Palaeolithic sites in the periphery of the Middle Son Valley, Northern Vindhyan Plateau, Central India: Preliminary investigation

Praveen Kumar [1,2], M. C. Srivastava [2], Pushpendra Kumar Nandan [2]

1. Archaeological Survey of India, Patna Circle, Patna - 800001, Bihar, India. Email: 1995nagod@gmail.com
2. Department of Ancient Indian History, Culture and Archaeology, APS University Rewa, Rewa - 486003, Madhya Pradesh, India. Email: Srivastava: dr.maheshapsurewa@gmail.com; Nandan: pknandan18@gmail.com

Abstract:

In South Asia, the northern Vindhyan Plateau in central India preserves a rich Palaeolithic record derived from both alluvial plains and the Kaimur hill range. The Middle Son Valley (MSV), one of the key river basins in this region, has been extensively studied by various scholars and institutions, yielding a significant record of Palaeolithic sites along with vertebrate fossils from dated, stratified alluvial sediments. However, relatively little is known about the nature of Palaeolithic remains in the tributaries, neighbouring river valleys, and foothill zones of the Kaimur Range within the peripheral areas of the MSV. This research addresses this gap through systematic archaeological investigations carried out between 2012 and 2025 in the neighbouring regions of the MSV. Fieldwork involved structured surveys, documentation of lithic assemblages, and analysis of their geomorphological contexts. A total of 787 lithic artefacts were documented from surface sites and stratified localities, collected from sedimentary exposures and selected surface contexts. The investigations led to the discovery of several new Palaeolithic sites, prehistoric painted rock shelters, and related archaeological assemblages in the Kaimur hill range and its foothills, as well as in adjacent river valleys, often preserved within well-stratified deposits. The foothill zones yielded Acheulean assemblages dominated by cleavers from secure stratified layers, alongside artefacts attributable to the Late Palaeolithic or Mesolithic, mostly recovered from surface contexts. Additionally, hundreds of painted prehistoric rock shelters were documented in the Kaimur Range, associated with Late Palaeolithic or Mesolithic assemblages and other archaeological remains. In neighbouring river valleys - such as the Rihand, Mayar, Tons, Gopad, Ken, and Choti Mahanadi - numerous Lower, Middle, and Late Palaeolithic or Mesolithic artefacts were recorded, along with vertebrate fossils from stratified layers. These findings demonstrate that the peripheral zones of the MSV form a significant archaeological landscape that reflects recurrent hominin occupation. The results further suggest that the Vindhyan basin provided a favourable ecological setting for sustained Palaeolithic habitation and adaptation, offering new insights into the distribution and behavioural patterns of prehistoric populations across the wider Middle Son Valley region.

Keywords: Acheulean assemblages; geomorphology; Kaimur hill range; Middle Son Valley; Palaeolithic archaeology; River basin; rock shelters; Vindhyan Plateau

Journal of Lithic Studies (2024) vol. 11, nr. x, 41 p. DOI: https://doi.org/10.2218/jls.9684

Published by the School of History, Classics and Archaeology, University of Edinburgh
ISSN: 2055-0472. URL: http://journals.ed.ac.uk/lithicstudies/

1. Introduction and background

The growing body of evidence and recent dating of Palaeolithic sites in South Asia make this region one of the most significant for prehistoric research (Akhilesh *et al.* 2018; Chauhan 2020; Pappu *et al.* 2011). Central India, in particular, is a crucial area within this region for prehistoric archaeological findings (Chauhan 2020; Mishra 2007; 2016; Ota & Deo 2014; Varma 2012). Throughout the Pleistocene, Central India served as a major corridor for the movement and exchange of technologies, ideas, cultural practices, and genetic material (Chauhan 2016; Krishnaswami & Soundarajan 1951).

The hilly landscape, river basins and abundant raw materials make this region a favourable refugia of Pleistocene hominins (Korisettar 2007; Kumar 2025). There are two major basin areas, the Satpura and Vindhyan basins, both of which consist of suitable landscapes and resources for prehistoric communities to thrive. A large number of prehistoric sites have been discovered from different landscapes, such as foothill areas, alluvial plains, and rock shelters, by various scholars in the past (Chauhan 2020; Kumar 2025; Mishra 2016; 2007; Ota & Deo 2014; Varma 2012; Wakankar & Robert 1976).

In the Vindhyan basin, the Northern Vindhyan region is well known for its prehistoric archaeological research. The first exploration at this area was conducted by Carlleyle (1883) and Cockburn (1879; 1889) at the Kaimur hill range, Banda area and Sigrauli basin. During the expedition in the Northern Vindhyan region, they explored painted rock shelters and vertebrate fossils along with the stone tools. After Carlleyle-, and Cockburn's work, new investigations were conducted at several Quaternary river basins, such as the Son, Tons, Ken and Belan valleys, which revealed rich prehistoric archaeological materials along with palaeontological remains (Ahmed 1966; Clark & Sharma 1983; Jones & Pal 2009; Kumar *et al.* 2020; Mehra 2018; Varma 1964; 2012).

Geographically, this area is bounded by the Ganga alluvial plains in the north, Chhota Nagpur plateau in the east and the Narmada basin in the south (Figure 1). The above areas surrounding the study region, except the Ganga basin, have yielded rich Palaeolithic assemblages (Ghosh 1970; Ghosh 2008; Khatri 1961; Mishra 2016); the Ganga basin, however, has yielded Microlithic assemblages, mostly of the Holocene epoch (Sharma 1973).

The Middle Son Valley (MSV) and adjoining regions probably were major hominin refugia during the Quaternary period (Ahmed 1966; Clark & Sharma 1983; Clarkson *et al.* 2020; Jones & Pal 2009; Kumar *et al.* 2020; Mehra 2018; Shipton *et al.* 2013).

The MSV is one of the major river basins in this region for prehistoric finds. Previous explorations in the Son Valley have reported prehistoric artefacts and vertebrate mammalian fossils from well-dated, stratified sedimentary archives of the Quaternary alluvium (Ahmed 1966; Clark & Sharma 1983; Clarkson *et al.* 2020; Haslam *et al.* 2012; Jones & Pal 2009; Mehra 2018; Sharma & Clark 1982; Shipton *et al.* 2013; Williams & Clarke 1995). It is obvious that prehistoric hominins with different lithic traditions have frequently occupied the MSV and adjoining regions at different time spans. However, very little is known about the nature of the Palaeolithic settlements in the adjoining foothill areas and along the major tributary streams of the MSV and adjacent river basins. Recent field investigations by the authors in major MSV tributaries - the Gopad, Rihand, Mayar (Kumar *et al.* 2021), Kanchan, and other basins such as the Tons (Kumar 2025), Ken (Kumar *et al.* 2020), and Yamuna - have yielded Lower, Middle, and Late Palaeolithic (or Mesolithic) artefacts from stratified Quaternary sediments along river channels (Figure 1). The Kaimur foothills have also produced numerous Acheulean and Microlithic sites, both as surface finds and from primary-context deposits, providing new insights into Palaeolithic occupation in the peripheral areas of the MSV.

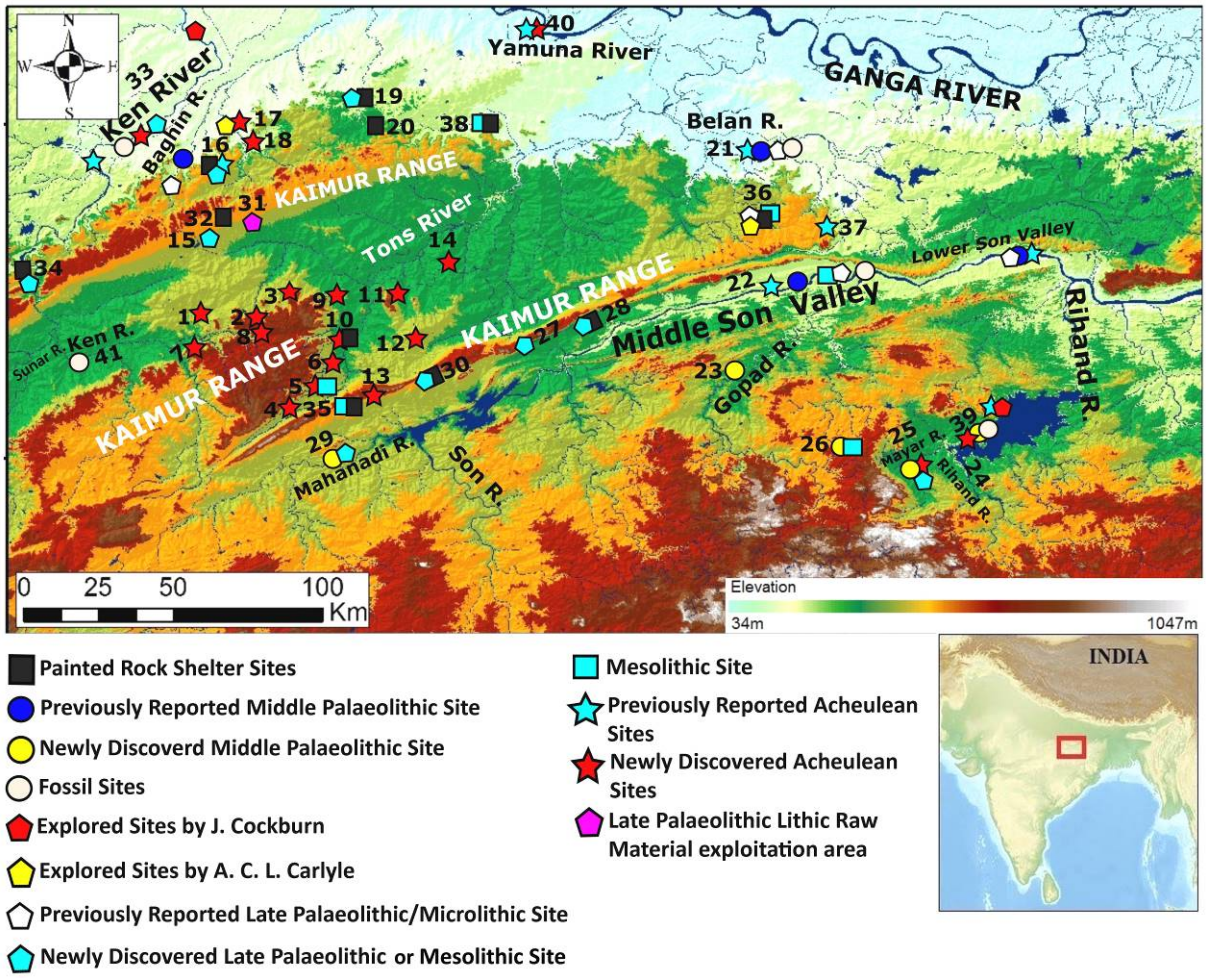

Figure 1. Distribution of Palaeolithic sites in the Middle Son valley and adjoining areas (1. Nirankali Mata Mandir, 2. Chhijora, 3. Siddhnath Mandir, 4. Roopganj, 5. Maihar, 6. Khoh, 7. Nayagaon, 8. Pipariya Don, 9. Bandhi Mohar, Birpur, 10. Bharhut, 11. Krishnagarh, Kudiya, 12. Semara, 13. Bhadanpur, 14. Kharahari, 15. Bhaji-Khera, 16. Brihaspati Kund, 17. Shahpur, 18. Baraundha, 19. Siddhpur, 20. Majhgawan, 21. Belan River, 22. Middle Son Valley, 23. Gopad River, 24. Rihand River, 25. Mayar River, 26. Lamidah, 27. Mohaniya Ghati, 28. Hatta hill, 29. Bhadaura, 30. Dhausada, 31. Pahadiya, 32. Usrar, 33. Middle Ken Valley, 34. Gharighat, 35. Manaura, 36. Mirzapur, 37. Adwa Ghati, 38. Dharkundi, 39. Judi, 40. Mau, 41. Dagdha) (Source of base map: Japan Aerospace Exploration Agency (JAXA). *ALOS Global Digital Surface Model "ALOS World 3D-30 m (AW3D30)*).

2. Methods

The survey work was conducted from the year 2012 to 2025, covering approximately 300 square kilometres in north-central India, across the districts of Satna, Singrauli, Sidhi, Panna, Rewa, Maihar, Katni, and Chitrakoot in northern Madhya Pradesh and southern Uttar Pradesh. Key locations in this region were selected to study geomorphology in detail and to collect lithic and sediment samples, aiming to understand the sites' environmental setting and overall techno-cultural features. ArcGIS software was used for making a raster DEM base map (Figure 1), and a geological map (Figure 2) for the study of the drainage network, lithology, and general topography of the research area. From most of the Late Palaeolithic and Mesolithic sites, artefacts were collected randomly from the surface. The collection was selective, focusing on technologically diagnostic pieces, such as cores, variously retouched tools, bifaces, points, *etc.* Undiagnostic debitage elements are poorly represented in the collection.

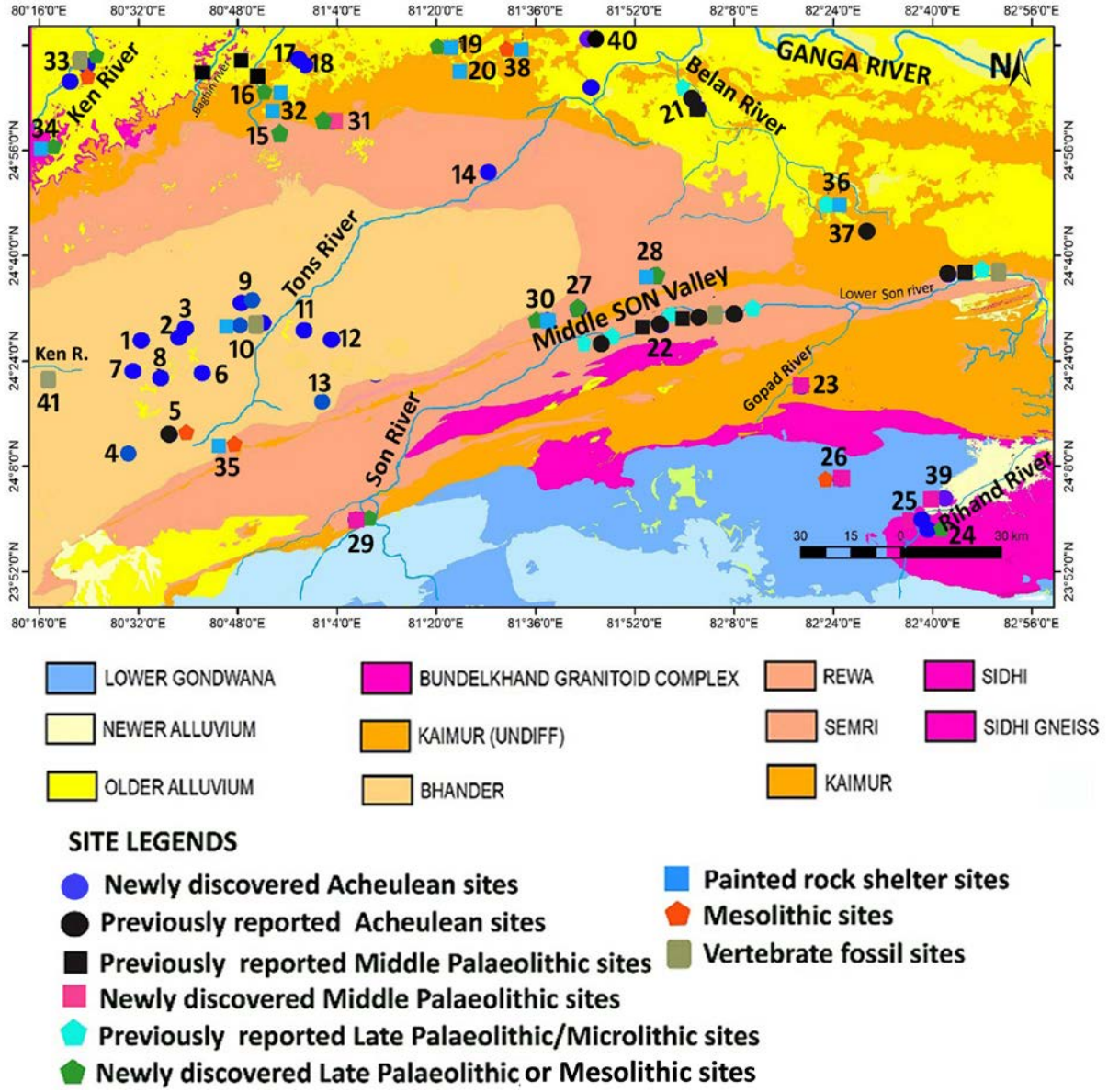

Figure 2. Major geological formations and river basins at the study area. (Note- serial numbers of sites are based on the figure 1 map) (base map from Geological Survey of India (2026)).

A total of 787 lithic artefacts were recorded in the survey, both from surface sites and stratified localities. The artefacts were collected randomly as and when they were located, especially from sedimentary sections and a few selected surface sites. For instance, lithics were collected directly from recently exposed sections at sites along the river channels (Rihand Basin, Tons River, and Gopad River site, Yamuna River), as well as from the foothill sites, such as Siddhnath Mandir Road, Semara, Bhadanpur, Pipariya Don, and Chhijora. The same method was followed while collecting artefacts from surface sites at foothills, where artefact scatters were found near exposed sections at Nirankali Mata Mandir, Roopganj, Bhadanpur, Shahpur, Baraundha, Shiv Nagar, Birpur, Bandhi Mohar, Pipariya Don and Chhijora.

At a few sites, such as the foothill site at Krishnagarh and the rock shelter sites at Usrar and Dhausada, a systematic (1m square grid) collection of artefacts was carried out to have better control over the collection. At these sites, the artefacts have been exposed recently by anthropogenic activities, and therefore, they are relatively less disturbed. The grid-sampling was intended to help understand the *chaînes opératoires* of the lithic production sequence.

The artefacts are classified by their cultural affinities, such as Lower Palaeolithic (Acheulean and pebble tools). The Acheulean sites mentioned here do not typologically represent a Late Acheulean assemblage; they could instead belong to the Early or Middle Acheulean phases. However, due to the lack of direct dating, it is currently difficult to determine precisely which phase they belong to.

Additional assemblages are attributed to the Middle Palaeolithic, Late Palaeolithic or Mesolithic (All Late Palaeolithic or Mesolithic are surface sites and have not been dated so far. These sites could be of pre-Holocene or Holocene phase) and Mesolithic phase (Mesolithic refers to Holocene microlithic surface assemblages with 'palette-stones' or 'mace-heads'). The term "Late Palaeolithic" is used to describe microlithic industries, distinguishing them chronologically from Mesolithic industries, and technologically from preceding Middle Palaeolithic technologies (Blinkhorn 2018). The lithics were analysed following a techno-typological approach (Andrefsky 2005; Débenath & Dibble 1994; Sharon 2006; Van Peer 1992), aiming to infer the *chaînes opératoires* of lithic production and technological adaptations of prehistoric knappers in the Vindhyan basin. For the analysis of Acheulean lithic assemblages, we followed the methods described by Sharon (2006), Corvinus (1983), Andrefsky (2005), and Débenath & Dibble (1994). For the typology analysis of Middle Palaeolithic tools, we referred to Andrefsky (1998) and Débenath & Dibble (1994). For the study of Late Palaeolithic or Mesolithic tools, we followed Allchin (1966) and Andrefsky (2005).

3. Geomorphology and Site Distribution

Exposed geological formations in the region range from the pre-Cambrian to the Quaternary phases (Figure 2). Sandstones of various geological phases, shales, limestones, and Quaternary sediments cover a large part of the area. Quaternary formations are mostly exposed in the river basins, such as the Son, Rihand, Ken, Tons and Yamuna. These river basins are part of the central Ganga drainage system and generally contain thick Quaternary sediments over the bank.

The exploration led to the discovery of 29 new sites belonging to the Palaeolithic and Mesolithic periods. Of these, 18 sites are Lower Palaeolithic, 4 are Middle Palaeolithic, and 7 are either Late Palaeolithic or Mesolithic. In addition, 28 sites from the same region have been previously reported, including Acheulean (N=1), Middle Palaeolithic (N=1), and Mesolithic (N=26) sites (Kumar *et al.* 2020; 2021; 2022; Nandan *et al.* 2020; Nandan 2013).

