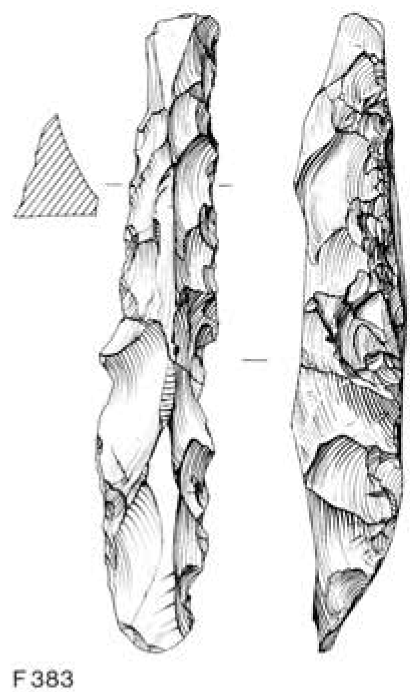

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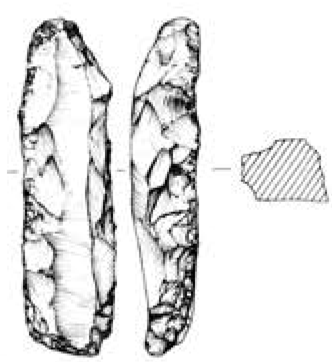

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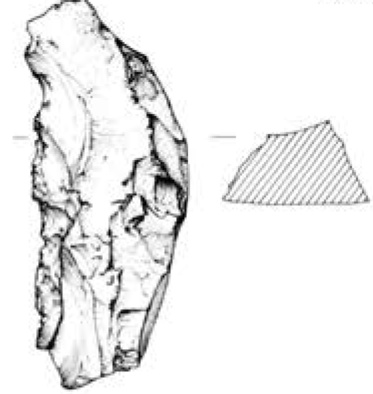
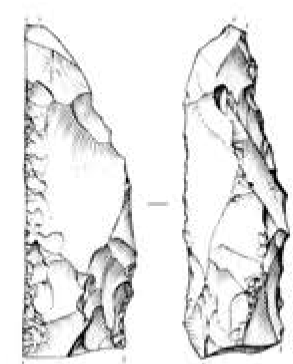


F385



F386

Figure 79 F379–386 (Scale 2/3)

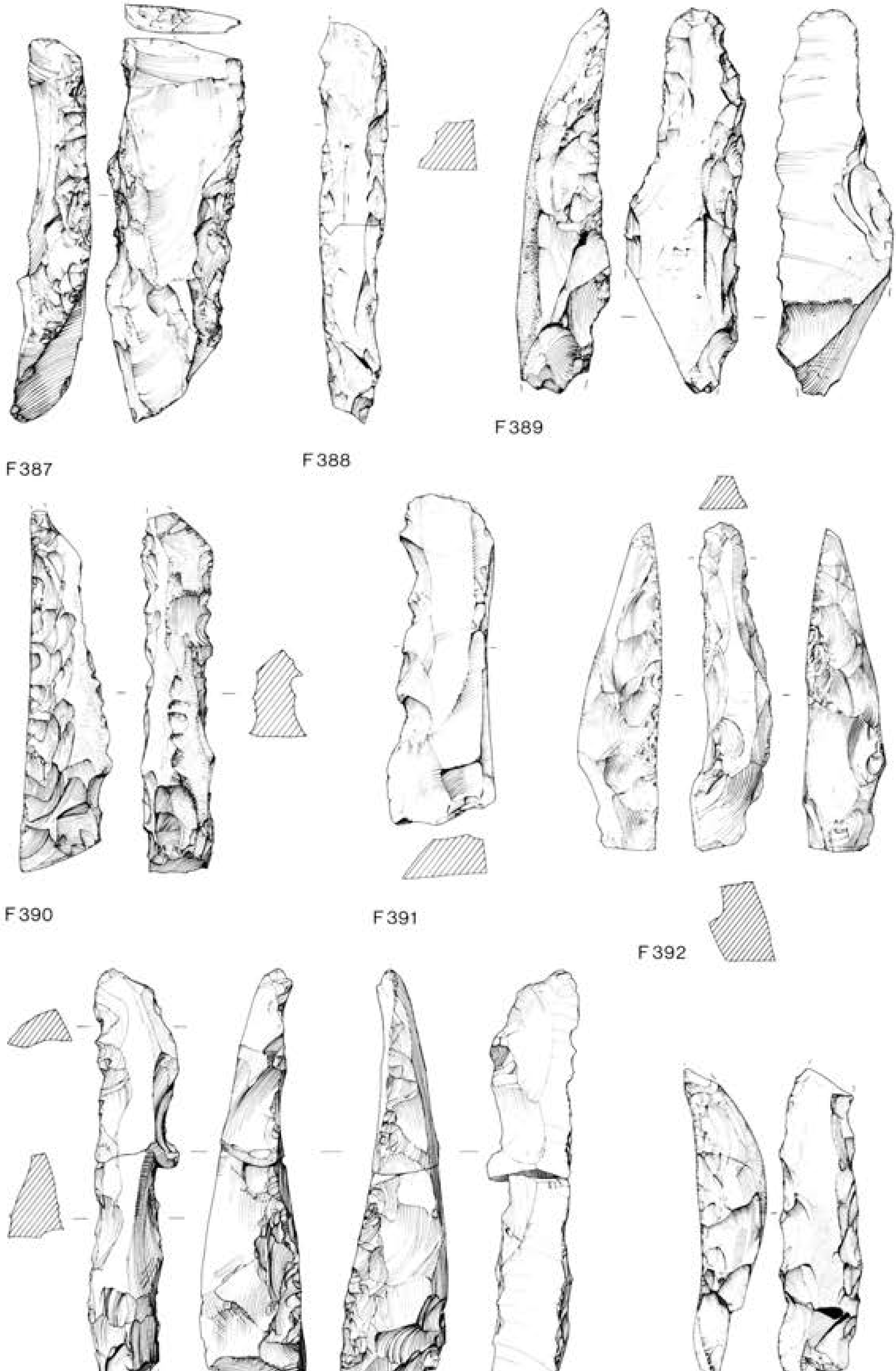
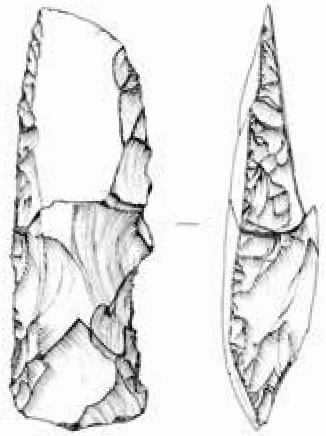
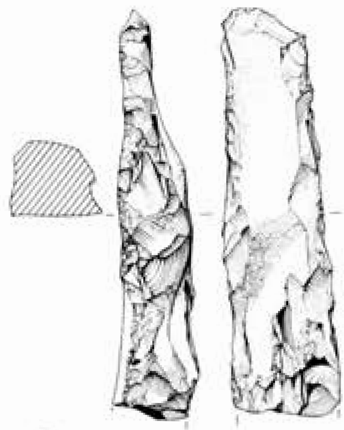


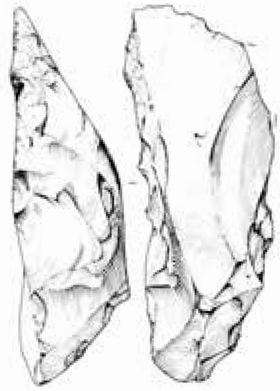
Figure 80 F387–394 (Scale 2/3)



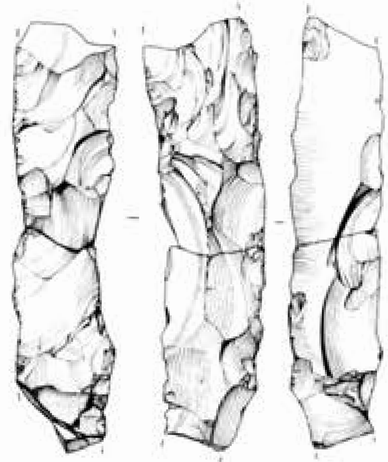
F 395



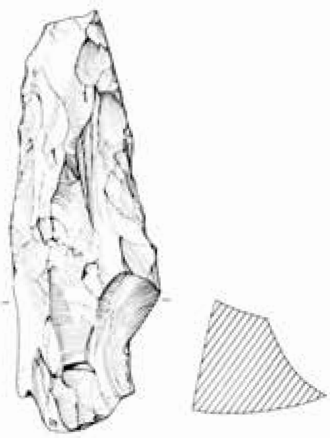
F 396



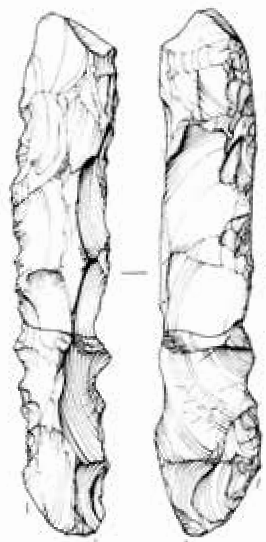
F 397



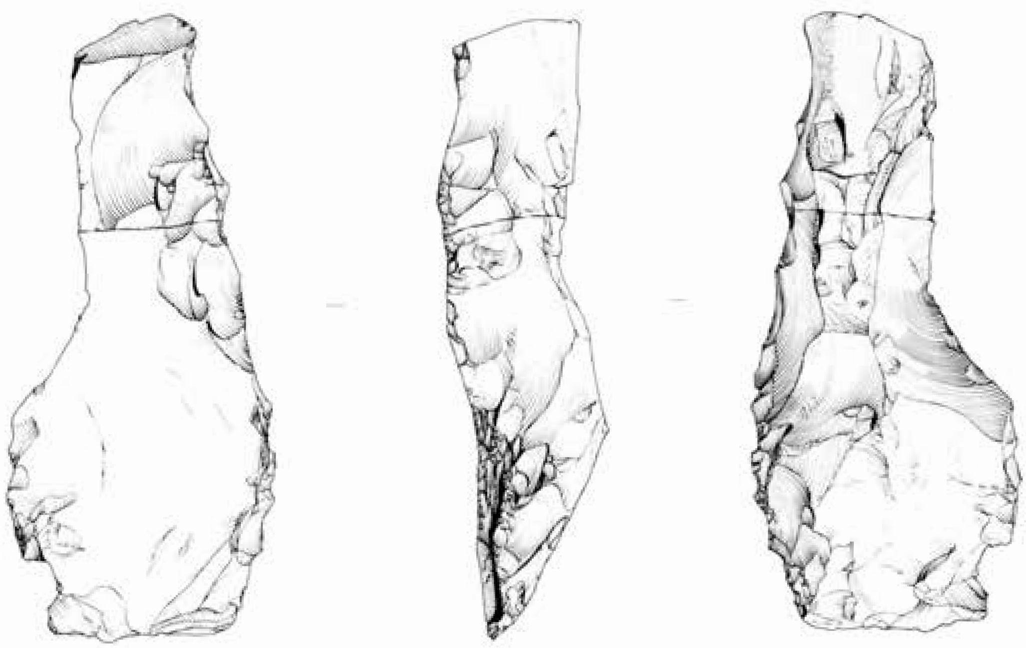
F 398



F 399



F 400



F 401

Figure 81 F395–401 (Scale 2/3)

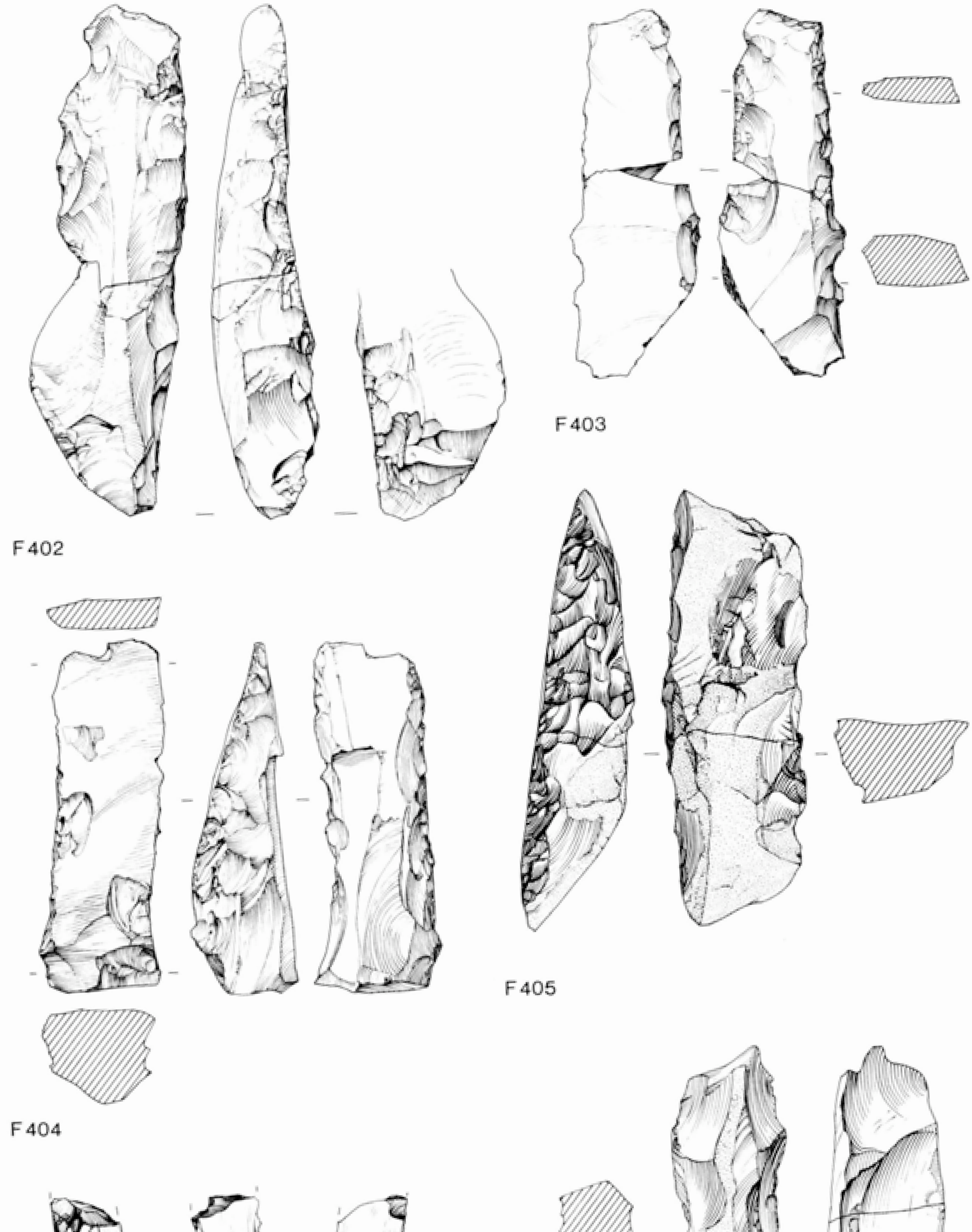


Figure 82 F402–407 (Scale 2/3)

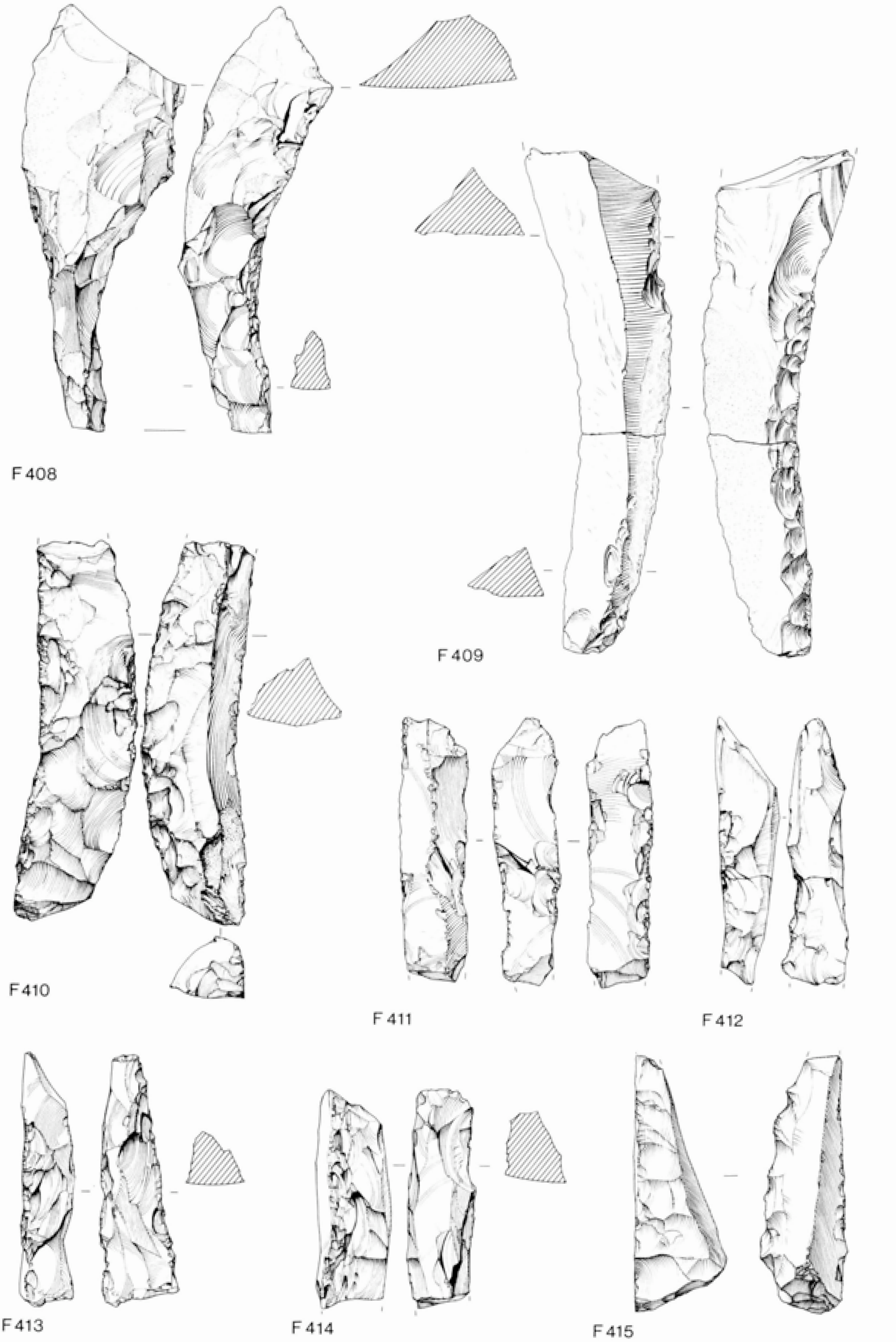
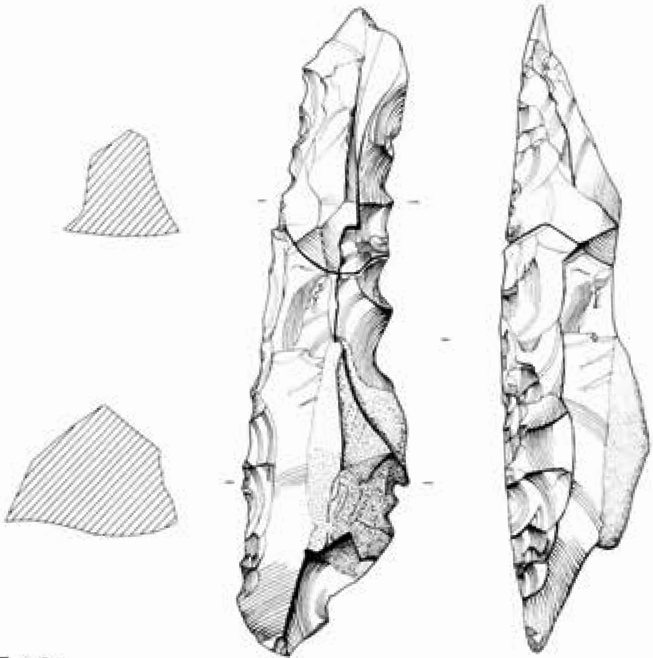
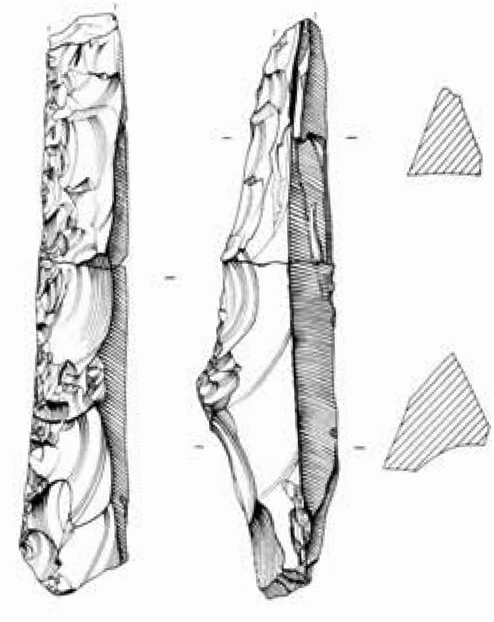


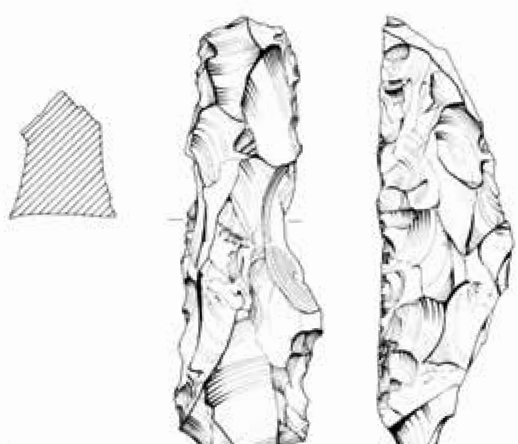
Figure 83 F408–415 (Scale 2/3)



