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An Early Date for the Stone Age at Kgale View in Gaborone, Botswana

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Abstract

Botswana is a long way from establishing a credible Stone Age chronology for any part of the country, especially for the earlier periods. Most recorded early sites are open gravel occurrences with limited archaeological value, given the increased probability of artefacts being redistributed and mixed with those from earlier or later events as well as the loss of organic matter. Relevant sites with any stratigraphic, ecological and other value are more likely to be buried and thus only exposed during erosion or excavation. Such a window of opportunity was offered with the development of a new shopping mall in Gaborone, the country's capital city. This paper demonstrates the potential contribution of salvage archaeology to understanding our past, especially where construction work opens up deep trenches with profiles, often exposing otherwise hidden relics. Second, in this instance, it has also produced the oldest cultural dates yet in Botswana. Thermo-luminescence dates obtained during the archaeological salvage of this site are important as they confirm the early replacement of the Early Stone Age (ESA) in the Southern African interior. Third, there is some suggestion for the re-use of artefacts by later Middle Stone Age (MSA) people. Finally, of particular interest is the provisional evidence for symbolic behaviour in the ESA. Cognitively modern behaviour is generally believed to have only started in the Middle Stone Age.

Introduction

Archaeological sites in Botswana are protected by the Monuments and Relics Act (2001). Any development that might impact on the land surface could feasibly damage or destroy archaeological sites and so the 2001 Act stipulates the need for pre-development impact studies. These might result in the further need for mitigation before the project is allowed to proceed. During an archaeological impact investigation of the construction site for the Game City shopping complex at Kgale View (latitude 27° 41'S; longitude 25° 52'E) near the southern outskirts of Gaborone in late 2001, two probable MSA artefacts were noted in the spoil heaps of a couple of soil test pits, although there was no surface indications of a site there (Walker, unpubl. a).

Unfortunately, construction work had commenced before any mitigation could be incorporated into the development programme and a large pit had already been excavated. A salvage programme was thus hastily drawn up to monitor the remaining foundation trenches and to rescue any finds. This is not an ideal basis on which to conduct research which requires proper planning and preliminary testing, but such opportunities must be taken when they arise.

In the end, archaeological material was recovered from the pit base as well as the profiles of the foundation trenches and the pit face in mid-2002 (Walker, unpubl. b). Thermo-luminescence samples were also taken from the pit face adjacent to some *in situ* stone tools. Unfortunately, most archaeological resource management reports remain unpublished and unavailable to the academic community, but it is considered that the findings presented here are sufficiently important for their publication.

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Background

Very little research has been conducted into the ESA and MSA in Botswana, given that the land surface of Botswana is largely a depositional basin (Thomas and Shaw 1991) In addition, the arid nature of the land meant that it was long suspected that the area was peripheral to human interest. Open sites are thus more likely to be encountered in the eastern hardveld, but here the problem is that this is largely an ancient erosional landscape, and so sites are quite likely to occur in secondary contexts such as gravels. Hitherto, the ESA has thus remained undated, and the oldest Botswana cultural dates go back only about 95 000 years ago (Brooks *et al.* 1990; Robbins *et al*. 2000) for two MSA sites. Dated sites are extremely rare even for the Late Stone Age.

Recent research in South Africa has focused on the evidence for modern behaviour and it is now clear that this began during the MSA, perhaps even going back some 200 000 years (Mitchell 2002). Evidence includes the presence of ochre, which is suggested to indicate the symbolic use of colouring matter. Intriguingly, ochre has been recovered in Acheulean (late ESA) deposits in rock shelters in Zimbabwe (Cooke 1963 and Walker 2012), but there is no clear evidence of paintings or other use surviving from this antiquity.

The Setting

Kgale Hill is the dominant landmark on the southern edge of Gaborone (Figure 1). This granite hill is also one of the highest features in Botswana, rising 1287 metres above sea level. At the eastern hill base, the ground slopes gradually for a few kilometres to the Notwane River, a major tributary of the Limpopo River. This is the main river separating Botswana from South Africa. It is a relatively reliable source of water and formerly, before the construction of the North-South Water Carrier, the Gaborone Dam on the Notwane River provided all of the city's water. Still, it is a seasonal river fed by summer rains, although it would have been possible to dig for water in sandy parts behind natural rock barriers in the dry months, judging by the permanent Iron Age homesteads nearby. The Quartzitic hills that occur just across the Gaborone Dam and further south towards the Notwane watershed were a source of raw material in the Stone Age.

