

Middle Palaeolithic stone tool technology in the Kortallayar Basin, South India

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A study of the Middle Palaeolithic stone tool technology from assemblages in South India reveals diverse reduction strategies, including preferences exercised in the choice of raw material and blanks for tool manufacture. Various behaviour patterns are identified which have significant implications for the relatively little known Indian Middle Palaeolithic.

Key-words: India, Kortallayar basin, Middle Palaeolithic, lithics

Introduction

Recent approaches towards the study of Palaeolithic stone tool assemblages in India vary greatly. Most reports on excavations or surveys contain lists of tool types and often use types as 'index fossils' for culture-stratigraphic successions. Others emphasize tool manufacturing techniques (Corvinus 1983; Jayswal 1978), and may put forward observations on hominid behaviour in their regional settings (Allchin *et al.* 1978; Misra 1989; Murty 1981; Paddayya 1982; Pappu 1997; Sharma & Clark 1983). Artefacts are also examined in terms of attributes which may inform on natural formation processes (Petraglia 1995; Pappu 1999: 135). This paper examines stone tool technology from the surface collection of artefacts from Middle Palaeolithic sites in the Kortallayar basin, South India, with emphasis on the lithic reduction sequence. This is one of the few regions in India where site formation processes have been studied, to identify well-preserved Lower and Middle Palaeolithic sites (Pappu 1996; 1997; 1999) and to make observations on hominid behaviour. This paper also places assemblages from the study region within the context of the relatively little known Indian Middle Palaeolithic, with implications for further studies of varied hominid behaviour patterns.

The region

The study region (FIGURE 1) in the Kortallayar Basin, Tiruvallur district, Tamil Nadu, South

India comprises an area of 200 sq. km. Upper Gondwana formations (the Allikulli hills and outliers; Muralidharan *et al.* 1993; Pappu 1996: 15) are the source of the raw materials in the form of quartzite and quartzitic sandstone pebbles and cobbles and quartz nodules, which were redistributed over the region via colluvial, sheet and stream flood processes (FIGURE 2). A regional survey (1991–1995) documented 22 localities with Lower and Middle Palaeolithic artefacts. Middle Palaeolithic sites have varied artefact densities ranging from 3–4 to 28 artefacts/sq.m, covering areas of 50 sq. m to around 1 sq. km. Sites occur in rock-shelters in the Allikulli hills; on hill slopes; in open-air contexts in low-to-medium-energy episodic sheet wash deposits; and erode out of ferricretes and ferricritized gravels (Pappu 1999: 132). Most localities have stratified Lower to Middle Palaeolithic horizons (FIGURE 2), testifying to the intense and continuous occupation of this region during the Pleistocene.

Middle Palaeolithic assemblages

An understanding of the complete lithic reduction sequence, as opposed to a listing of tool types, was necessary to study hominid behaviour patterns during the Middle and Late Pleistocene. Attributes chosen included general ones applicable for all tool types (such as raw material, blank form, patina, cortex percentage and position, dorsal flake scar patterns, dimensions, etc.) and those specific to certain artefact types

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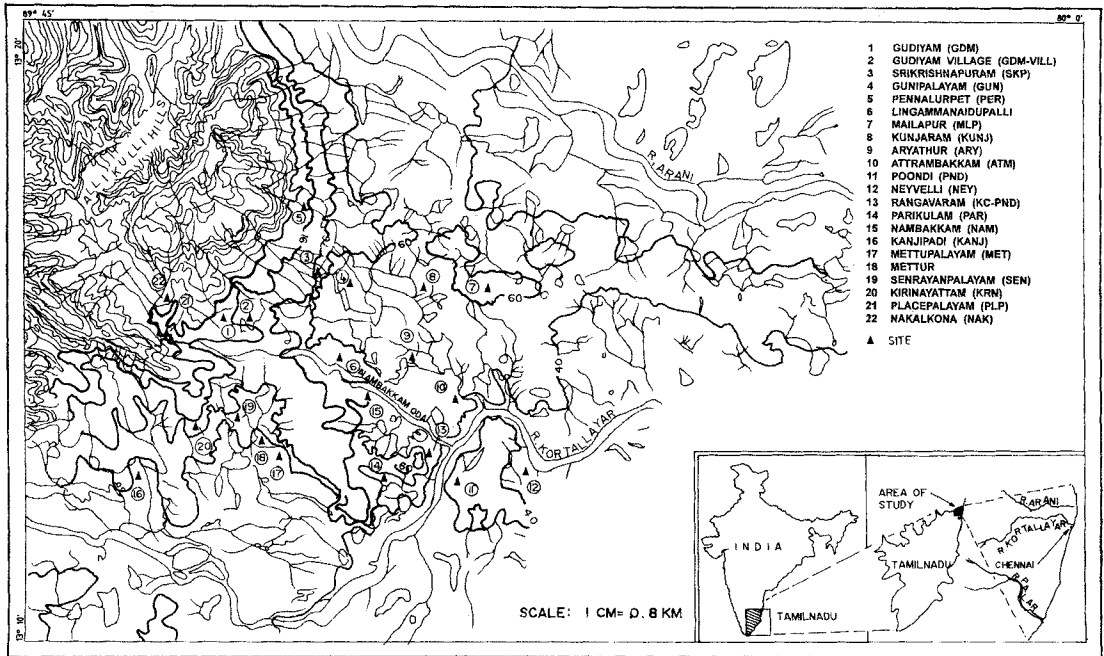


FIGURE 1. The Kortallayar Basin (contour and drainage) showing distribution of Palaeolithic sites.

