Chapter 4

FLK NORTH

Introduction

FLK North is part of the same gully as the FLK I complex, and is located a few dozen metres from FLK Zinj. According to the original description (Leakey 1971), FLK North has a 7.2 m stratigraphic thickness, in which 8 archaeological levels were identified. Five of these assemblages (Levels 6-1) are located in the Upper Member of Bed I, 1.5 m below Tuff IF (which limits the sequences in Bed I and II). Above Tuff IF, and therefore in the base of the Lower Member of Bed II, Leakey excavated levels FLK North Clay with Root Casts and FLK North *Deinotherium* Level. Excavation processes were carried out in that same sedimentary complex in the lower part of the Middle Member of Bed II, unearthing the most recent of all the FLK North levels, known as the Sandy Conglomerate.

Excavations were performed between 1960 and 1962, in 6 trenches measuring up to 7 metres long, and with a width ranging between 1.8 m and 3.15 m and a 1.8 m to 3 m depth (Leakey 1971:62). Although Leakey (1971:61) considered that functionally four of the levels (Levels 5-1) of FLK North Bed I were living floors and the other was a butchering site (Level 6), in the same work she specified that Levels 5-1 were sites with diffused materials, in which the archaeological remains were scattered along a thick stratigraphical sequence (Leakey 1971:258).

The interpretation of FLK North 6 was still sustained, a level which, alongside the *Deinotherium* Level, would embody two examples of butchering sites in the FLK North sequence. This lack of decision regarding the nature of the FLK North levels also appears in subsequent re-examinations: Potts (1994:20) calculates the densities for bone and lithic remains by m^3 in Levels 6-1, concluding that all units could respond to background deposits scattered naturally around the landscape, and not to intentional human accumulation. Nonetheless, Potts (1994) does not rule out them being human accumulations, since other areas of Bed I present densities even lower than in FLK North that are unquestionably remains deposited naturally.

The materials in FLK North have undergone numerous re-examinations. We can mention the paleontological investigations by Gentry and Gentry (1978) and Plummer and Bishop (1994) on the bovidae in the whole FLK North sequence, and works by Andrews (1983) on the microfauna in Level 1-2 and by Denys *et al.* (1996) and Fernández-Jalvo *et al.* (1998) on the micromammals in all levels of the site. Zoo-archaeological works have focused on Levels 6 and 1-2 (Bunn 1982, 1986; Potts 1988), paying less attention to the rest of the sequence (Shipman 1986). With regard to the industry, apart from Leakey's (1971) original study, we also have Sussman's (1987) use-wear analysis on several pieces from Level 1-2 and the *Deinotherium* Level, Sahnouni's (1991) on polyhedrons, Potts' (1988) re-examination of Level 6, the analysis of the choppers in some of the levels by Bower (1977) and Wynn (1981, 1989), and those in Level 1-2 by Roche (1980), Willoughby's (1987) analysis of spheroids in Levels 1-4 and the Sandy Conglomerate Level, the complete study of the Sandy Conglomerate Level (Kimura 1999), as well as Ludwig's (1999) unpublished work on the whole sequence of the site and by Kyara (1999) and Kimura (1997) on the FLK North levels located in Bed II. The quality of these contribution is uneven, biased by the variety of approaches and perspectives, which prevent a global vision. Hereunder we present a re-examination of the lithic industry from several of the archaeological levels in FLK North, starting with the oldest, FLK North Level 6, until reaching the most recent, FLK North Sandy Conglomerate.

FLK North Level 6

The bone assemblage

According to Leakey (1971:64), Level 6 was only excavated in Trenches IV and V and in a small part of Trench II. The thickness of the archaeological level reached 52.5 cm (Leakey 1971:260). Based on that information, we estimate a 56 m^2 area maximum, although the excavated surface was probably smaller, perhaps 37 m^2 - as Potts (1988:24) proposes - or 35 m^2 - as Isaac and Crader (1981) suggest -.

Leakey (1971) highlighted the finding of an almost complete *Elephas recki* skeleton linked to artefacts in Trenches IV and V, although she also indicated the presence of bovid remains and of a second elephant (albeit represented only via a few scattered remains) alongside the main *Elephas recki* carcass. As regards the industry, Leakey described a collection of 123 pieces linked to the elephant carcass, 77.2% of which would be *débitage* and the rest heavy duty tools. Given the apparent association between lithic and bone remains, Leakey considered Level 6 as a butchering site.

According to Leakey (1971:64), the *Elephas recki* skeleton was well preserved; with only the tusks and part of the skull missing. Leakey mentioned a movement of the remains, which she attributed to carnivores. In all, Leakey (1971:252) counted a total of 614 bone specimens, most of which belonged to the elephant, followed by remains of bovids, suids and carnivores, with a residual amount of remains from equidae, giraffids and hippopotamidae. Subsequent fauna studies modified part of Leakey's inventory. Bunn (1982) counted 622 bone specimens, of which, apart from 6 unrecognisable bone remains, 211 were fragments of the *Elephas recki* and another 405 were identifiable fragments from other taxa. Bunn (1982) indicated that, aside from the *Elephas recki*, there were another 35 individuals in Level 6. According to this author, the bone density was too high to be natural, and bones from several species supposedly presented cut marks (but see Domínguez-Rodrigo *et al.* in press). Bunn (1986) then modified this interpretation radically; by using patterns of skeletal representation, he went back to Leakey's (1971) original classification. The over 400 animal bones, apart from the elephant carcass, corresponded to a natural deposition background.

Binford (1981), Potts (1988) and Shipman (1986) also analysed the configuration of Level 6. Binford noted that the industry was not necessarily linked to the elephant carcass, but that it could be linked to the remains of the other individuals represented in the level. Potts (1988) disagreed, stating that most of the archaeological material was concentrated in Trenches IV and V, where the complete assemblage of artefacts were located, all the elephant bones and 95% of the macromammals. This author believes the spatial association between the industry and bone remains is irrefutable. Concurring with Bunn (1982), Potts (1988) proposes a complex taphonomic history, which contemplates the death of the elephant *in situ*, the selective transport of artefacts and bones from other animals (mainly bovids) to the site, and the interaction with other carnivores. Shipman (1986) observed that most of the cut marks on the elephant were located by the metacarpus and the ribs. She considered that both the percentage of marks and their distribution indicate a secondary access to the elephant carcass by the hominids. Shipman (1986) also draws attention to the presence of cut marks on several bones of *Parmularius*, therefore admitting that at least part of the bone assemblage linked to the *Elephas* skeleton had an archaeological origin (Bunn 1982; Potts 1988), not a natural provenance (Bunn 1986; Binford 1981). Thus, the interpretation of the bone remains from FLK North 6 is still currently under debate, since a recent zoo-archaeological study (Domínguez-Rodrigo *et al.* in press) suggests the absence of any kind of human modification in the bone assemblage, therefore proposing that the relationship between industry and fauna is absolutely fortuitous.

The lithic industry

The FLK North 6 lithic assemblage has been studied by Leakey (1971), Potts (1988) and Ludwig (1999). It consists of a small collection of 130 artefacts, which Leakey (1971:64) interpreted as the result of *débitage* activities. Potts' (1988:388) re-analysis reduced the original number of choppers to only one, and doubled the number of manuports identified by Leakey (1971:64). Our study has yielded different results (tabl. 4.1). One of the most remarkable features of the assemblage is that 52 pieces (40,3%) out of the 130 artefacts show battering damage. Taking into account that most of the assemblage is composed of chips smaller than 20 mm in which it is not possible to identify such traces, it is logical to think that the representation of battered pieces could be even higher. If we express this feature per amount of lithic mass represented, 14.378 grams out of the 16.539 grams of raw material represented bear traces of battering. In sum, the fact that over 14 kg out of the 16 kg represented are related to battering activities should be indicative of the nature of the assemblage.

In FLK North 6, knapping activities are represented by 4 cores suggesting *débitage* processes, although it is symptomatic that the only core in quartz also shows traces of battering (fig. 4.1). Two of the cores are bifacial choppers and the other two were created by reduction through abrupt flaking, one of them is unifacial and the other one is bifacial. None of them present long sequences of reduction and they indicate a moderate exploitation. The identification of the flaking products is, however, more problematic. The techno-morphological features that identify actual flakes are hard to observe in the FLK North 6 pieces previously identified as flakes. Very

	Quartz		Lava		Total	
	n	%	n	%	n	%
Test cores	-	-	-	-	-	-
Cores	1	0.9	3	14.3	4	3.1
Retouched pieces	-	-	-	-	1	0.8
Knapping hammerstones	-	-	10	47.6	10	7.8
Hamm. fract. angles	-	-	1	4.8	1	0.8
Anvils	9	8.3	1	4.8	10	7.8
Whole flakes	6	5.6	3	14.3	9	7
Frag. < 20 mm	35	32.4	-	-	35	27.1
Possible flake fragments	17	15.7	1	4.8	18	14
Angular fragments	9	8.3	-	-	9	7
Battered fragments	30	27.8	-	-	30	23.3
Unmodified material	-	-	2	9.5	2	1.6
Total	107	100	21	100	130*	100

Table 4.1. Lithic categories and raw materials at FLK North Level 6. (*) Included one chert retouched piece and one chert flake fragment not recorded in the rest of the table.

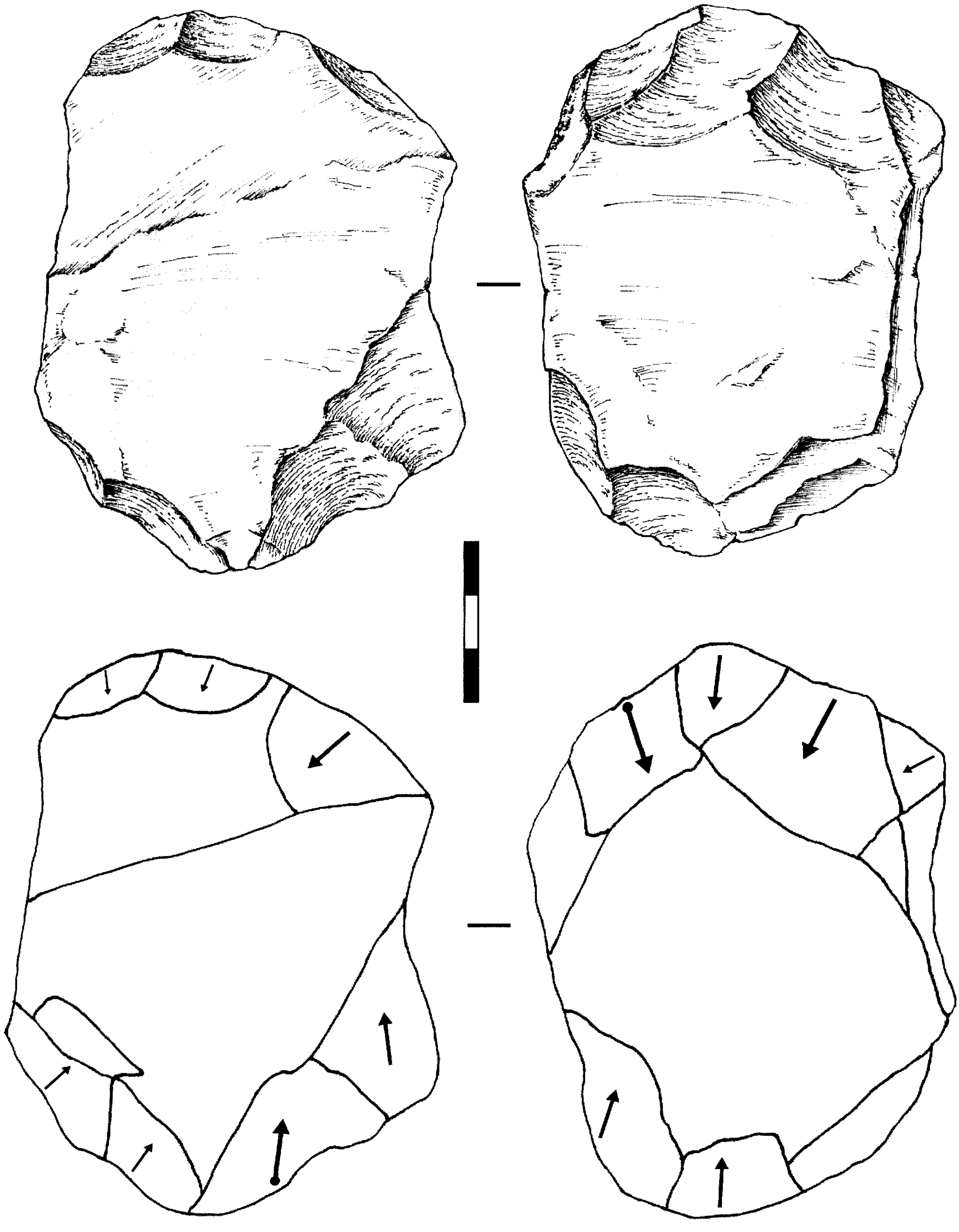

Figure 4.1. Bifacial partial quartz core from FLK North Level 6 (drawn by N. Morán).

often, it is difficult to differentiate these features from those produced by other activities. As a matter of fact, most of the 6 quartz flakes identified as such cannot be clearly defended to be actual flakes, and it should not be casual that the few undoubted flakes are from different raw materials. If it is difficult to identify possible flakes to any *débitage* system, it is even more difficult to link most of the purported knapping waste (flake fragments, angular fragments and chips) to any intentional flaking. A large number of the purported flake fragments, irregular and fairly small (<2 mm), even if lacking any traces of battering, could also be the result of processes alternative to *débitage*, making the percentages of products of intentional flaking even smaller.

In the present study, a total of 10 hammerstones have been identified, more than double as reported by Leakey (1971). They are high-quality rounded lava cobbles. In several of them, the battering traces are not very conspicuous. This may explain why Potts (1988) identified some of them as manuports. Anvils are the most relevant category of the artefacts represented at FLK North 6. As can be seen in table 4.1, these artefacts make up only 7.8% of the assemblage, but they account for almost half of the weigh of the lithic assemblage (7,642 g).

It is important to reflect now on the definition of this kind of objects. The description of the Olduvai anvils Leakey offers (1971:7) is still valid, as she considered these pieces as "*cuboid blocks or broken cobblestones with edges of approximately 90° on which there is battered utilisation, usually including plunging scars*". In an attempt to complete this description, it could be added that in these anvils, the natural tabular planes of the quartz blocks act as platforms that receive the blows from the active hammerstones. This is due to the regular surface visible on these tabular shapes, which allow one of the flat sides to be used as a percussion platform (A) whilst the opposite side (B) is positioned on a stable ground. Given the percussion processes (see fig. 4.2), platform A is full of impact marks, especially by the edges of the block and cause the abrading of the whole periphery of the platform. Platform B, although it does not receive direct blows, also experiences *écaillés* and fractures given the force transmitted to the block and being in contact with the ground, especially on the edges of the piece. Furthermore, and as a result of this whole process, the surface of the block exposed between the two natural planes (C) is also modified by percussion, generating numerous scars with hinged and stepped morphologies throughout the whole periphery of the block.

This shows that several small fragments were detached from anvils due to percussion during battering activities. This is where the purported *débitage* fits the functional interpretation resulting from our study. Many of the purported flake fragments lack the typical features that would identify them as actual flakes. They lack bulbs, dorsal faces with previous scars, butts, etc. Alternatively, the battering traces in some of them, together with the repetition of specific morphologies and sizes observed in the scars on the anvils, would indicate that most of these fragments could be the involuntary result of battering activities generated through percussion on the anvils. Given the morphological patterns observed, there have been distinguished several types of what we have designated "positives detached from the anvil" (see fig. 4.3).

The first group encompasses fragments that even emulate genuine edge-core flakes, breaking away part of the anvil's natural percussion platform (platform A) and plane C. Some of them are characterised by their triangular transversal sections and an elongated morphology (group 1.1.), whilst others are wide and short positives with sagittal sections that form a simple angle with an internal concave face (group 1.2.). As can be observed in figure 4.3, the weakest part of the blocks are the fragments detached from the anvil edges during the battering process.

A second group of positives is formed by fragments detached particularly from plane C of the anvil. The most common, herein designated group 2.1., are very thin fragments that

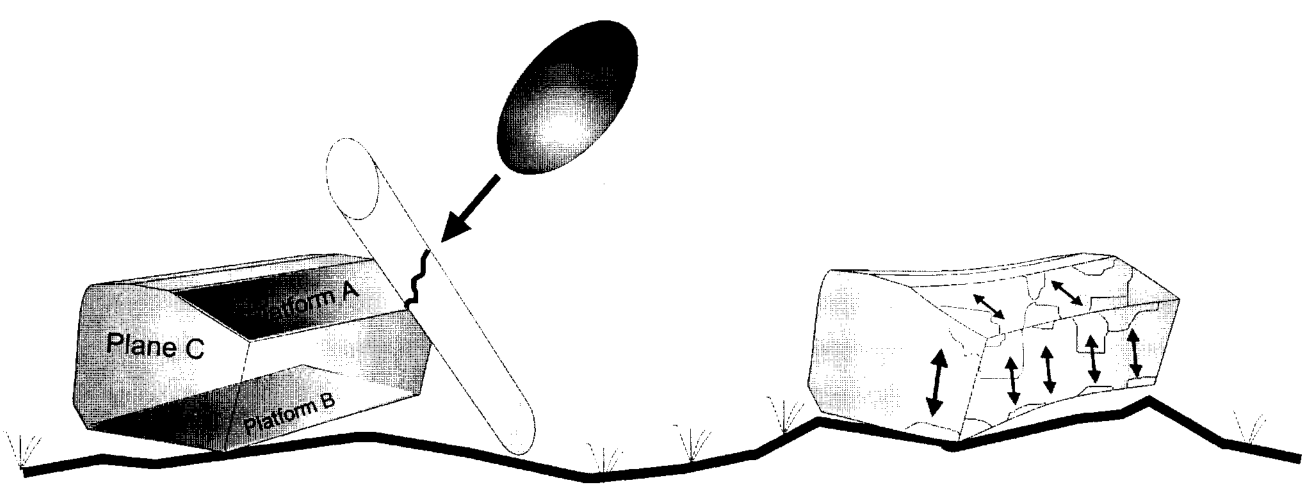

Figure 4.2. Diagram representing the process of use of the anvils.

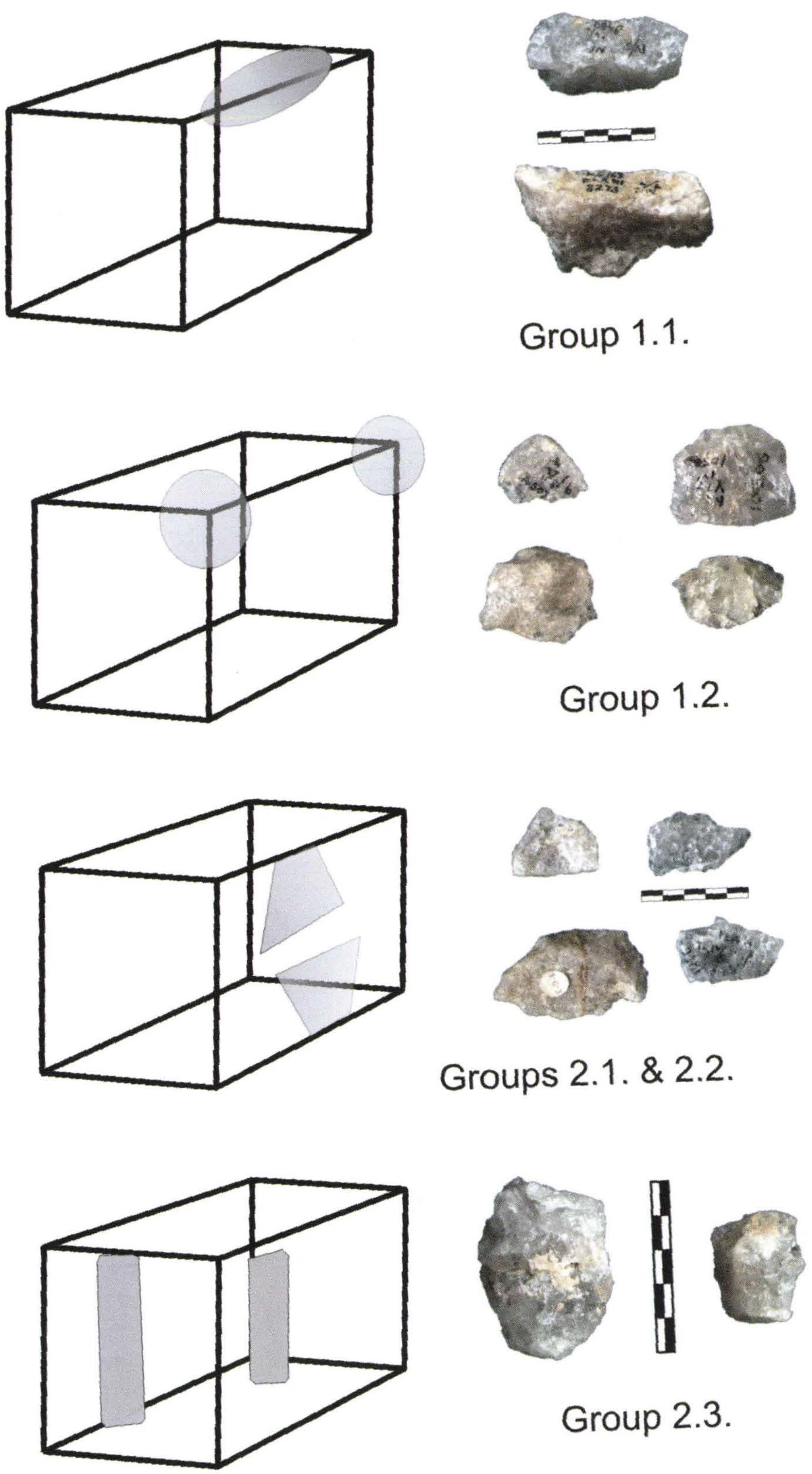

Figure 4.3. Different modalities of the products generated during the activities in which anvils are used. All examples are from FLK North 6, but the different modalities also are found in the remaining levels from FLK North and in later sites.

present wide and short morphologies, without butt, bulb or ridges on the dorsal face. These fragments produce negatives with obtuse angles and convex scars - instead of the typical concave morphology of the conchoidal fractures - on the anvils, that responds to superficial chipping of the blocks. Alongside these elements, there are thick and irregular positives (group 2.2.), genuine chunks from the fracturing of the anvils. Finally, we have identified positive bases with long typometric modules, that can even present a butt (group 2.3.). In this case, their classification as elements from percussion processes and not *débitage* is established given the irregularity of the dorsal face (which does not present ridges from previous extractions), the sinuous concavity on the ventral face (impossible on conchoidal fracture) and the thickness and abrading of the edges of the piece.

The classification of the positives detached by percussion presented above responds to morphological parameters, since the technological processes that generate these products actually respond to the same cause: the gradual modification of the anvils due to percussion activities performed on these passive objects. Nonetheless, it is relevant to discriminate the different shapes of percussion positives with a view to underlining the morphological variability and stressing the danger of confusion, which led Leakey (1971) to classify pieces generated spontaneously on the anvils' transversal planes as flake and flake fragments. This reclassification is of paramount importance, since a large number of the small items can be assigned to processes that resulted in the involuntary fragmentation of the anvils and not to activities involving the production of flakes. This leads to reflect on the role of percussion processes in the activities performed by hominids and the functionality of the studied sites. FLK North is a good example of this situation: with the exception of a few pieces, the entire lithic assemblage of this level could be interpreted as the result of percussion rather than flaking. Taking this presumption into consideration, the behavioural interpretation of the occupation can change radically.

