Interregional Contacts in the Later Prehistory
of Northeastern Africa
Poznań 1996

Michał Kobusiewicz and Jacek Kabaciński

Jebel Kobkabba: a Middle Palaeolithic site in Sudanese Nubia

In December 1993 we surveyed part of the Letti Plain and the edge of the desert on behalf of the Royal Ontario Museum Expedition to the Sudan directed by Krzysztof Grzymski. During a four days survey numerous Palaeolithic sites were discovered on the jebels and hills bordering the desert along the village of El Ghaddar, on the eastern bank of the Nile. One of the most promising sites named by us Jebel Kobkabba, was than selected for future detailed examination in 1994.

Jebel Kobkabba is located ca. 1600 m north of the Old Dongola Mosque, ca. 2500 m south-south-east of Jebel El Ghaddar and ca. 1600 m west of the modern bank of the Nile (Fig. 1). The jebel itself is made up of, as many other jebels in this area, ferrocrete sandstone. On the top of the jebel the outcrop of ferrocrete sandstone bedrock is visible. The artefacts cover an irregular oval shaped surface of ca 100 m x 50 m. After completing a general surface collection of the site, a one square meter grid was established and systematic surface collections of artefacts was undertaken from three separate areas located on the top of the jebel along its longer axes. These areas marked A, B and C covered respectively 12 m^2, 16 m^2 and 6 m^2 surface. In areas A and B two stratigraphic test-trenches of one square meter each were dug down to the bedrock.

Test trenches 1 excavated in squares 2a and 3a of Area A revealed the following stratigraphy (Fig. 2):

Surface: covered by dense concentration of rocks and more or less worn artefacts.
Subsurface (marked as A(s)) was divided into:

1. Upper layer: ca. 18 cm thick; gray, slightly yellowish (Munsell 7.5 YR-6/6), fine grained silty sand mixed with crushed pieces of ferrocrete sandstone and numerous artefacts.
2. Lower layer: ca 23 cm thick; reddish-brown (Munsell 2,5 YR-4/6), fine grained silty sand mixed with pieces of crushed ferrocrete sandstone and numerous artefacts.

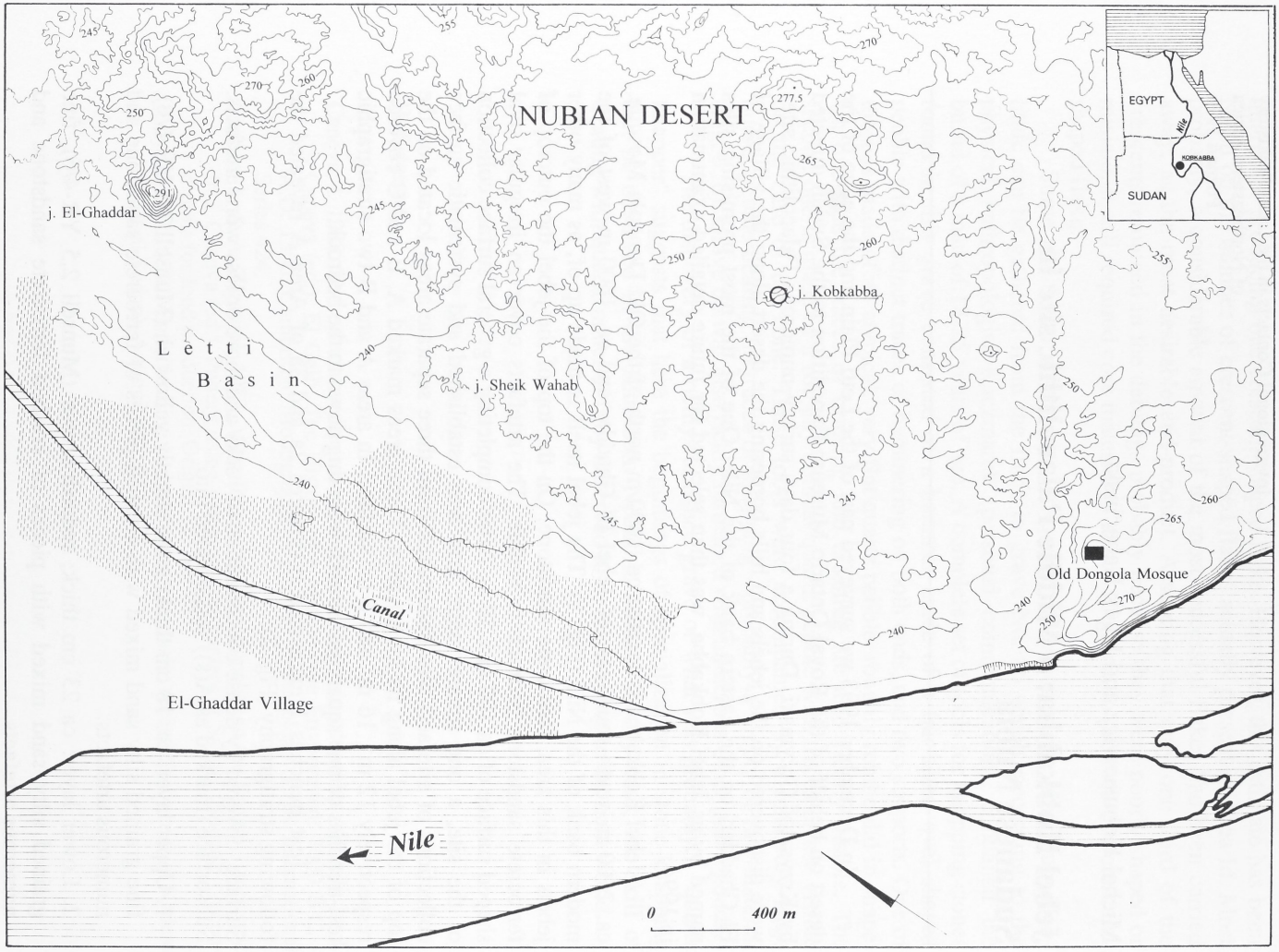

Fig. 1. Jebel Kobkabba. Location of the site (map after E. Karwowska).

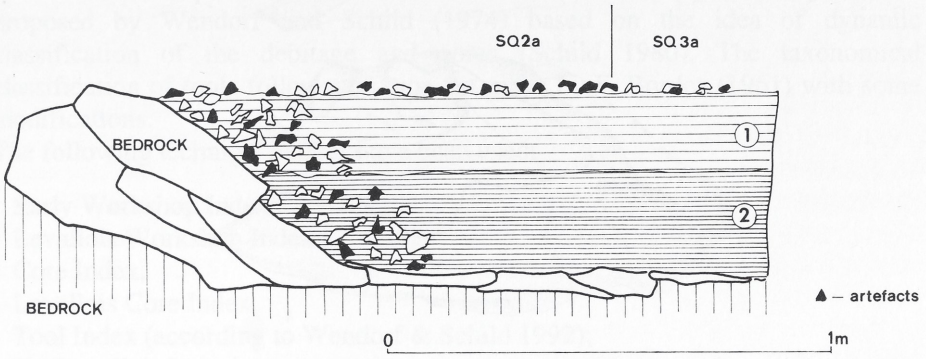

Fig. 2. Jebel Kobkabba. Stratigraphy of test trench 1 (1-upper layer; 2-lower layer).

The lower and upper layer differ only in coloration, probably reflecting content of iron oxides. The artefacts found subsurface are less worn, sometimes they look almost fresh.

Bedrock: blocks of ferrocrete sandstone.