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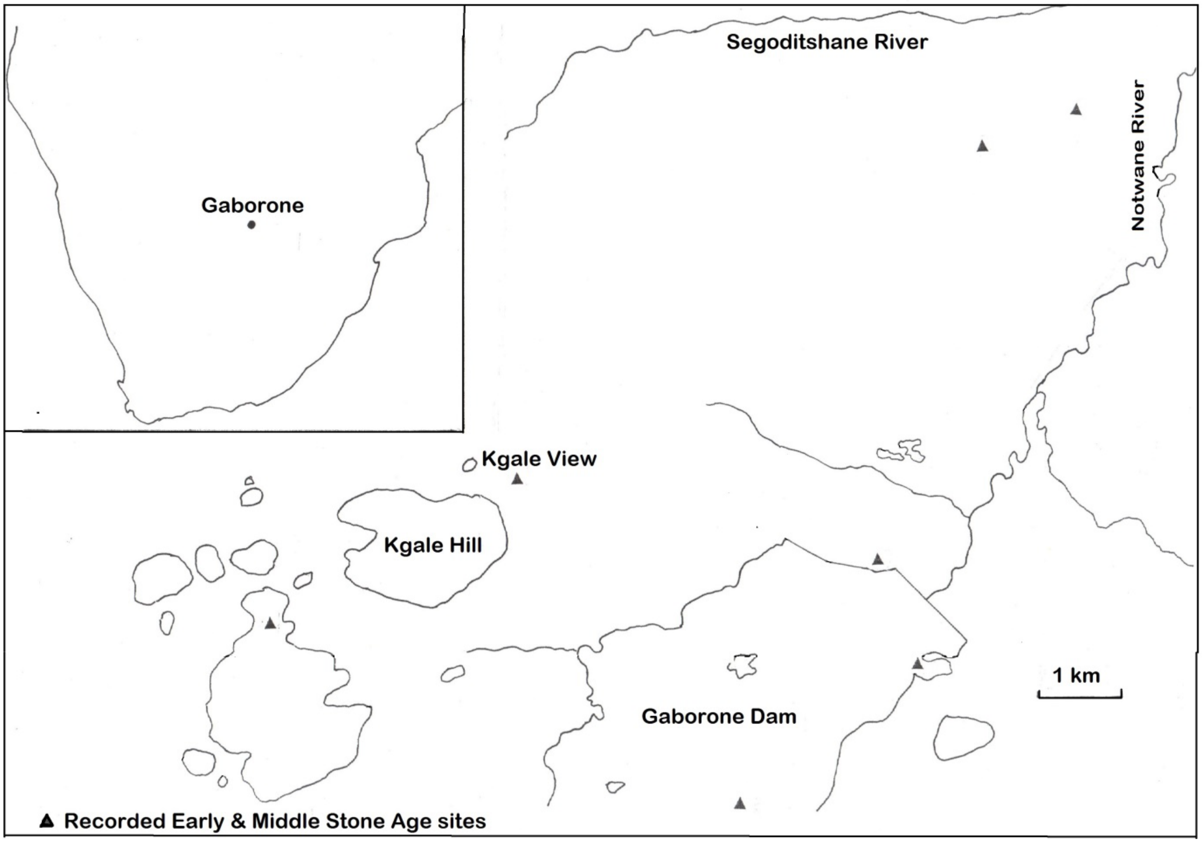
Figure 1: Map of Gaborone area showing the location of Kgale Hill and known early Stone Age sites. Inset: Map of Southern Africa, showing location of Gaborone



Source: Map compiled by Nick Walker

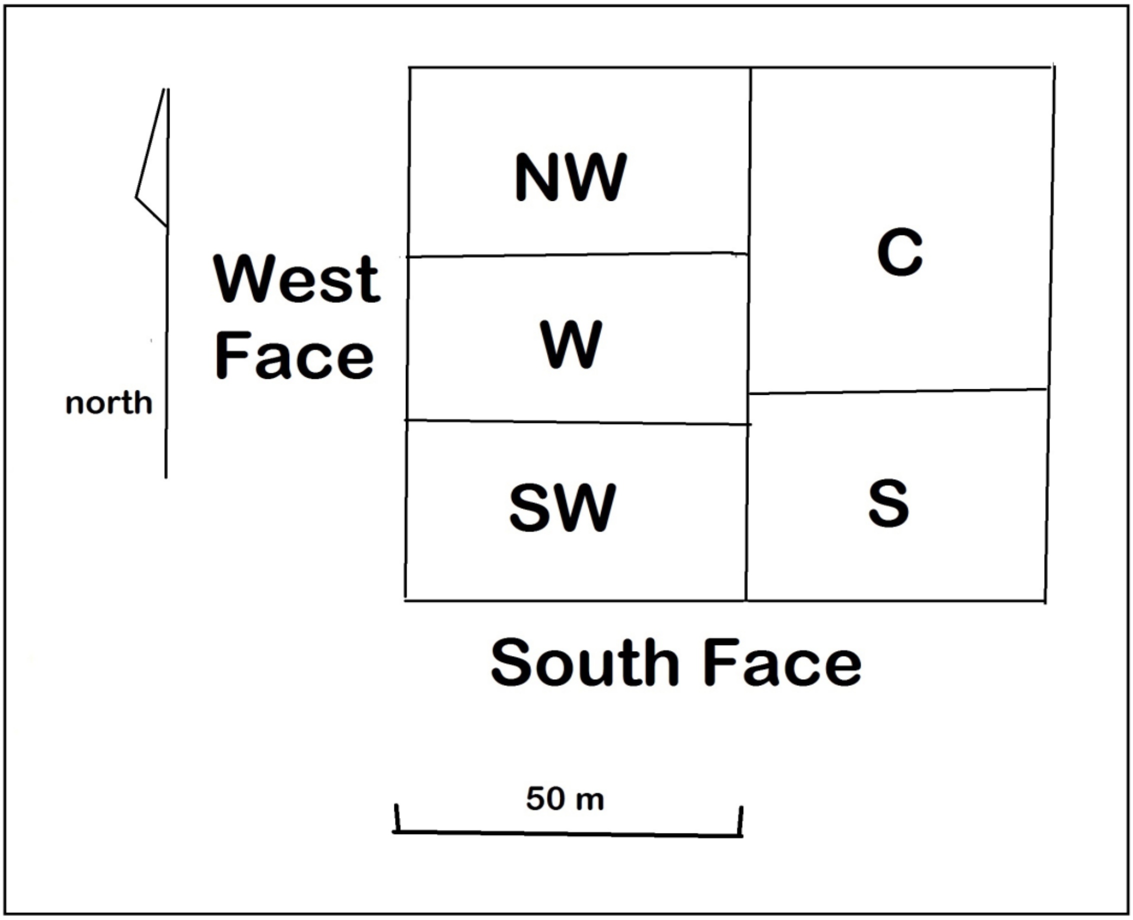
A feature of the site's vegetation was the large number of indigenous morula trees (*Sclerocarya birrea*) before their removal during the development of the shopping mall. The flesh and embryos of these fruits are an important food item in many areas and they were often actively collected during the Stone Age in parts where they were plentiful (Walker 1989). Nineteenth-century European travellers also referred to large numbers of game here (Chapman 1868 and Cummings 1850) and thus this area may have been a popular spot for hunter-gatherers at many times in the past.