The sites in the study area occur in two geomorphic contexts: (a) alluvial plains and (b) the foothills of the Kaimur ranges. Detailed information on site locations, stratigraphic context, artefact assemblages, and cultural affiliation is provided in Table 1.

Table 1. Newly discovered sites at the periphery of the Middle Son Valley. Abbreviations: LP= Lower Palaeolithic; MP= Middle Palaeolithic; LP or M = Late Palaeolithic or Mesolithic; M=Mesolithic; L= Laminar.

Site Name	Geo-coordinates	Cultural material	Evidence of Quaternary Fossil	Geological context
Foothill Sites				
Pipariya Don	N 24°15'52.82'' E 80°19'34.48''	LP (Acheulean)	-	Stratified
Nirankali Mata Mandir	N 24°21'45.41'' E 80°20'05.47''	LP (Acheulean)	-	Stratified
Chhijora	N 24°22'11.18'' E 80°23'40.74''	LP (Acheulean)	-	Stratified
Siddhnath Mandir Road, Jaitupura	N 24°22'16.89'' E 80°23'51.03''	LP (Acheulean)	-	Stratified
Siddhnath Mandir	N 24°20'35.8'' E 80°23'57.4''	LP (Acheulean)	-	Stratified
Nayagaon	N 24°22'39.8'' E 80°25'17.3''	LP (Acheulean)	-	Stratified
Birpur	N 24°29'13.05'' E 80°47'20.90''	LP (Acheulean)	-	Stratified
Bandhi Mohar	N 24°30'13.08'' E 80°48'08.55''	LP (Acheulean)	-	Stratified
Shiv Nagar	N 24°55'35.24'' E 80°48'12.88''	LP (Acheulean)	-	Stratified
Khoh	N 24°25'49.54'' E 80°44'37.30''	LP (Acheulean)	-	Stratified
Krishnagarh	N 24°28'30.14'' E 81°01'09.51''	LP (Acheulean)	-	Stratified
Semara	N 24°21'41.56'' E 80°58'51.06''	LP (Acheulean)	-	Stratified
Roopganj	N 24°11'55.18'' E 80°44'15.47''	LP (Acheulean)/ LP or M	-	Stratified
Bhadanpur	N 24°09'34.52'' E 80°49'03.09''	LP (Acheulean)	-	Stratified
Shahpur	N 25°02'15.70'' E 80°40'06.07''	LP (Acheulean)	-	Stratified
Baraundha	N 25°02'45.60'' E 80°39'30.99''	LP (Acheulean)	-	Stratified
Bhaji-Khera	N 24°40'45.13'' E 80°29'04.15''	LP or M	-	Stratified
Mohaniya Ghati	N 24°27'14.18'' E 81°35'39.41''	L	-	Surface
Pahadiya	N 24°45'39.49'' E 80°34'75.57''	LP or M with quarry site		Stratified
Majhgawa	N 24°55'35.73'' E 80°48'12.87''	LP (Acheulean) and LP or M	-	Surface
Usrar, Singhpur	N 24°45'57.93'' E 80°31'18.06''	LP or M	-	Stratified (rock shelter site)
Dharkundi	N 24°55'57.46'' E 81°03'19.88''	LP or M and M	-	Stratified (rock shelter site)
Dhausada, Amarpatan	N 24°20'22'' E 81°09'54''	LP or M	-	Surface Scatters (rock shelter site)
Lamidah	N 24°06'07.17'' E 82°21'06.42''	MP and M	-	Surface scatters hillslope
Manaura	N 24°06'28'' E 80°40'32''	M	-	Stratified rock shelter site

Site Name	Geo-coordinates	Cultural material	Evidence of Quaternary Fossil	Geological context
Hatta hill	N 24°29'30.94'' E 81°44'33.14''	LP or M	-	Surface scatters
Alluvial Plain Sites				
Rihand River basin, (Mayar River and Kanchan River)	N 24°00'11.38'' E 82°37'47.26''	LP (Late Acheulean), MP, and LP or M	-	Stratified
Kharahari (Tons River)	N 24°42'24.48'' E 81°09'53.53''	LP (pebble tools or core and flake)	-	Stratified
Bharhut area (Tons River)	N 24°25'10.99'' E 80°51'55.18''	LP (Acheulean), LP or M	Vertebrate fossil	Stratified
Bhadaura, Choti Mahanadi	N 24°49'17.52'' E 80°39'36.06''	MP and LP or M	-	Stratified (MP) and Surface scatters (LP/M)
Gopad river	N 24°25'37.65'' E 82°12'07.45''	MP	-	Stratified
Mau, Yamuna River	N 25°16'01.81'' E 81°24'13.73''	LP	-	Stratified, River section
Dagdha, Ken River	N 24°19'52.85'' E 80°04'32.20''	LP (pebble tools or core and flake)	Vertebrate fossil	Stratified
Koni Village, Amran River, Nagod	N 24°30′05.77″ E 80°32′23.19″	LP (Acheulean)	-	Stratified

4. Sites in the Alluvial Plains

Sites in the alluvial plains are distributed along the Son River channel and the mainstream channels in the Middle Son Valley, as well as adjoining regions, which include the tributaries of the Son, such as the Rihand, Mayar (Kumar *et al.* 2021), Kanchan, Gopad, and Mahanadi.

Sites are also reported from the Tons and the Ken River basins (Kumar *et al.* 2020), which drain into the Ganga River. The sites belong to three major cultural periods: the Lower Palaeolithic (N=4), Middle Palaeolithic (N=7), and Late Palaeolithic or Mesolithic (N=6) (Figure 3) (Table 2). Of all the alluvial sites reported in the survey, the Rihand basin is the richest, with a higher density of Palaeolithic localities (N=5) than other valleys in the MSV.

4.1. Rihand River basin

The Rihand River (Figure 1) is a major tributary of the Son, which flows through the Indian States of Chhattisgarh, Madhya Pradesh and Uttar Pradesh. Geologically, this river basin is a part of the Vindhyan supergroup, composed of low-dipping formations of sandstone, shale, and carbonate with a few conglomerate and volcanic beds (Chakraborty 2006). The Rihand River originates from the Matiranga hills, in the region southwest of the Mainpat plateau, which is about 1,100 metres above mean sea level.

The river flows northward through the central part of Surguja and Surajpur districts (Chhattisgarh) for approximately 160 km. It then continues northward into the Sonbhadra district of Uttar Pradesh via the Singrauli district of Madhya Pradesh, where it is called the Rhed river, and finally joins the Son river. The Mayar and Kanchan rivers are the two major tributaries of the Rihand. The Mayar is larger than the Kanchan and flows in a south-to-east direction, whereas the Kanchan River flows in a north-to-south direction.

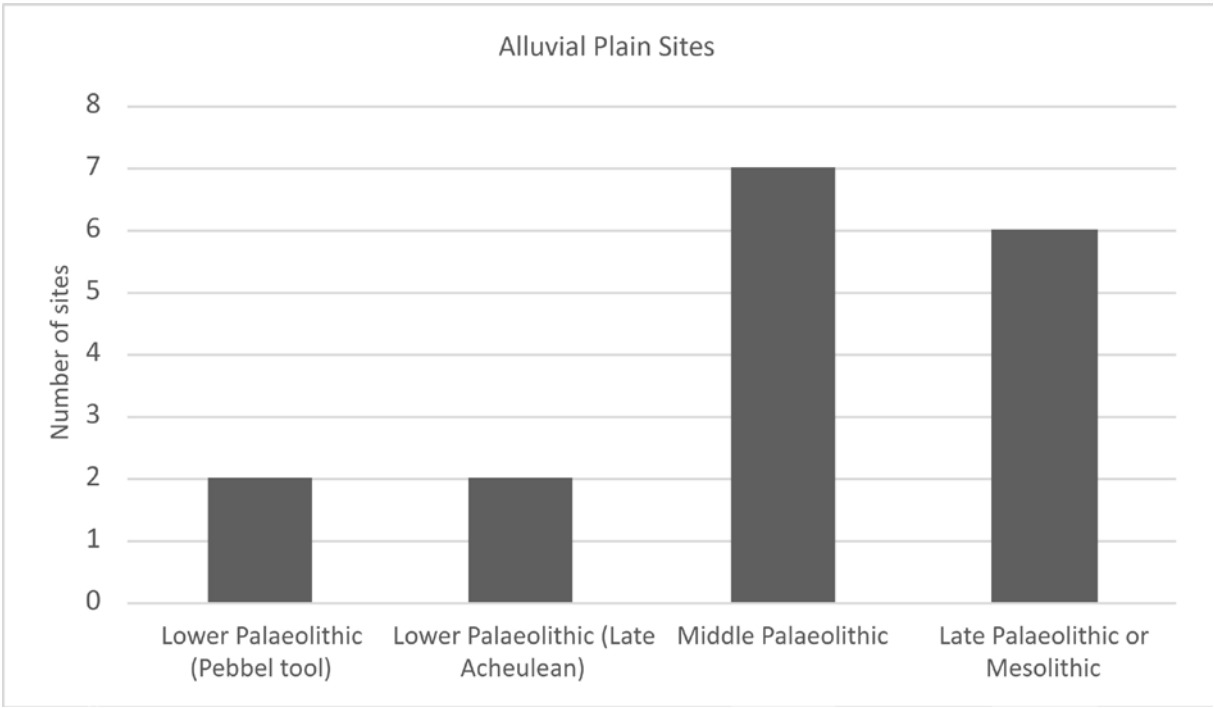

Figure 3. Distribution of Palaeolithic sites in the Alluvial plains.

Table 2. Newly discovered Palaeolithic alluvial plain sites with the number of recorded artefacts on the periphery of the Middle Son Valley. Abbreviations: LP = Lower Palaeolithic; MP = Middle Palaeolithic; LP or M = Late Palaeolithic or Mesolithic; M = Mesolithic.

No.	River	Locality/Sites	Cultural Material	No. of Artefacts
1	Tons River	Kharahari and Bharhut	LP (Pebble tools, cores and flakes)	10
2	Yamuna River	Mau	LP	8
3	Rihand River basin (Mayar & Kanchan rivers)	Judi, Kam, Naudhiya, Basauda and Gahidad	LP (Late Acheulean), MP and LP or M	104
4	Choti Mahanadi	Bhadaura	MP and LP or M	40
5	Gopad River	Bahri	MP	20
				Total -182

The first Palaeolithic implement from here was discovered by Cockburn (1888) in the late 19th century. After Cockburn's findings, the extensive exploration work at the lower reaches of the Rihand basin was conducted in the early 1950s by Krishnaswami & Soundararajan (1951); most of the sites they found are now submerged by the Rihand dam reservoir constructed in the late 1950s. Because of the abundance of pebble tools alongside the bifacial tools, this basin was then regarded by Krishnaswami & Soundararajan (1951) as the meeting point of the '*Madrasian*' (biface) and '*Soanian*' (pebble tools) tool traditions.

The Quaternary sediment sequence of the Rihand basin comprises 5 major units (Figure 4). The basal layer, RU 5, is the Talchir formation (Krishnaswami & Soundararajan 1951). RU 5 is overlaid by the RU 4 unit, a gravel formation incorporating Acheulean artefacts (Krishnaswami & Soundararajan 1951). The RU 4 at its top is covered by a reddish silt sedimentary unit, RU 3. RU 2 is another gravel horizon, lying over the RU3, and the top layer is a reddish silt unit, RU1. Various Palaeolithic and Late Palaeolithic or Mesolithic sites were reported by Krishnaswami & Soundararajan (1951) on either river channel banks, which are now submerged under the dam's water.

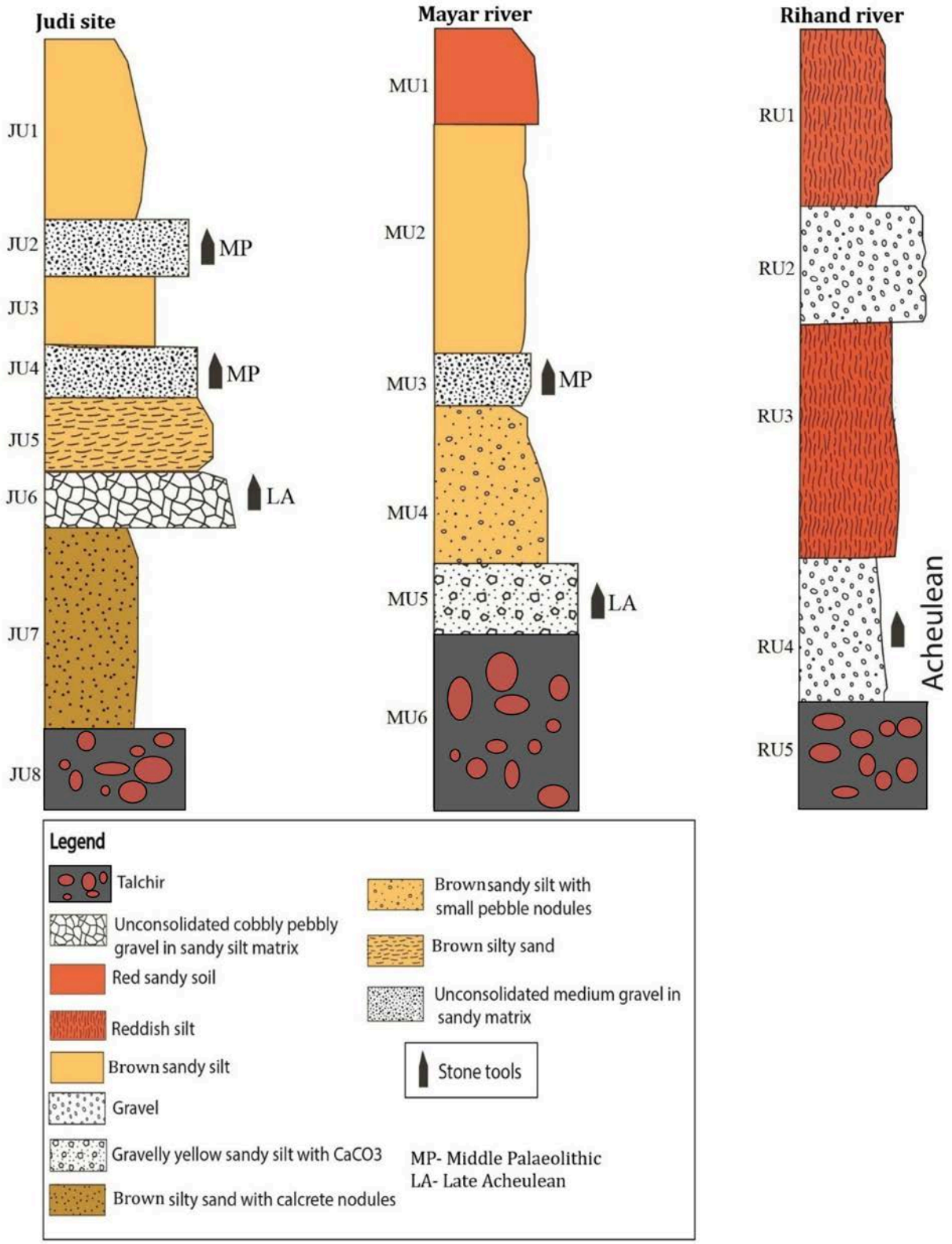

Figure 4. A Composite stratigraphy of the Rihand, Kanchan (Judi), and Mayar Rivers (Stratigraphic sequence of Rihand River drawn from Krishnaswami and Soundararajan, 1951).

4.1.1. Kanchan River (Judi)

There are four Palaeolithic and one Late Palaeolithic or Mesolithic localities alongside the Kanchan River. Most important among these is Judi having Late Acheulean and Middle Palaeolithic artefacts in stratigraphically distinct sedimentary contexts (Figure 4). The site at

Judi covers an area of approximately 2 square kilometres, drained by the Kanchan and several other seasonal streams. Constant erosion by these streams has exposed the Quaternary sediments at several places (Figure 5 a & b) that help to reconstruct a composite stratigraphy comprised of 8 sedimentary units (Figure 4). The lowest layer in the sequence is the Talchir bedrock (diamictites and poorly sorted conglomerate) (JU8), which, at some places, is found in a disintegrated form and is overlain by JU7, a brown, sandy silt formation with calcrete nodules.

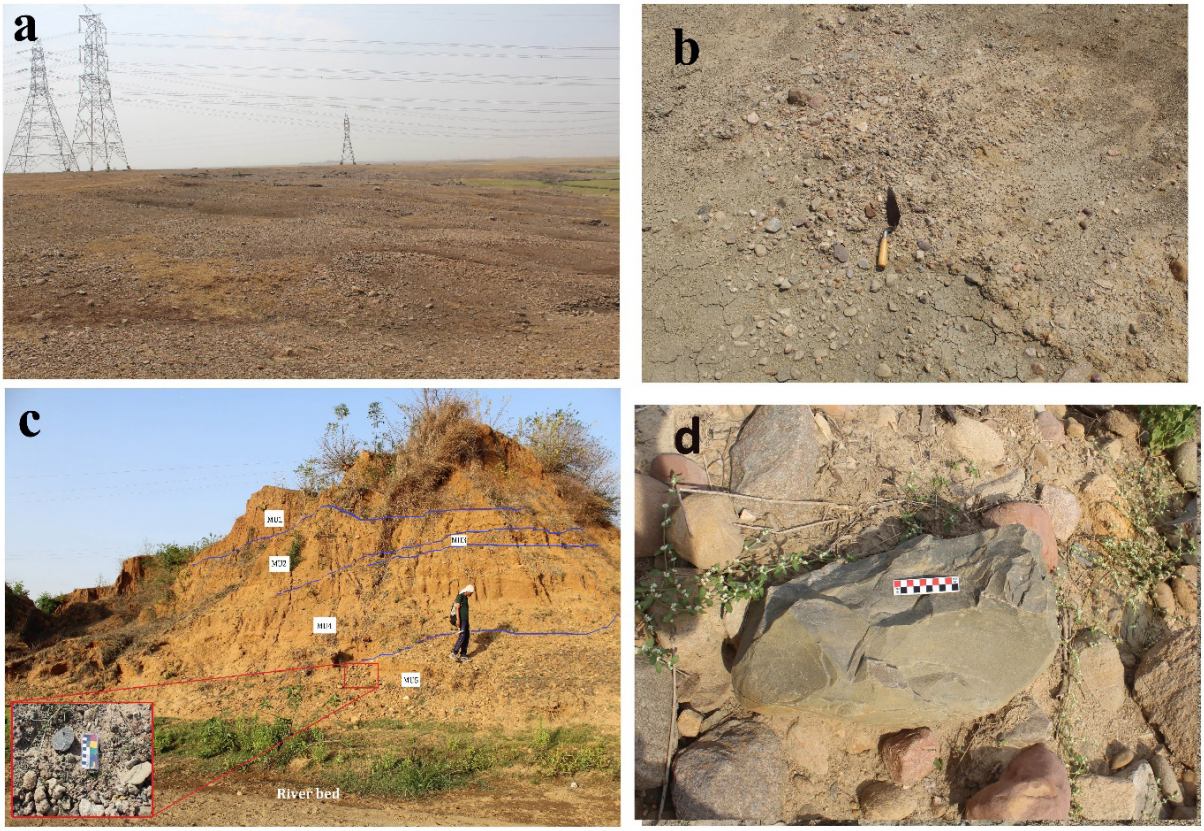

Figure 5. a) General view of Judi Palaeolithic locality, b) Exposed gravel in a sandy matrix at Judi, c) Alluvial section of the Mayar River, d) Giant core at the Mayar River bed.

JU6 is unconsolidated cobbly pebbly gravel in a sand matrix that yielded Late Acheulean tools. JU5 is brown, silty sand overlaid by a second gravel unit, JU4, which contains Middle Palaeolithic tools. JU4 is followed by JU3, a brown sandy silt. JU2 is the third gravel unit that contains a second horizon of the Middle Palaeolithic artefacts, which is followed by JU1, a brown, sandy silt formation.

