Lithic assemblage analysis from early-Neolithic sites 3-J-26 and 3-O-3 Fourth Nile Cataract

Piotr Osypiński

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1. Introduction

The Sudan Archaeological Research Society completed its rescue excavations begun in 1999 in the area threatened by the dam at the Fourth Nile Cataract (Welsby 2003; 2010). Intensive surface survey revealed a number of Neolithic sites. However the main research goals have focused on cemeteries and settlements of later periods. Stone Age sites - due to their poor state of preservation - had not attracted the same degree of attention.

In the winter excavation season 2002/2003, directed by Derek Welsby, the main aim was to examine the evidence for burial customs in a small area around et-Tereif village. Archaeological work was also undertaken on two sites, where besides sepulchral features, Neolithic settlement remains, lithics and pottery, were noted (Figure 1.1). Initially it was also assumed that there were Neolithic burials. During excavations both graves (as well as other features thought to be associated with burials) and relics of Neolithic settlement were analysed. Studies of lithic collections from both sites form the main subject of this report.

It should be underlined that recognition of the lithic production in the Fourth Cataract zone is a very important element of our understanding of the Prehistoric period. Certainly the phases of human activity which did not produce spectacular discoveries should not be ignored – the study of the lithics completes the picture. Presented here is an analysis of the assemblages coming from excavations which were at that time pioneer work in this area, although each expedition working at Fourth Cataract has noticed the presence of large numbers of Neolithic sites (Paner 1998; 2005; Usai 2003; Krzyżaniak *et al*., 2005; Lange 2005; Wolf and Nowotnick 2005; Smith and Herbst 2005; Żurawski 2005; Osypiński 2005).

Methods of analysis - theoretical basis

The analysed lithic collections can be studied from various aspects.

The basic criterion is a qualification of the context of artefacts' discovery. In the case of archaeological sites preserved mostly on the present-day surface we are almost devoid of possibilities to allow precise qualification of the relationship between the artefacts and with their meaning derived from contextual data. It is even difficult to call the surface a 'closed' and 'single' deposit. However, in the case of buried features the situation is better. We can assume that the intentional or unintentional deposition of the artefacts, occurred principally within a short period of time. The artefacts from such contexts provide a picture of the lithic economy and technology well-known to the people depositing them in the pits, hearths etc. - features related to the everyday life of the settlement. These provide precious evidence and are the source of comparative data for assemblages collected from the surface.

Another aspect is the material used which provides information on the raw material economy. The analysis included both the identification of the raw materials from different geological contexts as well as the different methods and technical approaches used which relate to particular categories of worked stone – whether they are

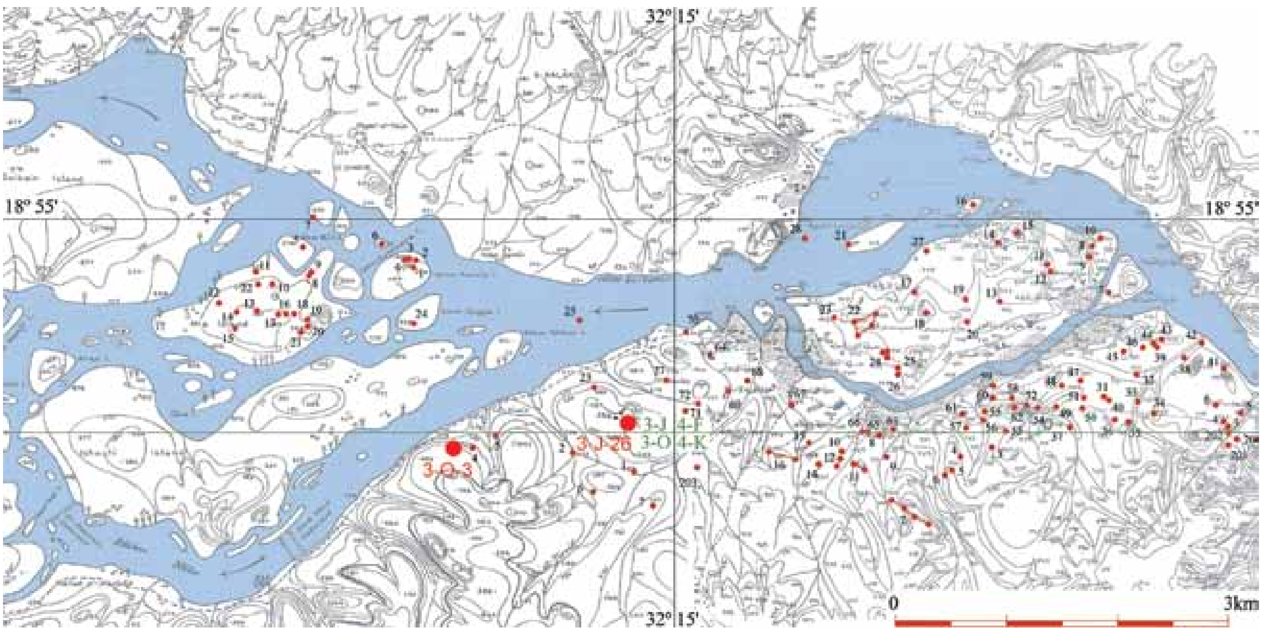


Figure 1.1. *Map of the central sector of the SARS concession with the location of sites 3-J-26 and 3-O-1.*

more or less suitable for knapping. The qualification of the origin and properties of raw materials is the basis for further technological and typological studies (see also Osypiński 2010).

The main aim of the next analytical criterion – a study of the technology - is to allow the recognition and understanding of the methods and techniques used on different raw material's debitage in the process of producing a specific product. In general these analyses rely on defining and associating every lithic artefact with the morphological group presenting its place in the chain of technical operations (*châine opératoire*). These groups are as follows: cores, chunks, flakes, elements of core rejuvenation, cresting elements and the intentional products - tools.

Cores

The cores group includes all kinds of cores, and it is therefore, necessary to divide them into different types according to the various concepts of reduction employed. The main division separates discoidal cores with centripetal flaking and single-platform cores with unidirectional exploitation and one surface consequently treated as a striking platform while the other is used as a flaking surface. Within the single-platform category also can be seen the dynamics of reduction and discarding the cores in various stages of reduction. Present are 'pure' single-platform forms (without reutilization marks) as well as 'reused' ones - with changed orientation (sometimes completely reversed – that are reminiscent of opposed-platform cores) and even a completely changed exploitation method.

In each case it has to be remembered that most of the artefacts from the collections were discarded. That is why the investigation of the reasons for rejection should be an essential element in core classification. It could be a matter of size – too small to allow the optimum blank production or lack of skill and mistakes making further reduction impossible. Another reason could be the nature of the raw material block (inner breaks, crystals or other inclusions).

Certainly one should not be discussing the optimum size of the flaked blank based on the measurement of the negatives taken from the final core. Cores were discarded simply because they offered no more possibilities for obtaining optimal blanks! The last products flaked off the core were the true reasons for the knapper's discouragement leading to the classification of the core as a waste product.

However the shape of the core provides information about the method of exploitation - used methods and technical actions leading to the optimum flake production. These were not accidental actions and their choice resulted not only from the general knapping tradition but also from personal choices.

Unfortunately, the size of Neolithic assemblages usually makes it very difficult to refit and thereby reconstruct the previous history of the cores. Usually that can be ascertained only on the evidence of the last negatives - marks of the final attempts at reduction often disturbed by repairing actions.

Chunks

These are mainly rock fragments undoubtedly coming from intentional knapping, but without the recognisable technological elements of a flake. A huge number of products from this category could point to the deposition of heavily 'used' cores or waste products and a lack of skill in utilising the debitage. In general it reflects the stone economy – the degree of raw material elaboration. High levels of elaboration (low chunk numbers) could indicate an economic use of raw material– considerable knowledge and skill in obtaining the optimum blank (blades or flakes) from the available raw material. Conversely a high number of chunks testifies to a raw material surplus and a 'wasteful' approach to debitage.

Flakes

These are all products of debitage with technical elements: butt, dorsal and ventral faces, marks of breaking direction - ripples and hackles. Also in this category were classified products with a length-width ratio of 2:1, typically blades.

The presence of flakes in the waste context provides evidence for the presence of morphological preferences in blank production which were destined to be transformed into tools. Theoretically in flakes recorded from waste contexts, there should be discarded products only, which do not have the required values. That is why computing the average length or width based on the measurement of such products makes sense only if we compare it to finished (and not repaired) products - the tools themselves. That should indicate whether waste contexts contained only sub-optimal flakes or also optimal ones which were discarded for example because they were surplus to requirements.

The flakes supply also priceless data about technical actions used during debitage. The shape and the presence/absence of specific negative marks indicate the use of such interventions as abrasion and striking platform preparation as well as techniques of direct percussion, pressure or polishing.

Rejuvenation element

This category defines elements related to the rejuvenation of the core striking platform. Their presence points to knowledge about complex technical operations during consequent unidirectional core reduction. The products originating from such reduction were marked with many predestined morphological features (such as the angle between the butt and ventral face, size and shape of the butt).

Cresting elements

Into this category were classified, in particular, flakes which had transversal negatives forming the so-called crested ridge. The creation of the crested ridge was typical for blade methods, when it was necessary to prepare (or in some cases using natural shape) the first edge 'guiding' the force which determined the elongated shape of the flaked product. The presence of cresting elements in a particular raw material group testifies undoubtedly to the use of blade methods.

Tools

All artefacts bearing traces of intentional use were classified into this category. The unbroken and not reused forms represent the final debitage products. These will have been productive and useful tools. Their form and character usually reflect the quality of stone tools preferred. Tools fragments were also classified into this category. Their presence in waste contexts is even more common than unbroken tools. They point to the use or repair of the tools, which had stone elements (sickles, drills, scrapers with handle, etc.). The presence of unbroken tools without traces of use points to different reasons for their deposition or to post-depositional movements.

The last aspect of the study concerns attempts at tools type definition. This is based on previously gained data on raw material analysis and different debitage methods. The form and quality of the tools were not accidental - these always reflect both what was required and the possibilities offered by the raw material and skill of the maker. The discussion of tool typology usually takes up a lot of space in lithic assemblage studies. However, these are considered independently from technological and raw material data. Such an approach could be termed as 'ethic'-type classification. The present study proposes a different method based on the dynamic nature of information gained during multi-aspect analysis of lithic assemblages. Conclusions are drawn from observation of the:

intentionally chosen raw materials
methods of production
form of a tool
alleged function
reasons for discarding and deposition in archaeological context

These create a much more realistic picture, in my opinion, than the previous metrical and typological (morphological) lists as well as the statistical 'jugglery' employed to create new 'lithic cultures'.

2. Lithic assemblage from site 3-J-26

Introduction

The site designated 3-J-26 and located near the village et-Tereif was discovered in 1999 (Welsby 2003, 15-16) and a collection of lithics was made by D. Usai from 1m squares on the periphery of the site to cause minimal disturbance (Usai 2003, 83-85). In December 2002 and January 2003 further surface examination as well as excavations were undertaken on the site by the writer. Exploration was carried out in the areas of the densest occurrence of archaeological artefacts - lithic products, pottery fragments. The artefacts were registered according to a $1m^2$ grid and by spits (100mm thick) or strategraphic contexts if preserved (e.g. pit fills).

The whole surface of the site was divided into sectors (Figure 2.1) according to their geographic location. Sectors were divided into metre squares. In several areas test trenches (1 x 1m in size) were also excavated to check the stratigraphy below the present-day surface and the presence of units containing artefacts. These trenches were marked with letters A, B, C. However, the small trenches did not provide a full picture of the preservation of subsurface features. Therefore larger trenches (5 x 5m in size) were dug in two areas of the greatest density of artefacts (designated D and E). Area D included also the stone superstructure of a tumulus (*c.* 3m in diameter) visible on the surface (see pg 000-000) probably dating to the Kerma Period. After removing the stones of the superstructure and remains of soil to the level of the granite bedrock the outlines of cuts filled with different stratigraphic units were discovered. Apart from two rectangular cuts filled with sediment containing Neolithic artefacts in a secondary context (the grave pit and an additional smaller pit - both related to the tumulus), numerous features dated to the Neolithic period were also recorded. These had been cut by the Kerma period grave, or occurred close by; Neolithic artefacts were recorded in all their fills (Figure 2.2). All the archaeological material has been analysed.[1]

General description of lithic collection

During archaeological research on site 3-J-26 in the 2002/2003 season a total of 7,151 lithic artefacts had been recorded. These occurred both in the fills of the subsurface features as well as (mainly) on the present-day surface and immediately below it (a consequence of natural post-depositional factors). The lithic material was preserved in good condition. The artefacts' faces were not covered with a layer of patina that could be younger than the debitage period (Neolithic). The number of fire-damaged and burnt artefacts was low, which suggests the lack of secondary 'thermal' factors (bush fires in the area of the archaeological deposits). Rather we could identify them with zones of human activity in the settlement (most likely not confined to a single-period).

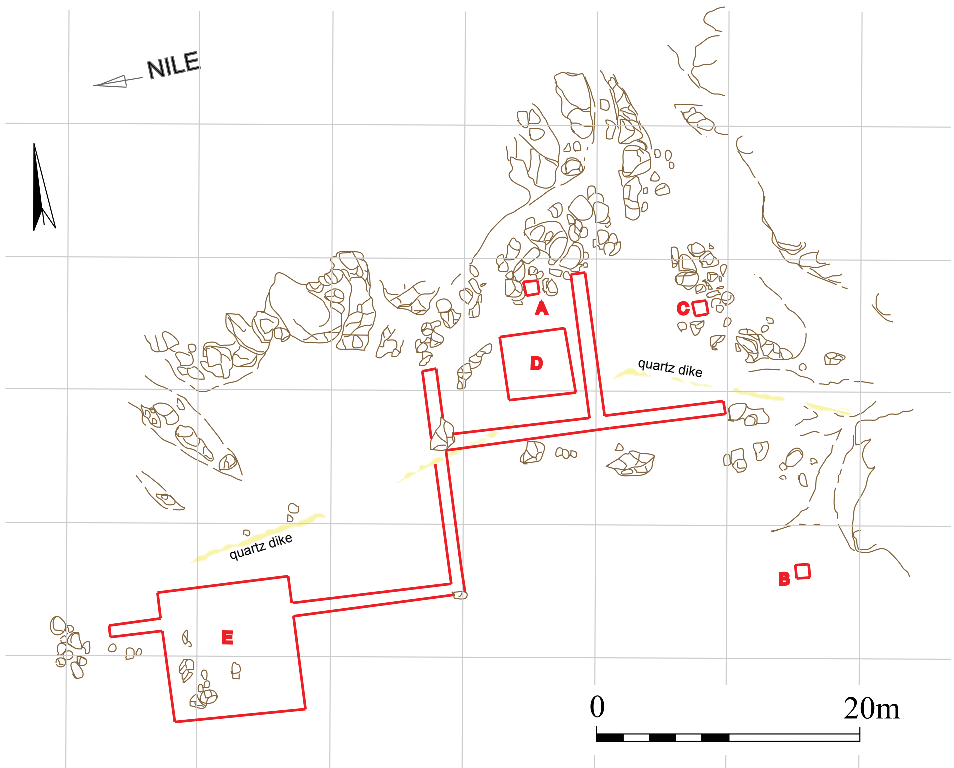


Figure 2.1. *Plan of site 3-J-26 with the location of the excavation trenches.*

The stone artefacts occurring on the present-day surface did not exhibit clear concentrations pointing to particular activity zones. Dense concentrations of artefacts were recorded only in two areas, where trenches D and E were excavated.

The artefacts recovered from the deeper layers of soil were preserved in a similar condition. In the excavated test trenches lithic artefacts came from all soil layers varying in thickness from 50 up to 300mm. The presence and quite large size differentiation of artefacts suggest that these were subjected to strong natural post-depositional factors (water movements, activities of plant roots and small fauna). It also should be noted that the present-day surface undoubtedly is the result of the same processes together with the destructive actions of wind and sun. These unfavourable conditions of preservation - intense erosion of a diverse character - could explain the small quantity of pottery fragments and almost complete lack of organic remains in stark contrast to the number of lithics. There was a slightly better state of preservation among

[1] For the pottery see Isabella Welsby Sjöström's report (in preparation); for the human bones from the burial which was studied in the field by Margaret Judd and later by Tina Jakob see Daniel Antoine's report (in preparation).

the artefacts from the pit fills. Pottery fragments were preserved in better condition and even organic remains were recorded.

Results of the analysis

Contexts

Lithic artefacts were recovered from various contexts. Most occurred on the surface – a unit formed as a result of the erosion of the overlying soil layer (thickness unknown). The smallest soil elements were blown away, only the heavier rock fragments remain creating a gravel layer. Concentrations of artefacts on the present-day surface reflect only in a general way zones where the small debris was originally deposited.

Numerous lithics and pottery fragments were also recorded in the sub-surface layers. The unit was composed of cemented dust and small granite and quartz grains – fragments of the eroded bedrock. Most probably this unit is the lower part of a mostly eroded paleo-soil. The artefacts recorded in the sub-surface level were spread equally without any concentrations suggesting that it was mostly natural penetration brought about by water movements as well as plant roots and the activities of small fauna which explains their location.

Units filling the Neolithic features in Area D represented a completely different state of preservation. The recovered artefacts had also a different character than that of the surface assemblage (see the raw material and technological analysis below).

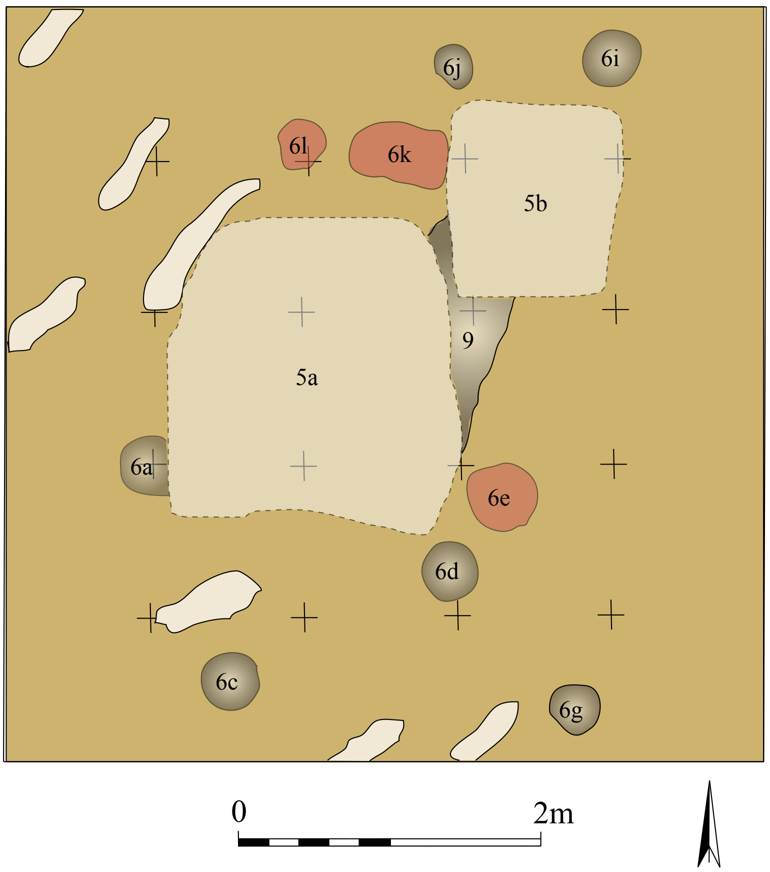


Figure 2.2. *3-J-26, Plan of Area D with the outlines of prehistoric features. Black – Neolithic pit and post-holes; Red – Neolithic fireplaces; Pale brown – post-Neolithic funerary pits. (scale 1:50).*

Features dated to the Neolithic (see: Figure 2.2) were a large pit utilizing a natural cavity in the bedrock [context 10, 18[2]], shallow post-holes [contexts 7a, 7c, 7d, 7g, 7j, 7m, 6o] and relics of fireplaces [contexts 7e, 7k, 7l]. Their relative proximity and similarity points to a common origin. Most probably all were remains of a settlement, however as a result of post-Neolithic disturbances and the small area excavated their functional relationship cannot be ascertained (e.g. if these were the remains of a hut). Artefacts recorded in the fills of the Neolithic features are presented in Table 2.1 – a complete analysis will be found in the next chapters.

The latest context type on the site was the layers filling the post-Neolithic (Kerma period) features in Area D. These undoubtedly funerary features were filled with soil extracted during the digging of the grave pit – as well as the material intimately associated with the burial. The contexts labelled with separate numbers came from different stages of filling the grave pit [context 11 – upper fill, context 16 – lower fill] and the additional smaller pit [context 14 – upper fill, context 17 – lower fill]. No lithic artefact can be certainly associated with the grave furniture. All the artefacts recorded in the post-Neolithic features are presented in Table 2.2 – their complete description is to be found in the following chapters.

Raw materials

Among the rocks worked at 3-J-26, there were a few groups of different types with proprieties (break character, internal structure, size of the blocks etc.) making them suitable for knapping.

Group I - Quartz outcrops on the rocky hill on which the site is located. The quartz outcrop forms an angled 500mm thick layer partly standing above the surface. The unit was breaking along the crystalisation faces and formed chunks of various sizes. Also antropogenic breaks of the rock were noted. Further debitage in the past was marked by the presence of many morphological categories (cores, flakes, retouched tools).

Group II - Quartz pebbles a few centimetres in diameter come from secondary geological deposits. Quartz fragments were rolled and polished during the Mesozoic era. Nowadays they can be found in the Nubian sandstone or washed out of it and lying among the gravel. Such raw material is not found on the site itself - all pebbles were collected most probably from the gravels on the river terraces or *wadi* beds. The presence of many morphological categories confirms intentional knapping. The properties of the quartz pebbles were similar to that of the quartz collected directly from the site (Group I) however, their rounded form undoubtedly determined their further technological treatment.

Group III - Rock crystals are available on the site in

[2] Field Numbers of the contexts - fillings

TABLE 2.1. ARTEFACTS RECORDED IN THE NEOLITHIC FEATURES. CONTEXT NUMBERS RELATE TO THE FILLS. ABBREVIATIONS BY THE CONTEXT NUMBERS: H – SHALLOW POST-HOLES; F – REMAINS OF FIREPLACES; P – PIT. LETTERS PRECEDING THE QUANTITY OF ARTEFACTS INDICATE THE RAW MATERIAL: F - FLINT; Q – QUARTZ; QP – QUARTZ PEBBLES; A – AGATE; V – VOLCANIC ROCKS.

Context	D7a - H	D7c - H	D7d- H	D7e - F	D7j - H	D7l – F	D10+D18-P
Contents	Pottery F/8 flakes F/6 chunks F/1 core Q/1 flake 1/ chunk A/ 1 chunk	F/2 flakes F/3 chunks Q/2 chunks	Pottery	F/1 chunk	Pottery F/1 flake V/1 chunk	Pottery F/2 flakes	Pottery Bones Grinders F/14 flakes F/26 chunks F/3 tool F/1 core Q/7 flake Q/21 chunks QP/3 flakes QP/7 chunks V/5 chunks A/1 core A/3 chunk

TABLE 2.2. ARTEFACTS RECORDED IN THE POST-NEOLITHIC FEATURES. CONTEXT NUMBER RELATE TO THE FILLS. FOR THE ABBREVIATIONS USED SEE TABLE 2.1.

Context	D11	D14	D16	D17
Contents	Pottery Bones F/ 80 flakes F/104 chunks F/7 cores F/11 tools F/3 rejuvenation el. Q/33 flakes Q/50 chunks Q/2 cores Q/2 tools QP/3flakes QP/10 chunks A/1 flake A/1 chunk A/1 tool A/1 rejuvenation el. V/3 flakes V/10 chunks V/1 core	Pottery F/4 flakes F/5 chunks F/1 core Q/ 1 flake Q/6 chunks V/ 2 chunks	Pottery Bones F/44 flakes F/44 chunks F/3 cores F/1 rejuvenation el. F/10 tools PW/1 flake Q/22 flakes Q/37 chunks Q/1 core QP/6 flakes QP/2 chunks RC/5 chunks V/1 flake V/10 chunks A/1 flake A/3 chunks A/1 core A/1 rejuvenation el.	F/12 flakes F/6 chunks F/1 rejuvenation el. Q/2 flakes Q/5 chunks QP/1 flake V/1 flake V/1 chunk A/1 flake

the form of regular transparent crystals. That raw material was sporadically worked, no tools nor clear marks of complicated processing methods were recorded.

Groups I, II and III are all raw materials with poor susceptibility to knapping but they were worked on the site not only because of their ready availability. Despite the fact that the percentage of various morphological groups and number of artifacts varied in each group, the form of the debris and final products (tools) were similar. This suggests that for Neolithic knappers, these raw materials were treated as a different group.

Group IV - flint of various colours and internal structure, all of which, on account of their conchoidal breaks, compactness and size, make possible the technical projects aimed at producing a blank for tools. The items from this category came from pebbles collected on the river terraces or in the *wadi* beds. All technological categories including rejuvenation and cresting elements as well as orientation change were recorded in this raw material group.

Group V - chert having proprieties similar to flint, but less compact and with common crystaline inclusions. This raw material was represented by the same morphological categories as flint although in much smaller quantity suggesting a preference for more compact and homogenous (clear) raw materials in the Neolithic.

Group VI - silicified mudstone of green colour and high quality - inner compactness, lack of any inclusions - occurs in the form of pebbles with highly polished outer surfaces (it was probably formed in the Mesosoic as an element of the Nubian Formation, see Whiteman 1971). Artefacts made of this raw material were very rare; no tools were recorded.

Group VII – artefacts made of petrified wood were noted in small quantities. As with the silicified mudstone, chert and flint, petrified wood was collected as natural polished pebbles and had very good quality for knapping.

It should be noted that in the group of raw materials with similar properties and collected most probably from the same geological context (river bed and/or large *wed-dan*) flint clearly dominates. That suggests clear, although not restrictive, raw material preferences in the Neolithic.

Group VIII - agate artefacts from site 3-J-26 were readily recognisable and present in large numbers, although as a raw material it was of poor quality (small stone size, inner oolithic structure, crystal nucleus). Outer surfaces did not have such intensive polishing as the flint or silicified mudstone. Also numerous small breaks were present, pointing to the origin of the agate pebbles in gravel formations. There were many morphological categories of artefacts made of agate - particularly a high percentage of cores and retouched tools.

Group IX - volcanic rocks e.g. basalt were represented on site 3-J-26 in a few categories. Outer surfaces were highly polished indicating that they were obtained from secondary geological contexts - most probably the river bed. The large number of this group of artefacts suggests easy access to the outcrop or intentional selection and some special importance in the Neolithic.

Group X - ferruginous sandstone is a common rock present throughout Nubia as one of the Mesosoic formation elements - nowadays mostly broken and surviving on the inselbergs' surface. All four artefacts made of this raw material were finished tools - most probably all were brought to site 3-J-26.

Group XI - quartzitic sandstone - a metamorphic Mesosoic rock used mainly for grinding bases or palette production. Fine-grained structure and homonegeneity are its main proprieties. No production debris was present on site 3-J-26.

Group XII - granite/gneiss - the main component of the Fourth Cataract itself. The only recorded artefact made of granite/gneiss was a grinder, suggesting that the Neolithic population did not use such coarse-grained material.

The occurrence of stone artefacts from a vertical perspective, on the present-day surface as opposed to within sub-surface levels was ascertained as a result of the exploration of 100mm thick spits in areas A and E.

