Chapter 6

# FC WEST OCCUPATION FLOOR

## Introduction

The FC West site is stratigraphically located in the Middle Member of Bed II, above Tuff IIB. Although it is more recent than EF-HR, the chronology of FC West also ranges near 1.6-1.5 my estimated respectively for Tuffs IIB and IIC (Manega 1993). Leakey (1971) opened a trench from the base of Bed III to the lower part of Bed II, locating two main archaeological levels, both in the Middle Member of Bed; FC West Occupation Floor (OF) and, right above it, level FC West Reworked Tuff.

FC West Reworked Tuff has a low archaeological resolution; the remains appeared in a thickness of 72 centimetres, and Leakey (1971:260) calculated a density of 7.6 pieces per $m^3$. On the other hand, in FC West OF almost 1200 lithic artefacts and 127 bone remains were recovered from 51 $m^2$ of excavated surface, only 9 centimetres thick, which led Leakey (1971:260) to estimate a density of 92 pieces per $m^3$, and Isaac and Crader (1981:64) to establish an average 67.2 artefacts per $m^2$. This makes FC West OF the densest concentration of remains in Olduvai Beds I and II (Petraglia & Potts 1994). Therefore, it is a well-defined assemblage that preserves a good part of its original archaeological integrity. In fact, given the sedimentary context the archaeological material appeared in – a clay paleosol similar to those typical of Bed I –, Leakey (1971:258) considered this level an occupation floor.

Despite these facts, Leakey (1971:157) assumed certain hydraulic alteration. Hence, she explicitly stated that the 251 unmodified cobbles and blocks recovered during the excavation could be natural, thus avoiding a reference to manuports (Leakey 1971:161). In this respect, Petraglia and Potts' insistence is surprising, since when referring to these 251 objects, they state that "*these stones were considered to be manuports carried by hominids to the site, an interpretation consistent with that of other sites (e.g. FLK-22) where plentiful manuports were found* (1994:240)". When speaking of FLK-22, arguments were presented rejecting an anthropic contribution

| | Quartz | | Lava | | Gneiss | | Chert | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % | N | % |
| Test cores | - | - | 3 | 1.6 | 1 | 14.3 | - | - | 4 | 0.3 |
| Cores | 12 | 1.2 | 27 | 14.3 | - | - | - | - | 39 | 3.2 |
| Core fragments | 2 | 0.2 | - | - | - | - | - | - | 2 | 0.2 |
| Large Cutting Tools | 2 | 0.2 | - | - | - | - | - | - | 2 | 0.2 |
| Small retouched pieces | 13 | 1.3 | - | - | - | - | - | - | 13 | 1.1 |
| Knapping hammerstones | 27 | 2.7 | 57 | 30.2 | - | - | - | - | 84 | 7 |
| Hamm. fract. angles | 26 | 2.6 | 5 | 2.6 | - | - | - | - | 31 | 2.6 |
| Anvils | 6 | 0.6 | 1 | 0.5 | 1 | 14.3 | - | - | 8 | 0.7 |
| Whole flakes | 43 | 4.3 | 25 | 13.2 | 1 | 14.3 | - | - | 69 | 5.7 |
| Flake fragments | 405 | 40.3 | 20 | 10.6 | - | - | - | - | 425 | 35.4 |
| Frag. < 20 mm | 230 | 22.9 | - | - | - | - | - | - | 230 | 19.2 |
| Angular fragments | 211 | 21 | 12 | 6.3 | 2 | 28.6 | - | - | 225 | 18.7 |
| Hammerstone fragments | 23 | 2.3 | 7 | 3.7 | - | - | - | - | 30 | 2.5 |
| Unmodified material | 4 | 0.4 | 32 | 16.9 | 2 | 28.6 | 1 | 100 | 39 | 3.2 |
| Total | 1004 | 100 | 189 | 100 | 7 | 100 | 1 | 100 | 1201 | 100 |

***Table 6.1.*** Lithic material studied in FC West Occupation Floor. We assume the 251 objects Leakey (1971) referred to as natural items are not included in the collection housed in the Nairobi Museum. Most of the objects classified as items without knapping and/or percussion traces mainly belong to those Leakey inscribed in the utilised cobblestones category. It is symptomatic that our recount of these pieces (n=39) is similar to Kimura's (2002:296), who counts a total of 35 so-called manuports.

of the unmodified material. This is not required in this section, since Leakey (1971) herself mentions the probable natural origin of the items. Thus, and although the unmodified material is contemplated briefly in the analysis (tabl. 6.1), these objects will be excluded from the study this chapter is based on.

Our constant insistence on the manuports issue is not trivial, in the case of FC West OF precisely taking into consideration the taphonomic implications. Petraglia and Potts (1994) turn to the weight of the objects to indicate the hydraulic alteration each assemblage underwent: the greater the percentage of very heavy objects, the more important the hydraulic disturbance that transported the smaller pieces. Their analysis concludes that, in terms of the weight of the objects, FC West OF is precisely the site presenting the greatest hydraulic alteration. Nonetheless, this outcome could be conditioned by the fact that their analysis included unmodified cobbles and blocks, which are generally heavy objects. Leakey (1971:164) totalled a number of 1184 lithic items, excluding the 251 unmodified blocks and cobbles. Petraglia and Potts (1994:242) counted up to 1196 pieces, and 1201 have been considered in this work. Our aggregate (tabl. 6.1) does not include the 251 objects Leakey (1971) identified as natural items, but does embrace a great number of pieces which both Leakey and Petraglia and Potts (1994) most probably considered modified, although they have been classified herein as pieces that have not undergone human alteration. This unmodified material totals 10,525 grams, which composes an important volume of raw material. If we subtracted those objects from Petraglia and Potts' (1994) calculations based on the weight ranges at FC West OF, that parameter would possibly no longer conclude that this level had experienced the greatest hydraulic alteration, if compared to all the sites they studied.

In any case, there do seem to be other arguments in favour of the assemblage having undergone certain taphonomic alteration. The documentation of two different concentrations in the dispersion of remains in FC West OF, for Leakey (1971:261) can be compared to a similar one located in FLK North, and for Petraglia and Potts (1994:247) appears as a hint towards the existence of space vacuums linked to fluvial processes. This fact, considered alongside the alteration of the edges of part of the stone pieces, would indicate the assemblage had experienced some disturbance. In all, and given the clay context, the vast amount of millimetric remains and the high quality preservation of most of the lithic material, post-depositional processes would only have affected the site lightly (Leakey 1971), perhaps transporting remains over a very short distance, not moving them far from their original location (Petraglia & Potts 1994).

## General characteristics

Leakey (1971:157) underscored the prevalence of quartz as the most used raw material, and mentioned choppers as the most profuse artefacts, alongside 5 fragments of bifaces and a vast amount of *débitage*. Our classification (tabl. 6.1 and fig. 6.1) offers different results. The first issue is linked to the raw material; table 6.2 shows that, as regards absolute frequencies, quartz objects are up to five times more abundant than lava pieces. When turning to statistical evidence to compare their proportional distribution by category (fig. 6.2), it becomes obvious that (as occurs in some FLK North levels) there is an overrepresentation of lava cores and hammerstones to the detriment of quartz objects. The low number of lava items is concentrated in specific categories, precisely those that are stand out in the Lien test (fig. 6.2), whilst quartz objects are more diversified in the different technological categories. Nonetheless, and differing from the sites in Bed I, here in FC West basalt is very high quality, with a very fine texture, without irregularities, and almost always comes from streams. On the other hand, quartz is predominantly tabular (although there are a great number of quartz stream cobbles).

As well as comparing absolute frequencies, the analysis has also included a classification of the different categories based

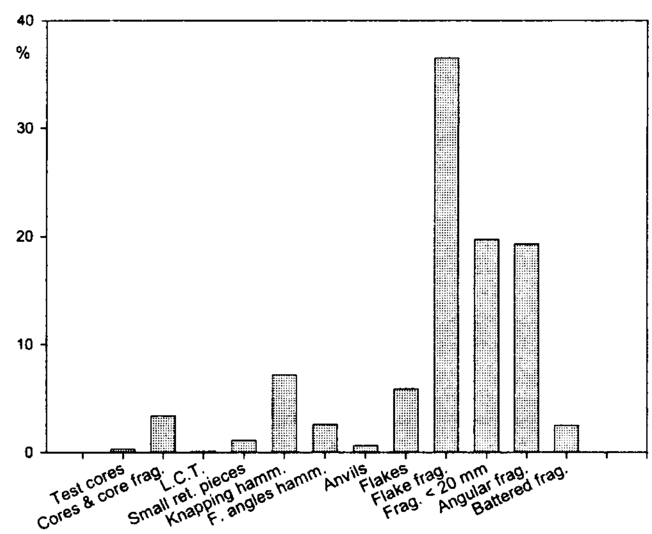



***Figure 6.1.*** General lithic categories at FC West OF.

| | Quartz | | Lava | | Total | |
|---|---|---|---|---|---|---|
| | n | % | n | % | N | % |
| Test cores | - | - | 3 | 1.9 | 4* | 0.3 |
| Cores | 12 | 1.2 | 27 | 17.1 | 39 | 3.3 |
| Core fragments | 2 | 0.2 | - | - | 2 | 0.1 |
| Large Cutting Tools | 2 | 0.2 | - | - | 2 | 0.1 |
| Small retouched pieces | 13 | 1.3 | - | - | 13 | 1.1 |
| Knapping hammerstones | 27 | 2.7 | 57 | 36.3 | 84 | 7.2 |
| Hamm. fract. angles | 26 | 2.6 | 5 | 3.1 | 31 | 2.6 |
| Anvils | 6 | 0.6 | 1 | 0.6 | 8* | 0.6 |
| Whole flakes | 43 | 4.3 | 25 | 15.9 | 69* | 5.9 |
| Flake fragments | 405 | 40.5 | 20 | 12.7 | 425 | 36.5 |
| Frag. < 20 mm | 230 | 23 | - | - | 230 | 19.7 |
| Angular fragments | 211 | 21.1 | 12 | 7.6 | 225* | 19.3 |
| Hammerstone fragments | 23 | 2.3 | 7 | 4.4 | 30 | 2.5 |
| Total | 1000 | 100 | 157 | 100 | 1162* | 100 |

***Table 6.2.*** Lithic categories at FC West OF, excluding all the unmodified objects. (*) Including gneiss pieces.

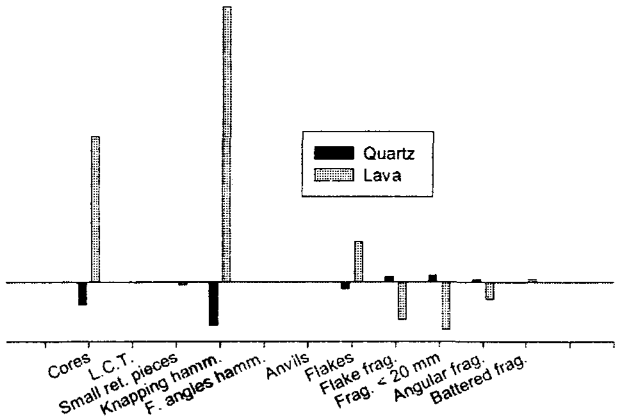



*Figure 6.2.* Lien Test comparing frequencies of lithic categories and raw materials.