4.1.2. Mayar River

The Mayar River sites are located approximately 2km south of Judi and are associated with a large expanse of Quaternary sediments deposited alongside the modern river channel. A total of two Lower Palaeolithic, seven Middle Palaeolithic and one Late Palaeolithic or Mesolithic localities have been found from the sedimentary context of this basin. The stratigraphy of the Mayar River is labelled as units MU 1 to MU 6 (Figures 4 & 5c). The lowermost Unit, MU 6, is a Talchir bedrock which is followed by MU 5 - a gravelly, brown, sandy silt and $CaCO_3$ formation - which yielded fresh, unabraded, Late Achulean artefacts.MU4 is composed of brown, sandy silt with small pebbles overlying the MU5. The MU3 unit is represented by unconsolidated gravel in a sandy matrix with Middle Palaeolithic

artefacts. Unit MU2 is composed of brown, sandy silt sediments, and the surface layer, MU1, is a red-coloured sandy soil.

4.1.3. Artefacts

All localities of Judi and Mayar have Late Acheulean, Middle Palaeolithic and Late Palaeolithic or Mesolithic artefact assemblages. In the recently exposed surface and river sections of Judi (JU6, JU4 & JU2) and Mayar (MU5 and MU3), a huge number of Late Acheulean and Middle Palaeolithic lithic scatter can be seen in the gravely sand matrix, suggesting they have recently been uncovered from stratified contexts. Many fresh flakes, lithic debitage, cores, and a few bifaces can be seen across the sites. The Late Palaeolithic or Mesolithic artefacts were recovered from the surface context of a few localities.

A total of 111 lithics were recorded from all the Rihand basin sites, mostly from surface sites and a few from stratified contexts. Table 3 describes the general features of the distribution of artefacts from different cultural periods in the foothill sites and the alluvial plains of the Rihand, Choti Mahanadi, and Gopad rivers of the MSV and the Tons River valley. While the Acheulean and Middle Palaeolithic artefacts were mostly made of quartzite and fine-grained sandstone, the Late Palaeolithic or Mesolithic artefacts were made of quartz, chalcedony and chert. All the above raw materials are locally available within the Gondwana Talchir conglomerate formation in the form of pebbles, cobbles, and boulders, and their primary source areas are distributed along the northeastern, eastern, and southeastern margins of the Singrauli Basin.

Table 3. Details of artefact assemblages from sites in the alluvial plains and foothills of the Kaimur ranges and their cultural affiliation.

Artefact type	Rihand basin	Tons River	Chotti Mahanadi River	Gopad River	Yamuna River (Mau)	Kaimur Range (foothills)	Total number
Lower Palaeolithic							
Handaxe	5	-	-	-	-	3	8
Cleaver	1	2	-	-	1	40	44
Pebble tools or core & flake	-	8	-	-	-	-	8
Prepared core	12	-	-	-	2	-	14
Giant core	7	-	-	-	-	50	57
Middle Palaeolithic							
Prepared core	28	-	-	-		6	35
Giant core	-	1	-	-	-	-	1
Scraper	30	-	5	5	-	-	40
Late Palaeolithic and Mesolithic							
Laminar core	5	-	-	15	-	6	26
Microlithic core	2	-	9	-	-	147	158
Laminar blade	7	-	-	-	-	20	27
Microlithic backed blade	4	-	7	-	-	40	51
Ringe stone or mace-heads	-	-	-	-	-	5	5

4.1.3.1. Late Acheulean and Middle Palaeolithic Cores

A total of 40 prepared cores were recovered and recorded from all gravel units of Judi (JU6, JU 4 & JU 2) and Mayar (MU5 & MU3) localities. The length of these cores ranges from 150 mm to 60 mm. The prepared cores are classified into two phases based on stratigraphy and characteristics of the lithic assemblage. The first phase is the Late Acheulean assemblage, which contains prepared cores along with bifaces, and the second phase is the Middle Palaeolithic core without a biface. The lower gravel layers (MU5 & JU6) yielded Centripetal Cores (Figure 6 e), Recurrent Centripetal Levallois Cores (Figure 6 a, c, d & h), Multidirectional Cores, Multiplatform Cores and Biface Cores alongside bifaces. These cores are made of cobbles and flake blanks. Platform preparation can be seen on the lateral side of the Centripetal Levallois Cores. From the upper gravel units (JU4, JU2 & MU3), Middle Palaeolithic cores such as Uniface and Biface Discoidal cores (Figure 6 g), Preferential Levallois Cores with centripetal preparation (Figure 6 b, f & i) and Unidirectional Cores are recovered.

At a few localities, Giant Cores or large-size cores have also been recorded (Figure 5 d). These Giant Cores are of quartzite and fine-grained sandstone boulders, which are part of the JU 6 and MU 5 (cobbly pebbly gravel) formation representing a high-energy aggregational event of the basin. Most probably, these large/giant cores were exploited by both the Late Acheulean and Middle Palaeolithic hominins. The block-on-block methods were applied on these giant cores to get ideal, large-sized flakes, which were most probably used as key blanks for making prepared cores and bifaces.

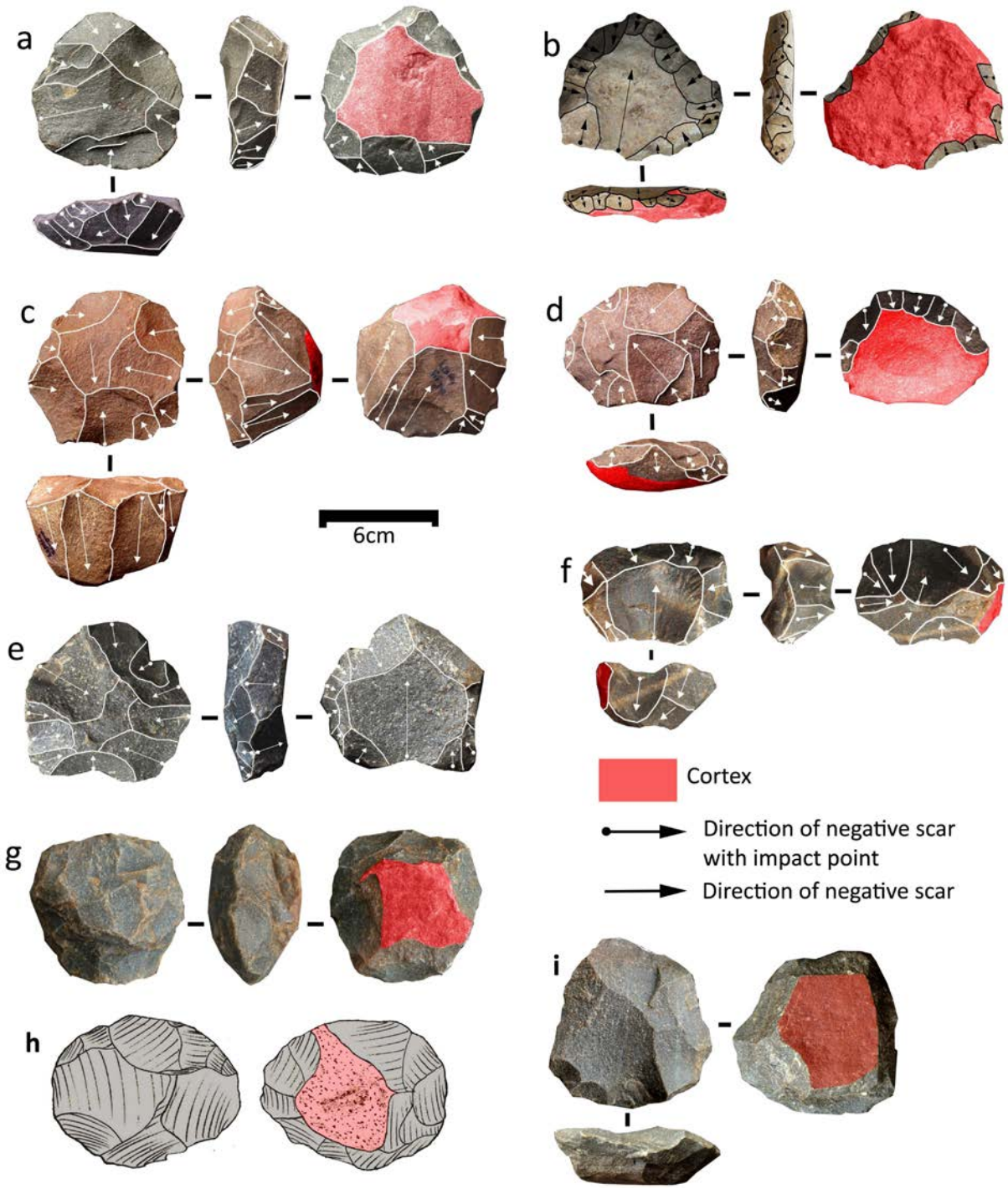

Figure 6. Prepared cores from Mayar and Judi: a, c, and d. Recurrent Centripetal Levallois Core (Judi, JU 6); f, i and b. Preferential Levallois Core (Judi, JU 4); e. Centripetal Core (Judi, JU 6); g. Biface Discoidal core (Mayar, MU3); h. Recurrent Centripetal Levallois Core (Mayar, MU3).

4.1.3.2. Retouched tools

A total of 40 scraper tools, such as notched scrapers, side scrapers, double side scrapers, end scrapers, bifacial scrapers, and retouched points, have been recorded (Figure 7). Their lengths range from 80 mm to 30 mm. All these artefacts were found from the exposed gravel at units (JU6, JU4, JU2, MU5, and MU3) of Judi and the Mayar River. A few scrapers were manufactured on Levallois flakes exhibiting platform faceting; cortical, dihedral, and plain platforms were also identified. The dorsal scar patterns on the flakes are predominantly centripetal, indicating that these blanks were detached from centripetal cores.

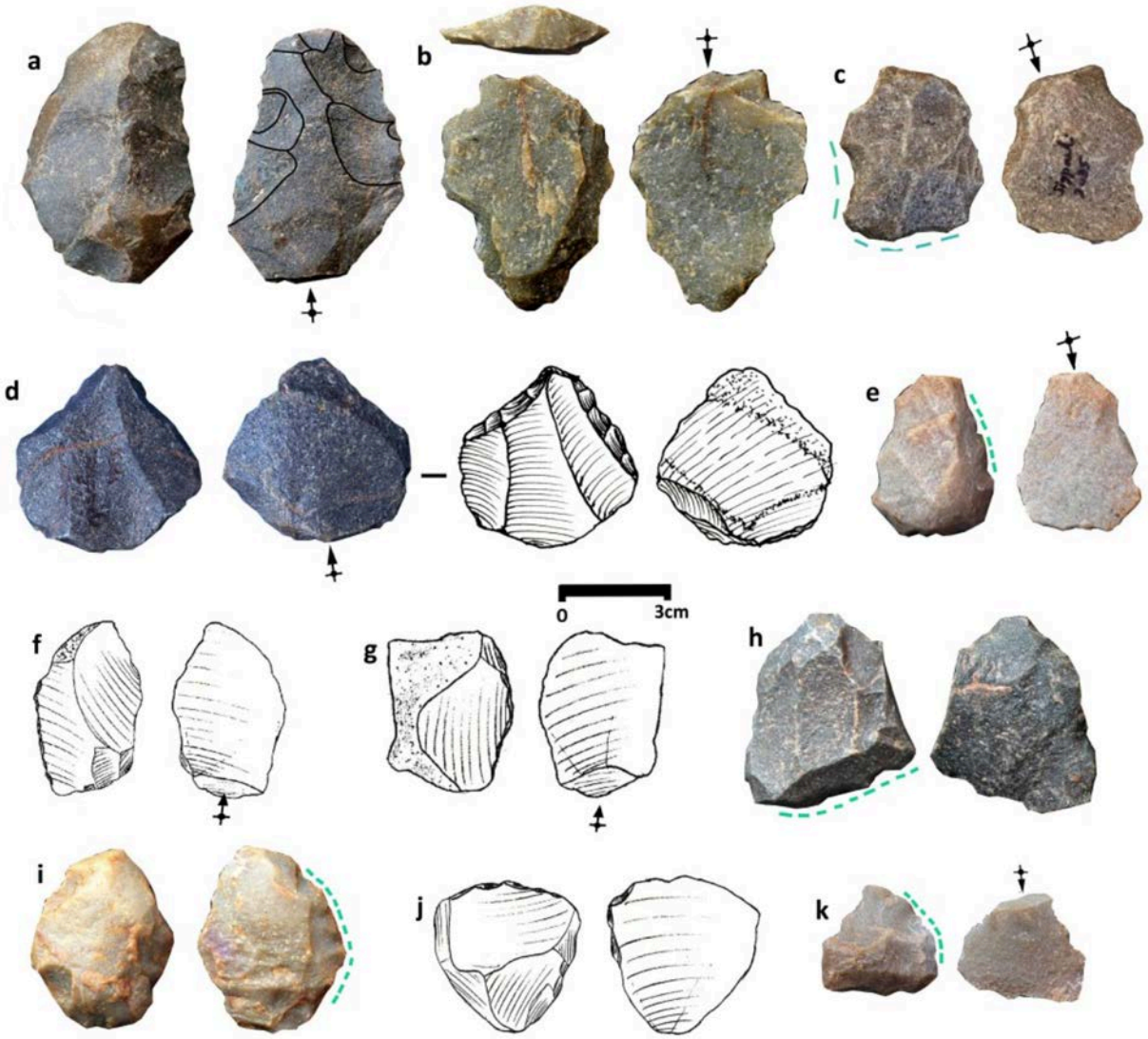

Figure 7. Various types of scrapers and flakes from the Mayar and Judi: a. core on flake (Judi, JU 4); b. Levallois flake (Mayar, MU 5); c. side notched end scraper (Mayar, MU 3); d. retouched point (Judi, JU 6); e, i & k side scraper (Judi, JU 4); f & g. side scraper (Mayar, MU 3); h & j. end scraper (Mayar, MU5).

4.1.3.3. Bifaces

A total of seven bifaces, including three elongated ovate hand axes (Figure 8 e & f), two ovate hand axes (Figure 8 h), one cordiform hand axe (Figure 8 g & b), and one reworked cleaver (Figure 8 d), which was possibly recycled letter were found. The bifaces measured between 180 mm and 120 mm range and were recovered from the lower gravel unit (JU6 & MU5). The ovate hand axes are made of sandstone and quartzite, and the diminutive bifaces and cleavers are made of quartzite. All the bifaces in this assemblage are made from flake blanks. One of the cleavers in the collection showed relatively fresh-looking bifacial flaking at the cleaver edge; perhaps an attempt to reuse the damaged cleaver edge (Figure 8 d).

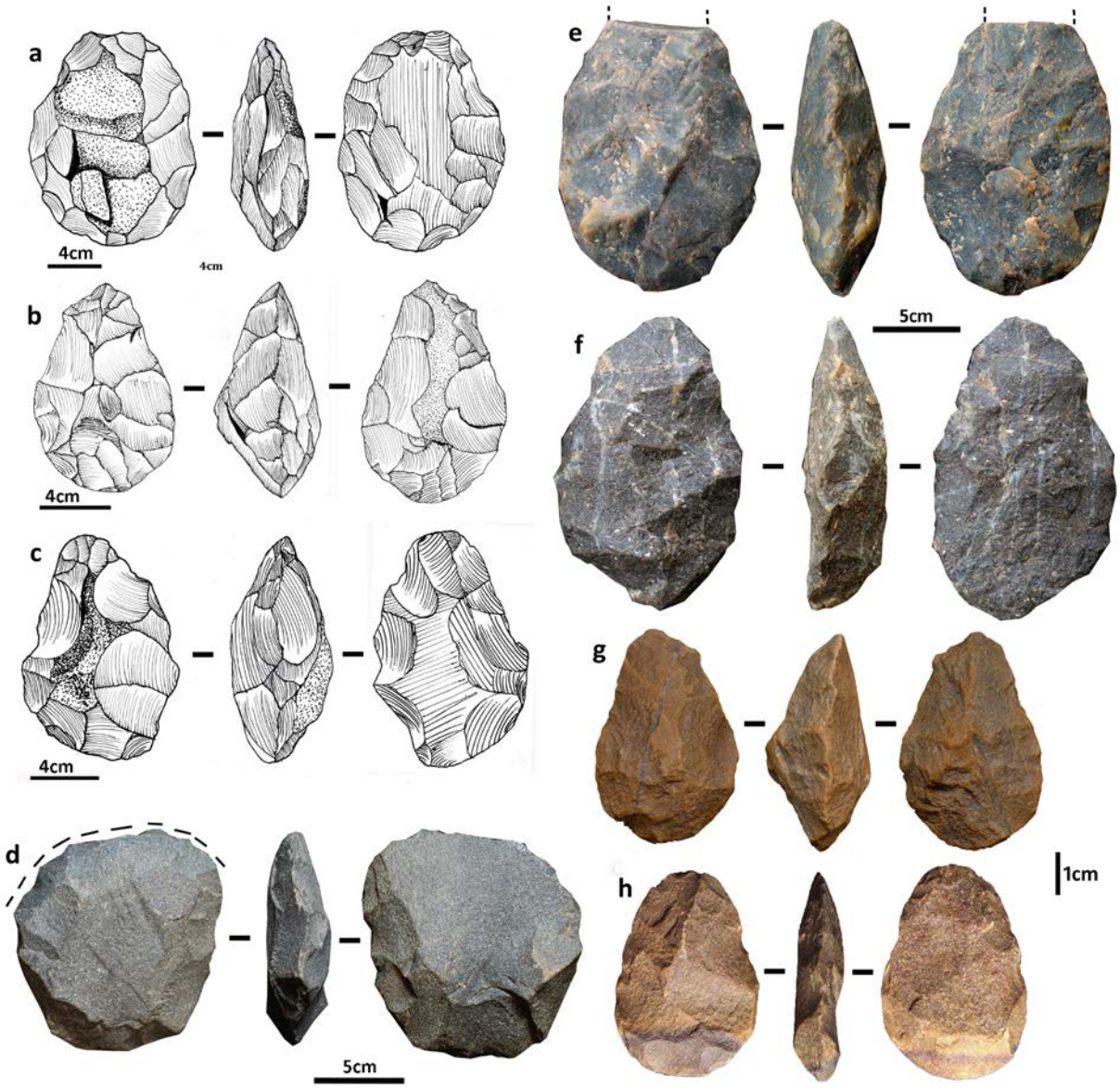

Figure 8. a) Ovate hand axe from Chhijora, b & g) Cordiform hand axe from Judi; both figures illustrate the same artefact. c) Cordiform hand axe from Lamidah (Drawing by Abhishek Kumar), e & f) elongated ovate handaxe from the Mayar river, h) ovate handaxe from Judi, d) reworked cleaver from Judi.

4.1.3.4. Late Palaeolithic or Mesolithic

A few selected pieces of the microblade and laminar blade cores have been collected (N= 18) from the Rihand basin sites (Figure 9). Their length ranges from 70 mm to 40mm. Microlithic tools are made mostly of quartz, and laminar blade assemblages are made of a whitish chert, comparable to the raw material observed at the Upper Palaeolithic sites of Rampur and Baghor in the MSV.