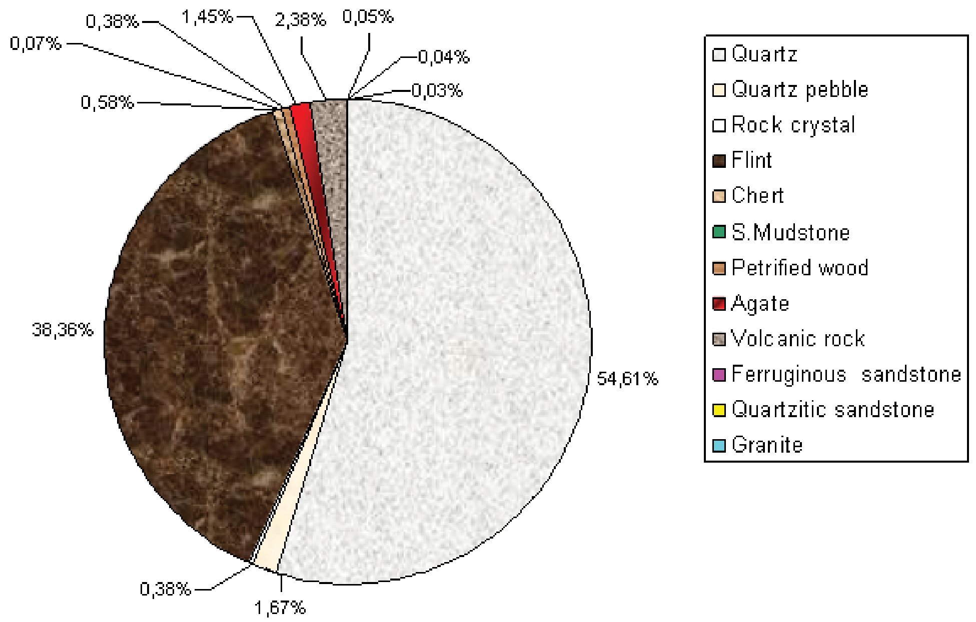
In area D, the collection from the surface – similar in character to other surface assemblages - was analysed as well as separately considering artefacts from Neolithic and Post-Neolithic features (containing mostly Neolithic artefacts in secondary contexts).

It should be noted that artefacts made of some rocks occurred on the present-day surface only - silicified mudstone, sandstones and granite. The absence of the sandstone and granite products in the sub-surface levels could be explained by post-depositional processes. Due to natural factors only small artefacts were moved to the deeper soil levels - larger fragments (grinding bases, grinders) remained on the surface. The absence of the silicified mudstone products seems to result from their rarity in general. Most probably that rock was worked on the site only incidentally.

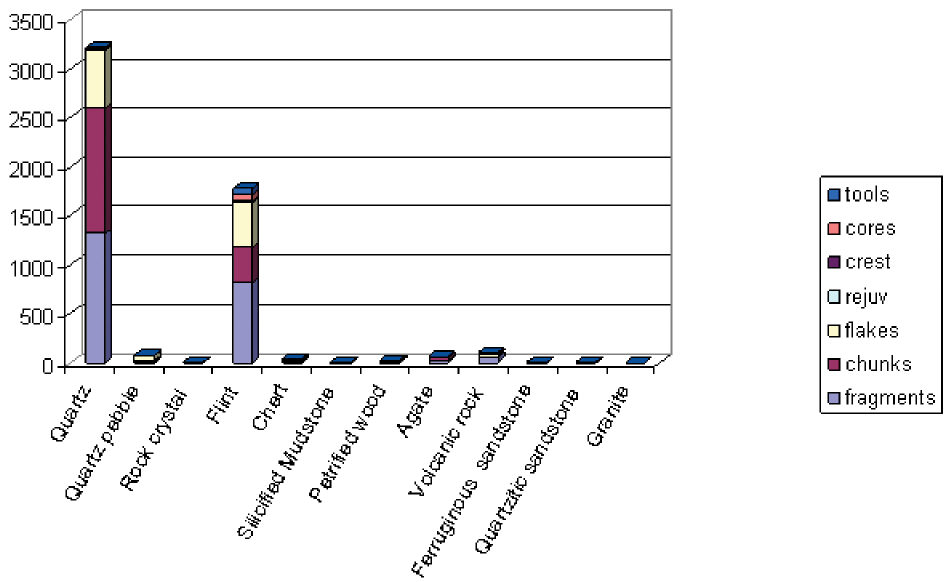
As a result of the initial analysis of the frequency of all lithic artefact occurrences, at site 3-J-26 the Neolithic assemblage was dominated by quartz and flint products. Artefacts made of other rocks of similar proprieties, even if coming from different geological contexts, seem only to complement these two rock types. At this stage in the study we can suppose that there were a few different technological approaches to stone working, reflected in the selection of such different raw materials.

Technology

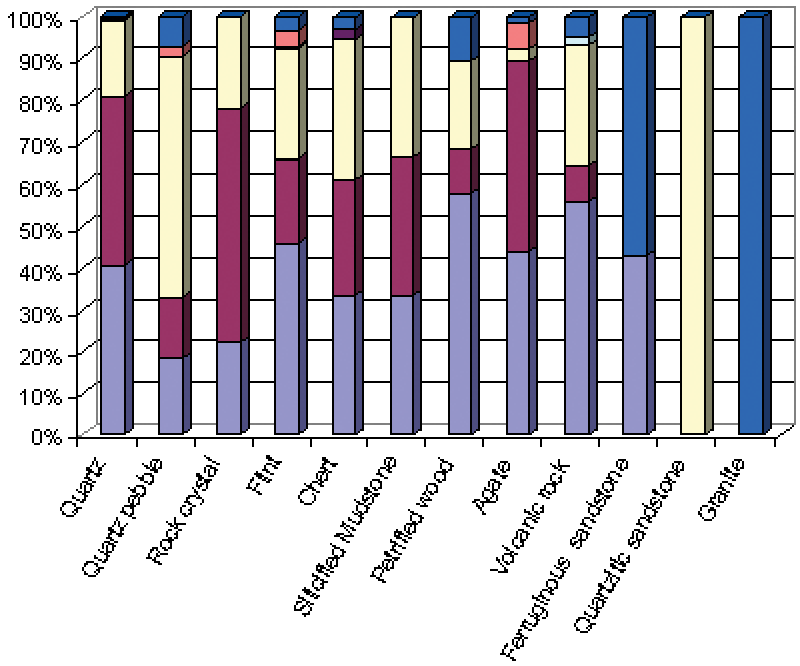
The technological analysis of the artefacts will be made for each raw material group separately. The results should verify preliminary hypothesis concerning different technological approaches, illustrate various components within the morphological categories as well as differences



Graph 2.1. *Raw materials in the site 3-J-26 assemblage (all contexts).*



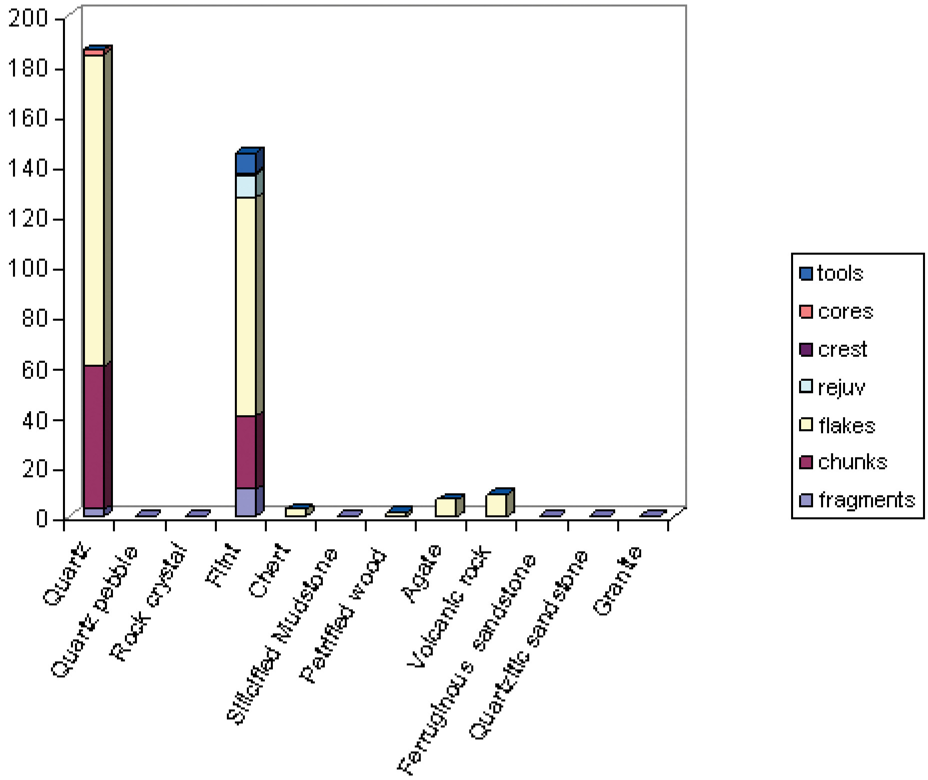
Graph 2.2. *Occurrence of all raw materials on the surface of site 3-J-26.*



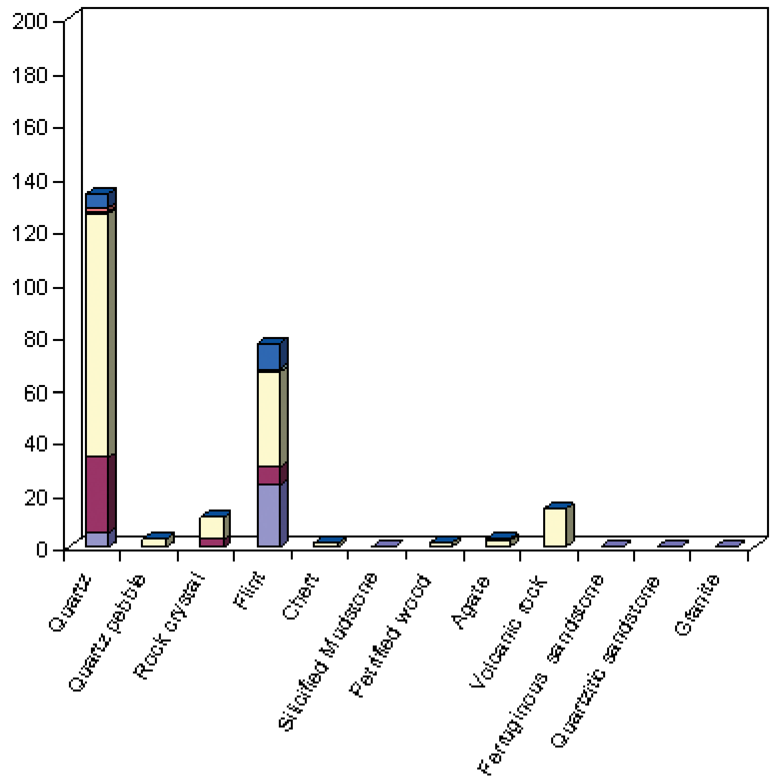
Graph 2.3. *Percentage of artefacts' morphological categories in all raw materials from the surface of site 3-J-26.*

TABLE 2.3. QUANTITY OF ALL MORPHOLOGICAL CATEGORIES IN THE RAW MATERIAL GROUPS AT SITE 3-J-26.

Raw material	chunks	flakes	rejuv.	crest	cores	tools	total	
Quartz	1450	2649	2	0	22	23	0,55%	4146
Quartz pebble	19	99	0	0	3	6	4,72%	127
Rock crystal	10	19	0	0	0	0	-	29
Flint	508	2148	31	2	93	130	4,46%	2912
Chert	10	32	0	1	0	1	-	44
Silicified mudstone	2	3	0	0	0	0	-	5
Petrified wood	3	24	0	0	0	2	-	29
Agate	35	57	2	0	8	5	4,54%	107
Volcanic rock	15	158	2	0	1	5	2,76%	181
Ferruginous sandstone	0	1	0	0	0	4	-	4
Quartzitic sandstone	0	2	0	0	0	1	-	3
Granite	0	0	0	0	0	2	-	2
Total	**2052**	**5192**	**37**	**3**	**127**	**179**	**7589**	



Graph 2.4. *Area A – Level 1 (0 – 100mm beneath the present-day surface)*

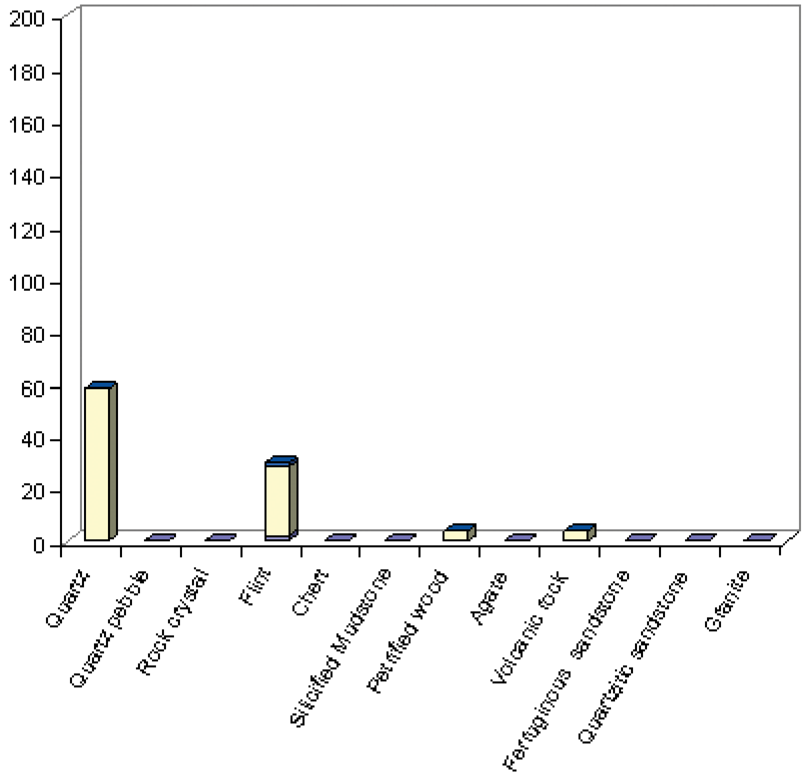


Graph 2.5. *Area A – Level 2 (100 – 200mm)*

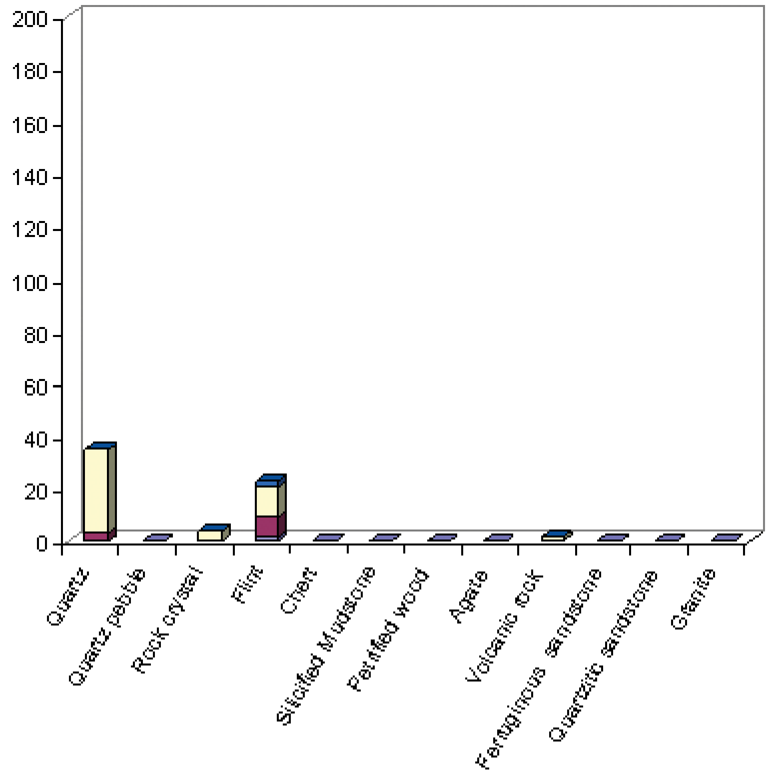
in metrical and morphological values.

Almost every raw material group (except of silicified mudstone and quartzitic sandstone) contains retouched tool forms. Of course this points to the use of tools made of almost all the accessible rocks, but also shows the preferences of the Neolithic tool makers/users. Leaving aside tools made from petrified wood and chert (because of their scarcity) as well as granite and sandstones, we obtain a picture of a dualism in preferences for the only local rock - quartz, and the group of rocks gained in *wed-dan* and/or the river bed. Quartz obtained from secondary contexts in the form of pebbles was worked and used (as tools) in a similar manner to flint or agate, completely different from that of the local quartz, although both had similar qualities. Further analysis of the tools allows us to define the aims of the production and complexity of the processes leading to it. However, already we can state that local quartz gained and worked on the site had minimal impact only in retouched tool production. Most probably that is the essence of the technological differences among the quartz artefacts at site 3-J-26.

The quantity of tools made of volcanic rocks points to a



Graph 2.6.
Area A – Level 3
(200 – 300mm).

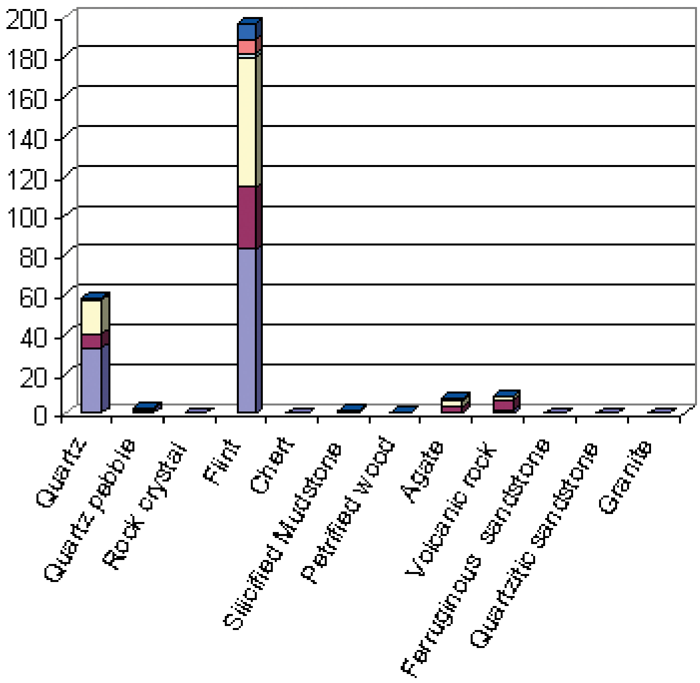


Graph 2.7.
Area A – Level 4
(300 – 400mm)

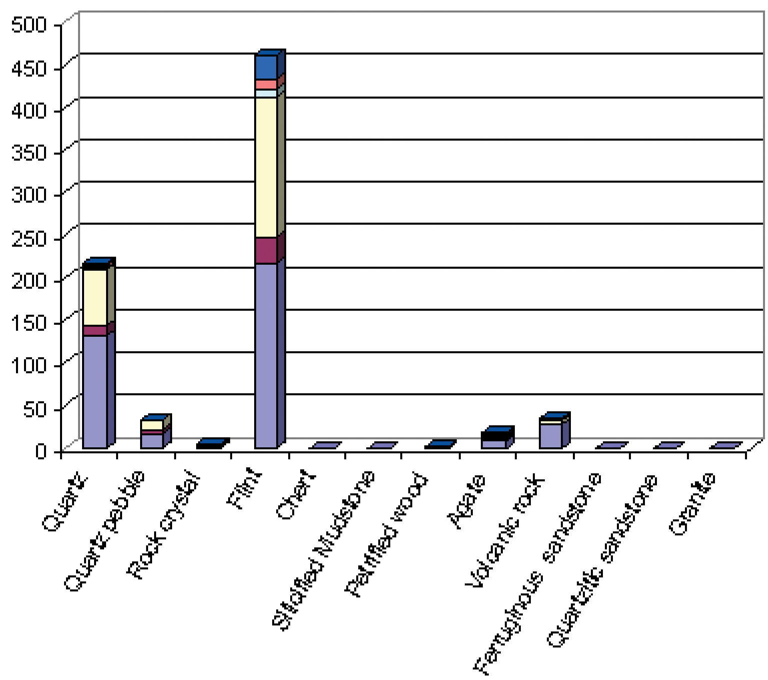
different technological approach. Probably the working of those rocks was oriented towards some other goals than tools production off flake blanks.

Cores

Single-platform cores (Figures 2.3 & 2.4) were recorded in many contexts - mostly on the surface. Only the fills of Neolithic features did not produce single-platform cores. The discovery of nine cores without changes of orientation and of much greater volume than specimens found outside the fills, suggests that there was unintentional deposition of these artefacts in the Kerma period grave along with the rest of the Neolithic pit fills disturbed during the digging of that grave. These cores were a very important part of our technological knowledge about the methods of blank production on the site in the early-Neolithic. Both on the surface and in the sub-surface levels only very worked forms were noticed - it is hard to ascertain the construction of the debitage methods based solely on the final forms. Nine cores from context D11 represent various stages of exploitation from those only with the formation of a flat surface (further striking platform), with side faces



Graph 2.8.
Area E – Level 1
(0 – 100mm)



Graph 2.9.
Area D – sub-surface
levels (feature fills)

prepared or crested ridges - up to cores with negatives of removed flakes (main reduction started) and with their forms destroyed due to mistakes. Striking platforms were usually formed with a few flat negatives. Flaked surfaces had been relatively flat and enabled the removal of massive, wide flakes of elongated forms. An irregular pattern of negatives on the flaked surfaces should not be interpreted as a reflection of the main debitage - usually these were negatives of the final products that made the core useless. In some cases that pattern could also reflect preparation or reparation of the surface. However, if we look closer at the distal parts of previously removed flakes, we notice a much more regular pattern of uni-directional reduction.

Also raw materials used for uni-directional core reduction require comment. Among single-platform cores flint specimens dominate the assemblage. Ten times fewer agate cores of a similar quality were recorded (Figure 2.4b). Also a surprisingly high percentage of single-platform cores made of quartz was noticed, although the precision and consequently the quality of reduction never reached the standards found on those of flint or agate. Because of the chunk character of the quartz, frequently it was used for removing a few irregular products treating one face as a platform. Any technical interventions were achieved by modifying such cores parameters (Figure 2.4d,e). In the case of quartz pebble and volcanic rock cores we have only single specimens. These were intensively reduced and did not allow the reconstruction of the main conception behind the flaking (Figure 2.4c).

Cores with changed orientation (Figure 2.5) as well as discoidal forms (numbers in brackets) were recorded in most of contexts. These waste products completed the scheme of flaking methods suggested by the interpretation

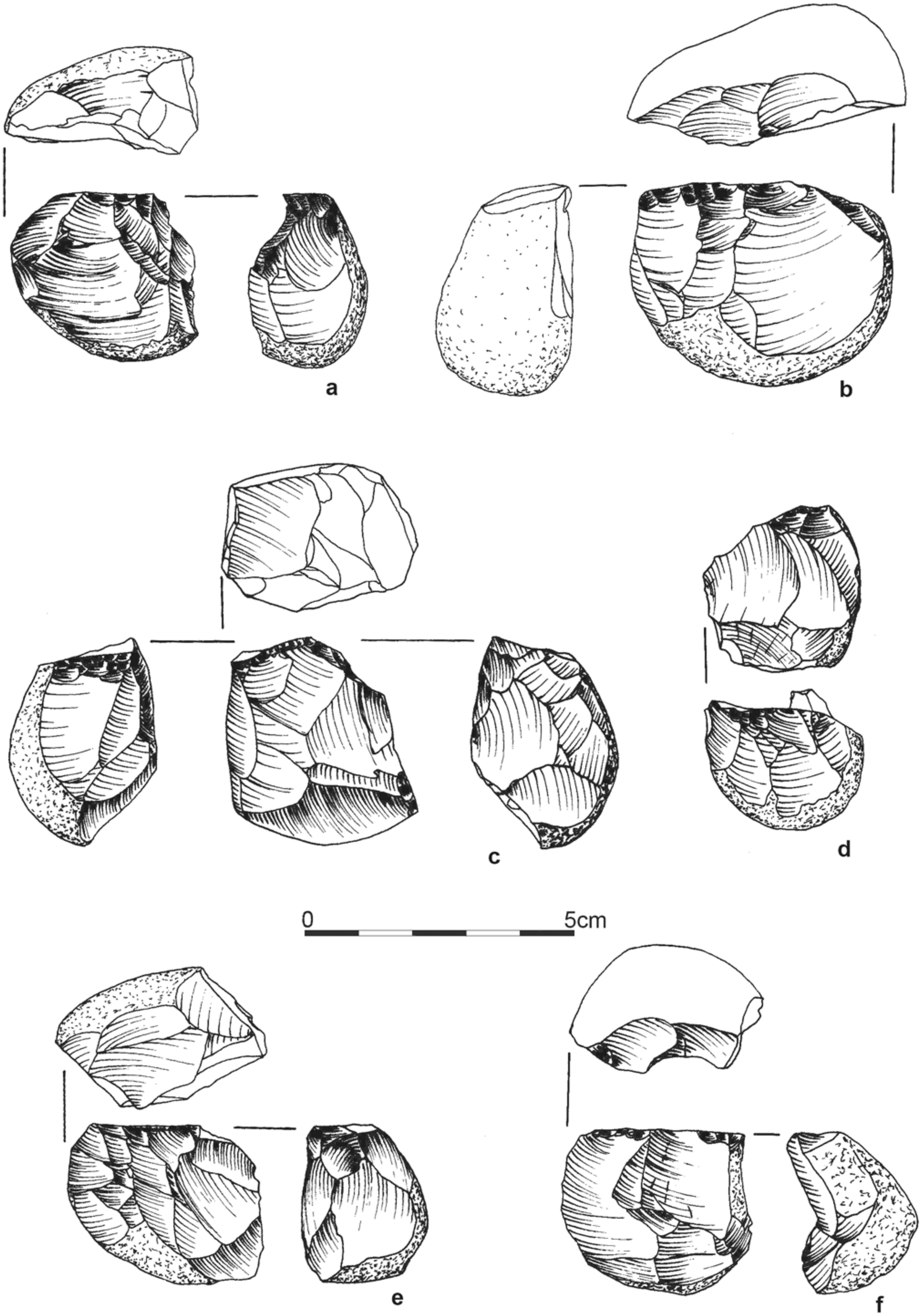


Figure 2.3. Single-platform cores (scale 1:1).

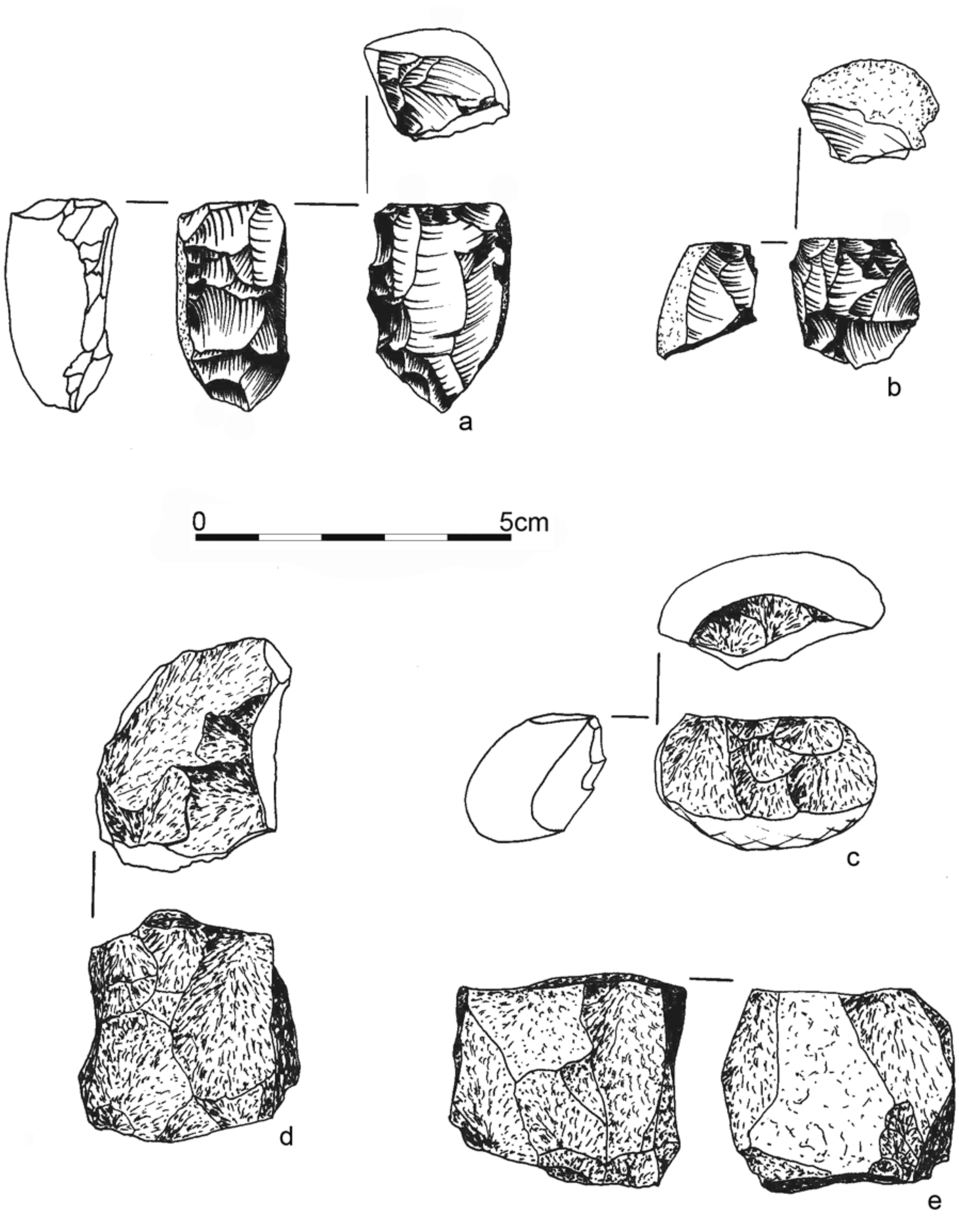


Figure 2.4. *Single-platform cores (scale 1:1).*

TABLE 2.4. SINGLE-PLATFORM CORES.