FLK North Level 5

Artefacts and bones were concentrated in the upper part of the level, although scattered remains were also located along the whole 45 cm thickness. Leakey (1971) documented earth movements that could have caused the postdepositional fractures of bone remains. It is relevant to note the finding of a terminal phalanx of a hominid foot, probably *Homo habilis* (OH 10). Leakey (1971:67) documented small concentrations of bones from microfauna interpreted as carnivore faeces.

Excluding the microfauna, 2210 bone specimens were recovered, with a predominance of bovids, followed by carnivores and suids, and documenting a residual presence of elephants, hippos, giraffes, equids, turtles, snakes, birds, etc. (Leakey 1971:252). Despite the large amount of bones, only Shipman (1986) performed a partial zoo-archaeological study, documenting a few examples of bones with cut marks.

	Quartz		Lava		Total	
	n	%	n	%	n	%
Test cores	-	-	1	1.1	1	0.6
Cores	2	2.6	13	14.9	15	9.2
Retouched pieces	1	1.3	-	-	1	0.6
Knapping hammerstones	-	-	17	19.5	17	9.9
Hamm. fract. angles	-	-	5	5.7	5	3.1
Anvils	9	11.8	-	-	9	5.5
Whole flakes	2	2.6	3	3.4	5	3.1
Frag. < 20 mm	2	2.6	2	2.3	4	2.5
Possible flake fragments	36	47.4	12	13.8	48	29.4
Angular fragments	22	28.9	1	1.1	23	14.1
Battered fragments	-	-	2	2.3	2	1.2
Unmodified material	2	2.6	31	35.6	33	20.8
Total	76	100	87	100	163	100

Table 4.2. Lithic categories and raw materials at FLK North Level 5.

	Quartz		Lava		Total	
	n	%	n	%	n	%
Test cores	-	-	1	1.8	1	0.7
Cores	2	2.6	13	23.2	15	11.3
Retouched pieces	1	1.3	-	-	1	0.7
Knapping hammerstones	-	-	17	30.4	17	12.8
Hamm. fract. angles	-	-	5	8.9	5	3.7
Anvils	9	11.8	-	-	9	6.8
Whole flakes	2	2.6	3	5.4	5	3.7
Frag. < 20 mm	2	2.6	2	3.6	4	3
Possible flake fragments	36	47.4	12	21.4	48	36.3
Angular fragments	22	28.9	1	1.8	23	17.4
Battered fragments	-	-	2	3.6	2	1.5
Unmodified material	2	2.6	-	-	2	1.5
Total	76	100	56	100	132	100

Table 4.3. Lithic collection at FLK North Level 5 excluding the supposed lava manuports. Quartz unmodified objects are included, assuming that quartz always was transported to the site.

On Level 5, Leakey (1971) documented 151 lithic artefacts, among which "*débitage*" was predominant and choppers were the most common tool type. Leakey also identified 29 manuports. When Ludwig (1999) reanalyzed the assemblage, he studied only 111 artefacts. We have been able to spot 163 pieces, including the purported manuports. Table 4.2 shows that unmodified stones are extremely well represented, only outnumbered by the possible flake fragments. As was the case of the FLK Zinj site, we estimate that several of the lava "manuports" could be natural rocks already present on the ground when the site was formed. This would also be supported by the fact that in most of the modified pieces, quartz is the predominant type of raw material (de la Torre & Mora 2005). Of the 23,823 grams of lithic material collected on Level 5, the supposed lava manuports composed 7305 grams, therefore totalling a volume larger than the quartzes (5134 grams). After subtracting the unmodified lava material, basalts and phonolites still prevail (10,818 grams) over the slightly above 5 kilograms of quartz, although we can see (tabl. 4.3) how the categories and percentages for each type of object are reorganised. If the supposed manuports are set aside, one feature that is surprising is the high number of cores with respect to flakes. Most of the cores are made on lava, whereas most of

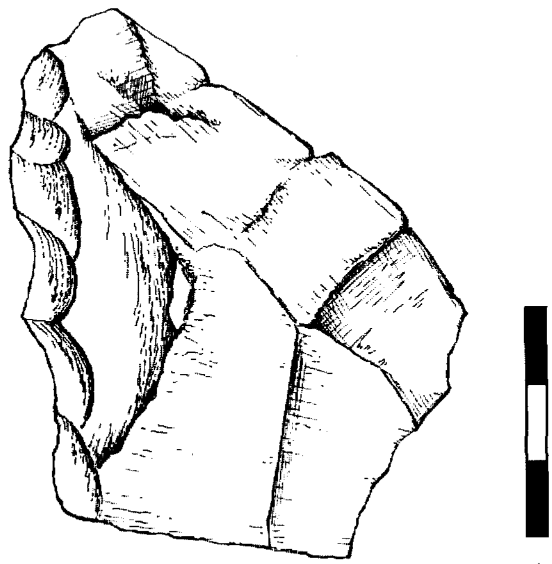

Figure 4.4. Quartz lateral side scraper, unique retouched piece from FLK North Level 5 (drawn by N. Morán).

the purported *débitage* (namely, small fragments) is made of quartz (tabl. 4.3). This is an important contradiction that demands explanation. Quartz *débitage* can be demonstrated by the presence of cores, refitting pieces and even one retouched flake (fig. 4.4.). However, the presence of artefacts functionally related to percussion is also important. The quartz anvils make up 3,736 grams out of the 5 kg of raw material represented. Thus, it may seem reasonable to interpret a substantial part of the purported flake fragments as the result of battering activities and, therefore, as being positives detached from anvils as is the case in the FLK North 6 (fig. 4.3).

The vast amount of cores is surprising. With a considerable sample (n=15), if compared to the rest of the assemblage, the main knapping processes described in previous chapters are represented. There is a predominance of choppers, both unifacial (20%) and bifacial (26.7%), all made of lava. Both the unifacial abrupt system (13.3%) and the bifacial system (also 13.3% with two samples) are frequent, as is the bifacial peripheral model (13,3%), with one sample in lava and the other in quartz. Moreover, there are also individual examples of the multifacial method and the unifacial peripheral model (fig. 4.5). Consequently, the variability of the knapping methods is proven in Level 5, as is the importance of the *débitage* processes. This does not coincide with the terms suggested in the rest of the assemblage. If we were to consider the flake fragments as whole flakes, which is quite questionable, we would come up with a maximum of 15 lava flakes. This implies an index of slightly over one flake per core, which is highly improbable, especially if we recall the structure of several of these cores.

In view of this shortfall, proposing plausible hypotheses emerges as a difficult task. Indeed, there was *in situ* lava knapping; the fragments recovered and even the existence of refits between cores and flakes verify this notion. Nonetheless, a great number of *débitage* products are missing, products which should have been found in the site in

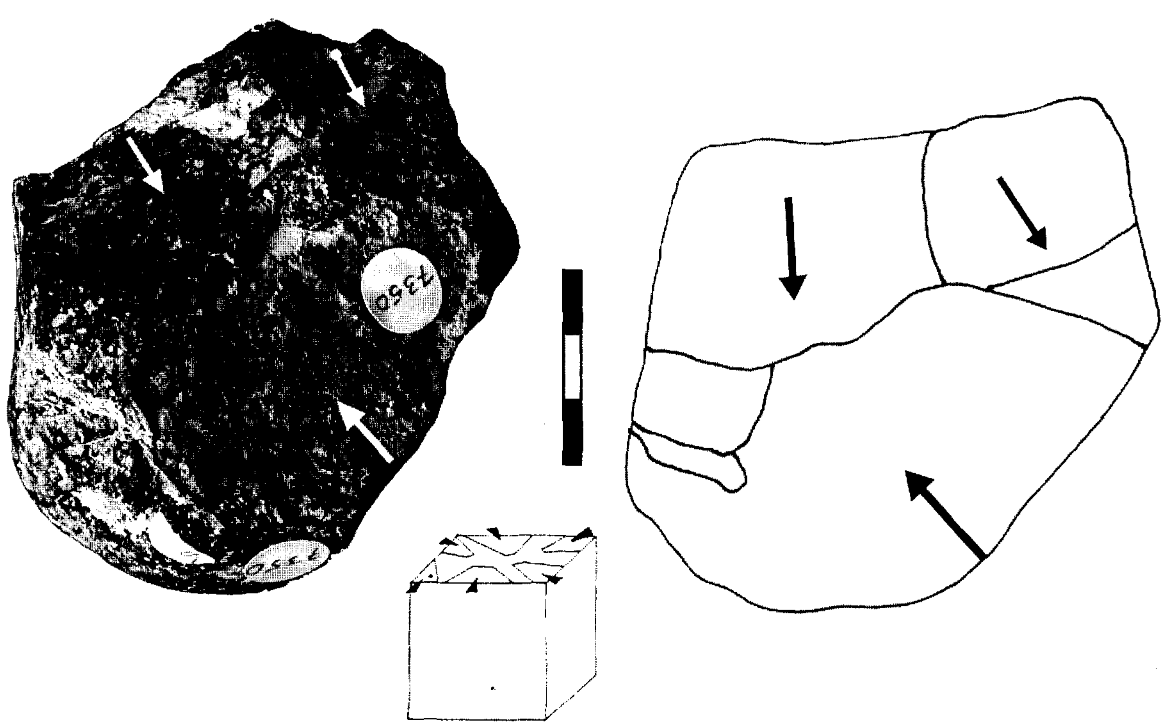

Figure 4.5. Unifacial peripheral lava core from FLK North 5.

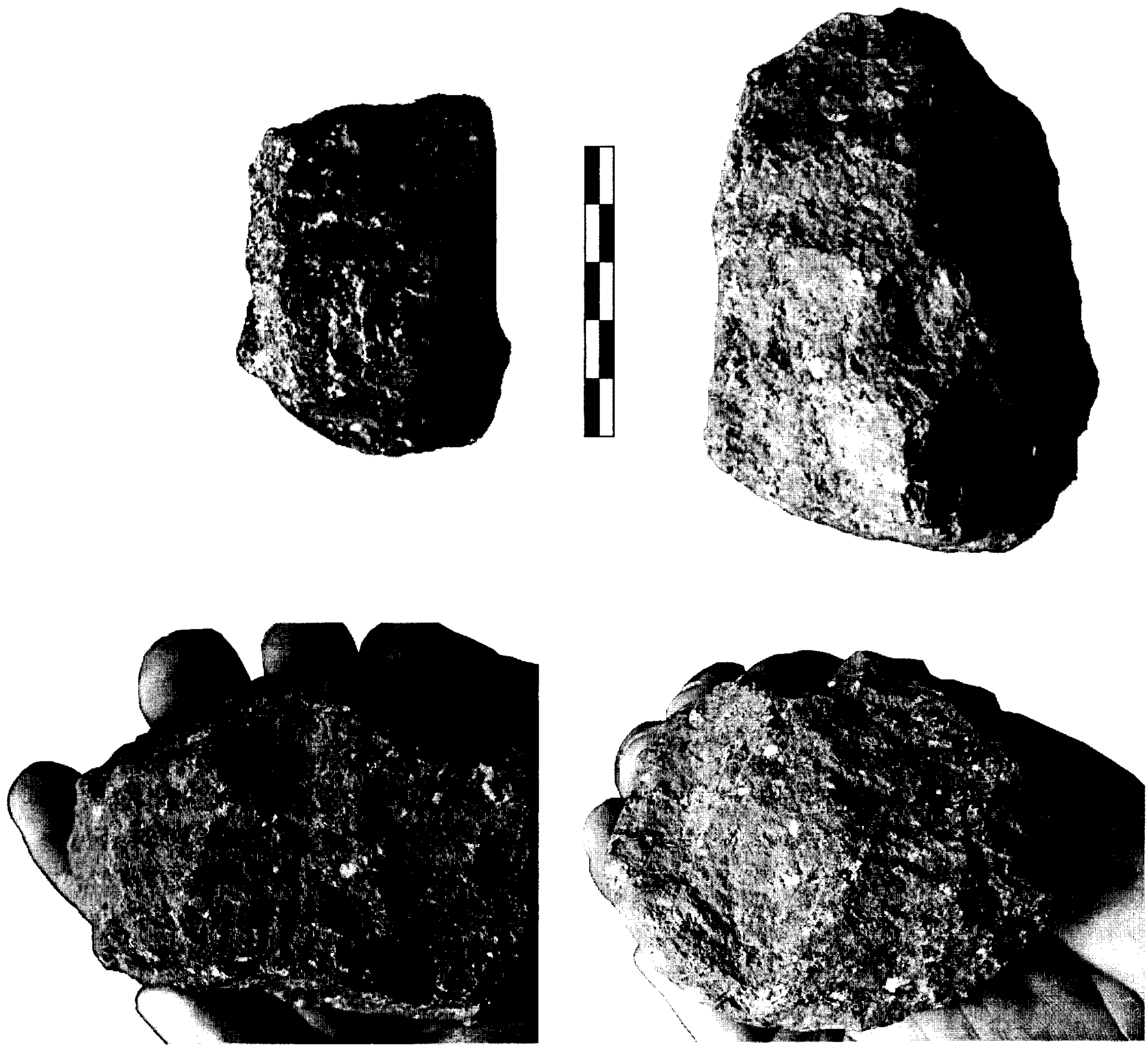

Figure 4.6. Cobbles from FLK North Level 5 with fractured angles caused by heavy percussion activities.

view of the core frequencies observed. This same assumption can be made as regards quartz. The actual percussion activities generate hundreds of fragments linked to large sized objects such as anvils. Nonetheless, such frequencies are not observed in FLK North 5. Consequently, an alternative option lies in considering a sorting process that suppressed the smaller fragments. In FLK North 5, the pieces under 20 mm long only represent 3% (tabl. 4.3). In FLK Zinj, for comparison's sake, these *debris* reached 49.5%. Thus, the differences are quite clear.

As regards hammerstones, FLK North 5 presents the same trends as other analysed assemblages, with basalt and phonolite cobbles appearing as the most prevalent blanks employed as knapping hammerstones. At Level 5, hammerstones constitute 30.4% of the lava pieces, being represented by higher numbers than cores and even combined frequencies of flakes and flake fragments (tabl. 4.3). Given their high number and their size, it can argued that elements of high dimensions are better represented than smaller ones and battering activities seem to be well supported. The lack of smaller sized pieces may be the result of post-depositional processes involving some hydraulic disturbance.

It is important to refer to the objects we have designated hammerstones with fracture angles. These items have been mentioned in other sites, but we delayed a systematic description until we had a sufficient sample. FLK North Level 5 has provided 5 of these objects, therefore we can now focus on their analysis. If classic hammerstones are characterised by pitting on cortical areas, rounded shapes and homogenous cobbles, hammerstones with fracture angles present battering traces along orthogonal non-cortical planes. These fracture planes are generated by the percussion activities. The process is as follows: when hitting an item with the hammerstone, the active element is fractured, producing orthogonal planes and irregular ridges. Instead of replacing the hammerstone or finding an undamaged area on the same piece -as occurs with classic hammerstones- in this case the generated fracture angles are used to continue banging the passive item. Thus, on these active pieces the area used for percussion becomes completely fractured (see fig. 4.6).

Due to this process, the ridges that formed the fracture planes are abraded by the battering, presenting sinuous edges along the ridge's silhouette. The generation of these planes is best explained through the existence of "simultaneous scars" on both sides of the ridges generated by the fracture planes: when hitting the hammerstone ridge generated by previous battering, the impact makes fragments of the hammerstone that are detached from both sides of the ridge simultaneously.

Quite often classic hammerstones ended up breaking after their use, and this could lead some to state that hammerstones with fracture angles are simply broken knapping hammerstones. However, in these pieces the battering affects previously fractured angles, meaning that the angles generated by fractures were employed after they were no longer effective for percussion activities linked to lithic knapping. Moreover, the battering marks appear on the ridges (fig. 4.7) seems to indicate that it was precisely these natural angles created by percussion which were used principally to perform the task.

In conclusion, the lithic collection in Level 5 does not have a good internal coherence, since it is lacking in major elements from the *chaîne opératoire*, most importantly those linked to production activities, such as flakes and knapping waste. On the other hand, there is a relative profusion of large sized elements like cores, and especially of anvils and different types of hammerstones. This indicates that percussion activities, not necessarily linked to lithic knapping, were more important than considered at first. Furthermore, it once again underscores the infra-representation of small elements, perhaps removed from the assemblage via postdepositional processes. Therefore, it is important to bear Leakey's (1971) warning in mind, since she considered this level contained diffused material, therefore making it difficult to reconstruct the activities performed by the hominids accurately.

FLK North Level 4

264 m² were excavated in Level 4, a vast area that only unearthed 84 lithic pieces and 929 bones of large mammals, according to Leakey (1971:260), concentrated in a thickness of 27 cm. Once again, the most abundant taxa are bovids, followed by carnivores and suids, alongside remains of giraffes, equids and hippos (Leakey 1971:253). As occurs in Level 5, the only zoo-archaeological re-examination was performed by Shipman (1986), who studied a small sample (131 specimens) of the bone assemblage without finding any traces of human modification. Nonetheless, the fact that Level 4 contains the greatest accumulation of microfauna species in the whole Bed I (Fernández-Jalvo *et al.* 1998) is quite peculiar.

Figure 4.7. Detail of the battering on the ridge of a hammerstone with fracture angles from FLK North Level 5.

	Quartz		Lava		Total	
	n	%	n	%	n	%
Test cores	-	-	-	-	-	-
Cores	-	-	8	15,4	8	9,6
Retouched pieces	-	-	-	-	-	-
Knapping hammerstones	1	3,2	9	17,3	10	12
Hamm. fract. angles	3	9,7	-	-	3	3,6
Anvils	1	3,2	-	-	1	1,2
Whole flakes	-	-	4	7,7	4	4,8
Frag. < 20 mm	5	16,1	-	-	5	6
Possible flake fragments	7	22,6	3	5,8	10	12
Angular fragments	14	45,2	-	-	14	16,9
Battered fragments	-	-	-	-	-	-
Unmodified material	-	-	28	53,8	28	33,7
Total	31	100	52	100	83	100

Table 4.4. Lithic collection at FLK North Level 4.

According to Leakey (1971:69), the lithic assemblage of FLK North 4 was composed of 67 flaked pieces and 25 manuports. This small assemblage was deemed even smaller by Ludwig (1999:28) who identified 55 pieces, among which there were 28 cores and only 23 *débitage* products. According to Leakey, choppers and polyhedrons were the most abundant artefacts, whereas the purported *débitage* only constituted 29,8%. In our study, we have found 83 pieces, including unmodified lithic material. As in the underlying level, the most striking feature of FLK North 4 is the abundance of non-modified pieces. As can be seen in table 4.4, the purported manuports are the most abundant type of the assemblage (28 pieces; 53,8%). Including the non-modified material, there is a total of 18,392 grams of raw material at this level. Unmodified stones are the most important type accounting for 8,294

	Quartz		Lava		Total	
	n	%	n	%	n	%
Test cores	-	-	-	-	-	-
Cores	-	-	8	33.3	8	14.5
Retouched pieces	-	-	-	-	-	-
Knapping hammerstones	1	3.2	9	37.5	10	18.2
Hamm. fract. angles	3	9.7	-	-	3	5.4
Anvils	1	3.2	-	-	1	1.8
Whole flakes	-	-	4	16.7	4	7.3
Frag. < 20 mm	5	16.1	-	-	5	9.1
Possible flake fragments	7	22.6	3	12.5	10	18.2
Angular fragments	14	45.2	-	-	14	25.5
Battered fragments	-	-	-	-	-	-
Total	31	100	24	100	55	100

Table 4.5. Lithic collection at FLK North Level 4 excluding unmodified objects.

grams, almost the double as in quartz pieces (4,313 grams). Once again, we consider it is a mistake to consider the unmodified vesicular lavas as related to the flakes and used artefacts. Therefore, as in the previous case, non-modified lithic material from this level was also excluded from our analysis. Table 4.5 shows that flaking products are very lowly represented compared to other sites.

Only larger artefacts like cores and hammerstones appear in high frequencies. This brings up the issue of taphonomic bias and differential preservation according to size. As a matter of fact, from a proportional perspective, the number of hammerstones made of phonolite and basalt cobbles is so high that it appears as slightly suspicious. Therefore we have considered the possibility that some of the battering observed on these pieces could, in fact, have been produced by mechanical causes, which would make these items natural pieces, corresponding to the unmodified material category.

Among the eight identified cores, there are methods based on different types of exploitation: unifacial and bifacial simple, bifacial abrupt (fig. 4.8), unifacial peripheral and multifacial (fig. 4.9). Hence, the presence of knapping activities is clearly documented on this level. Nonetheless, we have not come upon products linked to these activities and the few available cannot be used to typify their most relevant features.

In sum, as was the case with the previous level, this assemblage is extremely small and very likely biased, making impossible any technological or behavioural interpretation. We must not forget that this is a 55-piece assemblage in a excavated area spreading out over no less than 264 m². Therefore, it seems obvious that, either via vertical migration processes or fluvial postdepositional activities, this is a completely sorted sample that even prevents its classification as a level of occupation. Consequently, we will have to turn to Leakey's (1971) original classification once again, considering it a level with diffused material.

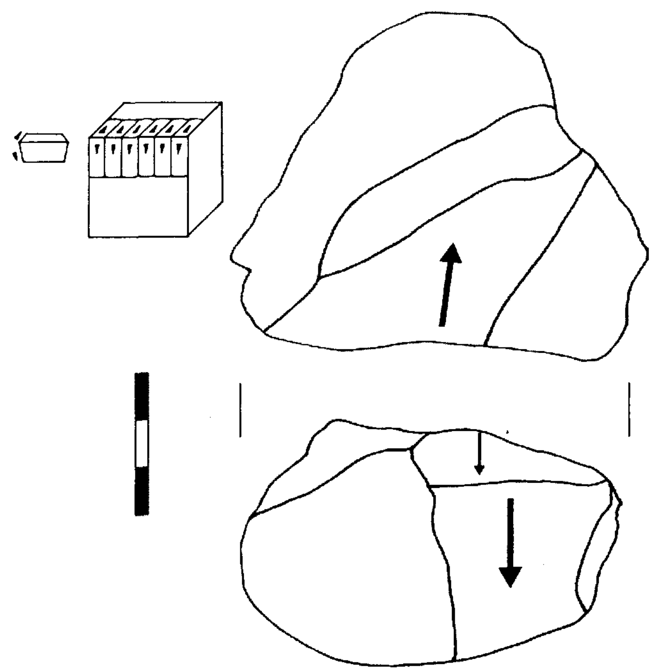

Figure 4.8. Bifacial abrupt lava core from FLK North Level 4.

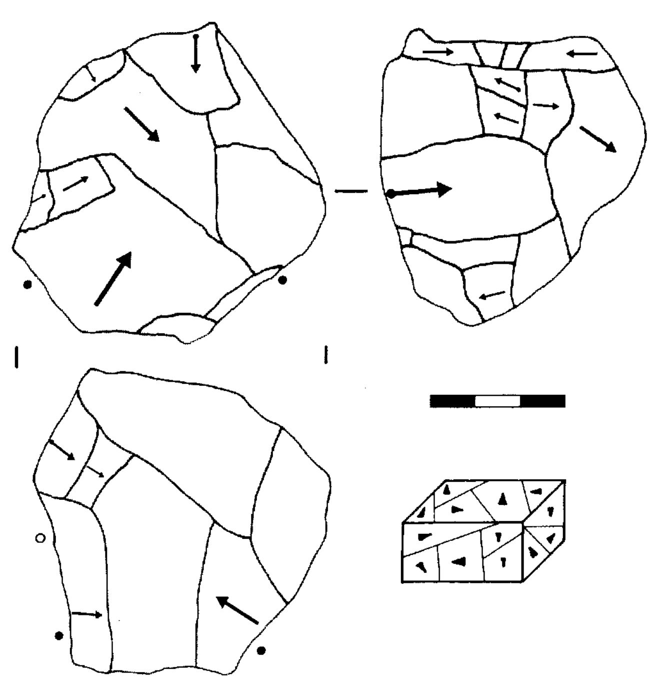

Figure 4.9. Example of the multifacial system at FLK North Level 4.

