University of
Sistan and Baluchestan

Iranian Journal of Archaeological Studies

Print ISSN: 2251-743X Online ISSN: 2676-2919

Archaeological Sciences
Research Centre

A Study of Lithic Assemblage from Battherma Nala, Southern Bargarh Upland, Western Odisha, India

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Received: 08/ 02/ 2024; Received in Revised form: 19/ 04/ 2024; Accepted: 07/ 05/ 2024; Published: 20/ 06/ 2024

Abstract

The present study investigates the prehistoric lithic assemblages from Battherma Nala, a sub-tributary of the Ghensali river in the southern Bargarh upland of Western Odisha, India. The stream, extends about 14 km from its origin to confluence, has revealed four significant prehistoric sites in two distinct geomorphic contexts i.e., riverbank and rocky outcrop. The surface exploration yielded 1,360 lithic artifacts, predominantly microliths including cores, flakes, blades, and bladelets. The assemblage also includes very few Middle Palaeolithic components, indicating advanced flintknapping techniques, structured blank removal process. The artifacts were analyzed for their techno-typology and raw material variability. The study area, characterized by diverse physiographic units and complex lithological formations, provides an abundant source of raw materials, mainly chert, quartz, and quartzite. This investigation enriches our understanding of the settlement patterns, lithic assemblages and raw material exploitation strategies in the Bargarh upland. The findings contribute to broader archaeological contexts, reflecting the cultural dynamics and early human presence in this region.

Keywords: Prehistory, Microlithic, Raw Material, Battherma Nala, Bargarh Upland.

Article Type: Research Article

Introduction

Odisha holds a unique place in the Indian subcontinent due to its numerous prehistoric sites, reported from various geomorphological contexts with diverse lithic assemblages. Since the first discoveries by Vallentine Ball at four different sites in Odisha thousands of such sites have been documented across the region. (Ball 1876; Mendaly and Hussain 2015; Padhan 2017; Patnaik *et al*. 2019; Barik *et al*. 2023). The last three decades prehistoric archaeology of Bargarh upland has expanded to a new horizon after discovery of more than hundred prehistoric sites in both northern and southern part of the upland. The exploration of major and minor tributaries of the Jira and Ong rivers has yielded many prehistoric sites, from the palaeolithic to the microlithic phase in this area. (Tripathi 1980; Behera *et al*. 2015; Thakur and Behera 2015; Thakur 2015 a, b; Deep 2016; Behera *et al*. 2018, Behera and Thakur 2019; Behera *et al*. 2020; Barik and Sabale 2021, Barik 2022, Behera and Barik 2022, Behera and Barik 2023, Barik *et al*. 2023, Padhan 2016). Although the major and minor river valleys in the Bargarh upland have been explored, the Battherma Nala, one of the important streams running out from the Jhanj-Malaikhaman reserve forest, was left blank.

The Battherma Nala, located within the Southern Bargarh Upland of Odisha, in eastern India. The river travels a very short distance of about 14 km and joins the Ghensali river, where four (04) important prehistoric sites were identified (Figure.1). This preliminary exploration in this area has revealed about early inhabitants' lithic assemblage, settlement pattern, and raw material exploitation pattern.

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DOI: 10.22111/IJAS.2024.48858.1302