(such as distinct measurements for bifaces, cores, etc.). Artefacts were divided into cores, debitage and finished tools. A few general types were chosen, acknowledging the fact that there is considerable gradation between types owing to technological or non-functional causes. A brief description of these assemblages is followed by a discussion and implications for hominid behaviour. Codes for the names of sites are listed in TABLE 1.

Raw material

The principal raw material comprised quartzite, followed by quartzitic sandstone, and quartz (TABLE 2). These were derived from the weathering and reworking of the Upper Gondwana Satyavedu and Sriperumbudur formations of the Allikulli hills, and their outliers. No site is more than 4 km from raw material sources.

Blank types

Tools made on cobbles and pebbles are seen at all sites but form an important percentage at sites located on hillslopes, where they would have been easily accessible. Artefact types on these blanks include core-scrapers, cores grading into bifaces or chopping tools, bifaces, and chopping tools. Natural spalls (termed here

thermal fracture spalls) resulting from prolonged weathering of cobbles and boulders were utilized to a greater extent in areas where the bedrock was easily exposed; and required only minimal modification to be used as tools. They were preferred for the manufacture of 'core-scrapers' or were irregularly retouched and are classified as 'pieces with retouch'. The bulk of tools are on flakes. These include prepared core flakes which are found at all sites but predominate at ATM. Artefacts may be on non-cortical flakes, or on cortical flakes (28-33%); the latter were rarer in localities situated close to abundant sources of raw material. Artefacts on flake-blades and blades constitute an important component of the total assemblage only at GUN and PLP. Tools on broken/exhausted cores and tools and those on debitage flakes, chunks, thermal fracture spalls/chunks predominate in areas away from raw material sources.

Cores

Modified cobbles/trimmed nodules representing early stages in core trimming and reduction are found at almost all sites and predominate at sites further away from raw material sources. Cores are few in number (FIGURE 3). Levallois cores (mean dimension of 103x77x45 mm) are

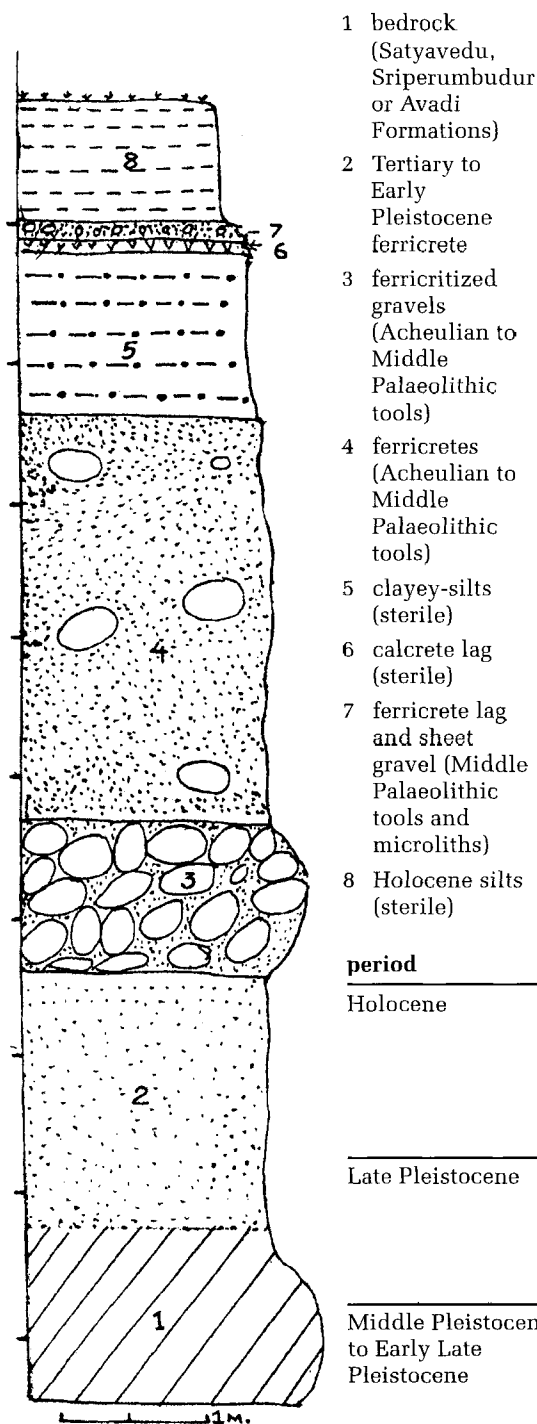


FIGURE 2. *Composite Quaternary stratigraphic sequence.*

- 1 bedrock (Satyavedu, Sriperumbudur or Avadi Formations)
- 2 Tertiary to Early Pleistocene ferricrete
- 3 ferricretized gravels (Acheulian to Middle Palaeolithic tools)
- 4 ferricretes (Acheulian to Middle Palaeolithic tools)
- 5 clayey-silts (sterile)
- 6 calcrete lag (sterile)
- 7 ferricrete lag and sheet gravel (Middle Palaeolithic tools and microliths)
- 8 Holocene silts (sterile)

on fine-to-medium-grained quartzites, some being unstruck. Levallois flakes outnumber cores at all sites. Discoidal cores (mean dimension of 92x80x40 mm) are also noted. Flake cores include single, opposed, multiple or 90° platform cores. In several cases they grade into other tools (or possess the 'potentiality' of doing so); in particular handaxes, chopping tools and core scrapers. In two cases, flakes were detached from an older patinated flake surface which represents an earlier phase of reduction.