	A+D surface	A+D sub-surface	E surface	E sub-surface	Post-Neo-lithic	Other surface	Total
Flint	8	-	10	7	8	19	52
Agate	1	1	1	-	-	2	5
Quartz	-	-	3	-	-	6	9
Quartz pebbles	-	-	-	1	-	-	1
Volcanic	-	-	-	-	1	-	1
Total:	9	1	14	8	9	28	68

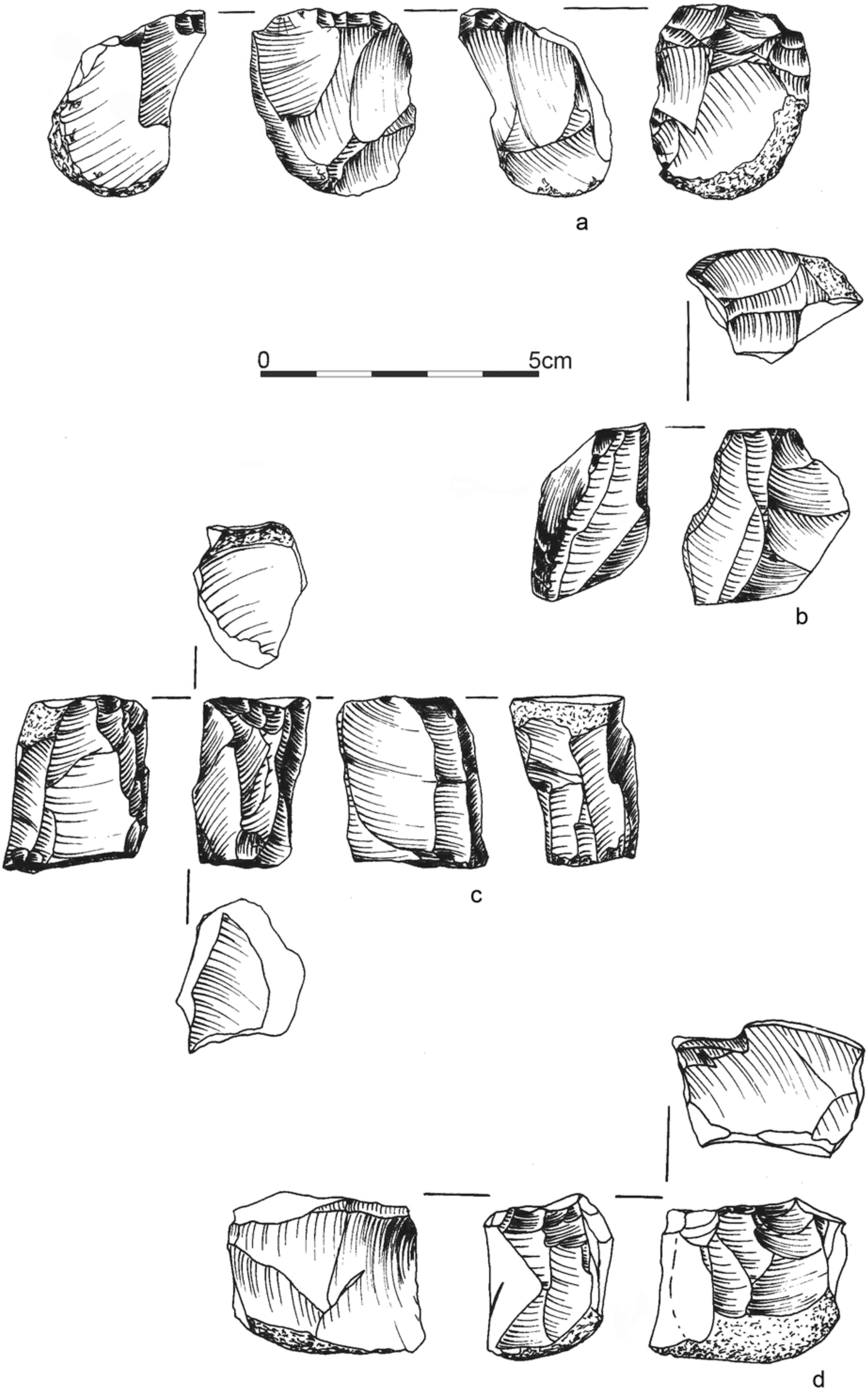


Figure 2.5. *Cores with changed orientation (scale 1:1).*

of the cores deposited at the single-platform stage. The orientation changes never created a different quality of debitage - still massive and slightly regular flakes were removed.

When discussing the changed orientation cores, the subject of the so-called '90º cores' should be mentioned. On the surface of area E a single specimen was recorded with negatives pointing to an orientation change at 90º to the initial flaking direction but still on the same surface (for debitage of this type see Figure 2.9a-c,l). I think, this phenomenon should not be classified as a separate core type. Neither the reduction concept nor the technique changed, new flakes were still removed from one direction only, not simultaneously from two perpendicularly arranged platforms. In many cases also crest creating was noticed and some negatives of that action extended more onto the flaking surface - however, that did not mean orientation change. A few small discoidal cores were recorded. The presence of the discoidal debitage on the site, where single platform schemas dominated, raised the question of the centripetal exploitation aims. In the course of that only irregular, small flakes were obtained. Thus, the only difference was in the final core shape. Usually discoidal cores from site 3-J-26 had a more or less rounded shape and trapezoidal cross-section with equal thickness (in contrast to the flakes becoming thinner toward the distal end). Most probably discoidal cores were produced as specific tool forms in the early Neolithic.

with a flat platform, formed with a single negative (Figure 2.6a-I, 2.7b-l).

Edged butts, if these were not a result of knapping mistakes, reflect the placing of the impact point very close to the edge of the platform and flaked surface and point mostly to the use of a soft hammer and direct percussion technique. Bipolar flakes are described separately although their butts also could be described as edged ones.

Cortical butts point to the placing of the impact point on the outer pebble surface (Figure 2.6p, 2.7s, 2.8b-c). Their common presence can reflect both the early stages of exploitation and most of the reparation actions. With the small size of the natural pebbles, actions of that character mostly meant working the outer surfaces.

Prepared butts were composed of a few small negatives fragments - remains of 'preparing' the exact placement for the impact point with optimum debitage angle and distance from the edge (Figure 2.6,j-o,q-r; for debitage see Figure 2.9d-h). The presence of that butt type reflects the use of a more complex method of blank removal than that which resulted in the production of plain butts.

In the case of quartz gained from the dike on the site, the dominance of plain-butt flakes was visible in all contexts. That proportion was however, a little smaller in the fills of the Neolithic features. This could be interpreted as reflecting the deposition in the pits and post-holes of a

TABLE 2.5. CHANGED ORIENTATION CORES AND DISCOIDAL CORES (NUMBERS IN BRACKETS).

	A+D surface	A+D sub-surface	E surface	E sub-surface	Neolithic	Post-Neolithic	Other surface	Total
Flint	6	-	5	-	2	1(1)	16	30
Agate	-	1	-	-	-	1	-	2
Quartz	2	-	(1)	1	-	3	-	6
Quartz pebbles	1	-	-	-	-	-	-	1
Total:	9	1	5	1	2	5	16	39

Bipolar cores similar to discoidal forms were recorded in small numbers and almost all the specimens bore traces of use as tools. Their small size points to the possibility of the removal of only very small and irregular flakes (even if these were a little bigger at the beginning).

TABLE 2.6. BIPOLAR CORES.

	A+D Surface	A+D Sub-surface	E surface	Other surface	Total
Flint	5	1	1	3	10
Quartz	1	2	-	2	5
Total:	6	3	1	5	15

Blanks

In the tables below various flake butts (both complete specimens as well as those with only the proximal parts preserved) are presented separately for each raw material group. Four butt types were defined: plain, edged, cortical and prepared.

Plain butts reflect the gaining of the blank from cores

relatively smaller quantity of debris (also plain butt flakes) than was discarded in other areas. At the same time in the pits were deposited edged and cortical butt flakes in relatively larger numbers, pointing to intentional quartz working in the area of the sub-surface features.

It should be mentioned that quartz was one of the worst raw materials for blank production. The number of cores as well as tools was relatively low. What was the reason for producing such large amounts of plain-butt flakes? The key to understanding that question is, in my opinion, the chunky character of the primary quartz blocks. Such large chunks had natural flat outer surfaces creating semi-right angles. That form made possible debitage without almost any preparation. Huge amounts of plain butts resulted from almost all removals and were not the same as the plain-butt flakes in other raw materials. In the case of quartz gained from a dike and worked using unidirectional methods, plain butts became during the early stages of exploitation (preparation?), both the main flake removed as well as all reparations (if present). The small number of cortical butts (more correctly - weathered or primary) confirms the working of quartz fragments coming from

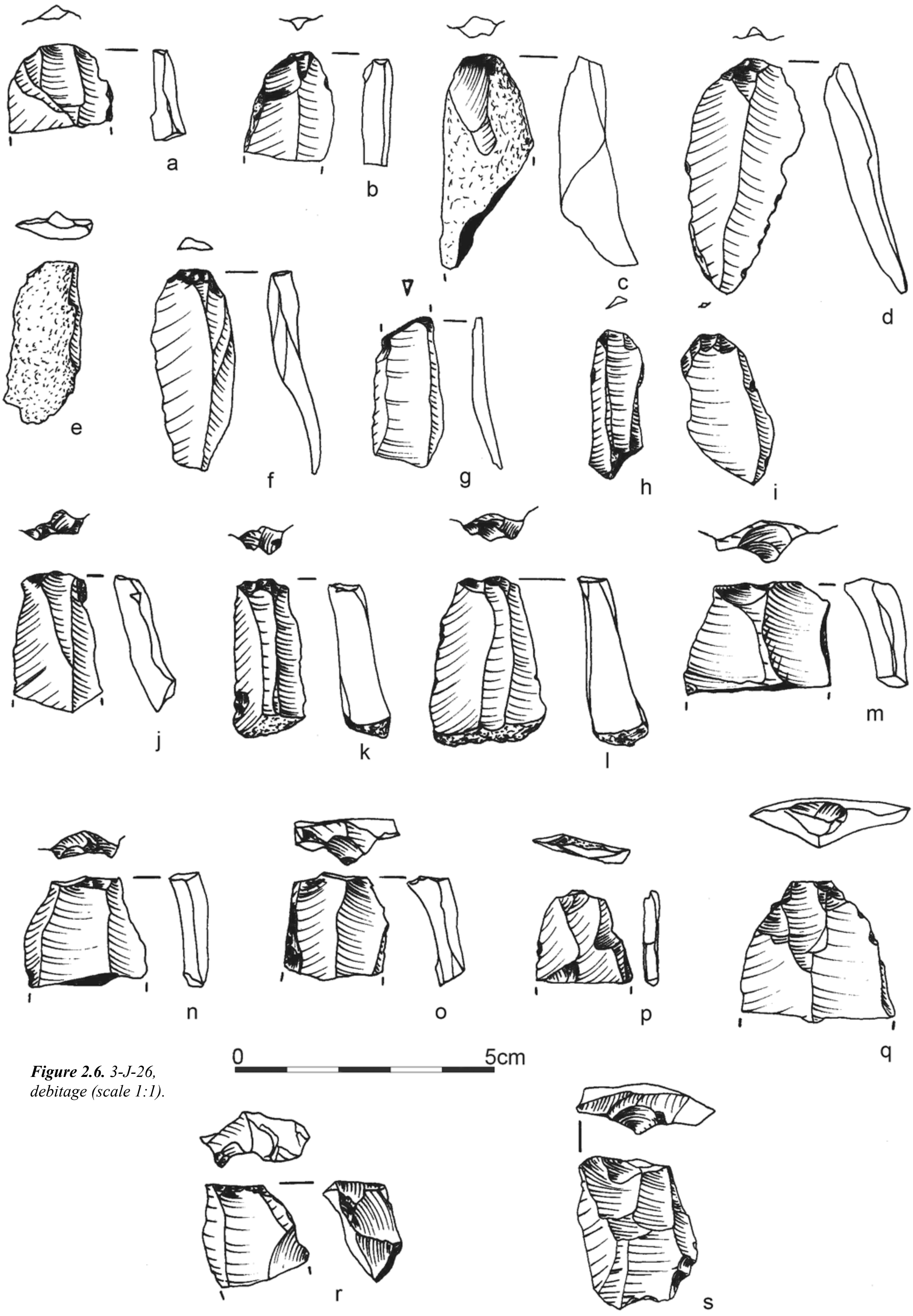


Figure 2.6. *3-J-26, debitage (scale 1:1).*

TABLE 2.7. FLAKE BUTT TYPES IN THE QUARTZ CATEGORY.

Butt type	A+D surface		A+D sub-surface		D features Neolithic		D Features Post-Neolithic		E surface		E sub-surface		Other surface collections
Plain	237	93.3%	323	99.7%	6	75%	33	57.8%	98	85.2%	15	88.2%	294
Edged	16	6.3%	1	0.3%	2	25%	12	21.1%	10	8.7 %	1	5.9%	7
Prepared	0	-	0	-	0	-	0	-	0	-	0	-	2
Cortical	1	0.4%	0	-	0	-	12	21.1%	7	6.1%	1	5.9%	7
Total	254	100%	324	100%	8	100%	57	100%	115	100%	17	100%	310

the outer parts of a dike with some faces weathered.

In the case of quartz pebbles brought to the site, there were equal numbers of flakes with plain and cortical butts. Edged-butt flakes were recorded mainly in the fills of the sub-surface features - similar to analogous local quartz products. Again deposition of more complex debitage debris in the settlement area was confirmed.

Debitage from the quartz pebbles was closely related to their shape and properties. Plain-butt flakes point to the use of debitage methods with formed striking platform. The same numerous cortical butt products points to possible exploitation with methods similar to the hypothetical models of Kobusiewicz (1976) or Caneva and Zarattini (1983). Unfortunately in the site 3-J-26 assemblage there were neither cores nor tools (lunates) - in theory the final products. These last flakes could also come from the initial stages of common unidirectional debitage.

Rock crystal was worked rarely on site 3-J-26. Flakes with a plain butt were recorded in small numbers only on the surface and in the sub-surface soil level in areas A and D. Single-edged butt flakes were also noticed there.

Flint was the second most frequently worked raw material (after quartz) however, it was the most common if we take into account the systematic and regular schemas of tool blank oriented production. That is the main difference between the Fourth Cataract early Neolithic sites and similar sites in the Khartoum region or near the Sixth Cataract where quartz (and quartz pebble) production dominated.

TABLE 2.8. FLAKE BUTT TYPES IN THE QUARTZ PEBBLES CATEGORY.

Butt type	A+D surface		A+D sub-surface		D features Neolithic		D features post-Neolithic		E Surface		E sub-surface		Other surface collections
Plain	6	46.2%	3	100%	1	33.3%	3	30%	2	66.7%	0	-	4
Edged	1	7.6%	0	-	2	66.7%	4	40%	0	-	0	-	1
Prepared	0	-	0	-	0	-	0	-	0	-	0	-	0
Cortical	6	46.2%	0	-	0	-	3	30%	1	33.3%	1	100%	5
Total:	13	100%	3	100%	3	100%	10	100%	3	100%	1	100%	10

TABLE 2.9. FLAKE BUTTS TYPES IN THE ROCK CRYSTAL CATEGORY.

Butt type	A+D surface		A+D sub-surface		D features Neolithic		D features post-Neolithic		E surface		E sub-surface		Other surface collections
Plain	2	66.7%	6	100%	0	-	0	-	0	-	0	-	0
Edged	1	33.3%	0	-	0	-	0	-	0	-	0	-	0
Prepared	0		0	-	0	-	0	-	0	-	0	-	0
Cortical	0		0	-	0	-	0	-	0	-	0	-	0
Total:	3	100%	6	100%	0	-	0	-	0	-	0	-	0

Similar ratios to those observed at site 3-J-26 were noted further downstream in the Dongola Reach (Usai 1998; Osypiński 2003; at Multaga, in press).

In all contexts plain-butt flakes predominated, pointing to a commonly used debitage schema with a striking platform formed with a single negative. Most of these flakes also have traces of abrasion. That picture is completed with equal numbers of edged and cortical-butt flakes. Flakes with prepared butts were, on the contrary, of a different quality. In area E these were the higher number recorded. That observation suggests a different functional or stylistic (cultural?) character of the artefact concentration in area E.

Chert flakes were represented by small number of specimens, reflecting similar debitage methods to that used on flint. In general the most numerous butt type was plain, also a single prepared butt flake was noticed.

Flakes made of petrified wood were recorded in a number of contexts but not in the fill of the Neolithic features. Products with plain and cortical butts were recorded in various ratios. On the site's surface both types occurred equally, but in the sub-surface levels plain butt specimens prevailed. In the post-Neolithic pit fill a single cortical butt flake was found.

Agate flakes were recorded both on the site's surface and in the fills of the sub-surface features. Only one flake with cortical butt was noticed, most of the preserved blanks had plain or edged butts pointing to real flake

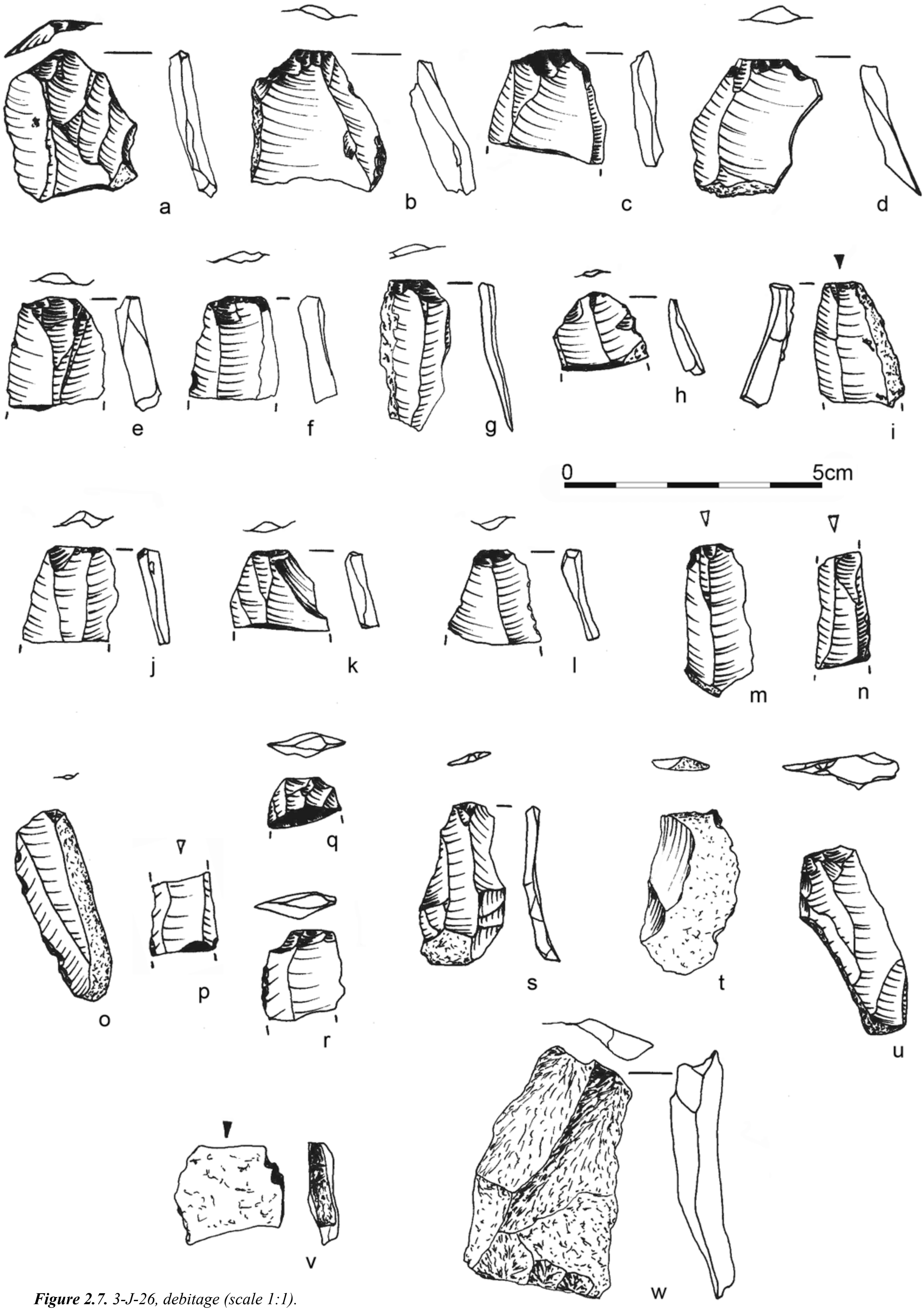


Figure 2.7. *3-J-26, debitage (scale 1:1).*

TABLE 2.10. FLAKE BUTTS TYPES IN THE FLINT CATEGORY.

Butt type	A+D surface		A+D sub-surface		D Neolithic features		D features post-Neolithic		E surface		E sub-surface		other surface collections
Plain	166	65.1%	177	95.2%	15	55.6%	82	61.7%	296	77.5%	49	61.4%	128
Edged	40	15.7%	6	3.2%	6	22.2%	21	15.8%	23	6%	15	18.7%	21
Prepared	5	1.9%	0	-	2	7.4%	4	3%	42	11%	1	1.2%	15
Cortical	44	17.3%	3	1.6%	4	14.8%	26	19.5%	21	5.5%	15	18.7%	34
Total:	255	100%	186	100%	27	100%	133	100%	382	100%	80	100%	198

TABLE 2.11. FLAKE BUTTS TYPES IN CHERT CATEGORY.

Butt type	A+D surface		A+D sub-surface		D Neolithic features		D features post-Neolithic		E surface		E sub-surface		Other surface collections
Plain	3	75%	5	100%	0	-	0	-	3	100%	0	-	5
Edged	0	-	0	-	0	-	0	-		-	0	-	0
Prepared	0	-	0	-	0	-	0	-		-	0	-	1
Cortical	1	25%	0	-	0	-	0	-		-	0	-	1
Total:	4	100%	5	100%	0	-	0	-	3	100%	0	-	7

TABLE 2.12. FLAKE BUTTS TYPES IN THE PETRIFIED WOOD CATEGORY.

Butt type	A+D surface		A+D Sub-surface		D Neolithic features		D features post-Neolithic		E surface		E sub-surface		Other surface collections
Plain	1	25%	7	100%	0	-	0	0	1	50%	1	100%	3
Edged	0	-	0	-	0	-	0	0	0	-	0	-	0
Prepared	0	-	0	-	0	-	0	0	0	-	0	-	0
Cortical	3	75%	0	-	0	-	1	100%	1	50%	0	-	0
Total:	4	100%	7	100%	0	-	1	100%	2	100%	1	100%	3

TABLE 2.13. FLAKE BUTTS TYPES IN THE AGATE CATEGORY.

Butt type	A+D surface		A+D sub-surface		D Neolithic features		D features post-Neolithic		E surface		E sub-surface		Other surface collections
Plain	0		10	100%	0	-	1	33.3%	3	75%	0	-	2
Edged	1	50%	0	-	0	-	2	66.7%	1	25%	0	-	2
Prepared	0		0	-	0	-	0	-	0	-	0	-	0
Cortical	1	50%	0	-	0	-	0	-	0	-	0	-	0
Total:	2	100%	10	100%	0	-	3	100%	4	100%	0	-	4

debitage with small amounts of core repairing.

Volcanic rock flakes usually had cortical butts. Very small numbers of plain butt flakes (prevalent in sub-surface levels) and edged butt specimens were noticed.

A few bipolar flakes were also noted (Figure 2.8o, 2.15r). Their presence in the Neolithic features points to activities producing such debris during the life of the settlement. In contrast to other flakes, the creation of bipolar flakes at site 3-J-26 did not result from their intentional production as a blank for tools. Rather their presence should be interpreted as a waste product resulting from the use of wedges or cleavers (Figure 2.15a-c). Small numbers of bipolar cores, on account of their tool character as well as lack of finished (retouched) tools made of bipolar

TABLE 2.14. FLAKE BUTTS TYPES IN VOLCANIC ROCKS CATEGORY.

Butt type	A+D surface		A+D sub-surface		D Neolithic features		D features post-Neolithic		E surface		E sub-surface		Other surface collections
Plain	9	50%	25	100%	0	-	0	-	0	-	2	100%	8
Edged	2	11.1%	0	-	0	-	0	-	0	-	0	-	0
Prepared	0	-	0	-	0	-	0	-	0	-	0	-	0
Cortical	7	38.9%	0	-	0	-	5	100%	4	100%	0	-	10
Total:	18	100%	25	100%	0	-	5	100%	4	100%	2	100%	18

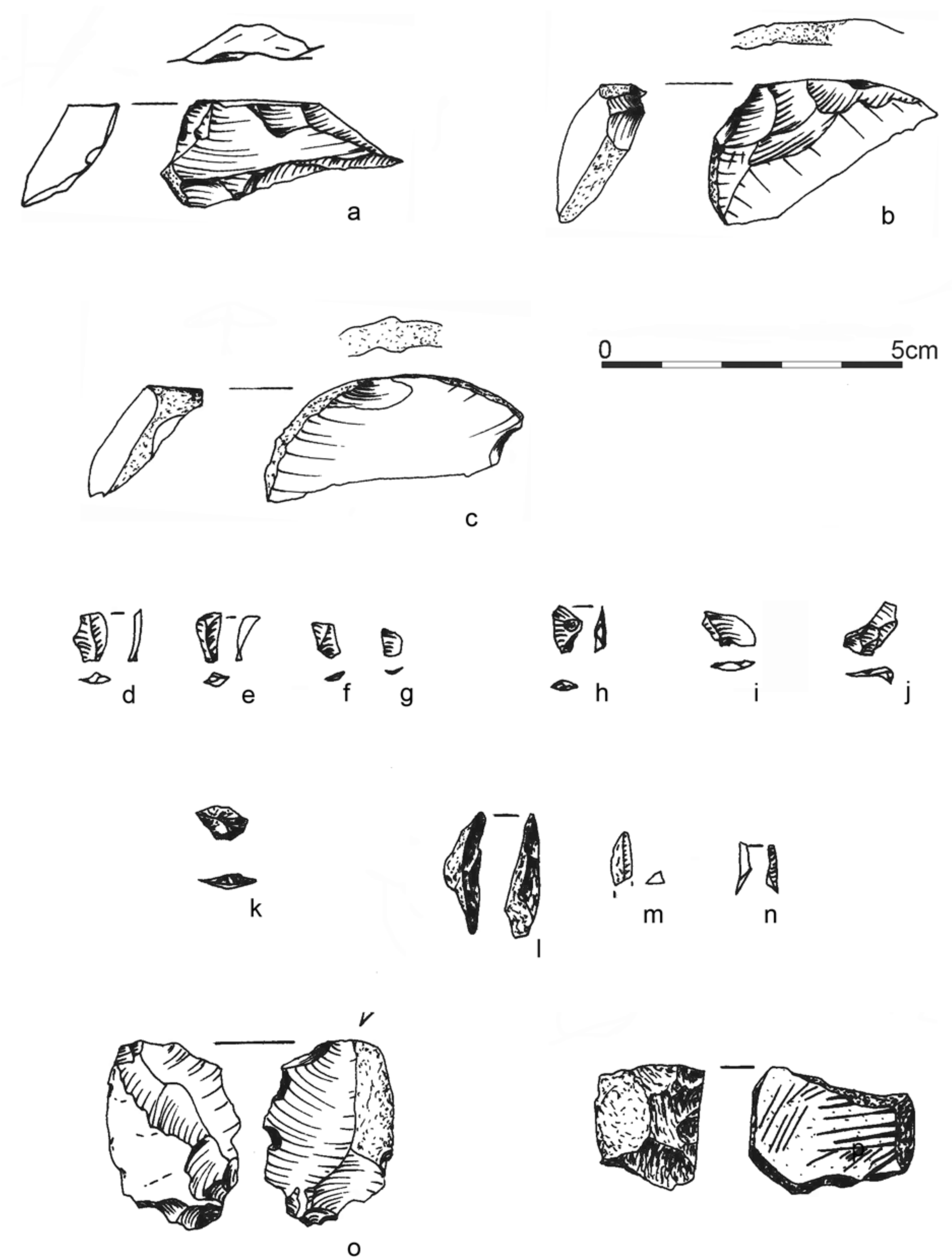


Figure 2.8. *3-J-26, preparion flakes (a-c), chips (d-k), burin spalls (l-n), bipolar piece (o), basalt anvil(?) fragment (p) (scale 1:1).*

flakes, again confirms the previously argued hypothesis.