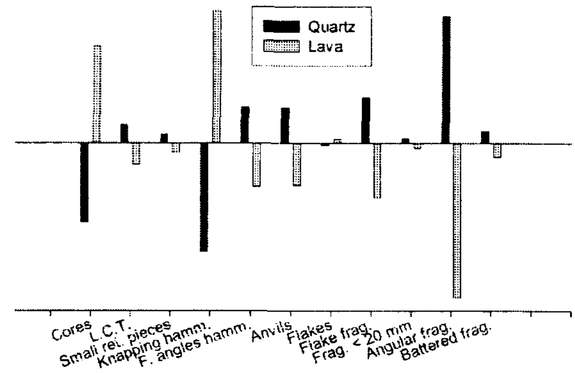



*Figure 6.3.* Lien Test comparing the weight of lithic categories and raw materials.

| | Quartz | Lava | Total |
|---|---|---|---|
| Cores | 4822 | 12047 | 16869 |
| Large Cutting Tools | 1290 | - | 1290 |
| Small retouched pieces | 590 | - | 590 |
| Knapping hammerstones | 10626 | 21857 | 32483 |
| Hamm. fract. angles | 7163 | 1898 | 9061 |
| Anvils | 4402 | 673 | 5075 |
| Whole flakes | 1328 | 1756 | 3084 |
| Flake fragments | 5478 | 781 | 6259 |
| Frag. < 20 mm | 321 | - | 321 |
| Angular fragments | 11572 | 769 | 12341 |
| Hammerstone fragments | 839 | - | 839 |
| Total | 48431 | 39781 | 88212 |

***Table 6.3.*** Weight in grams of each category. These calculations should be considered alongside the 1461 grams of worked gneiss. In total, the modified lithic material in FC West Occupation Floor amounts to 89673 grams.

on the number of worked kilograms of each raw material (tabl. 6.3). Compared to sites like FLK North or FLK Zinj (in which the total weight of the lavas was finally greater than that of the quartzes, contrary to the absolute frequency trend), in FC West OF the global weight of worked quartz surpasses that of the lavas. The statistical comparison of the number of kilograms for each category (fig. 6.3) confirms the trend observed in figure 6.2 (predominance of lavas among cores and knapping hammerstones), but also underlines the imbalances in favour of quartzes as regards the following categories: chunks, flake fragments, anvils and hammerstones with fracture angles.

There is an overrepresentation of lavas as regards quartzes in terms of the use of knapping hammerstones (fig. 6.2 and 6.3), although this trend is documented in practically all analysed sites. The original morphology of the lava cobbles makes them ideal blanks as knapping hammerstones, an aspect that led hominids to prefer these objects, aware of the advantages. There is, nonetheless, one exception, since FC West OF presents numerous quartz stream cobbles, which were also used as hammerstones. In fact, figure 6.3 shows that hammerstones with fracture angles are proportionally more important in quartz than in lava.

The second great discordance in the representation of quartzes and lavas appears in the core category. Despite the quartz *débitage* being much greater than the lava *débitage* (including flakes, so-called flake fragments and debris, quartzes total 678 pieces compared to 45 lava objects), the number of lava cores is unexplainably greater (n=27) than quartz cores (n=12).

With an average 5.75 detachments per core, the minimum number of scars is set at 2 and the maximum at 14. If we implement McNabb's (1998) predictions, we would have a range of 24-168 quartz flakes and 54-378 basalt flakes. These estimations are far from the real recounts, especially as regards lavas where, as in other sites, there is a chronic deficit of *débitage* products. Hypotheses to explain the absence of lava knapping products were already explored in the description of FLK North. The same interpretations (output of lava flakes, input of cores/flaked lava artefacts) can also be applied for FC West OF, and will, therefore, be re-examined in the general synthesis included in chapter 9. In any case, we once again encounter a very important deficit of lava *débitage* in terms of the number of cores, a lack that becomes even more noticeable upon observing that those lava cores double the amount of quartz cores, whilst the *débitage* total for the latter almost increases the amount of lava fivefold.

## Knapping products

FC West OF presents 69 whole flakes, 62% of which are made of quartz and the rest are in basalt, except for a single example in gneiss. Lava flakes are generally larger than quartz flakes (fig. 6.4). In fact, the 25 basalt flakes total quite a lot more grams of raw material than the 43 grams of quartz (see tabl. 6.3). Their dimensions were compared statistically (T Test for independent samples) and the results demonstrated there is no equality either in terms of the dimensions or the variations, therefore concluding that there is a significant difference of flakes in terms of the raw material (tabl. 6.4 and 6.5). In any case, all the flakes from FC West OF are included in a size range between 20-60 mm (fig. 6.5). Although there

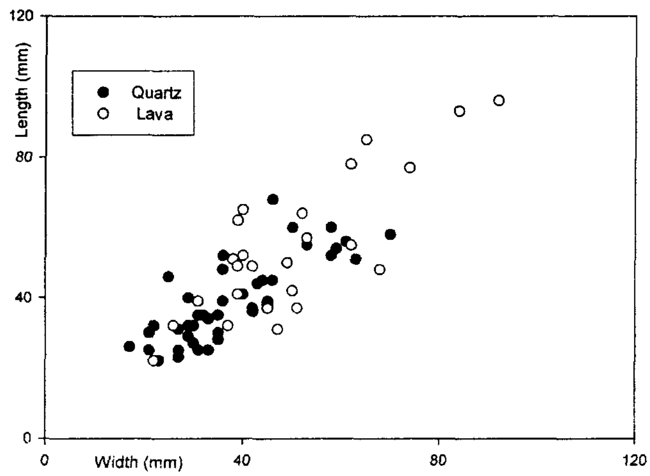



*Figure 6.4.* Dimensions of the whole flakes.

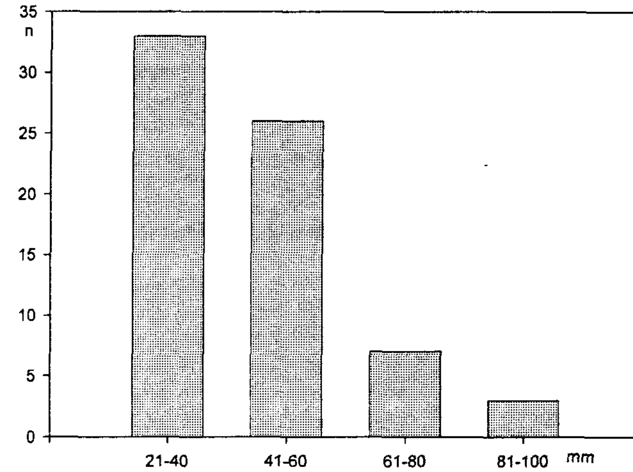



*Figure 6.5.* Length patterns in the whole flakes.

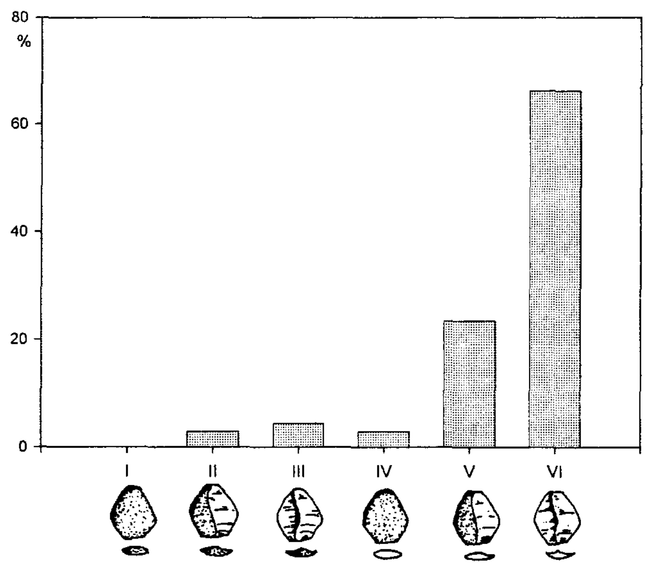



*Figure 6.6.* Types of flakes according to Toth´s (1982) classification.

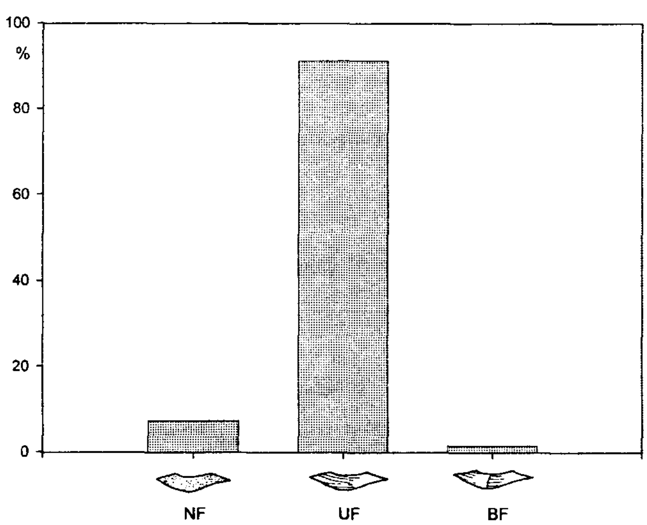



*Figure 6.7.* Types of striking platforms in the whole flakes.

| | Minimum | Maximum | Mean | Std. deviation |
|---|---|---|---|---|
| Length | 22 | 68 | 39.23 | 11.85 |
| Width | 17 | 70 | 38.26 | 12.797 |
| Thickness | 6 | 37 | 15.44 | 6.891 |
| Weight | 3 | 123 | 30.88 | 27.984 |

*Table 6.4.* Size of the quartz whole flakes (mm and grs.).

| | Minimum | Maximum | Mean | Std. deviation |
|---|---|---|---|---|
| Length | 22 | 96 | 53.76 | 19.787 |
| Width | 22 | 92 | 49.88 | 17.13 |
| Thickness | 7 | 46 | 17.32 | 10.447 |
| Weight | 4 | 387 | 70.24 | 91.253 |

*Table 6.5.* Size of the lava whole flakes (mm and grs.).

| Dorsal face | Striking platform | | | | Total | |
|---|---|---|---|---|---|---|
| | Cortical | | Non-cortical | | | |
| | N | % | N | % | N | % |
| Full cortex | - | - | 2 | 2.9 | 2 | 2.9 |
| Cortex > 50% | 2 | 2.9 | 5 | 7.4 | 7 | 10.3 |
| Cortex < 50% | - | - | 13 | 19.1 | 13 | 19.1 |
| Non-cortical | 3 | 4.4 | 43 | 63.2 | 46 | 67.6 |
| Total | 5 | 7.4 | 63 | 92.6 | 68 | 100 |

*Table 6.6.* Cortical frequencies in the whole flakes.

are a few larger examples, this site does not present the large flakes production system described in EF-HR.