Salvage Strategy

Salvage concentrated on the southwest corner of the construction site in an area of 100x100 metres, in part because the northeast portion had already been badly impacted by development but also this was where the construction pit was deepest and cultural material apparently richest. Artefacts were, nevertheless, thinly distributed in the faces exposed. This paucity of material, therefore, did not warrant controlled excavation of the remaining embankments and so a scavenge strategy was adopted. Seventy-seven artefacts were collected *in situ* from a profile exposure of some 400 square metres (Figure 2). More artefacts were collected from the foundation trench profiles as well as spoil heaps, the exposed pit and trench foundation floors. Thus, there is a bias in the sample as small chips and pieces are under-represented.

One of the developer's test pits southeast of the project area had a gravel horizon at 2.1 metres and the top metre or so had fairly high humus content but there was no distinct stratigraphy in the pit profile. The few indicators such as horizontal orientation of artefacts, nevertheless, suggested that the soil had built up uniformly and so the existing land surface was assumed to be an acceptable reference plane to calculate the depth of *in situ* material; although it is appreciated that soil build-up is unlikely to have been uniform over the whole site. To reduce the problem of incorrect correlation, the area was also divided into sectors (Figure 2).

Figure 2: Approximate location of the five sectors and two faces where artefacts were collected. NW = Northwest, C = Central, W = West, SW = Southwest, S = South sectors



Source: Salvage grid compiled by Nick Walker)

The main pit was approximately four metres deep in the southwest corner, but artefacts were only found between one and three metres below the pre-development ground surface. Relatively little of the site was excavated by the developers (Paledi Morrison Abdullah Consultant Engineers) down to four metres and it is likely that archaeological material is still more deeply buried under the shopping complex. Decomposed granite bedrock was, nevertheless, reached in several places below three metres.

Ferricretion (an iron-rich duricrust) increased with depth and several of the artefacts had iron stains or encrustation. Not surprisingly, the soil is rich in clay and small quartz grains, as it is close to Kgale Hill, which has several quartz veins. The lack of stratigraphy suggests gradual accumulation of soil derived from the hill as wash, as well as aeolian dust and sand.

Research Findings

The artefacts recovered are listed in Table 1. The assemblage is made up largely of milky quartz, quartzite and felsite (or basalt) tools (Table 2). These materials are quite variable in composition, suggesting several sources, or more likely, the variety available in nearby river gravels –many pieces were indeed made on water-worn cobbles. Tool technology was generally simple and flake production was mainly (but not exclusively) by hard hammer technique. When dealing with end-products, classifying cores was problematic and there was definite opportunistic flaking, giving the assemblage an expedient character.

Classification was further complicated as felsite decay and weathering was variable, even on single specimens. This suggests that there were often periods of long exposure before burial. Flake scars on quartz are especially difficult to recognise and core classification should be regarded as indicative rather than precise.

Table 1: Artefacts from Kgale View

			Sectors					
	Northwest	West	Central	South	Southwest	West Face	South Face	Total
Flakes >21mm	17	40	14	28	30	13	25	168
<20mm	15	39	14	26	28	13	21	157
Tools	3	7	5	2	2	3	4	26
Scrapers	2	3	1				2	8
Denticulates			1				1	2
Concaves			1	1				2
Awl		1						1
Point				1				1
Handaxes		1	3		1	1		6
Bifacial piece						1		1
Core-choppers	1	1			1	1	1	5
Chunks	11	5	2	7	13	8	7	53
Cores	3	11	10	10	9	9	5	58
Single platform			1		3	1	1	6
Opposed platform		2		1	1			4
Unifacial radial		2		1			1	4
Bifacial, partial radial				3	1	2	1	8
Bifacial, radial	1		4	1		3	2	11
Miscellaneous	1	1	3	1		1		7
Polyhedral	1	6	2	2	4	2		18
Manuports	1	3	1	5	9	1	2	22
Total	35	66	33	52	63	34	43	326

Source: Table compiled by Nick Walker

Table 2: Raw material of artefacts from Kgale View

					Sectors				
		Northwest	West	Central	Southwest	South	West face	South face	Total
Flakes	quartz	4	10	3	13	12	3	9	54
	quartzite	8	10	7	9	5	5	8	52
	felcite	5	20	5	8	11	5	8	62
Tools	quartz		3			1		2	6
	quartzite	2	1	1	1	1			6
	felcite	1	2	4	1		3	2	13
Chunks	quartz	7	4	1	4	4	3	3	26
	quartzite	1	1	1	4	2	2	3	14
	felcite	3			5	1	3	1	13
Cores	quartz	1	2	2	1	3	3	1	13
	quartzite	2	5	3	3	5	5	3	26
	felcite		4	5	5	2	1	1	18
Manuports	quartz				4	2		1	7
	quartzite			1	1	1		1	4
	felcite	1	3		4	2	1		11
Total		35	66	33	63	52	34	43	326

Source: Table compiled by Nick Walker

Cores were generally discarded after only a few flake removals, hence the large number of chunks (pieces with too few scars to discern the main knapping technique), and cores and flakes with cortex (eg Figures 4:3-5). Nevertheless, it is possible to identify two basic knapping approaches.

Ideally, in some instances, cobbles were first split to produce one or more wide striking platforms with steep edges (Figures 3:4). Some pieces already had the natural requisite angle. Flakes were then removed from either the fresh face or the surface adjacent to this scar (Figure 3:4). These equate with single platform or edge cores in the literature (Kuman *et al.* 1997). Thicker cores often had flakes struck from opposite ends (i.e. towards each other as opposed to the radial or bifacial method from an equator), producing opposed or double platform cores, but not on an anvil (eg Figure 4:4). Some of these platform cores show some preparation or trimming of the striking platform, making the strike angle steeper, as if to produce longer flakes (Whitaker 1999). However, most of the material is not really suitable for the manufacture of blades. The latter platform cores often had somewhat conical shapes when knapping continued around much of the circumference, and they superficially recall thick radial cores (Figure 3:1).

In other instances, flakes were removed from one or both faces of flat cobbles, producing relatively acute, bifacial edges which occasionally continued around the circumference, producing disc or radial cores (Figure 3:5). Partial radial cores were apparently used at times, judging by the edge damage on some (Figure 4:3) and these recall pebble- or core-choppers. Some cores were unifacial radial where the original pebble surface had the requisite angle for striking (Figure 3:3).