Debitage

At most sites non-cortical flakes predominate. When present, cortex is generally less than 25% of the total surface area, exceeding 50% at only four sites (NEY, NAM, ARY, ATM). The importance of cortex as a natural backing occurs especially in the case of unretouched, possibly utilized, flakes where it is noted along the right and left sides. A considerable proportion of flakes end in step terminations, considered to be the result of flaws in raw material as a result of which cores on quartzite often become exhausted.

Finished tools

These are marked by the predominance of scrapers and core-scrapers, a continuation of the biface and chopper-chopping element associated with the Acheulian, and negligible percentages of

period	sedimentary deposit	associated sites
Holocene	Palar-Kortallayar Surface (silts, sands and clays of the Kortallayar, including levees, pointbars, channel-lag deposits), gullies ferricrete lag	sterile microliths
Late Pleistocene	sheet and stream flood deposits, (ferricrete lag and sheet gravel) clayey-silts and calcrete lag (palaeopond)	Late Middle Palaeolithic sterile
Middle Pleistocene to Early Late Pleistocene	ferricretized and ferruginous colluvial deposits, stream and sheet flood deposits	Acheulian-Middle Palaeolithic

Tertiary to Early Pleistocene ferricretes

Upper Gondwana Satyavedu, Sriperumbudur and Avadi formations

artefact types	ATM	ARY	NAM	NEY	MLP	GUN
<i>modified cobbles</i>	1 (0.24%)	5 (0.98%)	1 (0.93%)	—	4 (2.45%)	2 (1.00%)
<i>cores</i>	14 (3.14%)	13 (2.56%)	2 (1.85%)	1 (1.75%)	19 (11.66%)	12 (6.00%)
Levallois	3	3	1	1	2	6
discoidal	2	—	1	—	5	1
flake	8	6	—	—	3	1
flake-blade	1	2	—	—	1	1
flake and blade	—	—	—	—	1	1
blade	—	—	—	—	1	2
exhausted	—	2	—	—	6	—
cores grading into chopping tools	3 (0.73%)	2 (0.39%)	—	1 (1.75%)	—	—
cores grading into bifaces	4 (0.98%)	—	1 (0.93%)	—	1 (0.61%)	—
<i>debitage</i>	284 (69.27%)	345 (67.91%)	55 (50.93%)	30 (52.63%)	92 (56.44%)	90 (45.00%)
chips	25	57	—	6	12	3
chunks	20	30	2	—	9	5
critical flakes	65	83	15	7	22	7
noncortical flakes	96	123	14	5	27	27
edge resharpening flakes	1	6	5	—	3	—
core rejuvenation flakes	6	—	—	1	1	7
biface trimming	—	—	—	—	5	—
unretouched utilized flakes	20	1	2	5	—	11
unretouched Levallois flakes	30	9	3	2	10	9
unretouched flake-blades	12	17	8	2	—	3
unretouched Levallois points	2	8	—	—	—	—
unretouched knives	3	—	6	—	—	6
broken artefacts	4	11	—	2	3	12
<i>finished tools</i>	104 (25.36%)	143 (28.15%)	49 (45.37%)	25 (43.86%)	47 (28.83%)	96 (48.00%)
scrapers	28 (6.83%)	20 (3.94%)	18 (16.66%)	10 (17.54%)	12 (7.36%)	25 (12.5%)
single straight sided	4	6	10	2	5	17
single convex sided	3	5	2	1	2	1
single straight sided & convex	—	1	—	1	—	—
single straight & end	—	—	—	2	1	—
convergent	9	3	—	—	1	2
double straight-sided	—	2	3	2	1	—
double straight sided & end	2	1	1	2	1	2
double straight sided & convex	—	—	1	—	1	—
dejeete	3	2	—	—	—	—
end	7	—	—	—	—	3
bifacial	—	—	1	—	—	—
scraper-grading into notches	1 (0.24%)	6 (1.18)	3 (2.77%)	3 (5.26%)	3 (1.84%)	12 (6.00%)
core scrapers	34 (8.29%)	26 (5.12%)	6 (5.55%)	9 (15.79%)	10 (6.14%)	4 (2.00%)
denticulates	4 (0.98%)	12 (2.36%)	2 (1.85%)	—	3 (1.84%)	7 (3.5%)
knives	5 (1.22%)	21 (4.13%)	—	1 (1.75%)	4 (2.45%)	9 (4.5%)
notches	2 (0.49%)	6 (1.18%)	3 (2.77%)	—	2 (1.23%)	2 (1.00%)
borers	—	—	1 (0.93%)	1 (1.75%)	—	—
Levallois points	—	15 (2.95%)	—	—	—	—
points	1 (0.24%)	1 (0.19%)	2 (1.85%)	—	1 (0.61%)	7 (3.5%)
pieces with retouch	25 (6.1%)	19 (3.74%)	7 (6.48%)	—	5 (3.06%)	25 (12.5%)
bifacially flaked tools	—	—	—	—	2 (1.23%)	—
chopper-chopping tools	—	13 (2.56%)	3 (2.77%)	—	2 (1.23%)	1 (0.5%)
handaxes	2 (0.49%)	4 (0.79%)	3 (2.77%)	—	3 (1.84%)	4 (2.00%)
cleavers	2 (0.49%)	—	1 (0.93%)	—	—	—
hammerstones	—	—	—	1 (1.75%)	—	—
<i>total artefacts from each site</i>	<i>410</i>	<i>508</i>	<i>108</i>	<i>57</i>	<i>163</i>	<i>200</i>