Publisher: University of Sistan and Baluchestan

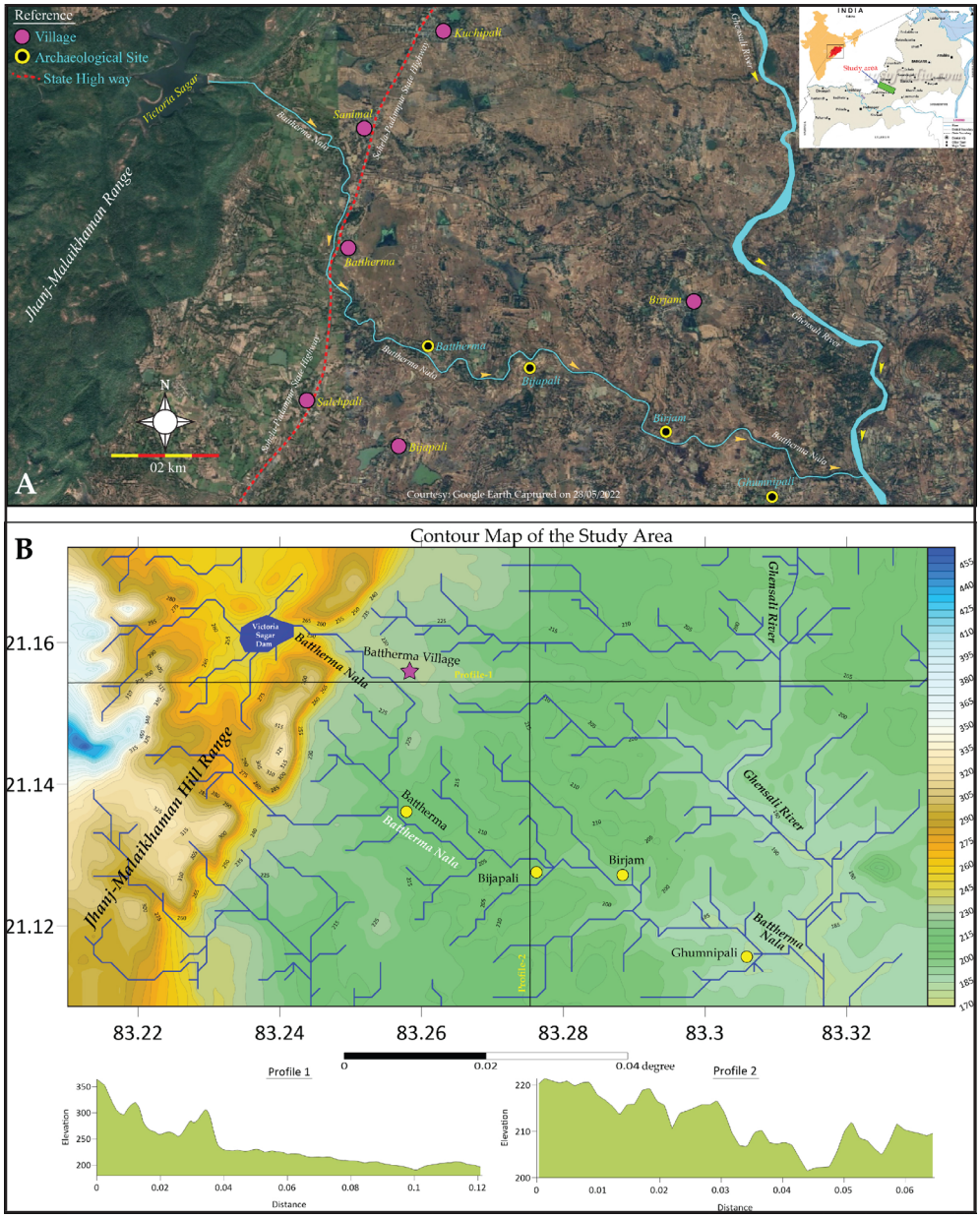


Figure.1: *A: Location of the Study area and sites. B: Contour and Drainage pattern of the Battherma nala.*

The Study Area and its Environment

The study area lies in the toposheet no of 64 (O/8) and 64 (O/4) prepared by Survey of India and published in the year 1981; 1982 of 1:50,000 scale. The Battherma nala is a right bank tributary of Ghensali river which is a major tributary of Ong river. The Battherma nala originates from the Jhaj-Malaikhaman range with an elevation from 695 m amsl. The survey area lies in the Sohela block of Bargarh District which is located 55 km south west of the district headquarter. With an average elevation of 198 metres (650 feet) above mean sea level, the region is characterized as a plain land that is flat and gradually undulating in a south-southeast direction. The ground slopes smoothly and gently along the Ong river valley, while further from it, the surface relief is undulating. The flatness of the plain land is frequently broken by the presence of few conical hillocks and low, linear reefs (Figure.2 A). The Ong river controls the drainage pattern of the region. The area is a small portion of the great Peninsular Shield, with lithological units belonging to the Archaean system of pre-Cambrian age. Three distinctive rock assemblages within the Archaeans are grouped: sedimentary metamorphites (quartz-mica schist and phyllite), meta-basites (hornblende

schist, amphibolite, epidiorite), and granitoid rocks. The granitoid varieties are divided into two groups: biotite granodiorite and migmatitic gneisses (perphyroblastic gneiss, banded gneiss, and 'augen' gneiss). Veining of these rocks by granitic material has been noted in some places. The granitoid varieties have been invaded by dykes of dolerite, thin quartz, and pegmatite veins (Figure.2B). Secondary veins of epidote have also been encountered in some places (Mohanty and Sahoo 2000).

The study region can generally be divided into four physiographic units. (i) The high hill ranges occupied by Chhattisgarh sedimentary in the north and northwest, (ii) the dissected hill ranges of the Eastern ghats in the south, forming plateau at Gandhmardan hills, (iii) a flat to slightly undulatory soil covered terrene occupied by the Bastar Cratonic Gneisses in the central part, and (iv) a low-lying narrow tract of circular mounds occupied by Gondwana sediments south of the Ong river course. The arable land comprises a significant portion of the overall land area. The vegetation cover in the forested regions is irregular and dense, with shrubby undergrowth. Common tree species consist of sal, pia sal, pipal, and bamboo, among others. Densely vegetated forested regions serve as habitats for various wild animals, including tigers, leopards, bears, along with venomous snakes. Temperature variations occur seasonally in the tropical Savana climate of the region. The summertime maximum temperature reaches 45°C. Wintertime temperatures typically fluctuate between 10° and 12°C. Commencing in June with the advent of the monsoon, the rainy season continues until October. The majority of the 20-25 cm annual average precipitation occurs during the monsoon season (Singh 1971).