There was also opportunistic use of previous flake scars of radial and platform cores as platforms, resulting in several polyhedral cores (eg Figure 3:2). Pieces showing several striking methods are called miscellaneous cores.

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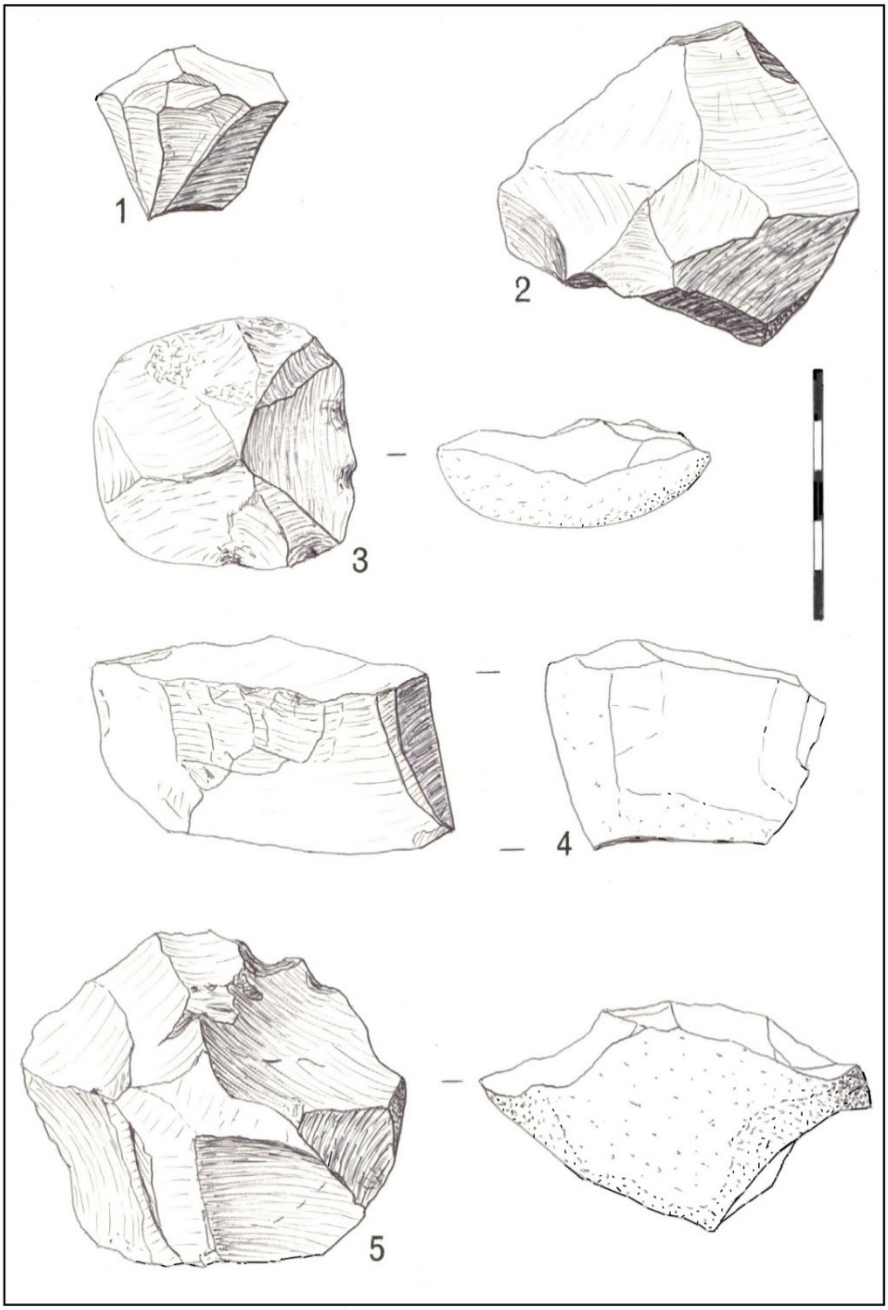
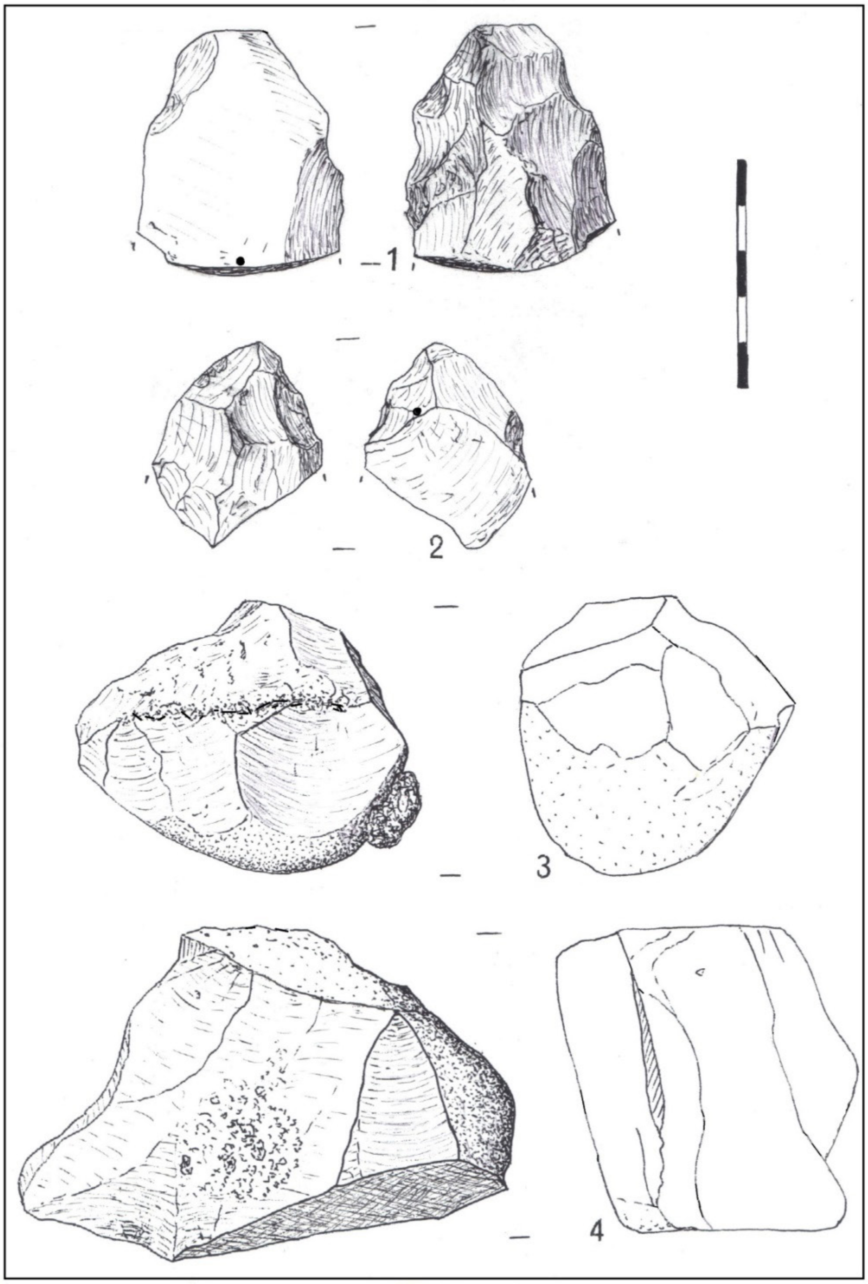
Figure 3: Cores from Kgale View. 1. Prepared platform core (quartzite, 280 centimetre depth, Southwest); 2. Polyhedral core (quartzite, West); 3. Unifacial radial core (quartzite, West); 4. Single platform core (quartzite, West); 5. Bifacial radial core (quartzite, Southwest). Scale five centimetres