FLK North Levels 3 and 1-2

In a homogenous clay sequence just under Tuff IF, Leakey (1971:70) distinguished two occupation periods. The main period is located in the upper part of the deposit (52.5 cm thick), coinciding with the so-called Level 1. Level 2 is composed by scarce remains located a few centimetres under Level 1, which are according to Leakey disperse materials corresponding to the upper occupation, which have sunk slightly into the underlying sediments. The archaeological materials in the lower part of the clay deposits (15 cm thick) correspond to a previous occupation and were discriminated as a different level, Level 3, although according to Bunn

(1986) Levels 1-2 could not be separated from Level 3 in the Trial Trench. This refers to an excavation which Kroll (1994:113) estimates at about 100 m².

Excluding the microfauna remains, in Level 3 Leakey (1971:253) counted up to 1254 specimens of large mammals in which, as in other levels, a predominance of bovids was noticeable, followed by carnivores, suids, and low percentages of equids, giraffes and rhinoceros. Level 1-2 presents more fauna than the rest of the FLK North sequence. Among the macrofauna, with a total number of 3294 specimens (Leakey 1971:261), we once again encounter an prevalence of bovids, followed by carnivores, suids and, secondly, equidae, hippopotamidae, turtles, primates, rhinoceros, etc. After a partial approximation (Bunn 1982), Bunn subsequently performed a systematic zoo-archaeological analysis of Level 1-2 (Bunn 1986). He observed that the most frequent species in the site was *Parmularius altidens*, followed by *Antidorcas recki* and several small bovids. Bunn (1986) highlighted the similarity between FLK North Level 1-2 and FLK Zinj, suggesting a selective transportation of the most nutritive parts of the carcasses to both sites. The patterns of skeletal representation were interpreted as evidence that FLK North Level 1-2 had been used as a reference point in the landscape, to where meat and lithic resources were brought systematically (Bunn 1986). According to Bunn (1982), the cut marks were less profuse than in FLK Zinj, although they were well represented in the *Parmularius altidens* sample. In her partial study of the assemblage, Shipman (1986) also identified cut marks on the *Parmularius*, as well as on the *Antidorcas recki* and other bovids, which were probably transported from other ecological niches (Plummer & Bishop 1994).

	Quartz		Lava		Total	
	n	%	n	%	n	%
Test cores	-	-	5	4.8	5	2.3
Cores	-	-	11	10.6	11	5.1
Retouched pieces	3	2.7	-	-	3	1.4
Knapping hammerstones	2	1.8	24	23.1	26	12.1
Hamm. fract. angles	-	-	4	3.9	4	1.9
Anvils	8	7.3	1	1	9	4.2
Whole flakes	8	7.3	8	7.7	16	7.5
Frag. < 20 mm	17	15.5	1	1	18	8.4
Possible flake fragments	52	47.3	7	6.7	59	27.6
Angular fragments	19	17.3	-	-	19	8.9
Battered fragments	-	-	-	-	-	-
Unmodified material	1	0.9	43	41.3	44	20.6
Total	110	100	104	100	214	100

Table 4.6. Lithic categories at FLK North Level 3.

	Quartz		Lava		Total	
	n	%	n	%	n	%
Test cores	-	-	5	8.2	5	2.9
Cores	-	-	11	18.1	11	6.4
Retouched pieces	3	2.7	-	-	3	1.7
Knapping hammerstones	2	1.8	24	39.3	26	15.2
Hamm. fract. angles	-	-	4	6.5	4	2.3
Anvils	8	7.3	1	1.6	9	5.2
Whole flakes	8	7.3	8	13.1	16	9.3
Frag. < 20 mm	17	15.5	1	1.6	18	10.5
Possible flake fragments	52	47.3	7	11.5	59	34.5
Angular fragments	19	17.3	-	-	19	11.1
Battered fragments	-	-	-	-	-	-
Unmodified material	1	0.9	-	-	1	0.5
Total	110	100	61	100	171	100

Table 4.7. Lithic collection at FLK North Level 3 excluding unmodified lava objects.

The large quantity of microfauna remains is surprising, a fact which led Leakey (1971:253) to think that they were part of the hominids diet (but see Andrews 1983; Fernández-Jalvo *et al.* 1998, 1999). Palaeontologists (Denys *et al.* 1996; Andrews 1983; etc) suggest this microfauna reflects a wet climate, with more vegetation than expected from the geological study (Hay 1976). Consequently, FLK North must have been very close to a source of fresh water, whilst the sedimentation medium in FLK Zinj was much less oxidising (Denys *et al.* 1996). As regards the industry, a very small number of items have been recovered from Level 3. More have been retrieved from Level 1-2, where Leakey (1971:83-84) counts a total number of 1440 pieces, of which 235 from Trench IV were lost before reaching Nairobi and were not included in subsequent analysis.

The FLK North 3 lithic assemblage is composed of 171 pieces and 39 manuports, according to Leakey (1971:72). Ludwig (1999) studied 121 artefacts, but we have counted up to 214 pieces, including non-modified material (tabl. 4.6). A total of 28,800 grams is the mass volume of this assemblage. Once again the poor quality of the non-modified pieces suggested their natural origin. If we exclude them from the analysis it can be noticed that the total amount of quartz transported (3,700 grams) is smaller than the lavas showing traces of hominid use (15,482 grams).

Although globally the over 19 kilograms of knapped and/or transported pieces could provide a vast amount of information, a detailed analysis of table 4.7 requires to be cautious before laying down any behavioural inference; Flakes and debris are once more underrepresented compared to the abundant presence of cores and anvils. One hypothesis would be that the enormous amount of objects linked to percussion (knapping hammerstones, hammerstones with fracture angles, anvils, etc) indicates that hominids interacted with the bone assemblage simply by breaking the bones, which would be the reason why there are no knapping products. Nonetheless, in subsequent chapters we will see how the actual percussion processes generate vast amounts of millimetric chips; which implies that waste should also have been documented in this case. Furthermore, there are 11 lava cores in this Level 3, which indicate that the knapping processes did constitute a relevant activity. Nonetheless, their products are genuinely scant (fig. 4.10). Therefore, we believe that, as occurred in the previous levels, Level 3 is a taphonomically sorted assemblage. The vast amount of microfauna recovered (Andrews 1983; Fernández-Jalvo *et al.* 1998) indicates a

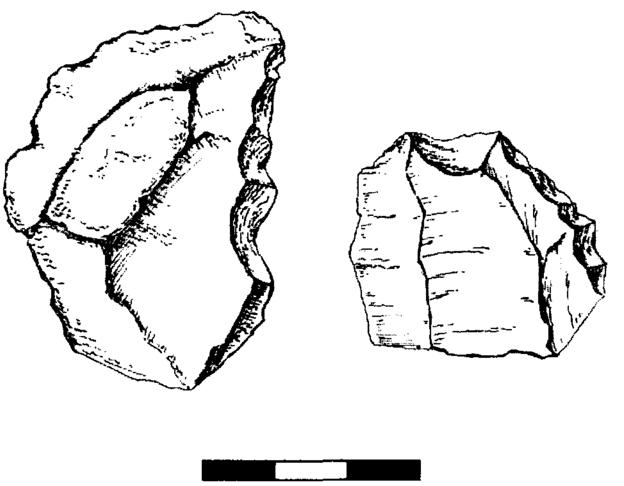

Figure 4.10. Quartz side scrapers from FLK North Level 3 (drawn by N. Morán).

	Quartz		Lava		Total	
	n	%	n	%	n	%
Test cores	2	0.2	14	2.5	16	1.1
Cores	8	0.9	77	13.5	85	5.9
Retouched pieces	6	0.7	2	0.4	8	0.5
Knapping hammerst. & frags.	9	1	67	11.7	76	5.2
Hamm. fract. angles	6	0.7	7	1.2	13	0.8
Spheroids & Subspheroids	1	0.1	-	-	1	0.1
Anvils	24	2.7	1	0.2	25	1.7
Whole flakes	39	4.4	45	7.9	84	5.7
Frag. < 20 mm	212	24	10	1.8	222	15.2
Flake fragments	458	51.8	84	14.7	543*	37.3
Angular fragments	97	11	20	3.5	117	8
Battered fragments	20	2.2	-	-	20	1.4
Unmodified material	2	0.2	244	42.7	246	16.9
Total	884	100	571	100	1456	100

Table 4.8. Lithic categories at FLK North Level 1-2. (*) A gneiss fragment is included.

practically zero energy deposition context. Yet, we should also considerer that palaeontologists do not link the presence of micromammals to human activity. Thus, there would be no difficulty in proposing two different deposition events that were finally integrated in the same stratigraphic level, which Leakey (1971) subsequently identified as a homogenous Level 3.

The contextual entity and the amount of lithic remains in Level 1-2 is substantially greater than that of any other FLK North level. It is necessary to bear in mind that the designation Level 1-2 stems from the impossibility of distinguishing two different levels of occupation, and the fact that, according to Leakey (1971), the few pieces from Level 2 are occupation remains from Level 1 which underwent a vertical movement. Hence, it is a homogenous assemblage belonging to a single level of occupation, thus justifying Leakey's (1971) joint processing, which we adhere to herein.

Leakey (1971) studied a total number of 1205 artefacts, alongside which we should consider no less than 170 so-called manuports. As in previous cases, we consider a good part of the so-called manuports are nothing of the sort. In FLK North, not only do we have a quantitatively relevant sample - 246 according to our study (tabl. 4.8) -, but we also have more explicit information in the original description: Leakey (1971:83) underscored the fact that unmodified cobbles were particularly common in Level 1-2, but that their provenance must be anthropic since there was no hydraulic disturbance in the assemblage. Alongside these high quality lava cobbles, Leakey also noted the presence of vesicular basalt blocks which she stated could not have been used for knapping activities, and therefore suggests they could have been used as missiles.

FLK North 1-2 provides a sufficiently ample portion that allows us to perform a statistic comparison between the so-called manuports with the material under consideration. As occurs on the previous levels, it is also surprising that North 1-2 has so-called raw material reserves that triple the percentage of cores. Once again, it seems difficult to explain why the hominids accumulated more unaltered lithic material than they actually modified. Referring to the hypothesis that the weight of the supposed manuports should be greater than that of the cores if they were genuinely raw material reserves, a T-Test was performed to compare both populations. As the data was not homoscedastic, it was necessary to transform the weight variable by Naperian logarithm, and then verify the normal distribution implementing the Kolmogorov-Smirnov test (see de la Torre & Mora 2005). However, the subsequent T-test assumed the equivalence of the averages in both samples; that is to say, both the unmodified objects and the cores have a similar weight, without visible substantial differences in size of the supposed manuports that would lead us to assume their subsequent reduction as cores.

A chi-square test was carried out in order to verify if the distribution of raw materials is similar in unmodified objects and in the cores. This time, phonolites were also included in the comparison of quartzes and basalts. The results are similar to those obtained for FLK Zinj, rejecting the option that both samples (cores and unmodified objects) come from the same population. That is to say, the raw material that predominates in the manuports does not coincide with the distribution of the cores, thus it seems difficult to sustain that the latter were selected from the unmodified lithic material.

On the basis of the analytical comparisons performed (de la Torre & Mora 2005), we consider we have justified the hypothesis asserting that most of the unmodified objects are not related to the activities of lithic artefact production and use. However, even though the visual analysis of the supposed manuports in FLK Zinj have already shed some light on the origin of these materials, given the bad quality of almost all of them, the pattern is not as evident in FLK North 1-2. In the different levels of FLK North some high quality river cobbles very similar to the blanks which were used as hammerstones can be identified, although they do not present

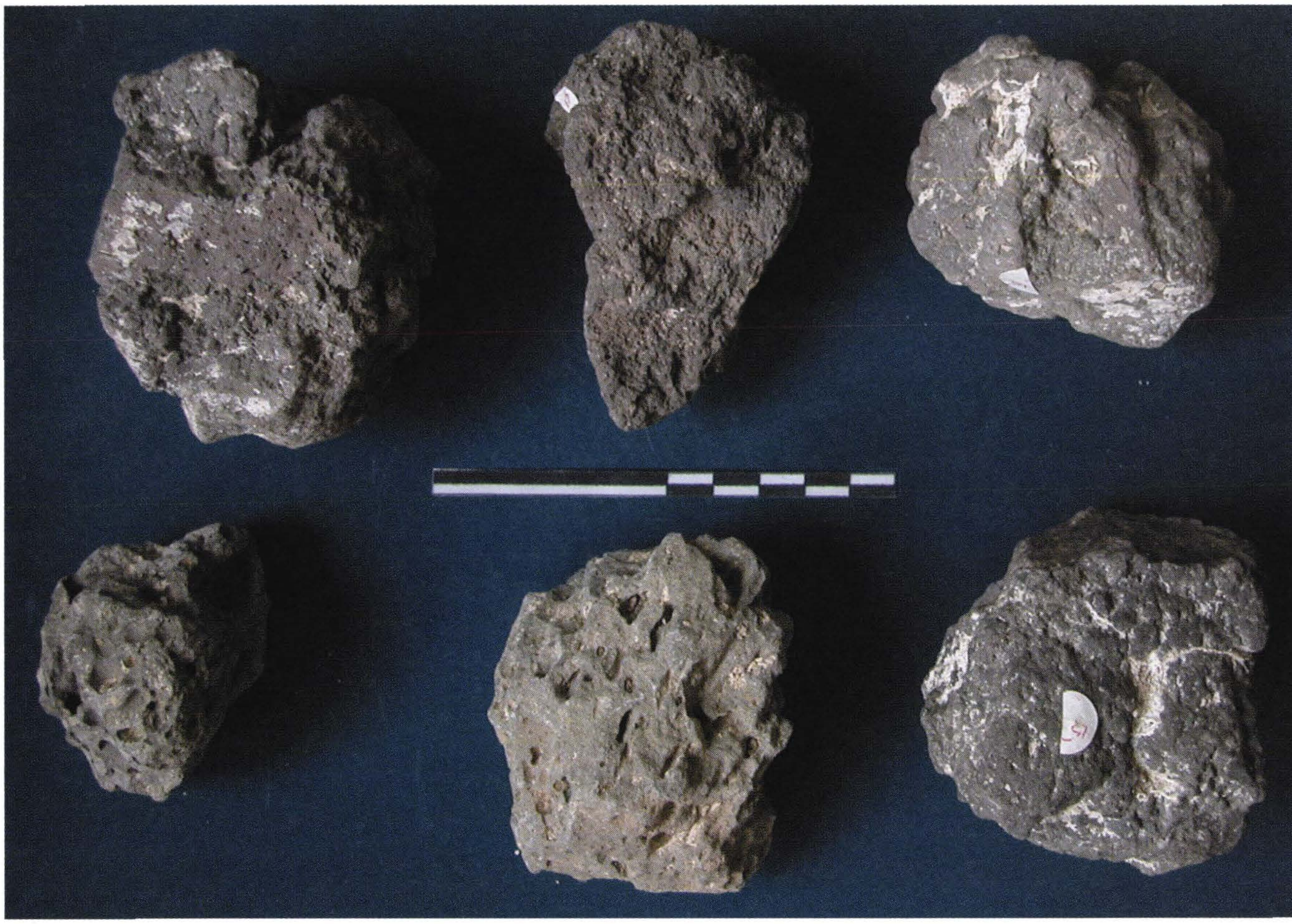

Figure 4.11. Basalt unmodified material at FLK North Level 1-2. See morphological irregularity of the pieces and their vesicular structure. These lavas are inadequate for knapping, and cannot be considered as raw material reserves.

traces of utilisation. Therefore, we cannot exclude the possibility that some of these unmodified river cobbles were supplied anthropically. Nonetheless, alongside these items there are numerous lava pieces, some vesicular and of extremely poor quality (see fig. 4.11) which, alongside the reduced size of some of them (30-40 mm), also provide qualitative information rejecting a human accumulation of these pieces. Therefore, we find it preferable to remove the unmodified lavas from the study. This decision is not irrelevant, since of the total number of 160,775 grams of lithic material weighed in Level 1-2, no less than 73 kilograms were allocated to those so-called manuports. Consequently, we remove almost half of the material. An issue that has relevant implications when assessing human incidence.

Raw materials in FLK North 1-2

Based on table 4.9, one could consider that quartz was the main raw material employed in FLK North 1-2 (see fig. 4.12). Nonetheless, if we rule out the number of objects and focus on the real influence of lavas and quartzes in terms of the contribution of raw material to the site, we find that phonolites and basalts were actually the most important materials (tabl. 4.10). We cannot connect this relevance of lavas to categories linked to percussion, since only the group of lava cores exceeds the whole amount of quartz material, which shows that lavas were involved in knapping dynamics.

The Lien Test was performed to elucidate the contradiction between the vast amount of lava cores and the high percentage of quartz products (fig. 4.13 and 4.14). The conditional frequencies obtained indicate that the most informative categories are the pairs composed by cores-lavas (positive association), hammerstones-lavas (positive association), cores-quartzes (negative association) and chips-lavas (negative association). Figure 4.13 shows an overabundance of lava cores compared to quartz cores, a pattern that is repeated quite similarly among hammerstones. Nonetheless, the frequencies for debris and lava flake fragments are quite inferior, compared to the profusion of those of quartz. It is hard to interpret this comparative test in behavioural terms. As regards the knapping hammerstones, we have already stressed the preference for lavas over quartzes, therefore the results are coherent in this sense. Nonetheless, the difference in percentages between lavas and quartzes in the hammerstone category is one thing, and the disparity between hammerstones and the other categories is another. Table 4.10 indicates that the weight of the hammerstones exceeds that of quartz material in absolute terms, and

	Quartz		Lava		Total	
	n	%	n	%	n	%
Test cores	2	0.2	14	4.2	16	1.3
Cores	8	0.9	77	23.5	85	7
Retouched pieces	6	0.7	2	0.6	8	0.6
Knapping hammerstones & frags.	9	1	67	20.4	76	6.2
Hamm. fract. angles	6	0.7	7	2.1	13	1
Esferoides	1	0.1	-	-	1	0.1
Anvils	24	2.7	1	0.3	25	2
Whole flakes	39	4.4	45	13.7	84	6.9
Frag. < 20 mm	212	24	10	3	222	18.3
Flake fragments	458	51.8	84	25.6	542	44.8
Angular fragments	97	11	20	6.1	117	9.6
Battered fragments	20	2.2	-	-	20	1.6
Unmodified material	2	0.2	-	-	2	0.1
Total	884	100	327	100	1211	100

Table 4.9. Lithic assemblage at FLK North Level 1-2, excluding unmodified lava objects and the gneiss fragment.

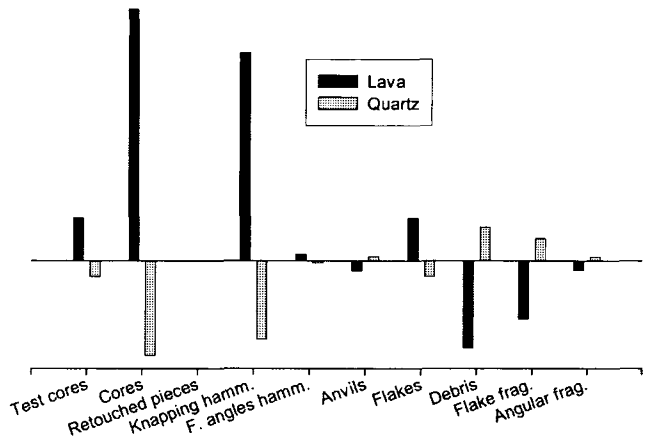

Figure 4.13. Lien Test comparing each technological category and raw materials.

	Quartz	**Lava**	**Total**
Test cores	365	4682	5047
Cores	1647	26187	27834
Débitage & frags.	9797	3426	13223
Hammerstones	2398	28028	30426
Anvils	9797	800	10597
Manuports	440	-	440
Total	24444	63123	87567

Table 4.10. Total weight (in grams) of the general categories according to raw material at FLK North 1-2, excluding the unmodified lava pieces

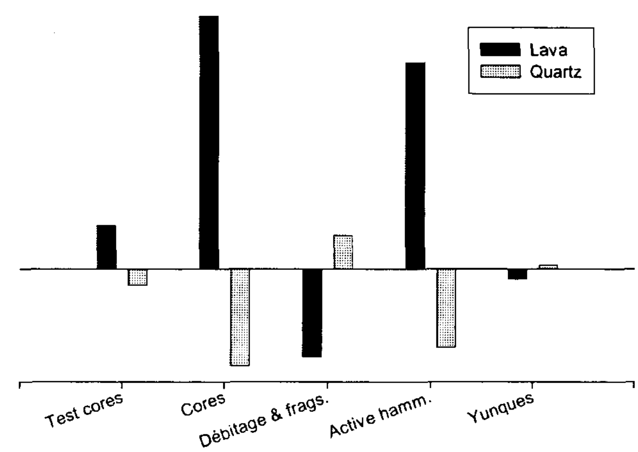

Figure 4.14. Lien Test comparing raw materials and general categories at FLK North 1-2.

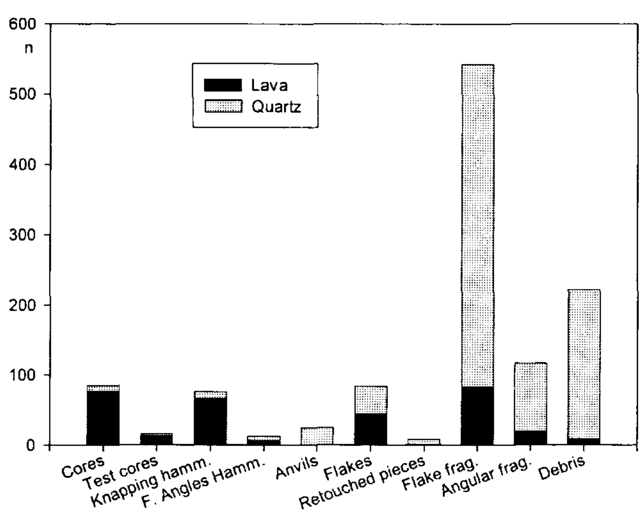

Figure 4.12. Absolute frequencies of lithic categories at FLK North 1-2, according to raw material.

even that of the actual lava cores. This trend is illogical. Therefore, we cannot rule out (as suggested for other levels of FLK North) that natural mechanical processes produced the battering on some of the pieces with diffused abraded areas, thus making them part of the unmodified lithic material.

The overabundance of lava cores represented in figure 4.13 could be explained as an intentional selection of basalt and phonolite knapped objects over quartzes. Nevertheless, this contradicts the patterns indicated in the knapping waste (chips), in which the basalts are almost absent, proportionally, - and also in absolute terms, in reality (tabl. 4.9). This incoherence led to the classification of all the *débitage* groups (flakes, flake fragments, debris, etc) in one single group which was then compared to other general categories, with a view to simplify the statistic comparison (fig. 4.14). Yet, the aforementioned pattern becomes even more evident, with a contradiction between the frequencies of lavas and quartzes among the flaked pieces (cores and test cores, chiefly in lava), and the actual flakes and derivates (principally in quartz).