F416



F417



F418

Figure 84 F416–418 (Scale 2/3)

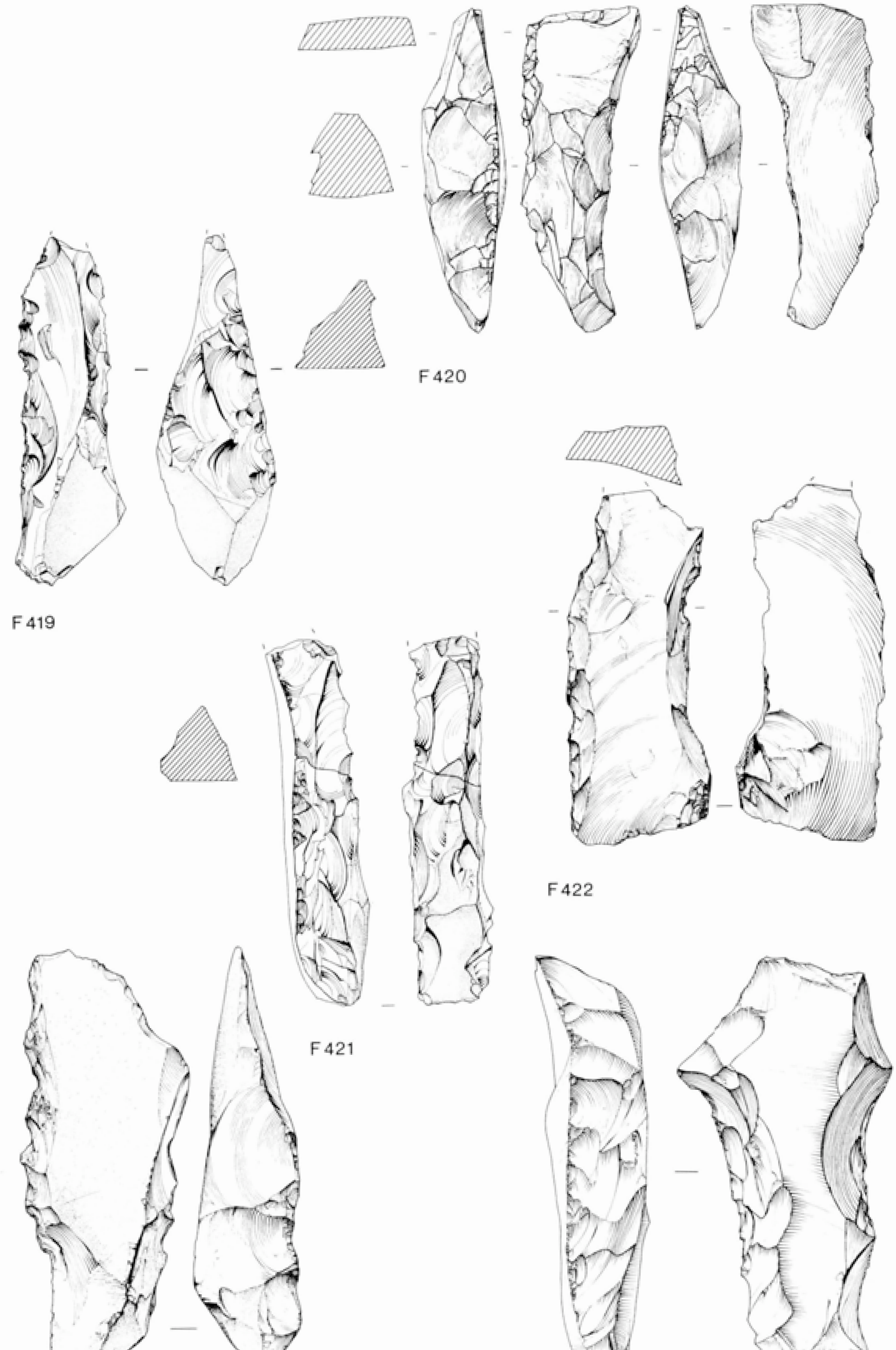


Figure 85 F419–424 (Scale 2/3)

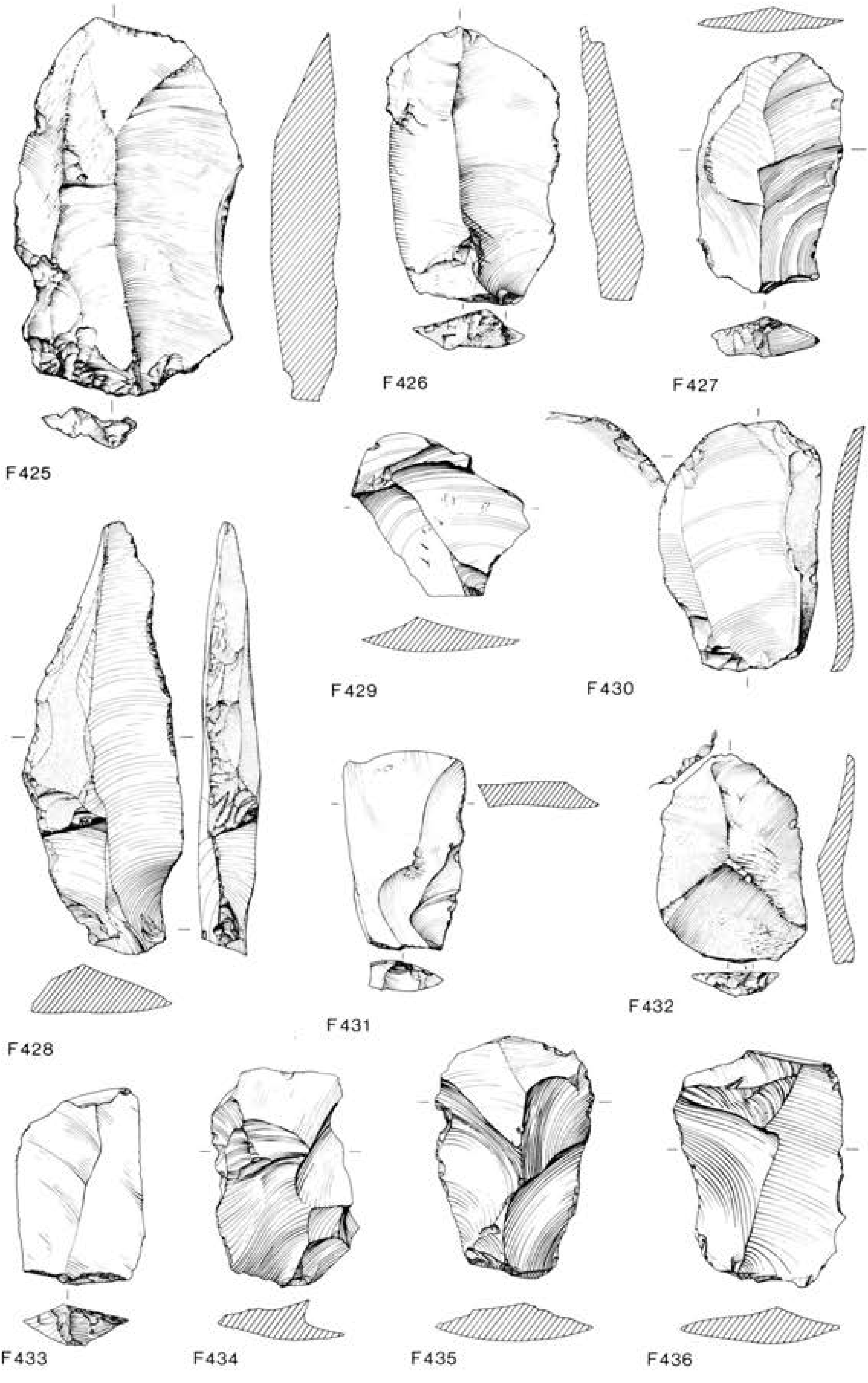


Figure 86 F425–436 (Scale 2/3)

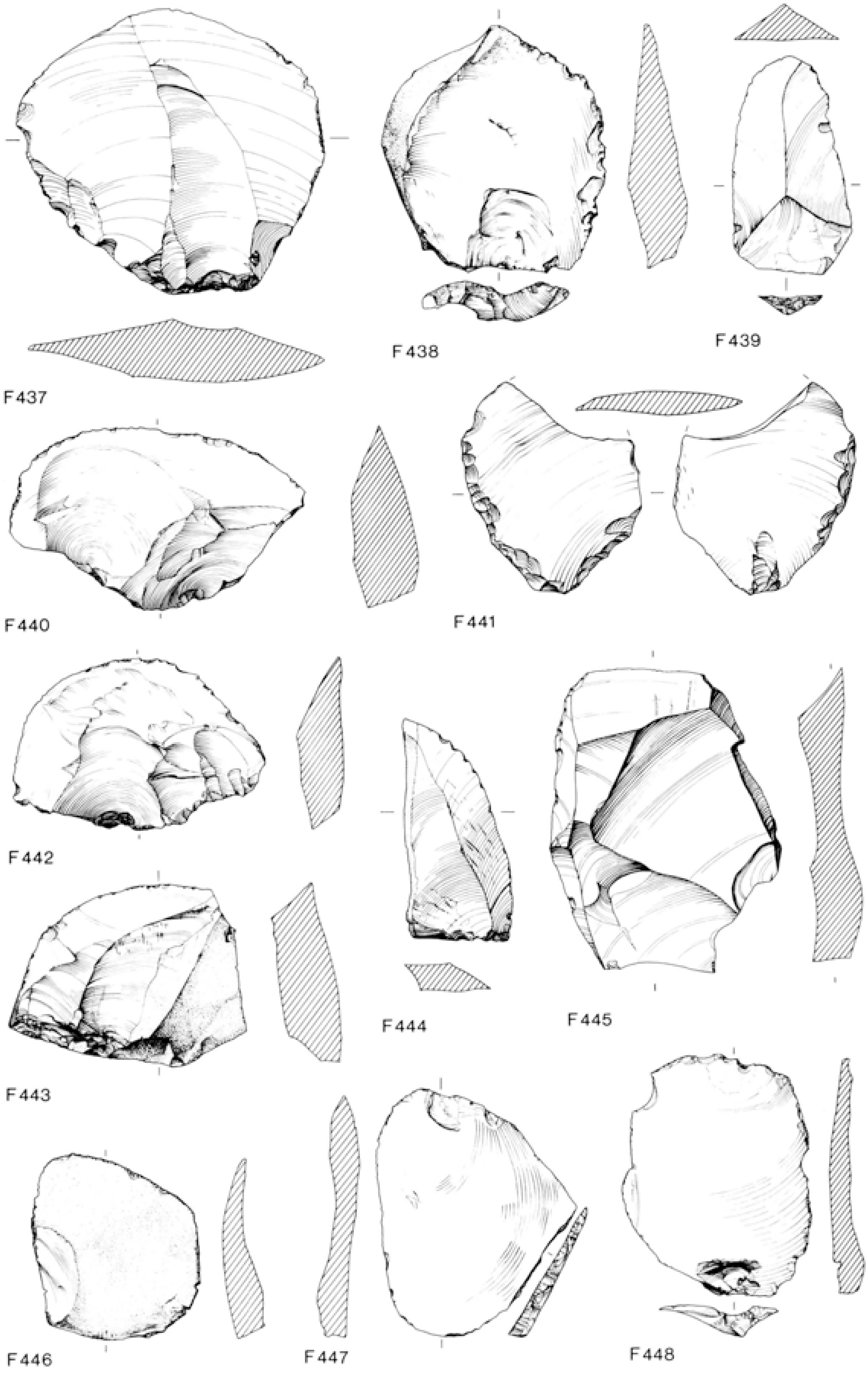


Figure 87 F437–448 (Scale 2/3)

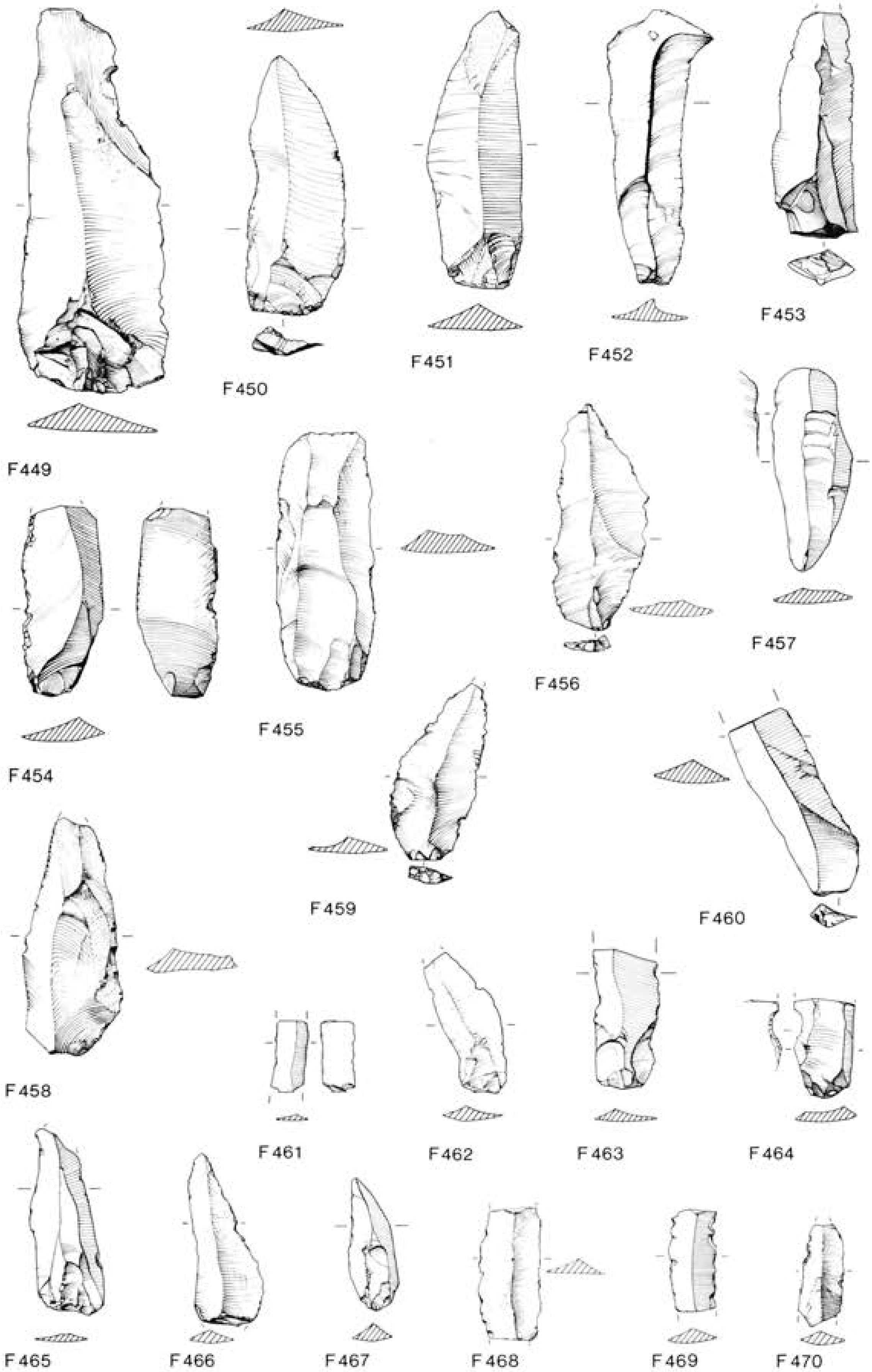


Figure 88 F449–470 (Scale 2/3)

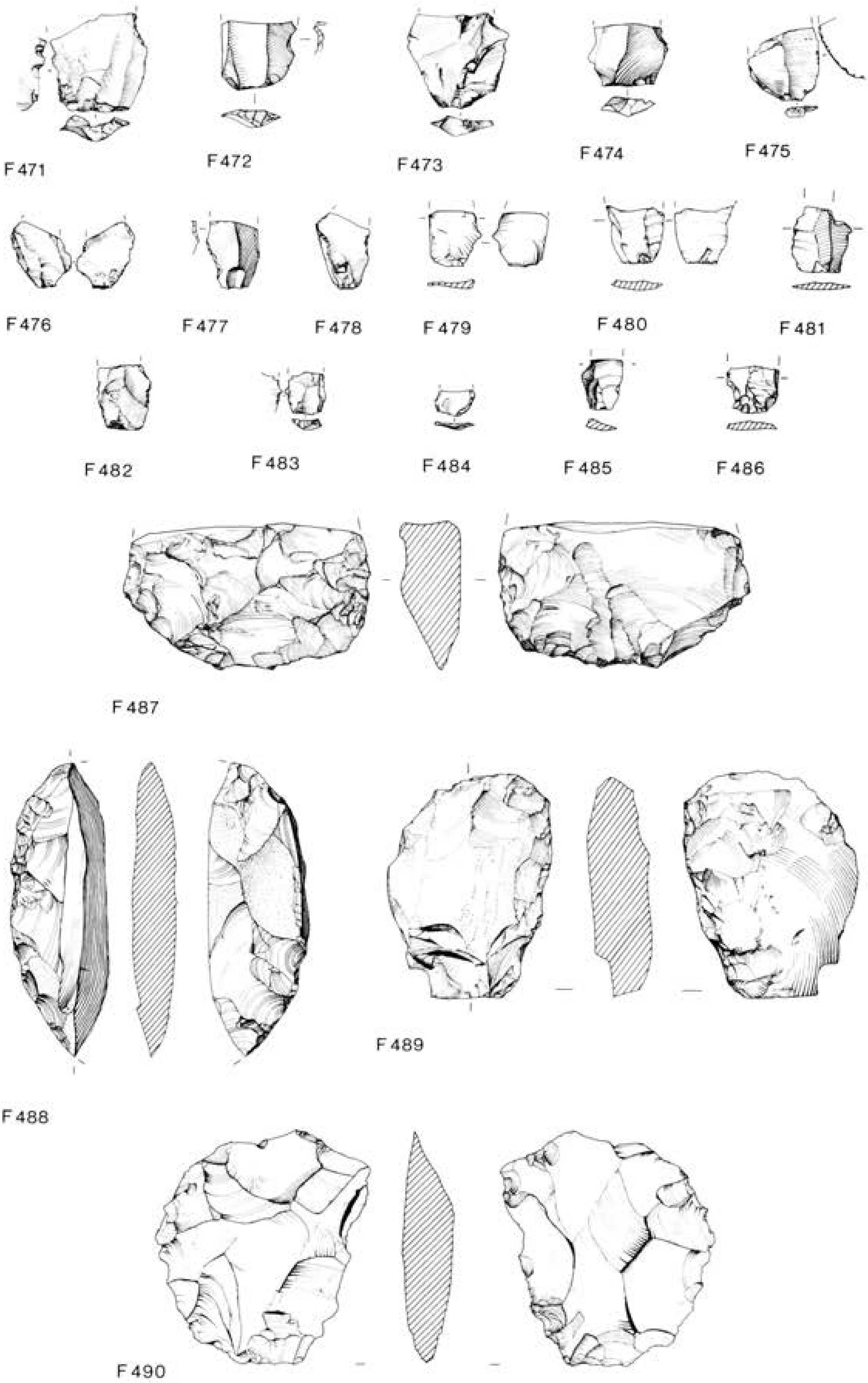


Figure 89 F471–490 (Scale 2/3)

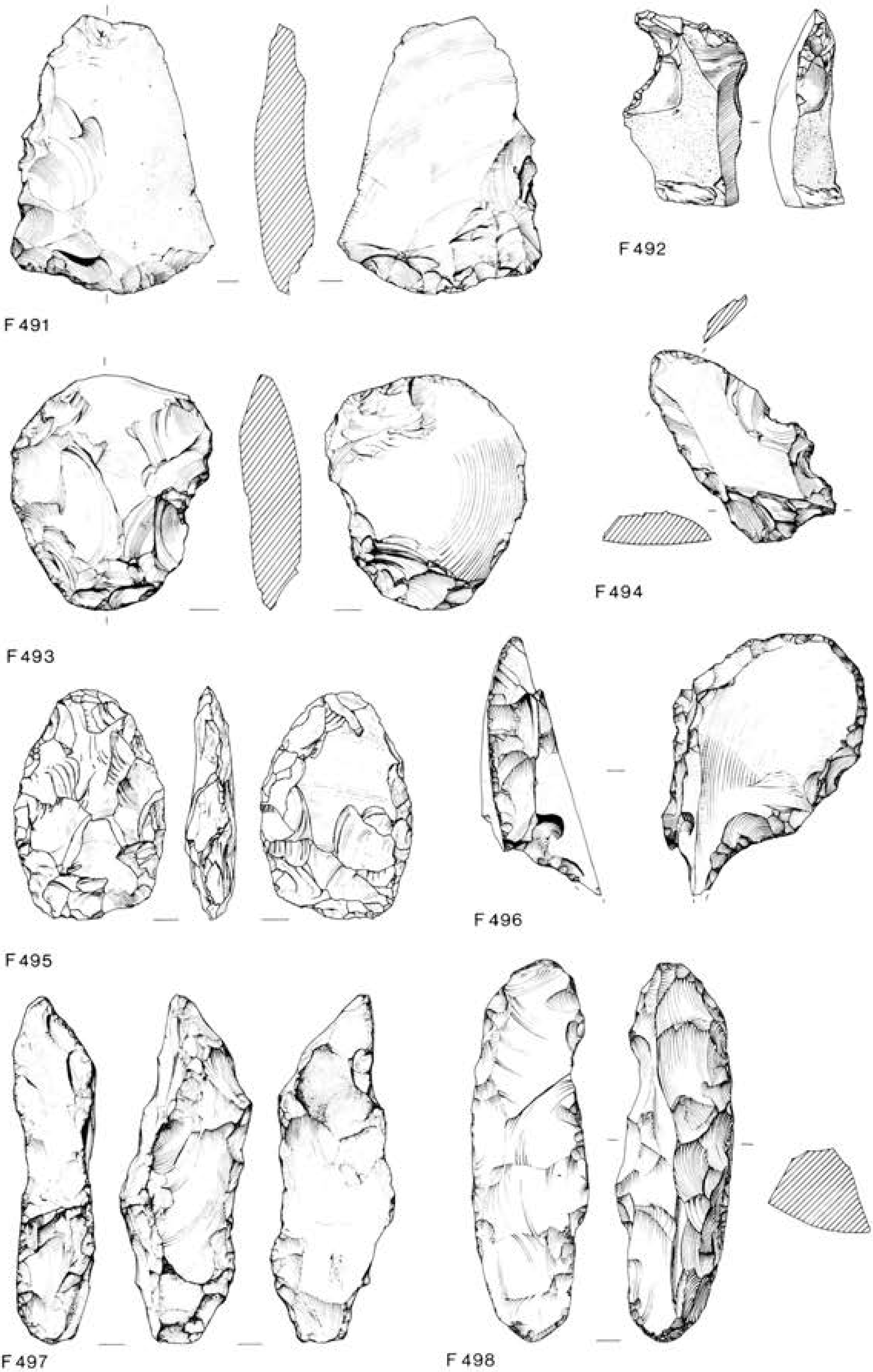


Figure 90 F491–498 (Scale 2/3)