As regards the technical specifications, no initial flaking products have been documented, with less presence of examples with cortex remains on their dorsal faces (tabl. 6.6 and fig. 6.6) in this level than in others. It is generally a case of flakes produced via previously modified platforms, although the butts are not usually faceted (fig. 6.7). The examples represented in fig. 6.8 and 6.9 show that both the quartz and basalt flakes were produced using an effective *débitage* system. With an average 2.8 previous scars on their dorsal faces, these flakes also seem to indicate various knapping systems. Consequently, figure 6.10 shows that, despite

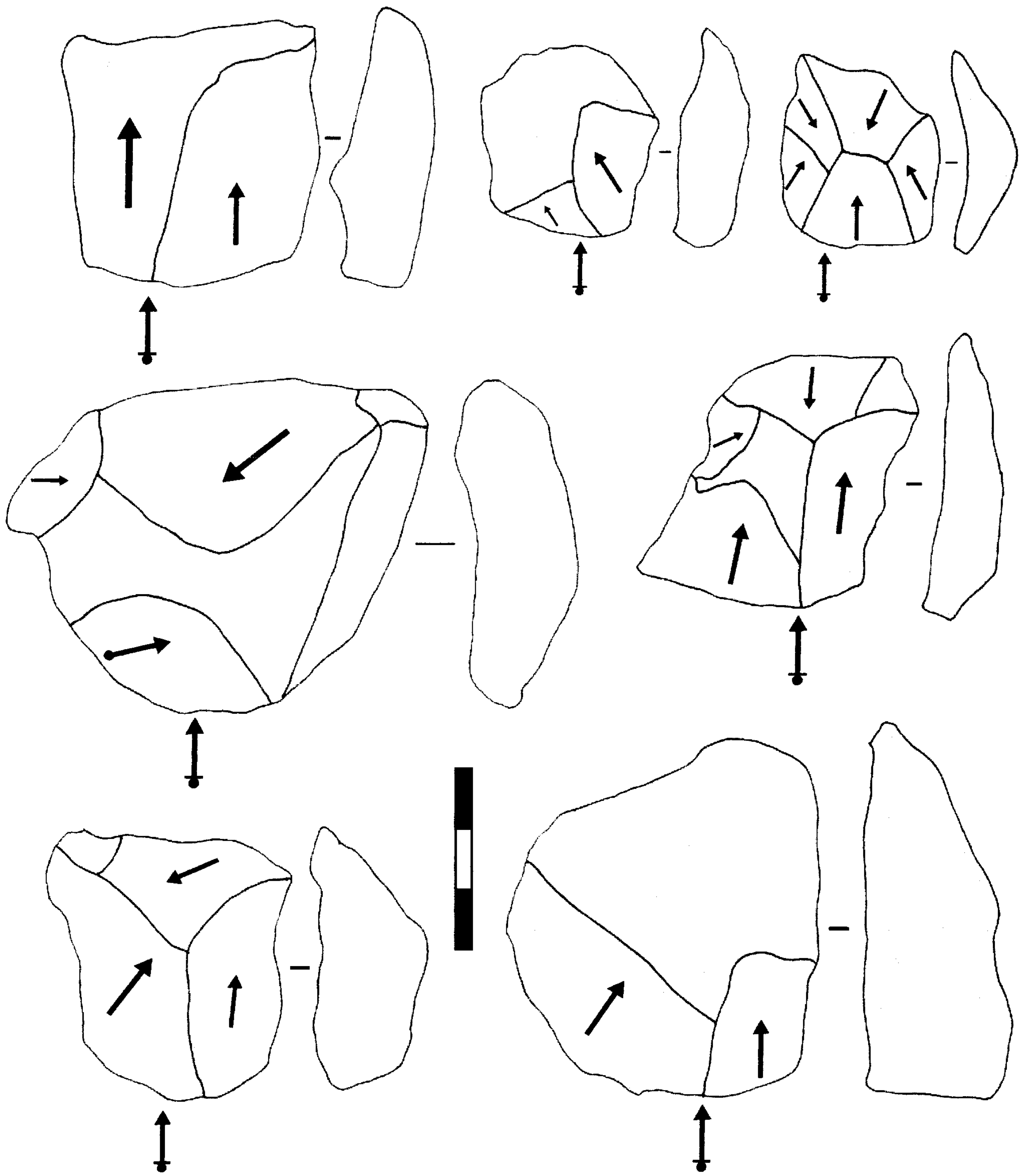


***Figure 6.8.*** Quartz flakes at FC West OF.

the prevalence of unidirectional knapping, several flakes also indicate partial core rotation (transversal pattern). Furthermore, some examples denote a more structured management of the knapping surfaces, which were exploited from different directions during the same reduction sequence.

There is a vast amount of flake fragments. This profusion is restricted to the production sequences for quartz (tabl. 6.2), since all *débitage* categories are underrepresented as regards lava items. The same occurs with remains under 20 mm and quartz chunks. With regard to debris, the relative abundance among quartzes suggests both that lithic activities were per-

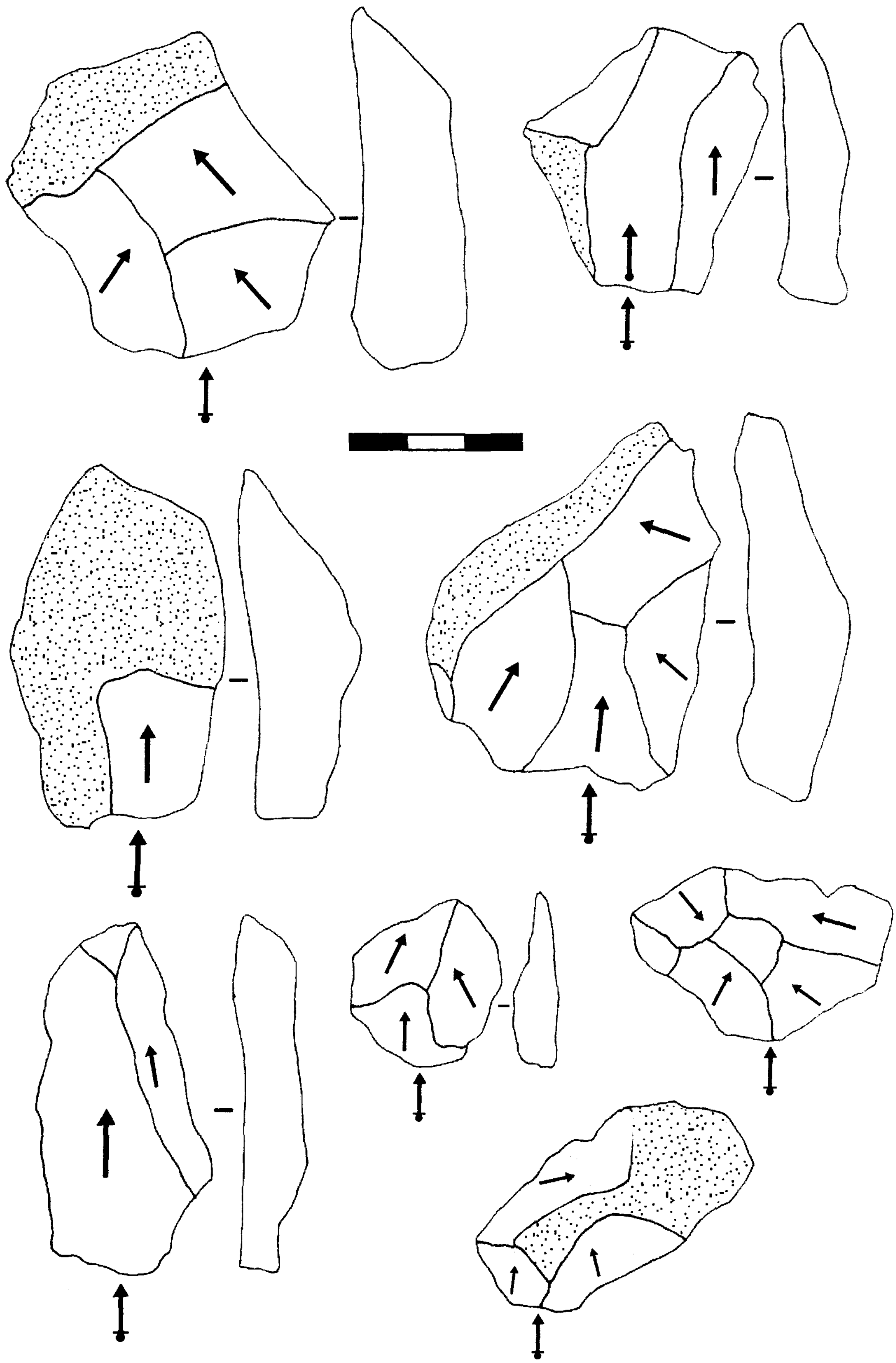


*Figure 6.9.* Basalt and phonolite flakes

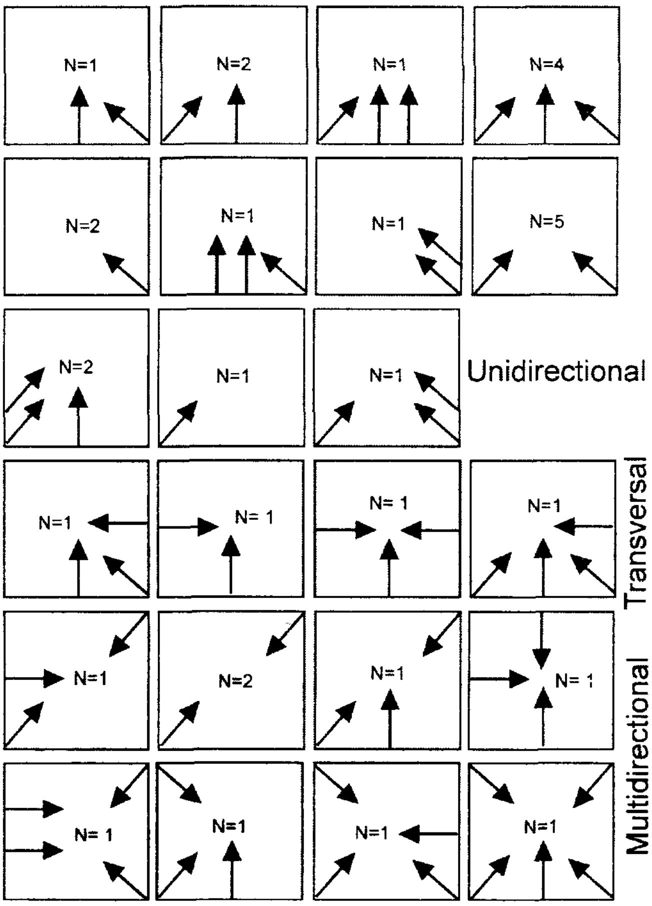



*Figure 6.10.* Diacritic schemes of the whole flakes.

formed *in situ*, and also that there was no severe hydraulic disturbance in the site. On the other hand, the fact that not a single basalt or phonolite chip has been documented is surprising, and seems to reject the consideration of the production of lava *débitage* being carried out in FC West OF, even partially. This lack of lava debris complements the lava flake deficit, thus consolidating the idea that practically all the basalt and phonolite material was flaked before it entered the site.