<u>Technical debris – rejuvenation elements and crested products</u>

A small amount of technical debris was also noted. This reflects two kinds of endeavours, rejuvenation of the core platform and creation of the crested edge. Material resulting from those actions were crested blades (Figure 2.9i-j) and rejuvenation core tablets (Figure 2.9k,m).

In total, only three crested blades were noted on site 3-J-26, two removed from a flint core and the third one of chert. All were found on the surface in the vicinity of area D. Both flint crested blades had plain butts while the chert debris had a prepared butt. The presence of crested

TABLE 2.15. BIPOLAR FLAKES.

Raw material	A+D surface		A+D sub-surface		D Neolithic features		E surface		E sub-surface		Other surface collection
Flint	3	75%	0	-	1	50%	3	75%	0	-	2
Agate	0	-	1	100%	1	50%	0	-	3	100%	0
Quartz	1	25%	0	-	0	-	1	25%	0	-	0
Total:	4	100%	1	100%	2	100%	4	100%	3	100%	2

blades confirm the intentional creation of a crest on the cores and its use as a guiding ridge during the first stages of elongated flake removal. Prepared crests (but not removed) were also noticed on a few cores.

Rejuvenation core tablets were recorded in much greater numbers (37 specimens). These occurred in all contexts. No one tablet was used as a blank for tool preparation. Most of the tablets were removed from flint cores (31), all the rest - agate quartz and volcanic rocks - completed the group of unidirectional worked raw materials. In the case of quartz tablets, their origin from quartz pebbles was possible but due to the absence of the outer surfaces it was impossible to prove this without refittings.

Tools

In every context of site 3-J-26 retouched tools of various forms were recorded. Each tool or tool fragment was registered as a small find and given a unique inventory number.

The general structure of the tool types is presented in the tables below. It should be remembered that the degree of elaboration of the various raw materials was different being closely related to specific technological approaches resulting in blank production for the final products (tools) (see Table 2.1).

On the surface in the north-north-east part of the site, including areas A and D, 36 tools or tool fragments were recorded. Flint tools predominated but also tools made of quartz and quartz pebbles were present. Not a single agate retouched form was noted. The only tool made of volcanic rock was a simple flake with traces of use in the form of irregular negatives. Sandstone tools were macrolithic hammerstones and grinders.

The typological structure in this area was characterised by a predominance of insertions, where typical lunates formed 36% of the assemblage. All the rest of the insertions were blades and flakes with traces of use as well as backed pieces. Other tool categories are presented in Table 2.17. Of note was the high number of small bipolar tools (wedges?).

Exploration of the sub-surface levels in area A (1m^2) as well as area D (excluding the fills of the Neolithic and post-Neolithic features) also produced a number of tools. Similar to the situation observed on the surface, most of the tools were made of flint flakes. Also a few quartz tools

TABLE 2.16. CORE REJUVENATION TABLETS.

Raw material	A+D surface	A+D sub-surface	D features Neolithic	D features post-Neolithic	E surface	E sub-surface	Other surface collections	Total
Flint	1	12	1	5	5	2	5	31
Agate	0	0	0	2	0	0	0	2
Quartz	0	1	0	1	0	0	0	2
Volcanic	0	0	0	0	0	0	2	2
Total:	1	13	1	8	5	2	7	37

TABLE 2.17. TOOLS FROM THE SURFACE AT AREA NNE (130M²).

Raw material	Lunates	Other Insertions	Backed pieces	Truncations	Perforators	Scrapers	Burins	Denticulate tools	Notch tools	Use-retouched pieces	Bipolar tools	Hammerstones	Grinders	Total:
Quartz	-	1	2	-	-	-	1	1	1	-	-	-	-	6
Quartz pebbles	-	1	-	-	-	1	-	-	-	-	2	-	-	4
Flint, Chert, Petrified wood	4	2	1	-	1	2	1	3	2	2	1	-	-	19
Agate	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Volcanic Rocks	-	-	-	-	-	-	-	-	-	1	-	-	2	3
Sandstone, Granite	-	-	-	-	-	-	-	-	-	-	-	2	2	4
Total:	4	4	3	-	1	3	2	4	3	3	3	2	4	36

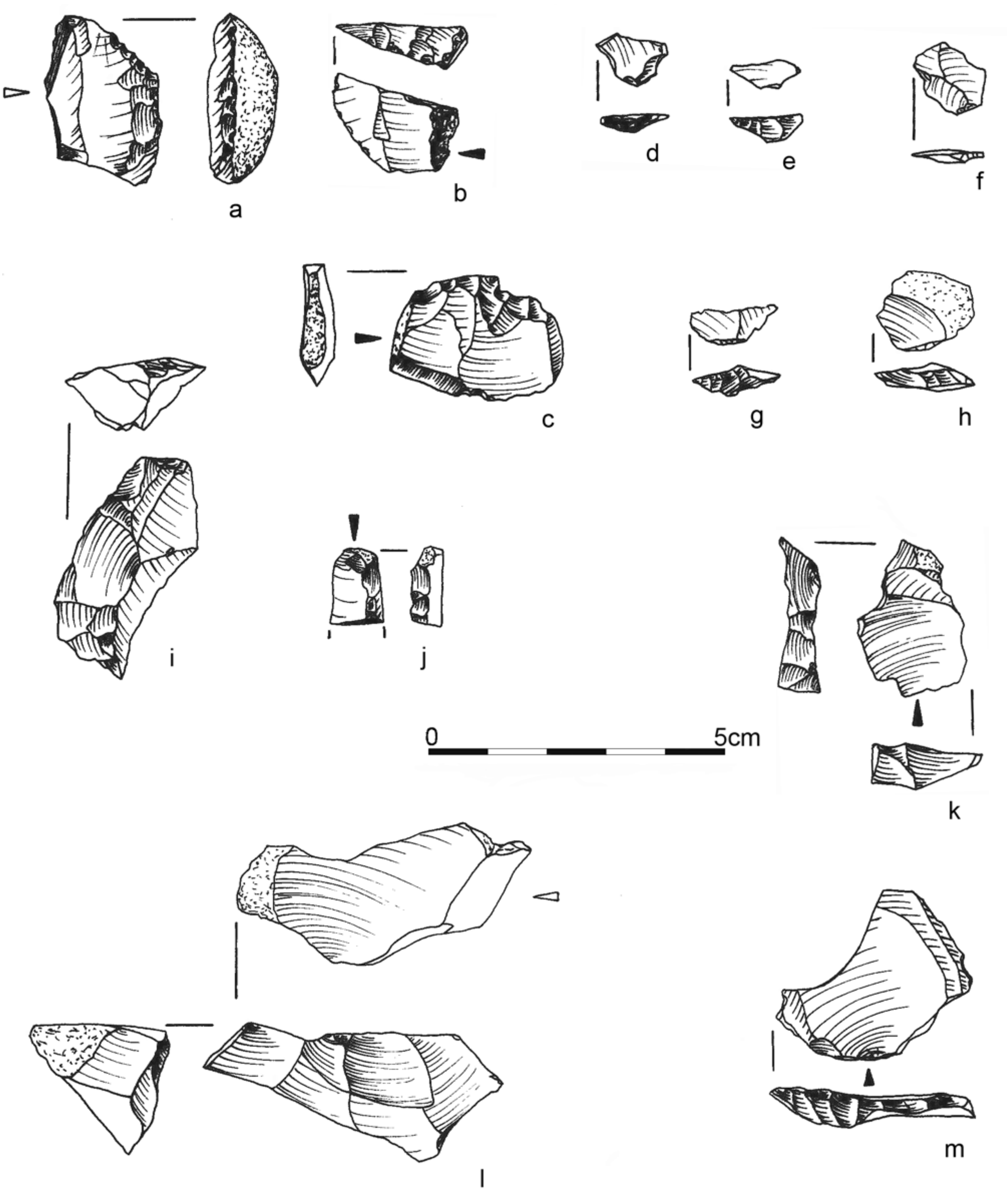


Figure 2.9. *3-J-26, reparation flakes (a-c), butt-preparation chips (d-h), crested flakes (i-j), rejuvenation-core tablets (k-m) (scale 1:1).*

were recorded as well as a single agate form.

Typological structure dominated insertions, where lunates were 38%. Also high numbers of denticulated tools were noted. Other tool types (perforators, scrapers, burins, notches) were present in equal proportions - as on the surface. The presence of burin spalls made of quartz and flint points to burin production exactly in that zone. In the sub-surface levels bipolar tools and macrolithic sandstone forms were not recorded confirming that only small fragments penetrated down into the soil.

In the south-west and north-west parts of the site (including area E), of 100m^2, tools were collected and that assemblage can be a reference point for the artefacts from the north-north-east sector.

Again flint tools predominated, also single quartz and agate tools were found. Similar to the situation in the north-north-east sector, macrolithic sandstone tools were observed mainly on the surface.

Among tool types insertion dominated, lunates made up 63%. Other types were also noted including bipolar forms.

TABLE 2.18. TOOLS FROM THE SUB-SURFACE CONTEXT AT AREAS A AND D (26M²).

Raw material	Lunates	Other Insertions	Backed pieces	Truncations	Perforators	Scrapers	Burins	Denticulate tools	Notch tools	Use-retouched pieces	Bipolar tools	Hammerstones	Grinders	Total:
Quartz	-	-	-	-	-	1	3	-	1	-	-	-	-	5
Quartz pebbles	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Flint, Chert, Petrified wood	5	6	1	1	2	-	-	12	2	-	-	-	-	29
Agate	-	-	-	-	-	1	-	-	-	1	-	-	-	2
Volcanic Rocks	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sandstone, Granite	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total:	5	6	1	1	2	2	3	12	3	1	-	-	-	36

Exploration of the sub-surface levels in area E produced a number of tools. Flint tools predominated, also a single quartz pebble and volcanic rock tools were noted.

Among the types structure insertions prevailed, lunates were 50%. Other types noted were burins, scrapers and use-retouched flakes. A single small hammer-stone made of quartz pebble was found.

Examination of the fills of the Neolithic features produced only a few tools all made of flint. These represented typical forms – two insertions and one scraper.

In addition to the tool collection from the features at site 3-J-26 were 25 forms recorded during the exploration of the post-Neolithic pits. No doubt these artefacts were not elements of the Kerma period burial, so we can associate them with the Neolithic settlement. The quantity, much higher than from the undisturbed Neolithic features, was a result of the large extend of the post-Neolithic pit and the almost complete removal of the earlier Neolithic pits. Simply, the same 'soft' spaces among the rocky bedrock were used.

Flint tools again predominated, single forms made of quartz and agate were also noted. Among the tool types as elsewhere insertions dominated, lunates making up 60%. Also many flakes with clear traces of use were noted as well as five scrapers and a single perforator, denticulated tool and bipolar forms made of quartz similar to those tools found on the surface.

A collection of tools from early-Neolithic 3-J-26 complemented the artefacts found on the surface in other areas. This material was from elongated sondages 1m wide, crossing the whole site along its east-west and north-south axis. These tools had the smallest value for our analysis, coming from parts of the site destroyed to a varying degree.

Tool typology

The form of the lithic tools, mostly acting as components of more complex instruments, is the main feature used to interpret their function. However, the greatest danger for the researcher lies in over-simplification in the analysis of the material and treating the stone tools divorced from their context of production and use. Particular tool types usually are studied without a consideration of the raw material used or of technological diversity, assuming a

TABLE 2.19. TOOLS FROM THE SURFACE AT AREA SW/NW (100M²).

Raw material	Lunates	Other Insertions	Backed pieces	Truncations	Perforators	Scrapers	Burins	Denticulate tools	Notch tools	Use-retouched pieces	Bipolar tools	Hammerstones	Grinders	Total:
Quartz	-	-	-	-	1	-	-	1	-	-	-	-	-	2
Quartz pebbles	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Flint, Chert, Petrified wood	7	2	1	-	1	5	3	5	3	7	1	-	-	35
Agate	-	1	-	-	-	-	-	-	-	-	-	-	-	1
Volcanic Rocks	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sandstone, Granite	-	-	-	-	-	-	-	-	-	-	-	-	2	2
Total:	7	3	1	-	2	5	3	6	3	7	1	-	2	40

TABLE 2.20. TOOLS FROM SUB-SURFACE CONTEXT AT AREA E (25M²).

Raw material	Lunates	Other Insertions	Backed pieces	Truncations	Perforators	Scrapers	Burins	Denticulate tools	Notch tools	Use-retouched pieces	Bipolar tools	Hammerstones	Grinders	Total:
Quartz	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Quartz pebbles	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Flint, Chert, Petrified wood	2	2	-	-	-	1	1	-	-	2	-	-	-	8
Agate	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Volcanic Rocks	-	-	-	-	-	1	-	-	-	-	-	-	-	1
Sandstone, Granite	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total:	2	2	-	-	-	2	1	-	-	2	-	1	-	10

TABLE 2.21. TOOLS FROM THE FILLS OF NEOLITHIC FEATURES (AREA D).

Raw material	Lunates	Other Insertions	Backed pieces	Truncations	Perforators	Scrapers	Burins	Denticulate tools	Notch tools	Use-retouched pieces	Bipolar tools	Hammerstones	Grinders	Total:
Quartz	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Quartz pebbles	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Flint, Chert, Petrified wood	1	-	-	1	-	1	-	-	-	-	-	-	-	3
Agate	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Volcanic Rocks	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sandstone, Granite	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total:	1	-	-	1	-	1	-	-	-	-	-	-	-	3

TABLE 2.22. TOOLS FROM THE FILLS OF THE POST-NEOLITHIC FEATURE (AREA D).

Raw material	Lunates	Other Insertions	Backed pieces	Truncations	Perforators	Scrapers	Burins	Denticulate tools	Notch tools	Use-retouched pieces	Bipolar tools	Hammerstones	Grinders	Total:
Quartz	-	-	-	-	1	-	-	-	-	-	1	-	-	2
Quartz pebbles	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Flint, Chert, Petrified wood	5	3	-	-	-	5	-	1	-	8	-	-	-	22
Agate	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Volcanic Rocks	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sandstone, Granite	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total:	5	3	-	-	1	5	-	1	-	9	1	-	-	25

functional homogeneity. Also morphological tools clustering is usually done defining position and type of retouch without an appreciation of technical constraints or how it was to be used (for example whether the retouched side was designed to be fitted into a handle or acted as a working edge?). The results of such analysis usually are used for interpreting cultural diversity.

Mostly in Nubian early-Neolithic inventories, tool categories are dominated by arched-backed insertions (crescents, lunates). Specimens with a burin blow negative on the blunted edge are singled out and defined as chronological markers (Marks *et al*. 1967-1968; Usai 2003). This was based exclusively on surface collections of material recovered from a few early-Neolithic sites located near ed-Debba. However, if we accept that such a burin scar could be done accidentally (e.g. due to unskilled use), we will find a lot of examples on elements of sickles as well as arrows from many periods (see Hon-

TABLE 2.23. TOOLS FROM THE SURFACE IN OTHER AREAS.

Raw material	Lunates	Other Insertions	Backed pieces	Truncations	Perforators	Scrapers	Burins	Lenticulate tools	Notch tools	Use-retouched pieces	Bipolar tools	Hammerstones	Grinders	Total:
Quartz	-	1	-	-	1	-	1	-	1	1	-	1	-	6
Quartz pebbles	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Flint, Chert, Petrified wood	7	4	-	1	2	4	-	4	-	4	-	-	-	26
Agate	1	-	-	-	-	-	-	-	-	1	-	-	-	2
Volcanic Rocks	-	-	-	-	-	-	-	-	-	-	-	2	-	2
Sandstone, Granite	-	-	-	-	-	-	-	-	-	-	-	-	3	3
Total:	8	5	-	1	3	4	1	4	1	6	-	4	3	40

egger 2008). Insertion damage frequently takes the form of breaks and blows along the working and backed edge (the same impacts were noticed on many late-Neolithic insertions from funerary deposit at Multaga 2 also close to ed-Debba - Osypiński, script a). Apart from lunates, other insertions are usually treated as separate types - backed pieces, truncations, triangles, trapezes etc. Their separate analysis makes sense only if we accept that their function was different from that of lunates. That is why, in my opinion, the basis of type definition should be the comparison of metrical features and traces of use (e.g. macroscopic impacts) instead of the degree of retouching of those parts used for fitting.

The other tool categories should also be analysed in their production context (intentional raw material selection, methods of blank production, methods and aims of retouching) as well as using other factors (degree of wear, repairing and reusing forms, type of final damage). We should remember the complex nature of processes influencing present-day tool forms (tools which were not primarily designed for use were extremely rare). Also post-depositional factors played some role (secondary overheating, breaking, patination, etc.).

TABLE 2.24. INSERTIONS TYPES IN THE VARIOUS CONTEXTS.

Type	Neolithic features	Post-Neolithic features	Surface, sub-surface
A	1	2	15
B	-	3	9
C	-	-	5
D	-	1	4
E	1	-	2
F	-	2	21

1.3.4.1 Insertions

In attempting to classify insertions from site 3-J-26 I sought to check if intentional raw material selection and shaping could be recognised. Such tool makers' intentions are constrained by the size of composite instruments - complete length of the working (cutting) edge, its segment character, width and depth of a groove in the frame. Of course I am conscious of a degree of oversimplification in the recording - I assume that all lithic tools of that category were elements of sickles-knifes and also assume that in the early-Neolithic, standards of forms and sizes for such instruments existed.

For the basic analysis a preliminary typology was established:

A - typical crescent-shaped insertions with straight working edge (sharp) and arched back (Figure 2.10a,b,n-y);
B - arched backed insertions but with irregular working edge (mostly convex) (Figure 2.10c-f,h-z);
C - straight backed blades/flakes with irregular working edge (Figure 2.11a,g-i);
D - wide trapezes with diagonally retouched sides and straight working and back (not retouched) edges (Figure 2.10g, 2.11c-f);
E - truncations with one side diagonally retouched and more or less regular working edge (Figure 2.10j-k);
F - unretouched flakes with clear traces of use as insertions (Figure 2.15d-n).

In the insertion production, the best quality raw materials were preferred - flint and chert. Other rocks only had minimal importance and were recorded mainly in the form of unretouched flakes (F-type). However, the form and size of these latter tools are best described as a preference for blank forms. If length and width standards for lithic insertions are functionally important, items with minimal

TABLE 2.25. INSERTIONS TYPES DIVIDED INTO RAW MATERIAL CATEGORIES.

Type	Quartz	Quartz pebbles	Flint/Chert	Agate
A	-	-	17	1
B	-	-	12	-
C	2	-	3	-
D	-	-	5	-
E	-	-	3	-
F	2	1	19	1

Figure 2.10. *3-J-26, insertions.*

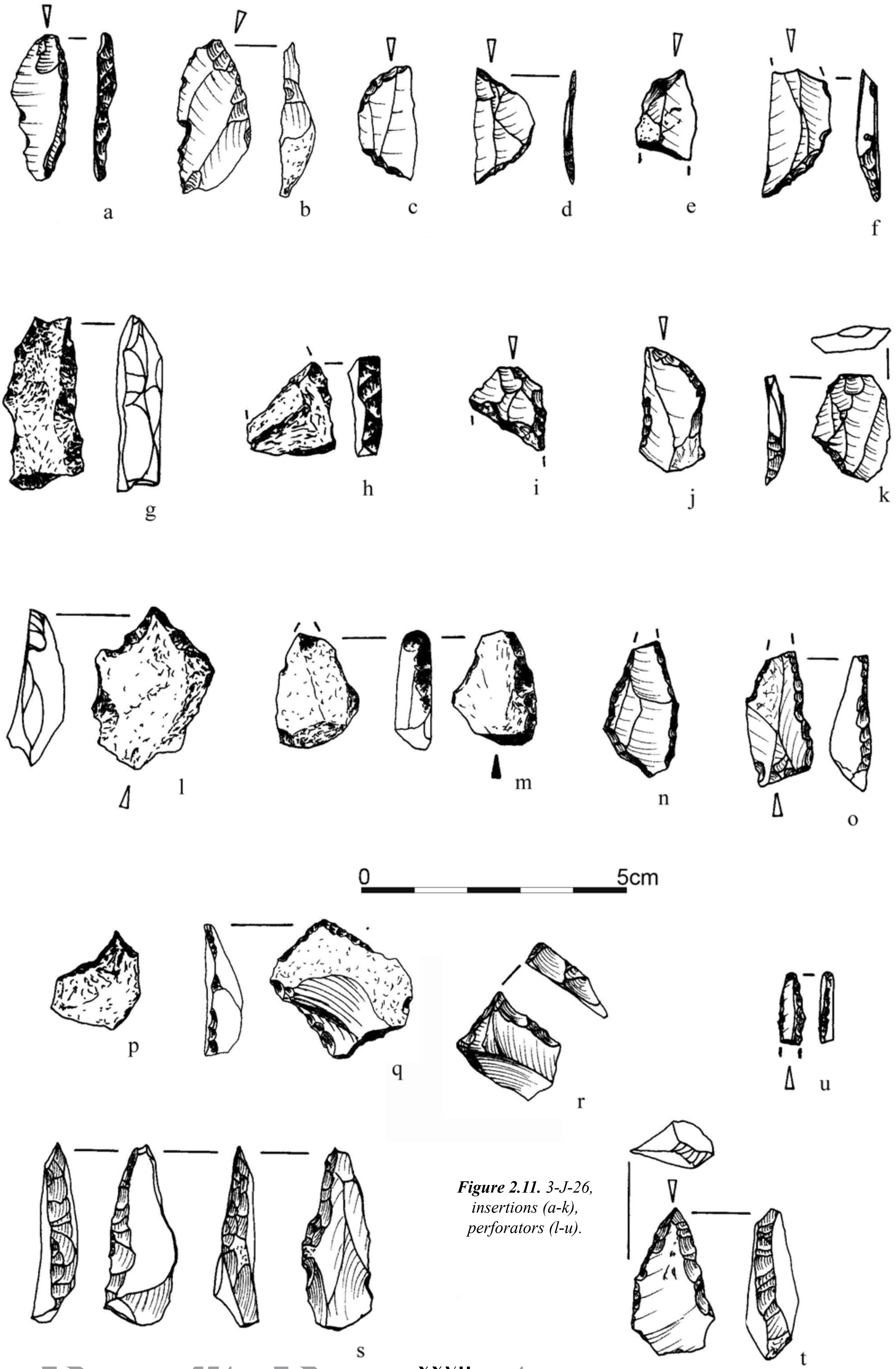


Figure 2.11. *3-J-26, insertions (a-k), perforators (l-u).*

changes (retouched) should be ideal. A comparison of the size (length and width) of F-type insertions with the most frequent retouched crescents (A and B-types) allows the final verification of the size standards hypothesis.

F-type insertions were a little shorter than A and B-types. The width of F-type insertions also is similar to B-type specimens. Thus, unretouched flakes (F-type insertions) almost perfectly fit into the size range defined by A and B-type crescents.

It should be noted, that the width of insertions, which influenced the regularity and continuity of the whole instrument's cutting edge, differs - A-type crescents were narrower (and thinner) than B-type specimens. Trapezes (D-type) mostly were similar to A-type lunates. Probably trapezes were the same tool category as A-type, but were performed (retouched) to a lesser extent (discontinuous back).

TABLE 2.26. INSERTIONS PARAMETERS IN ALL RAW MATERIALS (ONLY COMPLETE VALUES MEASURED).

Type	Length				Width				Thickness			
	min	max	average	sample	min	max	average	sample	min	max	average	sample
A	15	32	25	5	8	20	11.1	17	2	10	3.6	17
B	19	28	25.1	9	11	16	13.4	12	3	6	4.4	12
C	22	32	27	3	10	17	14.2	5	3	7	4.4	5
D	21	27	23	3	11	14	11.8	5	2	4	3.4	5
E	20	23	21.5	2	10	14	12	3	3	3	3	3
F	13	36	24.5	12	6	20	13	19	1	6	3.3	19

C-type insertions (backed flakes) exhibit greater difference - these were robust - massive and larger than all the other gracile tools from the insertions category (A and D types). C-type tools could be used at least together with the massive B-type insertions, more particularly as the width of both types is exactly the same.

Summing up, insertions from site 3-J-26 can be divided into two size categories:

- smaller and thinner tools, made mainly of gracile blade blanks (types A, D, E)
- larger and thicker insertions made of flakes and massive, trapezoidal in cross-section short blades (B and C types).

Another feature confirming the correctness of that division was the regularity of the working (cutting) edge. Types A and D had a straight edge while insertions of types B and C were irregular. Further verification of the proposed typological dualism (in its functional aspect) will be provided after wear traces studies. Having only single tools, without the preservation of functional sets, we are limited to metrical and technological analysis along with analogies drawn from other sites. However there are few published discoveries of preserved functional sets and these come exclusively from funeral contexts dated to the Late Neolithic period (e.g. Kobusiewicz 1996, 352). No doubt such sets were in use in Nubia also before the Late Neolithic period, and it was not funerary but everyday activities which defined the standards (shape and size) for the tools in what we could call 'mass-produced' products. The production of insertions for composite instruments had to conform to a particular technological regime, and there were no place for freestyle.

Discovering single insertions bearing many traces of use points to past reparation actions by the replacement of some cutting elements. Did this occur all at once or on single specimens only - that is the main question leading to the possible substantiation of the method of conscious standards (types) reconstruction. After existing in the Neolithic the system of single insertions replacement explains, in my opinion, the shape diversity within the insertion categories (gracile A and D types together with part of E and F types versus robust B and C types together with part of F-type insertions). Indirect evidence to support this hypothesis is also the discovery of insertion deposits of various shapes of retouched back, but most probably used for the same function (designed to fit into the same frame) (e.g. Multaga 2 D.17, Osypiński, script a).

Perforators

Tools used for piercing and drilling (assessed prior to wear-trace analysis) from site 3-J-26 were separated into two main categories. The first category were tools with the point (working part) slender, almost spindle-shaped (Figure 2.11m-o,s-u), while the second group were massive, wide tools with the point articulated to as lesser degree (Figure 2.11 l,p-r). Slender perforators were made of massive blade-like flakes, but the second type of tool was made mainly from flakes.

In four slender perforators breaks to the tip were noticed - most probably damage related to intensive use. Such damage was not recorded on the thicker perforators. Slender perforators could have been elements from complex instruments (drills, perforators with a handle). Also the size of most of the slender perforators was similar pointing to some existing standards in this tool category. One of the factors influencing the move towards a size standard could be the diameter and depth of the hole required. Among the pottery fragments found on site 3-J-26 were a few sherds with drilled holes for repairing. These holes were made undoubtedly after firing, thus their matrix can be considered as a hard material. In all cases, holes were made from both faces (outer and inner) what resulted in a bi-conical section. Thus, drilling tools should be made of a raw material harder than pottery, with a slightly conical tip and irregular outline. Drilling from both sides points to using tools with which it was impossible to make very deep hole. All these characteristics fit with the flint perforators with conical point and irregular (retouched) edges. In the case of pottery holes, the depth was not dependent on the 'spindle-form' because it was possible to drill from both sides (thus even thick flake tools could be used). Such work however, demanded precision and the uniform character (each pot had at least several very similar holes) points to the skilled use of tools of high quality. The only one preserved tip of a slender perforator bore traces of use (polishing) only at the end which suggests that it was used only for the making of shallow holes (Figure 2.11u). However in this case we cannot exclude the possibility that other material were being worked, for instance egg shell.