How can we explain this trend? A similar imbalance (albeit not as obvious) was previously described in FLK Zinj. In that site, we commented Binford's (1987) hypothesis, who maintained that said incoherence regarding raw materials was due to the fact that the quartz flakes and the lava cores corresponded to different depositional events. Although for a single example like Zinj (or any other site) we could consider a dynamic of this kind, it does seem difficult to assume the existence of a recurring pattern of natural events that always select the quartz flakes and the lava cores. This obviously makes no sense. Actually, the taphonomic explanations are not reliable for the FLK North 1-2 case. In certain previous levels we turned to postdepositional causes to explain the over-representation of cores compared to other categories, basically *débitage* categories. Nonetheless, Level 1-2 presents a profusion of millimetric debris, which does not, ever, indicate a severe hydraulic bias. The problem is, simply, that these debris are made of quartz, and not lava as would be expected given the vast amount of basalt and phonolite cores. In any case, we must also question our own assertions on the level's high resolution, since Roche (1980:87-88) registered signs of roundness and even doubted the contextual integrity of this Level 1-2.

One final argument against Binford (1987) and his hypothesis sustaining a diachrony between the choppers (lava) and the *débitage* (quartz), is that the basalt and phonolite flakes present technical features that link them to knapping systems deduced from core analysis. That is to say, there is a negative balance of knapping products compared to the number of cores documented, but, despite this fact and from a technical viewpoint, these flakes coincide with the knapping strategies represented in the cores.

Brantingham (1998:83) used Leakey's (1971) data to calculate an average of only 0.6 flakes per core in FLK North 1-2. McNabb (1998) speculated that there must have been at least 315 lava flakes and 1575 at the most. As regards FLK North 1-2, the lava cores range between a minimum of 2 and 14 detachments, with an average of 5.64 scares per core. Considering McNabb's (1998) calculations, we could estimate a minimum of 154 flakes and a maximum of 1078. This is nowhere near the real number of lava flakes (n=45), even if we were to add the flake fragments (see tabl. 4.8).

Quartz cores are quite scant (n=8) and are generally smaller than lava cores (fig. 4.15). This is probably not due to a greater reduction of the pieces but to the original size of the blanks, since the number of detachments is similar to that of the lava cores (fig. 4.16). Using McNabb's (1998) calculations, there should be between 24 and 96 flakes. Dividing the number of quartz flakes between the number of cores documented in this raw material gives an average of 4.8 flakes per core. This coincides broadly with the estimation calculated using the aggregate of the core scars, which indicates an average of 6.4 flakes per core. If we contemplate the considerable amount of other *débitage* objects, it seems clear that the distribution of quartz does present a coherent structure in the different knapping categories.

Since there are no features amongst the quartzes that allow us to refer to postdepositional biases, we find ourselves back at the starting point of the discordance between cores and products made of lava. In order to explain this customary preponderance of quartz *débitage*, Brantingham (1998) suggests the greater fragmentation of this raw material in view of its mechanical characteristics as regards disintegrating crystal. Although this could explain the abundance of quartz fragments, it does not solve the low number of lava flakes compared to the number of cores. Therefore it seems that the only answer lies in turning to behavioural parameters to explain this incoherence.

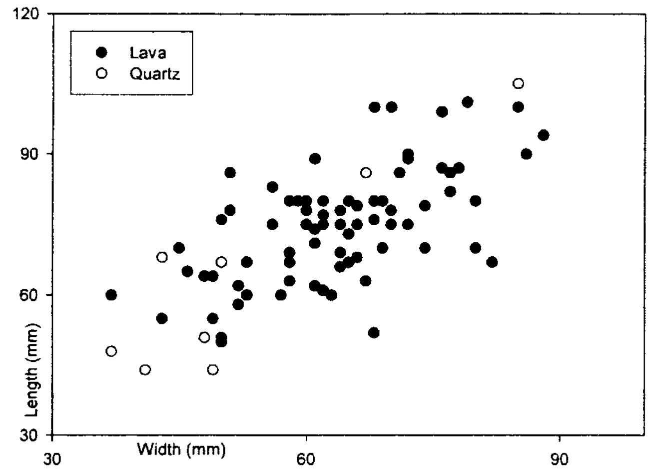

Figure 4.15. Size scatter diagram of lava and quartz cores.

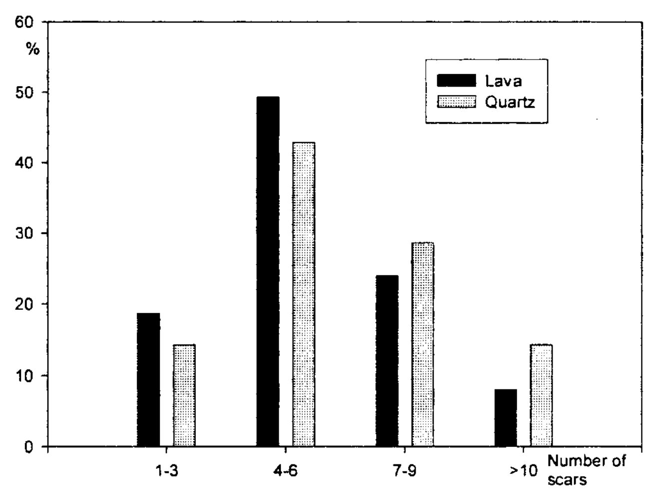

Figure 4.16. Amount of scars on the quartz and lava cores from FLK North 1-2.

Brantingham (1998) uses precisely FLK North 1-2, and FxJj 50 (Koobi Fora), as paradigms of the high level of mobility envisaged in the strategies for managing raw materials, using North 1-2 to study the low proportion of lava products. Although this author employed the aggregates published by Leakey (1971), we agree with his conclusions entirely; despite it being evident that *in situ* lava knapping did occur in FLK North 1-2, a good part of this material was imported and/or exported. One possibility maintains that the core forms were already flaked when they entered the site. This would be applicable to the choppers (which compose a good part of these core forms) if they were instruments employed in different activities performed to manage the documented carcas-

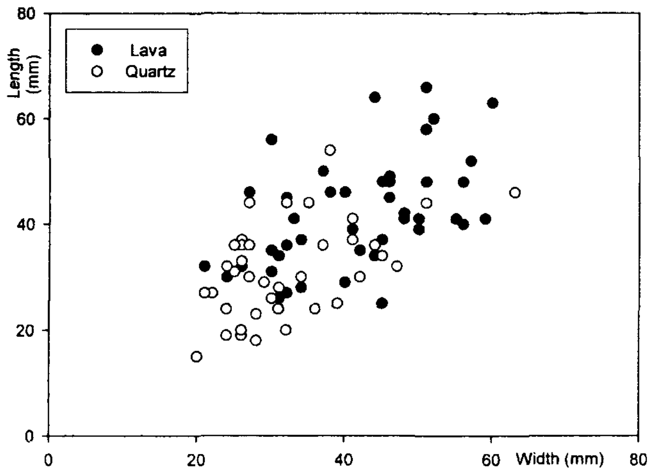

Figure 4.17. Dimensions of the whole flakes at FLK North Level 1-2.

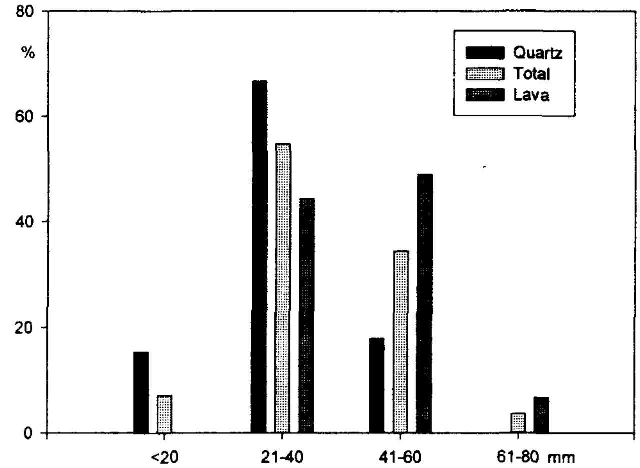

Figure 4.18. Maximum length patterns in the whole flakes.

	Minimum	Maximum	Mean	Std. deviation
Length	15	66	37.11	11.013
Width	20	63	37.56	10.763
Thickness	5	24	11.35	4.164
Weight	3	65	18.46	14.498

Table 4.11. Dimensions of the whole flakes at FLK North Level 1-2.

Dorsal face	Striking platform				Total	
	Cortical		Non-cortical			
	N	%	N	%	N	%
Full cortex	7	8.3	6	7.1	14	16.7
Cortex > 50%	4	4.8	10	11.9	13	15.5
Cortex < 50%	2	2.4	16	19	18	21.4
Non-cortical	1	1.2	38	45.2	39	46.4
Total	14	16.7	70	83.3	84	100

Table 4.12. Cortical frequencies in the whole flakes from FLK North 1-2.

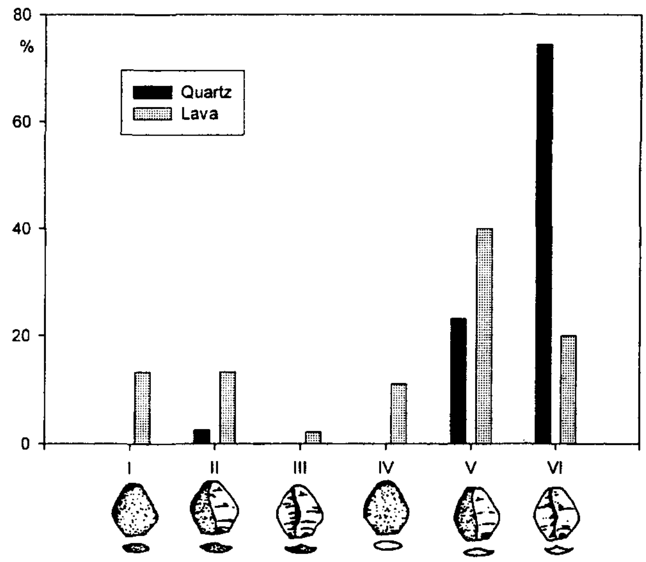

Figure 4.19. Types of flakes at FLK North 1-2, according to Toth's (1982) classification.

ses. If they were only cores, there would be no place for considering that they were already flaked upon entering the site, since it would be illogical to think hominids transported cores that were not subsequently exploited. Hence, if we consider the large pieces were only cores, it would be logical to think that the lava flakes were the pieces that were exported, once they had been flaked in the site.

Neither alternative is problem-free. To consider choppers as completed artefacts that were already shaped when brought to the site supposes a good contextual explanation for the scarce amount of lava debris, but shows other objections, such as the lack of conspicuous utilisation marks on the ridges, which are generally intact. If they had been used as artefacts, they would preserve marks on the edges. We will refer to the use of these pieces in chapter 9 and will therefore move on. As regards the hypothesis stressing that the lava cores were flaked at the actual site and that the flakes obtained were subsequently exported, we stumble upon a contextual problem: this option would have generated an amount of chips much greater than the volume documented, which would at least appear as evidence of *débitage* processes. Consequently, neither of the alternatives presents conclusive arguments and we will need to pursue other hypothesis to explain the considerable bias that appears as regards the *chaîne opératoire* of lavas. In any case, we are, as in FLK Zinj, facing a behavioural strategy encompassing a functional division of raw materials and in which, as Potts (1988, 1991) stated, the dynamics for rearranging, discarding and exporting lithic elements are part of a structured organisation implemented to manage the landscape.

Knapping products

We also encounter differences between quartzes and lavas in terms of knapping products. Although quartz and lava flakes are considered in the same size scatter interval (tabl. 4.11 and

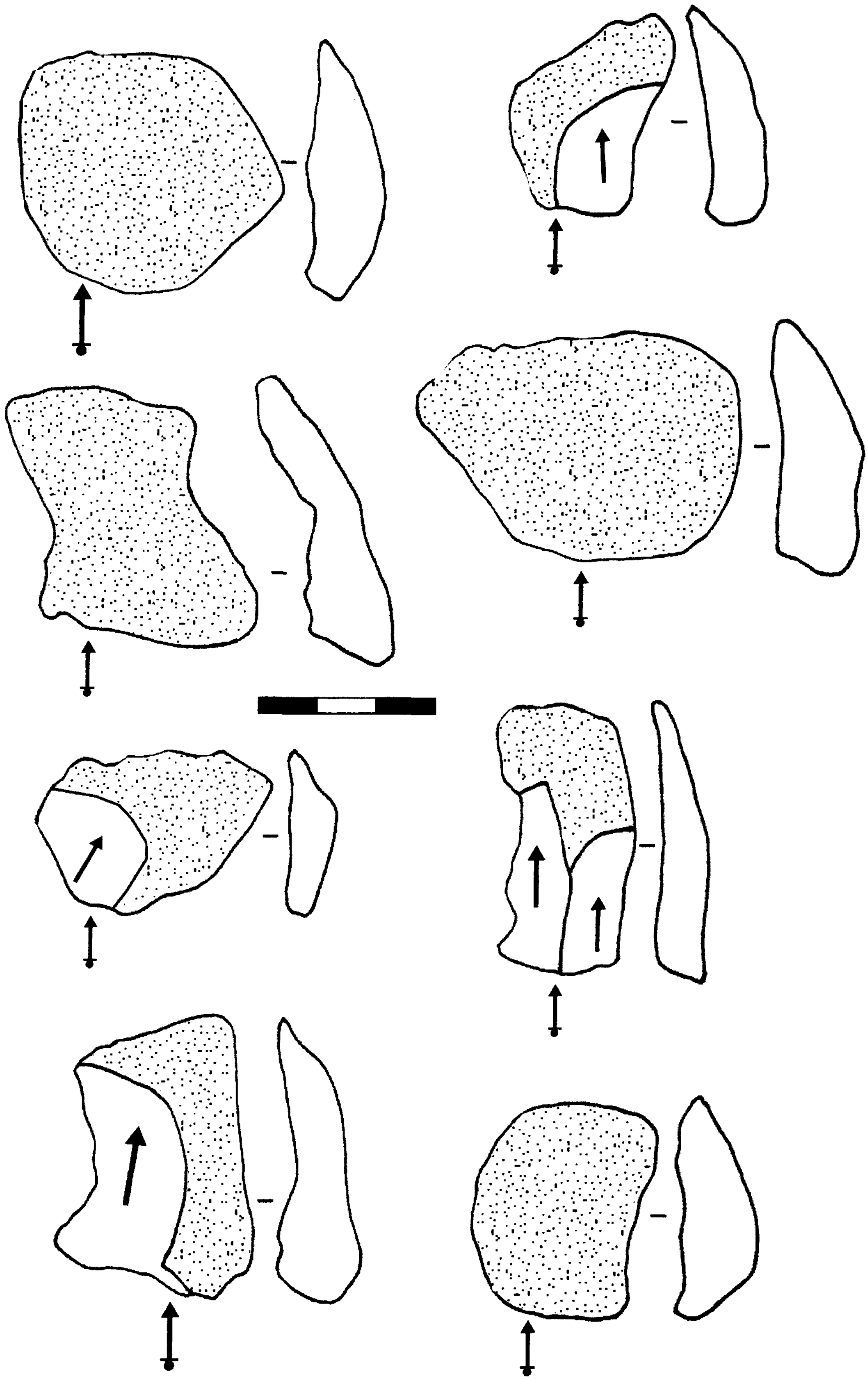

Figure 4.20. Examples of phonolite flakes with cortex at FLK North Level 1-2.

fig. 4.17), quartz flakes are systematically smaller than lava flakes (fig. 4.18). This comes as no surprise, since quartz cores are also smaller than lava cores (fig. 4.15).

The cortex percentages are extremely relevant in Level 1-2 flakes (tabl. 4.12): 53.6% of the dorsal faces maintain some cortex, and 16.7% of the flakes also present cortex on the butt. Therefore, the initial flaking stages obviously had a great bearing on *débitage* activities. We have already mentioned that it is difficult to identify cortical areas on tabular quartzes. Thus, cortical index patterns are underestimated systematically. With this in view, we have segmented our flake sample in terms of raw materials (fig. 4.19). In doing so, we see that quartz flakes were preventing the elucidation of the lava distribution pattern. Lava flakes are essentially cortical (fig. 4.20).

As regards the technological information retrieved after analysing the butts of the flakes, it seems that the cores' striking platforms were worked recurrently; although the dorsal faces usually present cortex remains, only 14 of the 84 flakes have cortical butts. Altogether, the striking platforms do not seem to have been prepared and were rarely (2.4%) bifaceted (fig. 4.21).

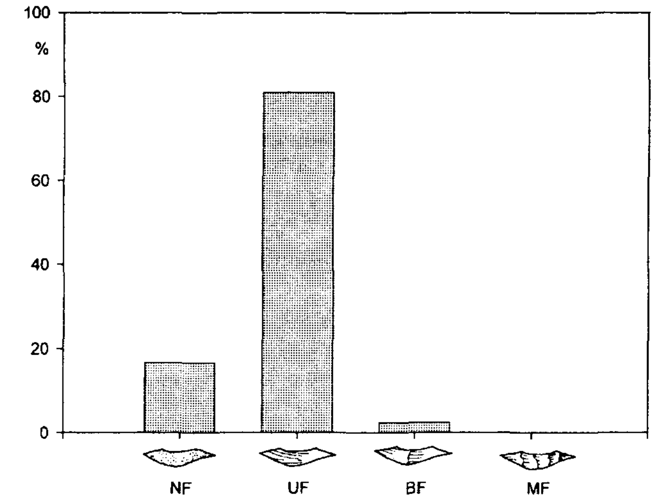

Figure 4.21. Types of striking platforms in the whole flakes.

Despite their cortical nature, lava flakes usually present an excellent manufacture. This can also be applied to most of the quartz pieces (fig. 4.22). If we only consider the items that present ridges from previous detachments, 47.8% of the flakes have 1-2 scars, 44.9% have between 3-4 scars and 7.2% have between 5-6 scars. This constitutes an average of 2.6 previous detachments per flake, and there does not seem to be a differential pattern between quartz flakes (2.8 scars per flake) and lava flakes (2.5 scars), which present a very similar distribution (fig. 4.23). Therefore, this time a greater intensity of the reduction of quartzes is not applicable.

The direction of the scars on the flakes informs of the systems used to reduce the cores. Figure 4.24 depicts how, as in DK and FLK Zinj, the unidirectional pattern prevails in FLK North 1-2, with cases in which the cores' exploitation surface is rotated partially, and some examples in which these knapping surfaces are worked multidirectionally.

In all, the Level 1-2 flakes are characterised by butts that are generally unifaceted and by longitudinal morphologies with dorsal faces that are typical of unidirectional knapping systems. Although some edge-core flakes have been documented, the analysis we have performed regarding the flakes does not suggest the striking platforms underwent systematic rejuvenation. In fact, most of the lava flakes seem to have been produced by a chopper-type knapping, a reduction which, moreover, would be performed in the actual site, given the high cortex percentages in these knapping products. This clashes with one of the aforementioned hypotheses regarding the transportation of shaped choppers to the site (fig. 4.19). As regards quartz flakes, they are also produced by a systematic reduction of blocks of that raw material. Despite their size, which is usually inferior to those of lavas, they do not seem to have been produced by a more intense reduction, but by the raw material constrictions quartz imposes.

Retouched pieces

Leakey (1971:81-82) referred to 12 light-duty scrapers and up to 68 flakes and flake fragments bearing traces of having been retouched or utilised. Sussman (1987) chose a sample to sift for use-wear traces, and only found two pieces presenting traces of wood working. We have identified 8 retouched pieces, observing that several of the items described by Leakey (1971:82) do not belong to this category. All retouched pieces, aside from one, come from a flake fragment blank, despite which they maintain a size similar to the average whole flakes (see tabl. 4.13 and compare to tabl. 4.11). If we consider that 6 of the 8 retouched pieces are made of quartz, and recall that the quartz flakes were smaller than the total average, we could propose that these blanks were chosen in view of their larger size. The 8 retouched pieces are side scrapers, one lateral, the other transversal and the other 6 are denticulates (fig. 4.25). In any case, we must recall that in Level 1-2 retouched pieces represent only 0.6% of the total and only 135 grams of the over 87 kilograms of anthropically altered lithic material, therefore their relevance is very limited.

Cores and knapping systems in FLK North 1-2

Since we have already submitted a good part of the information when analysing core representation and lava and quartz

	Minimum	Maximum	Mean	Std. deviation
Length	22	49	35.67	11.639
Thickness	26	49	35.5	8.758
Width	8	19	13.17	4.167
Weight	6	55	22.5	18.075

Table 4.13. Dimensions of the retouched pieces at FLK North Level 1-2.

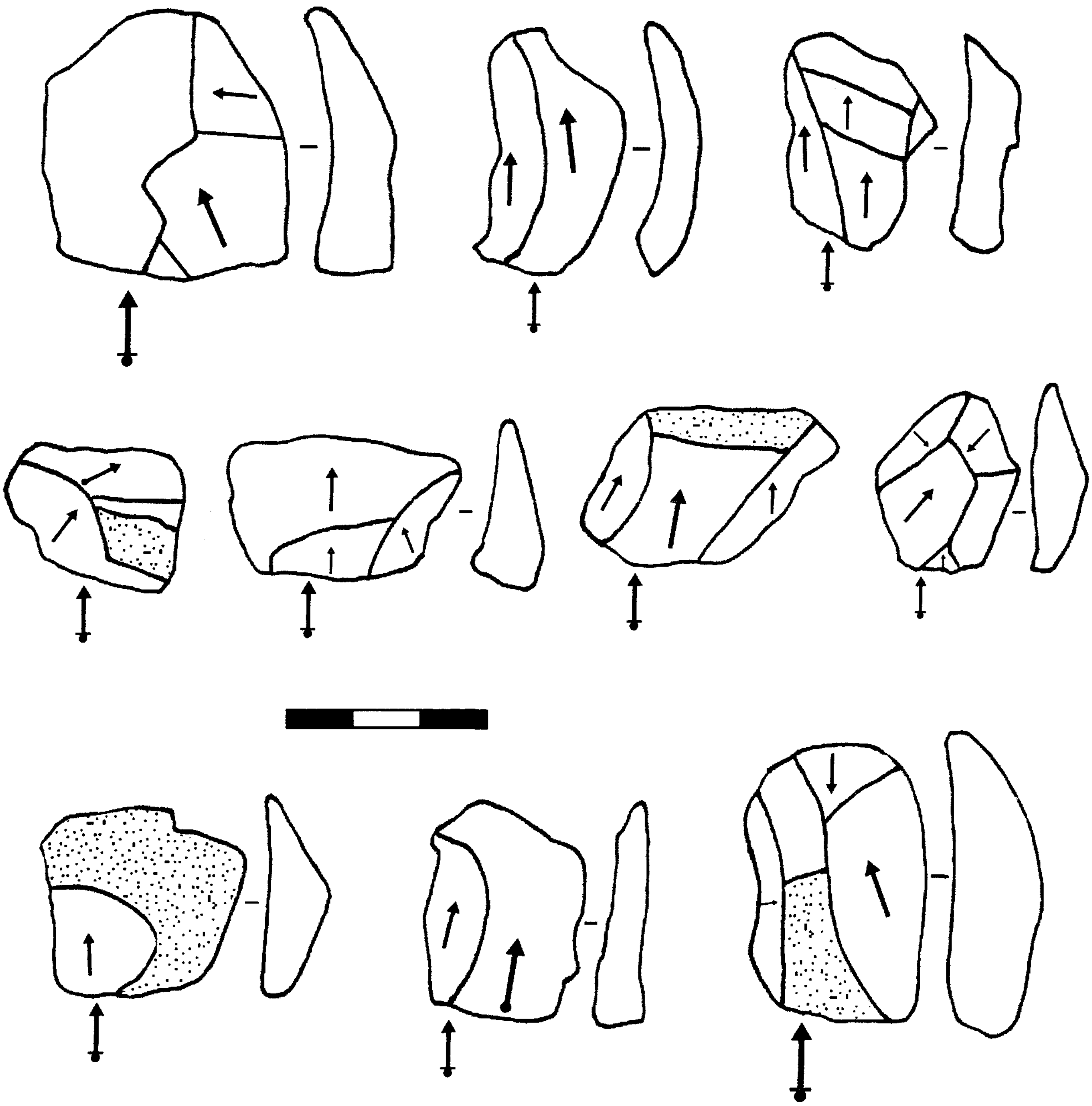

Figure 4.22. Quartz flakes at FLK North 1-2.

products, this section will deal with exploitation methods. Leakey (1971) insisted on the major importance of choppers, summing almost 100 samples. Subsequently, Roche (1980) recorded 78 choppers, underscoring the prevalence of phonolite as a raw material, cobbles as the main blank for their manufacture and an average of 2-3 scars per piece.