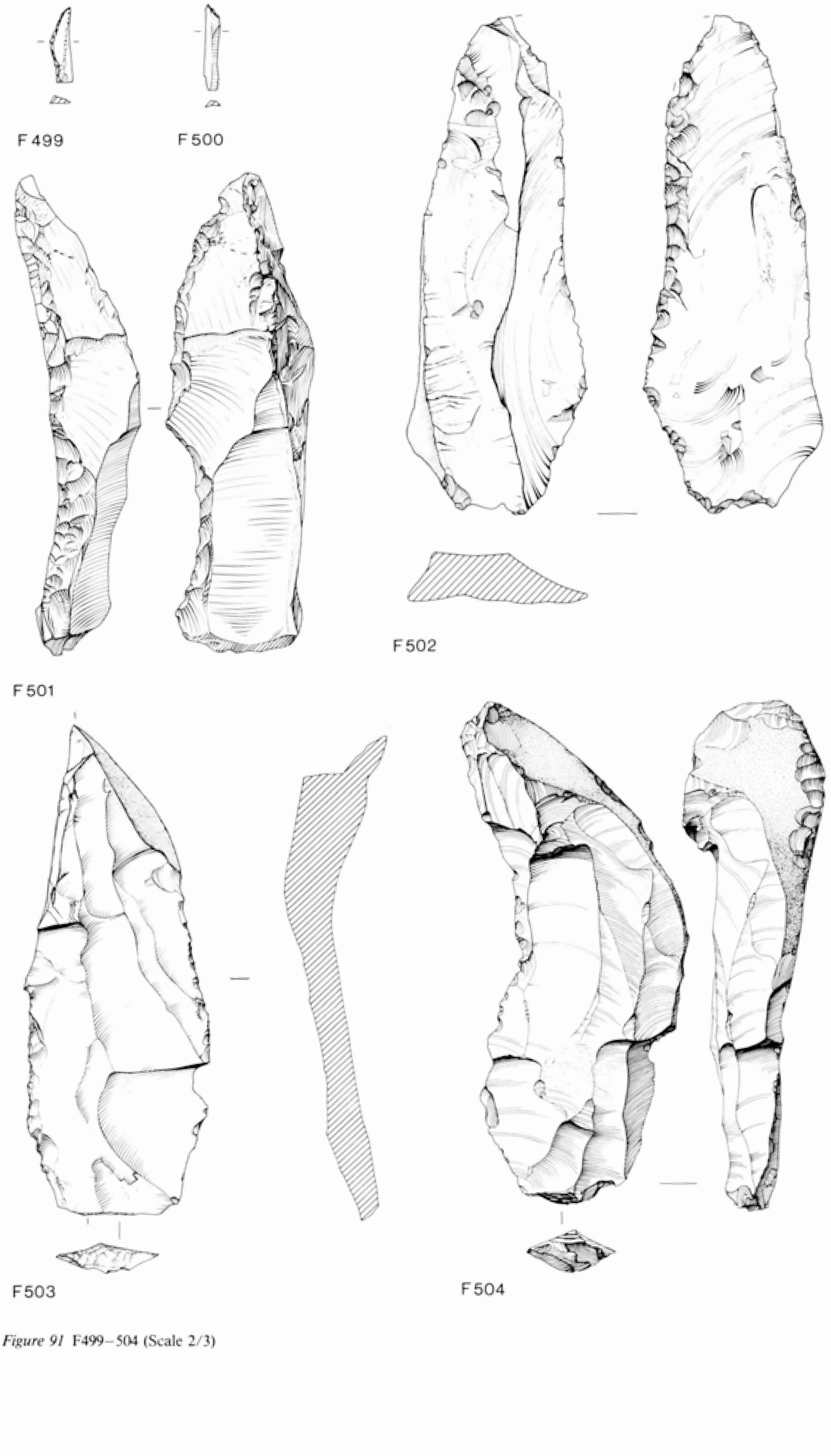


Figure 91 F499–504 (Scale 2/3)

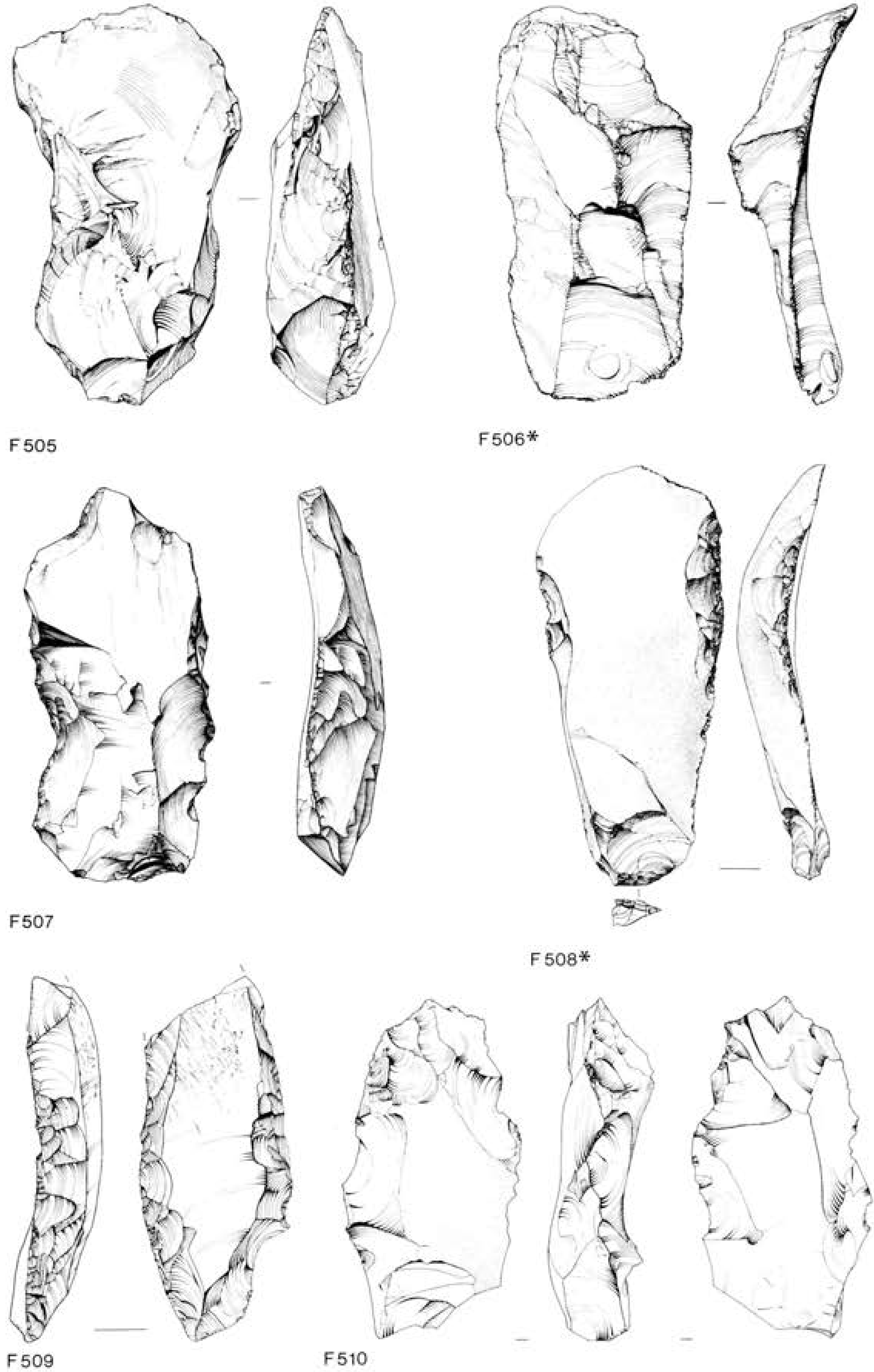


Figure 92 F505–510 (Scale 505, 507, 509, 510:2/3; 506, 508:1/3)

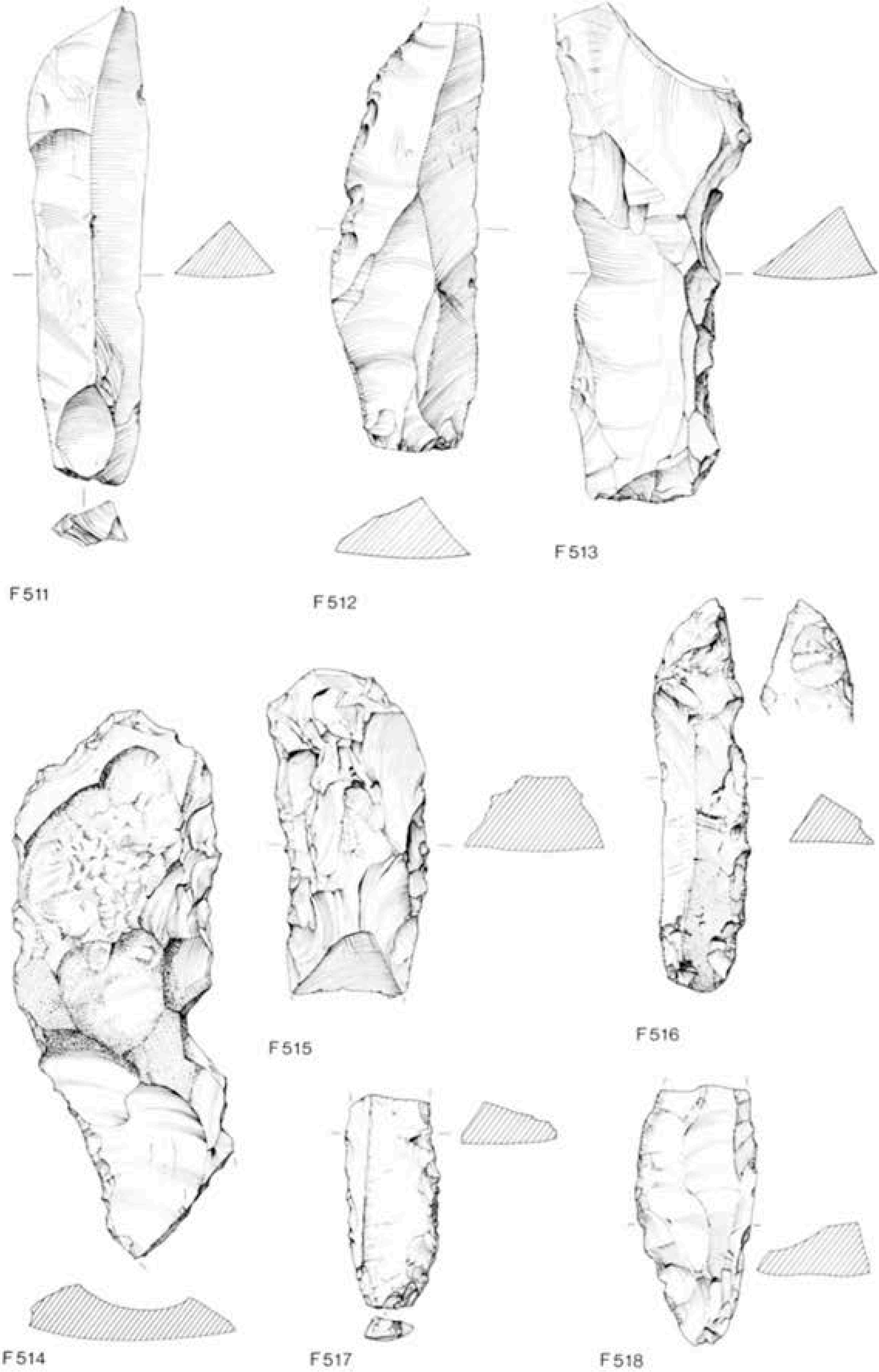
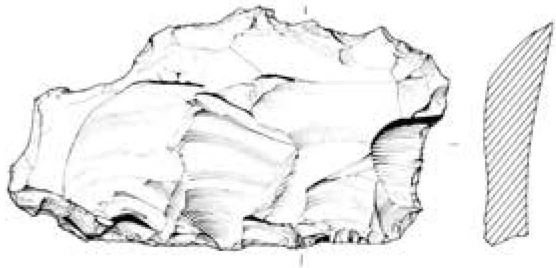
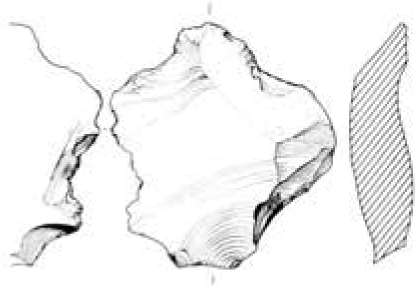


Figure 93 F511–518 (Scale 2/3)

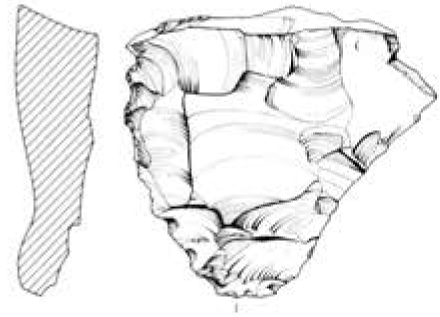


F519

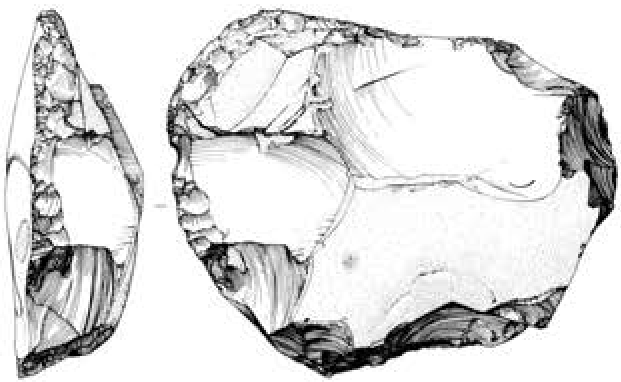


F520

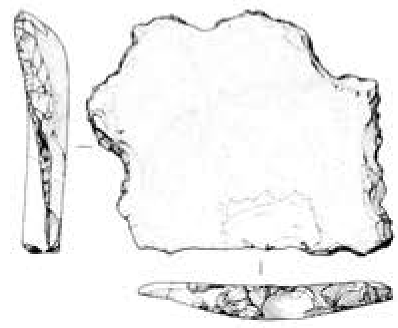
F521



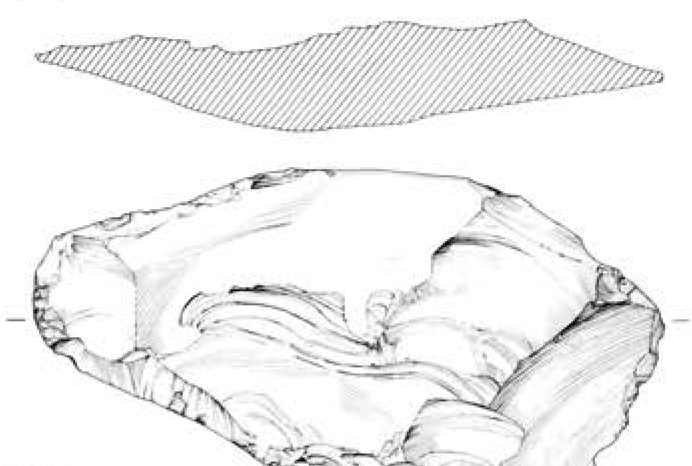
F522



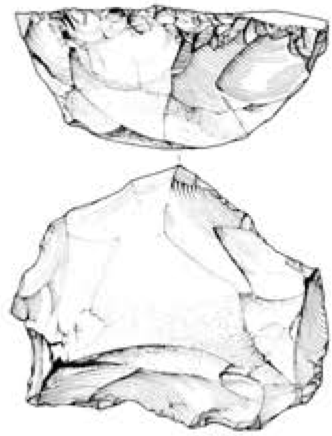
F523*



F524

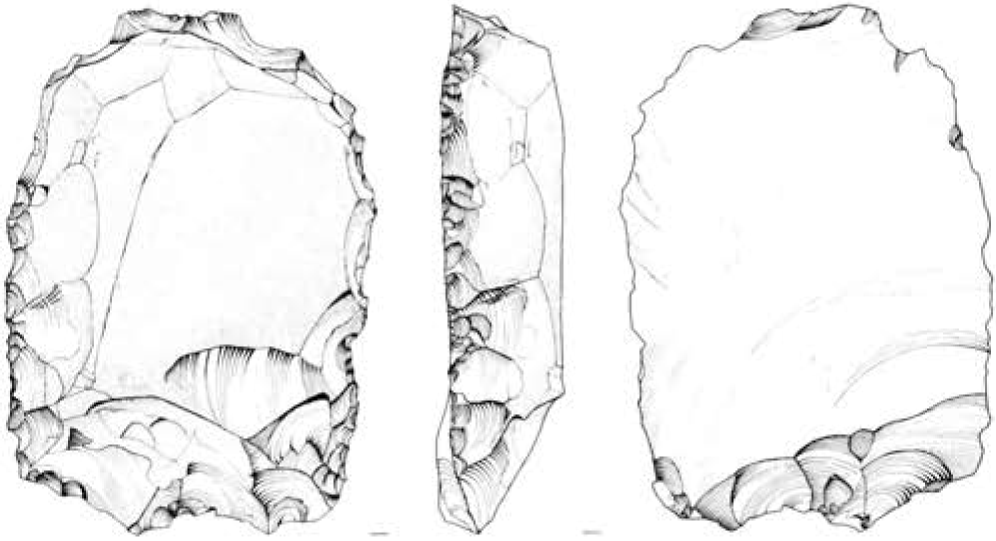


F525

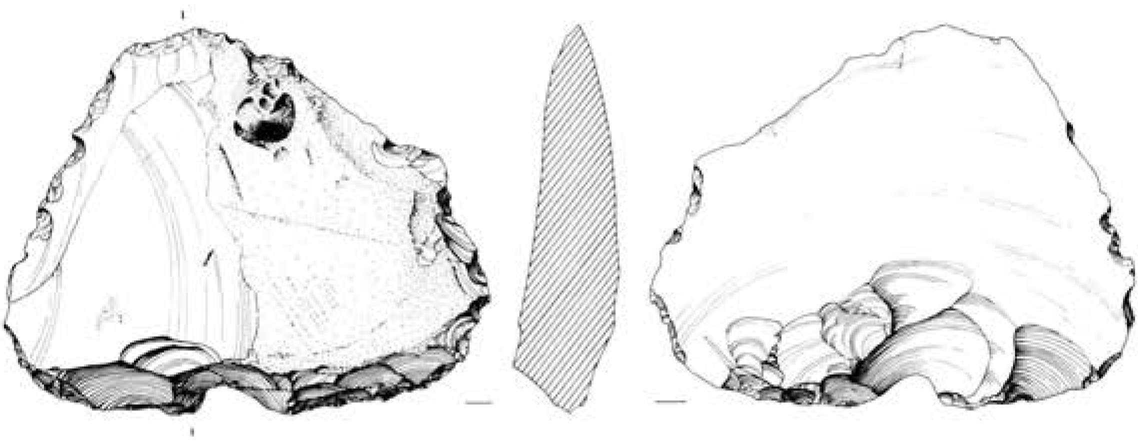


F526

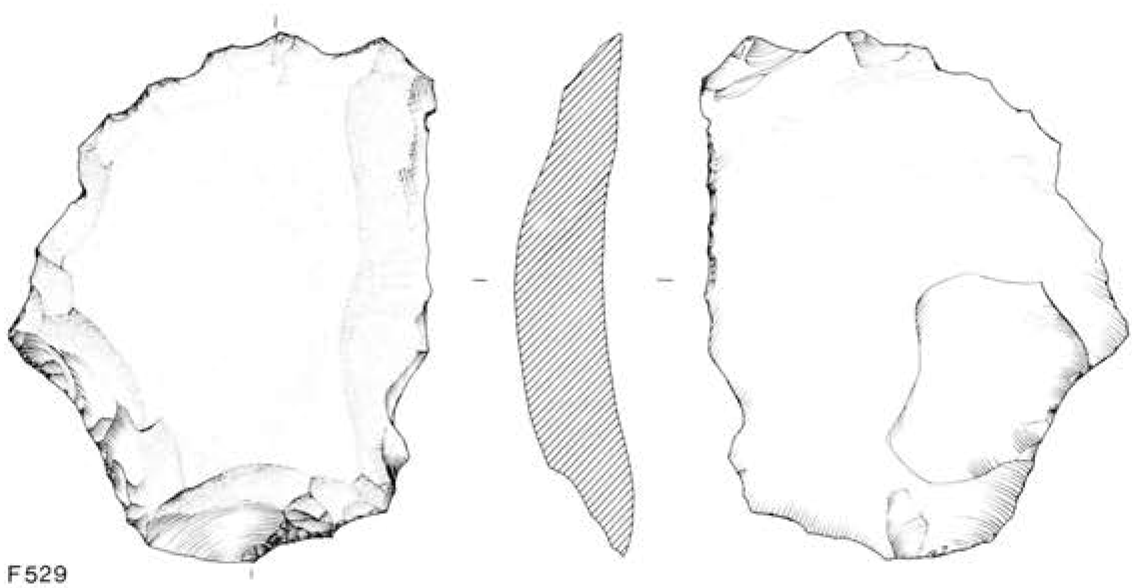
Figure 94 F519–526 (Scale 519–522, 524–526:2/3; 523:1/3)