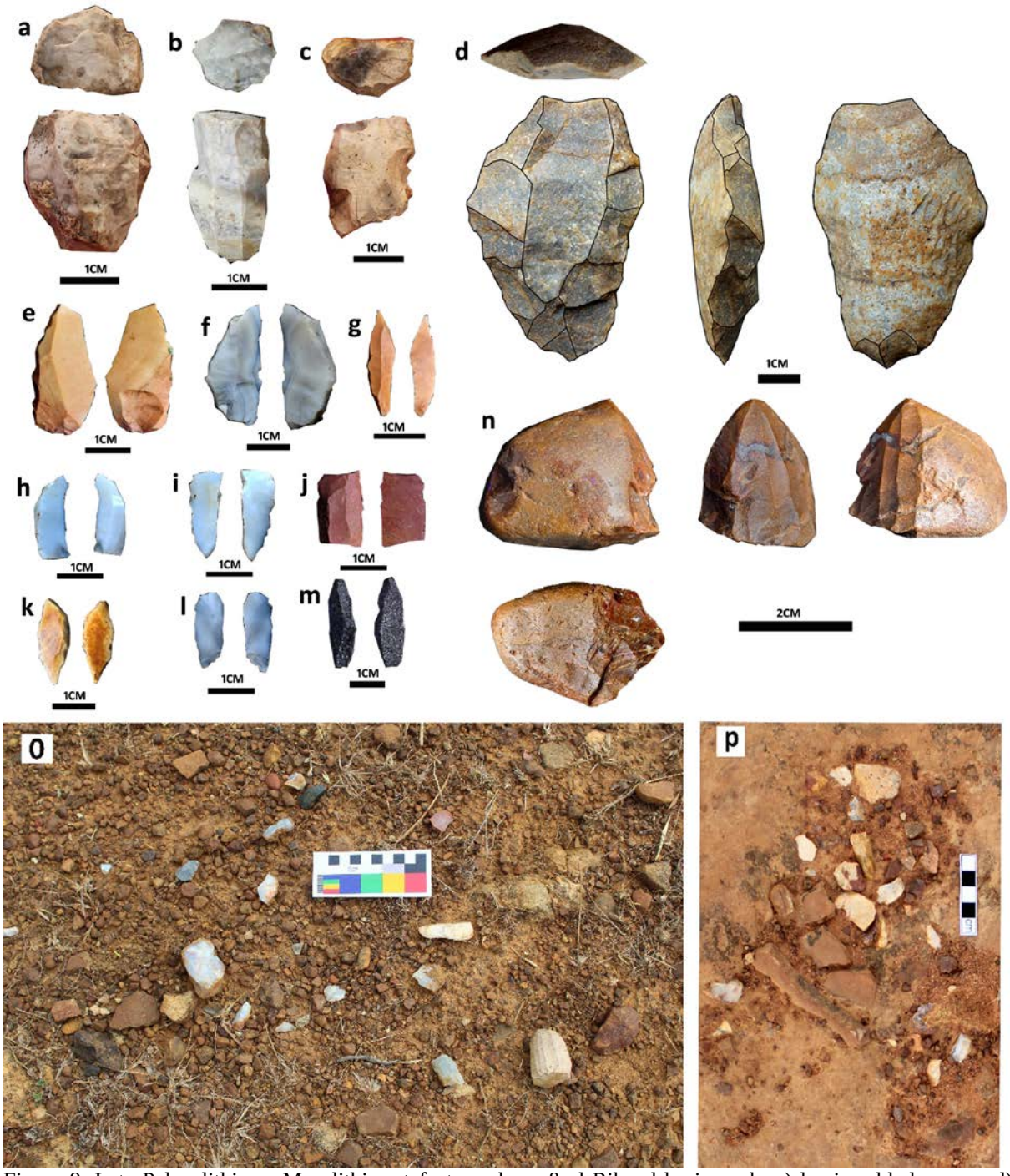

Figure 9. Late Palaeolithic or Mesolithic artefacts. a, b, c, & d Rihand basin: a, b, c) laminar blade cores; d) Numbian-like core. e,f, g, j, m, & n Bhajikhra: e, f, j, & m) backed blades; g) asymmetrical point; n) fluted micro-blade core made by quartering technique. h, i,k & l Chotti Mahanadi: backed blades; o) Laminar with microlithic scatters at Mohaniya Ghati; p) Microlithic scatters at Bhajikhera.

Among the laminar assemblage, a '*Nubian-like*' core (see Usik *et al.* 2013) of quartzite has been recorded (Figure 9 d). The core is intentionally shaped into a triangular form by removing small flakes from the distal (bottom) or lateral (side) margins. This preparation aims to produce an elongated blade from the core. This reduction method bears some resemblance to the Nubian core technique.

4.2. Gopad River

The Gopad River is another major tributary of the MSV (Figure 1), which revealed one Palaeolithic site in the survey. The stratigraphic context of the artefact assemblages is visible at the well-exposed section at Bahri, having four distinct depositional units. The lowest unit is the bedrock, overlain by a yellowish sandy silt. The third unit from the bottom is an unconsolidated sandy gravel incorporating Middle Palaeolithic artefacts. A higher number of large clasts of quartzite, sandstone, granite, and quartz of various sizes are also part of this sedimentary unit, which probably served as one of the sources of raw material for lithic artefact production.

Above this gravel formation, there is a layer of yellowish sand. A total of 40 artefacts consisting of prepared cores (N=5), flakes (N=20), and scrapers (N=15) have been documented from the site (Table 3).

4.3. Tons River

The Tons River (Figure 10a) is a tributary of the Ganga. Its stratigraphy has been documented at Bharhut (near the historic Buddhist stupa site) and at Kharahari, both located in the Satna district. Two Lower Palaeolithic sites preserving artefacts in stratified contexts have been documented along the Tons River (Table 1). The river mostly flows on the Bhander and Rewa group shale and sandstone bedrock, which is overlain by consolidated colluvial and gravel formation, often containing ferricrete gravels. This consolidated colluvial layer and gravel yield Lower Palaeolithic cultural material (pebble-made artefacts such as cores, flakes, and bifaces). The colluvial and gravel formation is overlain by a light brown silt containing $CaCO_3$ nodules, which has yielded vertebrate fossils.

A total of nine pebble artefacts (core and flakes) along with a cobble-sized core of quartzite are observed at Kharahari (Figure 10 b). All artefacts are found in situ, in mint-fresh condition. Most of the pebble artefacts (N=6) represent a unifacial core or chopper, and a few pebbles (N=2) contain bifacial flaking scars. Their size varied from 200 mm to 60 mm. The artefacts are buried underneath a thick pile of light brown silt; these sites have a high potential for future excavation that would help chronometrically date the sediments. At Bharhut, the artefacts were recovered from the colluvial layer, while vertebrate fossils were obtained from the overlying light brown silt containing $CaCO_3$ nodules. In total, two rolled bifaces (cleavers) and seven flakes, along with associated vertebrate fossils, have been documented from these deposits. Additionally, the present study documents microlithic scatters at the Bharhut Hills (also known as Laal Pahadi), which are situated close to the present river, along with painted rock shelters in the same area.

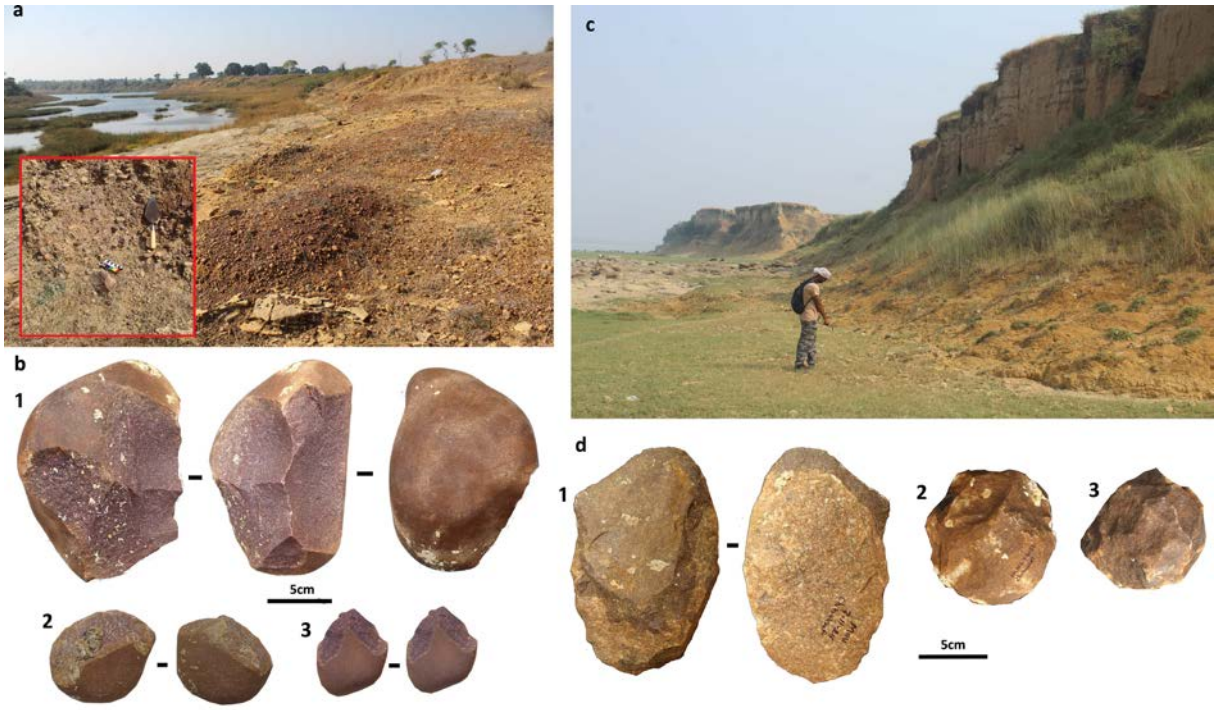

Figure 10. a) General view of the Tons River with in situ large core at the bottom left, b) 1 core, 2 & 3 pebble tools, c) exposed river section of the Yamuna River at Mau, d) 1, cleaver, 2 and 3) polyhedral.

4.4. Yamuna River

The Yamuna River is one of the major rivers of northern India and a significant tributary of the Ganga River basin, stretching approximately 1,376 kilometres. The small portion of the river flowing through the study area revealed an Acheulean site near Mau, in Chitrakoot district. The thick sedimentary section exposed here at the bank of the Yamuna River (Figure 10 c) reveals 5 major stratigraphic units (MU 1- MU5). The bottom layer (MU5) is the Vindhyan sandstone overlain by MU4 sediment, which comprises hard silty sandy clay with CaCO3. The MU3, overlying MU 4, is a coarse gravel formation in a sandy matrix with CaCO3. This layer yielded Acheulean artefacts. The MU 3 unit is overlain by MU 2, which is composed of brown silty sand with CaCO3. The uppermost layer (MU1) consists of loose brown silty sand. A total of eight (N=8) artefacts were collected from the MU 3 unit of the exposed section (Table 2).

Most of the artefacts (N=6) are fresh in condition, and their size ranges from 150 mm to 75 mm. The artefacts consist of a cleaver (N=1), polyhedral (N=2), prepared core (N=1), an amorphous core (N=2) and flakes (N=2) (Figure 10 d). These artefacts are made of sandstone, locally available in the Kaimur hills.

4.5. Mahanadi River

The Mahanadi (also known as Chhoti Mahanadi), a tributary of the MSV (Figure 1), flows largely through the areas in Katni and Umariya districts. A total of 2 localities of the Late Palaeolithic or Mesolithic artefacts are found in this valley. The alluvial sedimentary sequence exposed at the river cliffs near the Mahanadi railway bridge at Bhadaura, in Katni district, is recorded. The basal layer, resting on the bedrock, contains gravels of various sizes and large pebbles. A light brown silty sediment is visible above the gravel formation.

Prepared cores and microlithic artefacts have been found in the surface context at this site. A total of five prepared cores made of sandstone pebbles are recorded. Late Palaeolithic or Mesolithic scatters are visible on the surface of the top silty sediment layer. A total of 40

microlithic tools are recorded at the site. Generally, the length of these artefacts ranges from 80 mm to 20 mm. Artefacts are made of fine-grained siliceous stones such as chert, chalcedony, and agate, and a few artefacts are made of siliceous sandstone.

Various cylindrical and conical blade cores, and backed blade tools such as lunate and knife, are part of this assemblage (see Figure 9). Along the blade cores, a single specimen of a preferential Levallois core (Figure 11a) made of siliceous sandstone is also found at the site.

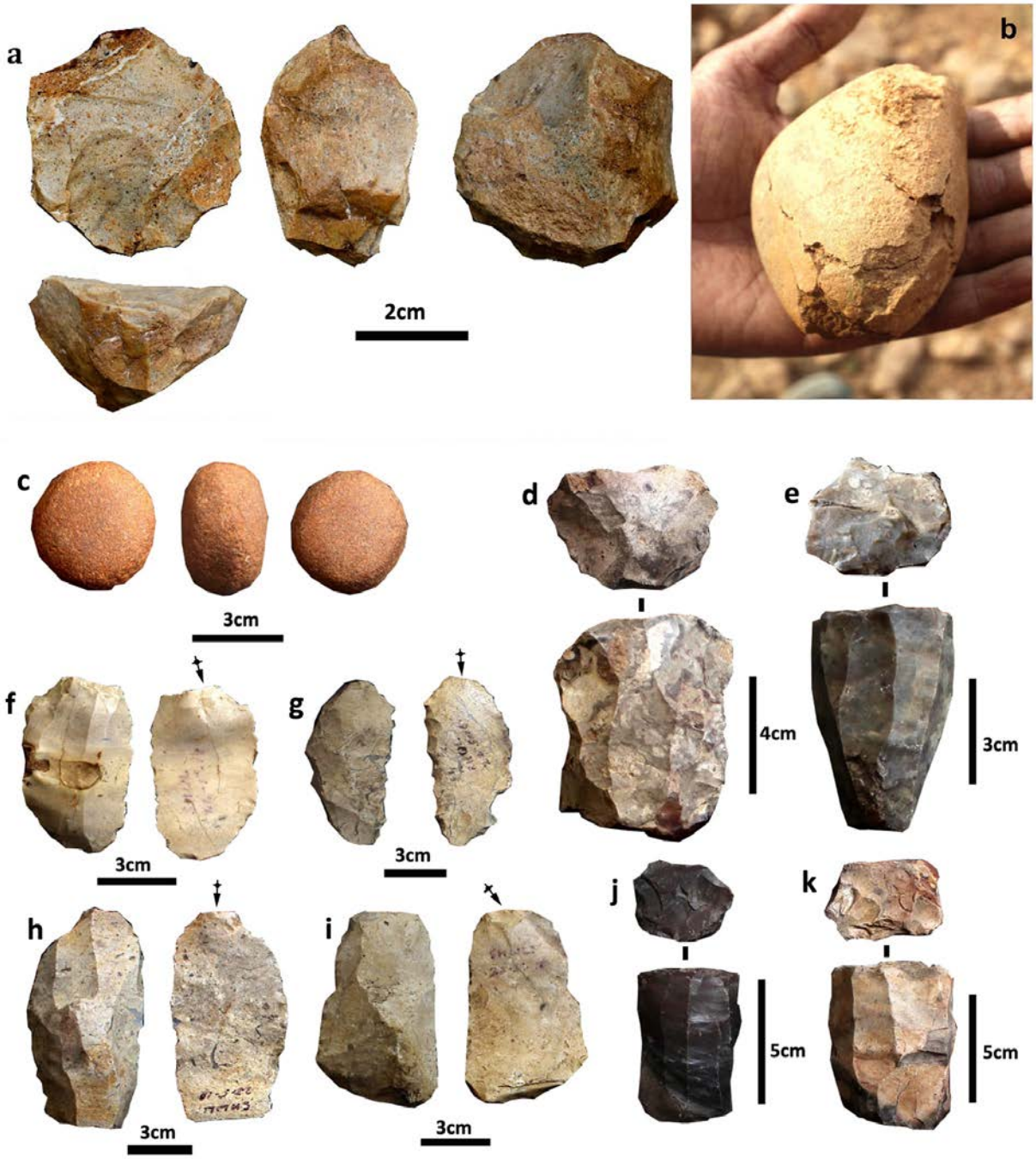

Figure 11. a) Preferential Levallois core from the Mahanadi River; b) damaged hammer stone from Lamidah; c) hammer stone from Bhajikhera; d, e, j & k) laminar blade core, f & h) laminar blade, g & i) side scraper from Rampur (MSV).

5. Foothill Sites (Kaimur ranges)

The Kaimur range is located in the eastern part of the Vindhyan ranges, and it extends about 483 kilometres from Katangi in the Jabalpur district of Madhya Pradesh to Sasaram in the Rohtas district of Bihar. Geologically, this range belongs to the upper part of the Vindhyan Supergroup and is known for the largest and best-preserved intracratonic, Proterozoic sedimentary sequence in the world (Chakraborty 2006). The Kaimur group predominantly consists of sandstone formations, which are prone to natural erosion and weathering. This hill range covers a large part of the study area (Satna, Maihar, Rewa, Singrauli and Katni districts). A total of 74 sites belonging to the Lower Palaeolithic (Acheulean) (N=16), Middle Palaeolithic (N=1), Late Palaeolithic or Mesolithic (N=13), Mesolithic (N=2) and Late Palaeolithic or Mesolithic rock shelter sites (including 26 previously reported) (N=34) (Kumar *et al.* 2022 & 2023; Nandan 2013; Nandan *et al.* 2020) have been discovered near the foothills of this range by the authors (Table 4).

Table 4. Newly Discovered Palaeolithic Foothill Sites with the number of recorded artefacts on the Periphery of the Middle Son Valley. Abbreviations: LP = Lower Palaeolithic; MP = Middle Palaeolithic; LP or M= Late Palaeolithic or Mesolithic.

No.	Site	Cultural material	No. of artefacts
1	Pipariya Don	LP (Acheulean)	4
2	Nirankali Mata Mandir	LP (Acheulean)	30
3	Chhijora	LP (Acheulean)	2
4	Siddhnath Mandir Road, Patharha bridge, Jaitupura	LP (Acheulean)	11
5	Nayagaon	LP (Acheulean)	9
6	Birpur	LP (Acheulean)	22
7	Bandhi Mohar	LP (Acheulean)	3
8	Shiv Nagar	LP (Acheulean)	4
9	Khoh	LP (Acheulean)	6
10	Bharhut area	LP (Acheulean) and LP or M	2
11	Krishnagarh	LP (Acheulean)	115
12	Semara	LP (Acheulean)	15
13	Roopganj	LP (Acheulean) and LP or M	2
14	Bhadanpur	LP (Acheulean)	18
15	Shahpur 1	LP (Acheulean)	6
16	Baraundha	LP (Acheulean)	2
17	Lamidah	MP and LP or M	27
18	Bhaji-Khera	LP or M	151
19	Pahadiya	MP and LP or M	10
20	Mohaniya Ghati	Laminar	50
21	Dhausada rock shelter	LP or M	40
22	Usrar rock shelter	LP or M	20
23	Manaura rock shelter	M	16
24	Dharkundi rock shelter	M	20
25	Hatta hill	LP or M	20
		Total	**605**

A period-wise distribution of sites (Figure 12) in the foothills suggests an abundance of Late Palaeolithic or Mesolithic sites followed by the Acheulian. Middle Palaeolithic sites are relatively poorly represented. All Acheulean sites are found in well-stratified contexts, buried deep within a thick pile of colluvial sediments. However, the Middle Palaeolithic, Late Palaeolithic or Mesolithic, and Mesolithic sites are found on the surface in a scattered condition.

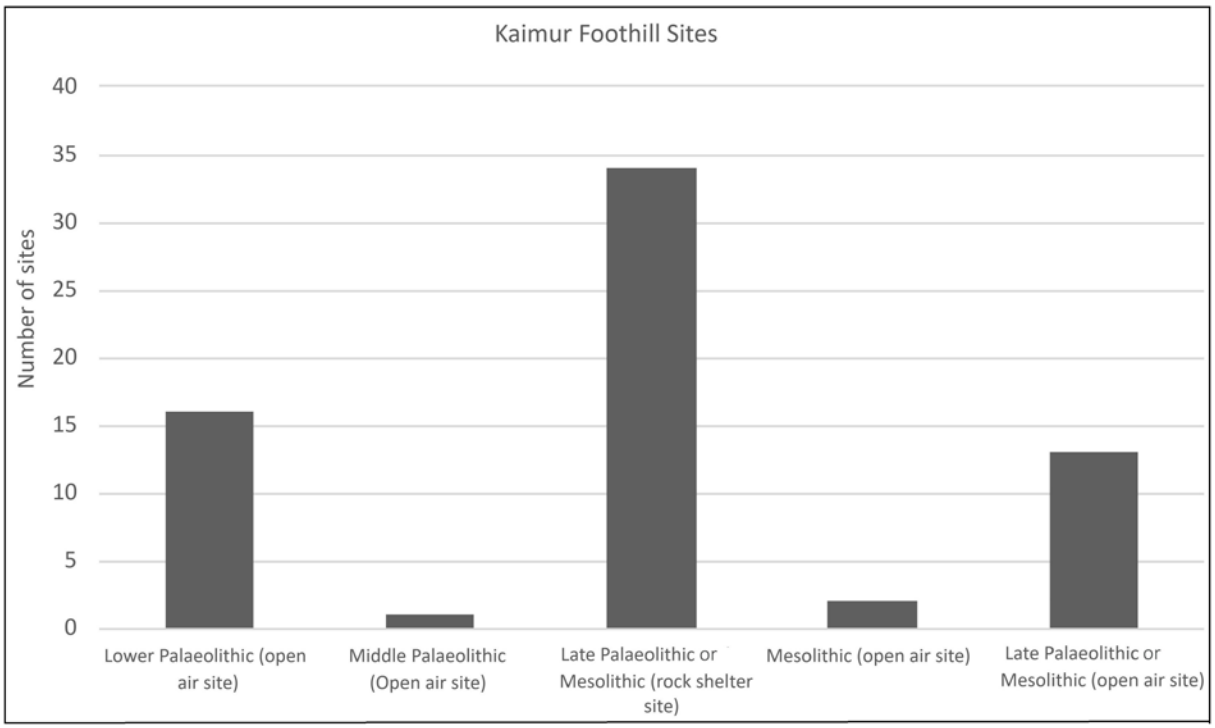

Figure 12. Distribution of Palaeolithic sites in the Kaimur foothills (Note: previously reported Late Palaeolithic and Mesolithic rock shelter sites are also included in the chart).