In view that we use the simple or abrupt angle criterion to discriminate different knapping systems, our technological aggregate differs slightly to Roche's (1980), and is completely different to Leakey's (1971) typological approximation. According to our recount, there are 49 choppers (including unifacial and bifacial choppers), which, nonetheless, still compose the most important category, with 57.7% of the total number of cores (fig. 4.26). The number of quartz cores is so minor that is does not allow for statistic comparisons with the sample of lava cores, and there does not seem to be a specific exploitation method associated to metamorphic materials. Neither does there seem to be a preferential selection between the lavas for manufacturing choppers, the number of items in phonolite and basalt appear in quite similar percentages. Choppers are mainly bifacial, with 47.1% of the total number of cores, although unifacial choppers (10.6%) still compose one of the main systems. This is consistent with the characteristics of the lava flakes; most present morphological features linked to a chopper-type exploitation, with high percentages of cortex, unidirectional knapping, etc.

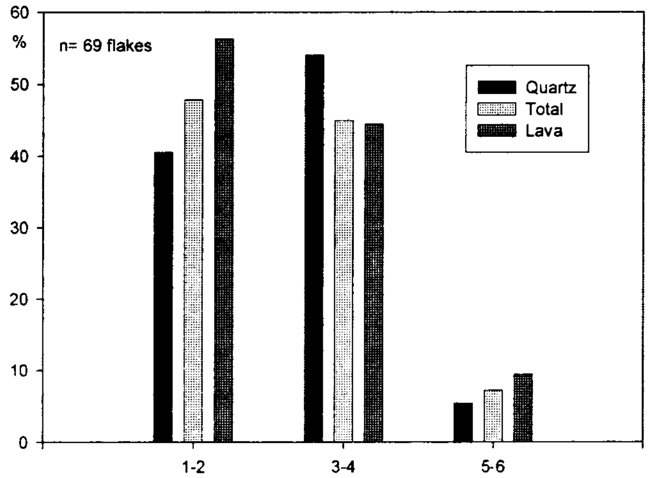

Figure 4.23. Amount of scars on the dorsal sides of the whole flakes.

Leakey (1971:73) had noticed a complementary use of the choppers' cortical areas and considered they had been employed as hammerstones, an aspect we also reflect in our analysis; of the 85 cores from Level 1-2, 28.2% (n=24) present traces of pitting on their surface. It is symptomatic that no less than 22 of these 24 pieces are choppers. This is due to a simple fact: the blanks for these pieces were essentially cobbles, identical to those used as simple knapping hammerstones. It would be no surprise to think that, after being used as active hammerstones, such cobbles were used for flake removal, thus becoming cores.

We also documented other types of exploitation. The bifacial abrupt exploitation totals 17.7% of the whole number of cores (fig. 4.26), whilst the unifacial abrupt method totals 9.5%. Leakey (1971) had classified some as choppers, as Roche (1980) surely did too. In truth, given that most only show a partial exploitation of the core periphery, and employ the same cobbles as the unifacial and bifacial simple methods, the difference between both systems could be very subtle, and therefore extremely subjective. Alongside these items, we also documented examples of unifacial and bifacial peripheral systems (both achieving a 7.2% of the total number of cores) (fig. 4.27) and several multifacial pieces (8.3%). In any case, we observed that the variety of systems could simply have been produced by a more intense exploitation of the choppers, which would have generated a more complex reduction, in line with the pattern described by Potts (1991).

Percussion objects in FLK North 1-2

Knapping hammerstones, hammerstones with fracture angles and anvils compose a very important percentage in terms of

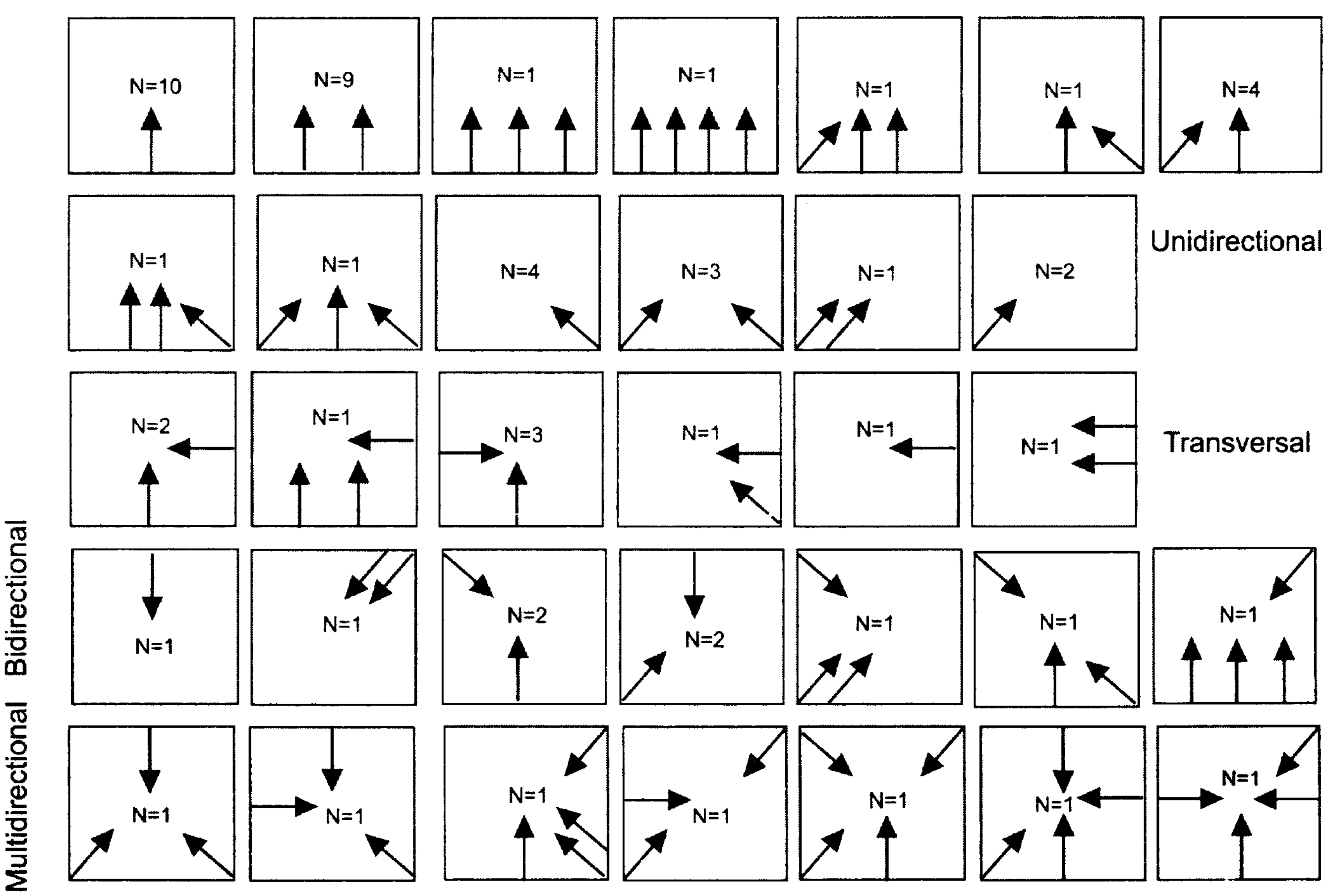

Figure 4.24. Diacritic schemes of the whole flakes.

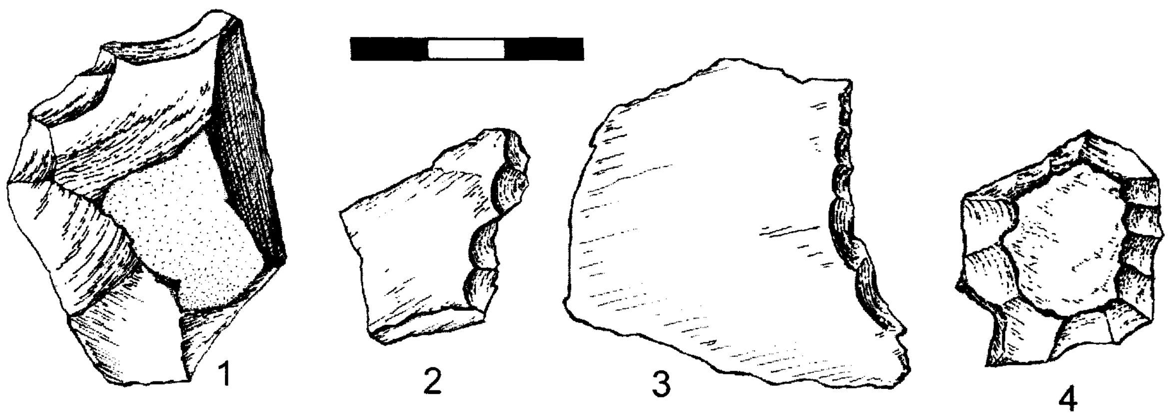

Figure 4.25. Quartz side scrapers from Level 1-2 (drawn by N. Morán).

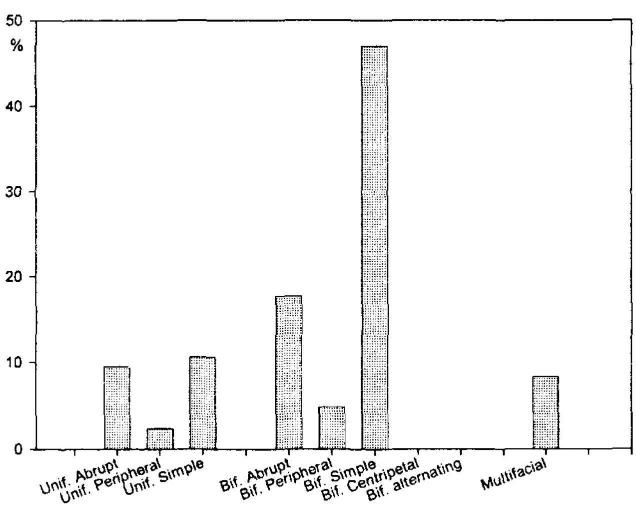

Figure 4.26. Knapping systems on the cores at FLK North 1-2.

	Minimum	Maximum	Mean	Std. deviation
Length	52	114	79.06	10.863
Thickness	46	83	64.85	8.436
Width	29	75	52.35	9.795
Weight	130	800	390.56	151.267

Table 4.14. Dimensions of the knapping hammerstones from FLK North 1-2.

	Minimum	Maximum	Mean	Std. deviation
Length	40	130	88.84	19.642
Thickness	41	96	67.95	14.316
Width	39	83	56.89	11.737
Weight	164	1150	557.74	252.752

Table 4.15. Dimensions of the anvils at FLK North 1-2.

the total number of items found in FLK North 1-2 (tabl. 4.9). In fact, among the hammerstones and anvils, percussion activities total 41 kilograms of raw material, exceeding any other technological categories (tabl. 4.10). If we add all the objects that present traces of pitting (most of the chopper-type cores preserve this type of traces on their cortical areas) to this figure, we discover that up to 52 of the 87 kilograms of raw material from Level 1-2 were at some time used directly in percussion processes. Therefore, it is essential to insist on the importance of these activities.

The most common objects are the knapping hammerstones which, as in other sites, are mainly phonolite and basalt cobbles to the detriment of quartz blocks (tabl. 4.9). The size, ergonomics and regular morphology of these lava cobbles make them appropriate for use as active hammerstones (tabl. 4.14). Hammerstones with fracture angles compose a relatively important percentage, with Level 1-2 presenting a more balanced percentage between quartzes and lavas (tabl. 4.9). Willoughby (1987) referred to isolated cases of spheroids and subspheroids from Level 5 of FLK North. Yet in Level 1-2, Willoughby (1987:11) identified 12 subspheroids and spheroids. However, we only identified one example in Level 1-2, and no examples in any of the previous levels. Thus, we will postpone describing these objects until we reach the section dedicated to the FLK North Sandy Conglomerate, which unearthed a sufficiently relevant sample that can define this category systematically.

Finally, Level 1-2 has 25 anvils, accounting for over 10 kilograms of raw material, approaching the total volume of *débitage*. The use of quartz for these objects is obvious (24 of the 25 pieces are quartz), and can be the reason for part of the so-called quartz *débitage*, which would, in fact, be nothing but fragments detached from anvils, during a process identical to the procedure described in the previous section. They were not selected as immobile elements on which to perform tasks in view of their size, since they are small enough to be used single-handedly (tabl. 4.15). More specifically, they were probably employed as anvils given their tabular shape, since this facilitated their stability on the ground.

Therefore, we see that percussion processes were clearly a very relevant activity in FLK North 1-2. Obviously, a great part of these processes were linked to *débitage*, as we can see through the knapping hammerstones. Nonetheless, the hammerstones with fracture angles and, especially the anvils,

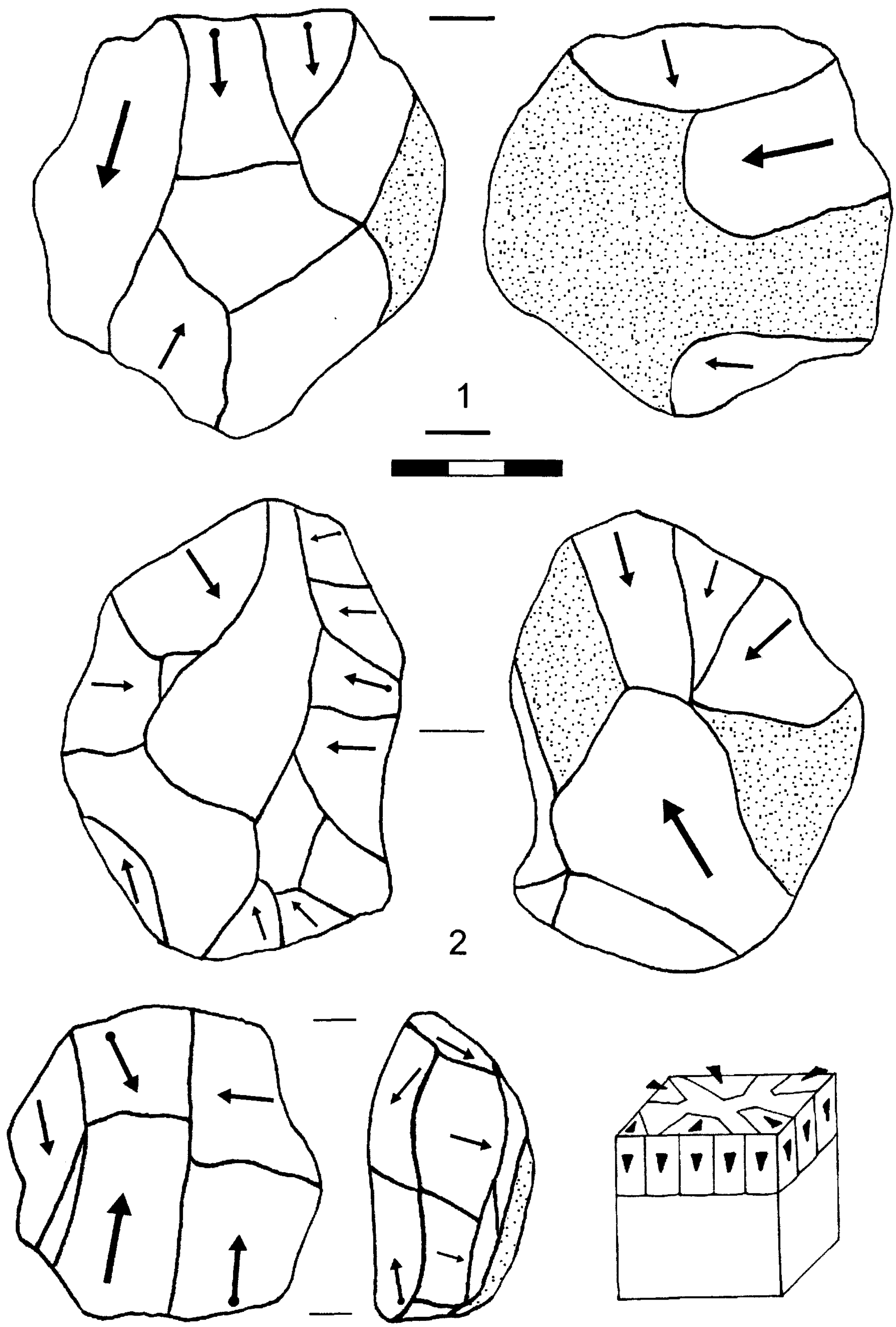

Figure 4.27. Bifacial peripheral cores. 1-2: lava; 3: quartz.

indicate that percussion activities not related to the management of lithic resources were also performed. Given the vast amount of fauna linked to lithic material, and the possibility of marrow extraction activities being performed by the hominids in this Level 1-2 (Blumenschine 1991; Bunn 1986, 1989; etc), we could link items such as the anvils (and probably a good part of the active hammerstones) to carcass processing.

The intensity of human activity is, therefore, verified for Level 1-2. The vast amount of fauna from different ecological niches, the documentation of percussion and cut marks, the presence of at least 87 kilograms of raw material modified and/or transported from different sources on more than one occasion, the intensity of the reduction, etc., all indicate that hominids considered FLK North 1-2 a reference point on the landscape, in which they performed subsistence activities and tool production activities jointly.

Deinotherium Level

The description of this level commences the analysis of the archaeological evidence from Bed II, and - consequently - of the sites after 1.75 my. We have not considered it appropriate, in this monograph, to trace a dividing line between the evidence discovered under Tuff IF and the evidence from Bed II, since in FLK North we have a continuous sequence which should be studied as a whole. We have not analysed the Clay with Root Casts Level, since in a thickness of 1.35 m this level only produced 21 lithic artefacts and a few fossil remains (n=174), usually set in nodular concretions. Leakey (1971:84) asserts that they are disperse remains that do not compose a genuine archaeological level. Therefore, we do not think it appropriate to spend time analysing materials with such as meagre informative value.

The same occurs with the level in question; the skeleton of a *Deinotherium bozasi* supposedly linked to the lithic industry was located approximately 2 metres above the base of Bed II. This skeleton was in a poor state of preservation, except for the tusks. Since the foot bones were found considerably below the rest of the skeleton, Leakey suggests the animal died trapped in a swamp. Alongside the remains of the *Deinotherium*, Leakey (1971:254) refers to the isolated presence of other taxa. The lithic assemblage, composed by 23 artefacts and 16 so-called manuports, seemed associated to the *Deinotherium* skeleton, with a chopper located in the pelvic area of the carcass (Leakey 1971:85). Altogether, this association has not been granted the same reliability as the connection documented in FLK North 6, therefore it has not been ruled out an accidental coincidence of the elephant skeleton and the lithic industry (Isaac & Crader 1981:63).

To our knowledge, no zoo-archaeological re-examination have been performed on the fauna recovered. As regards the industry, Kyara (1999) studied the raw materials and Kimura (1997) and Ludwig (1999) analysed the technology. The latter mentioned a total number of 20 pieces, among which he analysed 10 cores and 8 *débitage* products, and Kimura (1997:203) spoke of 22 artefacts, totalling 16 cores and 6 products. We have located 23 pieces and 13 unmodified objects. No knapping products were found (tabl. 4.16). Furthermore, of the total of slightly over 7600 grams of lithic material, the so-called lava manuports sum 2 kilograms. As in other occasions, the unmodified lavas compose the dominant category, which does not make much sense from a behavioural standpoint. Consequently, we - once again - believe these must be natural items. Actually, this time the pieces classified as lava hammerstones could also possibly be natural, given the great general inconsistence visible in the internal structure of the lithic assemblage.

As a result, human evidence would be limited to a meagre 4 kilograms and a half of quartz (tabl. 4.17) and, with the exception of a few isolated examples of *débitage*, it would be linked exclusively to percussion processes. Despite the fact that the number of artefacts in the *Deinotherium* Level is similar to the underlying assemblage (Clay with Root Casts Level), we decided to analyse it in view of its historiographic relevance, since it has been considered a reference in literature referring to the processing of large carcasses (Clark 1972; Clark & Haynes 1970; Isaac & Crader 1981; Crader 1983; etc). Nonetheless, the lithic assemblage's internal structure is not at all coherent, since it is lacking in *débitage* or small fragments that would allow us to refer to *in situ* activities, merely presenting large objects which almost exclusively suggest percussion processes. Thus, we can propose two alternatives; the first, as Isaac and Crader (1981) mentioned tentatively, deeming the association between the bones and the industry as accidental, in view of which the lithic remains would come from an occupation in which the smaller fragments would have been eliminated, perhaps by sorting processes. The other possibility believes that the industry is linked to the bone remains; in this case, we would be dealing with an extremely episodic occupation, in which quartz blocks were employed to perform limited percussion activities.

	Quartz		Lava		Total	
	n	%	n	%	n	%
Cores	3	14.3	-	-	3	8.6
Hammerstones	4	19	4	28.6	8	22.9
Anvils	7	33.3	-	-	7	20
Battered fragments	4	19	-	-	4	11.4
Unmodified material	3	14.3	10	71.4	13	37.1
Total	21	100	14	100	36*	100

Table 4.16. Lithic categories at FLK North *Deinotherium*. (*) Included a quartz flake not recorded in the table.

	Quartz	Lava	Total
Cores	562	-	562
Hammerstones	1115	1019	2134
Anvils	2311	-	2311
Manuports	623	-	623
Total	4611	1019	5630

Table 4.17. Weigth (grams) of lithic categories at FLK North *Deinotherium* excluding umodified pieces.

Sandy Conglomerate Level

This is the last level in FLK North described in Leakey's (1971) monograph, and the last Oldowan level we will consider in this book. Located in the lower part of the Middle Member of Bed II, Leakey (1971:111) merely indicates this level's correlation with HWK East Levels 3-5, without providing contextual information. She also notes that the sediments in this level were not sifted (which, in her opinion, explains the low *débitage* percentage), and underscores the high percentage of chert pieces, which does not appear in other parts of the Olduvai sequence. Likewise, she notes the absence of bone remains (Leakey 1971:254), which limits the archaeological evidence to 234 lithic pieces. As stated previously, aggregates vary in terms of the author, from the 234 pieces Leakey (1971) mentions, to the 175 analysed by Ludwig (1999:32), the 248 contemplated in our total, and the 226 counted by Kimura (1999:811), which she then reduces to 224 (Kimura 2002:301).