With reference to chunks, it is easy to assimilate the deficit as regards lavas (it simply follows the general pattern for *débitage* in this raw material), but it is not that easy to explain the great abundance among quartzes. Quartz chunks compose 21.1% of that raw material, five times more frequent than flakes. As occurred in FLK North, we think that in FC West OF a good part of these fragments must have involuntarily detached from the quartz hammerstones and anvils during percussion processes. Although we have calculated that only 19.6% of these chunks presents battering on any of their surfaces, given their small size, we cannot exclude the fact that the number of pieces of this type generated by percussion processes (not knapping processes) were greater. In fact, a good part of the 425 flake fragments counted could, in fact, be nothing of the kind; as demonstrated in the chapter dedicated to FLK North, percussion activities generate fragments that can be mistaken for broken flakes.

Despite this equifinality regarding the analytical allocation of each object, in FC West OF two arguments appear as the grounds to assign a good part of the so-called quartz *débitage* to percussion processes; one is the actual overabundance of categories like the so-called flake fragments or chunks, which are too abundant if compared to the percentages of quartz cores or the flakes themselves. The second argument appears in the vast amount of quartz hammerstones. Many of these items are hammerstones with fracture angles, and therefore the corresponding detached fragments should also be present. In our opinion this is, actually, the case; the fact is that normally these fragments have been included in *débitage* categories, thus mistaking the processes by which they were generated. The scope of this reinterpretation of the fragments is quite significant, since we are referring to over 16 kilograms of raw material (tabl. 6.3) which could be assigned to percussion processes and not to *débitage*, which would, in its turn, lead to a substantial modification of the general interpretation of the activities performed in FC West OF.

## Cores and knapping systems

Notwithstanding the previous paragraph, knapping activities were also relevant in FC West OF. Given the metric differences observed between quartz and basalt flakes, an initial analysis was performed to see if basalt cores were also larger than quartz ones. The graphic in figure 6.11 shows that quartz cores are smaller than lava cores, but are in the same size range. Means were compared via Student's T Test considering both the length and the weight. This test concluded that there are no significant differences regarding the dimensions in terms of the raw material. Therefore, statistical comparisons cannot be used to consolidate the hypothesis suggested when describing flakes, for which there is a statistically significant difference regarding the dimensions of the different raw materials. Thus, it seems that the average dimensions (tabl. 6.7) are valid for the whole sample of represented cores.

Given the number of cores and whole flakes (tabl. 6.2), it has been estimated that among the quartzes there is an average of

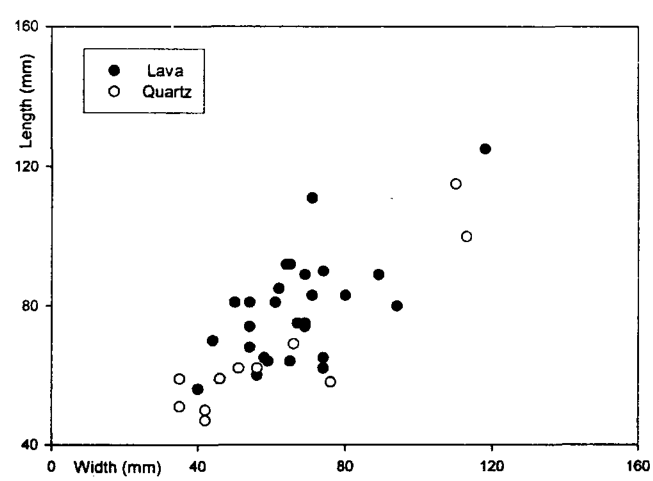



*Figure 6.11.* Dimensions of the lava and quartz cores.

| | Minimum | Maximum | Mean | Std. deviation |
|---|---|---|---|---|
| Length | 47 | 125 | 75.42 | 18.011 |
| Width | 35 | 118 | 65.18 | 19.871 |
| Thickness | 22 | 100 | 49.18 | 15.598 |
| Weight | 41 | 2049 | 387.92 | 378.117 |

***Table 6.7.*** Dimensions of the cores (mm and grs.).

3.5 flakes per core. This coincides with the rates observed for quartz cores, with an average of 5.5 scars from previous detachments. If whole flakes are considered alongside flake fragments (assuming that at least one part of them was effectively produced by *débitage* activities), the results are coherent regarding the proportion of products/cores. That is to say, there are no imbalances between the cores and flakes, and the *débitage* activities performed when exploiting the quartzes were performed in the site itself.

The complete opposite occurs with lavas. If test cores are considered alongside cores and the number of items is compared to the number of lava flakes (tabl. 6.2), the resulting proportion is 0.8 whole flakes per core. This is obviously impossible. Especially since an average 5.86 previous detachments have been counted on each core, and some examples present up even to 14 previous scars. If this is considered alongside the lack of knapping waste and the general scarcity of all *débitage* categories, it seems even more obvious that in FC West OF lava cores were taken to the site, but no knapping processes were performed *in situ*.

In other cases like FLK North we could offer an alternative hypothesis, stating that perhaps the initial flaking of the cores was performed in the site and that the basalt flakes were subsequently exported, leaving the cores in the site. This hypothesis, albeit highly improbably, could at least be contemplated as an alternative. Yet, in FC West OF, that possibility cannot even be considered, since the total lack of lava chips discards the thought of the cores being worked *in situ*, and the abundant profusion of millimetric quartz fragments rejects taphonomic causes being used to explain the deficit of lava debris. Thus, there is no other solution but to assume lava cores were transported to FC West OF but were not knapped in the site. This, obviously, supposes a conceptual contradiction which would call for a re-examination to conclude whether these objects are in fact cores, as stated over the last decades (Toth 1982; Isaac 1986; this work), or artefacts, as Leakey (1971) proposed originally, an idea that has been rescued in recent years (Kimura 1997, 1999). It is a complex matter and should be dealt with comprehensively, as we will do in chapter 9.

As regards reduction strategies, and despite the low number of tools among quartzes (n=12), they do not seem to have been manipulated following a different exploitation pattern than lavas, since quartz cores appear in all knapping varieties. In fact, an $\chi^2$ was performed representing the distribution of knapping systems by raw material, although it did not provide any significant differences. Consequently, a joint study of the

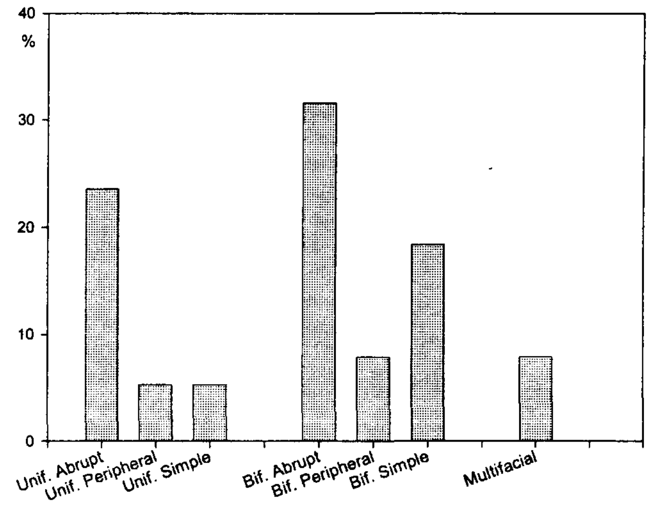



***Figure 6.12.*** Knapping systems in the cores from FC West OF.

exploitation systems can be performed without segmenting the sample by raw materials. Figure 6.12 shows that the commonest reduction method was the bifacial abrupt mode (31.6%), followed by the unifacial abrupt system (23,6%).

These methods will not been furthered in this section, since they have been described in preceding chapters. Nevertheless, there is room for a reflection on the issue of whether these large lava objects are cores or artefacts. In particular, the discrimination between exploitation edges with simple or abrupt angles (de la Torre & Mora 2004) was performed with a view to assessing the functional potential of the objects: whilst the edges with simples angles (unifacial and bifacial choppers) could, in principle, have a functional significance, the abrupt systems are unavoidably connected to flakes extraction, since the surfaces created cannot be used in any other context beyond *débitage*. In FC West OF most cores correspond to an abrupt exploitation system (fig. 6.13), and therefore, in this case, it would be logical to think that they were blanks for flakes extraction, not artefacts. However, at this point in the line of argument, the same contradiction reappears: if they were really cores, where are the lava flakes?

The following group, in terms of relevance among exploitation systems, encompasses the choppers, both unifacial (5.3%) and, mainly, bifacial (18.4%). If choppers were artefacts imported directly to the site (which would explain the deficit of lava flakes), this type of object would have been made mainly in basalt or phonolite. Although, as aforementioned, a global $\chi^2$ was performed with all the cores and it proved no significant differences in the distribution of knapping systems, another $\chi^2$ was carried out solely comparing the presence of choppers by raw material. Nonetheless, the statistical test showed that there is a homogenous distribution of quartzes and lavas, thus ruling out the possibility of arguing that lava choppers were imported to the site preferably. This once again underlines the contradiction inherent to the deficit of flakes. To make the matter even more complicated, there