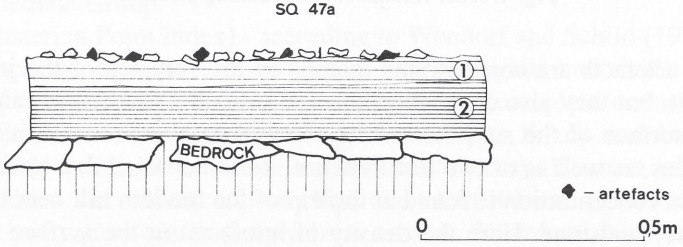

Fig. 3. Jebel Kobkabba. Stratigraphy of test trench 2 (1-upper layer; 2-lower layer).

In test trench 2 excavated in square 47a, scarce artefacts occur only at the surface. Below lies a ca 20 cm thick subsurface layer of fine grained silty sands mixed with a few crushed pieces of ferrocrete sandstone, containing no artefacts. The upper 8 cm of this layer is of yellowish gray colour (7,5 YR-6/6), whereas the lower 12 cm is reddish brown (2.5 YR-4/6; [Fig. 3]).

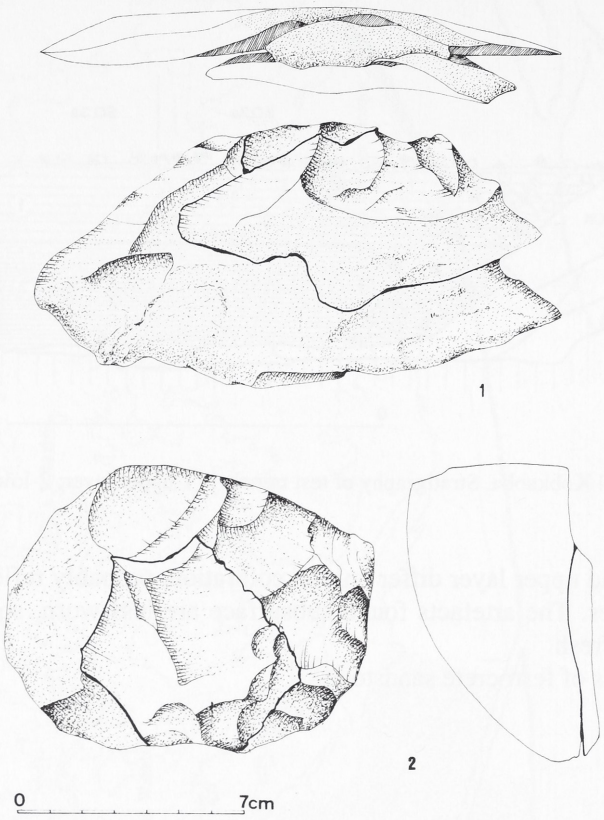

Fig. 4. Jebel Kobkabba. Articulating pieces.

The artefacts are concentrated mainly on the very top of the jebel, at the western part, but they also cover the slopes. Based on a thorough examination of the whole surface of the site, the results of regular collections taken from three separate areas, as well as of two test-trenches, it can be stated that by far the most dense lithics concentration is found at the top of the modern hill near the outcrop of ferrocrete sandstone. Here the density of artefacts on the surface (excluding chips and chunks) is approximately 100 pieces per square meter (Area A), whereas further down the hill the density diminishes to no more than several artefacts per square meter (Area B and C). This difference is even more striking if we consider the wealth of artefacts in 40 cm of the subsurface layer in Area A at the sandstone outcrop, and the total lack of subsurface material elsewhere. All artefacts found on the surface are rolled and worn but the degree of wear differs. At least some material is still found more or less *in situ* as shown by combinations of articulating pieces found very close to each other. One of these is composed of three articulating flakes (Fig. 4: 1), another of core and flake (Fig. 4: 2).

Methods

The description of the material was made according to the procedure proposed by Wendorf and Schild (1974) based on the idea of dynamic classification of the debitage and cores (Schild 1980). The taxonomical classification of tools follows the type list made by F. Bordes (1961) with some modifications.
The following technical indices have been used:

Early Workshop Index,
Levallois Workshop Index,
Core Index,
Levallois Core Index,
Tool Index (according to Wendorf & Schild 1992);
IL (Levallois Index)
I-lame (Blade Index, according to Bordes 1953a);
IGL (Index of Levallois Group, according to Wendorf & Schild 1974).

For description of tool group structure we applied several typological indices formulated by Bordes (1953; 1953a):

IL-ty (Levallois Typological Index),
IR (Side-scraper Index),
IC (Charentien Index),
IB (Biface Index),
I - Levallois Group,
II - Mousterian Group,
III - Upper Palaeolithic Index,
IV - Denticulate Group.
IMp (Mousterian Point Index) - according to Wendorf and Schild (1974).

To facilitate comparisons we present the typological indices the same way as Wendorf and Schild (1974) in three sets: large (complete count), essential (without Levallois unretouched pieces and retouched flakes and blades), and retouched tools (without Levallois unretouched pieces). Because of time and labor limitations we did not collect chips and chunks from all excavated units except in a one square meter sample from area A. Therefore chips, chunks and undetermined pieces are excluded from the percentage and indices calculations.

Description of materials

A total of 735 artefacts was systematically collected. All are made of ferrocrete sandstone. Table 1 presents stone material for all separately excavated units, according to the classification based on dynamic typology. Table 2 demonstrates the general structure of Levallois debitage and retouched tools. Measured attributes of debitage and tool categories, rich enough for statistics, are shown on Tables 3 and 4. Analyzing the general structure of the assemblage it is

apparent (Table 1) that there is an obvious difference in the frequency of primary pieces in areas considered. These are much more numerous at the south-eastern part of the site (Areas B and C) than in the north-western part (Area A and A [s]). Therefore, a technological analysis was made, additionally, for groups of units (Table 5). Statistical data for areas A/A(s) combined is presented in Table 6 (debitage) and Table 7 (tools); areas B/C combined in Table 8 (debitage). The number of tools from areas B and C was too small for statistical calculations. Technical indices are presented for both parts of the site, as well as for the whole assemblage in Table 9. Typological indices (Table 10) were calculated for the whole of the assemblage only, because of limited amount of tools from areas B and C. A selection of cores, retouched tools and debitage is illustrated in Figures 5-10.

Discussion

The results of technological and typological analysis presented above indicate that the Jebel Kobkabba assemblage belongs to the Middle Palaeolithic of the Nile Valley. The closest analogies which permit us to place our site within the cultural and chronological system of the Northeastern African tradition, are the rich sites from the Wadi Halfa area near the 2nd Cataract described as Nubian Mousterian. The presence of a few bifaces relates Jebel Kobkabba more closely to the Nubian Mousterian B (Marks 1968).

The research at Jebel Kobkabba does not reveal new evidence as regards the chronology of the Nubian Middle Palaeolithic. Typologically old elements, such as chopper and chopping tool, as well as Upper Palaeolithic types such as end-scraper and burin suggest a very long lasting occupation of the site. This is confirmed by the occurrence of artefacts in both reddish-brown and yellowish-gray layers connected with moist and semi-dry climatic periods respectively. It is possible that the lower (oldest) layer is dated to one of the local moist oscillations of the last Interglacial (Wendorf & Schild 1992).

It seems that the site was visited many times by hundreds of generations attracted by the outcrop of good quality ferrocrete sandstone. The outcropping rock was the heart of the site. Here the overwhelming majority of artefacts was accumulated. The abundance of artefacts deposited by thousands of years of activity makes it impossible to recognize the eventual subconcentrations or activity areas. Only the striking preponderance of primary pieces in the south-eastern part of the site (areas B and C), if compared to the north-western part (Area A), suggest that some activity areas may have existed.