Despite the low number of items, the Sandy Conglomerate level presents interesting features. Almost all these important characteristics are linked to the novel use of a new raw material in the Olduvai sequence, chert. This raw material was available in the deposition interval between Tuffs IF and IIB, which corresponds to the period when FLK North Sandy Conglomerate (henceforth FLK North SC) was created. Furthermore, this is the first time we encounter an assemblage in which quartz is predominant, not only quantitatively (as occurs in most of the analysed sites), but also in terms of the total number of kilograms taken to the settlement. Figure 4.28 shows that the quartz, with over 25 kilograms of raw material modified anthropically, is the most relevant group, followed by lavas (slightly over 20 kilograms) and then by chert (lagging behind with 1650 grams).

This time there is no call for debating the issue of the lava unmodified material; Leakey, although she does not explain this level's sedimentary context, does state that "*because of the nature of the deposit, it is not posible to determine whether these are manuports or are of natural origin*" (1971:114). Since this level of FLK North is synchronous in time-related and sedimentary terms with the HWK East Sandy Conglomerate, we can turn to the description Leakey (1971:96) made of the latter, in which she noted the existence of a major conglomerate with many lava pebbles. Therefore, it is surprising to see that Kimura (1997:210) included unmodified lithic material in her aggregates, when Leakey (1971) herself had already stated that, in this case, such pieces had a natural origin.

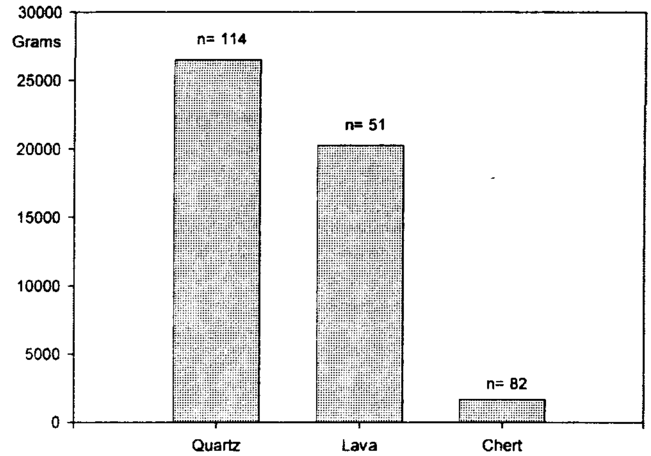

Figure 4.28. Total weight of each raw material at FLK North *Sandy Conglomerate.*

The immediate existence of lava pebbles makes the prevalence of the quartzes in the assemblage even more relevant, since - in principle - they would have a remoter origin. Moreover, quartz has a very marked distribution, intimately linked to percussion objects (tabl. 4.18 and fig. 4.29). This slant does not only appear in quartzes. If we consider the percentages for each category, we see certain distribution as regards raw materials. So as to check this fact statistically, a global χ^2 of table 4.18 was performed, resulting in highly significant differences between categories in terms of the raw

	Quartz		Lava		Chert		Total	
	n	%	n	%	n	%	n	%
Test cores	2	1.8	2	3.9	2	2.4	6	2.4
Cores	3	2.6	7	13.7	6	7.3	16	6.4
Retouched pieces	-	-	1	2	4	4.9	5	2
Knapping hammerstones & frags.	2	1.8	30	58.8	-	-	32	12.9
Hamm. fract. angles	1	0.9	2	3.9	-	-	3	1.2
Spheroids & Subspheroids	47	41.2	-	-	-	-	47	19
Anvils	-	-	2	3.9	-	-	2	0.8
Whole flakes	6	5.3	1	2	43	52.4	50	20.2
Frag. < 20 mm	-	-	-	-	-	-	-	-
Flake fragments	11	9.6	2	3.9	24	29.3	37	14.9
Angular fragments	32	28	3	5.9	2	2.4	37	14.9
Battered fragments	9	7.9	1	2	-	-	10	4
Unmodified material	1	0.9	-	-	1	1.2	2	0.8
Total	114	100	51	100	82	100	248*	100*

Table 4.18. Categories represented in FLK North SC. (*) Including an unmodified block of gneiss not contemplated in the rest of the table. These aggregates do not coincide with Kimura's (1999:815), since she counted 109 quartz pieces, 43 lava pieces and 73 chert pieces.

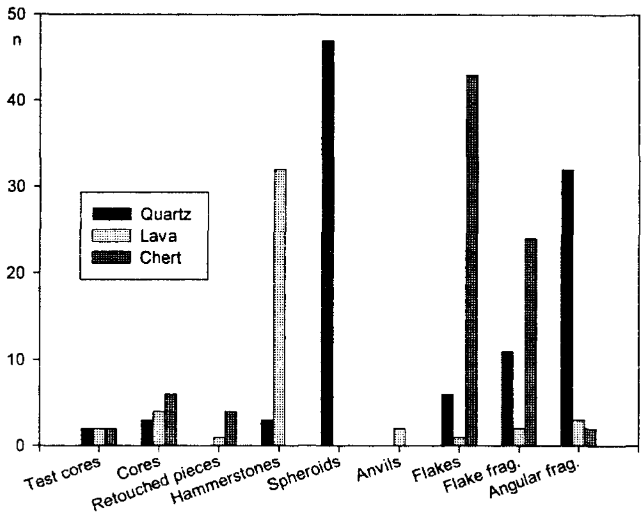

Figure 4.29. Distribution of raw materials according to technological categories at FLK North SC.

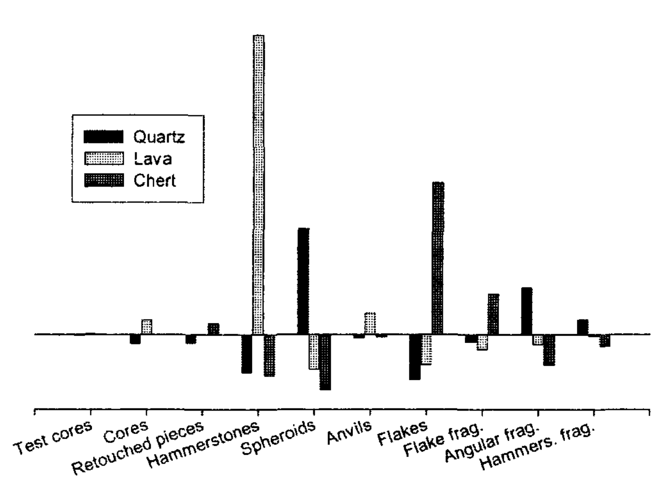

Figure 4.30. Lien Test comparing raw materials and lithic categories at FLK North SC.

material. Putting this same data through the Lien test, which is much more graphical (fig. 4.30), we find three essential trends: the predominance of lava hammerstones to the detriment of quartz and chert hammerstones, the profusion of chert flakes compared to other raw materials, and the over-representation of quartz in the spheroid group.

None of the previous sites has shown such an obvious trend in the distribution of categories per raw material. Therefore, opposite to what we have done in other chapters in which we described each technological category separately, the descriptive criterion implemented for this section will be the raw material: in FLK North SC quartz, lavas and chert respond to different *chaînes opératoires*, and should, for that reason, be treated differently.

The chaîne opératoire *of lavas*

Worked phonolites, trachytes and basalts only account for 51 pieces of the assemblage, but suppose no less than 20,269 grams. As occurred previously, the knapping hammerstones compose the most important category (see tabl. 4.18), being high quality cobbles with ergonomic sizes (tabl. 4.19) and morphologies. Once again, lavas show a flagrant contradiction between the number of *débitage* products and the amount of cores. We cannot attribute the absence of flakes to taphonomic processes, since these products abound among chert objects. Therefore, we need to turn to behavioural causes, either via the import of shaped core forms or the export of the flakes obtained. Both hypothesis encounter serious objections, as commented in the section dedicated to Level 1-2.

	Minimum	Maximum	Mean	Std. deviation
Length	60	112	84.55	14.532
Thickness	43	101	71.17	14.533
Width	35	87	57.17	12.918
Weight	180	1054	510.72	268.165

Table 4.19. Dimensions of lava hammerstones at FLK North SC.

It is hard to explain the enormous deficit of knapping products detected systematically among lavas. Even more so when we delve in the exploitation systems detected in the cores; we documented three choppers, two of which were bifacial and one unifacial; we found a single unifacial abrupt core and three cores that had been reduced using the bifacial peripheral system (fig. 4.31). Most of them did not undergo intense shaping, but this does not justify the fact that there is only one whole lava flake and a few fragments. Thus, there is obviously a bias, probably an anthropic bias, which acted to the detriment of knapping products made of lava.

In any case, we must not forget the fact that most phonolites, trachytes and basalts were linked to percussion activities. Alongside the aforementioned active hammerstones (among which there are some with fracture angles, not only knapping hammerstones), there are also two lava anvils, highly infrequent in the FLK North sequence, where quartz tabular blanks were the most common anvils.

The chaîne opératoire *of quartzes*

Quartzes were also used in a novel way in FLK North SC. This novelty consists in the massive presence of objects which Leakey (1971) called subspheroids and spheroids. Leakey (1971) suggested the existence of subspheroids even at the beginning of the Olduvai sequence, classifying certain objects from DK as such, which Willoughby (1987) accepted in her re-examination. Nevertheless, here, these objects have only started to appear in FLK North Level 1-2, where we find one of such pieces. Yet, FLK North SC produced an enormous sample of subspheroids and spheroids. In fact, these objects total 19 of the 26 kilograms of quartz taken to the site. This results in a vast population that allows us to determine some of their characteristics.

Leakey proposed a ranking from more angular pieces (subspheroids) to more rounded pieces (spheroids), stating that

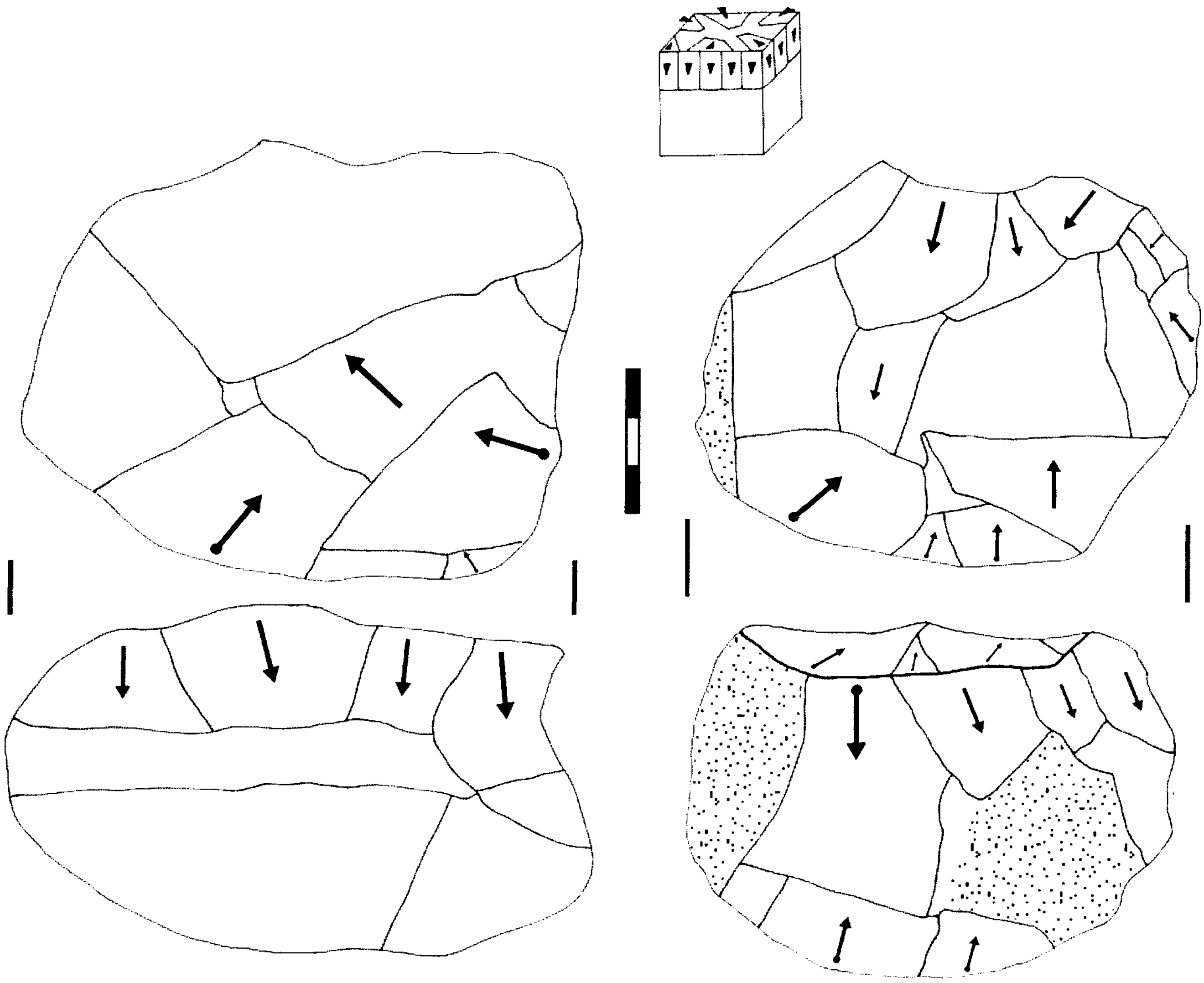

Figure 4.31. Bifacial peripheral partial lava cores from FLK North SC.

"*faceted specimens in which the projecting ridges remain or have been only partly removed are more numerous*" (1971:6), and consequently distinguished them from the so-called *bolas*, pieces completely rounded by pitting. The procedure consists in subjecting the quartz pieces to an intense percussion process that generates natural facets on the blocks. These facets usually present intense battering on the ridges, quite often with simultaneous extractions on both sides of the edge. These objects represent the first stage (stage 1) of the use of the quartz blocks, that present multiple facets given percussion activities, and include the pieces already described in FLK North 5 referring to the different types of hammerstones with fracture angles. With continuous use, battering spread all over the piece and the ridges collapsed, starting to blur the original shape of the quartz block. In order to integrate the items in discrete categories, this type of pieces has been included in what we have designated stage 2 of the reduction process, although it is actually the same process as that of the previous stage, but entailing a greater level of intensity of the percussion (see fig. 4.32). Finally, quartz pieces totally rounded by battering have been found at Bed II in Olduvai, which could be considered genuine spheroids and compose stage 3 or the final stage of modification once they have lost their original shape completely.

We segmented the types of subspheroids and spheroids by phases so as to offer a more comprehensible explanation of the work processes that generate these morphologies. Nonetheless, we ultimately decided to follow Leakey's (1971) terms, with a view to homogenising the nomenclature. As a result, we will always refer to subspheroids and spheroids when dealing with pieces presenting the characteristics described above, whilst the comments voiced by other authors (for example Willoughby 1987) regarding these objects must be taken with certain reservation and will be debated in chapter 9.

Regardless of these denominations, we are facing a continuum in the alteration of the original morphologies of the quartz blanks, a modification produced by a heavy

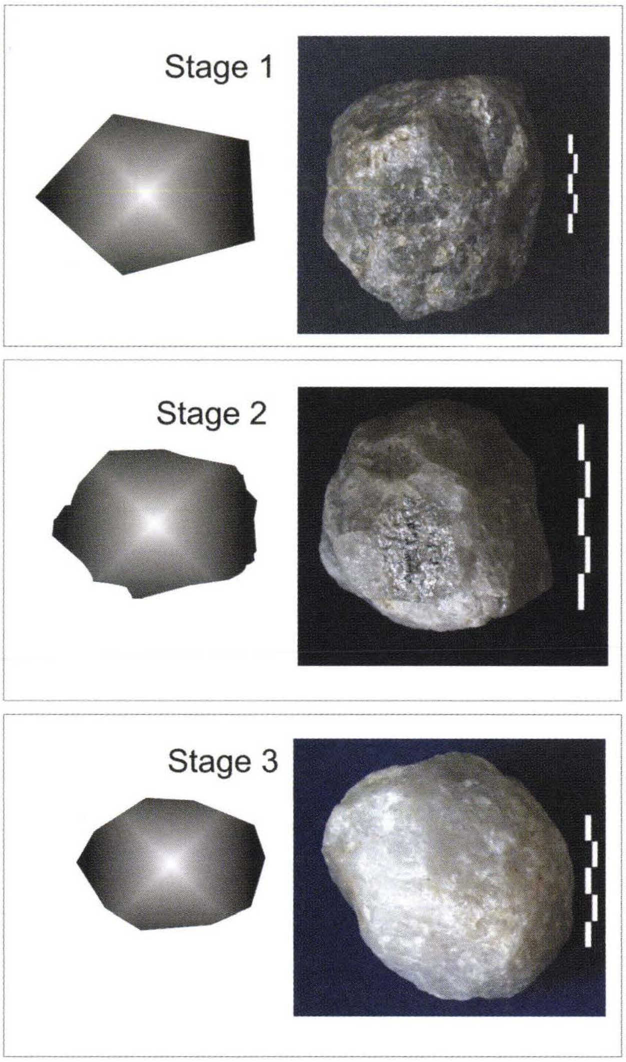

Figure 4.32. Examples of subspheroids and spheroids from FLK North SC, and diagrams representing the ideal stages of the reduction of the quartz blocks.

percussion activity. This prolongation of the life of an artefact (turning an angular block into a totally rounded sphere requires the pieces to be used intensively) is unprecedented in the Olduvai sequence, where pieces were - until now - discarded after a few knapping sequences or after little use. The fact that it only applies to quartzes is also exceptional. Table 4.18 indicates that quartzes in FLK North SC were almost exclusively linked to percussion activities; we only have 3 cores (fig. 4.33) and a few flakes that refer to *débitage* processes (fig. 4.34). Likewise, most of the chunks are probably parts detached from hammerstones and spheroids during percussion processes. If this is considered in combination with the fragments that do present pitting marks, and knapping hammerstones, hammerstones with fracture angles and, obviously, the actual spheroids and subspheroids, it seems clear that the *chaîne opératoire* of quartzes was basically linked to percussion activities.

The chaîne opératoire *of chert*

Alongside HWK East (Leakey 1971) and MNK Chert Factory (Stiles *et al.* 1974), FLK North SC is one of the few examples of chert exploitation in Bed II in Olduvai. The presence of chert allows us to analyse how hominids responded technically to the availability of a novel raw material, which presented knapping capacities that were superior to quartzes and basalts.

The hominids of FLK North SC were unquestionably aware of the mechanical advantages chert entailed. Table 4.18 shows that among the only 1650 grams of chert, there are more cores and flakes than in the total 47 kilograms totalled by lavas and quartzes. Chert was obviously used intensely for *débitage* activities, and it is therefore essential to explain those knapping processes. In this case, it is interesting to start with the cores, not the knapping products. This is due to a simple reason; the flake production and the management of chert cores was completely conditioned by the minuscule size of the available nodules, which measured a maximum of 5-6 centimetres long, with irregular morphologies, covered completely by cortex. These natural forms prevented hominids from obtaining flakes immediately; they had to rough-out the knapping platforms first. Tool-makers understood this fact, since 6 of the 7 chert cores were exploited using a similar bifacial abrupt strategy (fig. 4.35 and 4.36). The knapping platform was prepared removing any irregular cortical surfaces. The roughed-out surface was subsequently used in the horizontal plane as a striking platform to exploit the transversal and sagital planes. In view of these cores, which were very small (tabl. 4.20) and presented sharp edges, craftsmen could only reduce the cores partially, not knapping the whole circumference, leaving a good part of the surface reserved as cortex, most probably to be able to hold the small core during the knapping process. Hence, the flakes were always obtained from the same exploitation plane, without changing the original platform the core.

Among the knapping products, it is surprising to see the high quantity of flakes and flake fragments, on the one hand, and the absolute absence of chips, on the other: Leakey (1971) noted that she did not sift the sediments on this level, therefore no millimetric remains were recovered. Yet, the profusion of flakes does require further investigation; given the number of flakes, we can calculate an average of 6.8 flakes per core, an average that would increase if we considered the relative profusion of flake fragments. Chert cores, for which we calculate a minimum of 4 scars and a maximum of 10, present an average number of 6 scars per core, which coincides with the rate

	Minimum	Maximum	Mean
Length	39	67	51,17
Thickness	29	59	44,83
Width	21	43	29,67

Table 4.20. Dimensions of chert cores at FLK North SC.

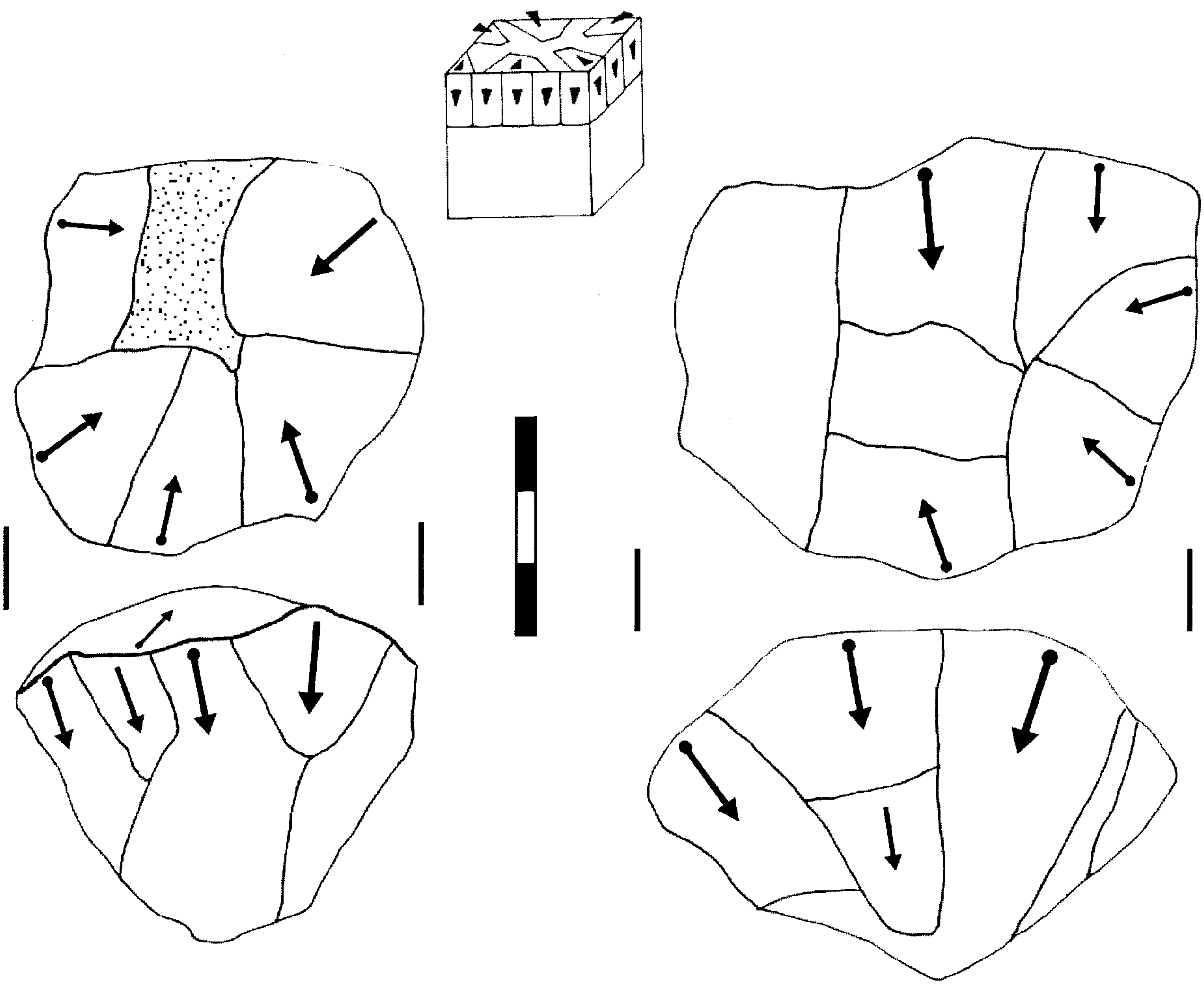

Figure 4.33. Bifacial peripheral quartz cores from FLK North SC.

obtained dividing the number of flakes by the number of cores. An average of 6 scars per core in such small nodules least us to ponder on the intensity of the chert reduction, especially when we consider the fact that in other sites cores presented a lower number of scars, which nonetheless were bigger in size.