Methodology Adopted

The initial exploration of the Battherma nala started in March 2018 and continued until May 2018. The survey covered all the nearby foothills of the Jhanj-Malaikhaman range and the granitic outcrops along the nala bank in the area. During exploration we have used Survey of India topographic sheets (1:50,000 scale) and District Resources Map (DRM) for systematic exploration. GIS applications helped in identifying potential areas from geological and geomorphological perspectives. The software's like ESRI ArcGIS (10.8.2), QGIS, Golden Surfer, and satellite data from Bhuvan, ISRO, USGS Earth Explorer, Bhukosh Geological Survey of India were utilised. The satellite imagery from Google Earth, and Bing images used during exploration. Various thematic layers such as Digital Elevation Model, drainage, contour, lithology, and geomorphology maps of the study area were created using GIS. For detailed documentation of each site, we have used Garmin Etrex-10 GPS (<3m resolution) and android app *GPS waypoints*, developed by Bluecover technologies was used to record site locations, site expansion and artifact distributions. The study area was surveyed on foot, walking along both banks and thoroughly examining exposed riverbank surfaces for sites. The sites were systematically surveyed and artifacts were randomly collected from surface of the selected large cluster areas for detailed techno-typological study. For statistical study and graph preparation the software like MS-Excel, Minitab and SPSS were used.

The Sites

The systematic explorations conducted in the Battherma Nala and its adjoining area has resulted in discovery of four (04) important prehistoric sites i.e. 1- Battherma (BTR), 2- Bijapali (BJP), 3-Birjam (BJM) and 4-Ghumnipali (GMP) in two different geomorphological setup (i) Riverbank context and (ii) Rocky out crop context. All these four sites are located in the Sohela block around 55 km southwest of the district headquarter Bargarh. During our systematic survey in this area a total no of 1360 (chip/chunk- 256) artifacts were collected (Table.1). The site of Battherma (Lat: 21.13101, Long: 83.26693, and Elevation- 207m) is situated on the left bank of Battherma nala, and can be approached 800m downstream of Battherma nala bridge on statehighway-3. The site is found in a riverbank context, and the artifacts were collected from the freshly exposed surface, which yielded very few middle palaeolithic artifacts prepared on fine-grain quartzite and large number of microlithic components (Figure.3). Bijapali (Lat: 21.12929 N, Long: 83.27646 E, Elevation: 201m) site is located on the right bank of the Battherma nala at a distance of 2.5 km towards the north of the Bijapali village. The lithic remains were sampled from the freshly exposed surface having microlithic components with flake-blade composition and, very few Levallois flake, point, etc (Figure.4). Birjam (Lat: 21.12687, Long: 83.28697, Elevation: 199m) is well connected by road and approachable from Sanimal to Birjam.