In the south-eastern part of the site two outlines of very primitive stone structures built of large cobbles occur on the surface. One is of a semi-circular and the second of an oval shape, both of ca. 1.5 m - 2 m in diameter (Fig. 11).

They are accompanied by smaller concentrations of flat stones ca 50 cm-60 cm in diameter. Similar features constructed of stones are known from some Lower and Middle Palaeolithic African sites, e.g. the Acheulean site Arkin 8

(Chmielewski 1968: 112), site 6 of Nubian Mousterian B in the 2nd Cataract area (Marks 1968: 261), site Toshkei 8-A-2, located ca. 30 km south of the 2nd Cataract on the western bank of the Nile (Vila 1978: 47), or the more distant South African site of Orangia (Sampson 1968). The preservation of such features from Middle Palaeolithic times at Jebel Kobkabba seems possible, because articulating pieces of stone artefacts have been found near them *in situ*.

Beside the concentration of Middle Palaeolithic sites in the Wadi Halfa Area (Guichard & Guichard 1968; Chmielewski 1968; Marks 1968), occupation traces of a similar character are known from a few sites located on the western bank of the Nile, ca. 30 km south of the 2nd Cataract (Vila 1978). Also, not far from Jebel Kobkabba, again on the western bank, between Korti and Debba, similar occupations were discovered (Heinzelin 1967-1968; Marks et al. 1967-1968). These however are characterized by the exploitation of a variety of different raw materials, in contrast to Jebel Kobkabba where only ferrocrete sandstone was used.

Site of Jebel Kobkabba, so rich in archaeological material, is not an exception in the El Ghaddar area. Similar, strikingly rich sites covered by millions of stone artefacts are present here, proving how attractive this part of Nubia was for human life in the Middle Palaeolithic times.

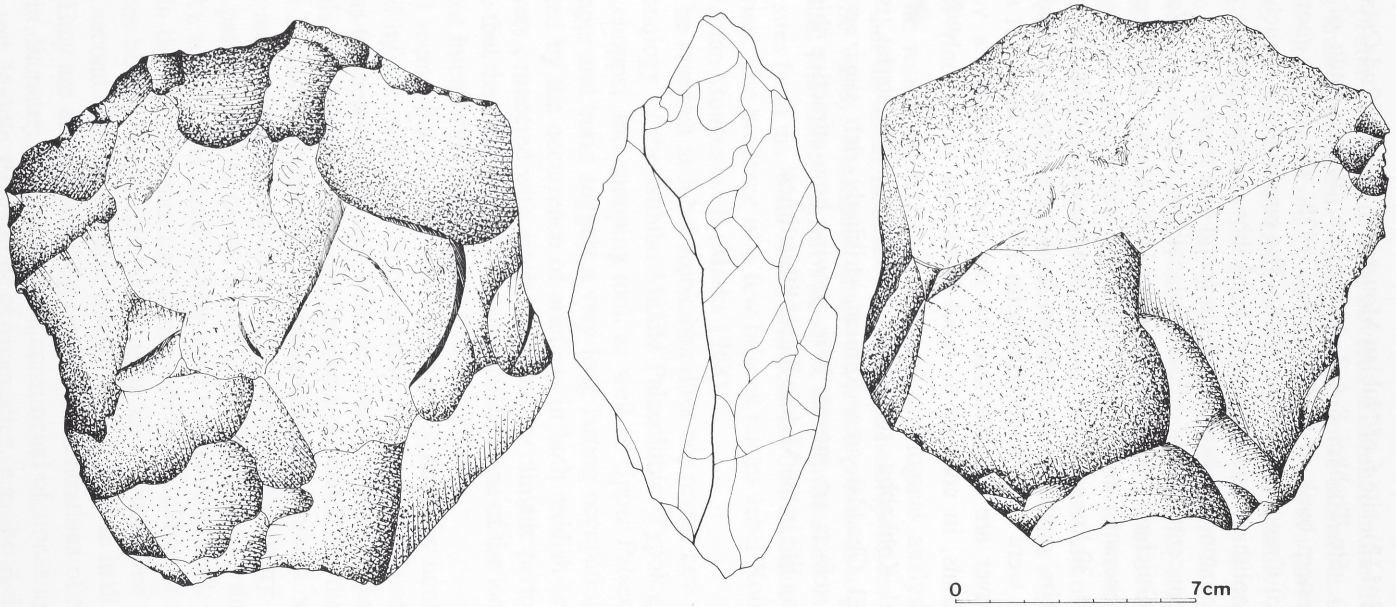

Fig. 5. Jebel Kobkabba. Unworked Levallois core.

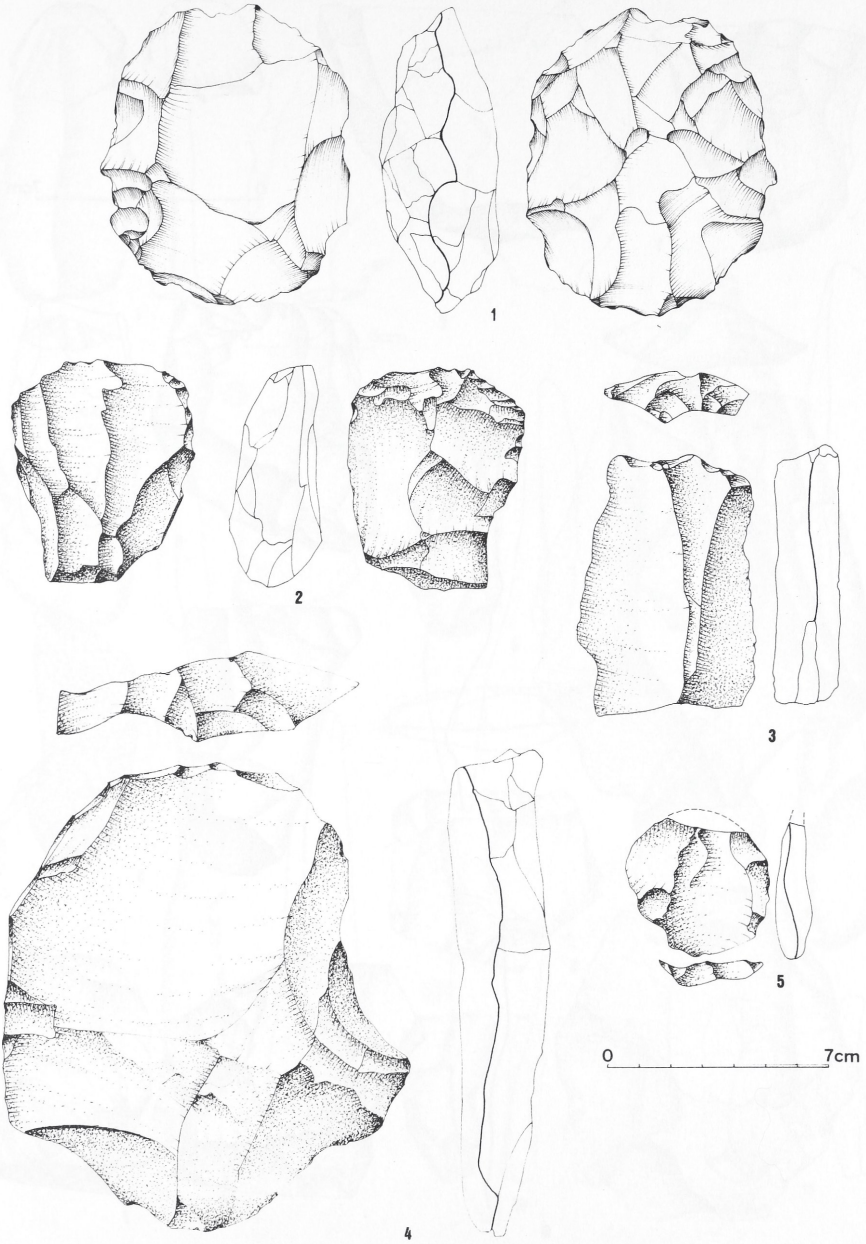

Fig. 6. Jebel Kobkabba: 1. Levallois single platform core for flakes; 2. Levallois single platform. core for blades; 3. Levallois blade from single platform core; 4. Levallois flake from early stage of core exploitation; 5. Levallois flake from single platform core.