5.1 Acheulean sites

The first Acheulean biface in the Kaimur hills was discovered in the 1880s by Carlleyle (Sitch 2017) in Saipur, Satna district. A large number of stratified Acheulean sites have since been identified near the foothills of the Kaimur ranges (Table 4), and Maihar was the first foothill site where systematic research work was conducted in the 1980s by Pandey and Pal (1988).

The sites have been exposed by small seasonal streams and anthropogenic activities, including the quarrying of sediments and rocks by the local community. Most of the sites are located along the naturally exposed vertical sections of the streams (Figure 13). Sites like Krishnagarh and Bandhi Mohar are good examples of exposure due to anthropogenic activities (Figure 13a). The abundance of flakes, lithic debitage, cores, and bifaces at most exposed sites suggests that these represent primary-context lithic workshop sites. Artefacts, although associated with colluvial formation, are in a fresh condition, indicating limited movement from their original place of deposition. The artefacts were manufactured from Vindhyan sandstone, which was abundantly available as suitably sized clasts within the colluvial deposits, thereby serving as a primary raw material source for lithic production.

Considering the extensive size of the foothill archaeological sites, we have preferred to focus on a smaller, representative collection of artefacts for the preliminary analysis. This approach allows us to examine the fundamental characteristics and context of the lithic materials while leaving a considerable number of artefacts for more detailed research in the future. Most of these sites are buried in the colluvial sediments and, as such, require further detailed work, including section scraping and systematic excavation to obtain further data for assessing their chronology and technological adaptations.

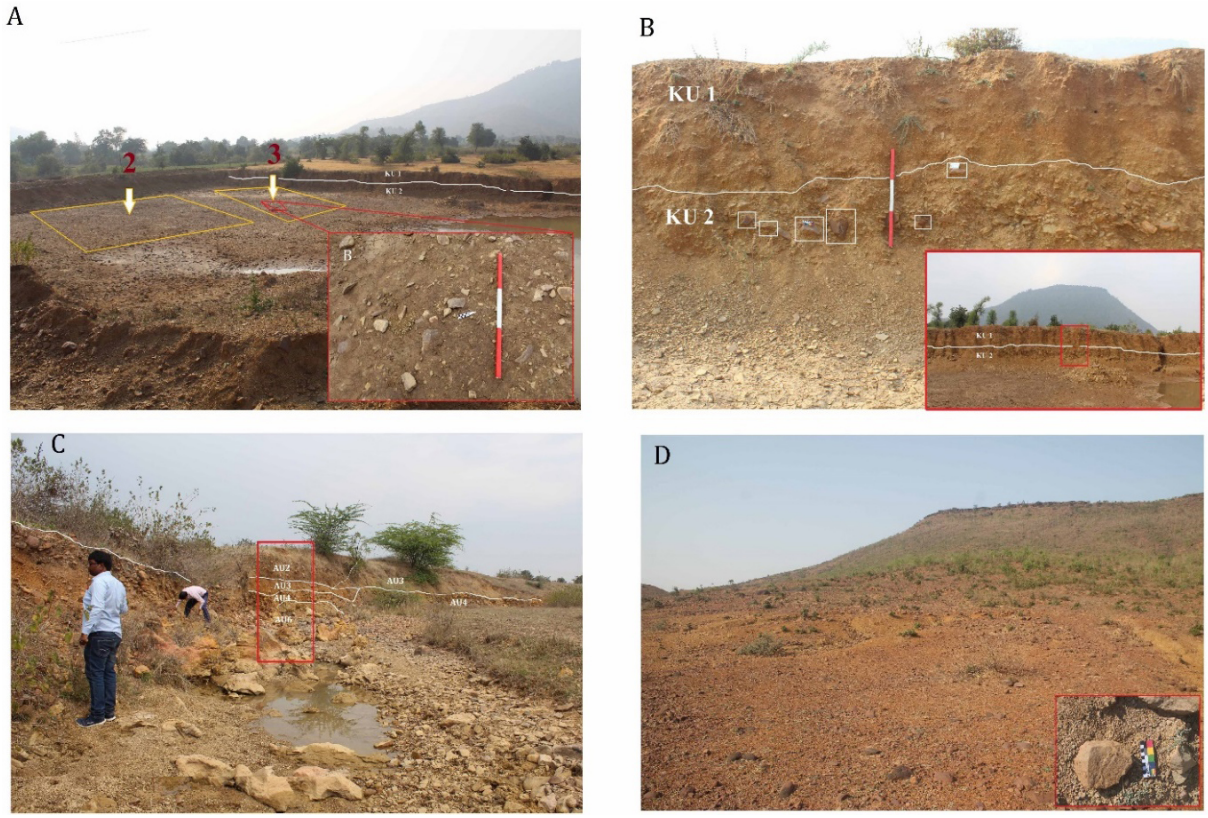

Figure 13. A) General view of Krishnagarh site (Artefacts bearing sediments exposed by anthropogenic activity); B) Exposed section at Krishnagarh with artefacts embedded in situ in the section; C) Exposed section at Semara; D) Bandhi Mohar site, with artefacts (inset at the bottom right).

5.1.1. Stratigraphy of foothills Acheulean sites

Very well-exposed sections are visible at the Maihar, Krishnagarh, Semara, and Siddhnath Mandir localities (Figures 14, 15, and 16). All artefacts from these localities have been recovered from the first (upper) and second (lower) colluvial formations. The upper colluvial formation is visible at only a few sites and has yielded artefacts in a secondary context, which may have been derived from the underlying second (lower) colluvial formation.The second (lower) colluvial formation, or boulder bed, contains $CaCO_3$ nodules and brown silt, along with angular, sub-angular, and rounded clasts, including cobbles and occasional ferricrete nodules. This layer has yielded mint-fresh artefacts and rests on top of a brown silt deposit with a high concentration of $CaCO_3$, and is overlain by another brown silt layer. The brown silty sediment is capped by a colluvial layer, referred to as the first (upper) colluvial formation, which consists of a loose deposit of black and brown sediments. The thickness of the second colluvial layer (MU4, KU4 and AU 4) varies from site to site, and the clast size within this unit is generally larger than that of the first (upper) colluvial formation.

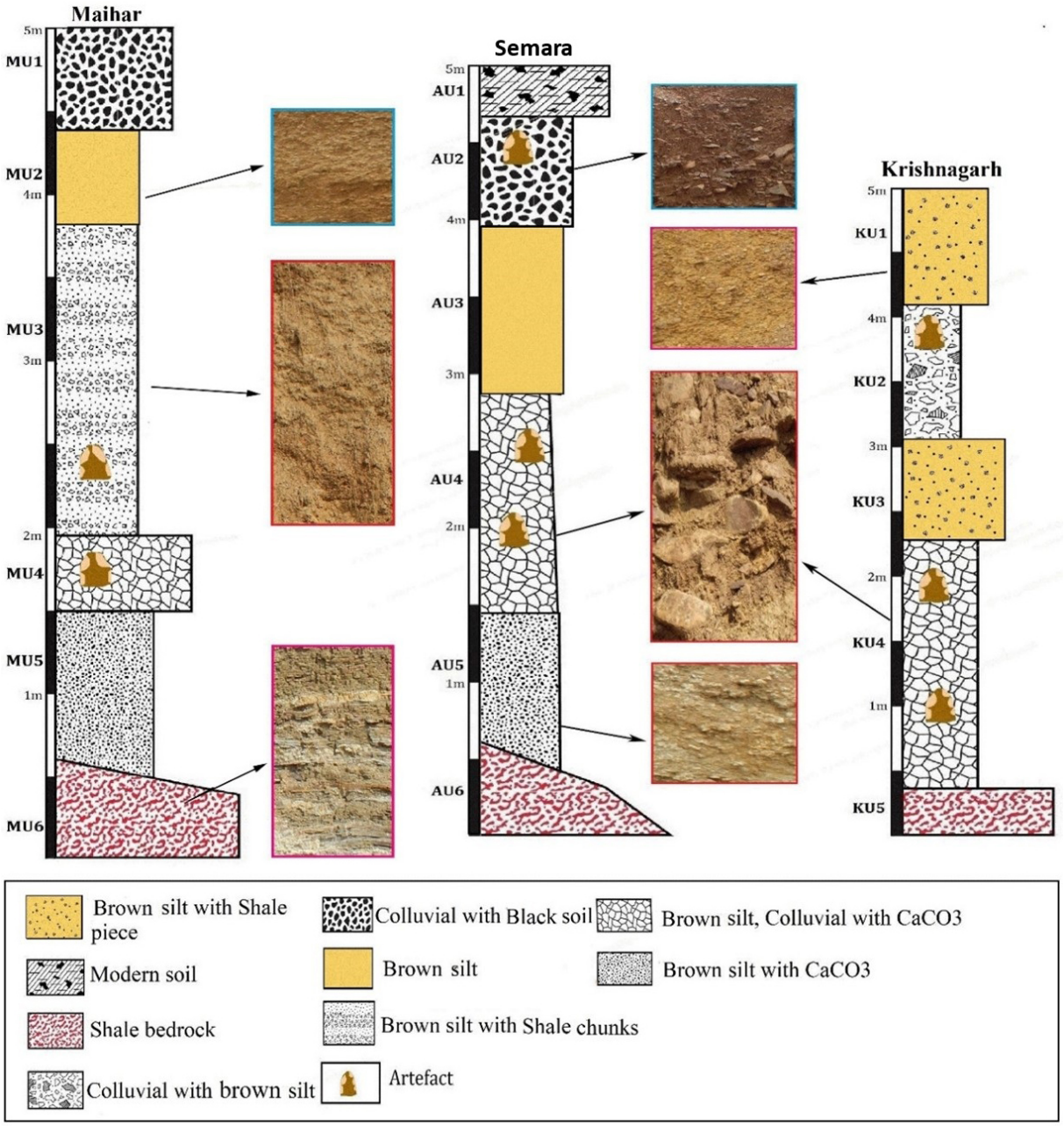

Figure 14. Stratigraphy of the foothills site.

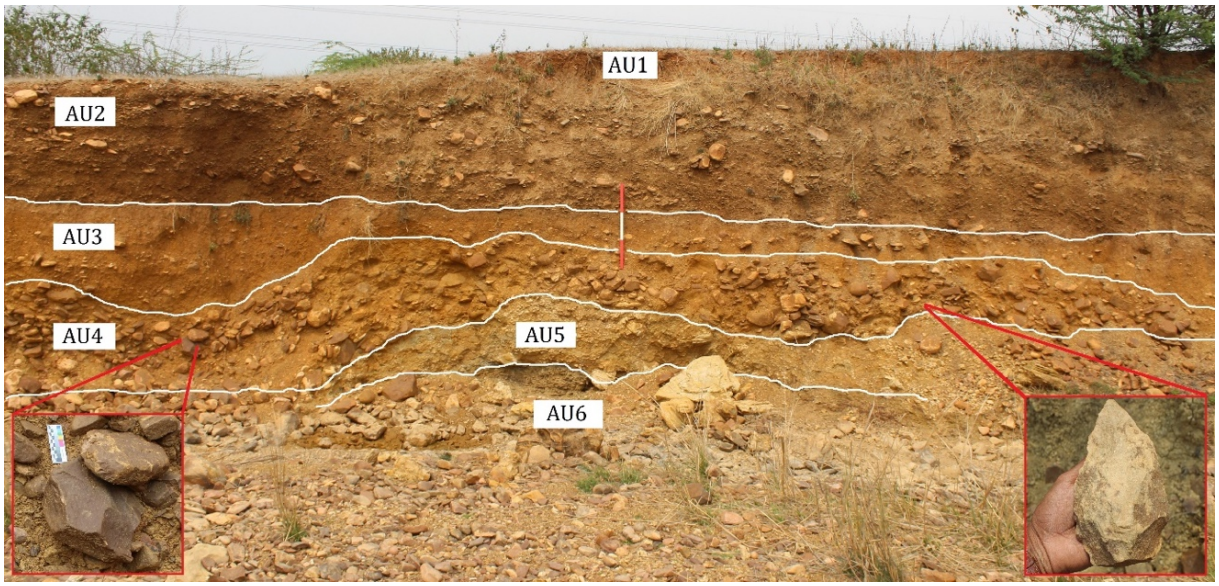

Figure 15. Exposed section at Semara, with in situ artefacts in the insets at bottom right (Hand axe) and bottom left (core).

Figure 16. Exposed section near Siddhnath Mandir, with in situ artefacts (giant core) in the inset at the bottom right.

5.1.2. Artefacts

The foothill sites contain different phases of *chaîne opératoire* of lithic reduction, such as bifaces, cores, flakes, and waste products (Table 3), indicating that the foothill sites are probably factory sites. All the artefacts are made from fine-grained pinkish and red sandstone, which is easily accessible at the foothills of the Kaimur range. Most of the Acheulean sites are located near the Bhander Group formation (Figure 2), which is one of the major sandstone formations of the Vindhyan basin.

5.1.2.1. Biface

The foothill sites are mostly cleaver-dominant in nature (Table 3) and have a relatively smaller number of hand axes. The assemblage has only three hand axes, recovered from the Lamidah, Semara and Chhijora (Figure 8a & c) sites. Semara, Berpur, Krishnagarh and Chhijora have yielded a higher number of cleavers than other sites (Figure 17). A total of 40 selected cleavers are collected from all the sites to study their basic attributes and morphology of them.

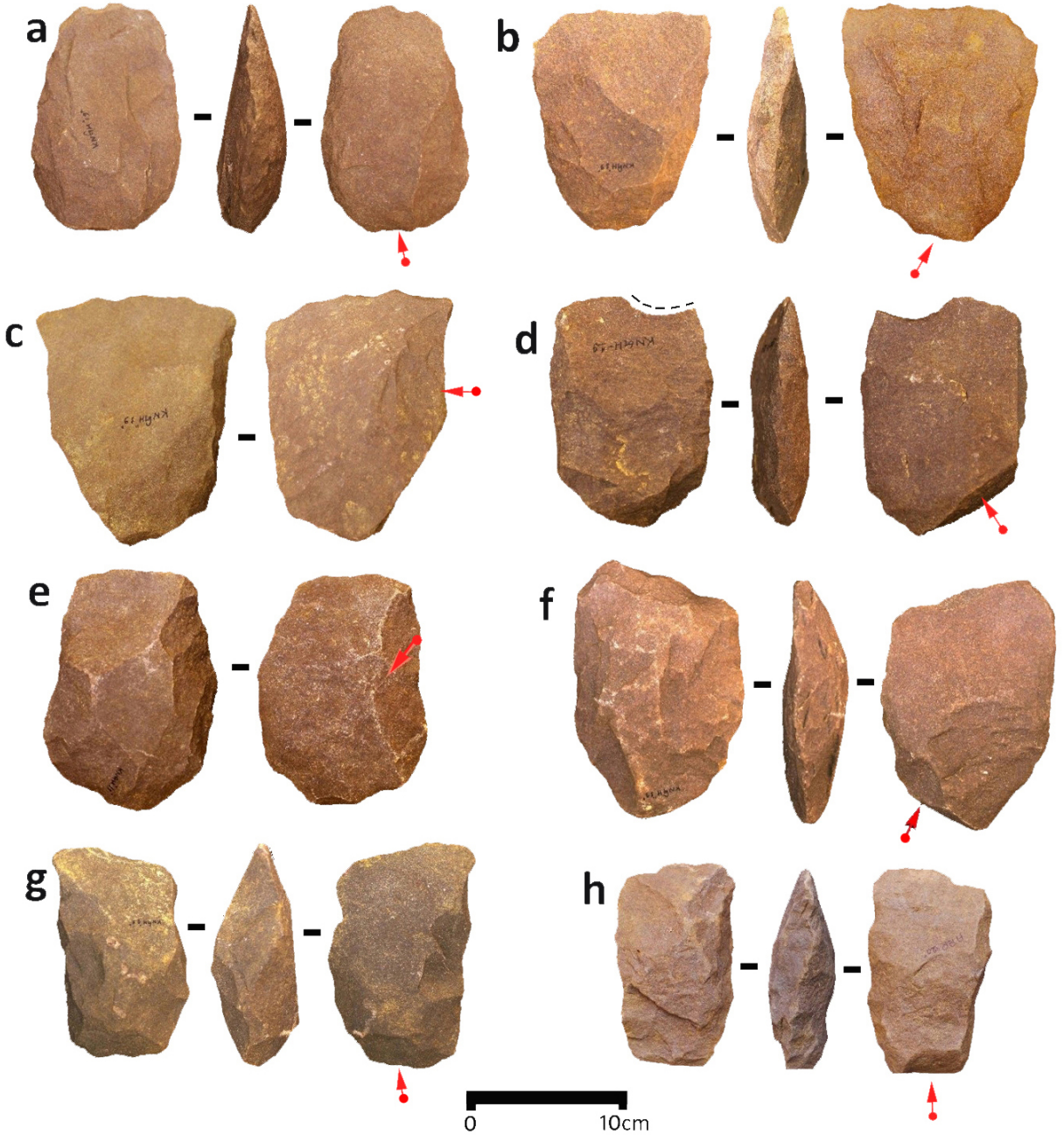

Figure 17. Cleavers from the foothill Acheulean site, Krishnagarh: a) Oval-shaped, straight-edged cleaver; b and c) V-shaped, straight-edged cleaver; d) U-shaped, concave-edged (notched-edged) cleaver; e) U-shaped, straight-edged cleaver; f and g) U-shaped, oblique-edged cleaver; h) U-shaped, straight-edged cleaver from Semara.

The length of the cleavers ranges from 170 mm to 100 mm. A large number of cleavers (30/40) are made of end-struck flake blanks that are either ‘U’ or ‘V’ shaped. Variation has been noticed in the form of their butts and cutting edges. Butts are either in angular shape,

straight or convex, and the edges are oblique, convex, or straight; only one example of a notched cleaver has been obtained (Figure 17 d). The majority of them have a straight edge, which indicates a low-intensity use of the working edge. Some cleavers have oblique and convex-shaped working edges. Most of the cleaver-flake striking platforms are plain and dihedral, and a few have unworked cortical areas.

5.1.2.2. Giant Core

A significant number of giant cores (larger than 150 mm) and giant core byproducts, like large flakes, from foothills sites have been documented. Of a total of 50 giant cores, 30 have been found at Semara and Krishnagarh sites. These cores are in fresh condition. The giant cores are classified based on differences in size and reduction method.

Based on refitting, and the assessment of the reduction method and flake scars several types of cores, such as polyhedral or multi-platform block cores (17/50), multi-direction block cores (10/50), recurrent block cores (7/50), semi-recurrent block cores (9/50), discoidal cores (2/50), prepared cores (1/50), recurrent centripetal block cores (1/50), and unidirectional block core (2/50), and bidirectional giant block core (1/50) (Figures 18 & 19) are identified.