Source: Illustration by Nick Walker

An interesting feature of the assemblage, despite its small size, is the relatively high number of hand-axes or bifaces, most of which are only fragments (Table 1). Weathering indicates that they had not been damaged during excavation. It is also unlikely that these broke during manufacture or use, considering that most impact points are in the middle of the faces, near the distal or pointed end. Some show typical percussion features, such as points of percussion and lips (Bergman *et al*. 1983). Two truncations are oblique (Figure 4:2), while the others are abrupt (Figures 4:1, 5:3), as if they had rested on anvils. The oblique breaks could have been for sharpening and they would have produced narrow cleaver or chisel ends. One intriguing piece has four breakage scars (Figure 5:1), with the subsequent flake removals in two directions, removing the original break. It is possible that the tool was subsequently turned into a core, but the subsequent flakes would have been small and so are more likely to have been struck by a much later visitor, for example to make hafted tools. Quite possibly, some of the artefacts classified as cores might also be recycled hand axe butts. In general then, many of these tools seem to have been deliberately smashed, with only one with a broken tip (Figure 5:2) showing possible usage or accidental damage.

Figure 4: Artefacts from Kgale View. 1. Broken hand axe tip, showing point of impact (felsite, from a foundation trench in centre of site at approx. 260 centimetres depth); 2. Broken hand axe tip, showing point of impact • (felsite central); 3. Partial radial Core-chopper with encrustation (felsite, Southwest); 4. Opposed platform core with encrustation stains (felsite, West). Scale five centimetres



Source: Illustration by Nick Walker

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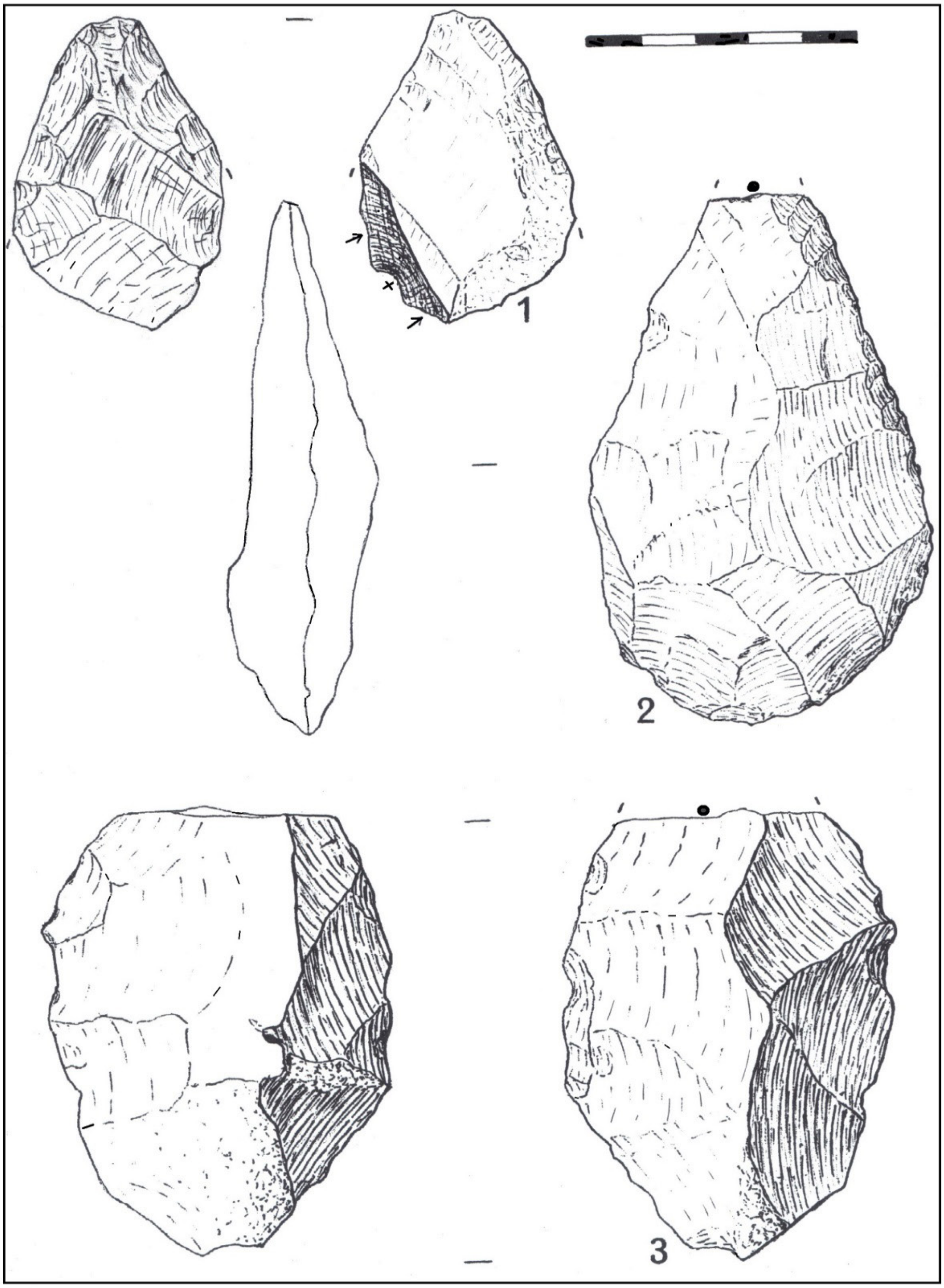
Figure 5: Handaxes from Kgale View. 1. Broken hand axe tip showing further reduction (x shows the blow struck - towards the viewer - to create a new striking platform; arrows show the direction of blows required to remove the two flakes subsequently from it: felsite, 220 centimetres depth, West); 2. Hand axe with tip missing, showing point of impact • (quartzite, West); 3. Broken hand axe showing point of impact • (felsite Southwest). Scale five centimetres