Key: ATM=Attrambakkam (Attirampakkam); ARY=Aryathur; NAM=Nambakkam ; NEY=Neyvelli ; MLP=Mailapur; PLP=Placepalayam; NAK=Nakalkona; GUN=Gunipalayam; SEN=Senrayanpalayam; MET=Mettur to Mettupalayam; KRN=Kirinayattam; GDM=Gudiyam ; PER=Pennalurpet

TABLE 1. *Middle Palaeolithic artefact types (counts and % of total number of tools at each site).*

artefact types	SEN	MET	KRN	PLP	NAK	GDM	PER	total
<i>modified cobbles</i>	–	2 (5%)	–	3 (3.85%)	–	–	–	18
<i>cores</i>	1 (2.08%)	–	–	2 (2.56%)	–	1 (5.26%)	–	65
Levallois	–	–	–	–	–	–	–	16
discoidal	–	–	–	–	–	–	–	9
flake	1	–	–	2	–	1	–	22
flake-blade	–	–	–	–	–	–	–	5
flake and blade	–	–	–	–	–	–	–	2
blade	–	–	–	–	–	–	–	3
exhausted	–	–	–	–	–	–	–	8
cores grading into chopping tools	–	–	–	3 (6.41%)	–	–	–	9
cores grading into bifaces	–	–	–	–	–	–	–	6
<i>debitage</i>	14 (29.16%)	29 (72.5%)	9 (50%)	55 (70.51%)	–	9 (47.37%)	1 (16.66%)	1013
chips	–	3	–	5	–	–	–	111
chunks	7	10	6	33	–	2	–	124
cortical flakes	2	–	–	1	–	–	–	202
non-cortical flakes	1	8	–	–	–	–	–	301
edge resharpening flakes	1	–	–	1	–	–	–	17
core rejuvenation flakes	–	2	–	3	–	2	1	23
biface trimming	–	–	–	–	–	–	–	5
unretouched utilized flakes	3	6	3	6	–	3	–	60
unretouched Levallois flakes	–	–	–	1	–	2	–	66
unretouched flake-blades	–	–	–	1	–	–	–	43
unretouched Levallois points	–	–	–	–	–	–	–	10
unretouched knives	–	–	–	–	–	–	–	15
broken artefacts	–	–	–	4	–	–	–	36
<i>finished tools</i>	33 (68.75%)	9 (22.5%)	9 (50%)	15 (19.23%)	2 (100%)	9 (47.37%)	5 (83.33%)	546
scrapers	11 (22.92%)	4 (10.00%)	1 (5.55%)	3 (3.85%)	1 (50%)	6 (31.58%)	2 (33.33%)	141
single straight sided	1	1	1	–	–	1	–	48
single convex sided	1	1	–	2	–	3	1	22
single straight sided & convex	–	–	–	–	–	–	–	2
single straight sided & end convergent	2	–	–	–	–	1	–	3
double straight sided	3	–	–	1	1	–	–	18
double straight sided & end	3	2	–	–	–	1	–	13
double straight sided & convex	–	–	–	–	–	–	–	15
dejeete	–	–	–	–	–	–	–	2
end bifacial	1	–	–	–	–	–	1	5
scrapers grading into notches	1 (2.08%)	–	–	–	–	–	–	10
<i>core scrapers</i>	10 (20.83%)	1 (2.5%)	–	–	–	–	–	3
denticulates	1 (2.08%)	–	–	–	–	–	–	29
knives	–	–	–	3 (3.85%)	–	2 (10.53%)	–	45
notches	–	1 (2.5%)	–	2 (2.56%)	–	–	1 (16.66%)	19
borers	–	–	2 (11.11%)	–	–	–	2 (33.33%)	6
points	1 (2.08%)	–	–	–	–	–	–	13
Levallois points	–	–	–	–	–	–	–	15
pieces with retouch	5 (10.42%)	1 (2.5%)	6 (33.33%)	3 (3.85%)	–	–	–	96
bifacially flaked tools	–	–	–	–	–	–	–	2
chopper-chopping tools	–	1 (2.5%)	–	–	–	1 (5.26%)	–	21
handaxes	1 (2.08%)	–	–	2 (2.56%)	–	–	–	19
cleavers	1 (2.08%)	–	–	–	–	–	–	4
anvil	–	–	–	1 (1.28%)	–	–	–	1
uniface	–	–	–	–	1 (50%)	–	–	1
hammer-stones	–	–	–	–	–	–	–	1
miscellaneous	2 (4.16%)	1 (2.5%)	–	1 (1.28%)	–	–	–	4
<i>total artefacts from each site</i>	48	40	18	78	2	19	6	

TABLE 1 (continued).