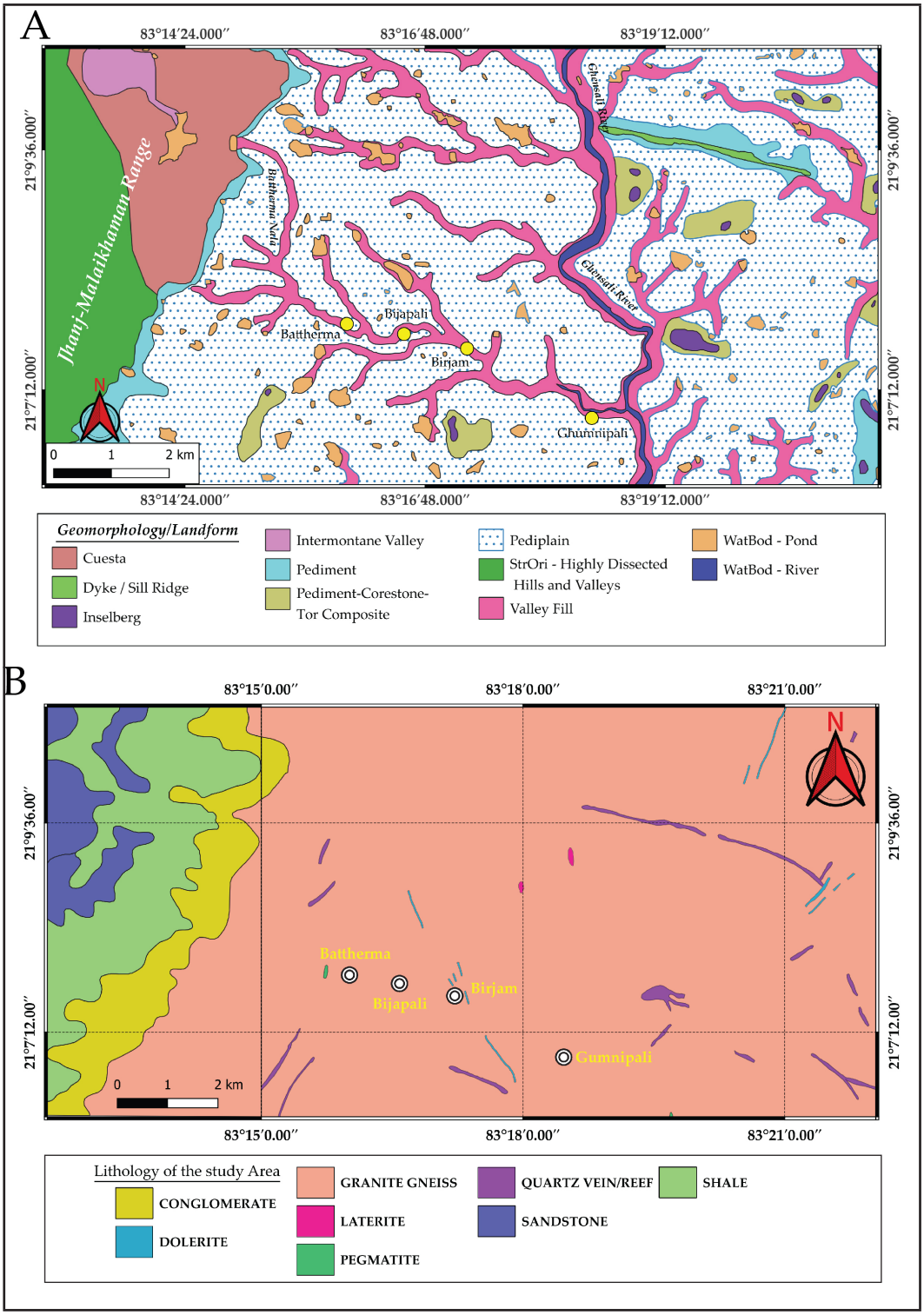


Figure.2: *A: Geomorphological land form of the Study area. B: Lithology of the Study area.*

It is found in a granitic rocky out-crop context on the left bank of the Battherma nala, and the artifacts are found scattered on the periphery of the out-crop (Figure.5). Another site Ghumnipali (Lat: 21.11533 N, Long: 83.28697 E, Elevation: 199m) located 1.8 kilometers northwest of Ghumnipali village on the right bank of the Battherma nala, in a rocky outcrop environment near the junction of the Battherma nala and Ghensali rivers. The exposed granite outcrop has revealed microlithic components collected from its slope and a considerable number of cup marks were identified at the top of the outcrop (Figure.6).

Table.1: *Site wise collected lithic artifacts from the Battherma Nala*

Sl. No	Site Name	Artefact Category														Total
		Core	%	Flake	%	Blade	%	Bladelet	%	Hammer	%	Red Ochre	%	Chip/ Chunk	%	
1	Battherma	42	14.29	137	46.60	49	16.67	38	12.93	1	0.34	2	0.68	25	8.50	294
2	Bijapali	50	13.40	183	49.06	26	6.97	41	10.99	-	-	-	-	73	19.57	373
3	Birjam	96	14.79	315	48.54	46	7.09	44	6.78	-	-	-	-	148	22.80	649
4	Ghumnipali	4	9.09	18	40.91	8	18.18	4	9.09	-	-	-	-	10	22.73	44
Grand Total																1360

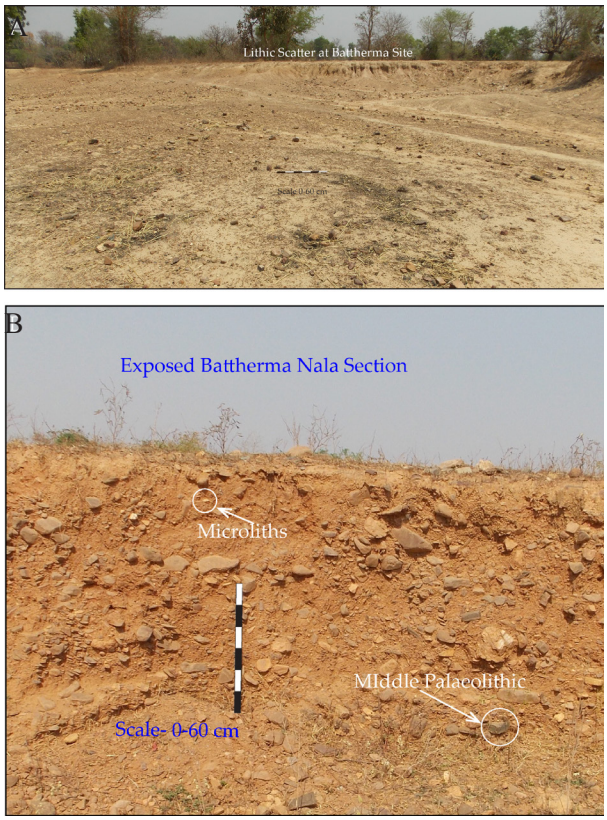


Figure.3: *A: General view of the Battherma Site. B: Exposed River section with embed Microliths and middle palaeolithic tools in high level gravel deposit.*