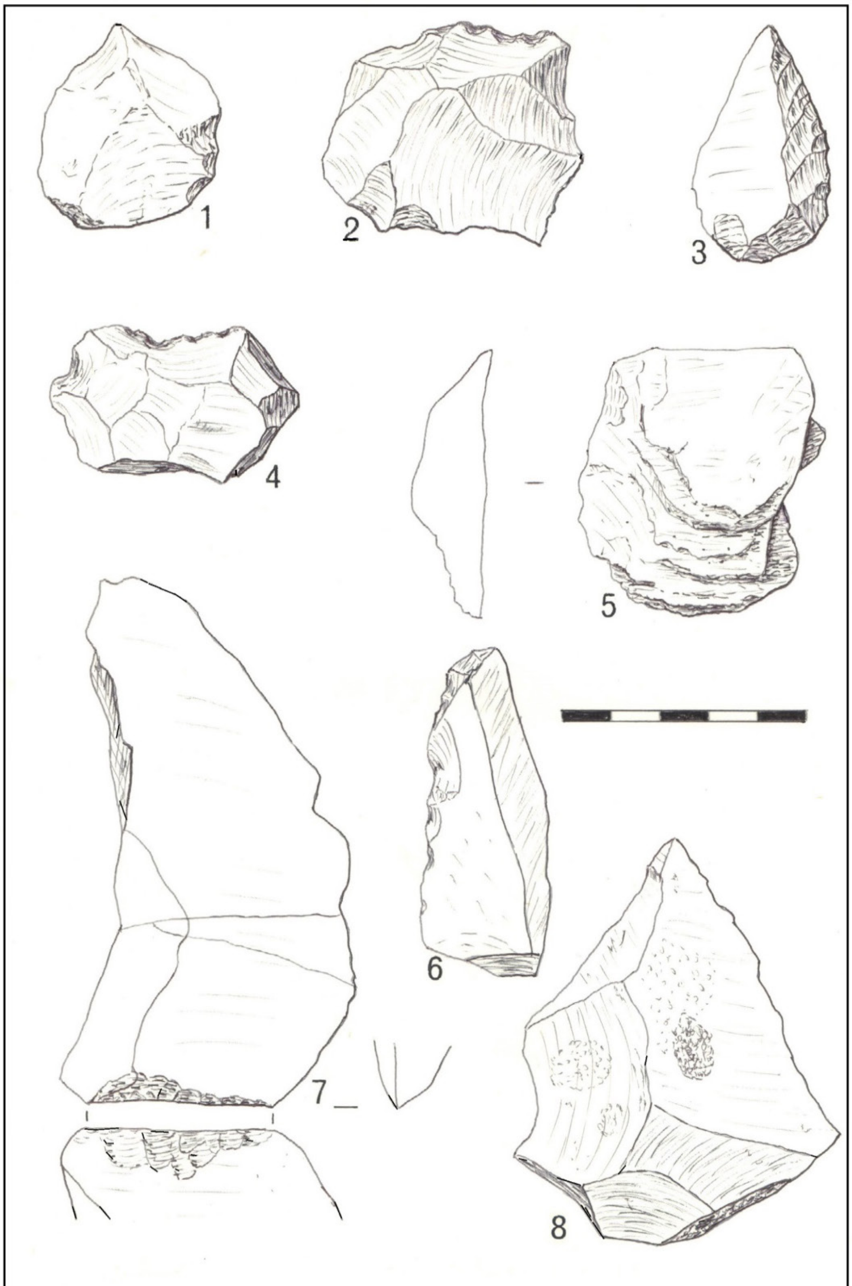


Source: Illustration by Nick Walker

Characteristically, these hand axes are relatively small, with all but one being thick and narrow. The exception (Figure 5:2) was made by pressure flaking and so they differ from most of those from the nearby Gaborone Dam site (National Museum collections, Gaborone), Serowe (Ebert *et al.* 1976) or Samedupe (Campbell 1992 and Cooke 1979), which are closer in shape to the typical Acheulean form, which is relatively large and flat. As such, they recall the small size of Cooke's (1979) so-called picks in the late Acheulean or Charama industry but the small sample size spread over two metres of depth, implying a great time depth and change, make it difficult to correlate with the technological models of, for example, Sampson (1974), Volman (1984) or Kuman (1998).

Three tools show pressure and/or soft-hammer preparation. These include the well-made hand-axe with broken tip (Figure 5:2) and a unifacial point (Figure 6:3). The latter is in fact made on an obliquely struck flake. The third piece (Figure 6:7) may well be an unfinished tool. There are also a few scraping tools (Figs 6:2, 6:4, 6:6) and a possible awl (Figure 6:1) showing only casual retouch or utilisation damage.