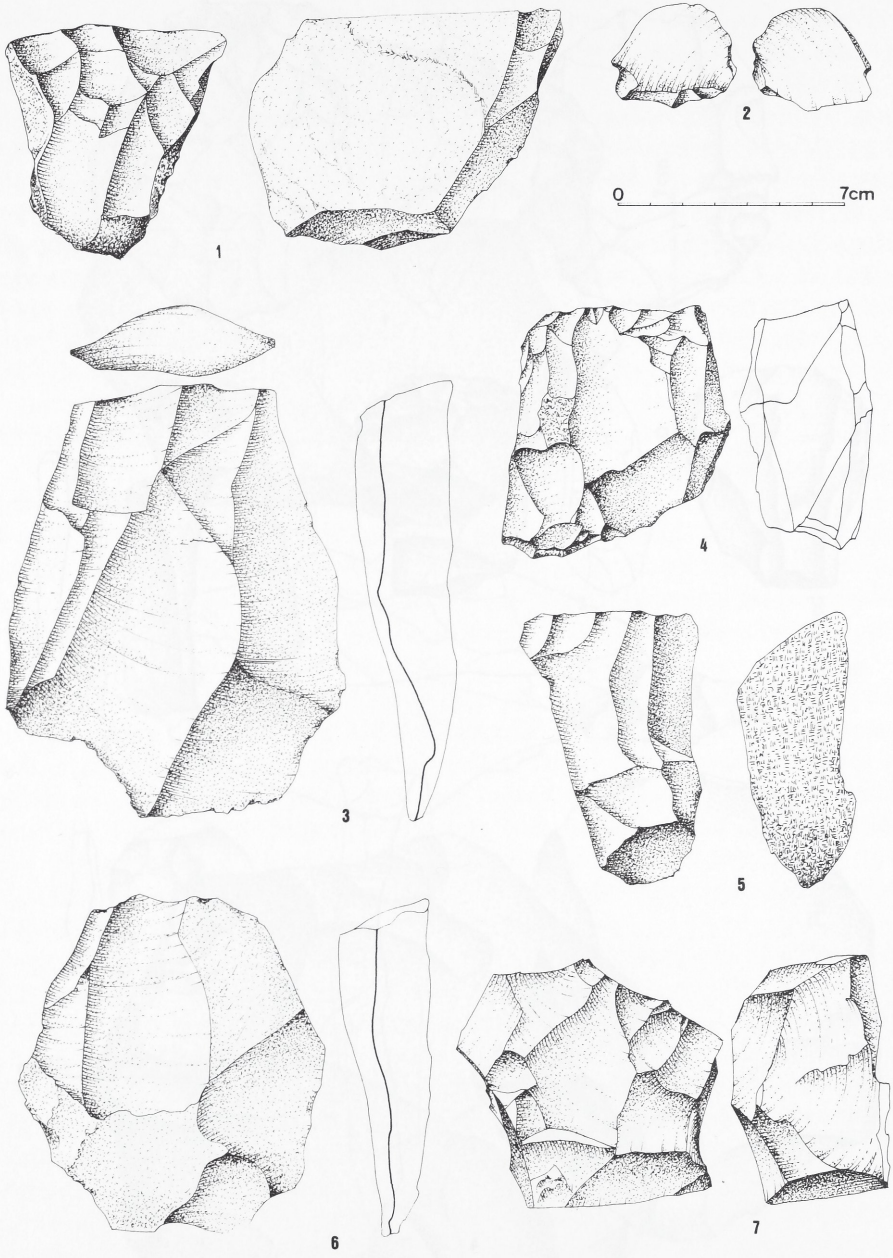

Fig. 7. Jebel Kobkabba: 1. single platform core for flakes; 2. core tablet; 3. flake from single platform core; 4. opposed platform core for flakes; 5 single platform core for blades; 6. flake from opposed platform core; 7. change orientation core for flakes.