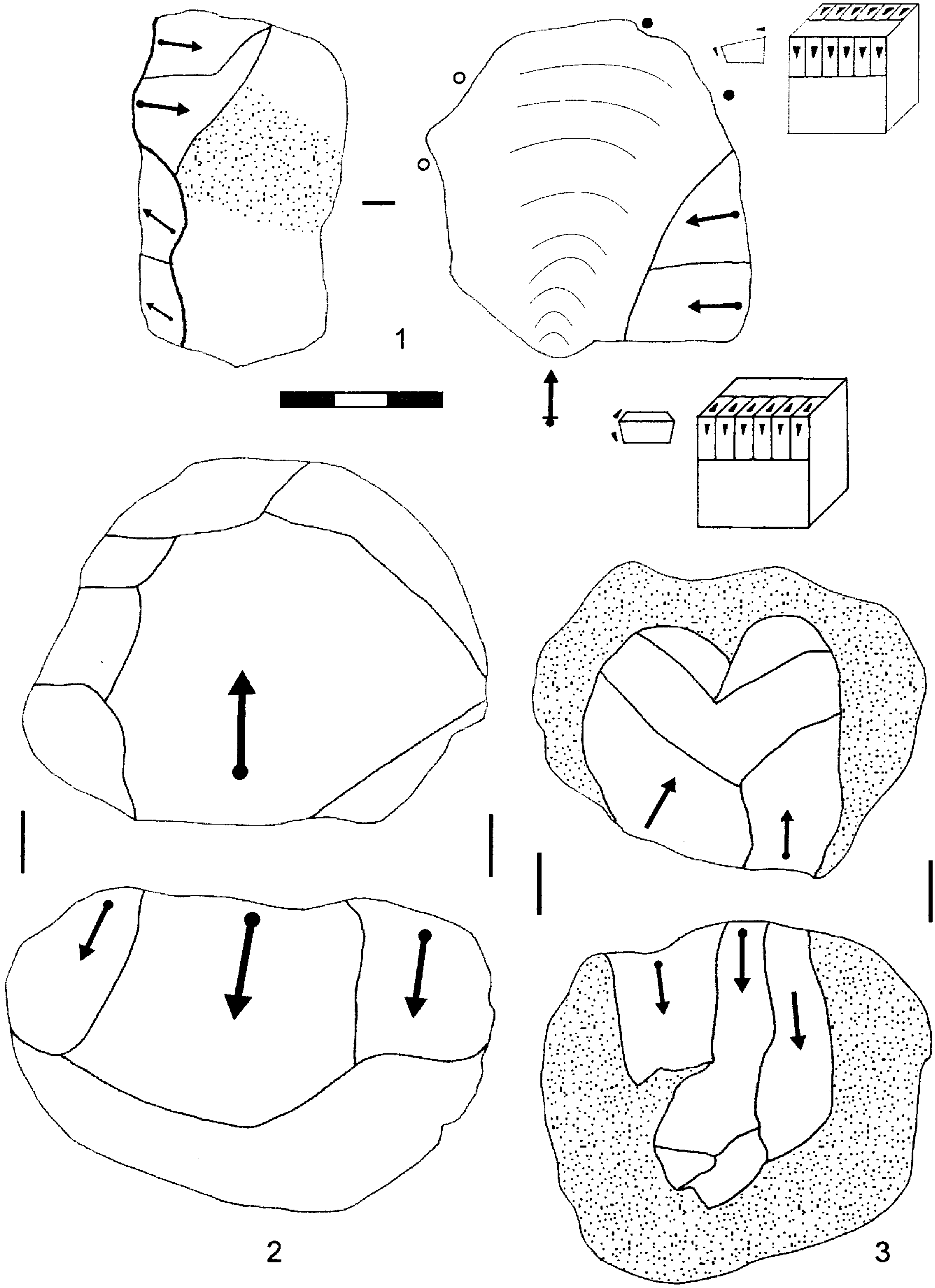



***Figure 6.13.*** 1: core on a unifacial abrupt phonolite flake with independent planes; 2-3: lava cores exploited following the bifacial abrupt partial method.

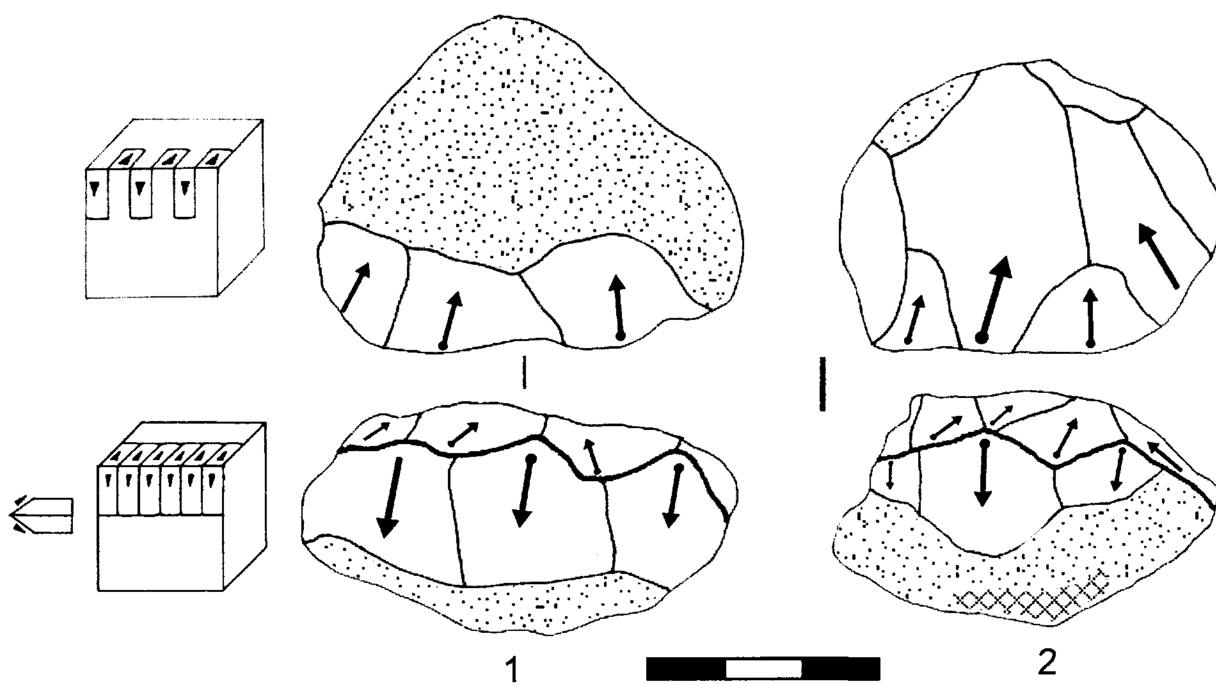



*Figure 6.14.* Examples of the bifacial simple partial system. In these cases the management of the edge is performed alternately, therefore they could also be classified in the bifacial alternate partial method defined in DK. Note the small size of the two cores, both in basalt (1) and in quartz (2). The quartz example also presents signs of battering on the cortical base.

are some examples of the bifacial simple partial system that are surprisingly small-sized (fig. 6.14). This makes it hard to conceive them as blanks for flake production. In all, there are contradicting arguments, some for and some against the distribution of these objects in core or artefact categories, without any of them contributing to explain the manifest lack of lava *débitage*.

The peripheral exploitation system used for the horizontal plane, both via the preparation of platforms (bifacial peripheral) and natural platforms (unifacial peripheral), provided 5 examples in FC West OF, composing 13.2% of the total amount of cores. Both the unifacial and bifacial examples (fig. 6.15) seem more structured than the older sites like DK or FLK Zinj, and in several cases only a mere nuance stops them from being included in the bifacial hierarchical centripetal system. In any case, the management of the cores reveals a capacity to exploit certain knapping surfaces systematically and rejuvenate exhausted planes (fig. 6.16), and therefore contrasts with the superficial reduction most of the unifacial and bifacial choppers were subjected to.

In all, FC West OF presents a high number of cores that underline the variability of the knapping methods employed. Cores are an average 7 centimetres long (maximum length) (tabl. 6.7) and, in view of the scars preserved on the cores, the resulting flakes would be approximately 3-5 centimetres, which in fact coincides with the information for knapping products. Nonetheless, this distances the *chaîne opératoire* documented for FC West OF from the production of large blanks, implicit in the strategies observed in EF-HR, an older

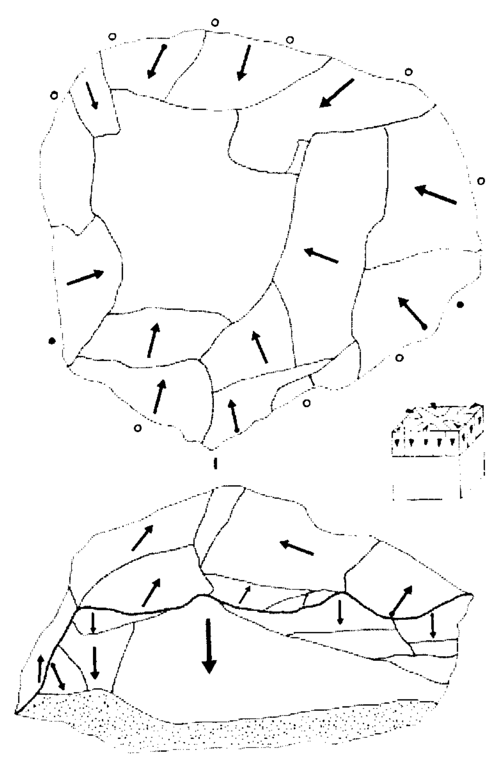


*Figure 6.15.* Basalt core classified as bifacial total peripheral. This is a good example of the difficulty involved in allocating cores to specific knapping systems, since this piece presents a simple angle edge on both planes that could inscribe it in the chopper group. Nonetheless, the exploitation throughout the whole periphery of the piece and the recurrent exploitation led to its inclusion in the bifacial peripheral model.

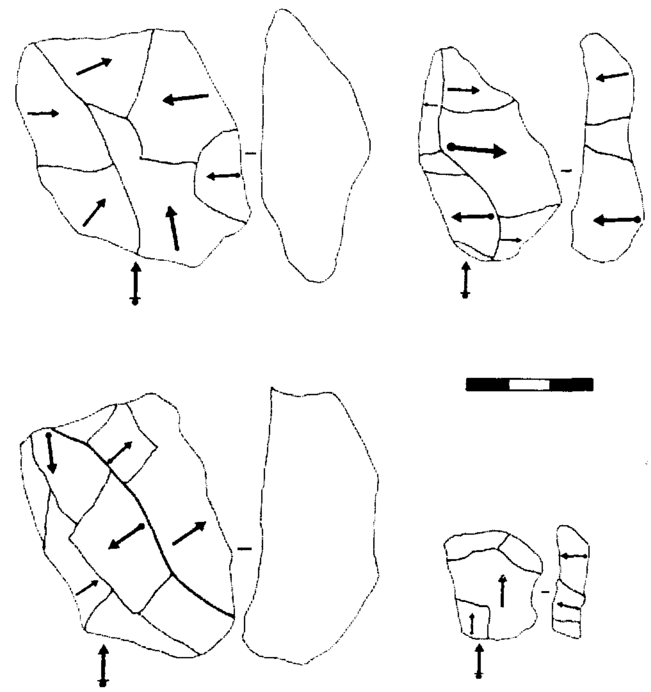


*Figure 6.16.* Edge-core flakes that show the rejuvenation of the cores' bifacial edge. It is symptomatic that all examples are in quartz, strengthening the idea that this raw material was reduced *in situ*, whilst there are no documented examples of rejuvenation among the lavas.

site. Therefore, these conclusions call for an analysis of the retouched blanks with a view to furthering the differences or similarities that could appear between the two sites.

## Retouched objects

FC West OF presents 13 small retouched pieces. Although all the pieces are made of quartz, it is hard to sustain that this is due to a preferential selection of this raw material, since it probably only perpetuates the deficit trend observed among lava *débitage*. Neither is there a selection of retouching blanks in terms of their size; comparing the length and weight of the whole quartz flakes and the retouched objects (tabl. 6.8) using Student's statistical T test shows a parity in the means of both categories. Nonetheless, all retouched objects were created on flake fragments, not whole products. Therefore, there are no grounds to exclude the fact that the original blanks could have been larger.

Leakey (1971:160) mentioned the prevalence of side scrapers, and also referred to the presence of two awls and a burin.

| | Minimum | Maximum | Mean | Std. deviation |
|---|---|---|---|---|
| Length | 27 | 79 | 45.23 | 13.299 |
| Width | 23 | 53 | 35.54 | 8.599 |
| Thickness | 14 | 38 | 18.62 | 6.104 |
| Weight | 14 | 140 | 45.38 | 32.875 |

*Table 6.8.* Dimensions of the small retouched pieces (mm and grs.).