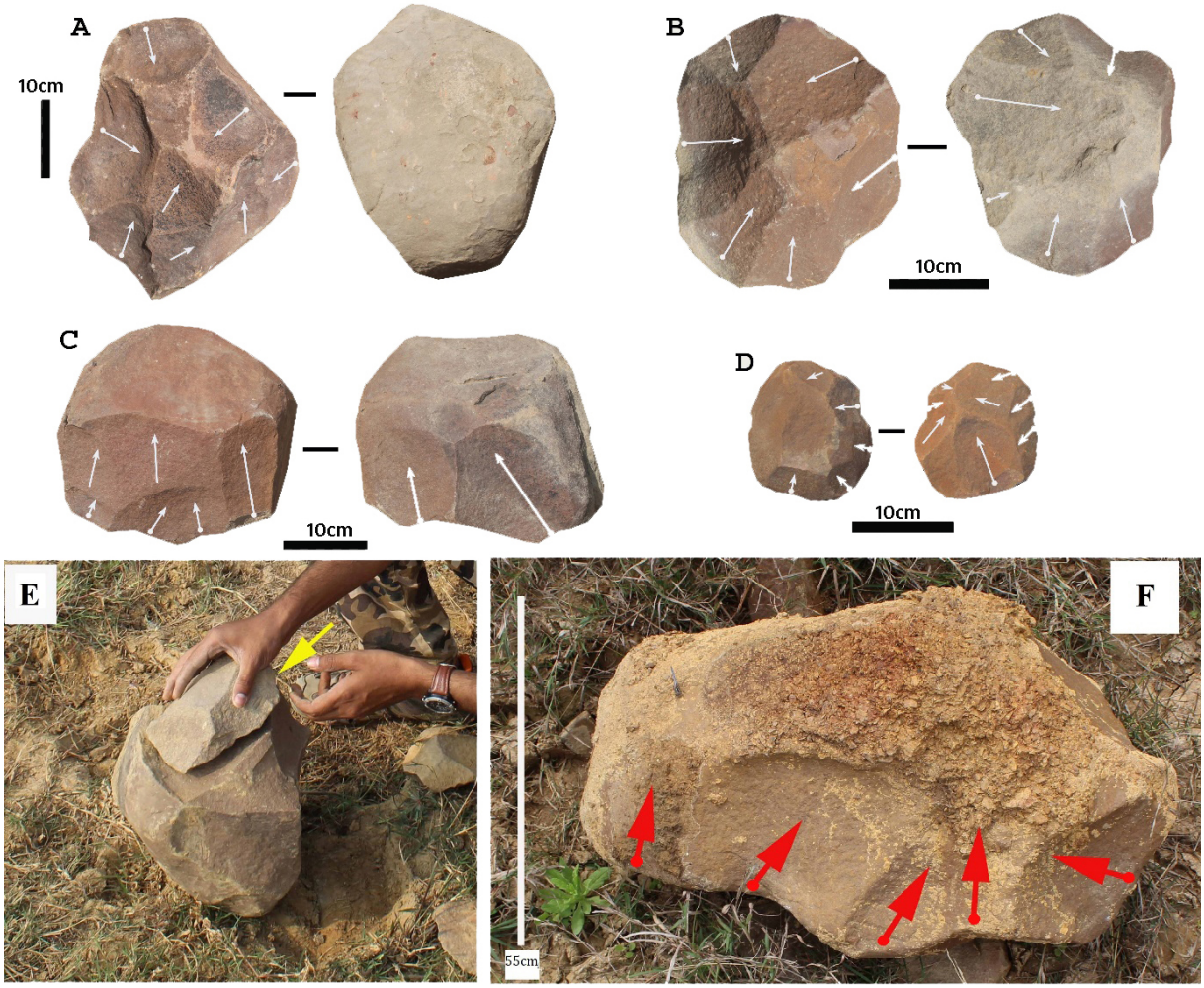

Figure 18. Giant cores from Foothill Acheulean sites. A, E & D Krishnagarh: A) multi-direction block core; E) cleaver refitting with giant core; D) prepared core. B & C Bandhi Mohar: B) discoidal core; C) unidirectional block core. F Semara: F) giant block core.

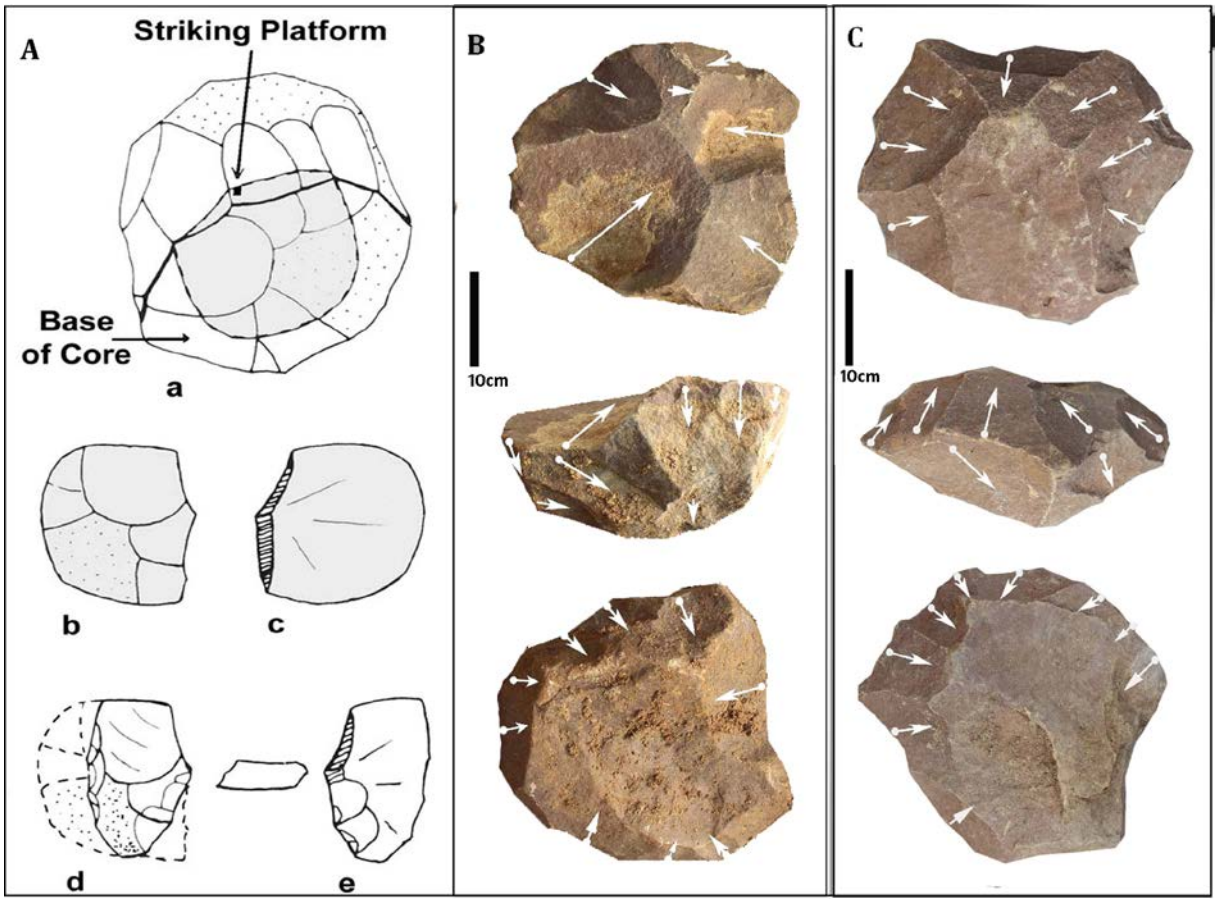

Figure 19. A) Diagram of *Chirki Cleaver Core Method* by Corvinus (1983). B) recurrent centripetal block core from Krishnagarh, similar to the *Chirki Cleaver Core Method.* C) recurrent block core from Bandhi Mohar, Satna district.

The dominant number of multiplatform and multi-directional giant corers indicates that hominins try to get large flake blanks randomly to make artefacts. However, a few cores, like a recurrent centripetal block core from Krishnagarh, indicate that advanced core reduction methods were also applied by hominins (Figure 19 B). This core reduction sequence is similar to the "*Chirki Cleaver Core Method"*, which was proposed by Corvinus (1983) (Figure 19 A). In this method, a few flakes were detached from one side, and a "base" was then prepared, which determined the future dorsal face of the cleaver flake (Corvinus 1983).

Most of the semi-recurrent block cores indicate the bifacial flaking method. In this method, flakes were removed from both faces of the same striking platform by alternate removals in which each of the scars was used as a striking platform for the removal of the next flake (for a similar scar surface exploitation) (Goren-Inbar *et al.* 2011).

There are also a few Kombewa flakes (N=2) recorded from Krishnagarh and Siddhnath Mandir Road, which indicate that this method is applied by hominins to detach large flake blanks. It is noticed that the shape of a block also affects the core reduction method. Most multidirectional and multiplatform cores are made of spherical or semi-spherical-shaped blocks. The semi-recurrent block cores are made of rectangular or semi-rectangular-shaped blocks.

This type of block is ideal for the bifacial flaking method. In most cases, cores found at the site belong to an early stage of the reduction sequence, and after getting a few large flake blanks, these cores were abandoned. There are also a few very large cores - in fact, giant blocks measuring up to 80 cm in length and 60 cm in width - with a few large unidirectional and bidirectional flake scars (Figure 18 F).

5.1.2.3. Flakes

Along with the giant cores and bifaces, several flakes have also been recorded from most of the sites. However, to understand systematic *chaînes opératoires*, we collected all the artefacts, including flakes, from a series of 1 m^2 grids at Krishnagarh locality. 142 flakes showing different stages of the production process have been collected along with cores and bifaces. The size of flakes ranges between 188mm and 30 mm. They are categorised into different types, such as cortical, semi-cortical, and plain flakes. Although they are mostly end-struck, there are a few side-struck flakes also in the assemblage. Striking platforms of the flakes are either plain or dihedral, and a few have an unworked cortical area. Different types of dorsal scar patterns, such as cortical, plain, unidirectional, bidirectional, and multidirectional, indicating different stages of reduction, are recorded on the flakes. A few step hinge fractures are recorded on the dorsal face of flakes near the platform, indicating poor control or unsuccessful removal of flakes. On a few flakes, such as those from the Semara site, notches are recorded on the distal end, which could have been used for scraping.

5.2. Middle Palaeolithic site.

Lamidah is the only foothill site which yielded Middle Palaeolithic artefacts. Geographically, the landscape of this area is close to the Rihand River basin. They are all found along with various sizes of weathered rock chunks and pieces. The artefacts, generally found in discrete clusters at the sites, belong to the Middle Palaeolithic. The artefacts comprise recurrent Levallois cores (N=4), flakes (N=14), a hammer stone (Figure 11 b), and a cordiform hand axe (N=1) (Figure 8 c).

5.3. Late Palaeolithic or Mesolithic sites

A good number of Late Palaeolithic or Mesolithic sites have been discovered (Figure 1 & Table 1); most of these are either open-air sites or rock shelter sites located near the foothills, hill slopes, and close to rivers and streams. The sites generally have a mixed collection of both microblade and laminar blade assemblages (Figure 9); the stratigraphic and temporal distinction between the two is currently unknown. Bhajikhera is one of the major open-air microlithic sites where several microlithic scatters are found in a primary context (Figure 9 p). Many backed artefacts (N=21), blade cores (N=130), and other artefacts were also collected from this site (Figure 9).

One of the notable findings from Bhajikhera is a small pit containing 120 microblade cores, a hammerstone (Figure 11c), and a large fine-grained sandstone cobble. The pit appears to have been deliberately covered with soil, suggesting systematic burial of lithic materials, possibly as part of artefact curation practices by hunter-gatherers. Mohaniya Ghati is the only foothill site to have yielded a laminar blade assemblage (Figure 9o), comprising cylindrical cores (N=6) and blades (N=44).

5.3.1. Rock-shelter Sites (Late Palaeolithic or Mesolithic)

It is significant to note that in the northern and southern sides of Satna, Panna, and Rewa, along the stretch of the Kaimur ranges, several painted rock-shelter sites such as, Majhgawan, Deur Kothar, Dhausada, Brhasapti Kund, Usrar (Figure 20 p), Gaddi, Siddhpur, Bharhut (Figure 20 o), and Manaura have yielded a rich collection of Late Palaeolithic or Mesolithic assemblages along with ochre crayon pieces and other archaeological materials (Figure 20) (Kumar *et al.* 2022; 2023; Nandan *et al.* 2020; Nandan 2013).

Figure 20. Archaeological material from rock-shelter sites,: a) broken ring stone, b) palette stone, c) ochre nodule (Dharkundi); f) Lunate, d) blade, h) notched scraper, i) tanged blade, g) blade core (Majhgawan); e) crested ridge blade, i, m & n) cylindrical shaped blade core (from disturb context) (Usrar); j) conical shaped blade core, k) cylindrical shaped blade core (Dhausada); o) view of Bharhut rock shelter, p) rock paintings from Usrar rock shelter (*DStretch*).

Most of the open-air Late Palaeolithic or Mesolithic sites are recorded in the lowland area lying between these rock shelters, and the artefact scatters were probably a part of the camping sites formed by the seasonal movement of hunter-gatherers between the upland and lowland areas.

There are several areas in the region with good potential for further research, such as the Panna Tiger Reserve and sites of the northern Kaimur hill ranges (Shankargarh, Partapur and Chhiolaha) in the bordering areas of Madhya Pradesh and Uttar Pradesh along the Yamuna River. A preliminary survey conducted in 2012 identified rich Microlithic scatters, rock art, and remains of historical temples along the Ken River at Gharighat within the Panna Tiger Reserve (Nandan 2013). A further systematic survey is required to locate and study the Archaeological remains and their context within the reserve.

5.3.2. Artefacts

Overall, the artefact assemblage includes both laminar and microblade products (Table 3), which are made of fine-grained stones such as chert, chalcedony, agate, jasper and siliceous sandstone. The source of these raw materials is found in the form of small nodules in the gravel beds of the nearby rivers and streams. Siliceous sandstone occurs at the Pahadiya hillock and probably represents one of the principal raw-material sources exploited during the Late Palaeolithic in the study area.

Microlithic blade cores from all sites range in size from 50 mm to 30 mm, while the backed blades measure between 30 mm and 15 mm. In the laminar blade assemblage from Mohaniya Ghati, the core size ranges from 70 mm to 30 mm, and the blades are measured between 65mm to 30mm. At Bhajikhera, most of the microblade cores are either conical or cylindrical in shape, including a fluted micro-blade core (Figure 9 n), a good example of the

quartering technique. The blade implements include lunates, asymmetrical points, penknives or curved-backed tools (Figure 9 e,f, g, j, m, & n).

At Dhausada, lithic debitage, early-stage reduction products, platform rejuvenation flakes blades, backed blades, and cores have been found (Figure 20 j & k). Among the backed blade tools, various geometric tools such as triangles, trapezes, lunates, penknives or curved-backed blades have been documented. Among the blade cores, the conical cores and cylindrical cores are documented. Also, some heavy-duty tools such as a notched scraper made of Chert, and an interesting piece of reddish crayon of ferricrete nodule has been found. The Usrar rock shelter site yielded conical cores and cylindrical cores (Figure 20 i, m & n), and one bullet core cum burin has been identified. Among the backed blade tools, the lunates, burins, oblique-backed blades, crescentic blades, and an asymmetrical points are documented. This surface collection includes a single example of a crested blade of porcellanite chert (Figure 20 e). It is notable that the crested guided blades are found in very scant numbers from this region and were reported from the late Mesolithic cultural layer in Mirzapur rock shelter by R.K. Varma (2007).

Accumulation of debris and scrap waste products (debitage, such as small flakes and chunks) at the shelter indicates that lithic reduction activities might have been carried out inside the shelter.

At the Dharkundi site, the assemblage comprises of microliths such as microlithic cores, backed blades, grinding artefacts, broken ring stone or mace-head, and palette stone (Figure 20 a & b).

6. Discussion

The present study demonstrates that the Kaimur foothills and adjoining river basins at the peripheral zones of the Middle Son Valley (MSV) preserve substantial evidence of prehistoric occupation spanning from the Lower Palaeolithic to the Late Palaeolithic and Mesolithic periods. The foothill zone of the Kaimur Range is marked by a dense Acheulean landscape, closely associated with a colluvial boulder-bed layer occurring at the base of Quaternary sediments. This deposit reflects short-duration, high-energy geomorphic events in this region and is consistently traceable parallel to the foothills across a significant extent of the study area. Stratigraphically, this colluvial layer (boulder-bed) is compared (based on Maihar stratigraphy) with Gravel 1 of the MSV and the Belan Valley in the past (Misra 1977). The scarcity of prepared cores and scrapers in the lithic assemblages from this context suggests that they may predate the Late Acheulean sites of the MSV. These assemblages exhibit several Early Acheulean features and likely represent the first wave of Acheulean hominins in the region. It is also important to note that a lack of prepared cores has been observed in certain Lower Palaeolithic sites of the MSV, which may be similar in age to the foothill sites (Kenoyer & Pal 1983; Shipton *et al.* 2013). Direct dating of these sites in the future would provide a clearer understanding of their chronology. Some large cores from foothill sites, however, exhibit characteristics of prepared cores, displaying hierarchical organisation and early features of the Levallois method, such as the *"Chirki Cleaver Core Method"* (Corvinus 1983), which closely resembles the recurrent Levallois reduction technique. This evidence suggests possible early experimentation with prepared core technology in the region.

There are several promising sites for dating, such as Maihar, Siddhnath Mandir Road, Semara, and Krishnagarh, which lie buried within thick Quaternary sediments, along with undisturbed Acheulean assemblages in the study area. It is interesting to note, as mentioned previously, that the artefacts are fresh and in mint condition, in complete contrast to the abraded and subangular colluvial blocks. Furthermore, these Acheulean lithics are associated with the entire lithic debitage reduction sequence, indicating that they are in situ and were not

deposited at the site due to high-energy events. All these factors make these sites promising for future detailed excavation, dating, and the study of techno-cultural adaptations of the Acheulean in the northern Vindhyan region through a *chaîne opératoire* approach. Sites of similar attributes are not visible in lowland areas, as they might be buried in deep sediments, or these areas were avoided by hominins because of a lack of raw material sources. The geomorphology of these foothill sites, features of the *chaîne opératoire* of lithic reduction, the higher frequency of cleavers among the bifaces (Figure 21), and the use of sandstone as the main raw material make the assemblage look more like the foothill Acheulean sites of Tikoda in the Raisen district, which are located in the southern Vindhyan basin (Ota & Deo 2014).

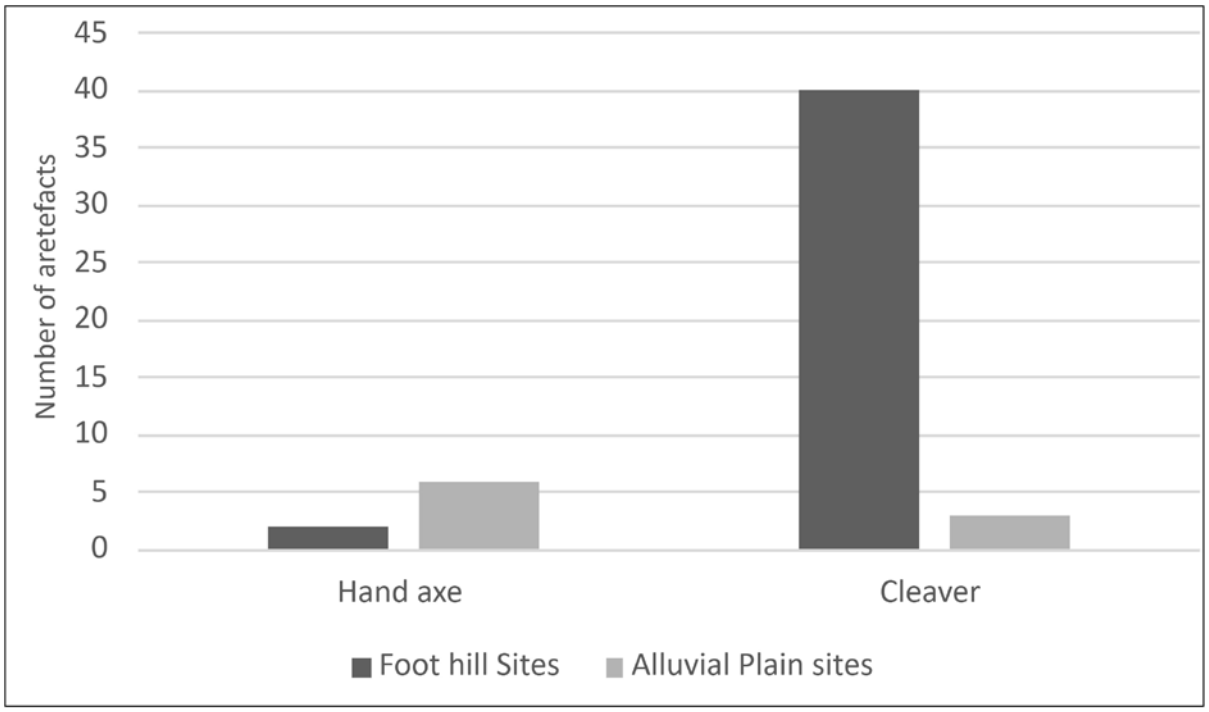

Figure 21. Distribution of bifaces (cleaver and handaxe) at the foothill and alluvial plain sites.