Scrapers

Excavations on site 3-J-26 produced 22 scrapers mostly made of flint/chert (Figure 2.12). All these tools were made of flakes, but only three of primary flakes. In most cases the working part was placed at the distal end of the blank.

A common feature of the scraping tools from early-Neolithic site 3-J-26 was their large size, not surprising when one considers their function (ascertained without wear-trace analysis). Based on working-edge shape, two categories can be defined, reflecting the degree of wear and reparation. The first category is scrapers with convex working parts, the second had straight working parts. In the few cases of broken scrapers, additional retouch on the sides was also noted (Figure 2.12d,i,v).

Similar to the previously described tools, scrapers also showed production/use dualism; tools made off better blanks (primary flakes, massive regular flakes) sometimes with the sides retouched (for the handle?) versus 'temporary' tools with a much lower degree of wear.

Burins

All ten burins recorded on site 3-J-26 came from the surface or sub-surface soil layers. They can be divided into two categories due to the form of the tip (working part) and its angle. The first category was truncation burins with the tip formed at a right angle (Figure 2.13a,c,d). The retouched edges (truncation) assumed the shape of a shallow notch, which makes these tools asymmetrical. The second category was dihedral-side burins with the tip formed also approximately at a right angle (Figure 2.13b, e-k). Two burins of that latter type had negatives of secondary blows (re-sharpening).

Undoubtedly the two burin types reflect various functions - these were not different stages of the same tool's wear. However, it is difficult to precisely define the function and results of work without wear-trace analysis or finds with elements fitting with the burin working parts. In general, burins are associated with the making of grooves in hard materials (bone, wood). Numerous insertions confirm undoubtedly the presence in early-Neolithic instrumentarium of handles from sickles/knifes made of wood or bone.

Denticulate tools

In the case of denticulated tools from site 3-J-26 diversity is visible in spite of the size and quality (blank selection, way of retouching). The first type of denticulated tool was made of large chunks, sometimes final cores – the working edge was created with a few deep clactonian notches (Figure 2.14a-d). The second type was tools made of more regular flakes (sometimes elongated) and the working part was created with a series of small negatives thus the tool could be used as a saw (Figure 2.14e-q). In both cases we can suppose the 'temporary' character of denticulated tools, no traces of long-time use or repair were noticed (however, without wear-trace analysis). Also raw materials used for production did not point to a particular preference - there are both quartz and flint tools present.

Notch tools

Also probably of a temporary character were notch tools. No raw material preferences was noticed - both quartz and flint tools were present. Notch tools can be divided due to their shape (depth, size) and location of the notch - working part. The first category was flakes with a small (*c*. 5mm in diameter) notch located on one edge (Figure 14m,n,p). The second group was of flakes with a wider notch often modifying the whole edge outline (Figure 14 l,o,q-v). The depth of the notches varied, usually they had a regular outline. The third type was represented by only one tool made on a big flake with two shallow notches located on two opposite sides (Figure 2.13x).

Use-retouched pieces

Another type of tool from site 3-J-26 was made from flakes without shaping retouch but which were undoubtedly used as tools for various functions. These were recorded mostly on the surface and in the post-Neolithic pit fills (in secondary contexts). These tools represented a wide variation in raw material and size. The most abundant flakes were made of flint and chert suggesting a preference for better quality blanks (of waste character?). Without wear-trace analysis we are limited to observations of the morphology and macroscopic traces of use. Some of these tools were used as unretouched insertions (described above as F-type insertions).

Bipolar pieces

Similar observations could be made for bipolar products. As mentioned in previous chapters doubts as to bipolar blank production are confirmed here, where the final forms of all debitage actions are described. There are no tools made of bipolar flakes. Our attention should be directed to bipolar negatives on the flakes, interpreted as traces (impacts) of work. These products were very similar to each other but were made of various rocks (both quartz and flint). Their shapes are reminiscent of small axes and all bipolar fractures started at the straight edge, perpendicular to the morphological axis. Preliminary interpretation of these forms are that they were used as wedges (Figure 2.15a-c).

Hammerstones

On the surface of the site a few stone hammerstones were noted. These were made of sandstone, quartz pebbles and volcanic rock pebbles. Selection of the raw material and blanks for tools took regard of hardness and size. The various forms and raw materials of the stone-working tools confirm the diverse methods and stages of debitage production. Other materials (not knapped rocks) working by hammerstones should not be excluded.

Figure 2.12. *3-J-26, endscrapers.*

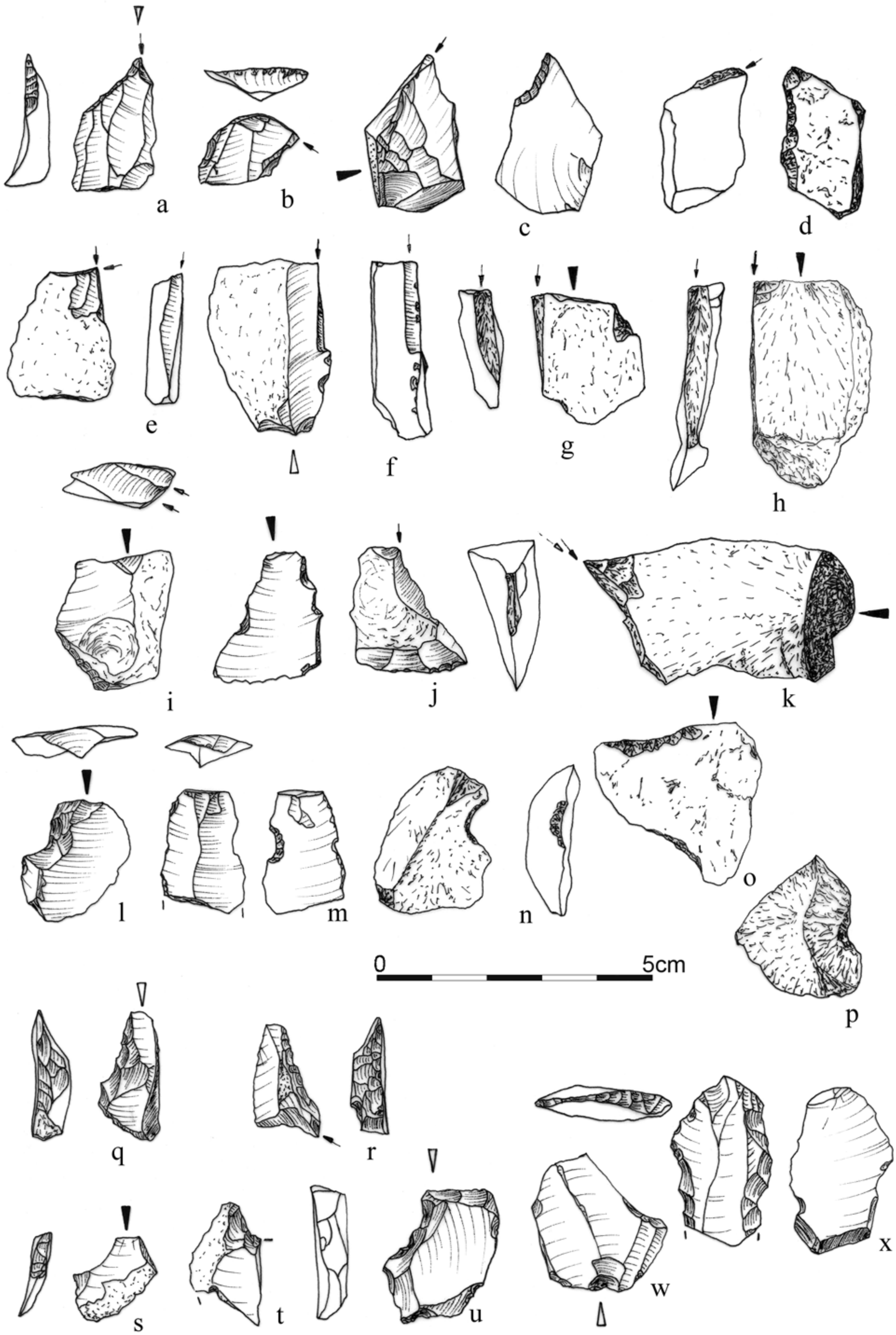


Figure 2.13. *3-J-26, burins (a-k), notch tools (l-z).*

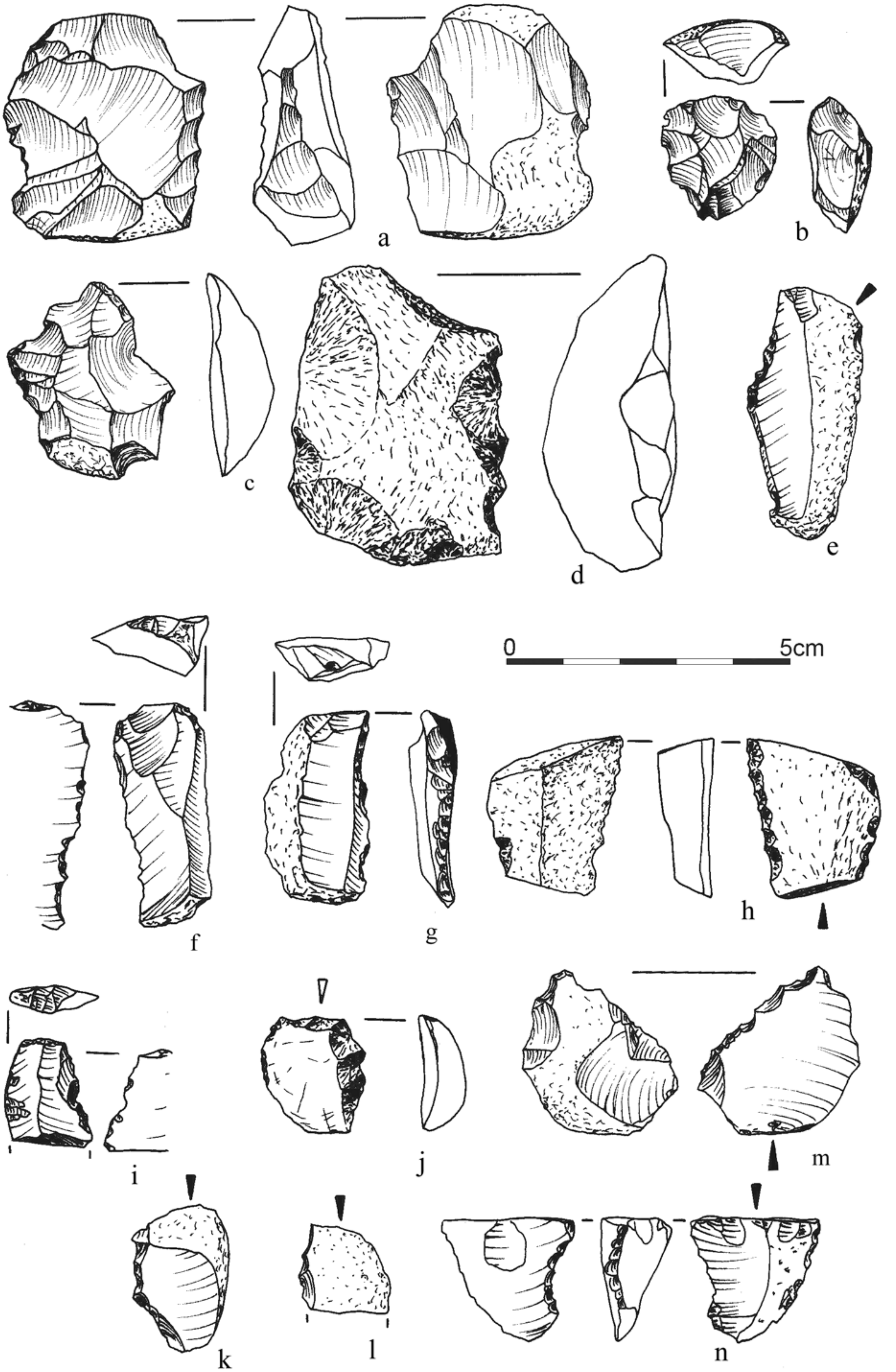
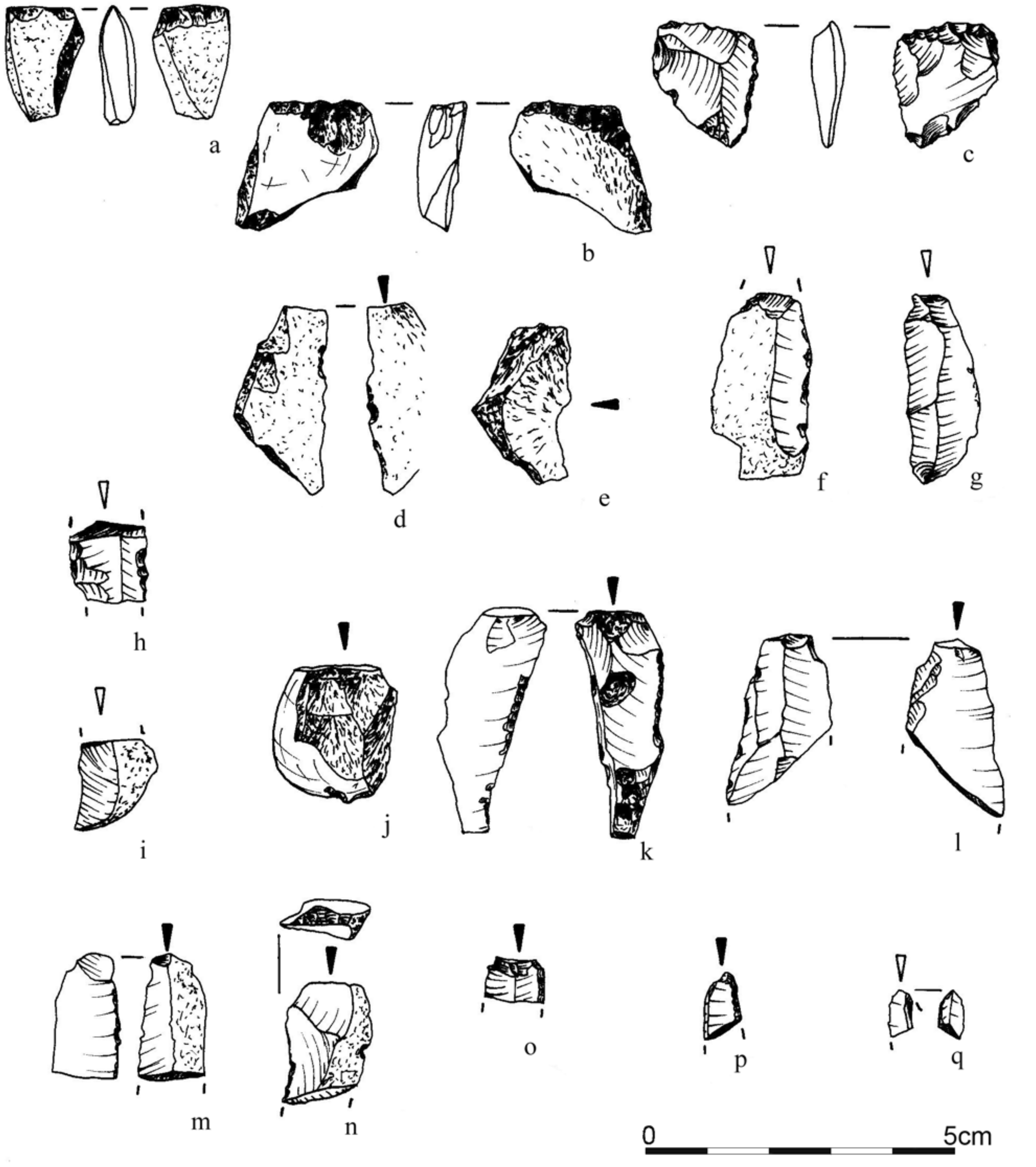


Figure 2.14. *3-J-26, denticulate tools.*



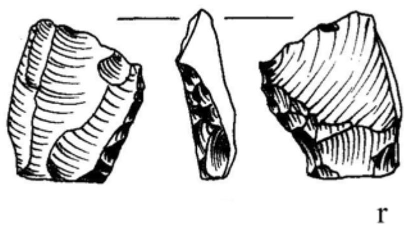


Figure 2.15. *3-J-26, bipolar pieces (a-c, r), using retouched flakes (d-q), eccentric piece(s).*

<u>Grinding tools</u>

A small number of tools related to grinding was recorded almost exclusively on the surface. These were both grinders and fragments of grinding bases or bigger palettes. Most were made of sandstone and volcanic rocks. In the Neolithic pit fill a fragment of a sandstone grinding base was found, confirming the relationship of such instrumentarium with the early-Neolithic settlement.

As a summary, a complete list of the stone tools recorded on site 3-J-26 is presented. The list includes many material correlates of activities made on the site, although undoubtedly much more data could be obtained as a result of wear-trace studies.

TABLE 2.27. TOOL KIT OF SITE 3-J-26.

Tool type	Quartz	Quartz Pebble	Flint,Chert, Petrified Wood	Agate	Volcanic rocks	Sandstone, Granite
Insertion A-type (lunate with straight edge)	-	-	17	1	-	-
Insertion B-type (lunate with convex edge)	-	-	12	-	-	-
Insertion C-type (e.g. backed piece)	2	-	3	-	-	-
Insertion D-type (e.g. other insertion - trapeze)	-	-	5	-	-	-
Insertion E-type (truncation)	-	-	3	-	-	-
Insertion F-type (e.g. use-retouch piece)	2	1	19	1	-	-
Perforator A-type (slender)	1	-	5	-	-	-
Perforator B-type (thickset)	2	-	1	-	-	-
Scraper (well-made)	1	1	14	1	1	-
Scraper (temporary)	-	-	4	-	-	-
Burin on truncation	1	-	3	-	-	-
Burin dihedral	3	-	3	-	-	-
Denticulate tool (massive)	2	1	4	-	-	-
Denticulate tool (saw?)	1	-	9	-	-	-
Notch tool (deep round notch)	2	-	1	-	-	-
Notch tool (shallow notch)	1	-	8	-	-	-
Notch tool (double-side notch)	-	-	1	-	-	-
Use-retouch piece (other)	-	-	2	2	1	-
Bipolar tools	1	2	2	-	-	-
Hammerstones	1	2	-	-	2	-
Grinding tools	-	-	-	-	2	7
Unidentified tool fragments	3	-	17	-	-	-

3. Lithic assemblage of site 3-O-3

Introduction

The main aim of the excavations carried out in December 2003 on site 3-O-3 was to test the hypothesis concerning the funerary character of the stone structures discovered during the 1999 survey suggested by the discovery of a Neolithic funerary vessel (caliciform beaker) in the vicinity (Welsby 2003, 20). The archaeological site was located on a medium size, relatively flat space between rocks as well as in a maze of huge boulders. Apart from the Late Neolithic beaker fragment, also early Neolithic artefacts were noted (pottery fragments, lithics) as well as some stone constructions (walls, mounds) and pottery of the Kerma and medieval periods.

Site 3-O-3 was investigated by a detailed collection of surface finds as well as by exploring sub-surface levels in areas of particular dense artefact concentrations. All the finds were registered in a 1m^2 grid and by 100mm spits. The excavated area was divided into 10 x 10m areas labelled A - G (Figure 3.1). Inside each area a 1m^2 grid was laid out. In some places also additional trenches were excavated to examine sub-surface levels potentially containing artifacts.

All the archaeological material is currently being studied, the pottery by Isabella Welsby Sjöström; the lithic assemblage is the main subject of this paper.

General description of the lithic collection

During the 2003 excavations a total of 4526 lithic artefacts were found in the fills of sub-surface features as well as on the present-day surface and in the sub-surface soil levels (due to natural post-depositional movements). Lithic artefacts were preserved in good condition, no patina younger than that of the period of the debitage (Neolithic) was noted. The small number of burnt items (384 in total) points to the lack of secondary thermal factors (e.g. burning of plant cover over the entire surface of the site). These artefacts could be associated with some human activity during the use of the settlement (most probably not of a single period), however, their present-day dispersion did not allow us to specify any particular activity zones. A general trend of artefacts dislocation and accumulation in the lowest places was observed: in Area E concentrations of artefacts were recorded, marking the direction of the secondary movement of items into low-lying areas of the site.

The artefacts recorded in the sub-surface soil levels were preserved in similar condition. In the excavated areas lithics occurred in the whole soil unit, between 50mm and 200mm down to the bedrock. Their presence and the variations in their size points to natural post-depositional factors (water activity, plant roots and small fauna). The present-day surface is no doubt a result of erosion of the upper soil layers mostly by wind and solar activity. Most probably due to this erosion a small amount of pottery as well as organic remains was found on the surface.

Results of the analysis

Contexts

As on most Neolithic sites in the Middle Nile region, preservation of deposition units (features) on site 3-O-3 was poor. Artefacts were recorded mostly on the surface – a product of upper soil level erosion of unknown thickness. If the surface was not flat small items were commonly moved down the slopes.

Only in Area E did the depth of the present-day soil reach 200mm. That unit contained sand and wind-blown silt elements cemented with rain water. Neolithic artefacts were equally dispersed throughout the whole soil unit. Much better was the condition of Neolithic pottery fragments with lack of later (medieval) admixtures. Moving of small items (lithics, pottery sherds) down through the soil undoubtedly happened during humid periods when the main factors were water, plant roots and small digging rodents. Since the final stages of the Holocene, the main element of climatic changes in Northern Sudan was aridity with surface erosion and cessation of the soil-creation processes.

A shallow pit fill was explored in Area D, initially interpreted as part of funerary feature, lying between huge boulders (Figure 3.1). The pit did not have a sepulchral character, in its fill Neolithic settlement waste was re-

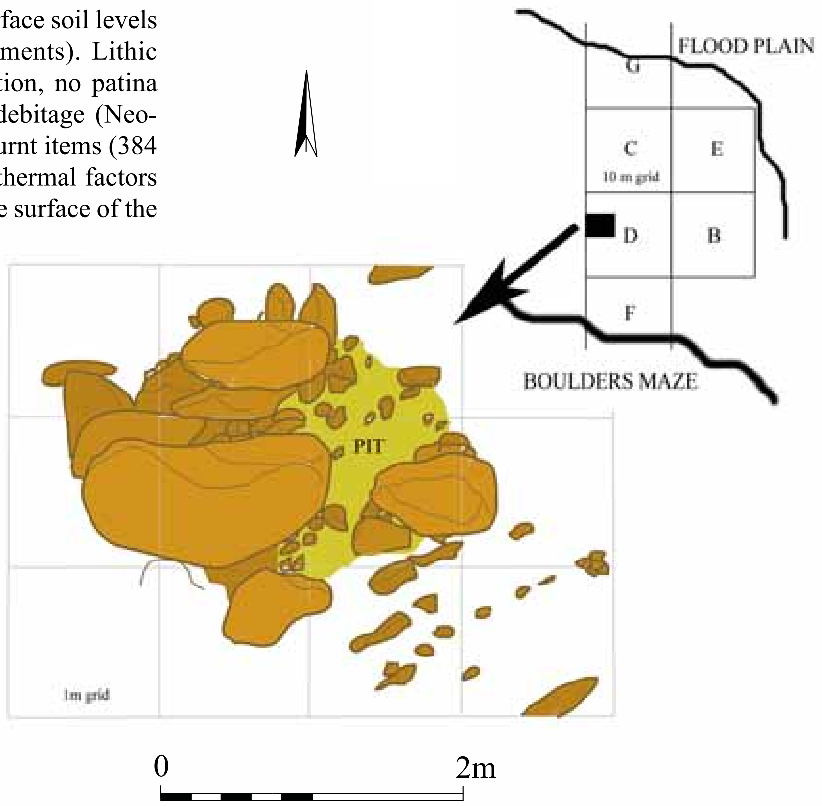


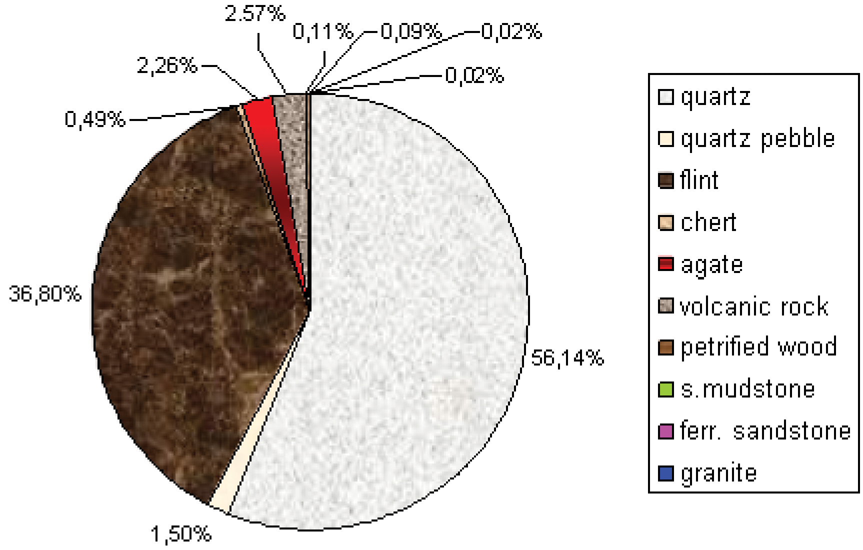
Figure 3.1. *Sketch of the excavated area at 3-O-3 and plan of the boulder cluster and Neolithic pit in Area D.*

covered (e.g. flakes, pottery sherds and a grinder). Most probably the pit was associated with an early Neolithic settlement, although a later date cannot be excluded - Neolithic artefacts may have entered the fill accidentally, incorporated within the soil (a similar situation was observed in the Kerma Period grave pit at site 3-J-26).

All the other features (hard to define) occurred in various parts of the site. Three small round stone constructions in Area A did not contain elements of a funerary character. Inner spaces were filled with wind-blown sand, in the vicinity, remains of a medieval fireplace and pottery fragments were recorded. If these features were associated with a medieval settlement, they have probably been used as storage places or pot-stands. The main medieval dwelling lay amongst the maze of boulders between Area A to the south and areas B-G to the north. Boulders and walls of small stone created separate rooms with openings in several directions. One of the entrances formed by additional wall led to kind of courtyard - open space with a stone pavement in Area F and round structure 5m in diameter in Area D and F. In that last structure, the natural form was improved with additional stones making a regular round, flat and hard surface. Its placing at some distance from the house points to a specialised function most probably for threshing using animals.

Raw materials

The types of rocks worked in the early Neolithic on site 3-O-3 were no different from those presented above from site 3-J-26. The only difference was a lack of rock crystal and quartz which on site 3-J-26 came from the dyke running through the settlement area. Thus, a smaller frequency of these raw material artefacts is to be expected on site 3-O-3. However, although no rock crystal artefacts were not recorded, quartz debris (not including quartz pebble items) was even more frequent than on site 3-J-26 (compare the pie-charts from both assemblages Graphs 2.1 & 3.1). In the collection of artefacts from site 3-O-3 no sandstone fragment was noted. Similarly on site 3-J-26 only a single grinding base fragment was recorded.



Graph 3.1. *Raw materials in the site 3-O-3 assemblage (all contexts).*

Group I - artefacts made of quartz were represented by almost all morphological categories, but irregular chunks dominated;

Group II - items made of quartz pebbles also were represented by almost all morphological categories;

Group III - artefacts made of rock crystal were not recorded;

Group IV - flint artefacts together with the next raw material group were the main items of interest with regard to retouched tools makers from site 3-O-3. That raw material group was represented by a complete repertoire of morphological categories including elements of cresting and platform rejuvenation. Percentage of tools was also the highest.

Group V - chert objects, of a little poorer quality than flint, formed an even higher percentage of tools than those in Group IV, but a much lower amount of chert items was recorded in general.

Group VI - rare artefacts made of silicified mudstone of a green colour, similarly to site 3-J-26 this material did not have any tool making importance.