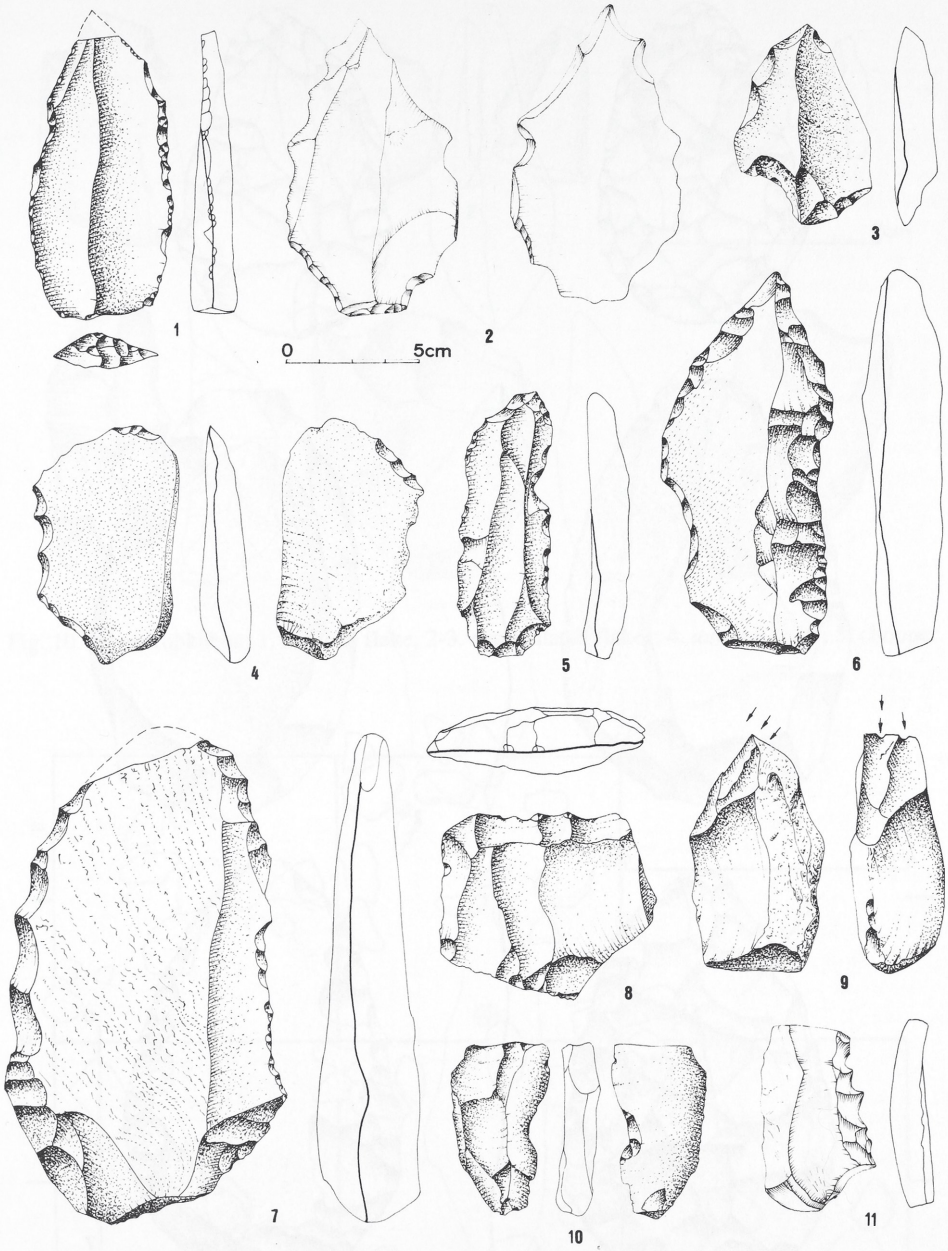

Fig. 8. Jebel Kobkabba: 1-2. Levallois points; 3. Mousterian-like point; 4. side-scraper inversely retouched; 5. retouched and notched blade; 6. convergent side-scraper; 7. side-scraper simple convex; 8. transverse side-scraper; 9. nuclei-form burin; 10. notched blade; 11. denticulated blade.

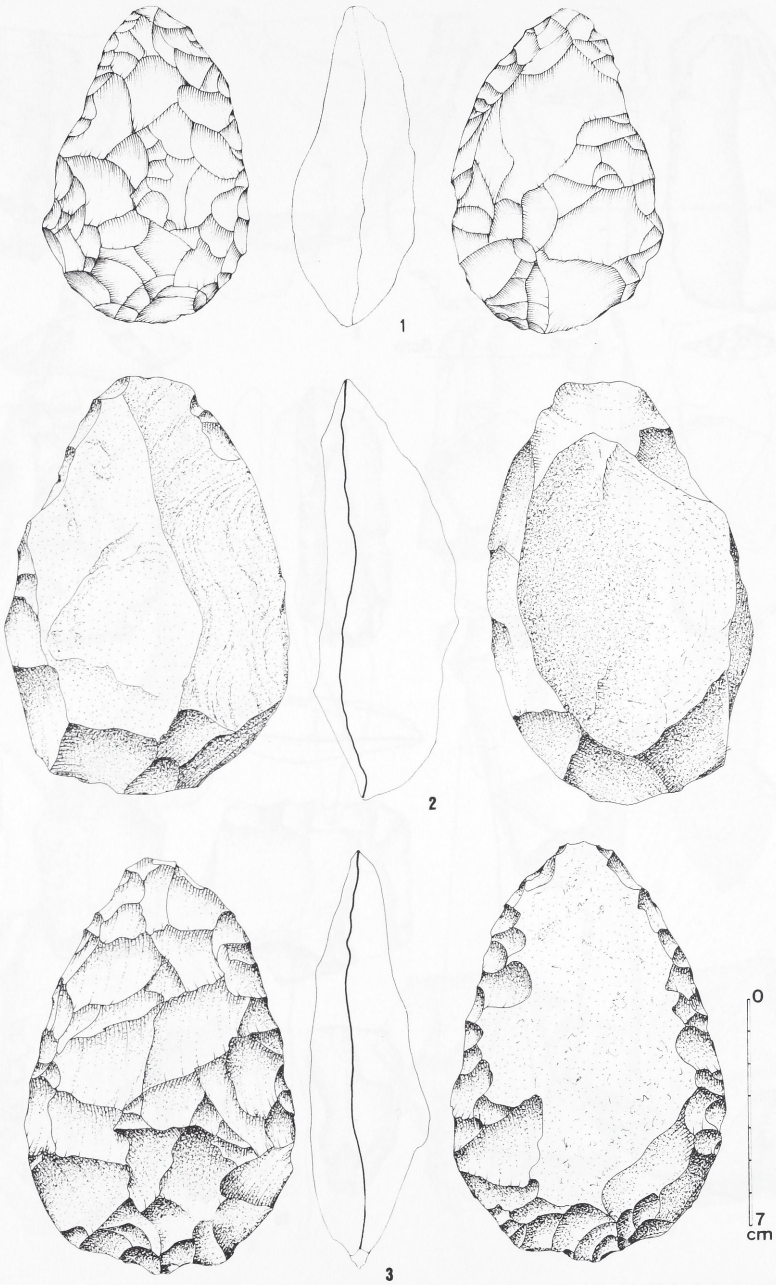

Fig. 9. Jebel Kobkabba. Handaxes.

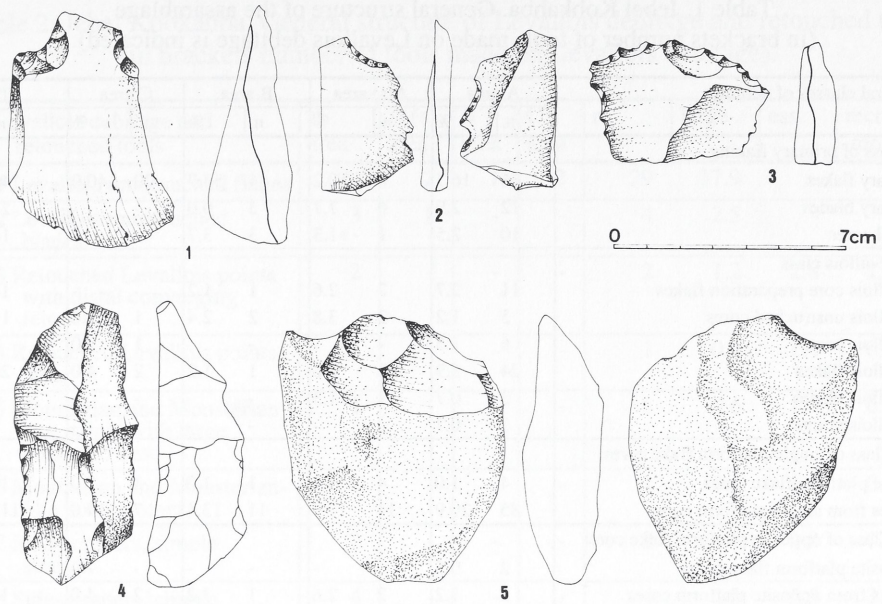

Fig. 10. Jebel Kobkabba: 1. notched flake; 2-3. denticulated flakes; 4. *lames à crête*; 5. chopper.

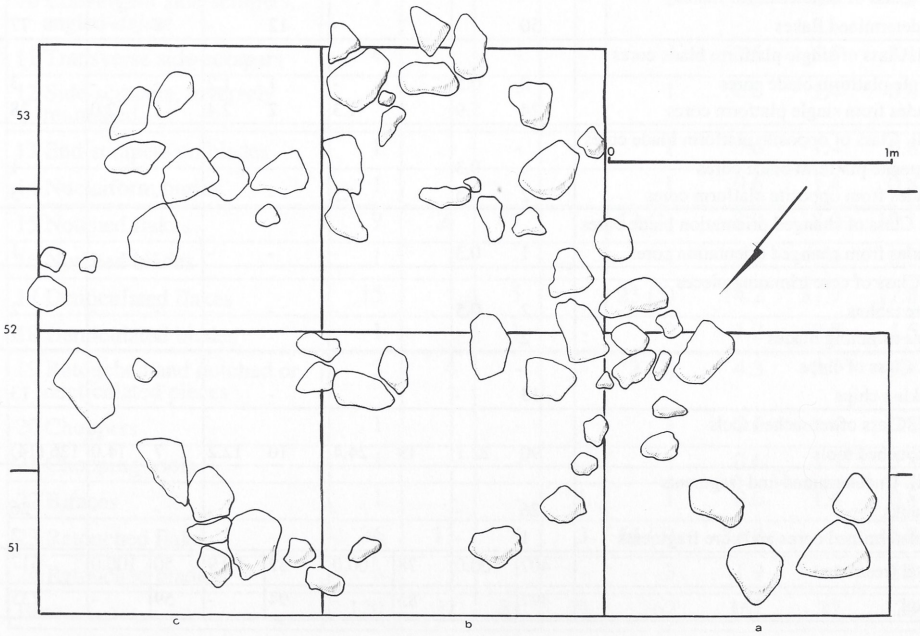

Fig. 11. Jebel Kobkabba. Semi-circular feature of stone cobbles.