F527

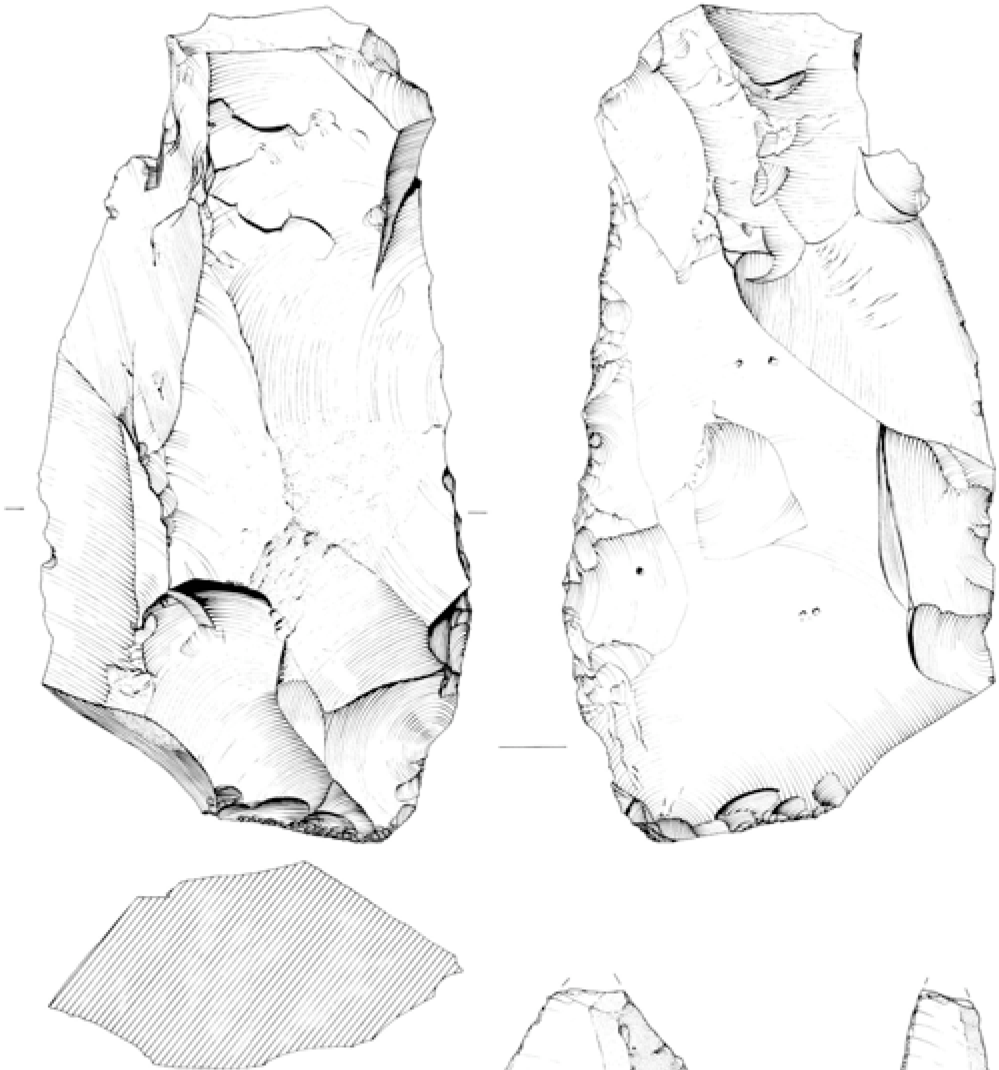


F528



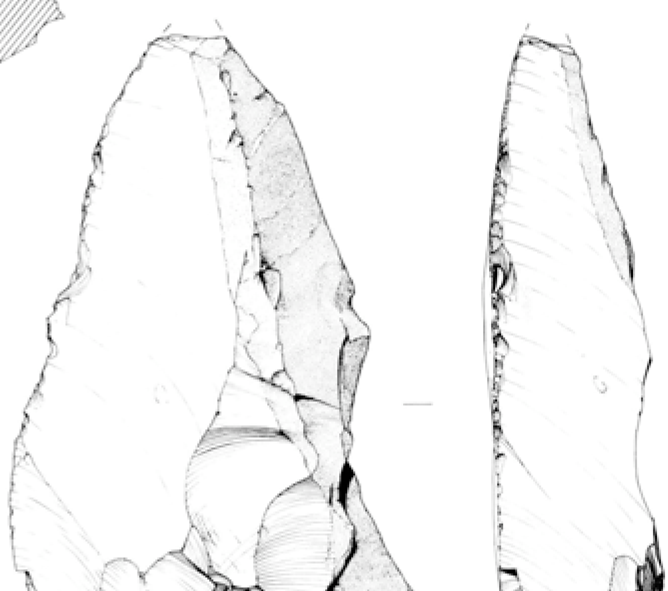
F529

Figure 95 F527–529 (Scale 2/3)



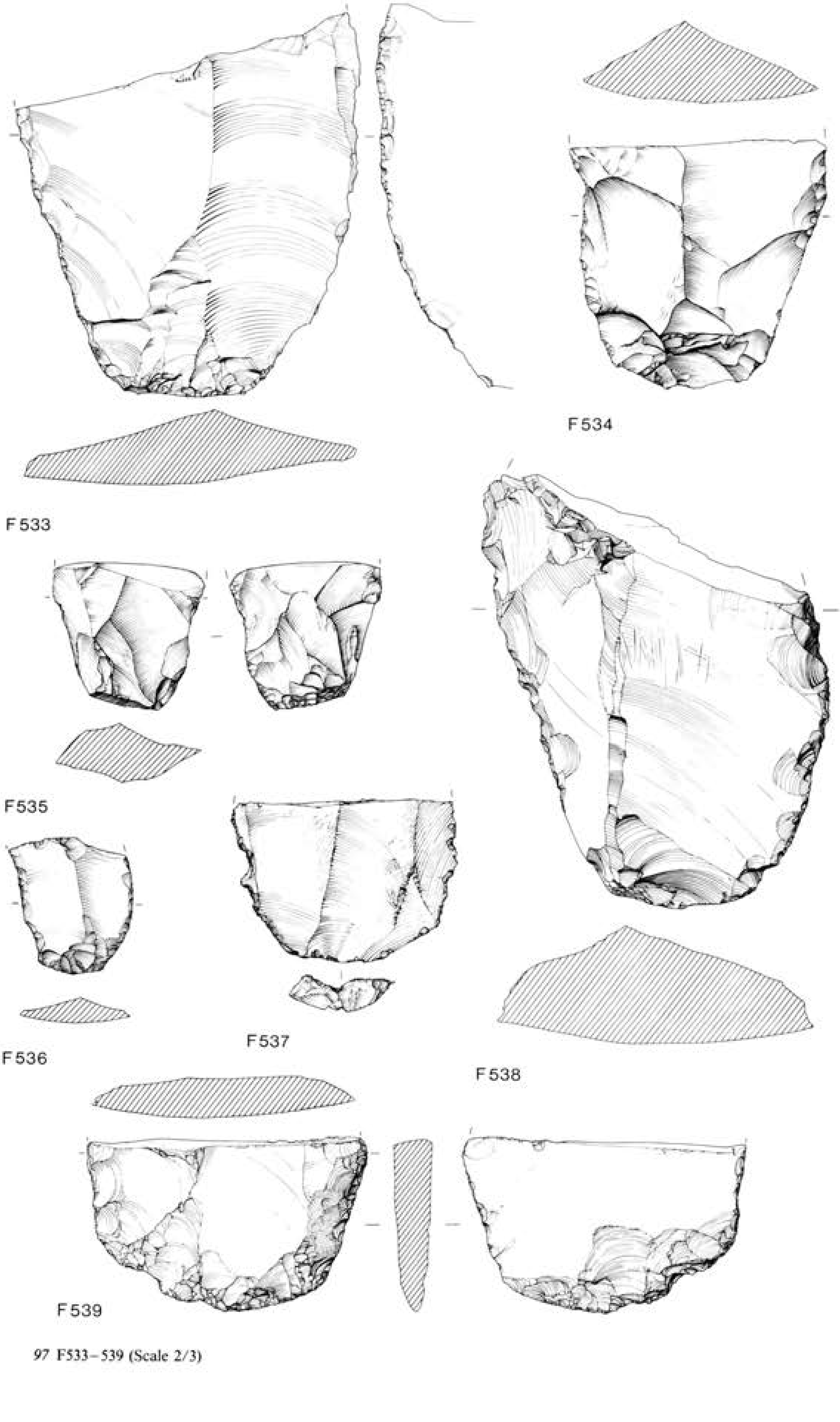
F530

F531

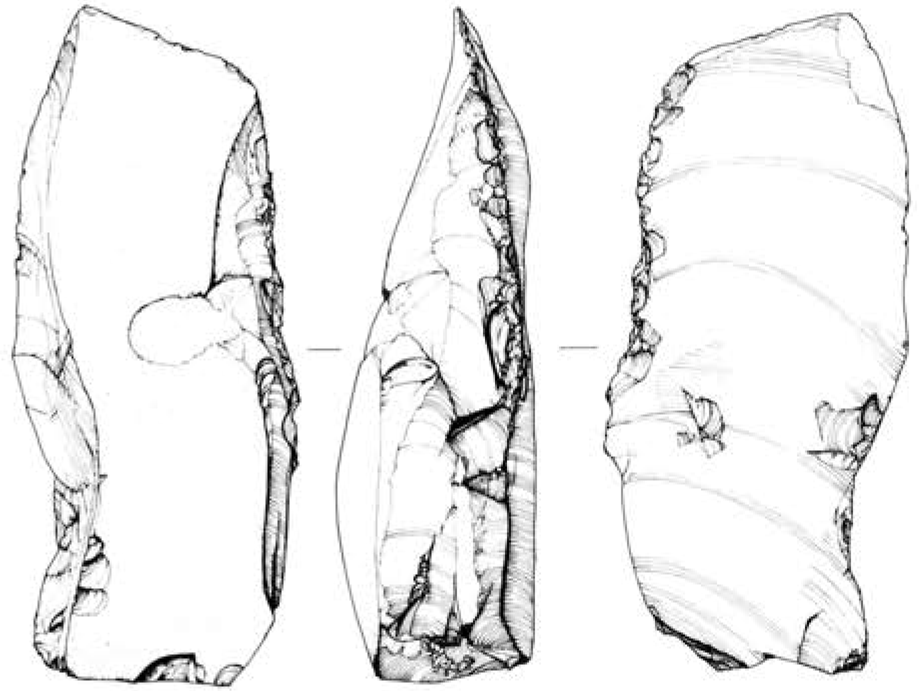


F532

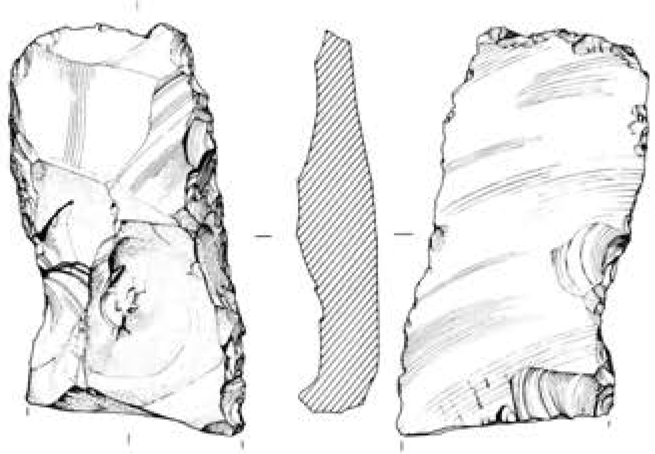
Figure 96 F530–532 (Scale 2/3)



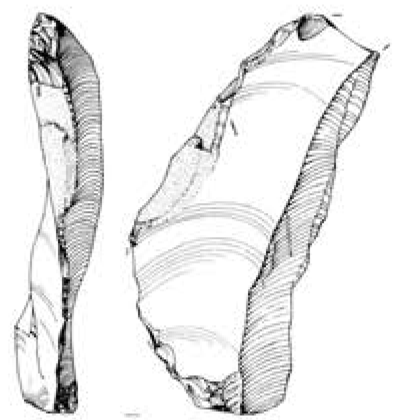
97 F533–539 (Scale 2/3)



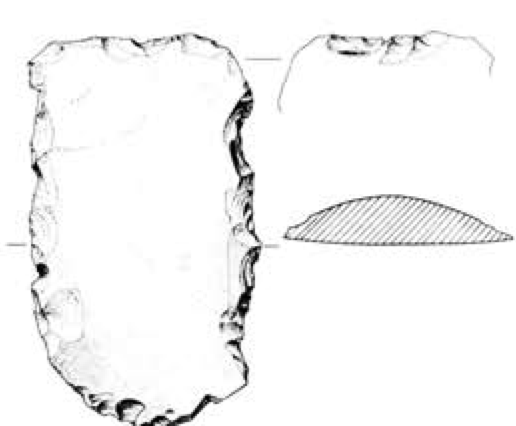
F540



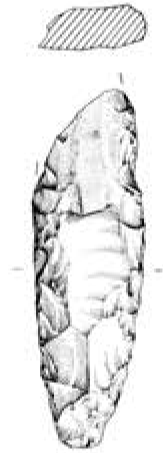
F541



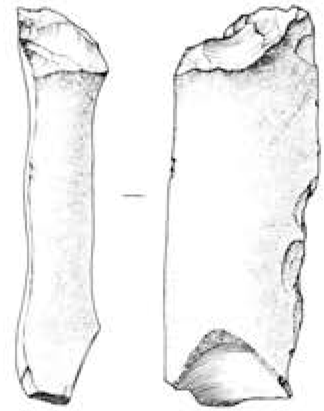
F542



F543



F544



F545*

Figure 98 F540–545 (Scale 540–544:2/3; 545:1/3)

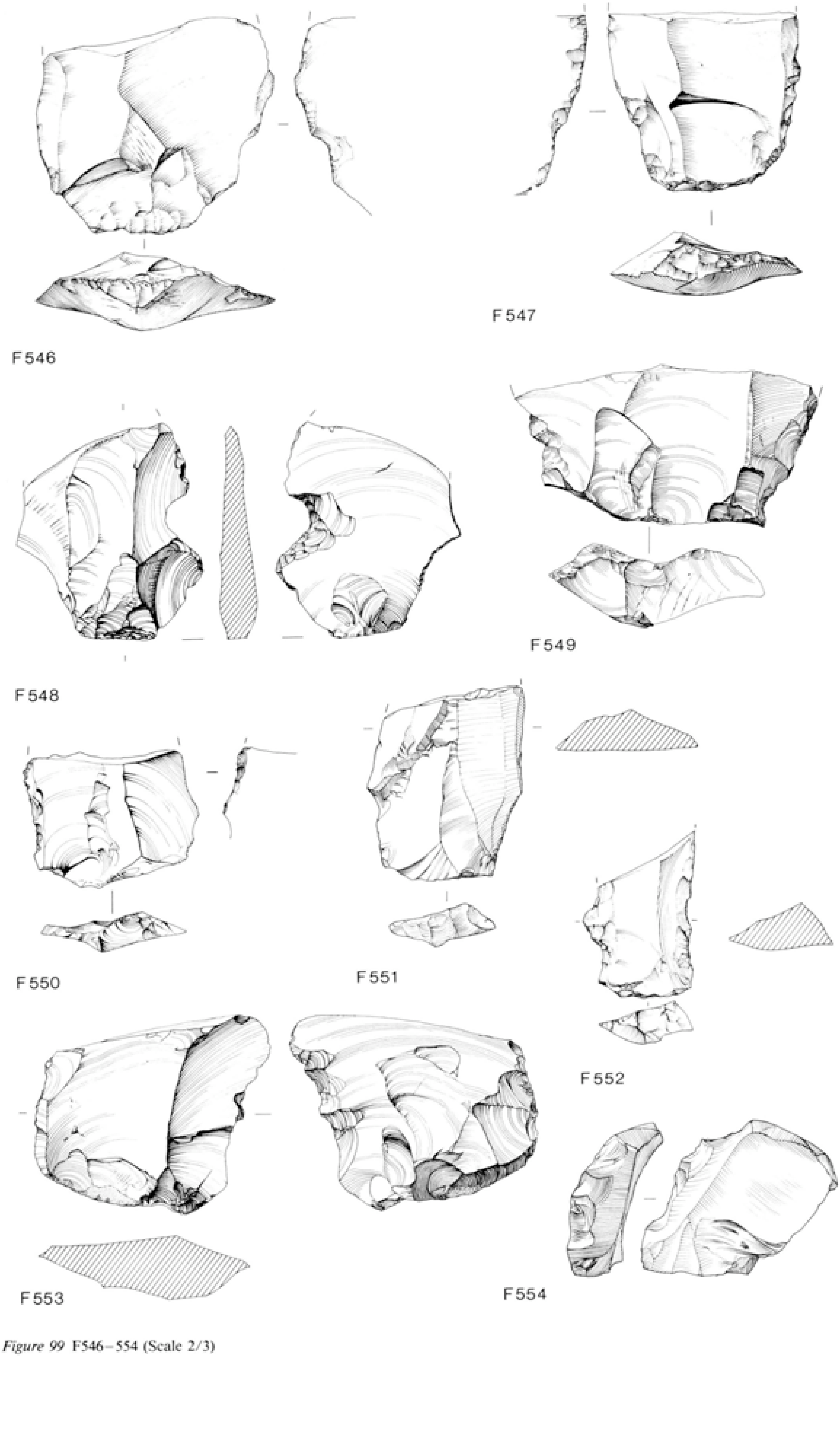


Figure 99 F546–554 (Scale 2/3)

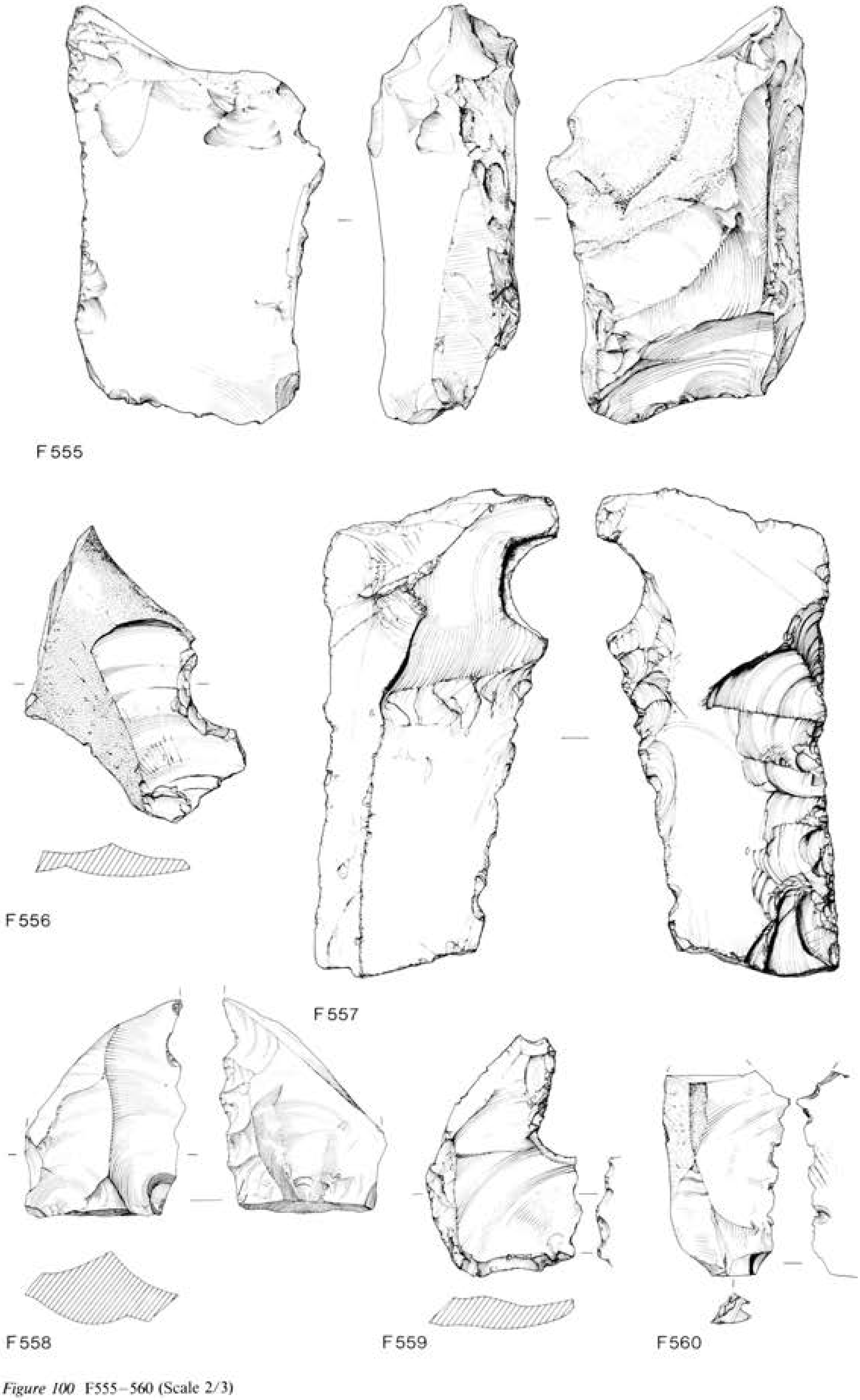


Figure 100 F555–560 (Scale 2/3)