However, we have interpreted the two so-called awls as simple flake fragments, and the piece Leakey classified as a burin is actually a Siret flake, mistaken once again as in the DK and FLK Zinj cases. Among the objects considered herein as genuine retouched items (fig. 6.17), there is a predominance of lateral side scrapers, with 7 objects, followed by denticulate side scrapers, with 5 objects, and a single case that could be classified as an end scraper. Small-sized retouched objects only compose 1.1% of the total number of items in the collection and total a mere 590 grams in the over 88 kilograms of worked lithic material. In any case, and since other categories like debris and fragments (in terms of absolute frequencies) and cores and hammerstones (in terms of the global weight of each category) undervalue the percentage-based representation of retouched objects, it is more operative to compare the number of these pieces in terms of the amount of flakes. In undertaking this task, the results show that the percentage of retouched objects is much greater than in older sites, and consequently (yet without forgetting that in FC West OF they compose an irrelevant sample) the quantitative increase of these retouched items compared to other previous sites is underscored.

The presence of large cutting tools is not evident in FC West OF either. Leakey (1971) stated that in this site there were only five bifaces, all fragmented. Considering the objects Leakey classified as bifaces, in our opinion only two genuinely belong to the large cutting tools category, with the other being three simple chunks (fig. 6.18). As regards the two which do seem authentic (fig. 6.19 and 6.20), they are both fragmented, as Leakey asserted, and therefore provide a limited amount of technological information. The example in figure 6.19 indicates the hominids in FC West OF also obtained large flakes, in this case broken by the technical accident of a Siret fracture, and proves a production of large flakes that is not represented, however, in the cores documented in the site.

On the other hand, the example in figure 6.20 involves the shaping of a large tabular block made of quartz, in which both sides are managed unifacially in order to create a edge which probably broke during the retouching process, when the knapper was trying to create a pointed area on the distal end. The *façonnage* method, which corresponds to a rhomboidal reduction system, will be explained in detail based on examples from TK; therefore we will not dedicate more time to it in this section. At present it is important to underscore the relevance of the documentation of large pieces which (albeit scarce in number compared to the frequencies of other categories) at least prove the fact that the hominids in FC West OF shared the technological knowledge of those who generated the EF-HR inventory, and those who would subsequently form the TK site.

## Percussion objects

In FC West OF, the three percussion objects categories (knapping hammerstones, hammerstones with fracture angles, and

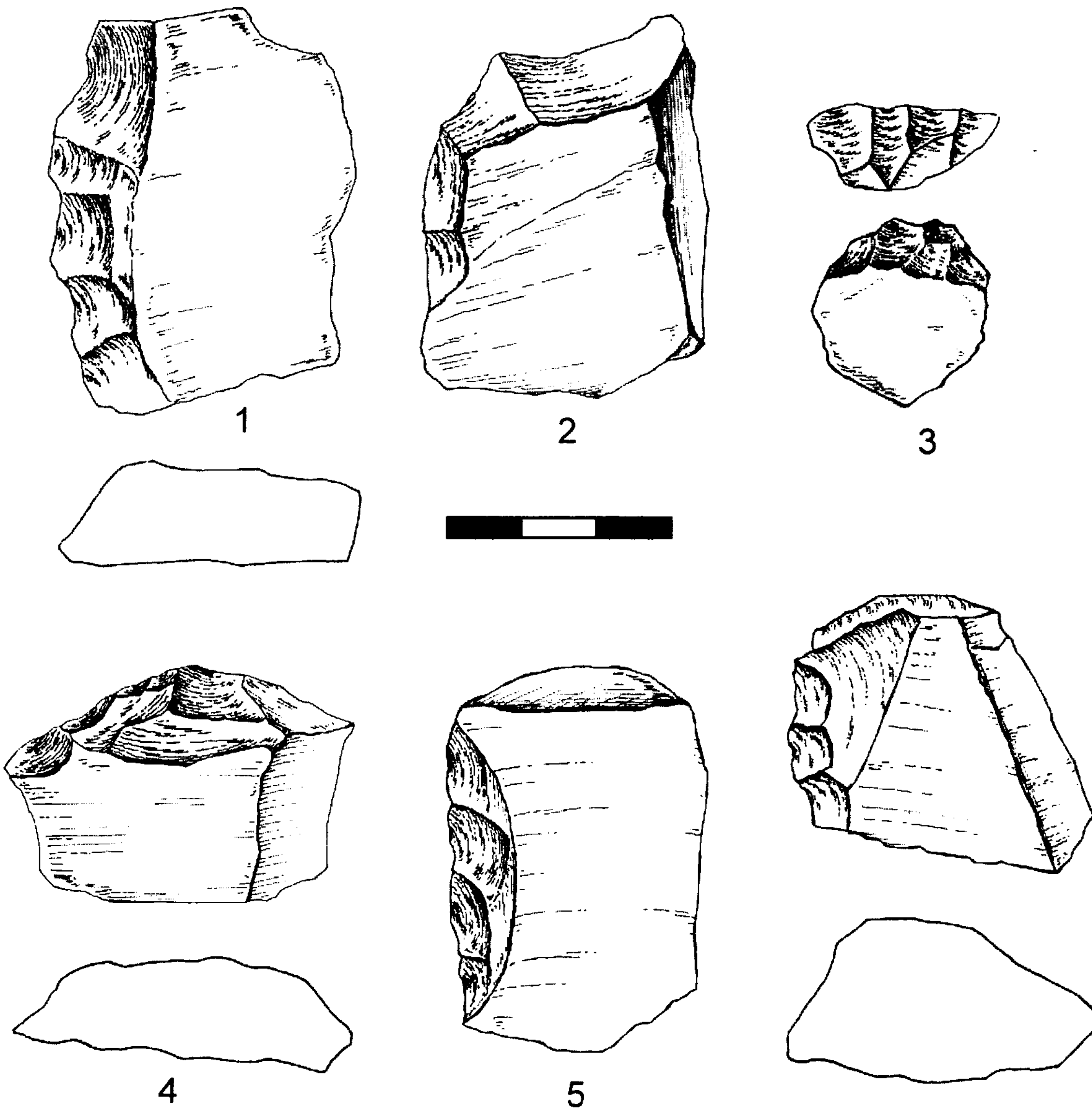



*Figure 6.17.* Quartz small retouched pieces. 1-2: denticulate side scrapers; 3: possible end scraper; 4-6: lateral and transversal side scrapers (drawn by N. Morán).

anvils) compose 46,619 grams of the 88 kilograms of worked lithic material. The fact that over half of the raw material was invested in objects linked to percussion indicates the relevance these activities must have had in the site. The distribution of the different objects by raw material has been referred to above: knapping hammerstones are mainly in lava, whilst hammerstones with fracture angles are mainly in quartz (see again fig. 6.2 and 6.3).

Table 6.9 and 6.10 and figure 6.21 show that both knapping hammerstones and hammerstones with fracture angles are similar in size. The statistical test envisaging a comparison of the different means using Student's T test confirms that there are no significant differences between both samples. Knapping hammerstones are generally good quality items, being fine grain phonolites and lavas stream cobbles. Their average size and weight (tabl. 6.9) make them suited for

| | Minimum | Maximum | Mean | Std. deviation |
|---|---|---|---|---|
| Length | 43 | 113 | 74.25 | 16.239 |
| Width | 29 | 95 | 60.8 | 14.27 |
| Thickness | 26 | 89 | 48.24 | 13.095 |
| Weight | 86 | 1128 | 345.3 | 211.062 |

*Table 6.9.* Dimensions of the knapping hammerstones (mm and grs.).

| | Minimum | Maximum | Mean | Std. deviation |
|---|---|---|---|---|
| Length | 39 | 110 | 68.77 | 15.485 |
| Width | 37 | 85 | 59.26 | 13.254 |
| Thickness | 28 | 71 | 48.9 | 12.637 |
| Weight | 76 | 633 | 292.29 | 161.49 |

*Table 6.10.* Dimensions of the hammerstones with fracture angles (mm and grs.).


***Figure 6.18.*** Pieces Leakey (1971) classified as broken bifaces. In our opinion, they do not present any characteristic that allows for their consideration even in the retouched objects category, therefore, despite their large size, we have classified them as chunks or flake fragments. A: dorsal face; B: ventral face.

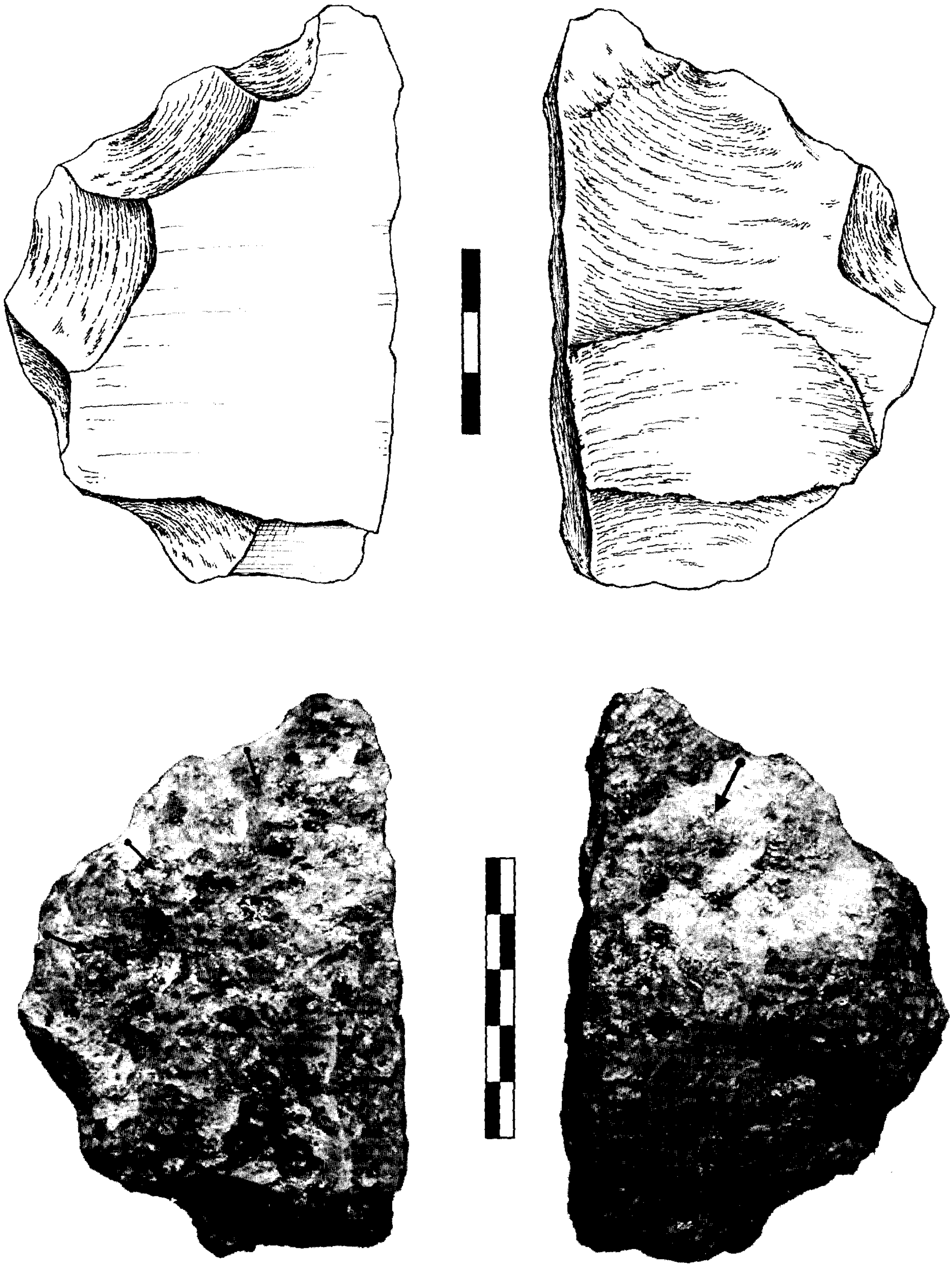


***Figure 6.19.*** Large cutting tool on quartz flake fragment, broken by the Siret accident. The *façonnage* could be performed with the soft-hammer technique (drawing: N. Morán).