Table 1. Jebel Kobkabba. General structure of the assamblage (in brackets number of tools made on Levallois debitage is indicated).

	General classes of debitage	A area		A(s) area		B area		C area		Total	
		n.	%	n.	%	n.	%	n.	%	n.	%
	I. Class of primary flaking										
1	Primary flakes	66	16.7	8	10.2	44	53.7	20	40.0	140	22.6
2	Primary blades	12	2.9	6	7.7	3	0.0	-	-	21	3.4
3	Initial cores	10	2.5	1	1.3	3	3.7	-	-	14	2.6
	II. Levallois class										
4	Levallois core preparation flakes	11	2.7	2	2.6	1	1.2	-	-	14	2.6
5	Levallois unstrucked cores	5	1.2	3	3.8	2	2.4	1	2.0	11	1.7
6	Levallois cores	6	1.5	-	-	-	-	1	2.0	7	1.1
7	Levallois flakes	24	5.9	2	2.6	1	1.2	2	4.0	29	4.7
8	Levallois blades	3	0.7	1	1.3	-	-	-	-	4	0.6
9	Levallois points	3	0.7	-	-	-	-	-	-	3	0.5
	III. Class of single platform flake cores										
10	Single platform flake cores	4	1.0	4	5.1	1	1.2	1	2.0	10	1.6
11	Flakes from single platform cores	85	20.9	14	17.9	11	13.4	7	14.0	117	18.9
	IV. Class of opposite platform flake cores										
12	Opposite platform flake cores	2	0.5	-	-	-	-	-	-	2	0.3
13	Flakes from opposite platform cores	5	1.2	2	2.6	1	1.2	2	4.0	10	1.6
	V. Class of changed orientation flake cores										
14	Changed orientation flake cores	5	1.2	2	2.6	-	-	1	2.0	8	1.3
15	Flakes from changed orientation cores	40	9.8	12	15.3	2	2.4	7	14.0	61	9.8
	VI. Class of undetermined flakes										
16	Undetermined flakes	50	-	7	-	12	-	8	-	77	-
	VII. Class of single platform blade cores										
17	Single platform blade cores	2	0.5	-	-	1	1.2	-	-	3	0.5
18	Blades from single platform cores	24	5.9	1	1.3	2	2.4	1	2.0	28	4.5
	VIII. Class of opposite platform blade cores										
19	Opposite platform blade cores	1	0.3	-	-	-	-	-	-	1	0.1
20	Blades from opposite platform cores	2	0.5	1	1.3	-	-	-	-	3	0.5
	IX. Class of changed orientation blade cores										
21	Blades from changed orientation cores	1	0.3	-	-	-	-	-	-	1	0.1
	X. Class of core trimming pieces										
22	Core tablets	2	0.5	-	-	-	-	-	-	2	0.3
23	Core trimming blades	2	0.5	-	-	-	-	-	-	2	0.3
	XI. Class of chips										
24	Flaking chips	13	-	-	-	-	-	-	-	13	-
	XII. Class of retouched tools										
25	Retouched tools	90	22.1	19	24.4	10	12.2	7	14.0	126 (14)	20.4
	XIII. Undetermined and fragments										
26	Chunks	26	-	-	-	-	-	-	-	26	-
27	Undetermined cores and core fragments	1	-	-	-	-	-	1	-	2	-
	Total (restricted *	407	100.0	78	100.0	82	99.9	50	100.0	617	100.0
	Total	497	-	85	-	94	-	59	-	735	

*Counted without undetermined pieces, chips and chunks

Table 2. Jebel Kobkabba. General structure of Levallois debitage and retouched tools (in brackets number of tools made on Levallois debitage).

Levallois debitage and retouched tools	A area	A (s) area	B area	C area	n.	large	ess.	rect. tools
1 Levallois unretouched flakes	24	2	1	2	29	17.9	-	-
2 Levallois unretouched blades	3	1	-	-	4	2.5	-	-
3 Retouched Levallois points with distal converging retouch	2	-	-	-	2	1.2	2.8	1.5
4 Retouched Levallois points, other	1	-	-	-	1	0.6	1.4	0.8
5 Mousterian and Mousterian-like points with large unaltered base	1	-	-	-	1	0.6	1.4	0.8
6 Mousterian and Mousterian-like points, other	1	-	-	-	1	0.6	1.4	0.8
7 Side-scrapers, simple straight	2	-	-	-	2	1.2	2.8	1.5
8 Side-scrapers, simple convex	4	-	-	-	4	2.5	5.5	3.1
9 Convergent side-scrapers, symmetric	3	-	-	-	3	1.9	4.2	2.3
10 Convergent side-scrapers, angled-*déjeté*	1	1	-	-	2	1.2	2.8	1.5
11 Transverse side-scrapers	4	-	-	-	4	2.5	5.5	3.1
12 Side-scrapers, inversely retouched	1	-	-	-	1	0.6	1.4	0.8
13 End-scrapers on blades	1	-	-		1	0.6	1.4	0.8
14 Nucleiform burins	1	-	-		1	0.6	1.4	0.8
15 Notched flakes	9	2-	2		13 (1)	8.0	18.0	10.1
16 Notched blades	1	-	-		-1	0.6	1.4	0.8
17 Denticulated flakes	15	1	5		23 (5)	14.2	31.9	17.8
18 Denticulated blades	1	-	1	-	2	1.2	2.8	1.5
19 Retouched and notched or denticulated pieces	3	4	-	-	7 (2)	4.3	9.7	5.4
20 Choppers	1	-	-		1	0.6	1.4	0.8
21 Chopping-tools	1	-	-		1	0.6	1.4	0.8
22 Bifaces	1	-	-	1	1	0.6	1.4	0.8
23 Retouched flakes	36	11	4	3	54 (3)	33.3	-	41.9
24 Retouched blades	3	-	-	-	3	1.9	-	2.3
Base	120	22	11	9	162	162	72	129

Table 3. Jebel Kobkabba. Measured attributes of selected debitage categories.