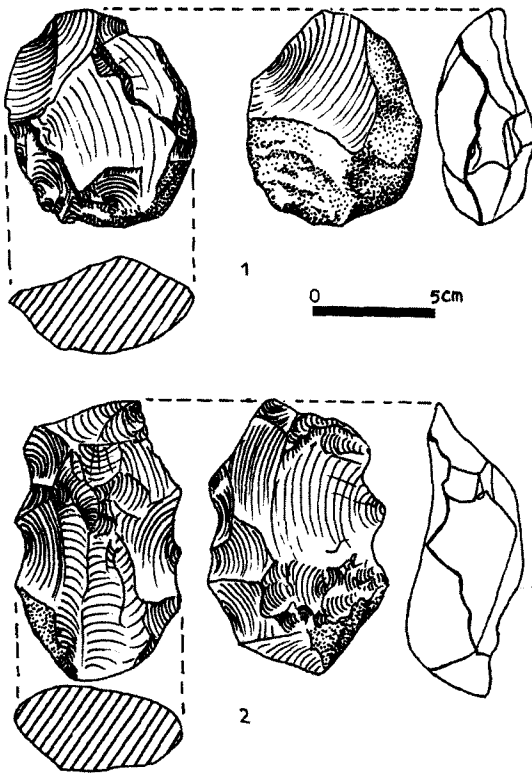


FIGURE 3. *Flake cores: 1 irregular flake core with extensive edge damage, possibly utilized; 2 prepared core, from which final flake was not detached.*

other artefact types (TABLE 1, FIGURES 4 & 5). Most scrapers have only one edge (convex or straight) retouched. Core-scrapers occur on varied blank types including cores, chunks/nodules/thermal fracture spalls/older flakes, pebbles/cobbles, on flakes. At MLP, GUN and ARY, there was a definite preference for using older flakes (as indicated by the presence of

two phases of patination), or thick flakes. In addition to standardized 'types', debitage, irregular flakes, natural spalls, and broken cores/tools were often irregularly irretouched and termed here 'Pieces with retouch'. Levallois points are concentrated at ARY, with no corresponding cores being noted. Chopper-chopping tools, handaxes (elongate ovate), and cleavers are rare; the latter are concentrated at sites further away from raw material sources.

Discussion of Middle Palaeolithic technology and behavioural implications

Middle Palaeolithic hominids, in this region, predominantly exploited locally available quartzite pebbles and cobbles. However, geomorphological processes and hominid exploitation through time affected the distribution and ease of accessibility of raw material sources (Pappu 1997). Gravel-based deposits along the hill slopes and foothills of the Allikullis and their outliers yielded clasts of all sizes and types, which were easily accessible throughout the Pleistocene. Colluvial, sheet and stream flood process led to the reworking and size sorting of these clasts over the region (Pappu 1999: 133). However, with the gradual formation of ferricretes, some of the clasts and bedrock sources were buried and inaccessible. The principal source of raw material now included clasts, derived from periodic sheet floods, which were smaller in size and of differing, mainly quartzite, lithology. In the case of sites located along the foothill zone and on hill slopes (PLP, GDM, PEN, MET, KRN, SEN, NAM), artefacts are generally greater than 80 mm in size (FIGURE 6). Sites located in sheet and stream flood deposits (ATM, MLP, ARY, GUN), exhibit a decrease in artefact sizes, which is in accordance with a decrease in the size of natural clasts

type	ATM	ARY	NAM	NEY	MLP	GUN	SEN	MET	PLP	total
quartzite	394	454	101	52	152	158	48	40	69	1468
quartzitic sandstone	14	47	6	4	6	39	—	—	8	124
quartz	2	7	1	1	5	3	—	—	1	20
<i>total</i>	<i>410</i>	<i>508</i>	<i>108</i>	<i>57</i>	<i>163</i>	<i>200</i>	<i>48</i>	<i>40</i>	<i>78</i>	<i>1612</i>

Quartzites were further divided according to colour (using Munsell colour) and grain (Pappu 1997). They included: 7.5R/1 (very dark grey); 10YR 5/2 (greyish-brown); 7.5 R 5/4 (brown); 5/1 (dark greyish green); 2.5 YR 4/1 (dark reddish-grey); 7.5 YR 7/2 (pinkish-grey); 2.5 Y 5/1 (grey); 10 YR 6/4 (pale brown); 10 YR 7/4 (yellow); 10 YR 6/6 (yellowish brown); 7.5 R 4/6 (red); 2.5 YR 7/2 (light reddish brown); 7.5 YR 7/3 (grey); 10 YR 6/8 (brownish-yellow); 7.5 R 5/3 (brown); 10 R 3/1 (dark reddish brown).