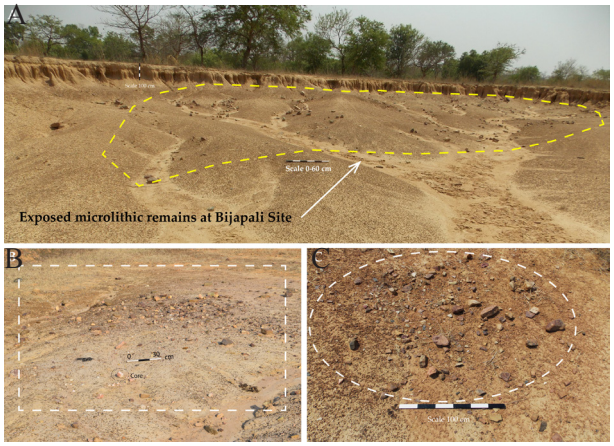


Figure.4: *A: Exposed surface with Microlithic remains at Bijapali site. B & C: Cluster of Microliths at Bijapali.*



Figure.5: *A: General view of the Birjam site. B: scattered microliths on the surface at Birjam.*

Lithic Assemblage

The analysis of lithic assemblages plays an important role in understanding technological evolution and human behaviour. All the lithic artifacts collected from the Battherma nala were examined individually. Preliminary classification was conducted to identify the specimens from each of the general artifact class. This study aims to analyse the composition, typology, raw material procurement strategies, spatial distribution patterns and contextual importance of the lithics collected from Battherma nala within the broader archaeological context of the area. The lithic assemblage comprised of core, flake, blade, bladelet, hammer stone and used red ochre. The collected artefacts are found in fresh condition and a total

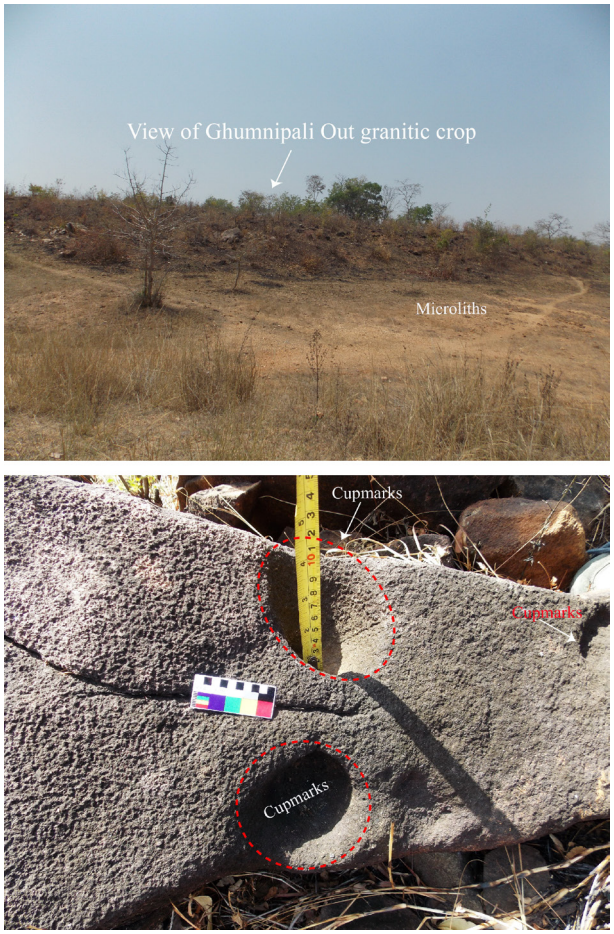


Figure.6: *A: General View of the Ghumnipali site. B: Cup mark remains at the rocky outcrop of Ghumnipali site.*

n-1360 specimens were collected for further study. The total assemblage composed of core (14.12%), flake (48.01%), Blade (9.49%), Bladelet (9.34%), Hammer (0.07%), Red ochre (0.15%) and chip/ chunk (18.82%) of the lithic composition (Figure.7) (Table.2).

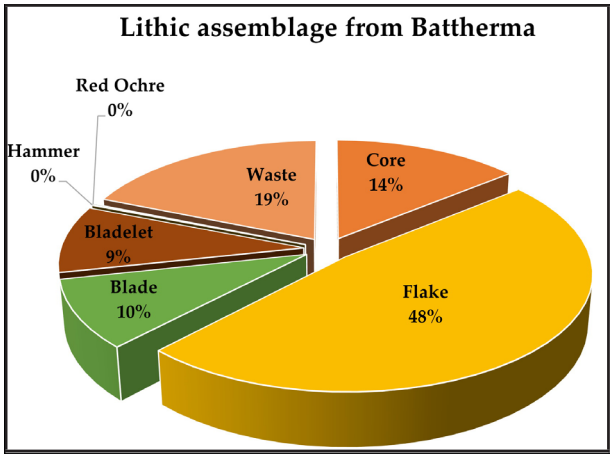


Figure.7: *Lithic assemblage from the Battherma nala.*

Core Technology

Cores consist of lithic raw materials that vary from unprocessed parent material to those with several negative flake scars and well-defined platforms. A total of 192 core were sampled from the study area and these were studied in details to understand their reduction process (Figure.8).