Debitage categories		n	min	max	Sx	x	s	s^2	Mode Range	No. in mode
Primary flakes	L	118	14	183	6712	56.88	28.44	808.63	41-45	16
	W	135	22	227	7168	53.10	28.27	799.27	41-45	22
	T	140	1	87	2823	20.16	12.72	161.89	15-16	22
	◁	77	41	100	5598	72.70	15.96	254.70	76-80	17
Primary blades	L	14	53	213	1268	90.57	37.56	1410.67	76-80	2
									81-85	2
									91-95	2
									106-110	2
	W	21	20	78	798	38.00	14.76	218.00	26-30	5
	T	21	11	51	448	21.33	9.45	89.37	13-14	4
Initial cores	L	14	40	149	1014	72.43	29.91	894.82	46-50	3
	W	14	41	159	1230	87.86	28.08	788.55	91-95	3
	T	14	34	165	1088	77.71	35.03	1227.20	34-35	2
									61-65	2
									81-85	2
									111-115	2
	∅	13	54	93	985	75.77	12.94	111.05	81-90	6
Levallois cores	L	13	30	111	717	55.15	22.97	527.51	36-40	3
preparation flakes	W	14	28	76	641	45.79	14.04	197.03	36-40	3
	T	14	8	26	223	15.93	5.61	31.49	22-23	3
	∅	14	45	88	973	69.50	10.27	105.53	61-65	5
Levallois cores	L	15	46	134	1370	91.33	23.23	539.42	66-70	2
									76-80	2
									86-90	2
									111-115	2
	W	18	55	107	1365	75.83	14.91	222.25	56-60	3
									71-75	3
									76-80	3
	T	18	16	61	636	35.33	11.15	124.22	36-40	5
	◁	15	58	90	1087	72.47	11.13	123.98	61-70	5
Levallois flakes	L	24	32	107	1467	61.13	18.95	358.94	36-40	4
									51-55	4
	W	26	23	107	1365	52.50	15.40	237.02	56-60	6
	T	29	9	28	476	16.41	5.27	27.76	15-16	5
	◁	27	56	94	1977	73.22	8.14	66.25	71-75	9
Single platform cores	L	10	35	97	671	67.10	18.71	349.89	56-60	2
									71-75	2
									96-97	2
	W	10	30	83	637	63.70	15.61	243.81	56-60	2
									81-83	2
	T	10	35	139	732	73.20	31.08	966.16	61-65	3
	◁	10	60	87	740	74.00	9.22	85.00	60-69	4
Flakes from single	L	89	30	115	4765	53.54	16.57	274.47	46-50	16
platform cores	W	112	26	111	5202	46.45	16.32	266.41	36-40	17
									41-45	17
									46-50	17
	T	117	6	35	1924	16.44	5.86	34.37	13-14	17
	◁	86	46	96	6234	72.49	10.73	115.13	66-70	16
Flakes from opposite	L	7	43	82	440	62.86	15.74	247.84	43-45	2
platform cores	W	10	34	103	545	54.50	19.82	392.85	34-35	2
									36-40	2
	T	10	1	53	200	20.00	13.28	176.40	10-11	2
									27-28	2
	◁	8	58	90	614	76.75	10.19	103.94	81-85	2
									86-90	2
Changed orientation	L	8	58	95	583	72.88	11.31	127.86	61-65	2
flake cores	W	8	47	133	646	80.75	29.00	840.94	56-60	2
	T	8	37	112	492	61.50	24.64	607.25	41-45	2
									46-50	2
	◁	9	61	89	673	74.78	10.11	102.17	61-70	4
Flakes from changed	L	50	32	153	3302	66.04	25.54	652.52	56-60	8
orientation cores	W	60	28	178	3480	58.00	24.64	607.07	41-49	9
									51-55	9
	T	61	7	56	1340	21.97	9.87	97.51	13-14	11
	◁	36	52	105	2806	77.94	10.75	115.66	81-85	9
Blades from single	L	10	43	107	688	68.80	18.12	328.36	61-65	3
platform cores	W	28	19	55	855	40.61	8.50	72.32	26-30	9
	T	28	7	29	389	13.89	5.90	34.81	13-14	9
	◁	11	67	95	882	80.18	8.57	73.42	81-85	3

Table 4. Jebel Kobkabba. Measured attributes of selected tool categories.

Tool category		n.	min	max	Sx	x	s	s^2	Mode Range	No. in mode
Notched flakes	L	9	33	81	559	62.11	15.76	248.32	71-75	2
	W	13	28	95	645	49.62	18.36	337.16	35-40	3
	T	13	10	27	253	19.46	4.63	21.48	19-20	3
									21-22	3
	◁	7	63	96	529	75.57	9.94	98.82	71-75	3
Denticulated flakes	L	14	38	104	861	61.50	19.43	377.68	46-50	3
	W	21	26	84	1026	48.86	16.58	274.79	26-30	3
									41-45	3
									46-50	3
	T	23	8	25	348	15.13	5.30	28.11	13-14	5
	◁	10	50	92	710	71.00	13.04	170.00	61-65	4
Retouched flakes	L	37	21	121	2293	61.97	22.27	496.08	61-65	7
	W	51	23	126	2586	58.55	23.40	547.46	56-60	10
	T	54	3	56	1146	21.22	11.24	126.40	19-20	7
	◁	25	37	90	1873	74.92	13.15	172.87	86-90	7

Table 5. Jebel Kobkabba. General structure of assamblages from areas A/A(s) and B/C (in brackets number of tools made on Levallois debitage is indicated).

	General classes of debitage	A/A(s) area n.	%	B/C area n.	%	Total n.	%
	I. Class of primary flaking						
1	Primary flakes	76	15.7	64	48.5	140	22.6
2	Primary blades	18	3.7	3	2.3	21	3.4
3	Initial cores	11	2.3	3	2.3	14	2.6
	II. Levallois class						
4	Levallois core preparation flakes	13	2.7	1	0.7	14	2.6
5	Levallois unstrucked cores	8	1.7	3	2.3	11	1.7
6	Levallois cores	6	1.2	1	0.7	7	1.1
7	Levallois flakes	26	5.4	3	2.3	29	4.7
8	Levallois blades	4	0.8	-	-	4	0.6
9	Levallois points	3	0.6	-	-	3	0.5
	III. Class of single platform flake cores						
10	Single platform flake cores	8	1.6	2	1.5	10	1.6
11	Flakes from single platform cores	99	20.4	18	13.6	117	18.9
	IV. Class of opposite platform flake cores						
12	Opposite platform flake cores	2	0.4	-	-	2	0.3
13	Flakes from opposite platform cores	7	1.4	3	2.3	10	1.6
	V. Class of changed orientation flake cores						
14	Changed orientation flake cores	7	1.4	1	0.7	8	1.3
15	Flakes from changed orientation cores	52	10.7	9	6.8	61	9.8
	VI. Class of undetermined flakes						
16	Undetermined flakes	57	-	20	-	77	-
	VII. Class of single platform blade cores						
17	Single platform blade cores	2	0.4	1	0.7	3	0.5
18	Blades from single platform cores	25	5.2	3	2.3	28	4.5
	VIII. Class of opposite platform blade cores						
19	Opposite platform blade cores	1	0.2	-	-	1	0.1
20	Blades from opposite platform cores	3	0.6	-	-	3	0.5
	IX. Class of changed orientation blade cores						
21	Blades from changed orientation cores	1	0.2	-	-	1	0.1
	X. Class of core trimming pieces						
22	Core tablets	2	0.4	-	-	2	0.3
23	Core trimming blades	2	0.4	-	-	2	0.3
	XI. Class of chips						
24	Flaking chips	13	-	-	-	13	-
	XII. Class of retouched tools						
25	Retouched tools	109 (11)	22.5	17 (3)	12.9	126 (14)	20.4
	XIII. Undetermined and fragments						
26	Chunks	26	-	-	-	26	-
27	Undetermined cores and core fragments	1	-	1	-	2	-
	Total (restricted) [1]	485	99.9	132	99.9	617	100.0
	Total	582	-	153	-	735	-

[1] Counted without undetermined pieces, chips and chunks

Table 6. Jebel Kobkabba. Area A/A(s). Measured attributes of selected categories of debitage.