Group VII - petrified wood was not a preferred raw material - as on site 3-J-26.

Group VIII - agate artefacts were noted in a little higher frequency than on site 3-J-26. That rock was used for tool production although most of the brought pebbles were discarded due to breaks in the form of irregular chunks.

Group IX - products made of volcanic rocks (kinds of basalt) were recorded in various stages of debitage. Also finished tools were noted.

Group X – a single tool made of ferruginous sandstone.

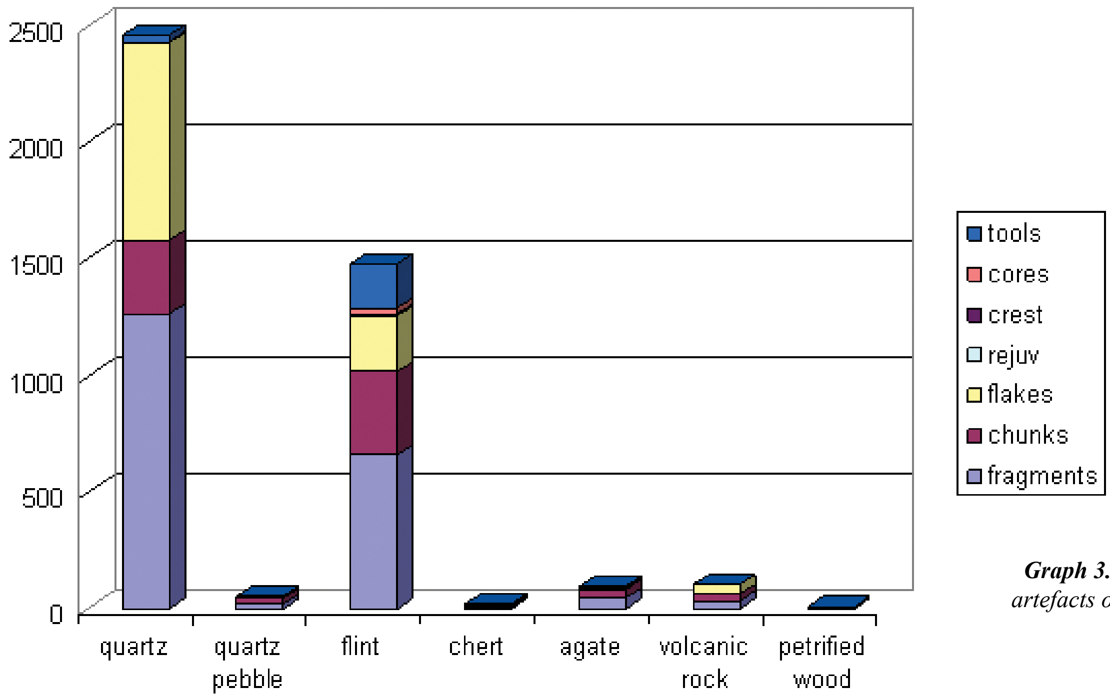
Group XI - quartzitic sandstone artefacts were not recorded on site 3-O-3.

Group XII - gneiss /granite items - made of the only local raw material – it occurs on the site and all around. It was represented by a single flake.

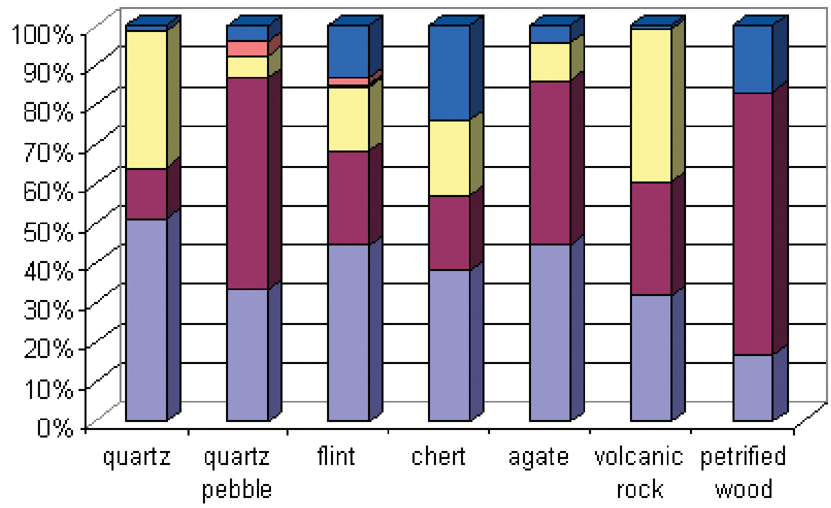
Separate exploration of surface assemblage and sub-surface levels showed the proportions of particular raw materials and morphological groups reflecting the degree of penetration of small items down into the soil.

Major differences in adjacent areas D and E (sub-surface levels) reflect not only more intensive deposition (of secondary character) in Area E, but also (mainly?) the varying depth of preserved soil. Almost the whole of Area E is a shallow cavity in the bedrock filled with soil, while gneiss/granite bedrock in Area D were mostly visible on the surface.

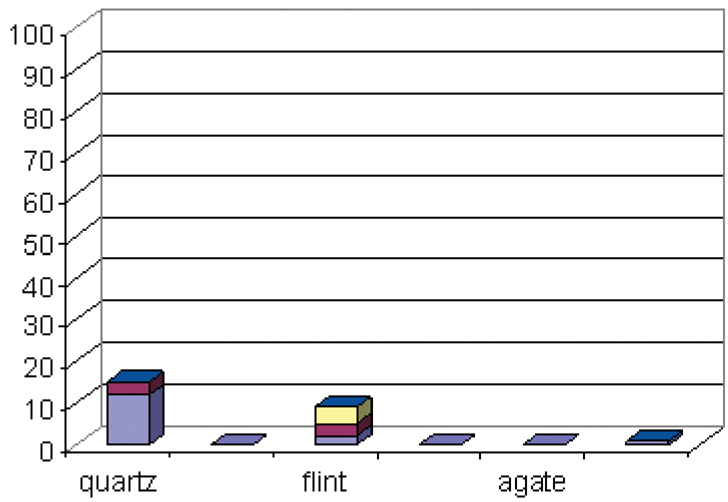
A much higher percentage of flint artefacts (in comparison to quartz items) in the sub-surface level should be noted. This suggests the occurrence of numerous quartz



Graph 3.2. *Frequency of artefacts on the surface of site 3-O-3.*



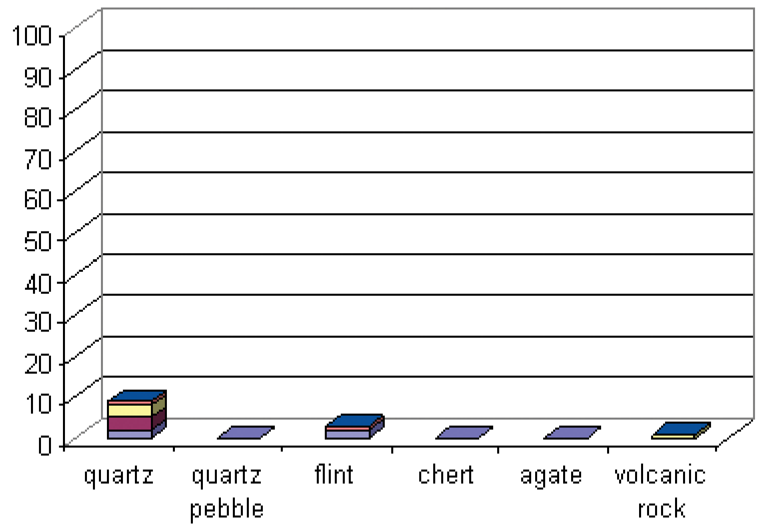
Graph 3.3. *Percentage of morphological categories in artefacts made of various raw materials from the surface of site 3-O-3.*



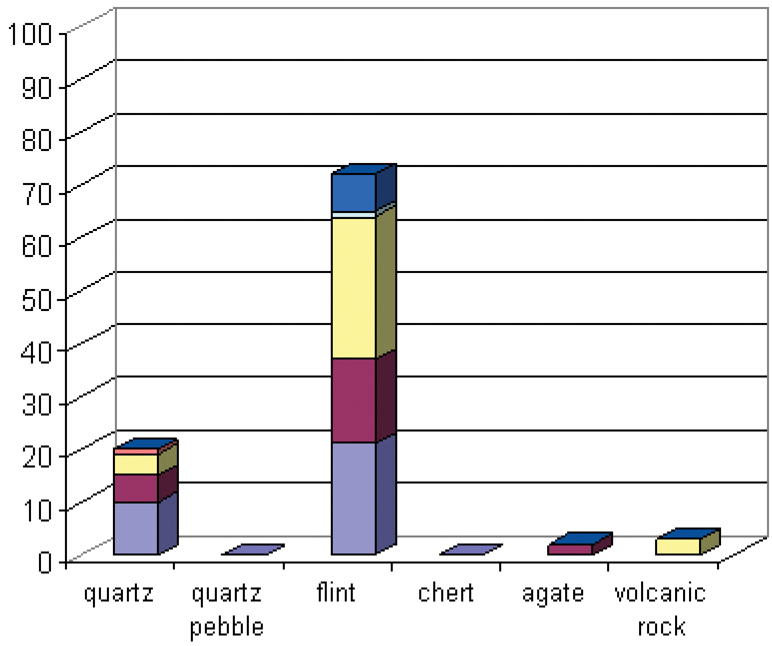
Graph 3.4. *Area D, Level I (1-100mm below present-day surface).*

debris on the surface that did not penetrated down into the soil. Thus, it cannot be excluded, that the bulk of the quartz artefacts were associated with later settlement activity (Kerma, medieval?).

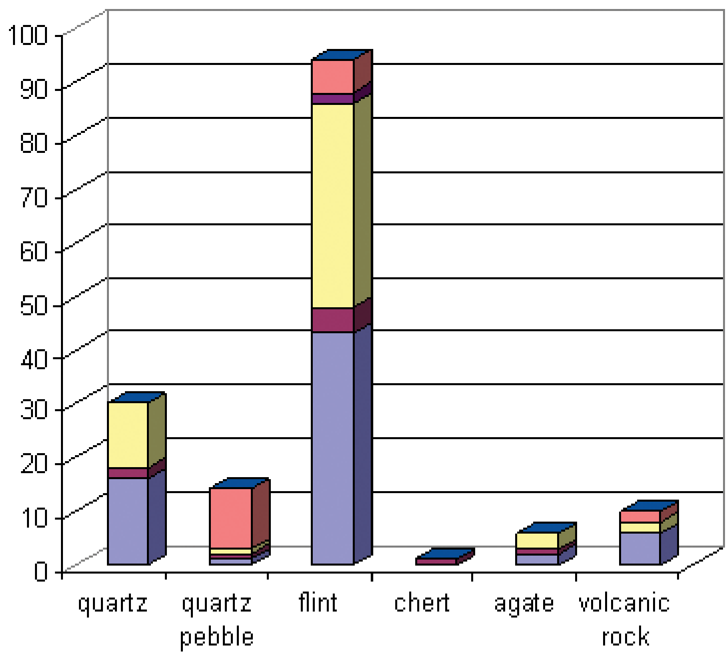
Artefacts made of quartz pebbles, chert and agate were noted mainly on the surface. However, their low frequency reflects the small number in all contexts. The same conclusions refer to sporadically recorded artefacts made of petrified wood and green silicified mudstone. Similar to the site 3-J-26 assemblage, in the sub-surface



Graph 3.5. *Area D, Level II (more than 100mm below present-day surface).*



Graph 3.6. *Area E, Level I (1-100mm below present-day surface).*



Graph 3.7. *Area E, Level II (more than 100mm below present-day surface).*

levels a number of volcanic rock artefacts were recorded.

Petrographic analysis of site 3-O-3's artefacts indicated many similarities to the site 3-J-26 assemblage. Two groups of differing character clearly dominated - quartz and flint products. Other rocks complete the picture of that dualism (apart from volcanic rocks and sandstone). No doubt, raw materials were selected on both sites in a conscious way, reflecting a wide knowledge of the utility of some rocks for particular activities. As on site 3-J-26, the presence of waste products of volcanic rock debitage were noted, however, fragments of macrolithic tools made of it (axe, mace) were not recovered.

Technology

In a similar way to the site 3-J-26 analysis, the technological study of the site 3-O-3 assemblage will be done separately for particular raw materials in the light of the thesis elaborated above concerning the various approaches to different rocks.[1]

As at site 3-J-26, almost all raw material groups were represented by final products - retouched tools. However, their frequency in particular rock fragments differed. Dualism in the making of tools of quartz and flint-like rocks was again clearly visible in the site 3-O-3 assemblage. If we accept, that quartz was worked and used(?) also in post-Neolithic phases of settlement, the percentage of tools in the Neolithic assemblage could be even lower. It is worth remembering that in contrast to site 3-J-26, quartz did not occur on the site, so all the worked fragments had to be brought from some distance away.

Low number of tools made of quartz pebbles, chert, agate and petrified wood were noted - all in similar percentages to those at site 3-J-26. In the site 3-O-3 assemblage tools made of the best raw material – flint - clearly predominated, pointing to the main goals of early-Neolithic stone working.

Also at site 3-O-3 a single tool made of volcanic rock was noticed, however, it did not state any new type, suggesting a different approach to that rock by Neolithic tool makers.

Cores

Most of the single-platform cores were recorded on the surface. Two cores were also discovered in the fill of the pit in Area D (context D6). In spite of raw material selection for single-platform methods, flint was clearly preferred (Figure 3.2a-d). The poorest materials, such as quartz, were marginalized (Figure 3.2f). No agate core was found, contrary to the situation observed at site 3-J-26.

The technology of single-platform debitage on site 3-O-3 was marked by a high degree of core exploitation, thus small volumes of final forms were found. Abrasion of the edges of the platform-flaked surface as well as crested edge creation for elongated flakes were common. However, irregular patterns of removed product negatives suggest problems with producing the desired shapes (blades). The dominant technique used was direct percussion. The striking platform was formed usually by a single removal, no platform preparation before each flake striking was noticed.

Changed-orientation cores were recorded in small quantities. Similar to at site 3-J-26 cores, change of the exploitation did not mean flake removal from a few directions simultaneously, thus it cannot to be said that these are opposite-platform cores or so called 90^{o}-cores.

The presence of a single agate core with changed orientation (Figure 3.2e) completes the overview of raw material preferences in unidirection flake methods,

TABLE 3.1. PARTICULAR MORPHOLOGICAL CATEGORIES IN ALL RAW MATERIAL GROUPS.

Raw material	chunks	flakes	rejuv.	crest	cores	tools		Total
Quartz	830	1668	-	1	6	34	1.33%	2539
Quartz pebble	40	23	-	-	3	3	-	69
Flint	380	1033	3	7	39	202	12.13%	1665
Chert	4	12	-	-	1	5	22.72%	22
Agate	41	56	-	-	1	4	-	102
Volcanic rock	31	84	-	-	-	1	-	116
Petrified wood	4	1	-	-	-	1	-	5
S.mudstone	0	3	-	-	1	-	-	4
Ferr. sandstone	0	0	-	-	-	1	-	1
Granite	0	1	-	-	-	2	-	3
Total	1330	2881	3	8	51	253	4526	

TABLE 3.2. SINGLE-PLATFORM CORES.

	surface	sub-surface	D6-filling of the cut between rocks	Total
Flint	19	6	1	26
Chert	0	1	0	1
Quartz pebble	2	1	0	3
Quartz	1	2	1	4
Total:	22	8	2	34

[1] 'Flake' category includes both complete items as well as those preserved in fragments. In the following chapters where the artefacts are described in detail, only items with distinctive elements preserved (e.g. butts) will be analysed.

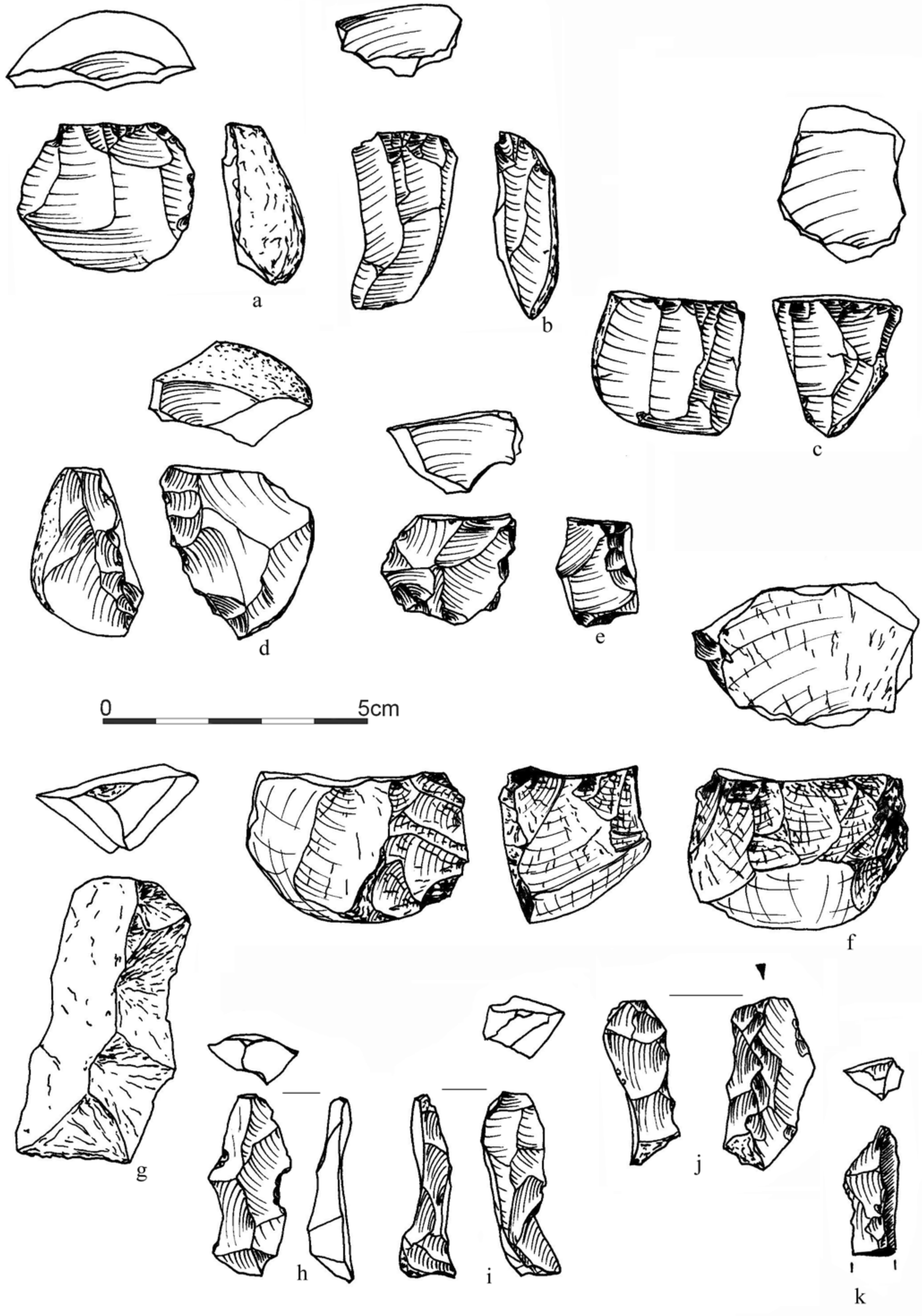


Figure 3.2. *3-O-3, single-platform cores (a-f) and crested flakes (g-k) (scale 1:1).*

TABLE 3.3. CHANGED ORIENTATION CORES.

	surface	sub-surface	Total
Flint	1	3	4
Agate	0	1	1
Quartz	1	0	1
Total	2	4	6

analogous to site 3-J-26.

A small number of discoidal cores was recorded on site 3-O-3 (Figure 3.3 l,m,o). All these were of small size and similar to site 3-J-26 specimens. They were most probably used as tools – removed flakes were thin and rather irregular.

TABLE 3.4. DISCOIDAL CORES.

	surface	sub-surface	D6	Total
Flint	6	1	0	7
Quartz	0	1	0	1
S. Mudstone	0	0	1	1
Total	6	2	1	9

Small bipolar cores made of flint and quartz pebble were also recorded (Figure 3.3p,q). As in the case of analogous items from site 3-J-26, these could be interpreted as functional tools - not cores for producing particular quality products.

TABLE 3.5. BIPOLAR CORES.

	surface	sub-surface	Total
Flint	2	0	2
Quartz Pebble	0	1	1
Total	2	1	3

<u>Blanks</u>

In the tables below frequencies of the four main butt types (plain, edged, cortical and prepared) are presented according to raw material groups. The presence of flake and blade blanks (Figure 3.3a-g) with various technological features completes the view of debitage methods derived from the observation of cores (their final forms).

Quartz flakes in more than 90% of cases had plain butts. However, this does not suggest the common platform formation, in the case of quartz, mainly big natural spheroid chunks were worked with many freshly-broken surfaces. Also few flakes with cortical butts were noted. Edged-butt flakes confirmed the intentional use of single-platform debitage.

TABLE 3.6. FLAKE BUTT TYPES MADE FROM QUARTZ.

Butt type	surface		sub-surface		D6		Total
Plain	314	91.54%	19	95%	3	100%	336
Edge	25	7.28%	1	5%	0	-	26
Cortical	4	1.16%	0	-	0	-	4
Prepared	0	-	0	-	0	-	0
Total	343	100%	20	100%	3	100%	366

Flakes coming from quartz-pebble debitage in the majority of cases had plain butts. In these forming the platform resulted in the decortification of one part of the pebble. The presence of a single flake with edged butt completes the picture of unidirection debitage of quartz pebbles on site 3-O-3 linking with cores. Production of debitage by the slice-method was not reflected in the products from site 3-O-3 - flakes with cortical butts were rare.

TABLE 3.7. FLAKE BUTT TYPES MADE FROM QUARTZ PEBBLES.

Butt type	surface		sub-surface		Total
Plain	16	88.88%	0	-	16
Edge	1	5.56%	0	-	1
Cortical	1	5.56%	1	100%	2
Prepared	0	-	0	-	0
Total	18	100%	1	100%	19

Without doubt flint flakes from site 3-O-3 varied widely. Cortical-butt flakes were second in frequency, pointing to the initial working of pebbles on the site. However, plain-butt flakes predominated, coming from the advanced stages of unidirectional or discoidal debitage. The picture is of used flake removing methods, complete products with edged butts (pointing to precise semi-blade methods) and prepared butts - bearing fragments of a few negatives on the butt (after rejuvenation or orientation change in these cases).

TABLE 3.8. FLAKE-BUTT TYPES IN THE FLINT CATEGORY.

Butt type	surface		sub-surface		D6		Total
Plain	256	70.33%	32	44.44%	1	100%	289
Edge	42	11.54%	11	15.28%	0	-	53
Cortical	61	16.76%	27	37.50%	0	-	88
Prepared	5	1.37%	2	2.78%	0	-	7
Total	364	100%	72	100%	1	100%	437

Flakes made of chert were recorded in small quantities, exclusively on the site's surface. Some of these had cortical butts suggesting debitage from the outer parts of pebbles on the site. Also single specimens of plain butt and edged-butt flakes were noted confirming single-platform debitage as suggested by the single core presence.

Agate flakes, although recorded in small numbers, were represented by specimens with all butt types. Products with cortical and plain butts dominated the assemblage, confirming that all stages of debitage production occurred on the site. Also single specimens with edged and prepared butts were recorded. In the case of the site 3-O-3 assemblage, all examples of multi-negative butts should be interpreted as products of exploitation restarted after orientation change (analogous to the flint flakes).

A few examples of flakes made of volcanic rocks were recovered. Their presence is confirmed by debit-

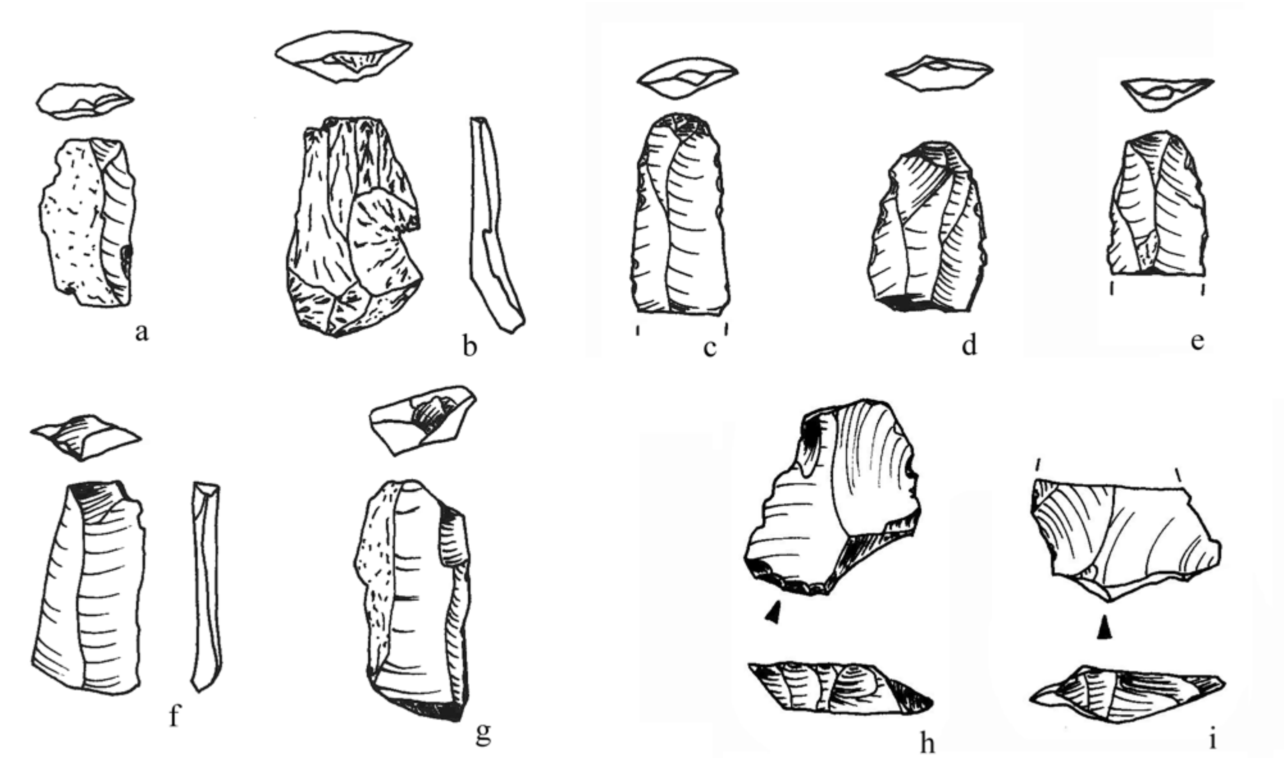
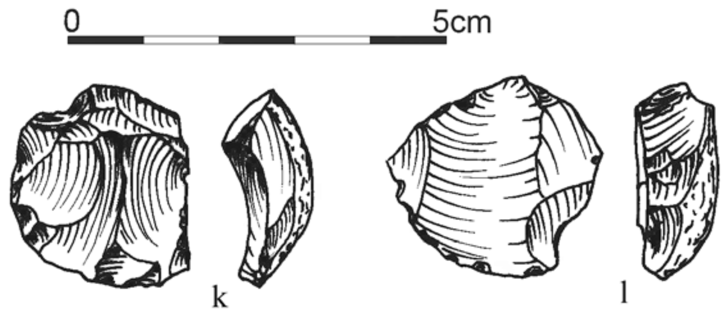


Figure 3.3. *3-O-3, single-platform flakes (a-g), rejuvenation core tablets or discoidal reduction flakes (i-j), discoidal cores (k-o), bipolar pieces (p,q) (scale 1:1).*



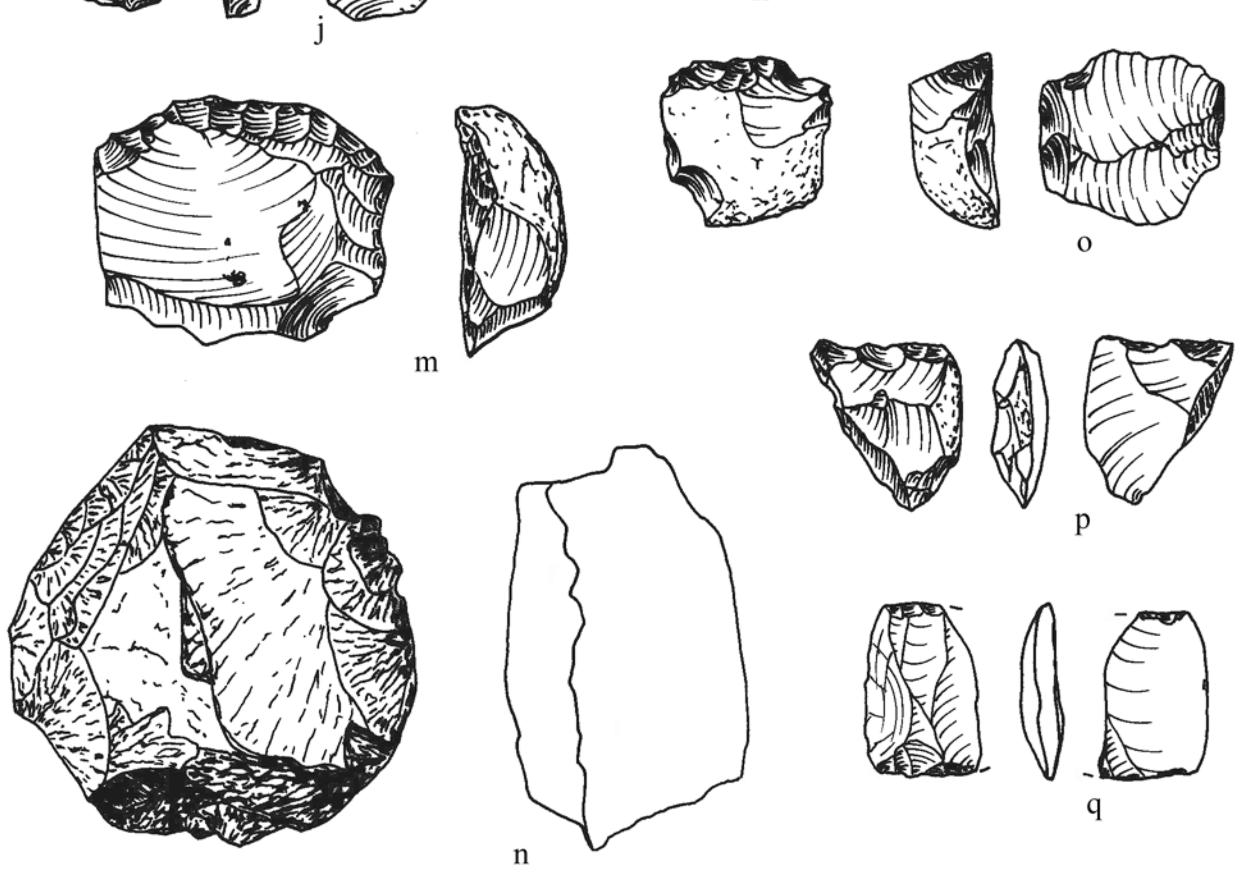


TABLE 3.9. FLAKE-BUTT TYPES MADE FROM AGATE.