It was observed that blank forms consist of angular nodules (7.29%), rounded nodules (2.60%), flakes (23.96%), chunks (63.54%), cobbles (0.52%) followed by undetermined (2.08%) artefacts in the collections. The cores were found with single platform single face (SPSF 53.65%), Single platform all-round face (SPAF 5.21%), opposite platform same face (OPSF 18.75%), opposite platform opposite face (OPOF 14.06%) followed by multiple platforms (6.25%) and Levallois (2.08%). The majority of the core have been observed with prepared platforms (60.35%), followed by cortical platforms (30.40%) and facetted platforms (9.25%).

Table.2: *Lithic assemblage from Battherma Nala*

Artefact Category	Total n	Percentage (%)	Unretouched n	Percentage (%)	Retouched n	Percentage (%)	Percentage Utilized
Core	192	14.12	163	17.95	-	-	-
Flake	653	48.01	521	57.38	44	57.89	6.74
Blade	129	9.49	109	12.00	20	26.32	15.50
Bladelet	127	9.34	115	12.67	12	15.79	9.45
Hammer	1	0.07	-	-	-	-	-
Red Ochre	2	0.15	-	-	-	-	-
Total	**1104**	81.18	-	-	-	-	-
Waste	256	18.82	-	-	-	-	-
Grand Total	**1360**	100.00	**908**	100.00	**76**	100.00	**31.69**

Close observation of the blank removal surface suggests that the majority of the cores have feathers (49.10%), followed by step (35.92%) and hinged termination (14.99%). The core types were flake (27.59%), bladelet (27.09%), blade (6.40%), flake-bladelet (33.99%) followed by blade-bladelet core (4.93%) (Figure.9). The cortical remains in core are majorly found in Back side of the core (30.91%), Lateral (25.76%), Platform (17.88%). The cores are usually amorphous or of unstandardized shape with multidirectional negative scar. The cores have negative scar oriented in unidirectional or bidirectional fashion indicating systematic blank removal process and the cores demonstrate establishment of routine platform preparation.



***Figure.8**: lithics core remains from the Battherma nala (1-10, 12, 13: Core, 11: Side scrapper, 14: Ovaloid flaked red ochre.)*

Debitage

The blanks comprise flakes (653), blades (129), and bladelets (127), in which broken artefacts account for 37.73% with 64.72% breakage occurs on the distal and tip portion of these blanks. The fresh breakage is very rare indicating that the blanks might have broken during the manufacturing process or after post-depositional erosional process. The blanks have different types of platforms where