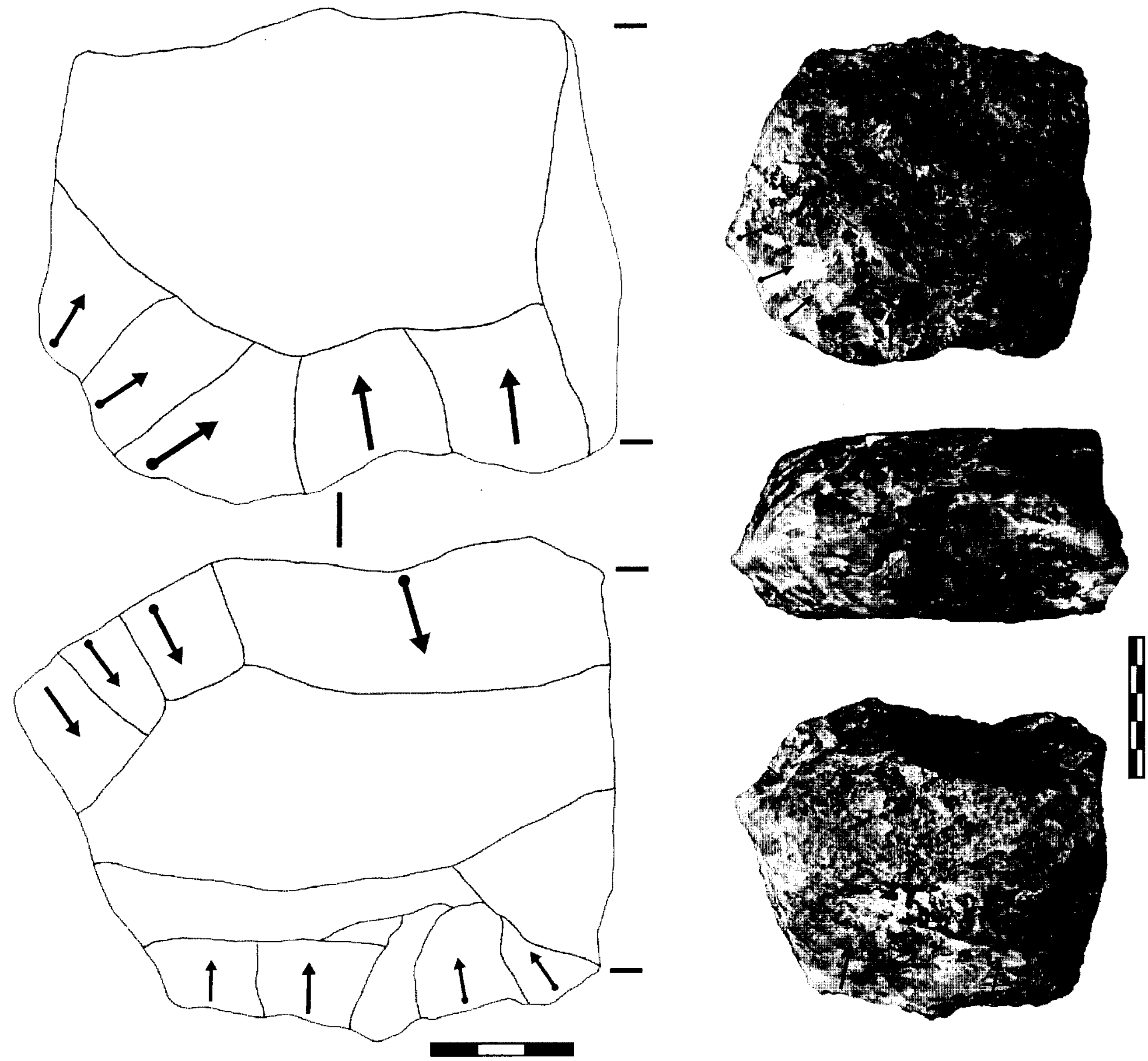


***Figure 6.20.*** Large cutting tool on quartz tabular block from FC West OF. The right part is broken, perhaps caused by the actual retouch. Retouching is always unifacial, with direct retouching on one side, inverted on the other, giving the worked block a rhomboidal shape.

knapping processes, also presenting different morphologies that indicate the alternation in the use of hammerstones in terms of the activity performed, either *débitage* on larger pieces or *façonnage* on the smaller examples. Therefore, the characteristics of these hammerstones coincide with the features of the rest of the lithic material, which means the size of the hammerstones are suitable for performing the documented knapping processes, which focus primarily on the reduction of average size cores (5-10 centimetres) and peripherally on retouching small quartz fragments.

As aforementioned, hammerstones with fracture angles are characterised by the intense battering linked to ridges caused unintentionally during percussion processes. In FC West OF this process is particularly evident, with a profusion of pieces with false knapping ridges that organise so-called detachments on both sides of the edge. Nonetheless, the ridges on these pieces, which Leakey (1971) sometimes classified as choppers, were produced by the simultaneous explosion of fragments of raw material on both sides of the edge, which is generated in its turn by the fracture planes produced during pounding (fig. 6.22). As defined in chapter 4, and also referred to in chapter 9, these completely battered ridges cannot be linked to knapping processes and must be related to other heavy-duty activities.

Consequently, we insist on the importance of anvils in FC West OF, which were most certainly connected to the same

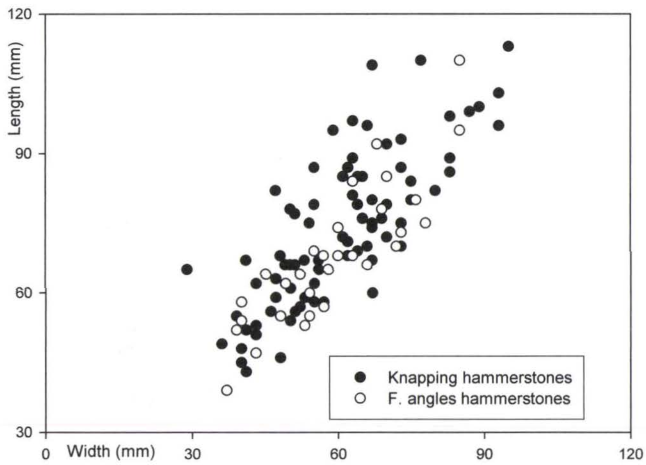
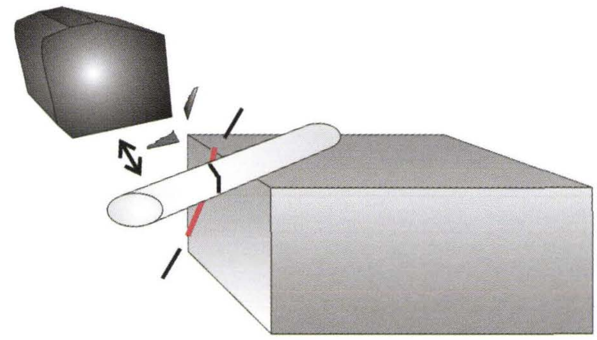



***Figure 6.21.*** Dimensions of the knapping hammerstones, and hammerstones with fracture angles.

| | Minimum | Maximum | Mean | Std. deviation | Variance |
|---|---|---|---|---|---|
| Length | 49 | 132 | 90,13 | 27,053 | 731,839 |
| Width | 51 | 107 | 78 | 19,413 | 376,857 |
| Thickness | 49 | 85 | 60,5 | 14,56 | 212 |
| Weight | 217 | 1827 | 756,75 | 553,864 | 306765,07 |

***Table 6.11.*** Dimensions of the anvils (mm and grs.).



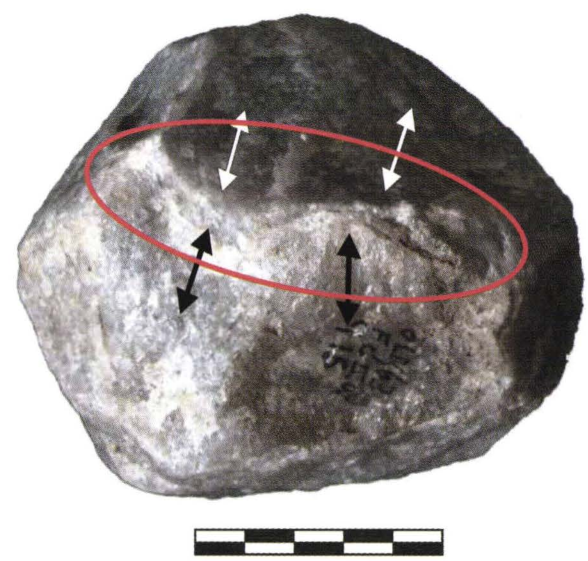


***Figure 6.22.*** Diagram of the process entailing the fracturing of the ridge of the hammerstone, with an example from FC West OF.

activities as hammerstones with fracture angles. If anvils are a minority (n=8) from a quantitative perspective, in terms of the volume of raw material invested they exceed the total number of whole flakes (tabl. 6.3). In fact, despite their enormous variance, these anvils are generally bigger and heavier (tabl. 6.11) than the other categories, which also supports their nature as static elements used to perform forceful percussion activities. As previously, tabular quartz blocks are selected as anvils. This preference becomes more relevant in FC West, since in the context of this site there were also quartz stream cobbles, which were nonetheless used for different purposes.

The issue of the spheroids appears linked to the question of the quartz stream cobbles. In FC West OF, Leakey (1971:159) counted a total of 10 spheroids and 38 subspheroids, practically all in quartz. Willoughby (1987:27) respected that original classification, analysing 48 so-called spheroids and subspheroids. Yet in our recounts (tabl. 6.1 and 6.2), there is not a single example allocated to those categories. Several of the objects Leakey (1971) and Willoughby (1987) classified as subspheroids have been allocated, in this study, to the category of hammerstones with fracture angles. As stated in chapter 4, this type of hammerstones responds to what we call stage 1 envisaging the rounding of the ridges (see fig. 4.32). That is to say, we are probably using different names to refer to similar or identical objects, generated by the same process: the rounding of the quartzes' natural planes caused by intense percussion activities.