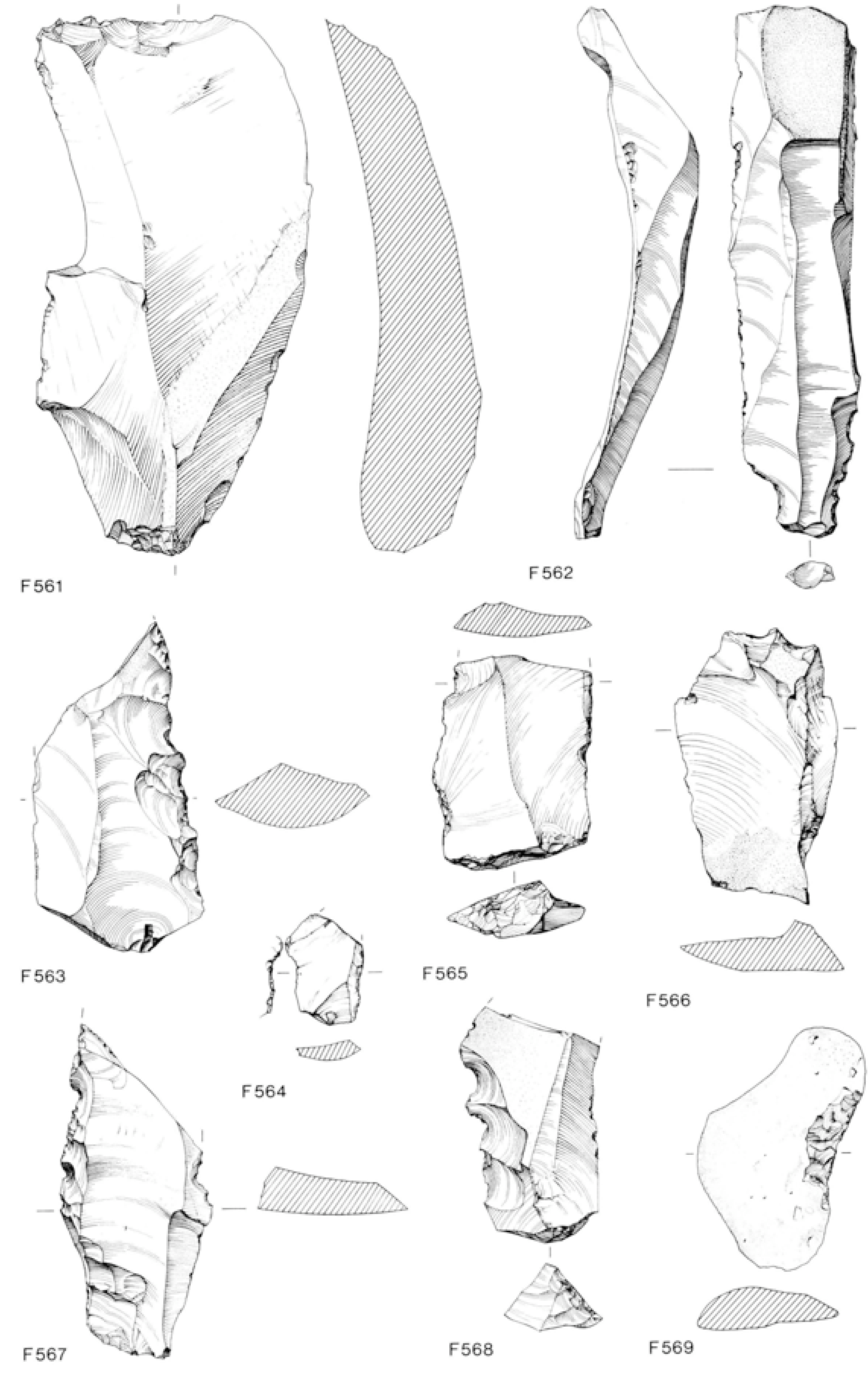
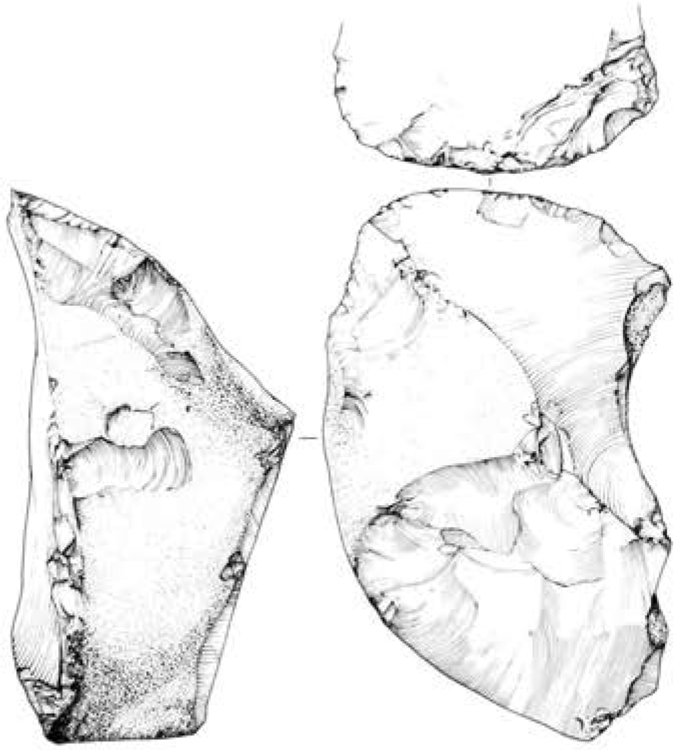
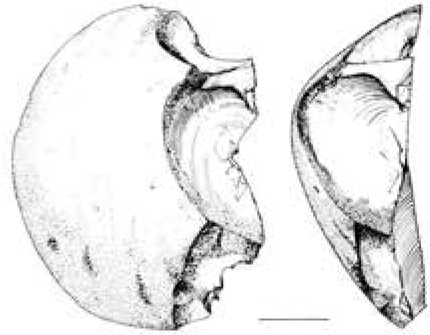


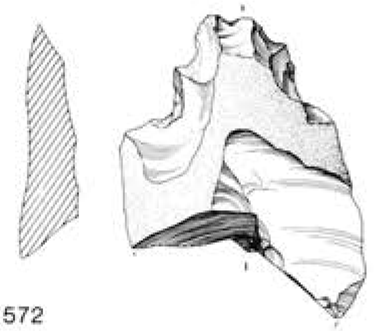
Figure 101 F561–569 (Scale 2/3)



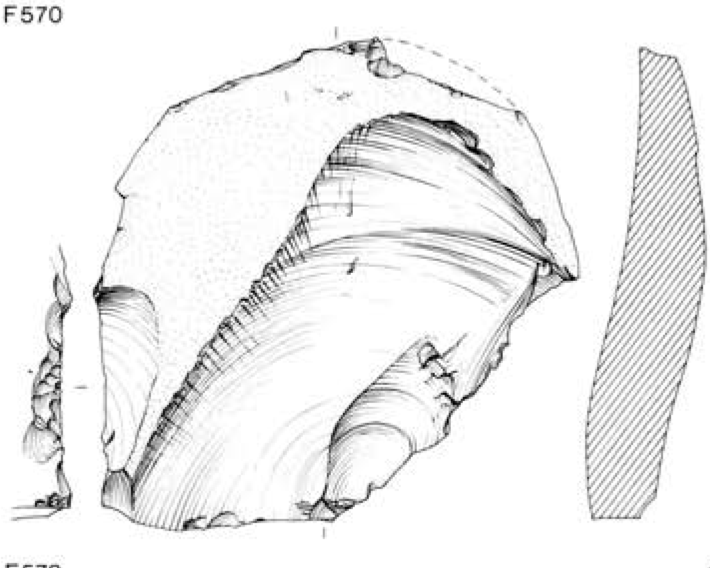
F570



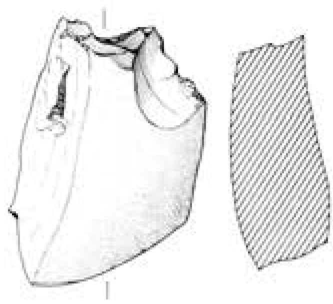
F571



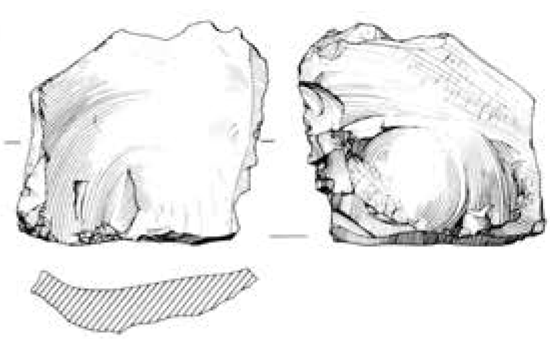
F572



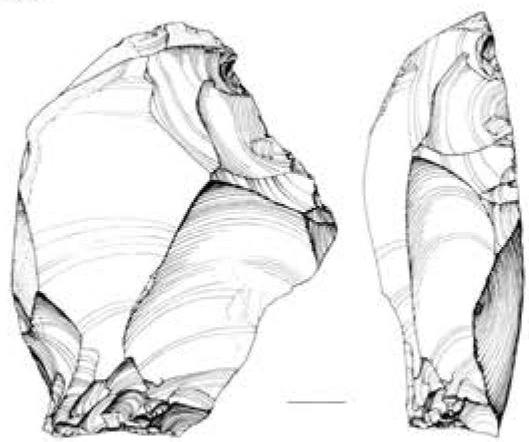
F573



F574



F575



F576

Figure 102 F570–576 (Scale 2/3)

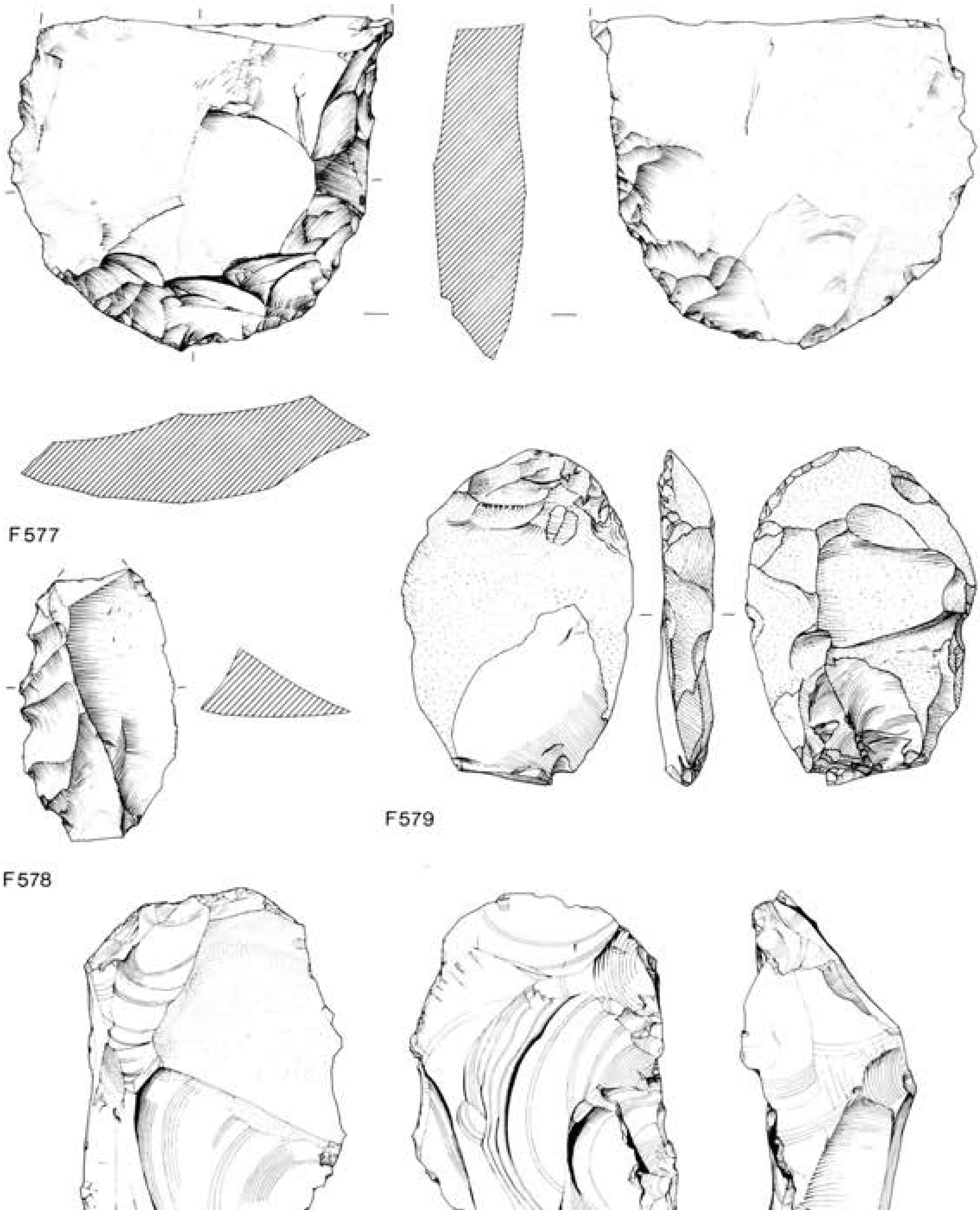


Figure 103 F577–580 (Scale 2/3)

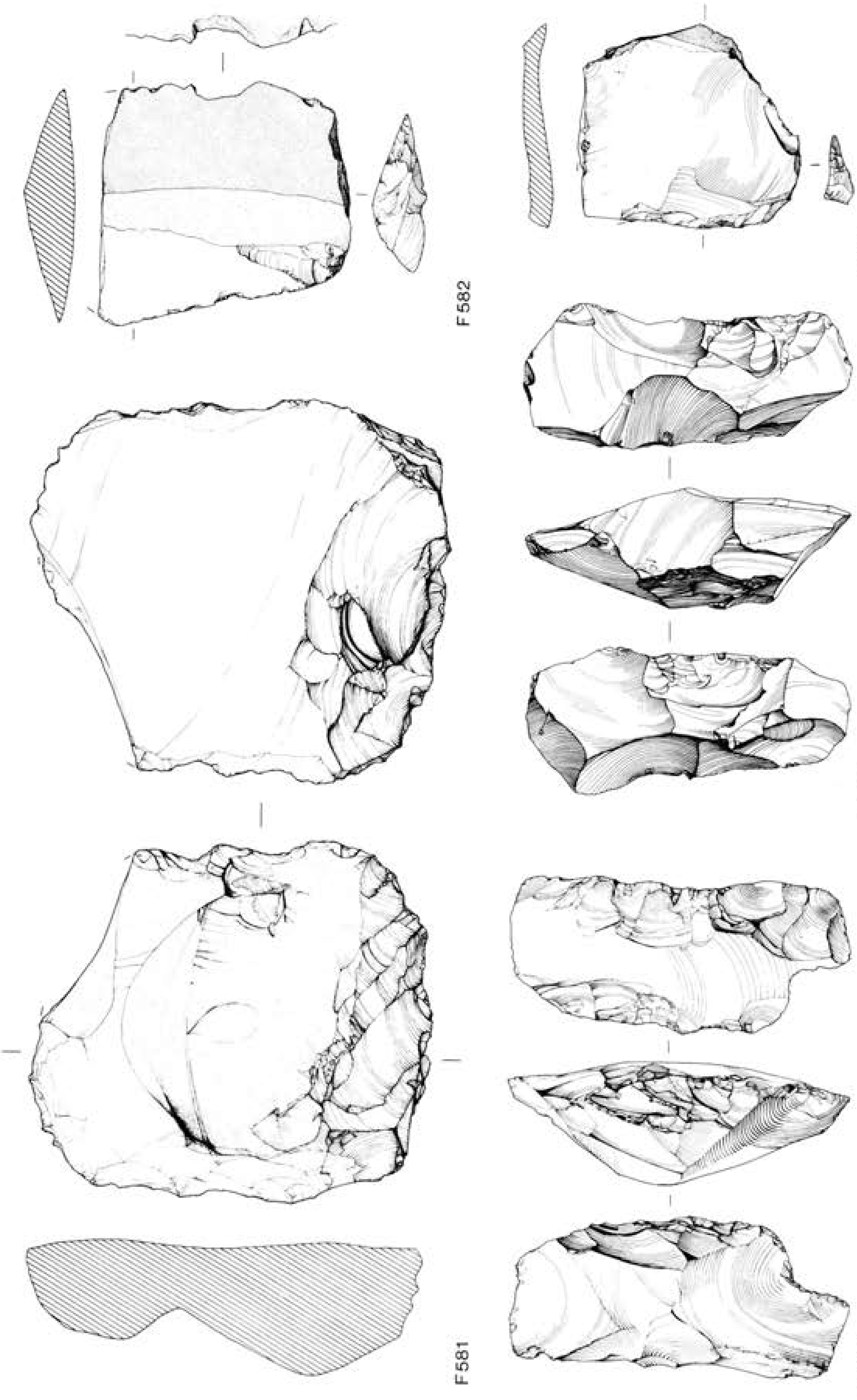


Figure 104 F581–585 (Scale 2/3)

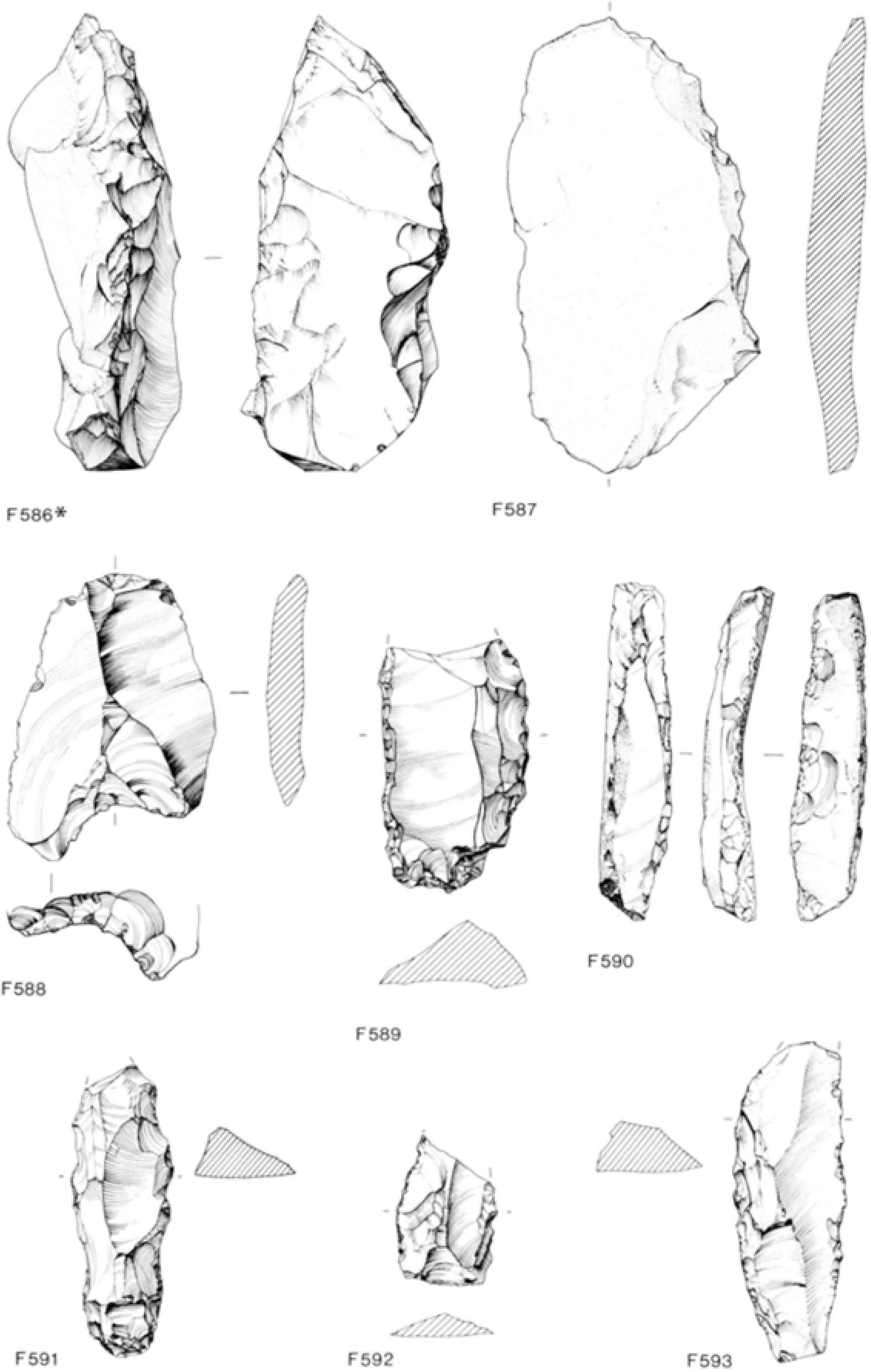


Figure 105 F586–593 (Scale 587–593:2/3; 586:1/3)