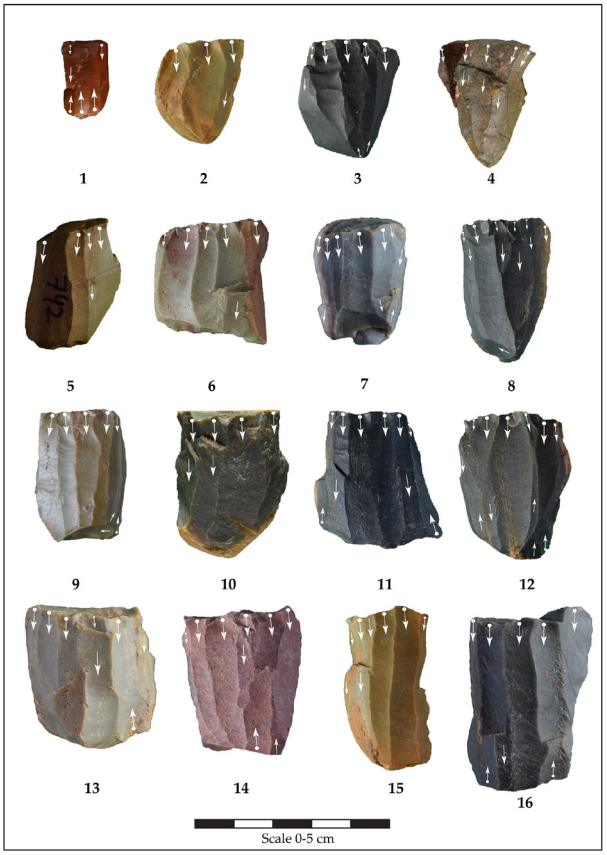


***Figure.9**: Unidirectional and Bidirectional fluted microlithic core from the Bijapali Site.*

majority are found prepared (40.73%) followed by cortical platform (27.56%) and thinned platform (11.95%) of the total assemblage (Table.3). The blanks with fully cortical dorsal surface and platform (first flakes/blades detached from unprepared core/ raw material) are rarely represented (1.21%), the large majority represents Toth's 'Flake Type-VI', i.e., non-cortical dorsal and prepared platform represents (45.36%) (Toth 1987). Most of the other types of flakes, i.e., those with cortical/non-cortical platform and partly cortical dorsal surface (Toth's Type II-V) appear to have been detached during the course of preparation of platform and blank removal surface of the cores (Table.4). Majority of the blanks have their maximum thickness at the Proximal end (50.50%) followed by Medial (33.11%) and Distal part (16.39%) of the assemblage. The different bulb type in debitage groups are classified as SB (Shallow Bulb), SB+IF (Shallow Bulb with Irrailure Fracture), PB (Prominent Bulb), and PB+IF (Prominent Bulb with Irrailure Fracture). This distribution reveals that the most prevalent bulb type across all categories is PB (Prominent Bulb), particularly dominant in the blade and bladelet

Table.3: *Types of platforms on different artifact category from Battherma Nala*

TYPES OF PLATFORMS	Flake		Blade		Bladelet		Total	
	N	%	N	%	N	%	N	%
Cortical	185	29.98	31	28.97	10	10.42	226	27.56
Prepared	263	42.63	36	33.64	35	36.46	334	40.73
Faceted	30	4.86	8	7.48	4	4.17	42	5.12
Punctiform	31	5.02	11	10.28	13	13.54	55	6.71
Thinned	65	10.53	8	7.48	25	26.04	98	11.95
Dihedral	4	0.65	2	1.87	-	-	6	0.73
Lipped	2	0.32	-	-	-	-	2	0.24
Modified	37	6.00	11	10.28	9	9.38	57	6.95
Total	**617**	100.00	**107**	100.00	**96**	100.00	**820**	100

Table.4: *Debitage Types Based on Toth's Classification from Battherma Nala*

Toth Type	Flake		Blade		Bladelet		Total	
	N	%	N	%	N	%	N	%
I	9	1.38	2	1.55	-	-	11	1.21
II	109	16.69	12	9.30	5	3.94	126	13.86
III	59	9.04	13	10.08	5	3.94	77	8.47
IV	6	0.92	1	0.78	-	-	7	0.77
V	200	30.63	62	48.06	30	23.62	292	32.12
VI	270	41.35	39	30.23	87	68.50	396	43.56
Total	**653**	100.00	**129**	100.00	**127**	100.00	**909**	100.00

categories. The SB (Shallow Bulb) type is most frequent in bladelets but less so in flakes and blades. The combined categories (SB+IF) and (PB+IF) are less common, with (PB+IF) showing a significant presence in flakes and blades but less so in bladelets (Figure.10) provides insights into the technological characteristics and possibly the knapping techniques employed for these lithic artifacts. The thorough examination of the scar directions on the various lithic objects, including the Flakes, Blades, and Bladelets. Across all artifact categories, it shows a dominant preference for unidirectional flaking pattern present in 79.21% of flakes, 74.07% of blades, and 81.36% of bladelets. This implies that single-directional flaking processes are widely used, probably because of their effectiveness or the properties of the raw materials. Bidirectional scars, found in 16.98% of flakes, 22.96% of blades, and, 18.64% of bladelets, suggest the employment of more intricate flaking techniques to obtain particular tool forms or optimize material consumption. Levallois scars are very rare; they present in just 1.90% of flakes and are absent from other artifacts. In contrast, mid rib scars are especially rare (1.90% of flakes and 2.96% of blades) and absent from bladelets. 78.74% of the unidirectional, 18.06% of the bidirectional, 1.82% of the mid-rib, and 1.39% of the Levallois data show that flaking is the most common technique, with specialized methods being used rarely (Table.5). This pattern implies a dominant lithic technology focused on efficiency and simplicity, with occasional employment of more advanced methods to achieve specific tool forms or optimize raw material use. The length ranges distribution of different types of stone tools such as Flakes, Blades, and Bladelets where Flakes, the most numerous types with 653 specimens, predominantly fall within the 21-30 cm range (44.26%), followed by the 11-20 cm range (26.65%) and the 31-40 cm range (20.21%). This indicates that Flakes are typically medium-sized tools. Blades, totalling 129 specimens, also exhibit a concentration in the 21-30 cm range (34.9%) and the 31-40 cm range (32.6%). Bladelets, with 127 specimens, are most frequently found in the 11-20 cm range (49.6%) and 21-30 cm range (47.2%) (Figure.11). The data show a sharp decline in the number of all tool types beyond the 40 cm mark, with Flakes and Blades still present but