Nonetheless, this only refers to some of the objects Leakey and Willoughby classified as spheroids. Many of the objects these authors considered spheroids are actually simple chunks, some of which do effectively present percussion traces, but which are in no case objects rounded by use, but parts detached from other pieces due to that percussion activity (fig. 6.23). Finally, some of the objects originally classified as spheroids are actually rounded simply because they are stream cobbles. This is a relevant fact, since it is quite different to classify an object as a spheroid because it has acquired a rounded shape after being subjected to human modification, and to classify it as such simply because it is a natural stream cobble, which is actually completely cortical. We will come back to this issue in chapter 9, but it is essential to at least outline the idea in this section. Although FC West OF does present a good number of objects covered by pitting traces, the genuine spherical shapes have a natural origin, and were not caused by a technological conception performed by the hominids. This matter has obvious chrono-cultural implications.

At the beginning of this section, it was mentioned that percussion objects, in all categories, compose over 46 kilograms of the total amount of worked raw material unearthed at the site.

***Figure 6.23.*** Pieces Leakey (1971) classified as spheroids at FC West OF, which are actually fragments detached from hammerstones. See the small size of many of them, measuring less than 4 centimetres long.

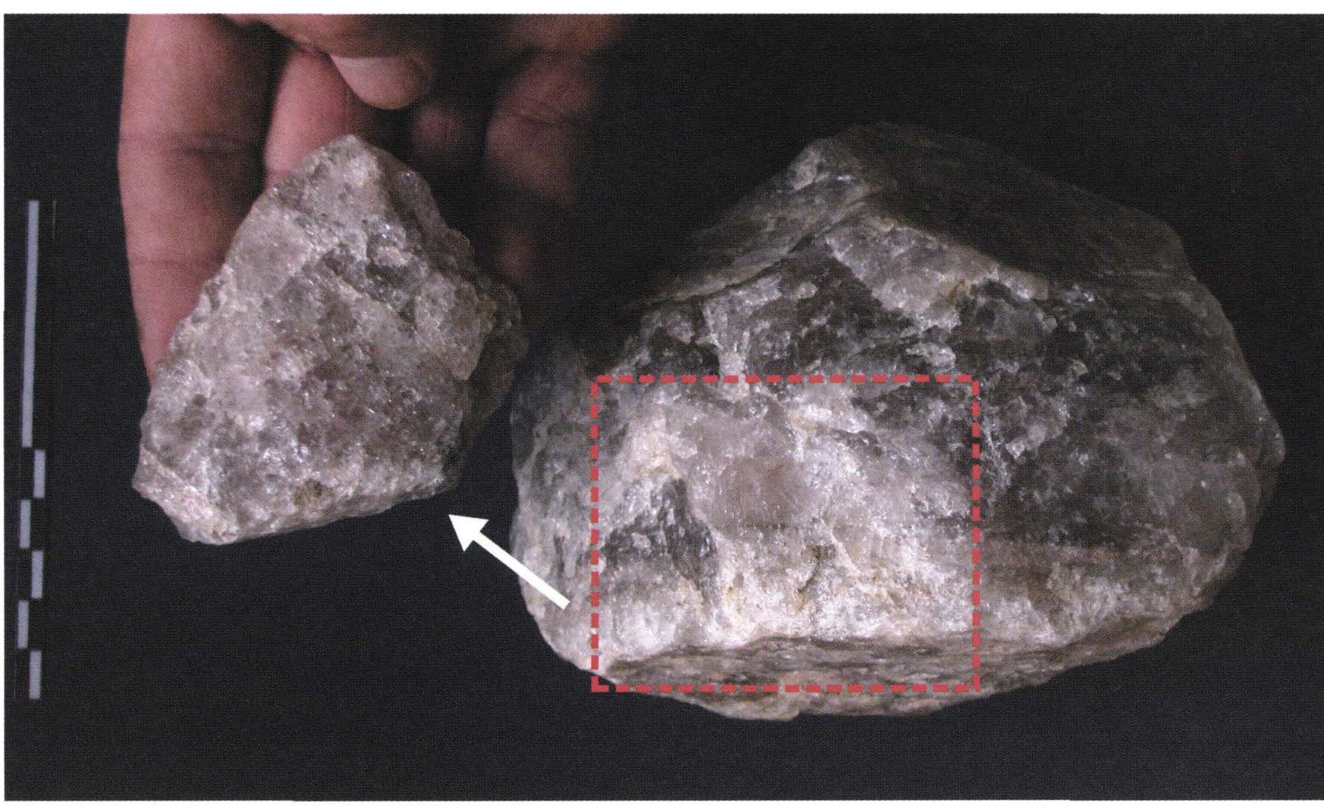


***Figure 6.24.*** Quartz fragment detached from an anvil at FLK West during the percussion processes.

Yet this is only a minimum estimation. The inclusion of all the objects that present traces of battering produces 58,145 grams of the 88,212 grams of raw material that were at some time linked to percussion activities. Up to 26.7% of the cores from FC West OF present traces of pitting that link them to a previous use as hammerstones, and there is a great amount of fragments that also present these traces; furthermore, a great part of these fragments were probably generated during those processes. Consequently, it is a case of underscoring yet again the importance of percussion activities in the site although, given the relevance of anvils and hammerstones with fracture angles, they were not always linked to knapping activities.

## Technological strategies at FC West Occupation Floor

Lithic resources were managed in two different ways in FC West OF. First, a great amount of raw material was invested in flake production activities. With this group including cores, retouched objects and, obviously, whole flakes, it totals 21,833 grams. This section presents a series of ambiguous categories that can be assigned partly to processes linked to knapping but also to alternative activities. One of these categories obviously focuses on the so-called knapping hammerstones, which despite their name could also have been used for other percussion activities. All categories of fragments usually allocated to *débitage* processes, but which could also be generated by alternative percussion activities (fig. 6.24), are also subject to equifinality.

Consequently, and with a view to being conservative in our estimation, these categories have not been given a specific activity. In principle, the objects unmistakably linked to percussion activities different to lithic knapping would be hammerstones with fracture angles and anvils. These two categories already compose a total of 14,136 grams, which contrasts with the scarcely over 21 kilograms that can be related to *débitage* with certainty. In all, the first assertion to underscore is the coexistence of two ways of using lithic raw material in FC West OF, and the fact that one of them is not linked to the transformation of those rocks into artefacts, but to the direct use of these objects for other types of activities.

Although it is relatively simple to rule out lithic knapping as the activity that generated a good part of the inventory, it is quite different to discern which specific process created it. The easiest option would be to link those anvils and hammerstones with fracture angles to bone marrow processing. Nonetheless, the possibility that that was the activity linked to such a heavy-duty percussion is quite limited; in FC West OF there are only 127 bone remains. This shortage cannot be explained using taphonomic preservation issues, since Leakey (1971:157) explicitly mentioned that, despite their scarcity, the bone fragments were well preserved. Therefore, there are not sufficient arguments to link the presence of anvils and hammerstones to the management of animal resources, and we should pursue alternative interpretations to explain the forceful percussion activities documented.

The other relevant activity performed in FC West OF was linked to *débitage* processes. There are a great number of cores that enable the reconstruction of knapping strategies. The exploitation systems employed in FC West OF are very similar to any of those analysed previously in DK, FLK Zinj or FLK North, and also closely resemble the cores preserved in EF-HR. There is a predominance of reduction methods without an intense structuring of the knapping platforms and/or surfaces, with a profusion of cortical areas and a shortage of exhausted cores that would refer to long exploitation sequences. The knapping products obtained are quite small (3-5 centimetres), and seem to be the main goal of the reduction. Thus, retouched pieces on this type of flakes are not abundant, and repeat the characteristics observed formerly in older sites such as FLK Zinj or FLK North, where retouching is never implemented to change the general morphology of the pieces but simply to modify the edge.

Alongside this type of artefacts, there are only two examples of large cutting tools, which nonetheless provide relevant information: alongside the unverified possibility of soft hammerstones being used (see fig. 6.19), this data confirms the fact that the FC West OF hominids, as in EF-HR, obtained large blanks which they subsequently retouched. The example in figure 6.20 also indicates that these craftsmen modified large natural blocks intentionally with a view to giving them a forceful edge. The fact that only two of this type of artefacts have been unearthed is surprising, especially because the technology implicit in their manufacturing (destined to the *façonnage* of large blanks) is not linked to the kind of exploitation that appears as the dominant system used in the assemblage (which focuses on the *débitage* of small blanks unmodified secondarily). As regards the retouched flake, it was not discarded after a technical mistake, since the retouch is subsequent to the fracture of the Siret flake, but the retouched quartz block could have been discarded when it broke. Therefore, it seems that the importance of large cutting tools was marginal in FC West OF. Moreover, and since they are not linked technologically to the other artefacts (none of the documented quartz cores could be used to obtain this type of blanks), they were probably transported to the site once completely shaped.

The issue of the input/output dynamics of artefacts calls for a final consideration of the greatest contradiction described in this chapter: the overrepresentation of lava cores compared to quartz cores appears alongside the incomprehensible deficit of basalt and phonolite products. The previous pages have explored different possibilities to explain this imbalance, although none is based on solid grounds. In any case, it seems that the movement of objects *towards* the site (not so much *from* the site) was a systematic event; the total lack of lava knapping waste indicates that cores were already flaked when they entered the site, just as the lack of large cores suggest the import of large cutting tools. The behavioural and functional interpretation of this pattern is, nevertheless, a lot more complex.

In all, it could be said that FC West OF offers more questions than answers. We assume it has substantial contextual integrity, which makes it the site with the greatest remain density in the whole of Olduvai (Petraglia & Potts 1994). Furthermore, all these remains were concentrated in a thickness measuring merely 9-10 centimetres, which suggests a relatively short formation period. Nonetheless, the site does not fulfil any of the expectations that could have arisen; the bone remains are scarce due to non-taphonomic causes, therefore they were not the focus of the hominids activity. Percussion activities were very intense but, precisely in view of the shortage of bone remains, they do not seem to have been linked to carcass processing. Lava cores are very profuse, yet products generated thereof have not appeared.

Moreover, large cutting tools exist, but in a completely residual manner. After studying the new technological boom EF-HR entails, something similar would have been expected of FC West OF. The required technical knowledge has been documented in FC West OF, yet only incidentally. Thus, whilst EF-HR presented a strategy completely focused on the *façonnage* of large blanks, in FC West OF the interest lies in the *débitage* of small flakes. These differences could be due to a functional option, as Hay (1976) noted previously, but it would be interesting to have information on the types of natural blanks available in the immediate landscape: perhaps their small size limited the technical possibilities developed in FC West OF, and therefore forced hominids to import large cutting tools to the site. In all, the information available for FC West OF makes it difficult to perform any type of general interpretation, and therefore, paradoxically, generates more questions than answers.