TABLE 2. *Artefact raw material types.*

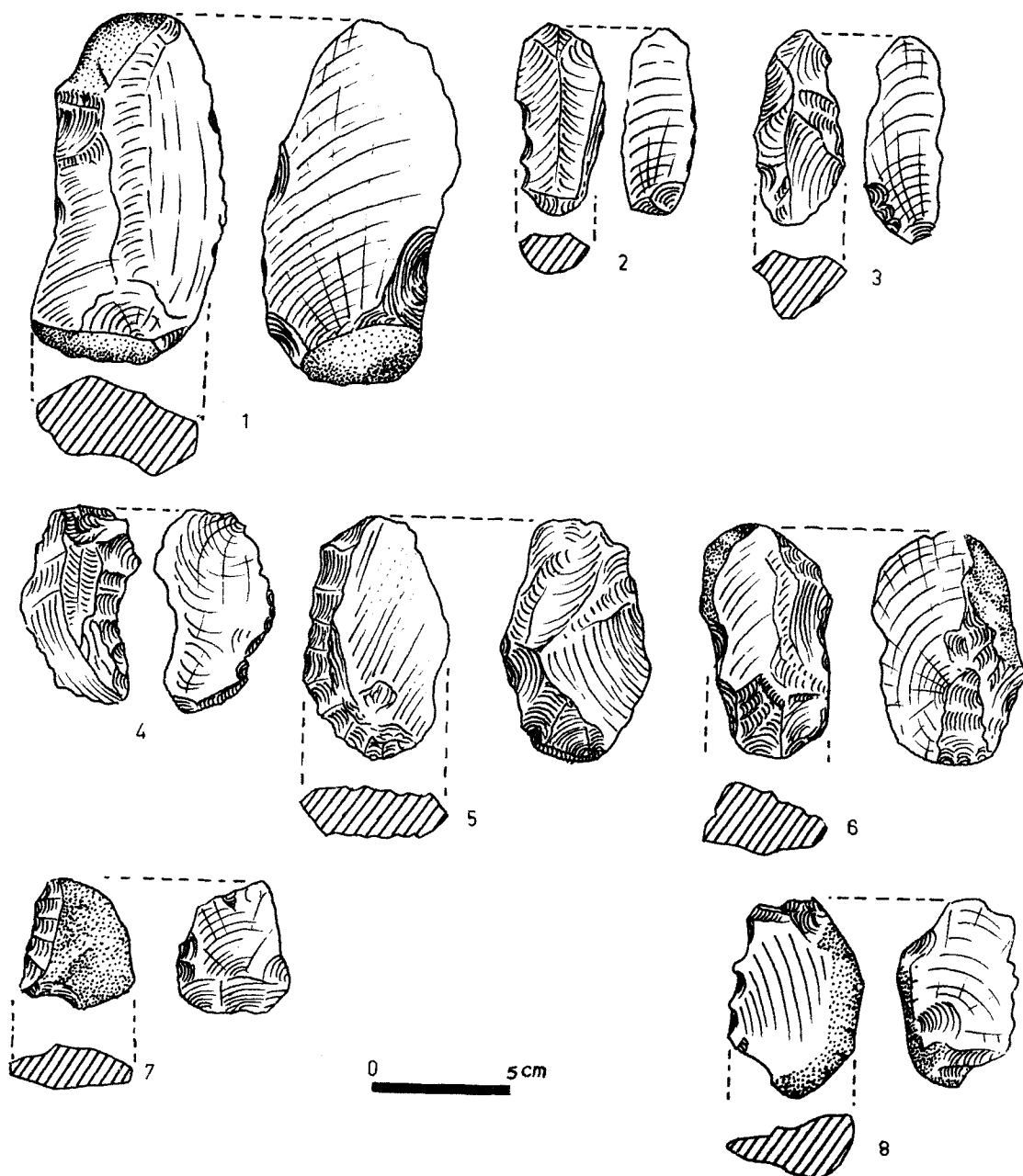


FIGURE 4. Finished tools: 1-3 flake-blades; 5 'knife' on natural thermal spall; 6 backed 'knife'; 4 7 pieces with retouch; 8 denticulate.

available. At ATM, a comparison of clast sizes and artefact sizes indicates that most tools >80 mm and all tools >160 mm have undergone preliminary off-site trimming and that raw material clasts were brought from elsewhere. In the case of sites located close to abundant

raw material sources a relatively limited number of rock types were exploited. In the opposite situation, even coarse-grained quartzites have been used. No relationship between artefact types and rock types is seen, and locally available raw material was predominant.

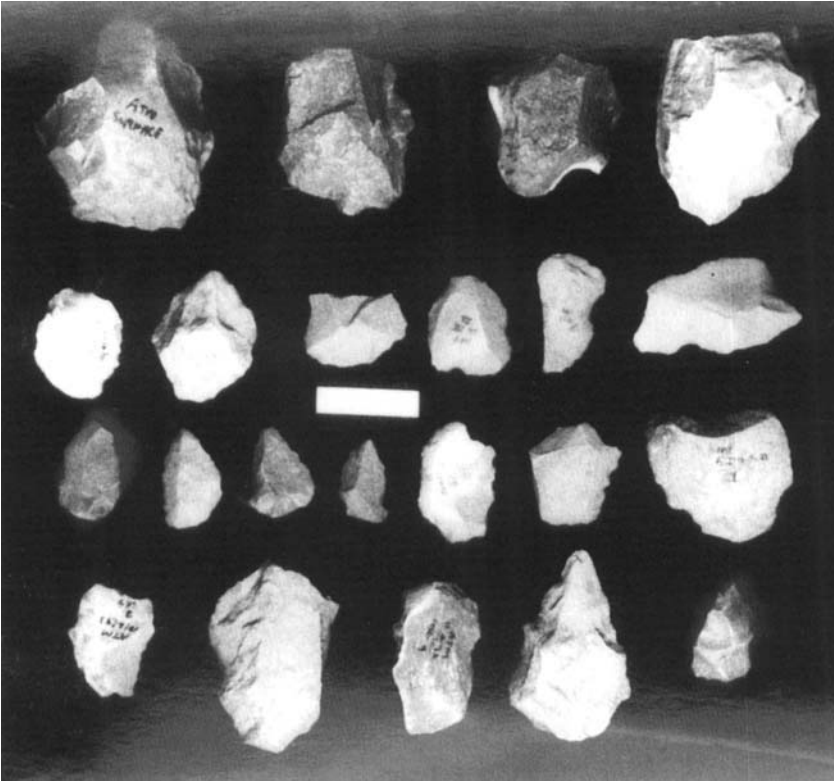


FIGURE 5. *Finished tools (from left to right): row 1 core scrapers; row 2 three scrapers and three notches; row 3 knife, points (three), denticulates (three); row 4 knives (three), points (two).*