	Minimum	Maximum	Mean	Std. deviation
Length	20	81	33.56	10.234
Thickness	20	62	30.28	9.009
Width	4	27	10.79	4.632
Weight	3	113	12.3	16.813

Table 4.21. Dimensions of chert flakes at FLK North SC.

The size of the flakes is also interesting. Whole flakes have an average length of 3 cms (tabl. 4.21). At first this seems small. Yet, table 4.20 shows that the cores are merely a few centimetres longer than the flakes, and these cores are in fact considered in the size scatter interval of the actual flakes (fig. 4.37). This indicates that, despite the small chert nodules, tool-makers were able to manage small blanks to obtain the largest possible flakes, many presenting sizes similar to the cores themselves. This supposes a vast technological ability to overcome the constrictions imposed by the dimension of the small available nodules, and maximise the good qualities chert offers as a raw material.

The chert flakes' attributes coincide with the information obtained from the cores. Thus, the high cortex percentage on the flakes' butts and dorsal faces (tabl. 4.22 and fig. 4.38) suggest an *in situ* decortication of the nodules. Nonetheless, although roughing out was performed in the site itself (87.1% of the dorsal faces present cortex remains), the cores were worked on knapping platforms without cortex (80.6% of the butts presents no cortex remains). Altogether, the decortication of the knapping platforms (required to obtain flakes on the *débitage* surface) does not imply a preparation of the butts, with most of them being unifaceted (fig. 4.39).

We have some examples of core rejuvenation, which suggests a bifacial interaction between the knapping platform and surface. In any case, the flakes present a longitudinal pattern of

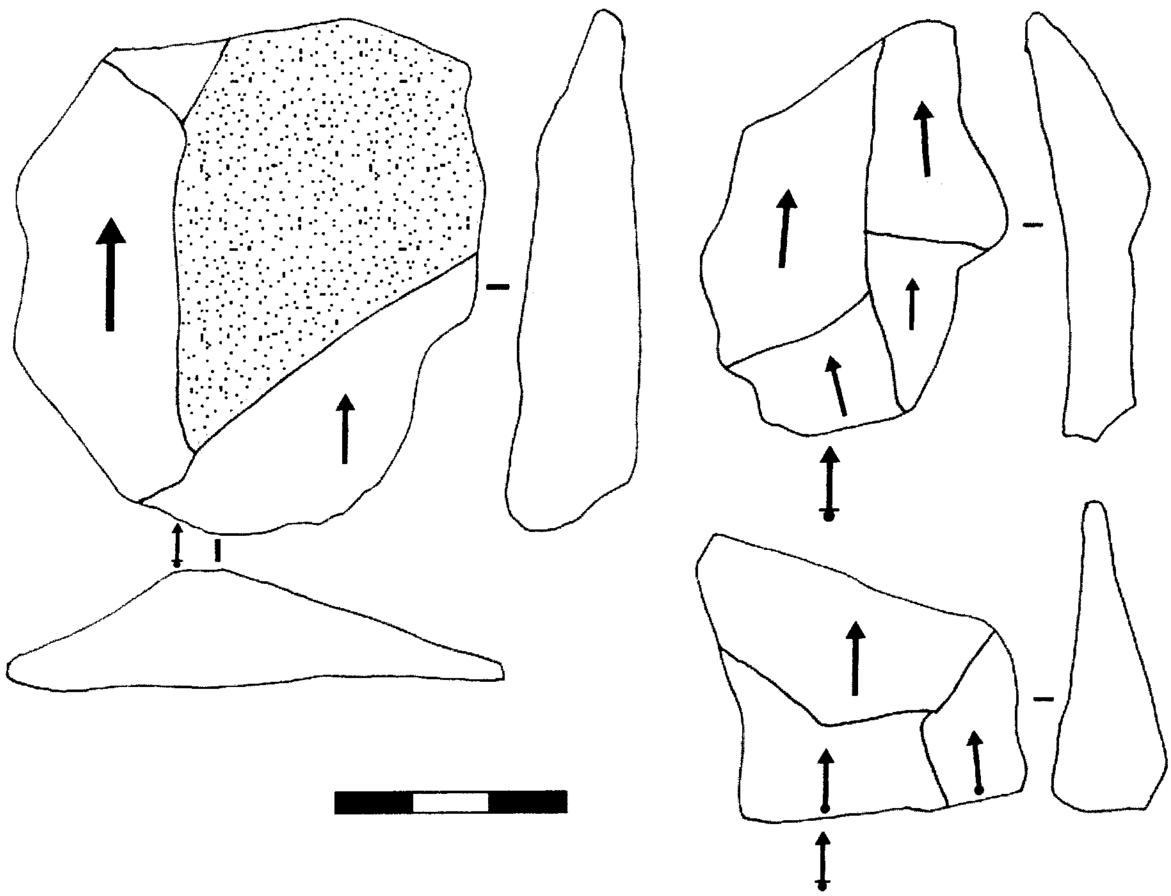

Figure 4.34. Quartz flakes from FLK North SC.

Dorsal face	Striking platform				Total	
	Cortical		Non-cortical			
	N	%	N	%	N	%
Full cortex	3	9.7	2	6.5	5	16.1
Cortex > 50%	2	6.5	4	12.9	6	19.4
Cortex < 50%	1	3.2	15	48.4	16	51.6
Non-cortical	0	0	4	12.9	4	12.9
Total	6	19.4	25	80.6	31	100

Table 4.22. Cortical percentages on a sample (n=31) of the whole flakes at FLK North SC.

parallel detachments, reproducing the unidirectional schema described above for the cores (fig. 4.40). In all, we are dealing with small flakes that present an optimal manufacture, with thin sections and sharp edges that indicate the ability of a craftsman who had to reduce very small and irregular nodules, battling the technical problems involved.

Finally we refer to retouched objects. Leakey (1971) described 23 chert formal tools and 36 flakes and retouched or used fragments. Kimura (1999, 2002) only mentioned percentages, and therefore, turning to her original study (Kimura 1997:207), this author describes up to 18 retouched chert items, probably making her aggregate coincide with the objects represented in fig. 55 by Leakey (1971:113).We have only classified 4 chert artefacts as retouched objects (tabl. 4.18), with the other items proposed by Leakey having been formed by the natural pseudo-retouching of the edges (fig. 4.41). We should not overlook FLK North Sandy Conglomerate's sedimentary context. It is composed by sand interbedded with pebbles, which indicates certain energy in the deposition of the archaeological material (which also supports the absence of knapping debris) or, at least, a probable friction between the sedimentary particles and the artefacts. Indeed, most of the chert pieces from FLK North SC are excellently preserved. Nonetheless, the edges of the chert pieces, sharper than most quartzes and lavas, are also more sensitive to damage (pseudo-retouching in this case) produced by the sediment itself. Most of the so-called retouched pieces Leakey (1971) describes present a very marginal modification on the edges, which is irregular, not systematic. Therefore, and although several are subject to equifinality, we believe the majority are not clear enough to be considered retouched pieces.

Consequently, we doubt that "the production of retouched flakes is simply raw material related, and may not be suggestive of technological development of the toolmaker" (Kimura 2002:302). This author asserted that the assemblage with most retouched pieces she had studied was FLK North SC. It is no coincidence to see that the second site on her list of

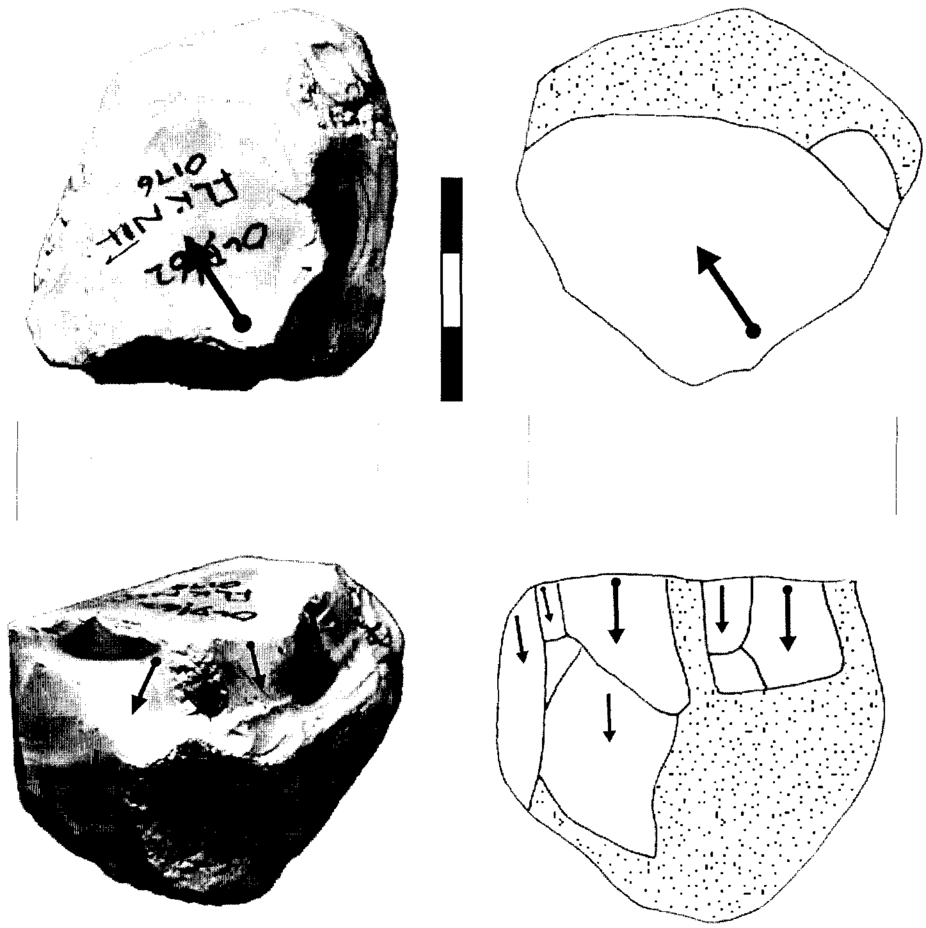

Figure 4.35. Chert nodule reduced using the bifacial abrupt partial system. The nodule is almost complete and preserves most of the cortex; despite the excellent quality of the chert, cores are scarcely exhausted (contradicting Kimura 1997, 1999).

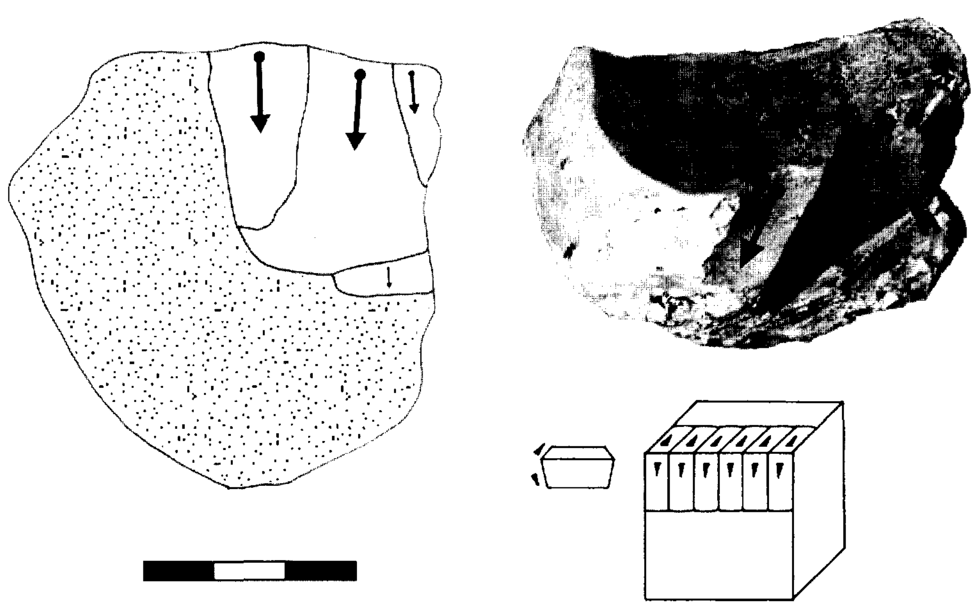

Figure 4.36. Chert core exploited using the bifacial abrupt partial system. As in the previous figure, it is a small chert nodule with a deep cortex layer which makes it difficult to strike knapping platforms. Therefore, the horizontal plane is cleaned with a single detachment, which is subsequently used as a striking platform to obtain flakes in the transversal plane. As occurs with the previous figure, the core is scarcely exhausted, despite the excellent quality of the raw material.

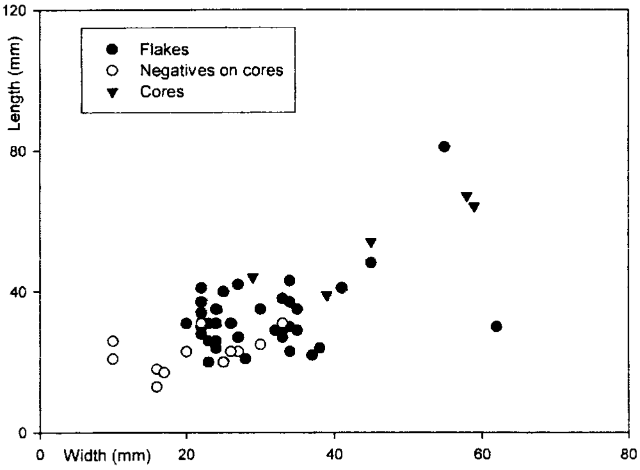

Figure 4.37. Size scatter diagram of the cores, flakes, and scars on cores at FLK North SC.

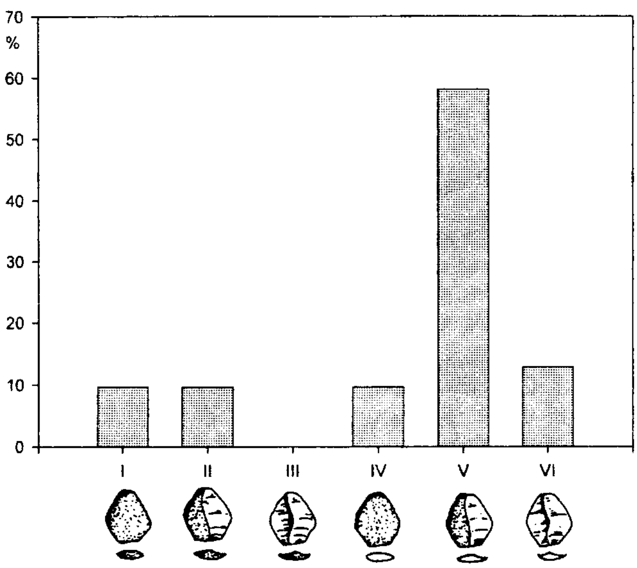

Figure 4.38. Types of flakes at FLK North SC, according to Toth´s (1982) classification.

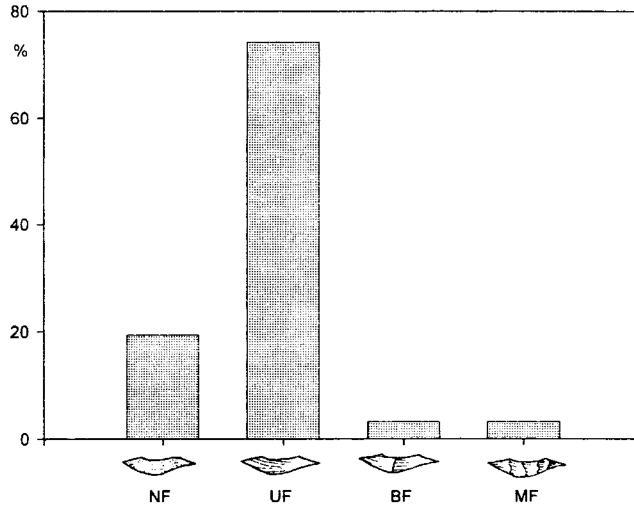

Figure 4.39. Types of striking platforms in the whole flakes from FLK North SC.

retouched pieces was HWK East (also in chert and in a medium-high energy context), and the third was DK, where there is no question regarding the derivate nature of part of the material and, therefore, of the natural modification of the edges. Thanks to the information gathered in DK and FLK North SC, we believe Kimura has attributed purely mechanical process to human action, reaching mistaken behavioural and evolutionary conclusions based on this confusion.

To conclude this section, we would like to reflect on the global structure of the assemblage. Some authors (Kimura 1999; Ludwig 1999) have granted this assemblage a high level of postdepositional alteration, despite Leakey (1971) never making explicit comments in this respect, and believed that most part of the assemblage presents intact edges. The pseudo-retouching some chert pieces underwent, can be explained in view of the actual sandy context, whilst the absence of debris was caused by the fact that the sediment was not sifted. Consequently, and without excluding a possible postdepositional alteration, the collection does not seem to have suffered severe taphonomic processes. This calls for the construction of a sound interpretation of the behaviour that generated this peculiar concentration, which - for the first time - presents relevant amounts of a new type of artefact, the subspheroid/spheroid, indicating an intense use of the same objects before they were discarded. Moreover, we find a *chaîne opératoire* for lava focused on using cobbles as hammerstones, and cores which, nonetheless, lack their respective knapping products. Alongside all this, we also observe a very focalised use of chert for flake production. Furthermore, this must be considered in line with the almost complete absence of bones. We could be tempted to attribute this final characteristic to the sedimentary context, but it seems fauna appears in relevant quantities in the same stratigraphic level in HWK East (Leakey 1971:254-257). Therefore, the absence of bones in FLK North SC is not necessarily linked to taphonomic causes. In that case, given the fragmentary nature of the *chaîne opératoire* of lavas, the fact quartzes focus on percussion objects and the dearth of fauna, could perhaps be used to suggest a hypothesis considering that the occupation of this FLK North SC level was linked to chert *débitage*. This would appear as a satisfactory explanation and would support the apparent coherence of the *chaîne opératoire* of chert. Nonetheless, the sole problem would be the fact that less than 2 kilograms of raw material were invested in chert processing, whilst the site presents over 48 kilograms of lithic material. Considering this fact, the hypothesis loses all grounds and requires we pursue alternative interpretations.

Conclusions

FLK North is the most interesting assemblage in Olduvai for a diachronic study, since it presents up to 8 levels bearing

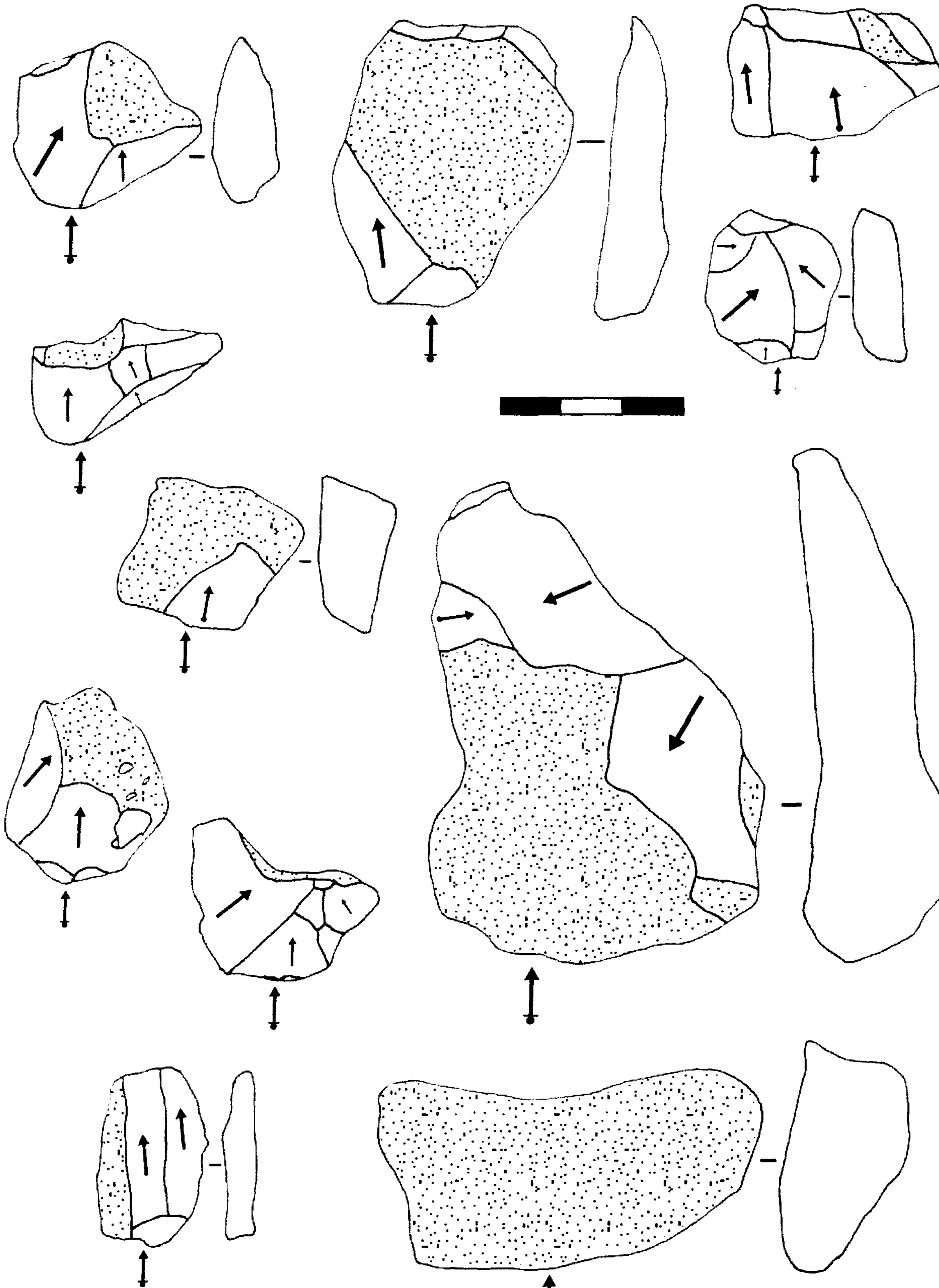

Figure 4.40. Chert flakes from FLK North SC. All of them show important amounts of cortex.