Furthermore, the Bundi area in Rajasthan, situated in the western part of the Vindhyan basin, is renowned for its numerous foothill Acheulean sites, which have been explored by Om Prakash Kukki and Varun Vyas (Vyas 2020). In contrast to this, the Late Acheulean sites of the MSV are handaxe-dominant in nature, and fine-grained raw materials such as quartzite and chert were used as the main raw materials for the manufacturing of lithics (Jones & Pal 2009; Pal 2019). The dominant number of cleavers at foothill sites compared to the alluvial plains may indicate a difference in the use of lithic artefacts at these two habitats of diverse ecological settings. Another interesting aspect of the Acheulean sites distributed in the sandstone hillocks of the Vindhyan basin is that they are mainly cleaver-dominant (Ota & Deo 2014; Pandey & Pal 1988; Vyas 2020), whereas most of the South Indian Acheulean sites are handaxe-dominant in nature (Pappu *et al.* 2011; Sharon 2006).

The palaeo-landscape and environmental conditions along the Kaimur foothills remain important questions for future research. A possible interpretation is that the colluvial boulder-bed layer formed under conditions of enhanced rainfall and increased slope activity, or represents part of a valley-fill sequence. The occurrence of fresh Acheulean artefacts in association with this deposit may indicate that hominin activity was broadly contemporaneous with the formation of the colluvial layer. This suggests that hominins may have occupied or utilized the foothill zone during phases of increased precipitation, although further geoarchaeological and stratigraphic investigations are required to substantiate this

interpretation. In the present context, Naro Hill, one of the key localities, is notable for its rich biodiversity and availability of diverse ecological resources. It is therefore plausible that such a resource-rich landscape - characterized by the availability of suitable lithic raw materials, floral and faunal resources, and perennial or seasonal water sources - provided favourable conditions for hunter-gatherer populations. These factors may have influenced the repeated presence, settlement, and movement of hominins along the foothill zone.

Alluvial context sites, such as those in the Rihand Basin and along the Yamuna (Mau locality), exhibit broad similarities with the lithic tradition of the Middle Son Valley (MSV), being dominated by Late Acheulean, Middle Palaeolithic, and Late Palaeolithic (microlithic) components. However, bifaces and microlithic elements are present in comparatively lower frequencies within these assemblages.

The presence of multiple gravel formation stages and associated Palaeolithic cultural remains at sites in the Rihand Basin indicates a cyclic pattern of short-duration, high-energy depositional events during the Pleistocene. In contrast, the exposed alluvial sections along the Yamuna River (Mau locality) reveal only a single phase of gravel formation. This gravel horizon may be contemporaneous with the Late Acheulean strata identified in the Middle Son Valley (MSV) and the Rihand Basin.

Other river valley sites, such as the Gopad and Chotti Mahanadi, are characterized by Middle Palaeolithic and Late Palaeolithic or Mesolithic assemblages. The Tons and Ken River sites (Kumar *et al*. 2020) are the only localities that have yielded pebble-based artefacts, suggesting a preference for pebble and cobble raw materials among hominins in these areas. This contrasts with the MSV sites and the foothill zones of the Kaimur Hills, where such raw material usage is notably rare.

The Late Palaeolithic or Mesolithic sites are found in large numbers at the periphery of the MSV. The recent dating of microlithics from this region underscores the significance of their early emergence (Clarkson *et al.* 2020).

The newly discovered Late Palaeolithic or Mesolithic sites comprise both open-air and rock shelter contexts. Most assemblages are microlithic-dominated, while a smaller proportion is associated with laminar blade assemblages (Figure 22). Laminar assemblages (Figure 11) are more frequently recorded at core MSV sites, such as Rampur, Baghor, and Sihawal, compared to those in the peripheral zones (Jones & Pal 2009). The presence of two distinct blade reduction methods - laminar and microblade - is evident in the assemblages from the study area.

However, as most of these assemblages are derived from surface contexts, the chronological relationship between these technologies - whether one precedes the other or both occur together - cannot be established on the basis of the present evidence. Further work is required to resolve this issue and to conduct a comparative analysis of the MSV laminar and upland microlithic assemblages, along with dating them to better understand the nature of the Late Palaeolithic in the northern Vindhyan region. The main issue with the Late Palaeolithic or Mesolithic assemblages is that most of them are surface contexts.

However, at the rock shelter sites such as Dharkundi and Usrar, and the open-air site at Bhajikhera, the archaeological layer is buried beneath the sediments. Such sites are ideal for future excavation and dating. The Bhajikhera microlithic assemblages do not contain any “palette-stones” or “mace-heads” (artefacts generally associated with Indian Mesolithic microliths), indicating that some of those assemblages could be of the pre-Holocene phase.

The seasonal movement of hunter-gatherer groups in the Northern Vindhyan Basin, between the upland foothills and the lowland basin, is an important area of study. Late Palaeolithic and Mesolithic evidence suggest that people may have moved seasonally between these zones. In the Kaimur Hills, painted rock shelters with Late Palaeolithic and Mesolithic materials are mainly found in the foothills, while open-air sites are more common in the

lowland basin. This pattern suggests that hunter-gatherer groups may have shifted their activity between these ecological zones according to seasonal conditions.

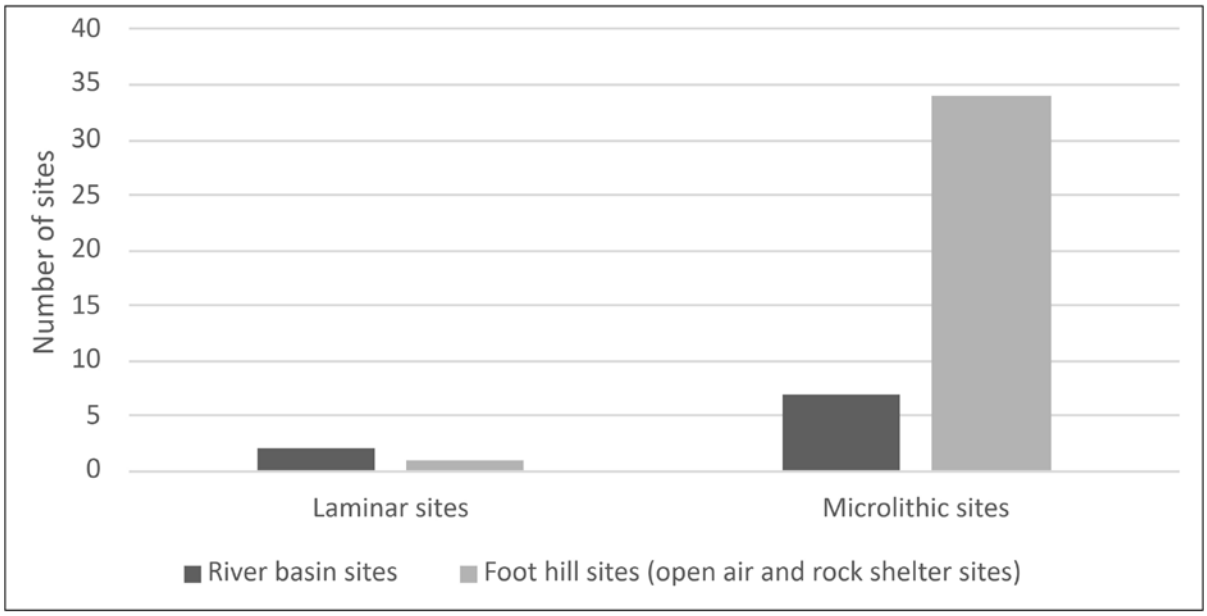

Figure 22. The number of microlithic and Laminar sites at river basin or alluvial plain sites and foothill sites.

During the monsoon season, the foothills would have offered favourable conditions for occupation due to raw material availability, rugged rocky terrain, perennial springs, and rock shelters. In contrast, the lowland basin areas may have been affected by flooding and sedimentation, reducing their suitability for occupation. During the dry season, the lowlands and river valleys may have become more attractive due to better access to water and stable surfaces, encouraging movement between these landscapes (Sinha 1984).

However, the applicability of this model to the Acheulean record remains uncertain. As noted earlier, foothill and river-valley Acheulean assemblages differ in character and context. It is also possible that some foothill-type Acheulean sites are buried beneath thick Quaternary sediment sequences in the lowland basin areas, meaning that the present surface record may be incomplete. Further geoarchaeological investigation is required to test this possibility and clarify early hominin landscape use in the region.

Another important observation from the study region is the limited occurrence of evidence for early farming settled communities (Neolithic communities) and their associated archaeological materials, such as ground and polished stone tools. This limited evidence may suggest that local prehistoric populations continued a hunter-gatherer lifeway into relatively late phases, possibly due to the availability of rich forest resources and faunal diversity - a pattern that may still be tentatively observed among some present-day tribal communities in the study area. The painted rock shelters may provide some direct evidence of late-phase activity, as many contain rock art from different periods along with associated archaeological materials. They are also located close to present-day tribal communities in forested areas, which may suggest possible continuity in the use of the landscape and resources over time. However, further evidence is required to substantiate this interpretation.

Changes in the palaeoenvironments and their possible implications for hominins in this region are other key areas of study. The Middle Son Valley is notable for containing deposits of the Youngest Toba Tuff (YTT) (Haslam & Petraglia 2010; Jones 2010). This ash layer originates from the Toba super-volcanic eruption that occurred approximately 74,000 years ago in Sumatra, Indonesia (Haslam & Petraglia 2010). The eruption certainly had an effect on

the environment and early human habitation in the region. Yet, key questions regarding the major impact of this event on hominin habitat, survival strategies, lithic technology, and local flora and fauna remain unanswered; they require considerable future investigations. There are numerous sites that hold high potential in this regard at the Ken, Tons, Rihand, and Yamuna rivers, which have thick, dateable sediments alongside vertebrate fossils (Figure 23). These sites are ideal for future excavations to uncover potential traces of YTT and reconstruct the palaeoenvironment.

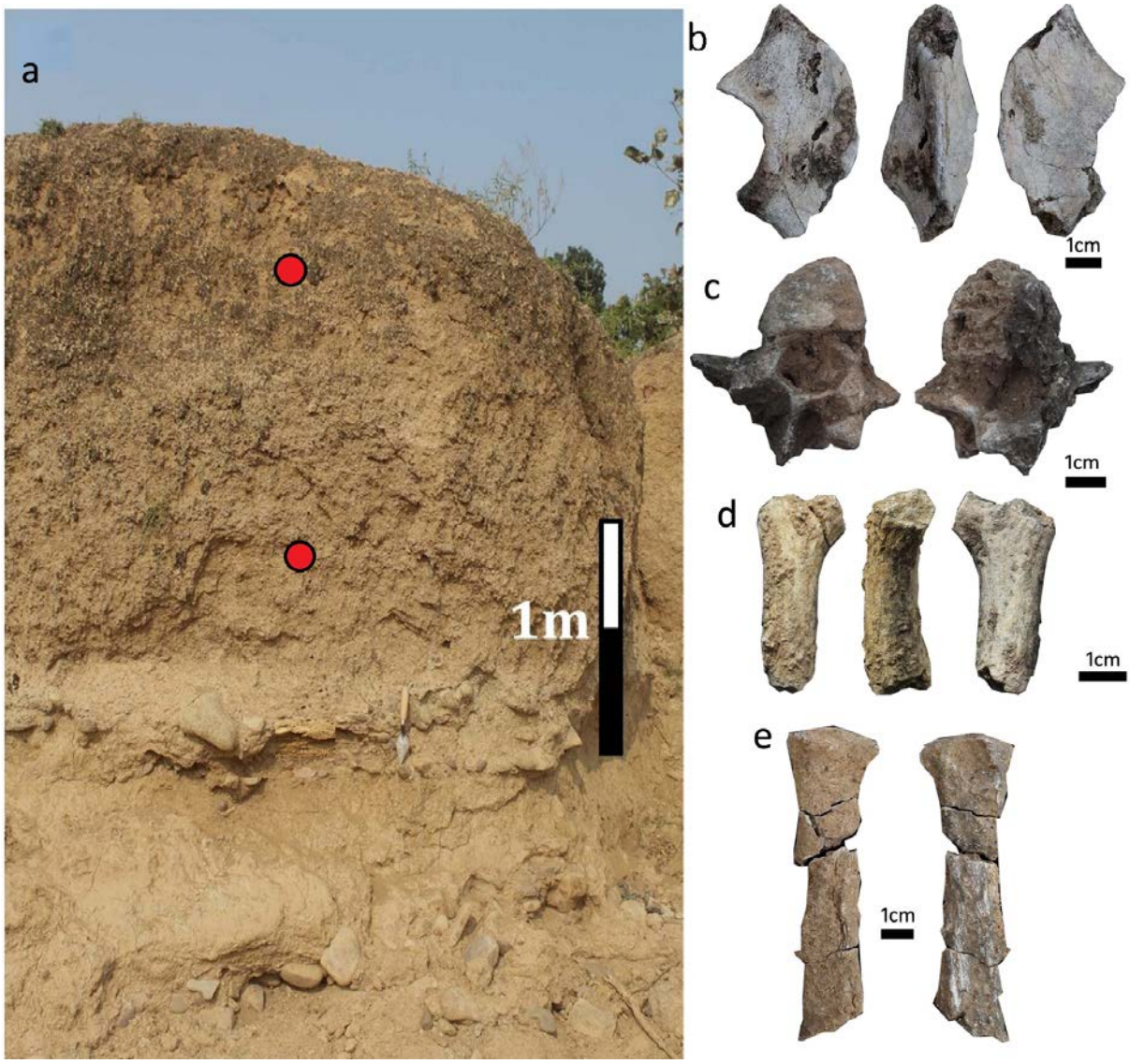

Figure 23. Vertebrate fossils from the different sites: Ken River - a) Exposed River section at Ken, red dot represents fossil location, b and e) part of mammal forelimbs, c) vertebrae of mammal; Satna River- d) fossilised antler.

7. Conclusion

This study highlights that the peripheral areas of the Middle Son Valley (MSV) experienced repeated hominin occupation during the Quaternary, spanning from the Lower Palaeolithic to the Mesolithic period. This is supported by the occurrence of rich Palaeolithic cultural materials, largely from stratified contexts, distributed across the foothill and rock shelter (upland) settings of the Kaimur Range and extending into the alluvial plains (lowland) of the river valleys.

Although a few well-dated sites are known from the MSV, comparatively limited work has been undertaken in the foothill and rock shelter contexts to understand technological adaptations, cultural variability, and the temporal span of prehistoric occupation. The stratified foothill sites, exhibiting early Acheulean characteristics, hold significant potential for future excavation and chronological refinement. The dominance of cleavers within these assemblages represents a distinctive feature that warrants detailed investigation into their functional role and associated activities in the foothill context. The identification of stratified Acheulean sites is particularly important, given their relative rarity in peninsular India (Mishra 2007).

Similarly, the alluvial plains of the Rihand Basin, the Ken River, and the Yamuna are associated with thick sedimentary sequences that have yielded Lower, Middle, and Late Palaeolithic artefacts, along with vertebrate fossils. These contexts provide important opportunities for systematic excavation and dating, which can significantly enhance our understanding of the prehistoric sequence and palaeoenvironmental conditions of the MSV and its surrounding regions.

In addition, the painted rock shelters of the Kaimur Hills, which preserve stratified and potentially datable cultural deposits, represent another key avenue for future research. Overall, this study highlights the archaeological potential of the MSV periphery and underscores the need for integrated geoarchaeological, stratigraphic, and chronological investigations to develop a more refined understanding of hominin occupation in this region.

Acknowledgements

The authors would like to thank Prof. P. Ajithprasad (MSU Baroda) for several insightful discussions and assistance in the study. We would also like to express our gratitude to the reviewers for their valuable comments and suggestions for improving the manuscript. The authors are also grateful to Amit Kumar Lodhi for his assistance in surveying the Bhajikhra, Manaura, and Bharhut sites. We especially appreciate the help and support of Mr Chandra Prakash and Mr Dewanshu Dwivedi during the fieldwork.

Data Accessibility Statement

The authors confirm that the data supporting the findings of this study are available within the paper. For further information, please write an email to the authors.

References

Ahmed, N. 1966, *Stone Age Cultures of the Upper Son Valley*, Ramanand Vidya Bhawan, New Delhi, Pune, 246 p.

Akhilesh, K., Pappu, S., Rajapara, H.M., Gunnell, Y., Shukla, A.D. & Singhvi, A.K. 2018, Early Middle Palaeolithic culture in India around 385-172 ka reframes Out of Africa models. *Nature*, 554(7690): 97-101. DOI: https://doi.org/10.1038/nature25444

Allchin, B. 1966b, *The Stone-tipped Arrow: Late Stone Age Hunters of the Tropical World*. Phoenix House, London, 1966, 224 p.

Andrefsky, W., Jr. 2005, *Lithics: Macroscopic Approaches to Analysis*. Cambridge University Press, New York, 142 p. DOI: https://doi.org/10.1017/CBO9780511810244

Blinkhorn, J. 2018, Buddha Pushkar revisited: Technological variability in Late Palaeolithic stone tools at the Thar Desert margin, India. *Journal of Archaeological Science: Reports*, 20: 168-182. DOI: https://doi.org/10.1016/j.jasrep.2018.04.020

Carlleyle, A.C. (1883), *Notes on lately discovered sepulchral mounds, cairns, caves, cave paintings and stone implements*. Unpublished manuscript (cited in other publications but not read by the current author).

Chakraborty, C. 2006, Proterozoic intracontinental basin: The Vindhyan example. *Journal of Earth System Science*, 115(1): 3-22. DOI: https://doi.org/10.1007/BF02703022

Chauhan, P.R. 2016, A Decade of Paleoanthropology in the Indian Subcontinent (2005-2015). In: *A Companion to South Asia in the Past*, Wiley, Chichester: p. 32-50. DOI: https://doi.org/10.1002/9781119055280.ch3

Chauhan, P.R. 2020, Human Evolution in the Center of the Old World: An Updated Review of the South Asian Paleolithic. In: *Pleistocene Archaeology - Migration, Technology, and Adaptation* (R. Ono & A. Pawlik), IntechOpen, London: p. 1-29. DOI: https://doi.org/10.5772/intechopen.94265

Clark, J.D. & Sharma, G.R. 1983, A discussion of preliminary results and assessment of future research potential. In: *Palaeoenvironments and Prehistory in the Middle Son Valley: Madhya Pradesh, North-Central India* (Sharma, G.R. & Clark, J.D., Eds.), Abinash Prakashan, Allahabad: p. 261-280.