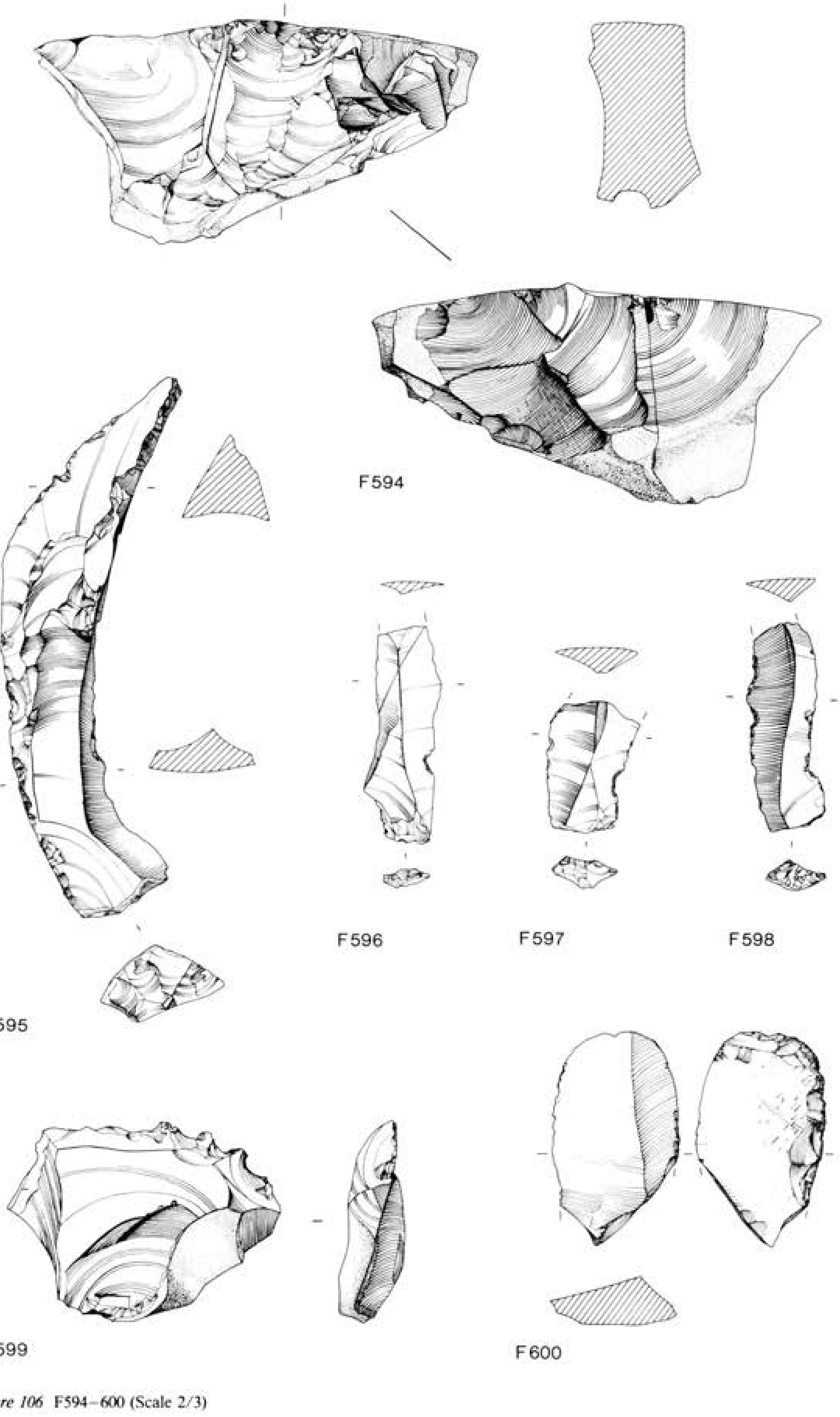


Figure 106 F594–600 (Scale 2/3)

Appendix 1
Logistics

'. . . it is not easy to carry on this branch of prehistoric work except for those with ample leisure and resources, as the material is so bulky' (Peake 1916, 307).

The preparation of the Grimes Graves flint report presented considerable organisational problems, and the reason for two of these, the physical size of the collection, and the time needed for study, merit description especially in view of the increased attention being focused upon the post-excavational processing of large bodies of archaeological material.

It has been described how the cultural flint from the 1971–72 excavations weighed in the region of 6 tonnes, and natural flint removed from the site in error added a further 450kg to the initial storage (and disposal) problem. The flints were packed in 445 cardboard boxes which had average dimensions of 46 × 22 × 16cm. The average box volume was therefore 16192cu cm, giving a total volume for 445 boxes of 7.2cu m. This indicates the absolute minimum space into which the boxes could be fitted, but the practical situation was obviously different. The highest the boxes could be stored was in stacks of seven, otherwise the weight caused the lower boxes to buckle, but because of other stipulations such as floorloading, the average storage situation was stacks five boxes high. The minimum floorspace required for a stack of five boxes is 1012sq cm. Thus the floorspace required for 445 boxes in stacks of five is 9sq m. This is the minimum figure, and taking into account other factors such as spacing for access, it was found that in practice at least 27sq m of floorspace was necessary. Translated into terms of the storage facilities actually used, this meant that two large office rooms were needed simply to house the collection during study.

It should be obvious that the size and weight of the flint collection posed considerable transportation problems, and will continue to present storage problems if the collection is to be preserved for future study.

Virtually all of the post-excavational processing of the flintwork was carried out off-site, except for some washing, preliminary sorting, and a little marking. Otherwise, all the stages from washing the flints to writing the report were performed by the present writer in London, with occasional assistance in the routine tasks of washing and marking. It was, therefore, possible to keep a check on the amount of time required to undertake this study, up until the completion of the initial typescript of the report. Approximately 370 days, which were spread over the period between May 1972 and February 1974, were necessary. This estimate assumes an average day of about 6 hours real work, which would give a total input requirement of 2220 man-hours. These figures do not include the drawing of the flints, which would probably at least double the man-hour total, nor any of the considerable follow-up work leading towards publication.

The figure of 370 days could have been considerably reduced if all the non-specialist manual tasks such as washing, marking, ordering and packing were excluded, and it would have been more economic on specialist time if, wherever possible, these could be eliminated by on-site processing. Even so, prospective excavators of sites likely to produce substantial flint assemblages should be warned that the processing burden, both on and off site is considerable. Similarly it should be appreciated that the specialist study of this kind of flint assemblage cannot realistically be undertaken on a part-time or amateur basis, and requires the provision of premises.

Appendix 2
Concordance of the numbers and provenances of the illustrated flint artefacts

The illustrations reproduce all the flints at ⅔ scale, except for the 13 instances indicated by a star on the drawings, which are at ⅓ scale. Where more than one artefact has the same general find number it is differentiated by an alphabetical suffix: an asterisk indicates that the find number applies to a single flint.

Flint No.	Figure No.	Artefact Designation	Excavation Find No.	Area	Trench (T) Quadrant (Q) or Baulk (B)	Horizon	Square	Group
F1	15	flint hammerstone	71.1137/A	1971 shaft	Q.5	1B	—	—
F2	15	quartzitic pebble hammer	71.911/A	surface	T.7B	1, spit 4	—	—
F3	15	flint hammerstone	71.471/FA	surface	T.2A	1, spit 5	—	—
F4	15	flint pebble hammer	71.464/A	surface	T.4 (ext.)	1A	—	—
F5	16	unretouched blade	71/3478*	1971 shaft	—	7th section	—	—
F6	16	unretouched blade	71.2981/A	1971 shaft	—	6th section	—	—
F7	16	unretouched Levalloisoid blade	71.2977/A	1971 shaft	—	6th section	—	—
F8	16	unretouched flake	71.383/G	surface	T.4	3	1	—
F9	16	unretouched flake	71.402/Q	surface	B.4/5	3	2	—
F10	16	unretouched flake, proximal segment	71.400/F	surface	B.4/5	3	4	—
F11	16	unretouched flake, proximal segment	71.401/F	surface	B.4/5	3	1	—
F12	16	unretouched flake, proximal segment	71.400/K	surface	B.4/5	3	4	—
F13	16	core, class C, 4 platforms	71.3116/B	1971 shaft	Q.5	6th section	—	—
F14	17	core, class E	71.245/A	surface	T.2B	1	—	—
F15	17	core, class D	71.3137*	1971 shaft	Q.4	6th section	—	—
F16	17	core, class D	71.178/A	surface	T.4	1, spit 2	—	—
F17	18	core, class B2	72.930/H	1972 shaft	T.8B	4B6	—	3
F18	18	core, class A2	71.2408/I	surface	T.2A	1, base	—	—
F19	18	core, class E	71.1120/H	surface	T.3	3	20	—
F20	18	core, class A2	71.1085/B	surface	T.2A	1, spit 5	—	—
F21	19	core, class A2	72.1071/B	1972 shaft	T.10	—	—	1
F22	19	core, class A2	71.468/A	surface	T.2B	1, spit 3	—	—
F23	19	core, class A2	71.2412/B	1971 shaft	Q.6	1B	—	—
F24	19	core, class A2	71.890/A	surface	T.1A	1–1A/3	—	—
F25	20	core, class B2	71.728/F	surface	T.2A	—	—	—
F26	20	core, class C, 3 platforms	72.503/E	1972 shaft	T.9	—	—	Above 1
F27	20	core, class C, (roughout?)	71.2226/D	surface	T.2A	1, base	—	—
F28	21	core, class A2	71.210/F	surface	T.3	1, spit 3	—	—
F29	21	core, class A2	71.2712/B	surface	T.7B	3	—	—
F30	21	core, class B2	72.515/B	1972 shaft	T.10	4A	—	Between 0–1
F31	21	core, class A2	72.1120/A	1972 shaft	T.10	7A, spit 1	—	Between 1–3
F32	21	core, class A2	71.1151/D	surface	T.2A	1, base	—	—
F33	22	core, class D	71.2979/A	1971 shaft	Q.3	6th section	—	—
F34	22	core, class D	71.2972/B	1971 shaft	—	6th section	—	—
F35	22	core, class D	71.516/B	surface	T.1A	1–1A/3	—	—
F36	22	core, class D	71.624/B	surface	T.2A	—	—	—
F37	22	core, class D	72.1101/B	1972 shaft	T.8B (ext)	2	22	Above 1
F38	22	core, class A1	72.516/C	1972 shaft	T.8B	4B	—	2

Flint No.	Figure No.	Artefact Designation	Excavation Find No.	Area	Trench (T) Quadrant (Q) or Baulk (B)	Horizon	Square	Group
F39	23	core, class C, 3 platforms	71.2260/D	1971 shaft	Q.6	1B	—	—
F40	23	core, class C, 5 platforms	71.3125*	1971 shaft	Q.4	6th section	—	—
F41	23	core, class A2	72.998/C	1972 shaft	T.10	5	62	1
F42	23	core, class A2	71.2499/D	surface	T.2A	1, base	—	—
F43	23	core, class A2	71.2447/I	surface	T.2A	1, base	—	—
F44	23	core, class A2	72.1054/B	1972 shaft	T.8B	7	45	3
F45	24	core(?), fragment	71.269*	surface	T.3	2, spit 3/sand	—	—
F46	24	core, class A2	72.1344/A	1972 shaft	B.8B/11	4B	13	2
F47	24	core, class D	71.194*	surface	T.3	2, spit 2	—	—
F48	24	core, class E	71.2220*	surface	T.2A	—	—	—
F49	25	core, class A2	71.2835/D	surface	T.2A	3	—	—
F50	25	core, class B2	72.1363/A	1972 shaft	T.10	—	—	3
F51	25	core, class A2	71.1042/C	surface	T.1A	1–1A/3	—	—
F52	25	core, class B2	71.2920/A	surface	T.7B	3	—	—
F53	25	core, class B2	71.2568/K	surface	T.2A	1, base	—	—
F54	26	core, class C	71.2321*	surface	T.1A	1–1A/3	—	—
F55	26	core, class D	72.1177/J	1972 shaft	B.8B/11	4A1	15	1
F56	26	core, class D	71.2405/I	surface	T.2A	1, base	—	—
F57	26	core, class A2	71.2392/A	1971 shaft	—	1B	—	—
F58	27	core, class C, 3 platforms	72.639/B	1972 shaft	T.11	4B	20	Between 1–2
F59	27	core, class C	71.2483/I	surface	T.7B	1, base/3	—	—
F60	27	core, class C	71.183/A	surface	T.4	1, spit 2	—	—
F61	28	core, class C, 4 platforms	71.2301/A	1971 shaft	Q.6	1B	—	—
F62	28	core, class B2	71.2235/I	surface	T.2A	1, base	—	—
F63	28	core, class C, 3 platforms	72.1172/A	1972 shaft	T.8B	4B	21	2
F64	29	core, class C	71.502/D	surface	T.3	3	21	—
F65	29	core, class A2	71.2306/A	1971 shaft	Q.6	1B	—	—
F66	29	core, class B3(?)	71.2300/B	surface	T.2A	1, base	—	—
F67	30	core, class A2	71.2695/A	surface	T.7B	1, base/3	—	—
F68	30	core, class E	71.709/C	surface	T.8B, SW	—	16	—
F69	30	core, class A2	71.405/A	surface	B.4/5	3	5	—
F70	30	*petit-tranchet* derivative arrowhead	72.944*	1972 shaft	T.8B	4B6	33	3
F71	30	*petit-tranchet* derivative arrowhead	71.2127*	surface	T.8B, SW	—	12	—
F72	30	*tranchet* arrowhead	71.771*	1971 shaft	Q.5	1B	—	—
F73	30	barbed-and-tanged arrowhead	71.1078*	surface	T.2A	1, base	—	—
F74	30	*petit-tranchet* derivative arrowhead	71.385*	surface	T.4	3	5	—
F75	31	pick	71.2649*	1971 shaft	Q.6	1C	—	—
F76	31	pick	71.983*	1971 shaft	Q.4	1B	—	—
F77	32	pick	71.386*	surface	T.4	3	5	—
F78	32	pick	71.596/A-B	surface	T.2A	1, spit 5	—	—
F79	33	pick	71.2350/A-2365/F	surface	T.7B	1, spit 4	—	—
F80	33	chisel-pick	71.265/B	surface	T.6	1B	—	—
F81	33	pick	71.2718/A	1971 shaft	Q.3	1C	—	—
F82	33	pick	71.708/C-	surface	T.1A	1A	—	—
			1088/D	surface	T.1A	1–1A/3	—	—
F83	34	pick	71.2648*	1971 shaft	Q.5	1B	—	—
F84	34	pick	71.823*	1971 shaft	Q.3	1B	—	—
F85	34	pick	71.183/B	surface	T.4	1, spit 2	—	—
F86	35	pick	71.988/A	surface	T.7B	1, spit 4	—	—
F87	35	pick	72.75/B	1972 shaft	T.8B	3	—	0
F88	35	pick	72.575/A	1972 shaft	T.11	3/4A	15	Above 1

Flint No.	Figure No.	Artefact Designation	Excavation Find No.	Area	Trench (T) Quadrant (Q) or Baulk (B)	Horizon	Square	Group
F89	36	pick	71.608/A	surface	T.1A	1A	—	—
F90	36	chisel-pick	71.517/A	surface	B.4/5	3	—	—
F91	36	chisel-pick	71.205*	surface	T.4	1, spit 2	—	—
F92	37	pick	71.560*	surface	T.8B	1	—	—
F93	37	chisel-pick	71.982*	1971 shaft	Q.4	1B	—	—
F94	37	chisel-pick	71.905/B	1971 shaft	Q.6	1B	—	—
F95	37	pick	71.2421*	surface	T.2A	1, base	—	—
F96	38	pick	72.430/A	1972 shaft	T.10	4	41	0
F97	38	pick	71.2584/C	1971 shaft	Q.3/6	1D	—	—
F98	38	pick	72.1344/M	1972 shaft	B.8B/11	—	—	2
F99	38	pick	71.2996*	surface	T.8B	1A	—	—
F100	39	pick	72.245/A	1972 shaft	T.8B	3	2	0
F101	39	pick	71.2431/A	1971 shaft	Q.4	1B	—	—
F102	39	axe	71.598*	surface	T.2A	1, spit 5	—	—
F103	40	axe	71.2873*	1971 shaft	Q.3	6th section	—	—
F104	40	axe	71.1075*	1971 shaft	Q.6	1B	—	—
F105	41	axe	71.2825*	1971 shaft	Q.6	5th section	—	—
F106	41	axe	71.2166*	1971 shaft	Q.4/6	1B	—	—
F107	41	axe	71.2291/A	1971 shaft	Q.4	1C	—	—
F108	42	axe	71.470/L	surface	T.2A	1, spit 5	—	—
F109	42	axe	71.2682/C	1971 shaft	Q.3/6	1B	—	—
F110	42	axe	71.358*	surface	T.5	below chalk dump	—	—
F111	43	axe	71.1100*-1157*	1971 shaft	Q.4	1B	—	—
F112	44	axe	71.2360/A	1971 shaft	Q.5	1C	—	—
F113	44	axe	71.2704*	surface	T.7B	3	—	—
F114	44	axe	71.1095/C	1971 shaft	Q.4	1C	—	—
F115	45	axe	71.904*	1971 shaft	Q.6	1B	—	—
F116	45	axe	72.879*	1972 shaft	T.8B	2	—	—
F117	45	axe	71.2272*	1971 shaft	Q.3	1B2	—	—
F118	46	axe	71.2552/A	1971 shaft	Q.3	1C	—	—
F119	46	roughout	71.2879*	1971 shaft	Q.3	6th section	—	—
F120	47	roughout	71.1083/B-1096/A	1971 shaft	Q.4	1C	—	—
F121	47	roughout	71.1125*	1971 shaft	Q.4	1B	—	—
F122	48	roughout	71.1126*	1971 shaft	Q.4	1B	—	—
F123	49	roughout	71.2261*	1971 shaft	Q.5	1C	—	—
F124	49	burin	71.3361/B	surface	T.8B east	Black	42	—
F125	49	burin	72.1448/S	1972 shaft	B.8B/10	—	—	3
F126	49	burin	72.1361/D	1972 shaft	B.8B/11	—	—	1
F127	49	burin	72.1429/B	1972 shaft	B.8B/10	—	—	Between 1–3
F128	50	burin	71.2096/B	1971 shaft	Q.5	1B	—	—
F129	50	discoidal knife	71.493*	surface	T.3	3	21	—
F130	50	discoidal knife	71.389*	surface	T.6	3	—	—
F131	51	knife	72.745*	1972 shaft	T.10	5	22	1
F132	51	knife	72.795*	1972 shaft	T.10	3/4A1	57	Between 0–1
F133	51	end scraper	72.727/A	1972 shaft	T.9	—	10	1
F134	51	end scraper	72.68/C	1972 shaft	T.8B	3	33	0
F135	51	end scraper	72.889/D	1972 shaft	T.8B	4B6	32	3
F136	51	end scraper	72.906/C	1972 shaft	T.10	5	42	1
F137	51	end scraper	72.694/A	1972 shaft	T.9	4	7	1
F138	52	end scraper	72.1056/A	1972 shaft	T.10	5A1	37	1
F139	52	end scraper	72.1361/K	1972 shaft	B.8B/11	—	—	1
F140	52	end scraper	72.1451/J	1972 shaft	B.8B/10	—	—	3
F141	52	end scraper	72.1170/F	1972 shaft	T.10	5	—	1
F142	52	end scraper	72.1448/N	1972 shaft	B.8B/10	—	—	3
F143	52	end scraper	72.1433/J	1972 shaft	B.8B/10	—	—	1
F144	52	end scraper	72.1305/H	1972 shaft	T.10	—	—	Betwen 1–3
F145	52	end scraper	72.212/B	1972 shaft	T.8B	4B	—	2
F146	52	end scraper	72.976/A	1972 shaft	T.10	5	—	1