Butt type	surface		sub-surface		Total
Plain	6	42.86%	2	40%	8
Edge	1	7.14%	0	-	1
Cortical	6	42.86%	3	60%	9
Prepared	1	7.14%	0	-	1
Total	14	100%	5	100%	19

age of that rock both on sites 3-O-3 and 3-J-26. Cortical-butt flakes dominate this group, indicating pebble form working on the site. Flakes with plain butts were also numerous and single specimens with edged butts pointed to the use of unidirectional methods. However, in the case of volcanic rocks other interpretation cannot be excluded; such rocks were used (in the late Neolithic) mainly for macrolithic production. Up to now, early Neolithic assemblages have not produced any fragment of such a tool (axe, mace head).

TABLE 3.10. FLAKE-BUTT TYPES MADE FROM VOLCANIC ROCKS.

Butt type	surface		sub-surface		D6		Total
Plain	16	40%	3	30%	0	-	19
Edge	2	5%	1	10%	0	-	3
Cortical	22	55%	6	60%	1	100%	29
Prepared	0	-	0	-	0	-	0
Total	40	100%	10	100%	1	100%	51

A single flake made of granite with plain butt was found. According to the characteristics of such rock as well as product size, we can suppose that it was related to a grinding base or other large tool produced outside the site.

Bipolar flakes were noted in small numbers. Most probably these were waste products of tools production (typologically bipolar cores) or originated from accidental removals during the use of such tools. Analogous finds were present on site 3-J-26.

TABLE 3.11. BIPOLAR FLAKES.

Raw material	surface	sub-surface	Total
Flint	6	1	7
Quartz pebble	1	0	1
Volcanic rocks	1	0	1
Total	8	1	9

Technical debris – rejuvenation elements and crested products

As at site 3-J-26, there was some debris, relating to two technological methods - crested flakes and rejuvenation-core tablets.

Eight crested flakes were noted on site 3-O-3, seven originating from flint debitage (Figure3.2h-k) and one of quartz (Figure 3.2g). All were recorded on the surface. In the case of flint-crested products, their presence confirmed attempts at producing elongated products (blades) using a unidirectional schema. However, quartz-crested flakes of large size could be accidental and do not point to blade-oriented debitage of quartz - it could be a side-flake from a discoidal schema.

Three flint rejuvenation core tablets were also recovered (Figure 3.3h-i). Similar to the site 3-J-26 assemblage, none of them had been used as a blank for tool.

Tools

Both on the surface and in sub-surface levels at site 3-O-3, retouched forms were recorded. In contrast to site 3-J-26, most of the features were eroded; artefacts were frequently displaced by soil erosion. Also most of Neolithic features were totally eroded. In the light of this all the tools have been considered together and entered into one table.

The general structure of retouched pieces (according to the classic typology) is presented in Tables 3.12 & 3.15. Selection of various raw materials is visible in the tool collection. This was related to different technological approaches in the production of blanks and the shaping of final products (tools). Each tool was registered as a small find and given a unique catalogue number.

The most abundant tool type was perforators. Some of these, due to specific patterns of retouch, could be defined as borers. Amongst the scraping tools, temporary forms worked with little care dominated the assemblage. The next group of temporary tools were denticulate and notched forms and their were huge numbers of non-retouched flakes and chunks bearing traces of single use. Stone elements of composite instruments (sickles, knifes) were recorded in small quantities and arched-backed geometrics (lunates) formed exactly one half of these. Burins were noted in very small numbers. In the initial comparison with the site 3-J-26 collection, tools from site 3-O-3, look more temporary; precisely-made tools were less frequent. There was also a lack of large granite objects (grinding bases).

Amongst the raw material selected for tools production, flint prevailed while all the other rocks copy the schema of the flint forms. Only quartz was used a little more frequently but also for temporary tool creation. The one tool made of ferruginous sandstone (the only product made of this rock) was a side scraper made of a large levallois flake. Its presence points to an earlier (Middle Palaeolithic) site in the vicinity or the utilisation of the district by Neolithic (or later) inhabitants of site 3-O-3 in the course of which they collected tools which were attractive and perhaps useful to them. In such a scenario the deposition of other tools not related to the early-Neolithic inventories on site 3-O-3 cannot be excluded.

Tools typology

In an attempt to study the tools from site 3-O-3, a system of retouched and unretouched form classification was used analogous to that employed for site 3-J-26. This allowed comparisons to be made between both tool kits, however without use-wear trace analysis our observations were limited only to morphological marks.

Insertions (Figure 3.4)

As with the site 3-J-26 insertion tools, the classification made use of six morphological types (A to F). Additionally triangle insertions were defined (absent at site 3-J-26).

Raw material	Lunates	Other Insertions	Backed pieces	Truncations	Perforators	Borers	Sidescrapers	Scrapers	Endsrapers	Burins	Denticulate tools	Notch tools	Use-retouched pieces	Unidentified tool fragments	Total
Quartz	-	1	-	1	15	1	-	3	-	1	9	1	-	2	34
Quartz pebbles	-	1	-	-	1	-	-	-	-	-	-	1	-	-	3
Flint	17	16	2	4	50	5	1	25	2	1	14	7	29	29	202
Chert	1	-	-	1	1	-	-	-	-	-	-	-	1	1	5
Agate	-	-	-	-	1	-	-	1	-	-	1	-	1	-	4
Petrified wood	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Volcanic Rocks	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Ferrug. sandstone	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
Total	18	18	2	6	68	6	2	29	2	2	26	9	31	32	251

TABLE 3.12. TOOLS COLLECTED FROM THE SURFACE.

These were characterised by retouched (backed) edges in the form of two straight lines joining at an obtuse angle.

As with the site 3-J-26 insertions, flint was clearly the preferred raw material. Other stone were used rarely, represented by single insertions only. Differences between both insertions kits appeared mainly in the presence of massive triangles and a lack of straight-backed flakes and trapezes at site 3-O-3 (apart from a single tool made from a quartz pebble). In contrast to the insertions from site 3-J-26, the dominant type was B-type tools. Less regularity of all insertions from site 3-O-3 was the main feature of the composite tool kit.

In comparison to insertions from site 3-J-26, tools from site 3-O-3 appeared more robust - in most categories (average results) measurements indicated shorter, wider and thicker products.

TABLE 3.13. INSERTIONS TYPES BY RAW MATERIAL.

Type	Quartz	Quartz pebbles	Flint/Chert	Agate
A	-	-	4	-
Triang.	-	-	7	-
B	-	-	16	-
C	-	-	-	-
D	-	1	-	-
E	1	-	4	-
F	-	-	9	1

Typical lunates with straight working edge (A-type) were represented by a single complete tool made from a regular blade blank (Figure 3.4u). This tool was also the thinnest of all the insertions from site 3-O-3. This feature clearly distinguish it from the rest of the material and may suggest a different origin (a late Neolithic utilisation of the site).

Triangle insertions (Figure 3.4aa-ae) were very standardised in size and blank - even broken specimens correspond to the complete tools' size. Only one specimen was much more massive and most probably did not fall into a common usage group with the other triangles.

Lunates with an irregular working edge (B-type) were most frequent on site 3-O-3 insertions (Figure 3.4a-p). Their size in general corresponds to analogous tool lengths and widths from site 3-J-26. However, the scale of variation was greater; insertions from site 3-O-3 were not as compact in size as site 3-J-26 tools. The same could be said about their thickness. Linking to blank production let us remember that no traces of thick-blade debitage with prepared butts were recorded on site 3-O-3, but exclusively simple single-platform methods allowing the production of flakes or at least blade-like products. Thus, the smaller regularity of the site 3-O-3 insertions

TABLE 3.14. INSERTIONS PARAMETERS IN ALL RAW MATERIALS (ONLY COMPLETE VALUES MEASURED).

Type	Lenght				Width				Thickness			
	min	max	average	sample	min	max	average	sample	min	max	average	sample
A	24	24	24	1	8	15	12.2	4	3	6	4.5	4
Tri.	22	27	23.6	3	11	21	13.5	7	3	7	4.7	7
B	23	29	25	11	10	18	13.2	17	3	6	4.1	17
C	-	-	-	-	-	-	-	-	-	-	-	-
D	18	18	18	1	16	16	16	1	5	5	5	1
E	19	27	22.5	4	15	19	17.2	5	4	9	5.8	5
F	22	23	22.5	2	10	17	14.2	10	3	8	4.2	10

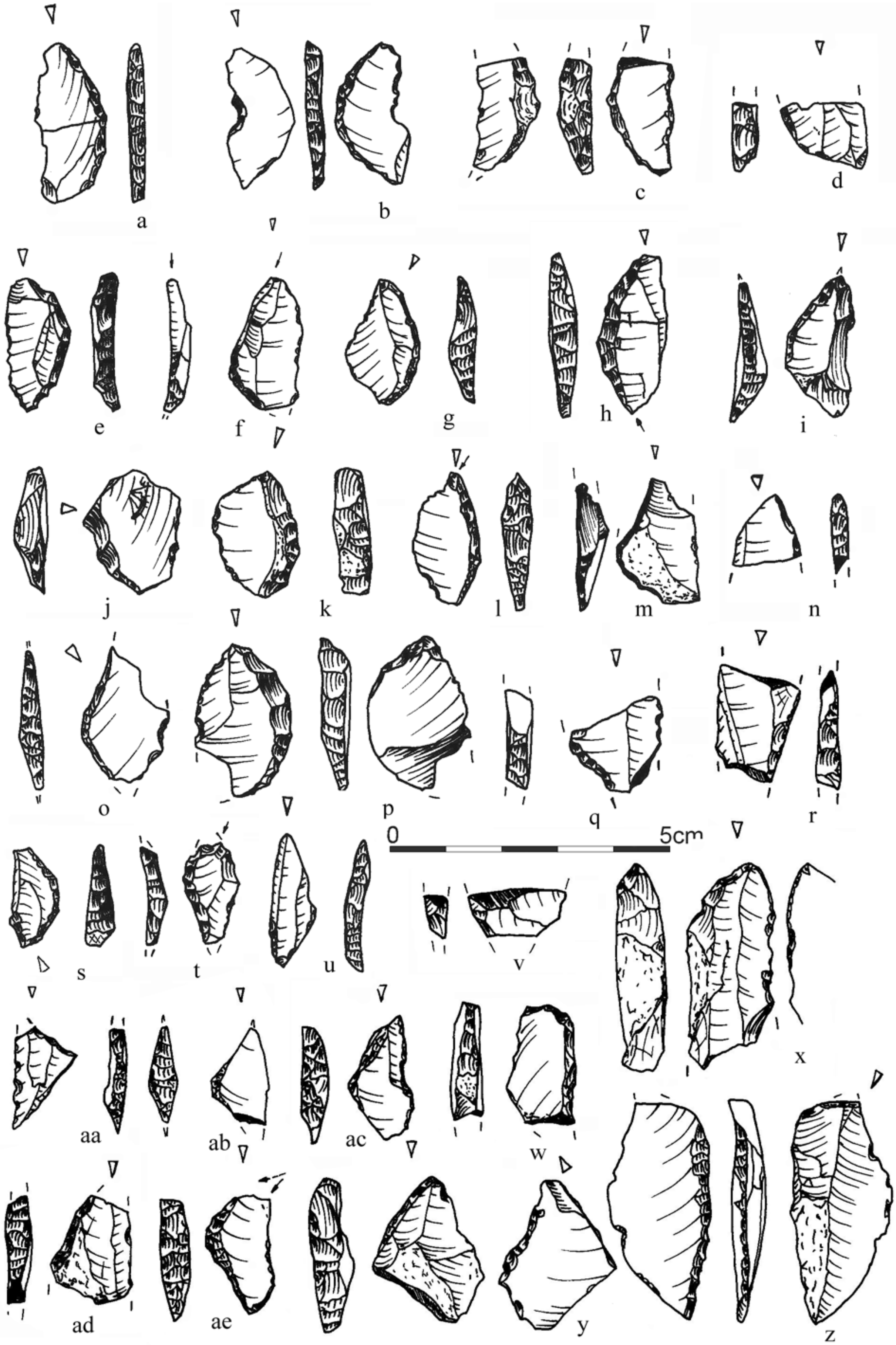


Figure 3.4. *3-O-3, insertions.*

resulted from less regular blank production. In general however, tools from both sites showed many similarities resulting from their identical functions and the same size standards existing in early Neolithic composite sickle/knifes *instrumentaria* (Honegger 2008, fig. 15).

The only trapeze (D-type) recorded on site 3-O-3 were made from a quartz pebble. Discontinuity of the retouched back may have resulted in this case not from the desire to form a trapeze shape, but only from length corrections. In that case, the tool could be defined as a double truncation and in fact its size corresponds well to other truncations.

The sizes of truncations (E-type) were similar both to B-type insertions as well as a defined category of much shorter tools (Figure 3.4x). All tools were also wider than B-type insertions. Similar to truncations from other sites, these could be used as temporary insertions - if fitted in the same frame with other types, creating a very irregular cutting edge.

Unretouched flakes and blades bearing traces of use as insertions into sickles/knifes (F-type) fall within the size parameters of triangle insertions and smaller B-type tools. In contrast to analogous tools from site 3-J-26, they were not so numerous and did not include the whole size range of insertions tools (although, also in site 3-J-26 they fit into B-type insertions in most cases).

Insertions from site 3-O-3 did not present the size dualism visible in the site 3-J-26 collection. A single A-type very regular small insertion was recorded, but its character and lack of waste products from such regular blade production suggests a different origin for this tool. Also small numbers of A-type insertions and the dominance of less regular B-type tools characterized the site 3-O-3 insertions. The presence of uncommon forms - D, E, F-types as well as a lack of products using the whole length of the blank (types recorded in the Dongola Reach - e.g. at Multaga 3) indicated close relations with early-Neolithic assemblages from the area between the Third and Fourth Cataracts, but also exhibit some differences.

<u>Perforators</u> (Figure 3.5)

Perforators and borers were the most numerous retouched tools in the whole site 3-O-3 collection. As at site 3-J-26, a preliminary division into slender and thickset forms could be undertaken. An additional element, absent in the previous assemblage, was the asymmetrical bend of the point according to the morphological axis in these thickset tools. Most probably this feature resulted from their being designed for a particular function.

On many perforators there are use impacts and wear traces, for example pseudo-burin blow negatives both along the side edges and on the faces (Figure 3.5w,x,z). On one perforator (identified according to the classic typology) clear rotation polishing was noted (Figure 3.5e), suggesting it had been used for drilling holes in a hard material (most probably pottery or stone) *c*. 10mm deep.

Tool type	Quartz	Quartz Pebble	Flint,Chert, Petrified Wood	Agate	Volcanic rocks	Granite
Insertion A-type (lunate with straight edge)	-	-	4	-	-	-
Insertion B-type (lunate with convex edge)	-	-	17	-	-	-
Insertion C-type (e.g. backed piece)	-	-	-	-	-	-
Insertion D-type (e.g. other insertion - trapeze)	-	1	-	-	-	-
Insertion E-type (truncation)	1	-	5	-	-	-
Insertion F-type (e.g. use-retouch piece)	-	-	9	1	-	-
Insertion Triangle	-	-	7	-	-	-
Perforator A-type (slender)	1	-	10	-	1	-
Perforator B-type (thickset)	14	1	44	-	-	-
Perforator multi-sting	-	-	1	-	-	-
Endscraper (well-made)	-	-	2	-	-	-
Scraper (temporary)	3	-	25	1	-	-
Burin dihedral	1	-	1	-	-	-
Denticulate tool (massive)	9	-	12	-	-	-
Denticulate tool (saw?)	-	-	3	1	-	-
Notch tool (shallow notch)	1	1	7	-	-	-
Use-retouch piece (other)	-	-	22	1	-	-
Bipolar pieces	-	1	2	-	-	-
Grinding tools	-	-	-	-	-	2
Unidentified tool fragments	4	-	37	-	-	-

TABLE 3.15. THE TOOL KIT OF SITE 3-O-3.

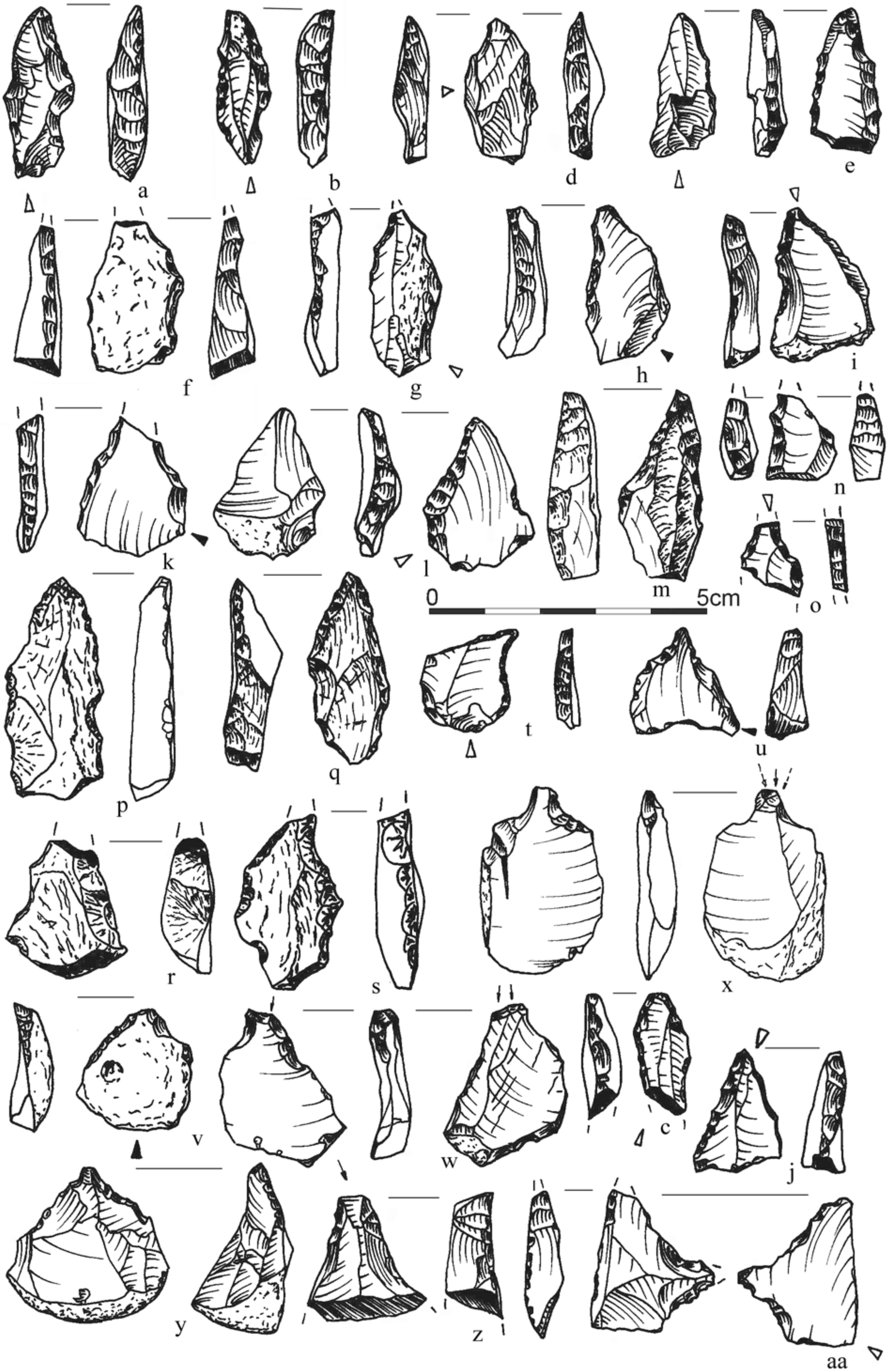


Figure 3.5. *3-O-3, perforators.*

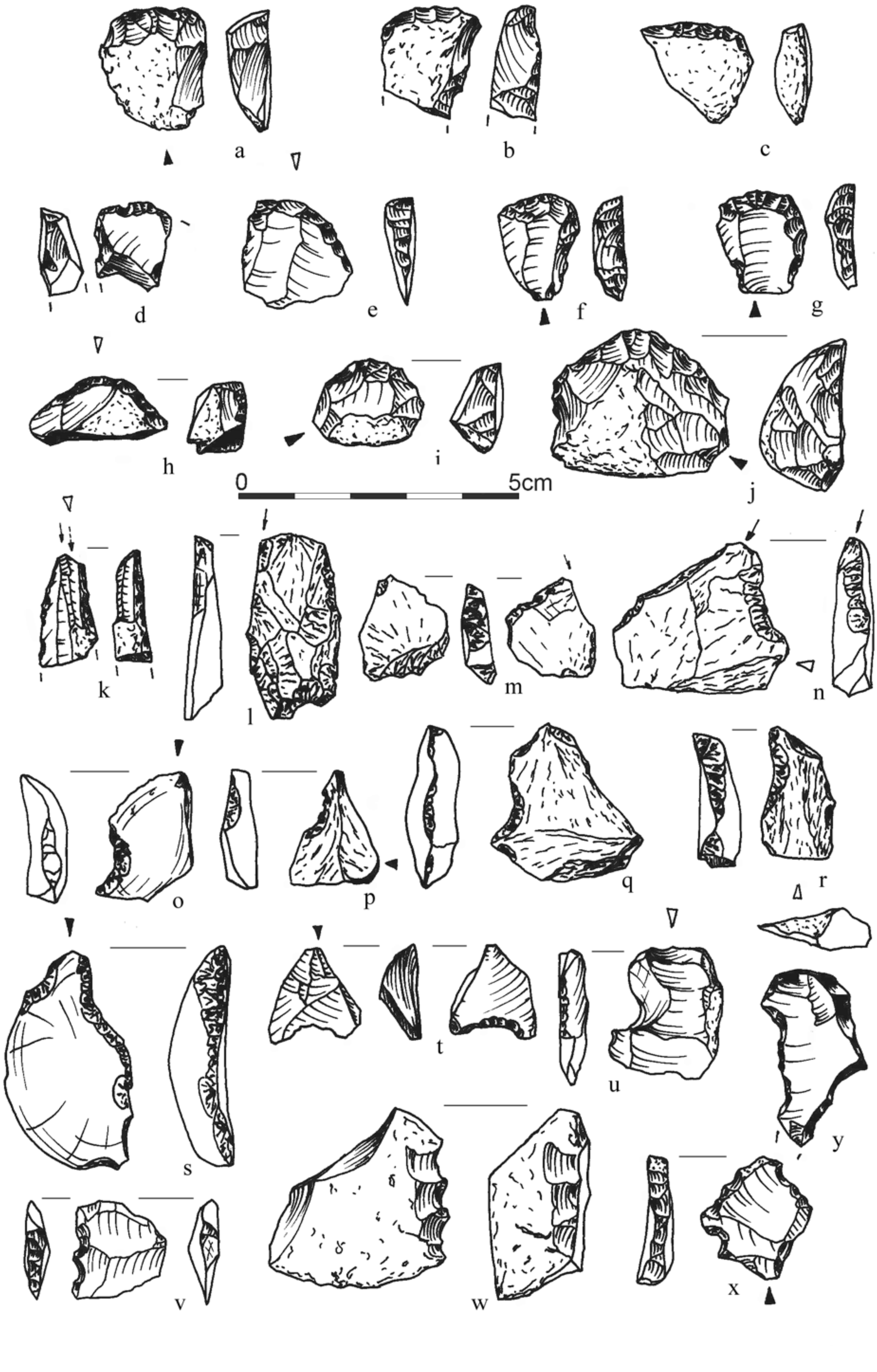


Figure 3.6. *3-O-3, endscrapers (a-j), burins (k-n), notch tools (o-u), denticulate tools (v-y).*

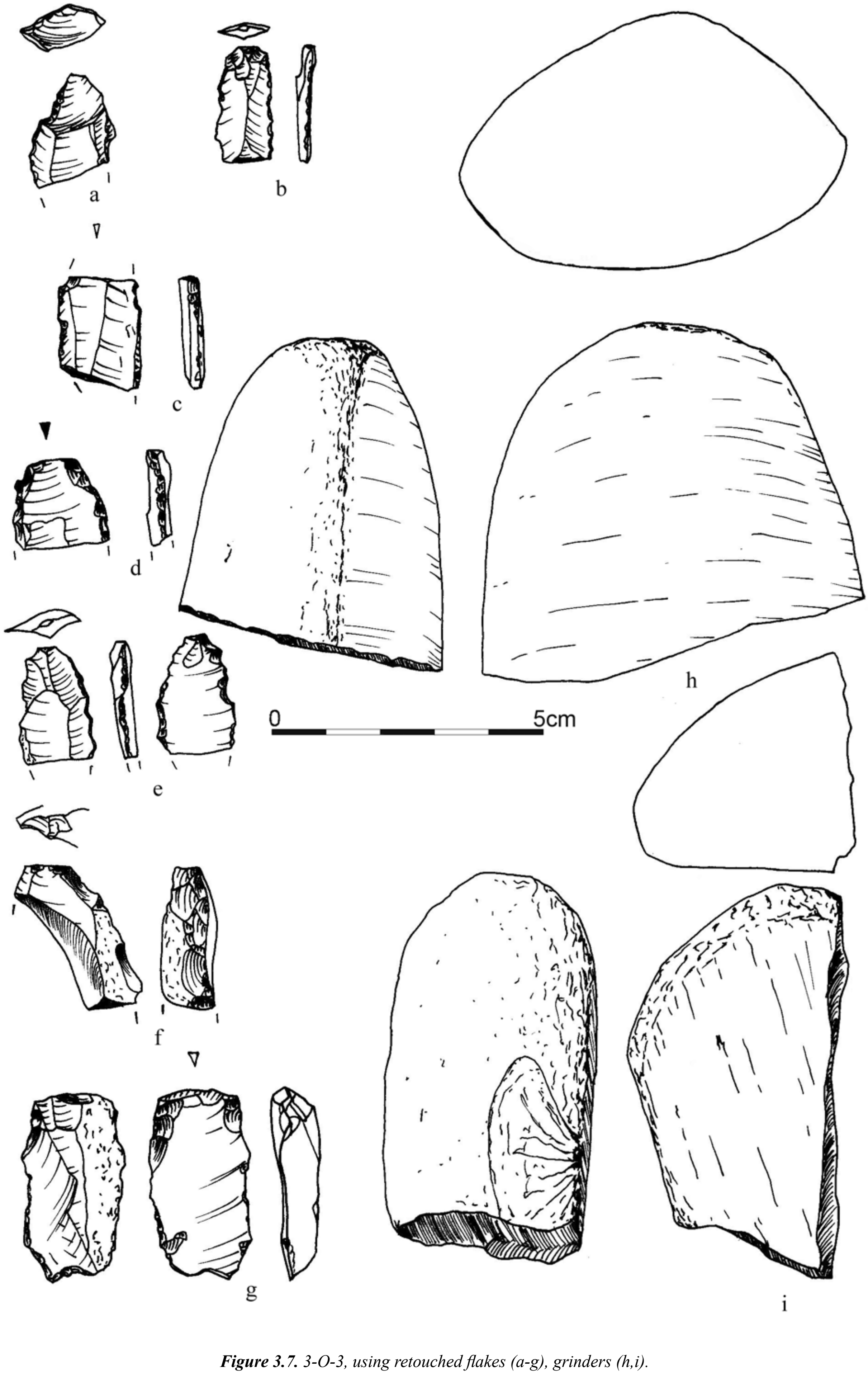


Figure 3.7. *3-O-3, using retouched flakes (a-g), grinders (h,i).*

Without doubt, this tool was used as the working part of a more sophisticated instrument (a drill). Among other slender tools were a few borers (in classic typology), although, without use-wear analysis it is impossible to define their real function (Figure 3.5f,n).