Cores are few in number and never match the percentage of debitage (TABLE 1). Flake cores grade into chopping tools, pounding tools and bifaces. On comparing bifaces with cores grading into bifaces, the latter are larger than the former, indicating some reduction in core volume. This is important when considering the fact that bifaces were possibly also a source of flakes (Jones 1994), and that no biface trimming flakes were found at these sites. At all sites the ratio of cores *versus* tools or cores *versus* debitage is very low. The highest number of cores is noted at sites further away from raw material sources. One reason for the small percentage of prepared cores could be attributed to clast size, where a smaller nodule size leads to the predominance of naturally backed pieces and lower frequency of the Levallois technique (Fish 1981: 379). Important to note is the existence of a possible gradation between Levallois and discoidal cores representative of stages in the reduction of Levallois cores. This is seen in West Asia (Bar-Yosef & Meignen 1992; Rolland 1988: 163) at Bir Tarfawi (Close & Wendorf 1993) and in the Son valley sites (Sharma & Clark 1983).

Naturally backed cortical retouched/unretouched 'knives' are most frequent at GUN, ATM and ARY where the clasts are comparatively smaller. This point is, however, debatable, as no such pieces are noted at MLP and NEY, while they are also present in the hills where clasts of all sizes are freely available. Levallois flakes predominate at ATM, where local nodule size is smaller. No Levallois blade and point cores were noted despite the presence of these blank types.

At sites where raw material is easily available the size of debitage, in particular cortical debitage, tends to be larger. Cortical debitage has a chunkier or globular aspect as is also noted in other areas where quartzites are used (Jones 1994: 279). At almost all sites, equal percentages of 'late' stage to 'early' stage debitage predominates.

Only a few tool classes are seen at each site. In general, retouch is only along one edge and rarely does the same edge bear more than one type of retouch. Artefacts with more than one type of retouch along different edges are noted in small percentages at all sites. Retouch types

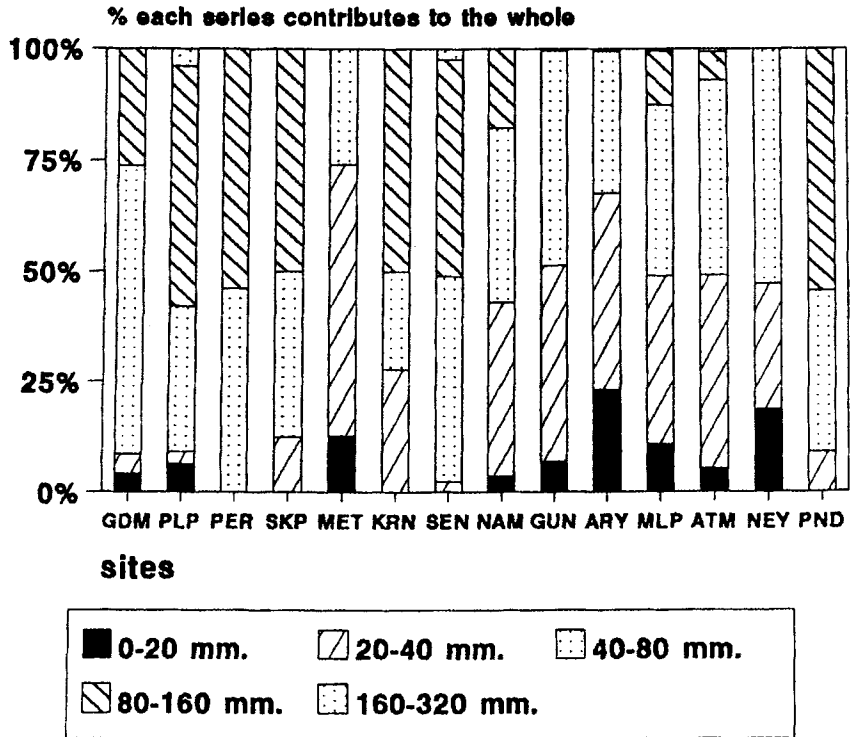


FIGURE 6. *Artefact sizes — intersite variability.*

are often dependent on the thickness of the tool/edge, with steep retouch in cases where the tool is thick. Retouch comprises steep abrupt, irregular scalar retouch with few cases of alternate or inverse retouch. Broken tools are few and re-use of older artefacts as indicated by differential patination is noted at some sites. At other sites broken/exhausted cores have been converted by re-chipping into core-scrapers. These are most common at ATM and ARY, along with a high percentage of tools on debitage, pointing to intensive utilization of such resources. FIGURE 7 is a simplified lithic reduction sequence.

In the absence of organic remains or excavated sites, interpretations of hominid settlement strategies must remain tentative. Sites such as NAK, KRN, PLP, located on hillslopes, with low artefact densities, use of thermal fracture spalls and minimally retouched large tools, may point to short-term special-purpose sites.

Most sites display little evidence of preliminary core trimming and the abundance of debitage in preference to cores points to considerable movement of partly trimmed cores and tools across the landscape. True quarry sites have yet to be discovered.

Strategies linked to the preparation of raw material in anticipation of use, the importing and transport of cores/bifaces to areas where raw material is rare and the re-use of older/broken tools and debitage is seen at most sites in the region. Artefacts representative of Levallois, blade and biface technology are often associated with strategies representing higher degrees of mobility, but are however outnumbered by non-standardized tools.