Flint No.	Figure No.	Artefact Designation	Excavation Find No.	Area	Trench (T) Quadrant (Q) or Baulk (B)	Horizon	Square	Group
F147	53	end scraper	72.354/A-366/A	1972 shaft	T.8B	4B	17	2
F148	53	scraper, unclassified	72.316/A	1972 shaft	T.8B	4A2	52	1
F149	53	end scraper	72.1337/E	1972 shaft	T.10	—	6	3
F150	53	end scraper	71.50*	surface	T.2B	1	—	—
F151	53	side scraper	72.975/C	1972 shaft	T.10	5	44	1
F152	53	scraper, unclassified	72.1048/A	1972 shaft	T.10	—	20	1
F153	53	side scraper	72.1436/F	1972 shaft	B.8B/10	—	—	Between 1–3
F154	53	end-and-side scraper	72.500/O	1972 shaft	T.8B	4B3	33	2
F155	53	side scraper	72.1433/H	1972 shaft	B.8B/10	—	—	1
F156	53	end-and-side scraper	72.1170/D	1972 shaft	T.10	5	20	1
F157	54	end-and-side scraper	72.705/B	1972 shaft	T.10	4A1	25	Between 0–1
F158	54	end-and-side scraper	72.1418/H	1972 shaft	B.8B/10	—	—	1
F159	54	end-and-side scraper	72.1438/J	1972 shaft	B.8B/10	—	—	Between 1–3
F160	54	denticulate scraper	72.1050/B	1972 shaft	T.10	5A1	40	1
F161	54	scraper, unclassified	72.528/A	1972 shaft	T.8B	4B2	—	Between 2–3
F162	54	denticulate scraper	72.852/A	1972 shaft	T.10	—	57	Between 0–1
F163	54	denticulate scraper	71.3372/E	surface	T.8B east	Black	48	—
F164	54	denticulate scraper	72.125/A	1972 shaft	T.8B	—	18	0
F165	54	pointed scraper	72.262/A	1972 shaft	T.8B	4A	49	1
F166	54	pointed scraper	72.143/G	1972 shaft	T.8B	—	31	1
F167	55	plane scraper	71.370/A	surface	B.3/6	3	—	—
F168	55	plane scraper	71.1176*	surface	T.3	3	—	—
F169	55	scraper, unclassified	71.312/A	surface	T.4 (ext)	1A	—	—
F170	55	end scraper	72.1325/E	1972 shaft	T.10	13	41	3
F171	56	end scraper	72.284/A	1972 shaft	T.9	2	—	Above 1
F172	56	end scraper	72.1178/B	1972 shaft	T.10	7A	59	Between 1–3
F173	56	end scraper	72.1001/B	1972 shaft	T.10	3/4A1	39	Between 0–1
F174	56	end scraper	72.999/I	1972 shaft	T.10	3/4A1	—	Between 0–1
F175	56	denticulate scraper	72.177/K	1972 shaft	T.8B	4A	15	1
F176	56	end-and-side scraper	72.852/G	1972 shaft	T.10	3/4A1	57	Between 0–1
F177	56	end scraper	72.852/C	1972 shaft	T.10	3/4A1	57	Between 0–1
F178	56	scraper, unclassified	71.2355*	1971 shaft	Q.6	1B	—	—
F179	57	scraper, unclassified	71.2038/A	1971 shaft	Q.4	1B	—	—
F180	57	end scraper	71.583/A	surface	T.8B	1	—	—
F181	57	end scraper	71.2228/A	1971 shaft	Q.5	1B	—	—
F182	57	end scraper	71.2483/G	surface	T.7B	1 base/3	—	—
F183	57	end scraper	71.470/N	surface	T.2A	1, spit 5	—	—
F184	57	end scraper	71.2057/A	surface	T.8B	1, spit 6	—	—
F185	57	end-and-side scraper	71.254/A	surface	T.4	1, spit 2	—	—
F186	57	end scraper	71.169/C	surface	T.2B	1, spit 2	—	—
F187	58	scraper, unclassified	71.2507/A	1971 shaft	—	1B	—	—
F188	58	scraper, unclassified	71.652/A	1971 shaft	Q.4	1A	—	—
F189	58	end scraper	72.1329/A	1972 shaft	T.10	13	60	3
F190	58	end scraper	71.722/L	surface	T.8B, SW	—	4	—
F191	58	end scraper	71.1164/C	1971 shaft	Q.6	1B	—	—
F192	58	side scraper	72.997/E	1972 shaft	T.8B	4B3	49	2
F193	58	end scraper	71.22/A	surface	T.1A	1	—	—
F194	59	end scraper	71.309/E	surface	T.8B	1, spit 1	—	—
F195	58	side scraper	71.2682/A	1971 shaft	Q.3/6	1B	—	—
F196	58	end scraper	71.2057/I	surface	T.8B	1, spit 6	—	—
F197	59	scraper, unclassified	71.2939/A	1971 shaft	Q.5	6th section	—	—
F198	59	end-and-side scraper	71.580/B	surface	T.2A	1, spit 3	—	—
F199	59	end-and-side scraper	71.95*	surface	T.1A	1/2	—	—
F200	59	scraper, unclassified	71.2676/B	surface	T.2A	1, base	—	—
F201	59	end scraper	71.52/C	surface	T.1A	1	—	—
F202	59	end-and-side scraper	72.1145*	1972 shaft	T.10	7A	55	Between 1–3
F203	59	end scraper	72.152/B	1972 shaft	T.8B	3	20	0
F204	59	end scraper	71.469/E	surface	T.2A	1, spit 5	—	—
F205	60	end scraper	71.1082/D	1971 shaft	Q.3	1B	—	—
F206	60	end scraper	71.792/A	1971 shaft	Q.3	1B	—	—
F207	60	end scraper	71.2446/C	surface	T.2A	1, spit 2	—	—

Flint No.	Figure No.	Artefact Designation	Excavation Find No.	Area	Trench (T) Quadrant (Q) or Baulk (B)	Horizon	Square	Group
F208	60	end scraper	71.457/A	surface	T.2B	1, spit 2	—	—
F209	60	end scraper	71.2589/C	1971 shaft	Q.4	1A	—	—
F210	60	end scraper	71.451/B	surface	T.3	3	—	—
F211	61	scraper, unclassified	71.401/A	surface	B.4/5	3	1	—
F212	61	end scraper	71.2685/B-C	surface	T.7B	1 base/3	—	—
F213	61	end scraper	72.1448/L	1972 shaft	B.8B/10	—	—	3
F214	61	end scraper	71.3381/B	surface	T.8B east	Black	28	—
F215	61	end scraper	71.1076/D	1971 shaft	Q.6	1B	—	—
F216	61	end scraper	71.498/A	surface	T.2A	1, spit 4	—	—
F217	62	side scraper	71.2584/A	1971 shaft	Q.3/6	1B	—	—
F218	62	scraper, unclassified	71.2024/A	1971 shaft	Q.6	1B2	—	—
F219	62	side scraper	71.63*	surface	T.2B	1	—	—
F220	62	side scraper	71.622/E	surface	T.8B	1, spit 4	—	—
F221	62	end-and-side scraper	71.2135/I	surface	T.8B, SW	—	8	—
F222	62	side scraper	71.2389/D	surface	T.2A	1, base	—	—
F223	62	end scraper	72.1418/I	1972 shaft	B.8B/10	—	—	1
F224	62	end scraper	71.2135/G	surface	T.8B, SW	—	8	—
F225	63	end scraper	72.152/D	1972 shaft	T.8B	3	20	0
F226	63	end scraper	72.1084/E	1972 shaft	T.11	—	—	Above 1
F227	63	double end scraper	71.480/B	surface	T.8B	1, spit 4	—	—
F228	63	end scraper	71.2834/A	surface	T.8B	3	—	—
F229	63	end scraper	71.2730/B	surface	T.8B	1A	—	—
F230	63	end scraper	71.2030*	surface	T.5	2/3	—	—
F231	63	scraper, unclassified	72.262/C	1972 shaft	T.8B	4A	49	1
F232	63	scraper, unclassified	71.740/G	surface	T.8B, SW	—	9	—
F233	64	end scraper	71.2386*	surface	T.7B	1, spit 4	—	—
F234	64	scraper, unclassified	71.553/B	surface	T.1A	1A	—	—
F235	64	denticulate scraper	71.219/A	surface	T.5	1, spit 2	—	—
F236	64	denticulate scraper	71.2234/B	1971 shaft	Q.6	1B	—	—
F237	64	pointed scraper	71.2236/C	1971 shaft	Q.6	1B	—	—
F238	64	end scraper	71.553/G	surface	T.1A	1A	—	—
F239	64	end scraper	72.1128*	1972 shaft	B.8B/11	1	—	Above 1
F240	64	denticulate scraper	71.2676/C	surface	T.2A	1 base	—	—
F241	64	scraper, unclassified	71.244/C	surface	T.4	1, spit 2	—	—
F242	64	end scraper	71.249/A	surface	T.2B	1/2	—	—
F243	65	pointed scraper	71.2050/B	1971 shaft	Q.6	1C	—	—
F244	65	point (others)	72.891/A	1972 shaft	T.10	5	38	1
F245	65	point (others)	72.854/A	1972 shaft	T.11	3	—	Above 1
F246	65	point (others)	71.3373/A	surface	T.8B east	Black	52	—
F247	65	point (others)	71.821/B	1971 shaft	Q.4	1A	—	—
F248	65	point (others)	72.1170/B	1972 shaft	T.10	5	20	1
F249	65	point (standard)	72.1433/K	1972 shaft	B.8B/10	—	—	1
F250	65	point (others)	72.1431/C	1972 shaft	B.8B/10	—	—	1
F251	66	point (others)	71.3340/B	surface	T.8B east	Black	43	—
F252	66	point (others)	72.987*	1972 shaft	T.10	3/4A1	—	Between 0–1
F253	66	point (others)	72.232/H	1972 shaft	T.8B	4A	—	1
F254	66	point (others)	72.71/D	1972 shaft	T.8B	3	19	0
F255	66	point (others)	72.1322/E	1972 shaft	T.10	13	39	3
F256	66	point (others)	72.408/G	1972 shaft	T.9	Test trench	—	Above 1
F257	66	point (others, double)	72.20/D	1972 shaft	T.8B	1	18	Above 0
F258	66	point (others)	72.73/B	1972 shaft	T.8B	3	21	0
F259	67	point (others)	71.2385*	surface	T.7B	1, spit 4	—	—
F260	67	point (standard)	71.870/C	1971 shaft	Q.4	1	—	—
F261	67	point (others)	71.1140/B	surface	T.7B	1, spit 4	—	—
F262	67	point (others)	72.515/D	1972 shaft	T.10	4A	—	Between 0–1
F263	67	point (others)	72.170/J	1972 shaft	T.8B	4A	—	1
F264	67	point (others)	72.644/F	1972 shaft	T.10	5	22	1
F265	67	point (standard)	72.721/H	1972 shaft	T.8B	4B	—	2
F266	67	point (standard)	72.828/B	1972 shaft	T.8B	4B5A	—	3
F267	67	point (standard)	72.889/F	1972 shaft	T.8B	4B4	—	3
F268	68	point (standard)	71.3389/N	surface	T.8B	1A	—	—
F269	68	point (standard)	72.766/A	1972 shaft	T.11	6	—	2

Flint No.	Figure No.	Artefact Designation	Excavation Find No.	Area	Trench (T) Quadrant (Q) or Baulk (B)	Horizon	Square	Group
F270	68	point (heavy)	72.1082/B	1972 shaft	T.8B	4B	19	2
F271	68	point (standard)	71.458/B	surface	T.2B	1, spit 3	—	—
F272	68	point (rounded)	72.87/B	1972 shaft	T.8B	2	—	Above 0
F273	68	point (heavy)	71.2096/D	1971 shaft	Q.5	1B	—	—
F274	68	point (others, double)	72.693/C	1972 shaft	T.10	—	—	1
F275	69	point (rounded)	71.2668/F	surface	T.2A	1, base	—	—
F276	69	point (standard)	71.2842/I	surface	T.8B	3	—	—
F277	69	point (standard)	72.1368/I	1972 shaft	T.10	13	—	3
F278	69	point (heavy)	71.2040/B	surface	T.7B	1, spit 4	—	—
F279	69	point (standard)	72.703/A	1972 shaft	T.8B	4B4	50	3
F280	69	point (standard)	71.717/X	surface	T.8B, SW	—	18	—
F281	69	point (standard)	72.574/B	1972 shaft	T.11	4	—	1
F282	69	point (standard)	71.2407/G	surface	T.2A	1, base	—	—
F283	69	point (standard)	71.243/A	surface	T.4	1, spit 2	—	—
F284	69	point (standard)	71.3141/A	1971 shaft	Q.3	6th section	—	—
F285	69	point (standard)	72.1362/H	1972 shaft	T.10	13	—	3
F286	69	point (standard)	71.3326/B	surface	T.8B	1A	—	—
F287	70	point (others)	71.1165/A	1971 shaft	Q.6	1B	—	—
F288	70	point (standard)	71.366/A	surface	T.2B	1, spit 2	—	—
F289	70	point (standard)	72.1448/R	1972 shaft	B.8B/10	—	—	3
F290	70	point (rounded)	72.1377/C	1972 shaft	T.10	13	—	3
F291	70	point (standard)	71.2834/I	surface	T.8B	3	—	—
F292	70	point (standard)	71.2688/B	surface	T.7B	1 base/3	—	—
F293	70	point (standard)	72.1068/G	1972 shaft	T.10	6A	4	—
F294	70	point (standard)	71.2410/D	surface	T.2A	1, base	—	—
F295	70	point (standard)	71.2410/J	surface	T.2A	1, base	—	—
F296	70	point (standard)	71.2131/I	surface	T.8B, SW	—	7	—
F297	70	point (standard)	71.470/O	surface	T.2A	1, spit 5	—	—
F298	70	point (standard)	72.174/L	1972 shaft	T.8B	4A	—	1
F299	70	point (standard)	72.1300/F	1972 shaft	T.10	—	—	Between 1–3
F300	70	point (standard)	72.927/B	1972 shaft	T.10	5A	40	1
F301	70	point (rounded)	71.658/C	1971 shaft	Q.4	1B	—	—
F302	71	point (standard)	71.2933*	surface	T.8B	1A	—	—
F303	71	point (others)	71.2334/A	surface	T.2A	1, base	—	—
F304	71	point (standard)	71.2103/A	1971 shaft	Q.4	1B	—	—
F305	71	point (others)	72.705/C	1972 shaft	T.10	4A1	25	Between 0–1
F306	71	point (heavy)	72.1038/H	1972 shaft	T.8B	4B4	49	3
F307	71	point (rounded)	72.343/J	1972 shaft	T.8B	—	—	2
F308	71	point (standard)	71.2019/A	1971 shaft	Q.4	1B	—	—
F309	71	point (standard)	72.399/G	1972 shaft	T.8B	4B	32	2
F310	71	point (standard)	72.706/E	1972 shaft	T.8B	4B4	—	3
F311	71	point (standard)	72.702/A	1972 shaft	T.10	—	—	Between 0–1
F312	71	point (standard)	71.169/E	surface	T.2B	1, spit 2	—	—
F313	71	point (heavy)	72.1271/A	1972 shaft	T.10	12	—	Between 1–3
F314	72	point (standard)	72.1173/A	1972 shaft	T.8B	4B	—	2
F315	72	point (standard)	71.471/L	surface	T.2A	1, spit 5	—	—
F316	72	point (standard)	72.69/A	1972 shaft	T.8B	1	22	Above 0
F317	72	point (standard)	72.721/J	1972 shaft	T.8B	—	—	2
F318	72	point (standard)	72.867/A	1972 shaft	T.8B	—	—	3
F319	72	point (standard)	71.723/I	surface	T.8B, SW	—	18	—
F320	72	point (standard)	72.1448/I	1972 shaft	B.8B/10	—	—	3
F321	72	point (standard)	72.392/D	1972 shaft	T.10	4	—	Above 0
F322	72	point (standard)	71.2689/B	surface	T.2A	1, base	—	—
F323	72	point (standard)	71.285/D	surface	T.2B	1, spit 2	—	—
F324	72	point (standard)	71.853/B	1971 shaft	Q.5	1B	—	—
F325	72	point (standard)	72.1179A/B	1972 shaft	T.10	—	—	1
F326	73	point (standard)	71.266/A	surface	T.4	1B	—	—
F327	73	point (others)	71.2592/B	1971 shaft	Q.4	1A	—	—
F328	73	point (standard)	71.369/A	surface	T.2B	1, spit 2	—	—
F329	73	point (standard)	71.2178*	1971 shaft	Q.4	1B	—	—
F330	73	point (rounded)	72.610/D	1972 shaft	T.9	3a	—	Above 1
F331	73	point (standard)	71.745/D	1971 shaft	Q.4	1B	—	—

Flint No.	Figure No.	Artefact Designation	Excavation Find No.	Area	Trench (T) Quadrant (Q) or Baulk (B)	Horizon	Square	Group
F332	73	point (standard)	72.256/Q	1972 shaft	T.8B	4a	—	1
F333	73	point (heavy)	71.2057/G	surface	T.8B	1, spit 6	—	—
F334	74	point (standard)	71.3340/A	surface	T.8B east	Black	43	—
F335	74	point (standard)	72.1353/D	1972 shaft	T.10	13	—	3
F336	74	point (standard)	71.1024/F	1971 shaft	Q.4	1A	—	—
F337	74	point (standard)	72.1446/F	1972 shaft	B.8B/10	—	—	3
F338	74	point (others)	72.1344/N	1972 shaft	B.8B/11	4b	13	2
F339	74	point (standard)	71.112/A	surface	T.1A	1/2	—	—
F340	74	point (standard)	71.2183/D	1971 shaft	Q.5	1B	—	—
F341	74	point (standard)	71.719/C	surface	T.8B, SW	—	4	—
F342	74	point (standard)	71.2438/D	surface	T.2A	1, base	—	—
F343	74	point (heavy)	71.288/B	surface	T.2A	1, spit 4	—	—
F344	74	point (standard)	72.1325/A	1972 shaft	T.10	—	—	3
F345	74	point (others)	71.612*	surface	T.1A	1A	—	—
F346	75	point (others)	71.2181/A	surface	T.1A	1–1A/3	—	—
F347	75	point (standard)	71.715/AA	surface	T.8B, SW	—	21	—
F348	75	point (standard)	72.1440/D	1972 shaft	B.8B/11	—	—	Odds
F349	75	point (standard)	71.2732/A	surface	T.2A	1/3	—	—
F350	75	point (standard, double)	72.7/A	1972 shaft	T.9	—	—	Above 1
F351	75	point (standard)	71.699/A	surface	T.8B, SW	—	11	—
F352	75	point (standard)	71.3057*	surface	T.2B	1A	—	—
F353	75	point (standard)	71.2493/A	surface	T.2A	1, base	—	—
F354	75	point (standard)	71.726/L	surface	T.8B, SW	—	5	—
F355	75	point (standard)	72.1134/B	1972 shaft	T.10	7A	—	Between 1–3
F356	75	point (standard)	71.2433/F	surface	T.2A	1, base	—	—
F357	75	point (standard)	72.1169/C	1972 shaft	T.10	7A/8	—	Between 1–3
F358	75	point (standard)	71.1029/E	1971 shaft	Q.4	1B	—	—
F359	76	point (standard)	71.657/A	1971 shaft	Q.4	1B	—	—
F360	76	point (others)	72.1439/P	1972 shaft	B.8B/10	—	—	Between 1–3
F361	76	rod (complete)	71.804/C-1088/F	surface	T.1A	1–1A/3	—	—
F362	76	rod (complete)	72.1451/I	1972 shaft	B.8B/10	—	—	3
F363	76	rod (fragment)	71.2254*	surface	T.2A	1, base	—	—
F364	76	rod (complete)	71.2350/E-2374/F	surface	T.7B	1, spit 4	—	—
F365	76	rod (complete)	72.640/C	1972 shaft	T.8B (ext)	2	2	—
F366	77	rod (complete)	71.1048*	surface	T.1A	1–1A/3	—	—
F367	77	rod (near complete)	72.1447/K	1972 shaft	B.8B/10	—	—	3
F368	77	rod (complete)	71.2625/C	surface	T.7B	1, base/3	—	—
F369	77	rod (complete)	71.515/I-	surface	T.1A	1A	—	—
			71.569/C	surface	T.1A	2	—	—
F370	77	rod (complete)	71.2174*	surface	T.1A	1–1A/3	—	—
F371	77	rod (near complete)	71.554/A	surface	T.1A	2	—	—
F372	78	rod (complete)	71.2483/Z-2688/D	surface	T.7B	1 base/3	—	—
F373	78	rod (near complete)	72.575/B-	1972 shaft	T.11	3/4A	15	Above 1
			71.2745/B	surface	T.8B	3	—	—
F374	78	rod (fragment)	71.2451/J	surface	T.2A	1, base	—	—
F375	78	rod (fragment)	72.989*	1972 shaft	T.10	3/4A1	—	Between 0–1
F376	78	rod (near complete)	71.2137*-	surface	T.8B, SW	—	13	—
			71.2363/A	surface	T.7B	1, spit 4	—	—
F377	78	rod (complete)	71.2214*	surface	T.1A	1–1A/3	—	—
F378	78	rod (complete)	71.2350/D-	surface	T.7B	1, spit 4	—	—
			71.2562/E	surface	T.7B	1 base/3	—	—
F379	79	rod (near complete)	71.2500/B-	surface	T.2A	1, base	—	—
			71.3056*	surface	T.2B	1A	—	—
F380	79	rod (complete)	72.1153*	1972 shaft	B.8B/11	4A1	—	1
F381	79	rod (complete)	71.3055*-3204*-3211*	surface	T.2B	1A	—	—
F382	79	rod (fragment)	71.2285/D	surface	T.2A	1, base	—	—

Flint No.	Figure No.	Artefact Designation	Excavation Find No.	Area	Trench (T) Quadrant (Q) or Baulk (B)	Horizon	Square	Group
F383	79	rod (complete)	71.476/A-	surface	T.7B	1	—	—
			71.2697/B	surface	T.7B	1 base/3	—	—
F384	79	rod (complete)	71.2509/B	1971 shaft	Q.6	1B	—	—
F385	79	rod (complete)	71.2249/B	1971 shaft	Q.6	1B	—	—
F386	79	rod (fragment)	71.515/B	surface	T.1A	1A	—	—
F387	80	rod (complete)	71.2177/A	1971 shaft	Q.4	1B	—	—
F388	80	rod (fragment)	72.1448/H-	1972 shaft	B.8B/10	—	—	3
			71.2387*	surface	T.7B	1, spit 4	—	—
F389	80	rod (fragment)	71.2099*	1971 shaft	Q.4	1B	—	—
F390	80	rod (complete)	71.854/A- 1046*	surface	T.1A	1–1A/3	—	—
F391	80	rod (complete)	72.202/E	1972 shaft	T.8B	4A	—	1
F392	80	rod (complete)	71.3058*	surface	T.2B	1A	—	—
F393	80	rod (fragment)	71.561/B-	surface	T.8B	1	—	—
			71.2128*	surface	T.8B, SW	—	3	—
F394	80	rod (fragment)	72.1225*	1972 shaft	T.10	12	44	Between 1–3
F395	81	rod (complete	72.1354/D-	1972 shaft	T.10	—	37	3
			72.1450/K	1972 shaft	B.8B/10	—	—	3
F396	81	rod (fragment)	71.2483/EE	surface	T.7B	1 base/3	—	—
F397	81	rod (complete)	72.1305/F	1972 shaft	T.10	12	63	Between 1–3
F398	81	rod (fragment)	72.500/K-	1972 shaft	T.8B	4B3	33	2
			72.706/I	1972 shaft	T.8B	4B4	49	3
F399	81	rod (fragment)	72.1322/K	1972 shaft	T.10	—	39	3
F400	81	rod (fragment)	71.2134/C-	surface	T.8B, SW	—	3	—
			71.2836/A	surface	T.8B	3	—	—
F401	81	rod (complete)	71.2590/C- 2590/F	surface	T.7B	1 base/3	—	—
F402	82	rod (complete)	72.1305/G-	1972 shaft	T.10	12	58	Between 1–3
			72.1331/F	1972 shaft	T.9	—	—	Odds
F403	82	(near complete)	71.575/I-	surface	T.1A	1A	—	—
			71.2048/B	surface	T.1A	1–1A/3	—	—
F404	82	rod (complete)	71.887/A	surface	T.1A	1–1A/3	—	—
F405	82	rod (complete)	71.686/D-	surface	T.7B	1, spit 4	—	—
			71.2688/F	surface	T.7B	1 base/3	—	—
F406	82	rod (fragment)	71.935/A	surface	T.1A	1 base/3	—	—
F407	82	rod (complete)	71.2483/N- 2483/CC	surface	T.7B	1 base/3	—	—
F408	83	rod (complete)	71.2674/A	surface	T.2A	1, base	—	—
F409	83	rod (fragment)	71.498/B-	surface	T.2A	1, spit 4	—	—
			71.2512/C	surface	T.2A	1 base	—	—
F410	83	rod (near complete)	71.2353*	1971 shaft	Q.6	1B	—	—
F411	83	rod (fragment)	71.945/C	surface	T.1A	1 base/3	—	—
F412	83	rod (fragment)	71.949/B-	surface	T.1A	1 base/3	—	—
			72.1101/E	1972 shaft	T.8B (ext)	—	—	Above 1
F413	83	rod (complete)	71.582/A	surface	T.8B	1	—	—
F414	83	rod (fragment)	71.2350/B	surface	T.7B	1, spit 4	—	—
F415	83	rod (near complete)	71.1173/B	surface	T.2A	1, base	—	—
F416	84	rod (complete)	71.2130*-	surface	T.8B, SW	—	3	—
			71.2666/K	surface	T.7B	1 base/3	—	—
F417	84	rod (fragment)	71.754/A-	surface	T.8B, SW	—	11	—
			71.2842/B	surface	T.8B	3	—	—
F418	84	rod (complete)	71.722/B	surface	T.8B, SW	—	4	—
F419	85	rod (near complete)	71.2483/B	surface	T.7B	1 base/3	—	—
F420	85	rod (complete)	71.862/A	surface	T.2A	1	—	—
F421	85	rod (fragment)	71.2590/G- 2685/A	surface	T.7B	1 base/3	—	—
F422	85	rod (near complete)	72.639/C	1972 shaft	T.11	4B	20	Between 1–2
F423	85	rod (complete)	72.1363/G	1972 shaft	T.10	13	24	3
F424	85	rod (complete)	72.539/B	1972 shaft	T.10	4A	60	Between 0–1
F425	86	cutting flake	72.1348/E	1972 shaft	T.10	12	—	Between 1–3
F426	86	cutting flake	72.491/A	1972 shaft	T.8B	4b	—	2
F427	86	cutting flake	71.666/D	surface	T.8B, SW	—	17	—