In the site 3-O-3 assemblage, a single multi-point perforator was recorded, a typical form of late Neolithic inventories between the Third and Fourth Cataracts (Figure 3.5aa). Apart from a single small geometric insertion (the previously mentioned A-type specimen), the multi-sting perforator provides evidence for use later than the early-Neolithic on the site.

Scrapers (Figure 3.6a-j)

Scraping tools from site 3-O-3 could be divided into temporary forms, irregular (also side scrapers and probably small discoidal cores), and the forms made from careful selected blanks. These last were more or less cortical flakes, with a working part pointing to intensive usage up to convexity reduction. Also two small end scrapers were recorded, made of non-cortical flakes (Figure 3.6f-g), with one side edge blunted, while the opposite edge was left sharp (on one specimen usage traces were noted on the sharp-side edge similar to insertions). Such tools could be multi-functional, used both as scrapers and cutting tools.

The side scraper made from a ferruginous sandstone levallois flake also requires some discussion (Figure 4.1a). If we accept that this tool was brought to the site by its early-Neolithic inhabitants, what may have been the reason? Was the artefact still being used as a tool? There were no negatives of shaping or usage retouch on the edges. Also the irregular outline of the edges excluded its use as a scraper (as we can reconstruct that based on small early-Neolithic forms).

Burins (Figure 3.6k-l)

In the whole site 3-O-3 assemblage, only two burins were noted, one made from a quartz bipolar flake and one from a small flint flake. Both forms represent a dihedral type, with a burin blow started from the natural face in the distal-blank part. In contrast to site 3-J-26, were the small number of burins and lack of truncated forms.

Denticulate tools

As in site 3-J-26, both thickset forms with dents formed with a few deep clactonian notches (Figure 3.6v-z) and gracile tools (used as small saws) were recorded (Figure 3.7a-g). No multifunctional tools were noted and wear traces were not abundant.

Notched tools (Figure 3.6m-u)

Notched forms also had a temporary character. Both quartz and and flint tools were recorded. Notches were rather shallow and no multi-notched forms were noted.

Use retouched flakes

A number of unretouched flakes were recorded with wear traces in the form of irregular usage retouch and breaks. Apart from the previously mentioned flakes used as immediate insertions (F-type), there were also a few bigger flakes most probably used for cutting. Wear traces occurred usually on one side edge only, but that was not invariably the case.

Bipolar pieces

A small number of bipolar forms recorded at site 3-O-3 point to the use of that method of blank production very rarely if at all. The only tool made from a bipolar flake was a burin, although, it cannot be excluded that it was a reutilisation of an earlier discarded flake amongst the usage debris. It seems that the bipolar method aimed, on both early Neolithic sites, to produce particular tools for use as wedges.

Grinding tools (Figure 3.7h,i)

In the shallow pit fill (context D6) as well as in the sub-surface soil level, two fragments of grinders were noted. Their date cannot be estimated as such forms were used in all periods up to the present; many times artefacts were also reused. Both tools from site 3-O-3 were fragmentary. That from the pit fill was sub-triangular in section and had a convex working surface. Its features point to its use with a concave grinding base, with a single-direction technique ('there and back'). The other grinder had a flat working surface and wear traces in one direction only. It must have been used on a relatively flat grinding base.

As a summary, a complete list of the stone tools recorded on site 3-O-3 is presented in Table 3.15. This list includes many material correlates of activities undertaken on the site, although undoubtedly much more data could be obtained through use-wear studies.

4. Results of the study of the lithics from sites 3-J-26 and 3-O-3

Results of the analysis - excavations

Results of the analysis are heavily influenced by the state of preservation of these early-Neolithic sites, which can be considered typical for the whole Fourth Cataract region. The huge scale of erosion of the upper soil levels caused the almost complete disappearance of the spatial relationships present during the use of the settlements and those on the sites after their abandonment. In some instances however, for example in the northern part of site 3-J-26, the sub-surface features, post-holes, pits and fireplaces, were preserved to some extent. Their character pointed to the presence of a semi-permanent settlement with diverse constructions related to storage and technical functions. The small finds suggested that this was a functioning semi-permanent settlement; early-Neolithic pottery making was suggested in association with burning in fireplaces or simple kilns, the workshop character of the lithic debris pointed to debitage of rocks collected in the vicinity being produced on site. Tool kits reflected many diverse activities undertaken both on the site and in the vicinity; production and repair of harvesting tools used no doubt outside the settlement, skin and hide working as well as that of other soft organic materials, e.g. meat, plants, hard organics - bone, shells, wood and mineral materials - stone and broken pottery. The presence of large grinding tools indicates the processing of wild or domestic grains. Some parts of the tool kit could be related to hunting weapons (especially tools with particular types of damage - pseudo-burin with blow negatives on the sides and faces). Although, neither site produced osteological remains in large quantities, other early-Neolithic datasets confirmed the dominance of a wild fauna oriented economy in northern Sudan. Both site 3-J-26 and 3-O-3 were placed in a strategic hunting area - on the first ridge of hills adjacent the river.

While the context of use and reasons for the deposition of artefacts are mostly impossible to reconstruct, we can still study the economy and technology of the lithic inventories. Features of the lithic products are clear even if the artefacts were moved hundreds of times. Only the absence (material not included in the analysis) of a large component of the lithics could distort the picture, however, in these sites the sample as found was large enough to provide a valid result.

Both assemblages of lithic artefacts contained elements of various raw material debitage, confirming the exploration of, and collection of rocks from the river valley and seasonal channels as well as in the rocky desert. Most of the rocks occurred in pebble form with heavy rolled and polished outer surfaces. Their origins were related to the Mesozoic Nubian Formation (silicified mudstone, agate) or tertiary formations e.g. Hudi Cherts (Whiteman 1971), moved to the cataract area by the river Nile. Similar (secondary) was the character of volcanic rocks (basalt) fragments occurring in the area in pebble form. Artefacts made of ferruginous sandstone (exclusively finished tools) had been brought to the site - that rock is very common in northern Sudan, however, it does not occur in the cataract area. The palette of the lithic raw materials, complemented artefacts made of granite/gneiss and quartz - the main elements of the cataract (precambrian Basement Complex - after Whiteman 1971). These last occurred in the vicinity of, or directly on, the sites.

In both assemblages clear dualism was noted in raw material preferences; while the majority of knapped fragments were quartz artefacts, amongst final forms (retouched tools) flint items were dominant.

Quartz was worked to a small extent by the simple method, linked to single platform schema. In the majority of cases chunks were recorded, the result of irregular breaking or even crumbling of the rock. The preliminary hypothesis should be accepted, that the use of quartz by early-Neolithic groups was also related to aims other than tool production. The presence of a high percentage of quartz chunks in both assemblages (as well as on other sites outside the Fourth Cataract) excludes the possibility of the chronological admixture of these artefacts.

Flint was undoubtedly the main focus of the tool makers' interest on both of the excavated sites. Artefacts made of that raw material form in each case more than 1/3 of the assemblage, while flint tools made up approximately ¾ of the kits. Clear preferences did not mean the complete avoidance of other raw materials, if these were available to the Neolithic knappers. Even quartz was used in limited quantities for debitage using methods targeted to tool production, reflecting flint forms (geometric insertions, perforators, scrapers, burins etc.). The following raw materials, quartz pebbles, agate and volcanic rock pebbles, were also used in similar quantities on both sites. The presence of many debris elements as well as retouched tools confirmed the intentional selection of these rocks. However, they were never create using a new technology - quartz pebble tools were not made by the so-called slicing method, agate products were not made by the microlithic bladelet method, no fragments of polished tools made of rhyolite or basalt were noticed. All the tools reflected flint retouched forms. Raw materials with the greatest similarity to flint, chert, petrified wood and green silicified mudstone occurred in minute quantities, thus conscious selection of these rocks was not confirmed by the quality nor quantity of specific artefacts.

The last category of raw materials used on both excavated sites was granite/gneiss and quartzitic sandstone for grinding instrument production. The only flake recorded on the surface of site 3-O-3 is rather weak proof for the production of such instruments on the early-Neolithic site. Thus we can assume that in the case of grinding bases, workshops were placed in separate areas away from the settlements.

The view sketched out above of the selection of diverse raw materials was no doubt dictated on both sites by technological reasons. As mentioned before, apart from single-platform debitage oriented towards retouched tools, some other schemas of rock fracture (even crumbling) the aims of which are as yet unidentified, was in use (mainly related to quartz). Rare examples of discoidal and bipolar debitage were also noted using a variety of rocks. In these examples it can be supposed that the main aim was to produce small core-forms for use as tools. The small size of these items point to rather tiny flakes having been removed from them. Use-wear analysis could help us to judge if the presence of small discoidal and bipolar forms should be defined as simple tools or marked the margin of flake oriented methods.

The single-platform method was the main way of blank (flakes) production in the inventories of sites 3-J-26 and 3-O-3. The presence of flint crested flakes (blades) as well as cores retaining their crests clearly points to the desire to produce elongated blanks, although the result was not so blade-like. In spite of crested edges creation, exploitation usually shifted to the creation of wide, flat surfaces. It was only possible to remove wide flakes, irregular in outline, from such a surface. Another technological relic of blade methods concept was the common abrasion of the platform/flaked surface edge. The main aim of such processing was the reduction of the overhangs created directly under the edge due to previous flake fracture. Reduction of the overhangs eliminated the danger of striking too close to the edge. The precision of that blow is also visible in butt size and shape (blade butts usually were only *c.* 1mm deep). In the case of flake (not blade) debitage, such perfection was unnecessary; their butts usually were much deeper, thus abrasion looks a little exaggerated. Too intensive abrasion could even have caused damage to the edge and thus forced rejuvenation of the platform (removing the core tablet). Such flint debris was noted in both inventories. Striking platforms mostly were formed with single or a few flat negatives, although the frequent repeating of the platform preparation with few negatives at 3-J-26 points to a different technological aim. All the products recorded with such an attribute, were thick and trapezoidal in cross section. At site 3-O-3 no one such remains were observed.

Summing up, the lithic inventories of both sites showed many similarities - the same raw material palette and the same technological schemas with the domination of the single-platform method that could be called the semi-blade method. Simultaneously, irregular quartz fracture was common as well as tool production using discoidal and bipolar methods. The presence of products in great numbers with outer surfaces retaining their cortex should not be surprising when pebble forms were mostly worked. For the successful reduction of such small blocks, flaking should be started almost at once because their volume reduced rapidly with each removal. The scale of reduction is reflected in final core sizes, much smaller on the site's surface in contrast to items from pit fills both on site 3-J-26 (secondary deposit of Neolithic pit fill in the later grave) and on site 3-O-3 (pit fill).

Analysis of the retouched tools as well as unretouched flakes but with wear traces, allows a description of the real production aims determining the entire system of technology and raw material selection.

Classical typology was not found to be precise enough, describing as it does the form only, for example few categories of insertions were defined (lunate, truncations, backed pieces, geometrics etc.), while various perforators (both thickset and slender) were put into one category. Thus, to facilitate the study of tool typology, new definitions were proposed which included also blank production and raw material.

Geometric insertions belonging to composite instruments (sickles, knifes) were recorded in both inventories. The proposed new classification system for these tools was derived from a presumption of serial production and size norms present in the past determined by the use of tools for a particular function. The straight outline of the cutting edge of the composite instrument forced the use of insertions with equal width and a straight working edge. Also the width of the groove forced the production of insertions of equal thickness. Reparations (replacing of single destroyed elements) points to the use of insertions of equal length. From a user's perspective, the availability of standard spare parts 'off the shelf', allowed fast repairs without the need to shape and size elements each time. On the other hand, curved sickles with less regular cutting edges (semi-denticulate) did not force the production of such standardised products.

Inventories from sites 3-J-26 and 3-O-3 exhibit some differences in geometric insertions' production. On site 3-J-26 two types of composite instruments were present, one with a regular cutting edge (insertions made of blade blanks) and the other with an irregular working edge (more massive insertions, made of thick blades and flakes). In the site 3-O-3 inventory, mainly irregular, thickset geometrics were recorded. In contrast to site 3-J-26, no thick-backed pieces were recorded, while some wide triangles were noted.

In describing geometric insertions, wear traces (macroscopic) and impacts should also be mentioned. Most probably sickles/knives/arrows were used outside the camp while the presence of large numbers of insertions points only to the production or/and repair of composite instruments. Only forms broken during production or with heavy wear traces resulting in their replacement would be introduced into archaeological contexts. Most of the recorded insertions had a number of irregular wear retouches, although no polishing was noted during preliminary macroscopic observations. Many tools were also broken. Some insertions from both sites, had pseudo-burin blow negatives on the back (retouched edge) - such impacts are common on projectile points (arrow-heads), but could also be the result of unskilled use of sickles or accidents (e.g. dropping onto hard ground).

The next category of retouched tools was perforators, especially numerous on site 3-O-3. In both site inventories diversity was observed, slender perforators (and borers in morphological type) most probably were used as working parts in more complex instruments, while thickset tools were used probably without any handle. Among the thickset perforators from site 3-O-3 were also a few specimens with the point bent asymmetrically. These latter were undoubtedly connected with a particular function. On many perforators numerous wear traces were noted, most commonly broken points but also pseudo-burin blow negatives and polishing confirming their use for drilling into a hard material (most probably pottery).

Scrapers from both sites represented temporary forms made of incidental flake or chunk blanks and irregular working parts as well as tools of higher quality, mostly made from cortical flakes with sides retouched (for a handle?). Their working parts were re-sharpened many times resulting in complete convexity reduction. On site 3-O-3 two small endscrapers were discovered, made of regular flakes (non cortical) and blunted on one side edge. Scraping tools include complete small side-scrapers made on irregular chunks or even small pebbles as well as most probably discoidal cores.

The inventories from both sites produced also a few specimens of burins. Dihedral forms were noticed on both sites, while truncated burins were present only on site 3-J-26.

Among temporary denticulate tools found on both sites, massive tools were recovered with the working edge (denticulated) composed of a series of deep notches, as well as more gracile forms made of flakes, that could be used as saws. Also single-use character had notched tools made of chunks and irregular flakes.

Unretouched flakes were commonly used as tools as well as small bipolar pieces with a lentoid cross-section. Flakes (mostly of flint) were used as insertions on site 3-O-3, also bigger flakes with cutting wear traces were found.

The only macrolithic tools found on sites 3-J-26 and 3-O-3 were grinders and grinding base fragments. No fragments of bifacial tools nor polished forms were recovered.

The differences between the site 3-J-26 and 3-O-3 inventories included (except for technological features such as thick blank production with platform preparation) the presence of some tool forms on one site which were absent on the other. All these forms are presented in Table 4.1. The following dissimilarities concerned the quantities of particular tool types in each assemblage. In the site 3-J-26 tool set various sizes of insertions were noticed (smaller, more regular and bigger) while on site 3-O-3 except for a single small insertion of possibly later date, only large irregular insertions were recorded. All the cataract insertions plotted to the length-width diagram (according to Honegger proposal – 2008, fig.15) fit into the same range of Kadero Neolithic tools and much older Jebel Sahaba implements, but lie outside the Mesolithic el-Barga standard.

Additionally thickset perforators prevailed in the site 3-O-3 tool kit, while in that at site 3-J-26 such tools were in a minority.

- Early Neolithic sites, but metrical features of the flakes collected on site 3-O-3 pointed the author towards a little earlier dating of those inventory.

Site 3-J-26

Ninety percent of the collection was flint artefacts, the rest being quartz and agate debris. The technology of the inventory was defined as blade-flake oriented, with frequent orientation changes in the final stages of reduction. Also three core tablets were collected. The tools assemblage was dominated by temporary notched forms, denticulates, and less common geometric insertions. All drawn insertions (Usai 2003, fig. 5.2:12-14) represented regular forms with a straight or irregular working edge. Also a number of unidentified retouched flakes and unretouched blanks with clear wear traces were noticed.

Site 3-O-3

Almost all the collected artefacts were made of flint, only a few products of quartz and agate completed the set. The technology was defined as flake-oriented single platform. Amongst the tools the prevalence of lunates was noted. Drawn insertions (Usai 2003, fig. 5.4:1-4, 7-9) represented both forms with a straight and irregular working edge but large in size in each case. Two specimens (Usai 2003, fig. 5.4:3,8) - if preserved in a complete form, could be defined as backed pieces. Also a few perforators and some unidentified retouched flakes were collected.

Comments

The proportions of the rocks worked on both sites (based on the results of excavations) were different from those from the survey collections. Also the palette of raw materials found was much wider. However, in the group of single-platform fractured items flint prevailed and agate did not create a separate cluster (with different technology or tool types).

Both inventories were dominated by single platform methods, although the defining of debitage precision based on collected flakes length-width proportions seems to be an inappropriate analytical instrument. It started with measurements of secondary features - most often of failed products and hence is not assessing the desired products. In this report the proposed term 'semi-blade method' contains information about production intentions and the results. Flakes (other than blades) could be produced by another method, which did not include a set of technical operations, the results of which could be seen on the site 3-J-26 and 3-O-3 artefacts (preparation of the core side faces, crests creation, abrasion, striking platform rejuvenation etc.).

TABLE 4.1. TOOL FORMS PRESENT EXCLUSIVELY ON SITES 3-J-26 OR 3-O-3.

3-J-26	3-O-3
1. Thickset backed pieces – insertions of composite instruments 2. Scrapers with retouched side edges 3. Truncated burins	1. Thickset triangles – insertions of composite instruments 2. Thickset perforators with the point bent asymmetrically 3. Small endscrapers with blunted one side edge

Previous studies of the site 3-J-26 and 3-O-3 lithic inventories

Both sites were discovered in 1999 by the SARS team directed by Derek Welsby. Lithic collections from the survey were analysed by Donatella Usai (Usai 2003). Sites 3-J-26 and 3-O-3 were classified as Late Mesolitic

In the lithic collections from a few more early-Neolithic sites some small discoidal and bipolar cores were recorded (sites 4-F-38, 4-F-61 - after Usai 2003). During excavations, also the site 3-J-26 and 3-O-3 assemblages produced such artefacts, which were interpreted as specific tools.

The small survey collections showed the ineffectual nature of tool frequency analysis. In the case of site 3-O-3 insertions, those forms did not predominate in the general tool kit. However, the total assemblage recovered through excavation confirms the presence of thickset backed pieces in the insertions category. Also the presence of a few more straight working edge lunates (Usai 2003, fig. 5.4:4,7) changes a little the proportions of that category, which made the site 3-O-3 kit more similar to that at site 3-J-26. As a result of the excavations, a number of burins were also discovered as well as truncations - tools absent in the survey collections.

Not a single early-Neolithic site from the Fourth Cataract produced proof of intentional blade blank fracture using the microburin method. Even very regular insertions did not have negatives of microburin blows on the back - in contrast to the very common impacts in the form of pseudo-burin blow negatives placed both on the edges (not only retouched ones) and on the tool faces. Also no microburins were found. The tradition of insertions production using the microburin method, present in the Dongola Reach (Multaga 3, Argi Basin, Letti Basin) and near Atbara (Wadi Muqabrat 8) was not observed in the Fourth Cataract region. Let us remember that this tradition is descended from Saharan early-Neolithic inventories (Al Adam Type, Al Ghorab Type - after Wendorf *et al*. 1984) based on slender triangles production from gracile blade blanks. In the Forth Cataract up to now, inventories with such quality blank production are still unknown.

Final remarks

In conclusion a wide palette of worked raw materials, decay of blade blank production methods as well as tool kits with an absence of slender triangle insertions, allows both studied inventories to be compared closely with Al Jerar Type assemblages from Nabta Playa (Wendorf *et al*. 2007). Assemblages of this type are associated with the end of the Saharan early-Neolithic period, with absolute dates estimated at between 8000 and 7300 BP[1] (Wendorf and Schild 2001, 6). A similar date was obtained for early-Neolithic pottery of the Karmakol Tradition from the Dongola Reach (*c.* 7500 BP[2] - pers. comm. F. Geus; see also Gatto 2006). Sites 3-J-26 and 3-O-3 also produced this type of pottery (chaff tempered) and lithic inventories suited to the model of lithic production from Multaga 3's early-Neolithic phase. Thus, the date of the early-Neolithic colonisation of the Fourth Cataract region can be estimated as belonging to the Holocene rainfall maximum in the Egyptian Sahara some less than 8000 years ago.

Differences between the site 3-J-26 and 3-O-3 invento-

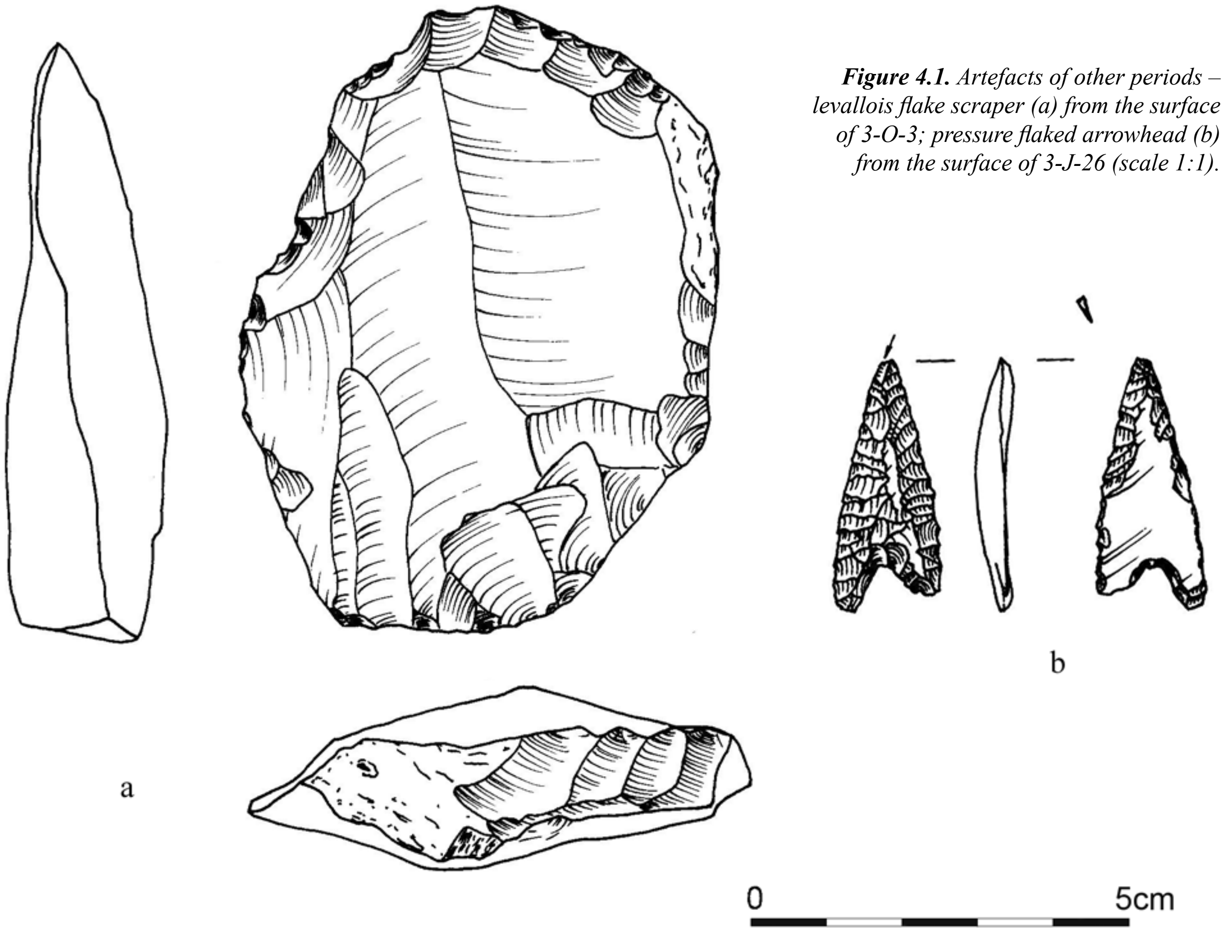


Figure 4.1. *Artefacts of other periods – levallois flake scraper (a) from the surface of 3-O-3; pressure flaked arrowhead (b) from the surface of 3-J-26 (scale 1:1).*

[1] Calibration using OxCal 4.1 program by Bronk Ramsey 2010, see also Bronk Ramsey 2009.
8000BP = 7046 - 6831 CalBC, 95.3% probability
7300BP = 6220 - 6092 CalBC, 95.4% probability
[2] 7500BP = 6423 - 6378 CalBC, 95.4% probability

ries appearing in various insertions sets and frequency of perforators or scrapers types can be explained in behavioural terms only partially. Most probably many of those differences came from various stylistic traditions being present in the same period (lasting a few hundred years). The frequent presence of flake-made thickset perforators (according to the site 3-O-3 assemblage) was rather typical for late-Neolithic sets, but there were no traces of other specific elements such as microlithic bladelett production and agate was fractured infrequently. In the case of site 3-O-3 later use associated with some activities was confirmed by other typical tools (single small regular lunate and multi-pointed perforators). Thus, among the set of perforators from site 3-O-3 some admixture of later tools should be expected (exactly the same in form as early-Neolithic examples). Following that reasoning, later admixtures could be present also on site 3-J-26. Directly on the early-Neolithic settlement remains, a member of so-called *Kerma Horizon* was buried. Societies of that period will no doubt have still used stone tools. Adjacent to the early-Neolithic settlement at site 3-O-3 were single stone tumuli (related to the *Kerma Horizon*). Even later prehistoric presence on the sites is confirmed by a single find of a flint arrowhead recorded on the northern periphery of 3-J-26 (Figure 24b). Such tools are not related to Neolithic Fourth Cataract technologies. The earliest known examples of pressure retouched bifacial arrowheads are known from the Western Desert (late Neolithic inventories) but the tradition of manufacturing stone arrow-heads is known in Nubia into the later Kushite period (see Jesse 2005,65; Welsby 2004, 153).

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