Figure 6: Artefacts from Kgale View. 1. Possible awl (quartz, West); 2. Scraper on rejuvenation flake (quartz, Northwest); 3. Point (quartzite, Southwest); 4. Concave (quartz, South); 5. Rejuvenation flake with multi-stepped butt (felsite, Southwest); 6. Scraper (felsite, West); 7. Broken bifacially retouched piece ((felsite, 240cm depth, West); 8. Naturally pointed quadrilateral flake with ferricrete stains (felsite 260cm depth, Southwest). Scale five centimetres



Source: Illustration by Nick Walker

Dating the Artefacts

After discussion between the co-authors, it was decided that the site would be suitable for thermoluminescence dating. Samples were collected at night from horizontal deep-coring into the pit profiles near selected *in situ* artefacts to exclude light contamination.

Analysis was carried out in the Physics Department laboratory of the University of Botswana by WS Downey. Below is a discussion of the principles involved in this dating technique.

Principles and Age Determination

Thermoluminescence (TL) is an accumulated radiation. The intensity records the time elapsed (i.e. the age of the sample) since the last setting of the TL clock. In the case of soil sediments, this is achieved by their exposure to sunlight (bleaching). If the natural dose rate (NDR) is constant during the time lapse 't', then the absorbed dose (AD) can be expressed by Aitken's (1985) formula as: AD = t x NDR or t = AD/NDR.

Secular equilibrium has been assumed for these samples, that is, no daughter products of uranium or thorium have been removed from the sampling environment. The Dose Equivalent (DE) determined from a laboratory beta (β) source is regarded as the dose producing a TL intensity equivalent to the natural dose absorbed. The NDR was derived from alpha (α), beta (β) and gamma (ϒ) radiation, primarily from uranium (U), thorium (Th) and potassium (K) in the sand. Some cosmic radiation also contributes to the dose.

Natural Dose Rate

The NDR was calculated using both field and laboratory techniques. On-site dose was measured using a Brno Geofyzika GS256 gamma spectrometer with an external sodium iodide crystal sensor. Thick source low level alpha counting was carried out in the laboratory using an Elsec 7286 alpha counter to determine the U and Th. A Corning Flame Photometer 410 was used to measure the K converted to weight. Comparable field and laboratory values were obtained.

As the dose rate can be attenuated by the presence of moisture, the moisture content of the sample was measured. In this case, sedimentological evidence suggests that the environmental context had been relatively dry from the time of deposition to the present. A water content value was estimated at five per cent plus minus five per cent. The cosmic radiation dose usually accounts for three per cent or less of the total effective NDR and can be estimated fairly accurately (Prescott and Hutton 1994). It is a function of the depth, burial history, latitude, longitude and altitude of the sample. Values of 180, 190 and 200µGy/a (plus minus ten per cent) were assigned to these samples for depths of three metres, two metres and one metre respectively.

Sampling and Method

Three soil samples, Kas 1, Kas 2 and Kas 3 were collected from the south pit face at depths of one, two and three metres respectively for TL dating (see Table 3). The samples were protected from sunlight during recovery.

The coarse grain technique was used in the TL dating of quartz grains in the size range 90-125µm. This is the optimum choice of grain size fraction in view of the dosimetric and sedimentological consideration. To isolate the quartz grains, the raw sample was sieved and then cleaned using hydrochloric acid and hydrogen peroxide to remove carbonates and organic components respectively. The clay component was removed using sodium oxalate. A flotation technique using sodium polytungstate 'heavy liquid' at a density of $2.8 g/cm^3$ was used to separate the heavy mineral present.

A final etch of forty minutes in hydrofluoric acid was performed in order to dissolve any existing feldspars and to remove the outer α-affected surface skin in the quartz grains. Test measurements using infrared stimulation showed no luminescence signal, thus indicating no interference from feldspars. The clean quartz grains (three milligrams per aliquot) were mounted on one centimetre diameter stainless steel discs using a silicon spray and measured on a Riso DA-12 TL reader using the additive dose technique. A calibrated Sr 90β source delivered 2.0 plus minus 0.1 Gy/minute was used.

The doses used (Gy), subject to initial test dose results were, for Kas1, β1 66.7, β2 116.7, β3 166.7, β4 266.7; Kas2, β1 66.7, β2 200.0, β3 316.7; Kas3, β1 83.7, β2 166.7, β3 266.7. Plateaux obtained from the glow curves were good. Regeneration, using 6Gy doses on glowed-out aliquots, was used for normalisation. Residual TL values were obtained after forty hours of exposure to sunlight and subtracted. The residual regression curves were comparable in form to the natural plus additive dose regression curves, indicating little or no change in sensitivity.

Results

Table 3 shows the values obtained for the Dose Equivalent Gy (DE) obtained by exponential regression for the natural plus β doses for the quartz aliquots. Also shown are the U ppm, Th ppm and K (Wt%) from the surrounding host sediment, the annual dose rate (Gy/a) and the TL ages determined. Dates are 143,537 +- 24,487 (Kas3), 34,289 +- 4,130 (Kas2) and 32,434 +- 3,376 (Kas1) BP.

Table 3: Dated soil samples from Kgale View

Sample Code	Kas1	Kas2	Kas3
De (equivalent dose Gy)	139.7+-7	147.34+-15.1	611.3+-97.6
U ppm sediment	4.44+-0.23	4.48+-0.25	4.42+-0.26
Th ppm sediment	15.52+-0.76	15.6+-0.81	15.77+-0.77
K(Wt%) sediment	2.02+-0.03	2.04+-0.03	2.02+-0.03
Dose rate (μGy.a-1)	4,307+-393	4,297+-272	4,289+-272
TL Age (years BP)	32,434+-3,376	34,289+-4,130	143,537+-24,487

Source: Data compiled by William Samuel Downey

The dates are clearly minimum ages as it is uncertain for how long the artefacts lay exposed on the land surface, or indeed whether they had subsequently been re-exposed before final burial. Nevertheless, they suggest that the deposit containing the assemblage(s) began forming almost 150,000 years ago. They also suggest that the upper two and a half metres of sediment built up rapidly between about 30,000 to 35,000 years ago. The gravel horizon noted elsewhere on the site at about 2.1 metres implies a period of erosion or a break in deposition at or shortly before this time.