Flint No.	Figure No.	Artefact Designation	Excavation Find No.	Area	Trench (T) Quadrant (Q) or Baulk (B)	Horizon	Square	Group
F428	86	cutting flake	71.2937/A	1971 shaft	Q.3	6th section	—	—
F429	86	cutting flake	71.2138/H	surface	T.8B, SW	—	13	—
F430	86	cutting flake	71.2276/A	1971 shaft	Q.3	1B2	—	—
F431	86	cutting flake	71.2483/BB	surface	T.7B	1 base/3	—	—
F432	86	cutting flake	72.331/C	1972 shaft	T.8B	—	—	2
F433	86	cutting flake	71.379/N	surface	T.4	3	7	—
F434	86	cutting flake	72.952/D	1972 shaft	T.9	—	—	Above 1
F435	86	cutting flake	72.1366/B	1972 shaft	T.10	—	—	3
F436	86	cutting flake	72.1418/E	1972 shaft	B.8B/10	—	—	1
F437	87	cutting flake	71.699/D	surface	T.8B, SW	—	11	—
F438	87	cutting flake	72.829/B	1972 shaft	T.10	3/4A1	—	Between 0–1
F439	87	cutting flake	71.2524/C	1971 shaft	Q.4	1B	—	—
F440	87	cutting flake	71.2364/B	surface	T.2A	1, base	—	—
F441	87	cutting flake	72.1446/G	1972 shaft	B.8B/10	—	—	3
F442	87	cutting flake	71.2446/F	surface	T.2A	1, base	—	—
F443	87	cutting flake	72.770/C	1972 shaft	T.8B	—	—	3
F444	87	cutting flake	71.2136/E	surface	T.8B, SW	—	1	—
F445	87	cutting flake	71.2552/B	1971 shaft	Q.3	1C	—	—
F446	87	cutting flake	72.430/E	1972 shaft	T.10	4	—	0
F447	87	cutting flake	72.1368/B	1972 shaft	T.10	13	—	3
F448	87	cutting flake	71.704/A	1971 shaft	Q.3	1B	—	—
F449	88	utilised blade	72.1309/C	1972 shaft	T.10	—	61	Between 1–3
F450	88	utilised blade	71.2346/B	1971 shaft	Q.5	1C	—	—
F451	88	utilised blade	71.400/L	surface	B.4/5	3	4	—
F452	88	utilised blade	71.2132/H	surface	T.8B, SW	—	6	—
F453	88	utilised blade	71.1005/B	surface	T.2A	1, base	—	—
F454	88	utilised blade	71.2226/A	surface	T.2A	1, base	—	—
F455	88	utilised blade	71.2282/B	1971 shaft	Q.6	1B	—	—
F456	88	utilised blade	72.1331/G	1972 shaft	T.9	—	—	Odds
F457	88	utilised blade	71.2905/D	surface	T.8B	1A	—	—
F458	88	utilised blade	72.1438/A	1972 shaft	B.8B/10	—	—	Between 1–3
F459	88	utilised blade	72.1340/B	1972 shaft	T.10	—	—	Between 1–3
F460	88	utilised blade	71.2961/D	surface	T.8B	—	—	—
F461	88	utilised blade	71.3461/A	surface	T.8B	—	—	—
F462	88	utilised blade	71.380/G	surface	T.4	3	4	—
F463	88	utilised blade	71.3213/H	surface	T.8B	—	—	—
F464	88	utilised blade	71.469/M	surface	T.2A	1, spit 5	—	—
F465	88	utilised blade	71.614/E	surface	T.7B	1, spit 2	—	—
F466	88	utilised blade	72.1428/F	1972 shaft	B.8B/10	—	—	1
F467	88	utilised blade	71.3214/J	surface	T.8B	—	—	—
F468	88	utilised blade	72.262/R	1972 shaft	T.8B	4A	—	1
F469	88	utilised blade	71.2334/C	surface	T.2A	1, base	—	—
F470	88	utilised blade	72.204/M	1972 shaft	T.8B	—	—	1
F471	89	bulbar segment	72.756/B	1972 shaft	T.8B	4B5	—	3
F472	89	bulbar segment	71.2233/C	surface	T.2A	1, spit 5	—	—
F473	89	bulbar segment	72.286/F	1972 shaft	T.8B	4A	—	1
F474	89	bulbar segment	71.2662/G	surface	T.2A	1, base	—	—
F475	89	bulbar segment	72.262/F	1972 shaft	T.8B	4A	—	1
F476	89	bulbar segment	72.311/D	1972 shaft	T.8B	—	—	1
F477	89	bulbar segment	71.2410/I	surface	T.2A	1, base	—	—
F478	89	bulbar segment	72.283/E	1972 shaft	T.8B	4A	—	1
F479	89	bulbar segment	71.379/K	surface	T.4	3	7	—
F480	89	bulbar segment	71.2131/V	surface	T.8B, SW	—	—	—
F481	89	bulbar segment	71.2971/F	surface	T.8B	—	—	—
F482	89	bulbar segment	72.997/F	1972 shaft	T.8B	4B3	—	2
F483	89	bulbar segment	72.213/S	1972 shaft	T.8B	4A	—	1
F484	89	bulbar segment	71.731/AA	surface	T.8B, SW	—	—	—
F485	89	bulbar segment	71.938/A	surface	T.1A	1–1A/3	—	—
F486	89	bulbar segment	71.3397/H	surface	T.8B	—	—	—
F487	89	bifacial	71.2681/A	surface	T.2A	1, base	—	—
F488	89	bifacial	72.706/B	1972 shaft	T.8B	—	—	3
F489	89	bifacial	71.2690/A	1971 shaft	Q.4	1B	—	—

Flint No.	Figure No.	Artefact Designation	Excavation Find No.	Area	Trench (T) Quadrant (Q) or Baulk (B)	Horizon	Square	Group
F490	89	bifacial	71.499/A	surface	T.4	2	—	—
F491	90	bifacial	71.1000*	1971 shaft	Q.5	1B	—	—
F492	90	multiple tool	71.169/F	surface	T.2B	1, spit 2	—	—
F493	90	bifacial	71.905/A	1971 shaft	Q.6	1B	—	—
F494	90	multiple tool	71.515/G	surface	T.1A	1A	—	—
F495	90	bifacial	71.220*	surface	T.2B	1, spit 2	—	—
F496	90	multiple tool	71.3387/F	surface	T.8B east	Black	49	—
F497	90	'fabricator'	71.995*	unproven-anced	—	—	—	—
F498	90	'fabricator'	71.2107*	1971 shaft	Q.5	1B	—	—
F499	91	microlith	71.383/A	surface	T.4	3	1	—
F500	91	microlith	71.382/B	surface	T.4	3	5	—
F501	91	misc. retouched	71.3394/D	surface	T.8B east	Black	34	—
F502	91	misc. retouched	72.39/E	1972 shaft	T.9	1	—	Above 1
F503	91	misc. retouched	71.1168/A	1971 shaft	Q.6	1B	—	—
F504	91	misc. retouched	72.188/K	1972 shaft	T.8B	4A	—	1
F505	92	misc. retouched	71.622/N	surface	T.8B	1, spit 4	—	—
F506	92	misc. retouched	71.605/A	1971 shaft	Q.3	1B	—	—
F507	92	misc. retouched	72.1362/A	1972 shaft	T.10	13	22	3
F508	92	misc. retouched	71.2779/C	surface	T.7B	3	—	—
F509	92	misc. retouched	71.94/A	surface	T.1A	1	—	—
F510	92	misc. retouched	71.139*	surface	T.4	1, spit 2	—	—
F511	93	misc. retouched	71.363*	surface	T.5	3	—	—
F512	93	misc. retouched	71.410/A	surface	T.3	3	—	—
F513	93	misc. retouched	71.1124/A	surface	T.3	3	23	—
F514	93	misc. retouched	71.3070*	surface	T.8B	1A	—	—
F515	93	misc. retouched	72.308/A	1972 shaft	T.10	4	1	0
F516	93	misc. retouched	71.743/A	1971 shaft	—	1B	—	—
F517	93	misc. retouched	71.2682/B	1971 shaft	Q.3/6	1B	—	—
F518	93	misc. retouched	72.234/K	1972 shaft	T.8B	4A	—	1
F519	94	misc. retouched	71.411/B	surface	T.2B	1, spit 2	—	—
F520	94	misc. retouched	71.366/C	surface	T.2B	1, spit 2	—	—
F521	94	misc. retouched	71.864*	1971 shaft	Q.4	1B	—	—
F522	94	misc. retouched	71.497/A	surface	T.2B	1, spit 3	—	—
F523	94	misc. retouched	71.2965/A	1971 shaft	Q.3	6th section	—	—
F524	94	misc. retouched	72.1439/F	1972 shaft	B.8B/10	—	—	Between 1–3
F525	94	misc. retouched	71.2430/A	surface	T.2A	1, base	—	—
F526	94	misc. retouched	71.247/A	surface	T.2B	1, spit 2	—	—
F527	95	misc. retouched	71.362*	surface	T.5	Below chalk dump	—	—
F528	95	misc. retouched	72.168/A	1972 shaft	T.10	1	3	Above 0
F529	95	misc. retouched	72.1308/B	1972 shaft	T.10	13	65	3
F530	96	misc. retouched	71.2702*	surface	T.7B	3	—	—
F531	96	misc. retouched	71.3150*	surface	T.8B	—	—	—
F532	96	misc. retouched	71.987*	surface	T.8B	1, spit 4	—	—
F533	97	misc. retouched	71.2483/A	surface	T.7B	1 base/3	—	—
F534	97	misc. retouched	71.2451/C	surface	T.2A	1, base	—	—
F535	97	misc. retouched	71.2805/D	1971 shaft	Q.4	1B	—	—
F536	97	misc. retouched	72.166/J	1972 shaft	T.8B	4A	14	1
F537	97	misc. retouched	71.471/H	surface	T.2A	1, spit 5	—	—
F538	97	misc. retouched	71.2692/A	1971 shaft	Q.5	1B	—	—
F539	97	misc. retouched	71.2284/B	surface	T.8B	1, spit 4	—	—
F540	98	misc. retouched	71.2924/A	1971 shaft	Q.4	6th section	—	—
F541	98	misc. retouched	71.31*	surface	T.1A	1/2	—	—
F542	98	misc. retouched	71.713/A	surface	T.8B, SW	—	2	—
F543	98	misc. retouched	72.1438/C	1972 shaft	B.8B/10	—	—	Between 1–3
F544	98	misc. retouched	71.2022*	1971 shaft	Q.6	1B2	—	—
F545	98	misc. retouched	71.2713/A	surface	T.7B	2	—	—
F546	99	misc. retouched	72.331/A	1972 shaft	T.8B	4B	40	2
F547	99	misc. retouched	71.1025/B	1971 shaft	Q.5	1B	—	—
F548	99	misc. retouched	72.39/I	1972 shaft	T.9	1, spit 2	—	Above 1
F549	99	misc. retouched	72.417/K	1972 shaft	T.9	—	—	Above 1

Flint No.	Figure No.	Artefact Designation	Excavation Find No.	Area	Trench (T) Quadrant (Q) or Baulk (B)	Horizon	Square	Group
F550	99	misc. retouched	71.162/A	surface	T.2B	1/1–2	—	—
F551	99	misc. retouched	71.3389/E	surface	T.8B	1A	—	—
F552	99	misc. retouched	72.121/A	1972 shaft	T.8B	3	14	Above 0
F553	99	misc. retouched	72.1067/B	1972 shaft	T.10	6	23	1
F554	99	misc. retouched	71.3398/A	surface	T.8B	1A	—	—
F555	100	misc. retouched	71.2597/A	surface	T.2A	1, base	—	—
F556	100	misc. retouched	72.26/D	1972 shaft	T.9	1	—	Above 1
F557	100	misc. retouched	71.193*	surface	T.5	1, spit 2	—	—
F558	100	misc. retouched	72.931/A	1972 shaft	T.10	5	55	1
F559	100	misc. retouched	71.2780/A	1971 shaft	Q.4	1B	—	—
F560	100	misc. retouched	71.400/C	surface	B.4/5	3	4	—
F561	101	misc. retouched	71.3265*	surface	T.8B east	Black	—	—
F562	101	misc. retouched	72.1036/E	1972 shaft	T.8B (ext)	2	18	—
F563	101	misc. retouched	72.578/B	1972 shaft	T.8B (ext)	2	14	—
F564	101	misc. retouched	71.752/A	surface	T.8B, SW	—	—	—
F565	101	misc. retouched	72.613/A	1972 shaft	T.10	5	1	1
F566	101	misc. retouched	71.2027/A	1971 shaft	—	1B	—	—
F567	101	misc. retouched	72.1451/Q	1972 shaft	B.8B/10	—	—	3
F568	101	misc. retouched	72.1186A/E	1972 shaft	B.8B/11	4B	15	2
F569	101	misc. retouched	71.3/A	surface	T.1B	1	—	—
F570	102	misc. retouched	71.2160/A	surface	T.2A	1, base	—	—
F571	102	misc. retouched	72.681/A	1972 shaft	T.9	—	—	—
F572	102	misc. retouched	72.1188/C	1972 shaft	B.8B/11	—	—	1
F573	102	misc. retouched	71.3473/A	1971 shaft	Gallery	—	—	—
F574	102	misc. retouched	72.1015/A	1972 shaft	T.10	5	19	1
F575	102	misc. retouched	72.1450/A	1972 shaft	B.8B/10	—	—	3
F576	102	misc. retouched	72.1188A/A	1972 shaft	T.10	7B	43	Between 1–3
F577	103	misc. retouched	72.1431/D	1972 shaft	B.8B/10	—	—	1
F578	103	misc. retouched	71.2275/C	1971 shaft	Q.5	1B	—	—
F579	103	misc. retouched	71.382/F	surface	T.4	3	5	—
F580	103	misc. retouched	71.2346/A	1971 shaft	Q.5	1C	—	—
F581	104	misc. retouched	71.746/C	surface	T.5	2/3	—	—
F582	104	misc. retouched	71.722/F	surface	T.8B, SW	—	4	—
F583	104	misc. retouched	71.516/A	surface	T.1A	1–1A/3	—	—
F584	104	misc. retouched	71.615/B	surface	T.1A	1A	—	—
F585	104	misc. retouched	71.2134/B	surface	T.8B, SW	—	3	—
F586	105	misc. retouched	71.2975/A	1971 shaft	Q.3	6th section	—	—
F587	105	misc. retouched	71.2324*	1971 shaft	Q.4	1B	—	—
F588	105	misc. retouched	71.3142/C	1971 shaft	Q.3	6th section	—	—
F589	105	misc. retouched	71.378/A	surface	T.4	1, spit 2	—	—
F590	105	misc. retouched	71.981*	surface	T.8B	1, spit 4	—	—
F591	105	misc. retouched	71.991*	1971 shaft	Q.6	1A1	—	—
F592	105	misc. retouched	71.2005/A	surface	T.3	3	—	—
F593	105	misc. retouched	72.1188/L	1972 shaft	B.8B/11	—	—	1
F594	106	core, class A2	71.405/C-	surface	B.4/5	3	5	—
			71.407/C	surface	B.4/5	3	3	—
F595	106	point (others)	71.247/J	surface	T.2B	1, spit 2	—	—
F596	106	utilised blade	71.950/B	surface	T.1A	1–1A/3	—	—
F597	106	utilised blade	71.568/C	surface	T.2B	1, spit 3	—	—
F598	106	utilised blade	71.247/B	surface	T.2B	1, spit 2	—	—
F599	106	misc. retouched	71.977/B	surface	T.7B	1, spit 4	—	—
F600	106	misc. retouched	71.2077/A	1971 shaft	Q.4	1B	—	—

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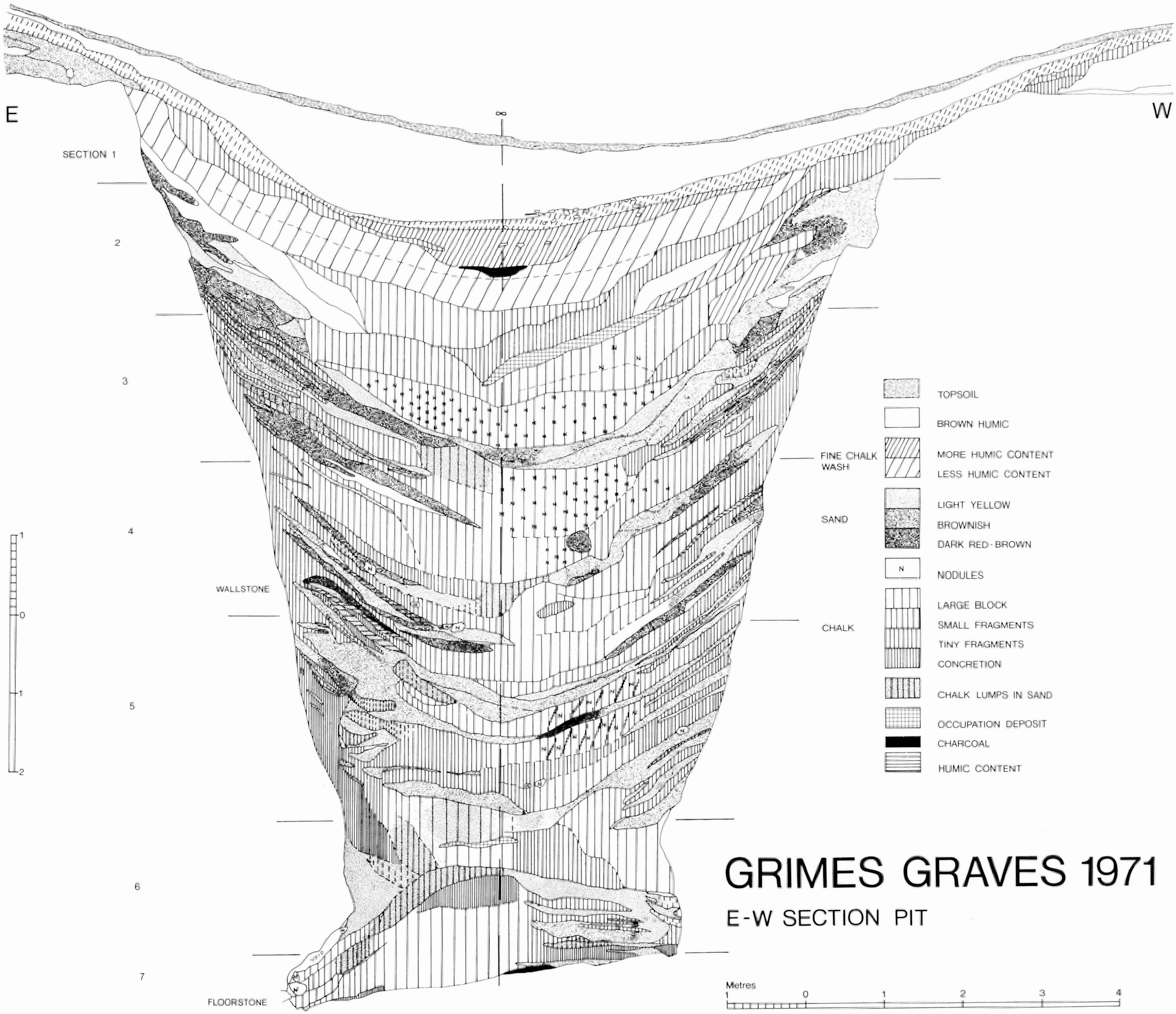

Figure 2 1971 Shaft east/west section (reprinted from Volume I, Figure 18)

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