In addition to resource structure, the repeated reoccupation of sites through time (from the Acheulian onwards), with the highest tool densities in sites located close to the river, could be tied to anticipation of re-usable raw materials, in particular in those areas where they are scarce. One possible strategy emerging is the seasonal movement of hominids between the river and the hills based on the availability of water and associated game.

The Kortallayar basin represents the southernmost extension of the Indian Middle Palaeolithic, and regional variability as reflected in lithic technology needs to be examined. Most Indian Middle Palaeolithic sites display predominant use of locally available raw material, except at Samnapur (Misra *et al.* 1990) and the

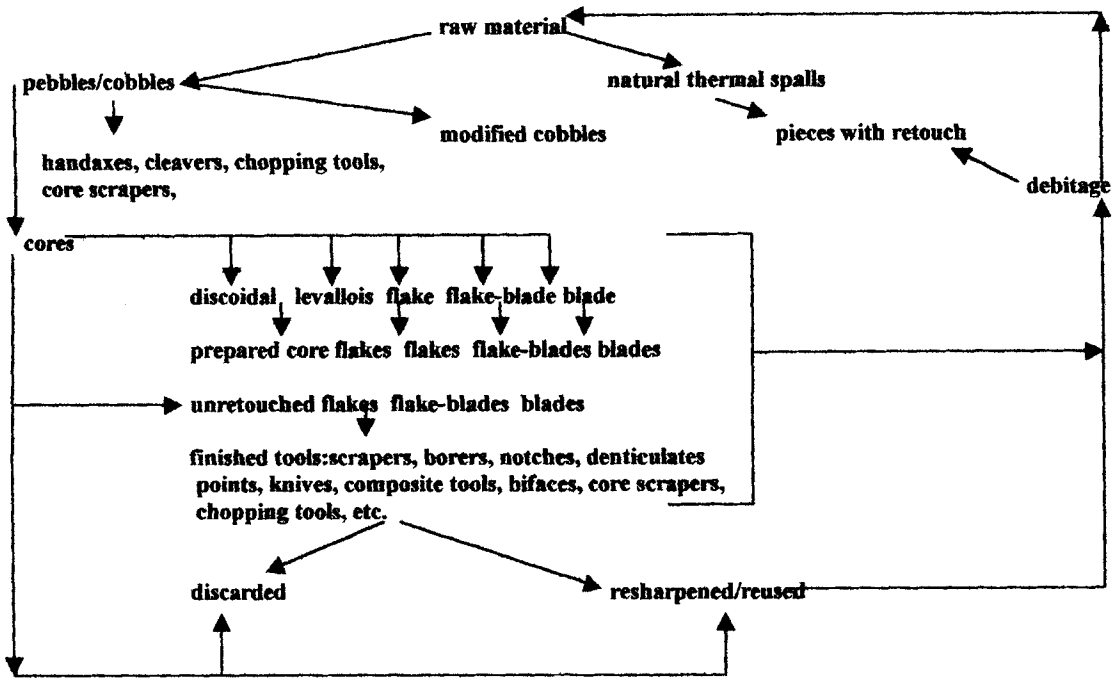


FIGURE 7. *Simplified lithic reduction sequence.*

Son valley sites (Sharma & Clark 1983), and this pattern also emerges from the Kortallayar site complex. No relationship between artefact types and rock types is seen in the study region; and this is true for most Indian Middle Palaeolithic sites except Jamalpur (Jayswal & Pant 1977–78) and the Son valley sites (Sharma & Clark 1983). A shift in raw material from quartzites used during the Acheulian to siliceous rocks is noted only in those areas where such material was available. It has been noted that at Indian Middle Palaeolithic sites where quartzites predominate, tools have greater dissimilarities in shapes and less pronounced retouch (Alam 1990; Misra 1972), and this is a common feature in the Kortallayar basin sites. A continuation of Acheulian types is noted here as elsewhere and has been linked by Misra (1972) to the continued use of quartzites. The prepared core element (Jayswal 1978) is observed in the Kortallayar basin sites; and is linked to the use of quartzites, in contrast with the blade element predominant in areas with siliceous raw materials. As studied elsewhere in India (Sankalia 1974: 148), the size of tools in the Kortallayar basin is closely linked to the size of raw materials. Misra (1972) believes that during the

Middle Palaeolithic there is a decrease in the size of tools and craftsmanship, and a decline in the percentage of Levallois flakes and an increase in tools on thin natural pieces with retouched margins. This is also seen over parts of Central, Western and Southern India (Sankalia 1974: 150; Joshi & Sali 1969), where natural nodules or pieces of stone were retouched into points and borers marked by a lack of symmetry and refinement. These observations hold good for the Kortallayar basin sites as well. Important to note is the unusual predominance of cores at the site of Lakhmapur (Petraglia *et al.* in preparation), in contrast to other Indian Middle Palaeolithic sites. In the present state of our knowledge, variability in lithic technology in the Indian Middle Palaeolithic appears to cross-cut geographic and environmental boundaries and to be largely conditioned by raw material constraints.

This study takes a small step forward in highlighting aspects of lithic technology and regional variability within the little-known Middle Palaeolithic of South India. A programme of excavations of selected sites, beginning with on-going work at the Lower and Middle Palaeolithic site of Attirampakkam (ATM), will aid

in resolving problems related to the Lower to the Middle Palaeolithic transition in this region, and provide dates and more information on Quaternary environments. The Indian Middle Palaeolithic has yielded little except stone tools and much work remains to be done towards understanding hominid behaviour in this part

of the Subcontinent, in contrast to its better-known counterparts in Europe, Africa and Asia.

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