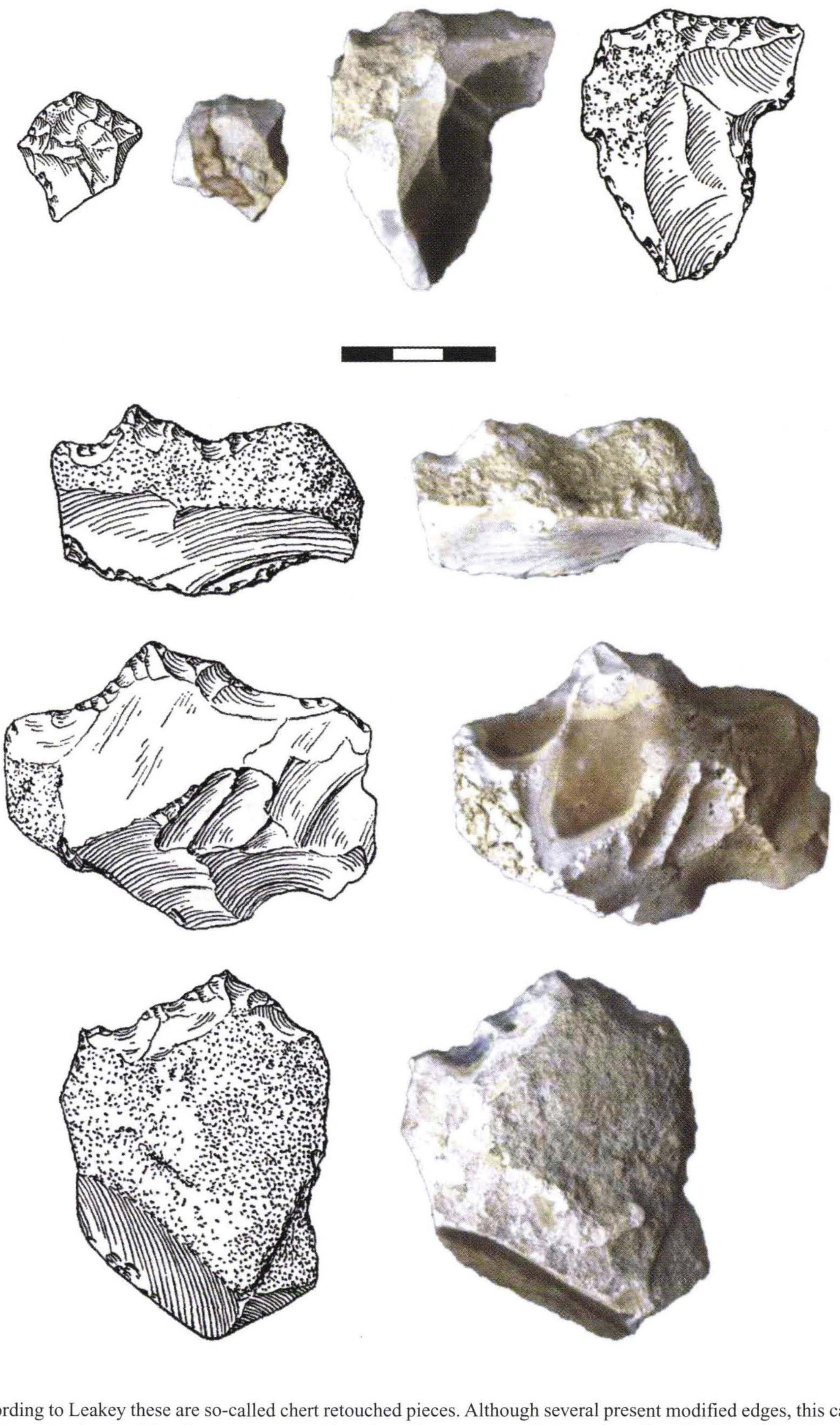

Figure 4.41. According to Leakey these are so-called chert retouched pieces. Although several present modified edges, this cannot be assigned with reliability to intentional retouching. Layout composed based on photographs and pieces from fig. 55 of the Olduvai monograph (Leakey 1971:113).

archaeological material, which allow us to analyse how the strategies the hominids developed in one same point of the territory changed over time. Although this is not strictly true from a palaeo-environmental perspective (since the landscape surrounding FLK North varied over time), it is relevant in terms of the provisioning of raw materials, the availability of which (although it endured diachronic alterations) was more predictable than the biotic resources.

We must recall the time scale we have employed. Levels 6-1, located under Tuff IF, are slightly older than 1.75 my (Walter *et al.* 1991, 1992). *Deinotherium* Level, on the Lower Member of Bed II, must be slightly more recent than 1.75 my, and older than the 1.66 my estimated for Tuff IIA (Manega 1993). Finally, the FLK North Sandy Conglomerate, in the Middle Member of Bed II, located above Tuff IIA and below Tuff IIB, must be older than 1.6 my. In all, we are dealing with approximately 150,000 years from the top of the FLK North sequence to the lower levels, which, *in principle*, supposes an exceptional example to study the diachronic variability of technologic strategies. This goal has not been achieved entirely, mainly due to contextual problems, since several levels do not present a coherent internal organisation.

A first approximation to contextual issues is performed comparing the densities of the remains found in each level, in order to assess the contribution of each one to the FLK North assemblage. This presents an initial problem, whether or not to include unmodified lithic material. This is no banal issue. Firstly, since if we add all the levels in FLK North (except the Sandy Conglomerate, where Leakey herself rejected the presence of manuports), we have 101 kilograms of unmodified lavas (excluding quartzes, in principle transported anthropically) from the total amount of 311 kilograms of raw material analysed on this site. That is to say, a third part of the lithic material in FLK North did not undergo human modification, yet Leakey (1971) states it was transported by the hominids. Throughout this chapter we have demonstrated that this hypothesis is not sound, primarily through specific comparisons on each level between the unmodified and the modified material. Nonetheless, we also find more general contextual arguments that reinforce the natural provenance hypothesis.

Although Leakey (1971:61) considered that functionally four of the levels (Levels 5-1) of FLK North Bed I were living floors and the other was a butchering site (Level 6), in the same work she specified that Levels 5-1 were sites with diffused materials, in which the archaeological remains were scattered along a thick stratigraphical sequence (Leakey 1971:258). Potts (1994:20) is also ambiguous when assessing the contextual integrity of FLK North, initially stating that the densities in Levels 5- 1 are very similar to non-human backgrounds, to immediately move on to state that the systematic superimposition of archaeological levels in FLK North is due to an anomaly in the landscape unrelated to natural causes.

FLK North Level 6 and *Deinotherium* Level, which Leakey (1971) considered as belonging to single archaeological events but fortuitously linked to a natural background of bones (also Bunn 1986), also seem to correspond to long formation periods with different *tempos* in the deposition of the carcasses (Leakey 1971; Bunn 1986; Potts 1988, 1994). Therefore, despite once again encountering - as occurred in FLK Zinj - clay contexts linked to low energy sedimentation, it is easy to propose processes such as the ones stated by Ashley and Driese (2000), Mack *et al.* (2002), etc, regarding the complexity of the formation of the strata associated with a lake-margin. It would be perfectly plausible to consider a natural explanation for a large part of the unmodified clasts which could have their origin in, for example, small hydraulic events like sheet flows.

Another possibility to consider is the vertical migration of lithic objects. FLK North is around 7.2 m in depth (Leakey 1971:61). Therefore, speaking of generally very fine sediments such as clays, there could have been vertical movements of large elements, a fact that is very common in archaeological sites (i.e. Cahen & Moeyersons 1977; Villa 1982; Villa & Courtin 1983; Hofman 1986; Gifford-González *et al.* 1985; etc). Leakey herself (1967) observed that part of the archaeological remains of FLK North Level 1-2 "*appear to have sunk down from the higher level, either when the clay was wet, or else down cracks which form when it becomes dry*" (Leakey 1967:428). Likewise, vertical migration was one of the possibilities Hay (1976) considered to explain the presence of pebbles in clay deposits in many of the Olduvai contexts. According to this author, in Olduvai we must contemplate the possibility whereby pebbles originally deposited in a level above the unconsolidated sediments could subsequently be scattered vertically via trampling or burrowing by animals, or by the effect of the roots themselves (Hay 1976:85).

We could consider this in combination with the earth movements which according to Leakey (1971:67) affected Level 5 in FLK North, for example. Hay (1996:228) also described an erosive channel, full of gravel in the basal deposits in Bed II precisely here in FLK North. Therefore, it would be easy to imagine some of these cobbles, given the permeability of the sediment, migrating to the archaeological deposits. Therefore, it seems justified to assert that these vertical migration processes could have occurred systematically in FLK North, mixing elements from different depositional stages and, among them, natural cobbles which were fortuitously associated with archaeological remains.

As a whole, it is viable to assume the possible existence of small hydraulic events, slow sedimentation processes, vertical migrations, and a variety of events that mixed a natural background deposit of bones with genuine archaeological remains (i.e. Leakey 1971; Isaac & Crader 1981; Bunn 1986), or at least archaeological pieces from different occupations of the site (Potts 1988). Considering all the above processes, it would seem appropriate to justify the non-anthropic presence of unmodified stones in FLK North which we now know were also scattered naturally around the landscape of the Olduvai lake-margin.

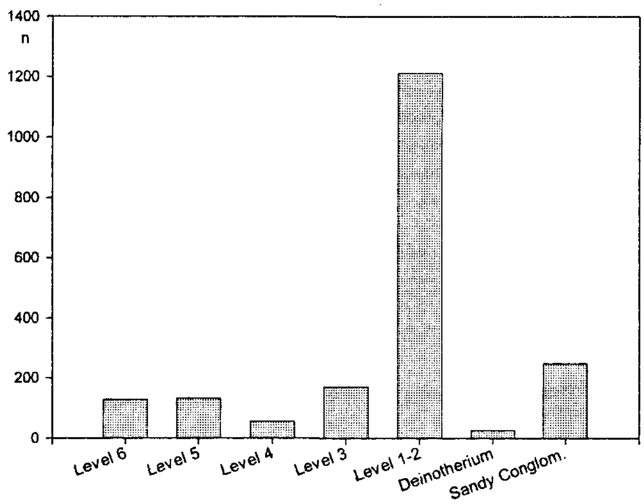

Figure 4.42. Number of pieces in each level of FLK North. Lava unmodified material is excluded.

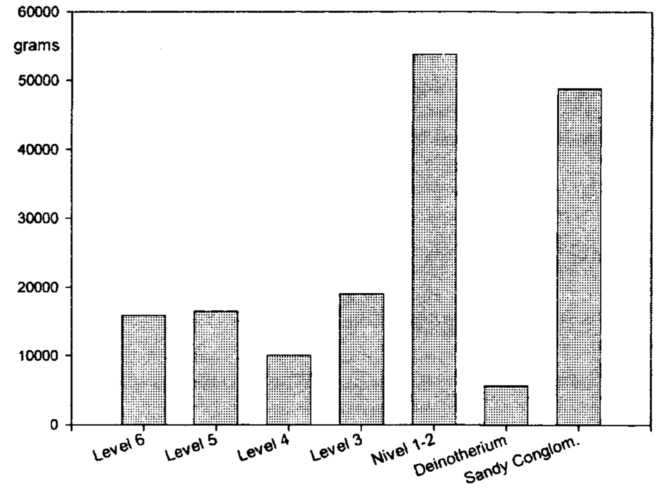

Figure 4.43. Total amount of raw material (in grams) transported to each level of FLK North. Again, lava unmodified material is excluded.

The debate on manuports must lead us to consider the integrity of the rest of the collections obtained from each level. Leakey (1971:259) considered Levels 5-1 of FLK North as low-energy clay deposits, in which bone remains and lithic remains were scattered and did not form genuine living floors. This author said nothing about the Sandy Conglomerate Level, and included Levels 6 and *Deinotherium* among the examples of butchering sites. Nonetheless, upon comparing the number of pieces (fig. 4.42) or the total weight of shaped raw materials (fig. 4.43), we see that Levels 1-2 and the Sandy Conglomerate Level are the most important. This issue is not limited to comparing absolute frequencies or global weights, it is also linked to the internal coherence of each assemblage. Hence, it is no coincidence that Levels 1-2 and the Sandy Conglomerate Level are precisely the two levels that seem to present the most coherent structure in terms of the different lithic categories and also the two that have the highest remain densities.

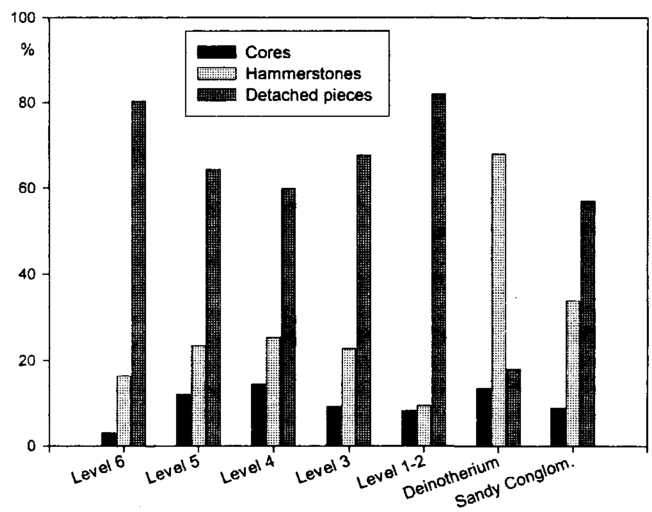

Figure 4.44. General lithic categories in each level. Cores include test cores, hammerstones contain all objects related to such activity (knapping hammerstones, hammerstones with fracture angles, anvils), and products include flakes and derived products.

We must bear in mind that knapping products were almost non-existent in Levels 6, 5, 4, 3 and *Deinotherium*. In FLK Zinj *débitage* exceeds 90% of the total amount of items, which also occurs in DK, despite the fact that we do not discard certain hydraulic biases in the latter. Figure 4.44 shows that only Level 1-2 and perhaps Level 6 present a sufficiently high rate of knapping products (or percussion fragments) to have a coherent proportion in terms of the large objects (cores and hammerstones). With the exception of the Sandy Conglomerate Level (where we know not all small fragments were collected), it seems obvious that the rest of the levels present a severe taphonomic bias. Leakey (1971) had already mentioned it for Levels 5, 4 and 3, and therefore, we see no need to insist on these assemblages. It is more relevant to turn to Levels 6, 1-2, *Deinotherium* and Sandy Conglomerate, where our interpretation appears as an alterative to the existing hypothesis.

FLK North 6 has been a reference point in the literature, appearing as the paradigm of butchering sites in Africa (Isaac 1982, 1984; Isaac & Crader 1981; Clark 1972; Clark & Haynes 1970; Leakey 1971, 1975; etc). Nevertheless, in this description, we have stressed the problems referred to zooarchaeological interpretation, which have led to contradicting conclusions regarding a natural (Binford 1981; Domínguez-Rodrigo *et al.* in press) or human (Potts 1988) origin of the fauna linked to the elephant, even in the works of one same author (Bunn 1982; *contra* Bunn 1986). Furthermore, it is not clear that the elephant remains were modified anthropically, since whilst some researchers note the presence of cut marks on this *Elephas recki* (Shipman 1986; Potts 1988; Bunn 1982, 1986), others consider the elephant presents no human traces (Domínguez-Rodrigo *et al.* in press). The scarce lithic industry in this level seems to be related to battering activities. Anvils and hammerstones are predominant over flakes, which are basically absent from the assemblage (see tabl. 4.1). Leakey (1979:92) had thought that the high number of anvils at the site could be related to the breakage of bones to obtain marrow. However, Leakey herself discarded the idea given that most elements are fairly complete. On the other hand, Crader (1983) stresses the elephant's fragmented nature, which would lead us back to the idea that anvils were used to process the carcass, as occurs with the few flakes and fragments that could have been produced by the documented cut marks. This alternative is not entirely plausible, since the small size of the documented anvils makes it hard to conceive them being employed as blanks to fracture large elephant bones.

Some years ago, it was stressed that "*the position and condition of the FLKN6 carcass also suggests minimal hominid or carnivore disturbance*" (Crader 1983:130), a statement that has been supported by the most recent zoo-archaeological studies (Domínguez-Rodrigo *et al.* in press). This statement can also be supported on the basis of the analysis of the lithic industry: As we have seen in figure 4.42 and 4.43, Level 6 has an artefact density similar to Levels 5, 4 and 3, classified by Leakey (1971) as levels with diffused materials. The distribution of lithic types at the FLK North 6 does not show qualitative or quantitative differences with respect to those levels either. We could argue that the presence of another 35 macromammals in Level 6 (Bunn 1982) is a clear indication of their human transportation. Yet this is not strictly true, since Bunn (1986) himself does not reject the fact that they could have been deposited naturally (Domínguez-Rodrigo *et al.* in press). No authors question the scarce archaeological integrity of some examples like Levels 5, 4 and 3, despite the number of represented macromammals being very similar to FLK North 6 (Shipman 1986). The distribution of artefacts cannot be distinguished from the distribution in other levels either. Therefore, we suggest an in-depth re-examination of the interpretation of the so-called butchering site in Level 6, and grant it the same level of archaeological integrity as more eroded assemblages like Levels 5, 4 and 3.

Continuing the butchering site issue, we should also re-examine the interpretation of the *Deinotherium* Level. Although they decided to include it among the type B sites or butchering sites, Isaac and Crader (1981:63) did not rule out the fact that the association between the elephant and the scarce amount of lithic pieces were coincidental. Furthermore, although tooth marks had been documented, there were no traces of human modification, which led them to conclude that "*it is not possible to determine whether the site really served as the butchery place for a large animal or not*" (Crader 1983:129). Our description of the lithic collection indicates it comes from a completely fragmented *chaîne opératoire* and presents an unconnected structure. Furthermore, the densities of both the industry and the bone remains are practically identical to those of assemblages with diffuse material like Levels 6, 5, 4, 3. Therefore, and with even more arguments than in Level 6, we believe the proposal suggesting the *Deinotherium* level as a butchering site should be ruled out.

As regards Level 1-2, we have already stated Leakey's contradictions, since she initially considered this assemblage as a living floor (1971:61), most probably referring only to its functional connotation, and subsequently insisting on linking its contextual integrity to sites with diffused artefacts and not genuine living floors (Leakey 1971:258). Potts stated that "*even FLK North 1/2 had artefact-bone densities similar to those in the background scatter across the paleolandscape of Member 1 Olorgesailie*" (1994:20). Isaac and Crader (1981), however, included Level 1-2 in type C sites, i.e. those presenting conspicuous concentrations of artefacts and bones from different species. Bunn (1986) agreed with this diagnosis, whilst Shipman (1986) found several bone remains with cut marks that also proved the relationship between fauna and industry.

The internal structure of the lithic collection is coherent and allows for a reliable assessment of the technical guidelines. *Débitage* activities were very relevant in FLK North 1-2, as occurred in other analysed sites like DK and FLK Zinj. However, Level 1-2 presents a greater importance of percussion processes, not always linked to flake production activities. This suggests a novelty in the time sequence under analysis, and has evident behavioural connotations.

Perhaps given the absence of bone material in the deposit, the Sandy Conglomerate level in FLK North has not been given much attention. Leakey (1971:258) herself ignored this level in her conclusions on the contextual and functional character of the sites included in her monograph. Nonetheless, and although we cannot exclude certain taphonomic biases given the sandy sediments in which the industry was recovered, we believe the collection from the SC Level presents a good archaeological resolution, at least better than the resolution of Levels 6, 5, 4, 3 and *Deinotherium*. Its relevance does not only lie in its contextual integrity, since this level presents an unprecedented processing of the raw materials, with a clear division between the categories of artefacts in terms of each raw material. Alongside the novel documentation of the chert industry. This calls for an in-depth re-examination of the assemblage, with a view to understanding the function of a site in which the absence of fauna could not be linked to taphonomic causes (see above) and in which one of the main goals was obtaining of chert products.

Bearing this in mind, it is fundamental to contextualise the SC Level in the general framework of chert exploitation in Olduvai. Hay (1976) noted that chert was formed inside the lake during the deposition of Bed I. Subsequently, when the lake declined, the chert was episodically exposed during the deposition period of the basal part of the Middle member of Bed II. HWK East Sandy Conglomerate, FLK North SC and MNK Chert Factory were formed at that time, all in a 1 kilometre radius. Stiles (1991, 1998; Stiles *et al.* 1974) has studied MNK Chert Factory, and proposed this site would have acted as an atelier from which artefacts were transported to other points of the basin. The density of lithic remains in MNK Chert Factory (henceforth MNK CF) is spectacular, with a 5 x 2 m pit only 20 cms deep unearthing over 30,000 chert pieces, all despite the fact that Stiles *et al.* (1974) state that the exploited chert nodules do not come from an area near the site (contradicting Kimura 1997, 1999). Stiles (1991, 1998) compared a sample from MNK CF to a contemporary level in HWK East, and concluded that the flakes in HWK East could have been transported knapped from MNK CF, which for this author *"suggests that early hominids could plan ahead, and the bias in the selection and transport of whole flakes to another place over time demonstrate 'logistically organized' behaviour"* (Stiles 1991:13).

His assertions are debatable, since Stiles bases his conclusions on the size difference between the flakes in both sites: with 20-40 mm flakes prevailing in HWK East and flakes under 10 mm prevailing in MNK CF (see Stiles *et al.* 1974:301). This, according to Stiles, supposes a clear evidence of the transportation of certain blanks from one site to another. Nonetheless, this could be linked exclusively to a greater profusion of knapping waste (i.e., pieces under 10 mm) in MNK CF, and not to the fact that hominids selected pieces in view of their size and then transported them to HWK East, despite Stiles *et al.* (1974) insisting on the absence of taphonomic biases in the latter site. In fact, in FLK North SC the size range is also around 20-40 mm, but we cannot consider the flakes were already knapped when transported to the site. The core study - which Stiles (1991,1998; Stiles *et al.* 1994) never performed in MNK - suggests nodules were introduced intact in FLK North, and that the cores were roughed-out, exploited and subsequently discarded in the site. Altogether, it does not seem appropriate to elaborate general conclusions, as Stiles aims to, based merely on the study of a flake sample, without even considering the rest of the categories represented in the site.

Since we do not have a technological study of the MNK CF by Stiles (1991, 1998; Stiles *et al.* 1974), it is hard to perform reliable comparison with FLK North SC based on his analysis, and therefore we have to rely on Kimura's (1997, 1999). According to this author, the natural chert nodules in MNK CF are even smaller than the recovered cores, which suggests that the hominids selected the largest nodules as blanks for flake production. Furthermore, Kimura (1999) observes that cores are less worked in MNK CF than in FLK North SC, estimating an average of only 2.9 scars per core in the former, in comparison to the 6.8 scars estimated for Level SC. Kimura's (1999) analysis provides an interesting conclusion, underscoring the scarce amount of chert cores in MNK CF compared to the number of flakes. This author considers this evidence of the fact that cores were transported to other sites once flaked. This would not be the case though for FLK North SC, since we consider the small chert nodules were decorticated in the site although, nevertheless, we cannot rule out the raw material being transported from MNK CF.

The petrological analyses performed on the chert from MNK CF (Stiles *et al.* 1974) have demonstrated the variability of the provenance of the nodules found in the site, thus indicating different source areas for different types of chert. Kimura (1997, 1999) considers this changeability could have a local explanation, proposing an autochthonous origin for all recovered nodules. In any case, and despite these interpretative differences, the MNK CF example appears as a compulsory reference point to interpret the function of FLK North SC; in MNK CF, as in FLK North SC, bone remains are practically nonexistent (Stiles 1998). Therefore, the stratigraphic concurrence, close topography and technical similarity between both assemblages underscore the relevance that the exploitation of an exceptional and prized resource, chert, had in the occupation of the Sandy Conglomerate Level, the last level in FLK North and also the last Oldowan assemblage we have studied in the Olduvai sequence.