Debitage categories		n.	min	max	Sx	x	s	s^2	Mode Range	No. in mode
Primary flakes	L	66	14	183	4129	62.56	33.22	1103.64	41-45	10
	W	72	22	227	4154	57.69	34.99	1224.35	31-35	10
	T	76	1	87	1675	22.04	15.30	234.01	15-16	14
	◁	51	45	100	3876	76.00	14.39	207.21	76-80	11
Primary blades	L	12	53	219	1102	91.83	40.42	1633.97	56-60	3
	W	18	20	78	688	38.22	15.22	231.73	21-25	3
									26-30	3
									31-35	3
									41-45	3
	T	18	11	51	384	21.33	9.91	98.22	11-12	3
									13-14	3
Initial cores	L	11	40	120	770	70.00	20.04	485.82	71-75	2
	W	11	60	159	1014	92.18	27.89	777.60	76-80	2
	T	11	34	165	838	76.18	37.02	1370.15	31-35	2
									65-70	2
	◁	10	54	93	768	76.80	13.70	187.76	81-90	5
Levallois cores preparation flakes	L	12	30	111	681	56.75	23.20	538.35	36-40	2
									51-55	2
	W	13	28	76	601	46.23	14.47	209.41	26-30	2
									31-35	2
									36-40	2
									46-50	2
	T	13	8	26	213	16.38	5.57	31.01	22-23	3
	◁	13	45	88	901	69.31	10.64	113.14	61-65	5
Levallois cores	L	13	46	134	1188	91.38	23.10	533.78	76-80	2
									86-90	2
	W	14	55	102	1041	74.36	13.74	188.66	71-75	3
	T	14	16	61	482	34.43	12.43	154.53	26-30	4
	◁	12	58	90	890	74.17	11.48	131.81	56-60	3
									66-70	3
									86-90	3
Levallois flakes	L	22	32	107	1339	60.86	19.62	384.54	36-40	4
									51-55	4
	W	23	23	107	1211	52.65	16.15	260.66	46-50	5
									56-60	5
	T	26	9	28	414	15.92	5.05	25.46	9-10	4
									11-12	4
									15-16	4
									19-20	4
	◁	24	56	86	1749	72.88	7.24	52.44	71-75	9
Single platform cores	L	8	47	97	562	70.25	17.11	292.69	56-60	2
									96-97	2
	W	8	30	83	512	64.00	17.36	301.25	81-83	2
	T	8	35	139	624	78.00	32.87	1080.25	61-65	2
	◁	8	60	87	598	74.75	9.86	97.19	81-87	3
Flakes from single platform cores	L	75	30	115	4109	54.79	17.09	292.01	46-50	14
	W	94	26	111	4482	47.68	16.79	281.88	46-50	16
	T	99	6	35	1634	16.51	5.87	34.51	13-14	16
	◁	75	46	93	5403	72.04	10.26	105.27	66-70	16
Flakes from opposite platform cores	L	6	43	82	365	60.83	16.14	260.47	43-45	2
	W	7	34	103	403	57.57	22.07	487.10	35-40	2
	T	7	1	53	142	20.29	15.28	233.35	16-20	2
	◁	6	56	90	451	75.17	11.33	128.47	86-90	2
Changed orientation flake cores	L	7	58	95	502	71.71	11.63	135.35	61-65	2
	W	7	47	133	525	75.00	26.39	696.57	56-60	2
	T	7	37	112	418	59.71	25.86	668.49	41-45	2
									46-50	2
	–	8	61	89	584	73.00	9.30	86.50	61-70	4
Flakes from changed orientation cores	L	42	32	153	2759	65.69	25.18	633.79	41-45	6
									61-65	6
	W	51	32	178	2950	57.84	25.02	625.95	41-45	8
	T	52	9	56	1133	21.79	9.87	97.40	13-14	11
	◁	31	52	105	2461	77.94	11.26	126.90	81-85	7
Blades from single platform cores	L	8	43	107	557	69.63	20.14	405.48	61-65	2
	W	25	19	55	773	30.92	8.90	79.27	26-30	7
									31-35	7
	T	25	7	29	354	14.16	6.16	37.89	13-14	7
	◁	9	67	90	710	78.89	7.91	62.54	67-70	2
									71-75	2
									81-85	2

Table 7. Jebel Kobkabba. Area A/A(s). Measured attributes of selected retouched tool categories.

Tool category		n.	min	max	Sx	x	s	s^2	Mode Range	Number in mode
Notched flakes	L	7	42	81	466	66.57	13.33	177.67	71-75	2
	W	11	28	95	546	49.64	19.95	398.05	31-35	2
									36-40	2
									41-45	2
	T	11	10	27	214	19.45	5.00	24.98	19-20	3
	◁	7	63	96	529	75.57	9.94	98.82	71-75	3
Denticulated flakes	L	11	43	104	696	63.27	20.52	421.11	46-50	3
	W	14	30	84	769	54.93	16.57	274.49	50-54	3
	T	16	8	25	261	16.31	5.53	30.84	12-13	4
	◁	7	62	92	512	73.14	11.15	124.41	62-65	3
Retouched flakes	L	33	21	121	2032	61.58	22.99	528.73	61-65	6
	W	45	23	126	2721	60.47	23.92	572.16	56-60	8
	T	47	3	56	1034	22.00	11.68	236.38	17-18	6
									21-22	6
	◁	21	37	90	1543	13.63	13.63	185.77	86-90	5

Table 8. Jebel Kobkabba. Areas B/C. Measured attributes of selected debitage categories.

Debitage categories		n.	min	max	Sx	x	s	s^2	Mode Range	Number in mode
Primary flakes	L	52	27	123	2583	49.47	18.47	341.30	51-55	8
	W	63	23	103	3014	47.84	16.18	261.69	41-45	17
	T	64	8	47	1148	17.94	8.19	67.12	13-14	12
	◁	26	41	94	1722	66.23	16.87	284.64	76-80	6
Flakes from single platform cores	L	14	32	65	656	46.86	11.29	127.55	36-40	4
	W	18	27	70	720	40.00	11.67	136.11	27-30	5
	T	18	8	31	290	16.11	5.78	33.43	19-20	4
	◁	11	49	96	831	75.55	13.10	171.70	76-80	4
Flakes from changed orientation cores	L	8	39	128	543	67.88	27.33	746.86	56-60	3
	W	9	28	111	530	58.89	22.34	499.21	46-50	2
									51-55	2
	T	9	7	39	207	23.00	9.84	96.89	31-32	2

Table 9. Jebel Kobkabba. Technical indices.

Index	A/A(s) area	B/C area	Total
Early Workshop Index	19.71	44.44	24.71
Levallois Workshop Index	2.39	0.65	2.01
Core Index	8.83	7.84	8.62
Levallois Core Index	29.17	33.33	30.00
Tool Index	33.52	13.73	29.17
Levallois Index (IL)	11.98	3.22	10.98
Blade Index (Ilam)	13.28	4.89	11.22
Levallois Group Index (IGL)	14.64	8.33	13.29

Table 10. Jebel Kobkabba. Typological indices.

Indices Tools	large	ess.	ret. tools
Levallois Typological Index (ILty)	20.37	00.00	00.00
Side-scraper Index (IR)	9.88	22.22	12.40
Charentian Index (IC)	4.94	11.11	6.20
Biface Index (IB)	0.62	1.39	0.78
I - Lavallois Group	20.37	00.00	00.00
II - Moustarian Group	11.11	25.00	13.95
III - Upper Palaeolithic Group	1.23	2.78	1.55
IV - Denticulate Group	15.43	34.72	19.38
IMp - Mousterian and Mousterian-like Points Index	1.23	2.78	1.55

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