Clarkson, C., Harris, C., Li, B., Neudorf, C.M., Roberts, R.G., Lane, C., Norman, K., Pal, J., Jones, S., Shipton, C., Koshy, J., Gupta, M.C., Mishra, D.P., Dubey, A.K., Boivin, N. & Petraglia, M. 2020, Human occupation of northern India spans the Toba super-eruption ~74,000 years ago. *Nature Communications*, 11(1): 961-961. DOI: https://doi.org/10.1038/s41467-020-14668-4

Cockburn, J. 1879, Notes on stone implements from the Khasi Hills and the Banda and Vellore Districts. *Journal of the Asiatic Society of Bengal*, 48: 133-143. URL: https://archive.org/details/in.ernet.dli.2015.280513/page/n136/mode/1up

Cockburn, J. 1888, Palaeolithic implements from the drift gravels of the Singrauli Basin, South Mirzapur. *Journal of the Anthropological Institute of Great Britain and Ireland*, 17: 57-65. DOI: https://doi.org/10.2307/2841670

Cockburn, J. 1899, Art. V. - Cave Drawings in the Kaimūr Range, North-West Provinces. *Journal of the Royal Asiatic Society of Great Britain & Ireland*, 31(1): 89-97. DOI: https://doi.org/10.1017/S0035869X00026113

Corvinus, G. 1983, A survey of the Pravara River system in Western Maharashtra, India. In: *The Excavation of the Acheulian Site of Chirki-on-Pravara, India* Vol. 2 (Corvinus, G., Ed.), Verlag Archaeologica Venatoria, Institut für Urgeschichte der Universität Tübingen, Tübingen: p. 1-91.

Debenath, A. & Dibble, H. 1994, *Handbook of Palaeolithic Typology: Lower and Middle Palaeolithic of Europe. Vol. 1*. University of Pennsylvania Museum of Archaeology and Anthropology., Philadelphia, 202 p. URL: http://www.jstor.org/stable/j.ctt14btgq9

Geological Survey of India 2026, *National Geoscience Data Repository*. Geological Survey of India. Retrieved 2026. URL: https://geodataindia.gov.in/

Ghosh, A.K. 1970, The Palaeolithic Cultures of Singhbhum. *Transactions of the American Philosophical Society*, 60: 1-68. DOI: https://www.degruyterbrill.com/document/doi/10.70249/9798893981599/html

Ghosh, A.K. 2008, Prehistory of the Chotanagpur Region Part 2: Proposed Stages - Palaeolithic and Mesolithic. *Internet Journal of Biological Anthropology*, 2(1): 1-14. URL: https://ispub.com/IJBA/2/1/9185

Goren-Inbar, N., Grosman, L. & Sharon, G. 2011, The technology and significance of the Acheulian giant cores of Gesher Benot Ya'aqov, Israel. *Journal of Archaeological Science*, 38(8): 1901-1917. DOI: https://doi.org/10.1016/j.jas.2011.03.037

Haslam, M., Harris, C., Clarkson, C., Pal, J.N., Shipton, C., Crowther, A., Koshy, J., Bora, J., Ditchfield, P., Ram, H.P., Price, K., Dubey, A.K. & Petraglia, M. 2012, Dhaba: An initial report on an Acheulean, Middle Palaeolithic and microlithic locality in the Middle Son Valley, north-central India. *Quaternary International*, 258: 191-199. DOI: https://doi.org/10.1016/j.quaint.2011.09.007

Haslam, M. & Petraglia, M. 2010, Comment on "Environmental impact of the 73ka Toba super-eruption in South Asia" by M.A.J. Williams, S.H. Ambrose, S. van der Kaars, C. Ruehlemann, U. Chattopadhyaya, J. Pal and P.R. Chauhan [Palaeogeography, Palaeoclimatology, Palaeoecology 284 (2009) 295-314]. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 296(1-2): 199-203. DOI: https://doi.org/10.1016/j.palaeo.2010.03.057

Jones, S.C. 2010, Palaeoenvironmental response to the ~74 ka Toba ash-fall in the Jurreru and Middle Son valleys in southern and north-central India. *Quaternary Research*, 73(2): 336-350. DOI: https://doi.org/10.1016/j.yqres.2009.11.005

Jones, S.C. & Pal, J.N. 2009, The Palaeolithic of the Middle Son valley, north-central India: Changes in hominin lithic technology and behaviour during the Upper Pleistocene. *Journal of Anthropological Archaeology*, 28(3): 323-341. DOI: https://doi.org/10.1016/j.jaa.2009.05.003

Kenoyer, J.M. & Pal, J.N. 1983, Report on the excavation and analysis of an Upper Acheulian assemblage from Sihawal II. In: *Palaeoenvironments and Prehistory in the Middle Son Valley* (Sharma, G.R. & Clark, J.D., Eds.), Abinash Prakashan, Allahabad: p. 23-28.

Khatri, A.P. 1961, Stone Age and Pleistocene chronology of the Narmada Valley. *Anthropos*, 56: 519-530.

Korisettar, R. 2007, Toward developing a basin model for Paleolithic settlement of the Indian subcontinent. In: *The Evolution and History of Human Populations in South Asia: Inter-disciplinary Studies in Archaeology, Biological Anthropology, Linguistics and Genetics* (Petraglia, M.D. & Allchin, B., Eds.), Springer Netherlands, Dordrecht: p. 69-96. DOI: https://doi.org/10.1007/1-4020-5562-5

Krishnaswami, V.D. & Soundarajan, K.V. 1951, The lithic tool industries of the Singrauli Basin. *Ancient India*, 9: 40-65.

Kumar, P. 2025. Early hominin lithic strategies in the Vindhyan Basin, South Asia: Raw material procurement and technological trends in the wider Asian Palaeolithic framework (abstract). In: *Inter-Congress Conference APT2025: Asian Prehistory Today - Bridging Science, Heritage & Development* (H. Widianto & F. Sémah, Eds.), Union Internationale des Sciences Préhistoriques et Protohistoriques (UISPP), Salatiga-Sangiran-Yogyakarta: p. 141. URL: https://drive.google.com/file/d/1icfH23dvkPHn32e59-Ar83aXPkrlGYcy/view

Kumar, P., Dwivedi, D. & Singh, C.P. 2022, Preliminary report on the survey of prehistoric sites in Chitrakoot District, Uttar Pradesh, Northern Vindhyan Region. *Heritage:*

Journal of Multidisciplinary Studies in Archaeology, 10: 787-795. URL: https://www.heritageuniversityofkerala.com/JournalPDF/Volume10/54.pdf

Kumar, P., Srivastava, M.C. & Nandan, P.K. 2020, Prehistoric explorations in the Central Ken Basin, Panna District, North Central India. *Heritage: Journal of Multidisciplinary Studies in Archaeology*, 8(2): 527-537. URL: https://heritageuniversityofkerala.com/JournalPDF/Volume8.2/29.pdf

Kumar, P., Srivastava, M.C., Singh, A. & Lodhi, A.K. 2021, Prehistoric Explorations in the Mayar River, District Singrauli, North Central India. *Journal of Archaeological Studies in India*, 1(1): 62-74. URL: https://docslib.org/doc/1897019/prehistoric-explorations-in-the-mayar-river-district-singrauli-in-north-central-india

Mehra, S.B. 2018, The Palaeolithic and Microlithic Records of the Lower Son Valley, Sonbhadra, Uttar Pradesh: A Review and New Data. *Heritage: Journal of Multidisciplinary Studies in Archaeology*, 6: 148-168. URL: https://www.heritageuniversityofkerala.com/JournalPDF/Volume6/7.pdf

Mishra, S. 2007, The Indian Lower Palaeolithic. *Bulletin of the Deccan College Postgraduate and Research Institute*, 66: 47-94. URL: http://www.jstor.org/stable/42931441

Mishra, S. 2016, The Narmada River in Indian prehistory. *Puratattva*, 46: 36-47.

Misra, V.D. 1977, *Some Aspects of Indian Archaeology*. Prabhat Prakashan, Allahabad, 128 p.

Nandan, P.K., Kumar, P. & Baviskar, Y. 2020, Prehistoric Rock Paintings of Usrar, Singhpur, district Satna, North Central India: A Preliminary Investigation and Analysis. *ICON Journal of Archaeology and Culture*, 7: 15-23.

Ota, S.B. & Deo, S.G. 2014, Investigation of Acheulian Localities TKD-I and TKD-II at Tikoda, District Raisen, Madhya Pradesh (2010-12). In: *Quaternary Environments and Geoarchaeology of India* (Paddayya, K. & Deo, S.G., Eds.), Geological Society of India, Bengaluru: p. 57-66.

Pal, J.N. 2019, A Review of the Researches on the Acheulian Culture in the Vindhyas, North-Central India. *Indian Journal of Archaeology*, 4(2): 1-10. URL: https://ijarch.com/wp-content/uploads/2025/06/IJA-VOL-4.-NO.-2.pdf

Pandey, J.N. & Pal, J.N. 1988, Acheulian occupation at Maihar. *Man and Environment*, 12: 201-202.

Pappu, S., Gunnell, Y., Akhilesh, K., Braucher, R., Taieb, M., Demory, F. & Thouveny, N. 2011, Early Pleistocene Presence of Acheulian Hominins in South India. *Science*, 331(6024): 1596-1599. DOI: https://doi.org/10.1126/science.1200183

Sharma, G.R. 1973, Mesolithic Lake Cultures in the Ganga Valley, India. *Proceedings of the Prehistoric Society*, 39: 129-146. DOI: https://doi.org/10.1017/S0079497X00011646

Sharma, G.R. & Clark, J.D. 1982, Palaeo-environments and prehistory in the Middle Son valley, northern Madhya Pradesh. *Man and Environment*, 6: 56-62.

Sharon, G. 2007, *Acheulian Large Flake Industries: Technology, Chronology, Distribution and Significance*, BAR International Series (Archaeopress), Oxford, 236 p.

Shipton, C., Clarkson, C., Pal, J.N., Jones, S.C., Roberts, R.G., Harris, C., Gupta, M.C., Ditchfield, P.W. & Petraglia, M.D. 2013, Generativity, hierarchical action and recursion in the technology of the Acheulean to Middle Palaeolithic transition: A perspective

from Patpara, the Son Valley, India. *Journal of Human Evolution*, 65(2): 93-108. DOI: https://doi.org/10.1016/j.jhevol.2013.03.007

Sinha, P. 1984, *Stone age cultures of Satna District (Madhya Pradesh)* Unpublished PhD thesis, University of Allahabad, Allahabad, 334 p.

Sitch, B. 2017, *Prehistoric India at Manchester Museum I: Archibald Campbell Carlyle*. Ancient Worlds: Ancient Worlds at Manchester Museum. Manchester Museum, University of Manchester, Manchester. Retrieved 01 August 2026. URL: https://ancientworldsmanchester.wordpress.com/2017/06/23/prehistoric-india-at-manchester-museum-i-archibald-campbell-carlyle/

Usik, V.I., Rose, J.I., Hilbert, Y.H., Van Peer, P. & Marks, A.E. 2013, Nubian Complex reduction strategies in Dhofar, southern Oman. *Quaternary International*, 300: 244-266. DOI: https://doi.org/10.1016/j.quaint.2012.08.2111

Van Peer, P. 1992, *The Levallois Reduction Strategy*. *Monographs in World Archaeology*. *Vol. 13*. Prehistory Press, Madison, Wisconsin, 137 p.

Varma, R.K. 1964, *The Stone Age Cultures of Mirzapur*. Unpublished D.Phil. Dissertation, University of Allahabad, 569 p.

Varma, R.K. 2007, *Bhartiya Pragaitihasik*. Pram Jyoti Prakashan, Allahabad, 353 p.

Varma, R.K. 2012, *Rock Art of Central India, North Vindhyan Region*. Aryan Books International, New Delhi, 146 p.

Vyas, V. 2020, *Localization of global technology: regional variability in Acheulean techno-complex at the South-eastern margin of the Thar Desert*. Unpublished Master's thesis, Maharaja Sayajirao University of Baroda, Baroda, 79 p.

Wakankar, V.S. & Brooks, R.R. 1976, *Stone Age Paintings in India*. D.B Taraporevala Sons&Co., Bombay, 176 p.

Williams, M. & Clarke, M.F. 1995, Quaternary geology and prehistoric environments in the Son and Belan valleys, north-central India. In: *Quaternary Environments and Geoarchaeology of India* (Wadia, S., Korisettar, R., & Kale, V.S. Eds.), Geological Society of India, Bangalore: p. 282-308.

मध्य सोन घाटी के परिधीय क्षेत्रों में स्थित पुरापाषाणकालीन स्थल, उत्तरी विंध्यन पठार, मध्य भारत: एक प्रारंभिक अध्ययन

प्रवीण कुमार [1,2], एम. सी. श्रीवास्तव [2], पुष्पेन्द्र कुमार नंदन [2]

1. भारतीय पुरातत्व सर्वेक्षण, पटना सर्किल, पटना-800001, बिहार, भारत. ई-मेल: 1995nagod@gmail.com
2. प्राचीन भारतीय इतिहास, संस्कृति एवं पुरातत्व विभाग, ए.पी.एस. विश्वविद्यालय, रीवा-486003, मध्य प्रदेश, भारत.
ई-मेल: श्रीवास्तव: dr.maheshapsurewa@gmail.com; नंदन: pknandan18@gmail.com

सारांश:

दक्षिण एशिया में, मध्य भारत का उत्तरी विन्ध्य पठार जलोढ़ मैदानों और कैमूर पर्वतश्रेणी में संरक्षित पुरापाषाणीय अभिलेखों के लिए महत्वपूर्ण है। मध्य सोन घाटी (M.S.V.), इस क्षेत्र की प्रमुख नदी घाटियों में से एक, का व्यापक अध्ययन विभिन्न विद्वानों और संस्थानों द्वारा किया गया है, जिससे तिथिबद्ध और स्तरित जलोढ़ अवसादों से पुरापाषाणीय स्थल और कशेरुकी जीवाश्मों का साक्ष्य प्राप्त हुआ है। परंतु M.S.V. के परिधीय क्षेत्रों में सहायक नदियों, समीपवर्ती घाटियों तथा कैमूर पहाड़ी तल क्षेत्रों के पुरापाषाणीय अवशेषों की प्रकृति पर अपेक्षाकृत कम जानकारी उपलब्ध है।

वर्तमान शोध वर्ष 2012-2025 के मध्य M.S.V. के समीपवर्ती क्षेत्रों में किए गए व्यवस्थित फील्ड अन्वेषणों द्वारा इस अंतर को पूरा किया गया। अन्वेषण में योजनाबद्ध सर्वेक्षण, पाषाण उपकरण समूहों का अभिलेखन और उनके भू-आकृतिक संदर्भों का विश्लेषण शामिल था। कुल 787 पाषाण कलाकृतियों का अभिलेखन सतही और स्तरित स्थलों से किया गया।

अवलोकनों से कैमूर पर्वतश्रेणी, उसके तलहटी क्षेत्रों और समीपवर्ती घाटियों में अनेक नए पुरापाषाणीय स्थल, प्रागैतिहासिक चित्रित शैलाश्रय और संबंधित पुरातात्त्विक समूह अभिलेखन किया गया है। कैमूर तलहटी क्षेत्रों से प्राप्त अशूलियन उपकरण समूहों में बिदारनी (Cleaver) उपकरणों की बहुलता एक महत्वपूर्ण अवलोकन के रूप में दर्ज किया गया है, जबकि उत्तर पुरापाषाण और मध्यपाषाणकालीन अवशेष मुख्यतः सतही संदर्भों से संकलित हुए।

समीपवर्ती नदी घाटियों - रिहन्द, मयार, टोंस, गोपद, केन, और छोटी महानदी - में निम्न, मध्य और उत्तर पुरापाषाण या मध्यपाषाण कालीन अनेक उपकरण और स्तरित परतों से कशेरुकी जीवाश्म रिकॉर्ड किए गए।

ये निष्कर्ष दर्शाते हैं कि M.S.V. के परिधीय क्षेत्र महत्वपूर्ण पुरातात्त्विक परिदृश्य प्रस्तुत करते हैं और होमिनिन के पुनरावर्ती अधिवास को प्रतिबिंबित करते हैं। परिणाम यह भी संकेत देते हैं कि विन्ध्य घाटी ने पुरापाषाण कालीन मानव निवास और अनुकूलन के लिए अनुकूल पारिस्थितिक परिवेश प्रदान किया, जिससे मध्य सोन घाटी के व्यापक क्षेत्र में प्रागैतिहासिक जनसमूहों के वितरण और व्यवहारिक प्रतिरूपों के संबंध में नई अंतर्दृष्टियाँ प्राप्त होती हैं।

कुंजी शब्द: अशूलियन उपकरण समूह; भू-आकृतिक अध्ययन; कैमूर पर्वतश्रेणी; मध्य सोन घाटी; पुरापाषाणीय पुरातत्त्व; नदी घाटी; शैलाश्रय; विन्ध्य पठार

Sitios paleolíticos en la periferia del Valle Medio del Son, Meseta Vindhyan septentrional, India central: una investigación preliminar

Praveen Kumar [1,2], M. C. Srivastava [2], Pushpendra Kumar Nandan [2]

1. Servicio Arqueológico de la India (ASI), Patna Circle, Patna - 800001, Bihar, India.
E-mail: 1995nagod@gmail.com
2. Departamento de Historia Antigua de la India, Cultura y Arqueología, Universidad A.P.S., Rewa - 486003, Madhya Pradesh, India. E-mail: Srivastava: dr.maheshapsurewa@gmail.com; Nandan: pknandan18@gmail.com

Resumen:

En el sur de Asia, el norte del Altiplano Vindhya, en el centro de la India, conserva un rico registro paleolítico proveniente tanto de los llanos aluviales como de la cordillera de Kaimur. El Valle Medio del Son (MSV), una de las cuencas fluviales clave de esta región, ha sido ampliamente estudiado por diversos académicos e instituciones, proporcionando un registro significativo de sitios paleolíticos junto con fósiles de vertebrados provenientes de sedimentos aluviales datados y estratificados. Sin embargo, se sabe relativamente poco sobre la naturaleza de los restos paleolíticos en los afluentes, las cuencas fluviales vecinas y las zonas de estribaciones de la cordillera de Kaimur dentro de las áreas periféricas del MSV.

Esta investigación aborda esta laguna mediante exploraciones arqueológicas sistemáticas realizadas entre 2012 y 2025 en las regiones vecinas del MSV. El trabajo de campo incluyó encuestas estructuradas, documentación de conjuntos líticos y análisis de sus contextos geomorfológicos. Se documentaron un total de 787 artefactos líticos provenientes de sitios superficiales y localidades estratificadas, recolectados en exposiciones sedimentarias y contextos superficiales seleccionados.

Las investigaciones condujeron al descubrimiento de varios sitios paleolíticos nuevos, refugios rocosos pintados prehistóricos y conjuntos arqueológicos relacionados en la cordillera de Kaimur y sus estribaciones, así como en las cuencas fluviales adyacentes, frecuentemente conservados en depósitos bien estratificados. Las zonas de estribaciones proporcionaron conjuntos achelenses dominados por bifaces (cleavers), los cuales constituyen una evidencia significativa de la ocupación, junto con artefactos atribuibles al Paleolítico Superior o Mesolítico, la mayoría recuperados de contextos superficiales.

Además, se documentaron cientos de refugios rocosos pintados en la cordillera de Kaimur, asociados con conjuntos del Paleolítico Superior o Mesolítico y otros restos arqueológicos. En las cuencas fluviales vecinas, como Rihand, Mayar, Tons, Gopad, Ken y Choti Mahanadi, se registraron numerosos artefactos del Paleolítico Inferior, Medio y Superior o Mesolítico, junto con fósiles de vertebrados provenientes de capas estratificadas.

Estos hallazgos demuestran que las zonas periféricas del MSV constituyen un paisaje arqueológico significativo y reflejan la ocupación recurrente de homínidos. Los resultados sugieren además que la cuenca Vindhya proporcionó un entorno ecológico favorable para la ocupación y adaptación paleolítica sostenida, ofreciendo nuevas perspectivas sobre la distribución y los patrones de comportamiento de las poblaciones prehistóricas en la región más amplia del Valle Medio del Son.

Palabras clave: conjuntos achelenses; geomorfología; cordillera de Kaimur; Valle Medio del Son; arqueología paleolítica; cuenca fluvial; refugios rocosos; Altiplano Vindhya