Discussion

The site demonstrates the value of test excavation or at least monitoring foundation trenches during construction work in Botswana as many important sites are deeply buried with little or no surface indication (see also, for example, Brooks and Yellen 1987). This site is important because it is one of the few in Botswana which have provided early dates for the Stone Age, the others being MSA sites at /Gi (Brooks *et al*. 1990) and Tsodilo (Robbins *et al*. 2000) in the northwest of Botswana.

The lower levels at Kgale View seem to straddle the transition between the Early and the Middle Stone Age, given the nature of the cores, the generally small size, shape and variation in hand axes and the presence of a point. Other ESA hand axes recovered in the Gaborone area are substantially larger and fit the typology of an older Acheulean industry. This size reduction recalls the pattern noted by Cooke in his Charama or late Acheulean industry in his Zimbabwe model (Cooke 1979; Walker and Thorp 1997). The minimum base date of some 143,000 BP is consistent with dates elsewhere in Southern Africa that place this transition as starting before 200,000 BP (Mitchell 2002), allowing for long periods of exposure to sunshine subsequent to abandonment.

Given the widespread horizontal and vertical distribution of lithics at Kgale View, the location seems to have attracted repeated visits over a long period by ESA foragers. Perhaps there were repeated seasonal visits to exploit the morula in late summer or in the dry season in late winter to collect water or exploit the game also coming to drink at the nearby river. This of course assumes that vegetation (and fruiting seasons) and indeed climatic factors have not changed substantially over the millennia.

The distribution in the trench profile does suggest clustering of artefacts into temporal zones at c1.5, 2.2 and 2.9metre depths (Table 4), suggesting some change in visiting behaviour. Alternatively, there were shifts in preferred camp locations, perhaps to take advantage of available shade trees, for example.

Table 4: Distribution of in situ artefacts by depth at Kgale View

Approx. depth		West face	South face	Total	Formal tools	Date
meters						
0,9			2	2		
1			2	2		
1,1			1	1		
1,2						
1,3		1	3	4	2 scrapers	Kas 1
1,4		1	1	2		
1,5		1	5	6		
1,6		1	3	4		
1,7			1	1		
1,8			2	2		
1,8			3	3		
2		5	2	7	1 scraper?	
2,1		3	5	8	1 scraper?	
2,2		5	4	9	handaxe tip	Kas 2
2,3		5	4	9		
2,4		1		1	bifacial piece	
2,5						
2,6		2		2		
2,7						
2,8		4	3	7		
2,9		2	2	4		Kas 3
3		3		3		
3,1						
Total		34	43	77		

Source: Table compiled by Nick Walker

Judging by the large number of cores present, at least some preliminary tool manufacturing took place here. Scraping tools also indicate the working of organic matter. Without any organic matter surviving or features being noted, however, it remains impossible to discuss the activities carried out here.

A distinctive feature of the assemblage is the relatively high number of hand axes, all of which are broken, something not generally reported at ESA sites. It is argued here that most were deliberately broken. Only one, the most carefully made and symmetrical specimen, and so possibly with a different function or age, may have been unintentionally broken. Bunker (1994) notes the deliberate burial of ritually broken bifaces in American Indian Holocene burials, but any symbolic behaviour at Kgale View is unexpectedly early. This is significant because it is currently believed that cognitively modern behaviour only began in the MSA proper (cf Marean *et al*. 2007).

However, in this regard we can also note that ochre occurs in the Charama levels in Zimbabwe (eg Cooke 1963). It is generally accepted that using colouring matter implies some sort of symbolic behaviour, or at least complex thinking. Additionally, there is the problematic Lower Palaeolithic appearance of cupules (Bednarik 2008), items which in later periods at least appear to have had a symbolic function or association (Walker 2008).

Finally, there is the problem of identifying the function or functions of the hand axes themselves, many of which apparently show no obvious use-damage. Many elsewhere were made with extreme care and skill, some of which are too large to have been easily used, suggesting a non-utilitarian role for at least some of them (Miller 2001). This would then suggest a slightly earlier introduction of complex behaviour than currently postulated or alternatively the retention of some early technology into the later period.

Another possibility is that hand axes were purposefully broken by later MSA people. One specimen (Figure 5:1) appears to have been re-used as a core. The possibility of scavenging old tools for raw material is consistent with the dates. Still, most hand axe fragments do not show any subsequent reworking or use, so both possibilities hold, but more research is needed on this intriguing problem, especially considering the small sample size of this assemblage.

Conclusion

This exercise demonstrates the potential contribution of archaeological resource management (ARM) to the construction of Botswana's past, especially for the earlier periods where sites are likely to be buried. Conditions are nevertheless far from ideal for problem-orientated research, as the developers pressurise the team conducting the rescue of material to speed up their work. Still, an integrated study, using the expensive industrial equipment of the developers will save on the otherwise prohibitive costs. A further problem is that most of these ARM reports remain difficult for researchers to access. A journal such as *Botswana Notes and Records* (or Occasional Papers of the National Museum in Botswana) could play a valuable role in publishing the more significant of these reports, even if only as abstracts.

A problem in Botswana is the difficulty of dating older sites where there is no datable organic material and so the development of techniques, such as thermoluminescence, as well as a well-funded laboratory is essential. In this instance we have calculated the earliest date for an archaeological site in Botswana, but clearly more dates are needed to refine Botswana's early cultural history. Of interest is the fact that all the hand axes were broken, most deliberately. A problem in this regard is that the sample size is small. Though the sample is small, along with evidence from elsewhere, it challenges the argument that the makers of the late Acheulean were significantly intellectually inferior to their successors and so modern cognitive ability may have had a more gradual development. More research can assist in this regard.

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