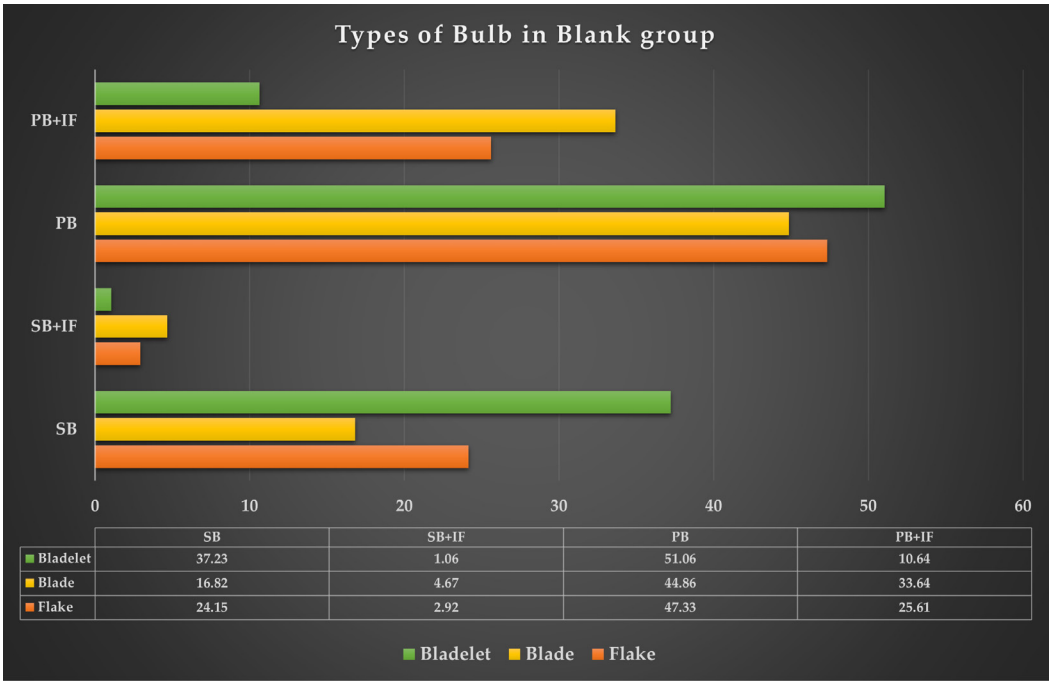


Figure.10: *Types of different bulb of percussion in different blank group.*

Table.5: *Scar direction on different debitage types*

Scar Direction	Flake		Blade		Bladelet		Total	
	N	%	N	%	N	%	N	%
Unidirectional	541	79.21	100	74.07	96	81.36	737	78.74
Mid Rib	13	1.90	4	2.96	-	-	17	1.82
Bidirectional	116	16.98	31	22.96	22	18.64	169	18.06
Levallois	13	1.90	-	-	-	-	13	1.39
Total	**683**	100.00	**135**	100.00	**118**	100.00	**936**	100.00

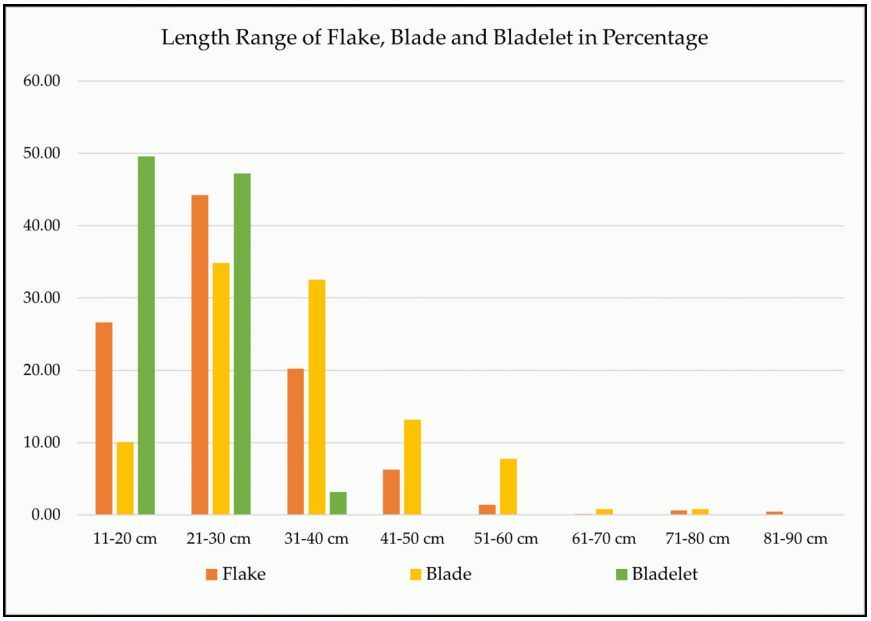


Figure.11: *Length range of different debitage group from Battherma nala.*

in much smaller numbers, and Bladelets absent. The detailed metric table containing the artefacts mean, standard deviation, and coefficient variation is provided in the (Table.6) suggests that the majority of these tools were designed for use within a specific size range, likely due to functional requirements or material constraints.

Table.6: *Metrics range of Core and debitage types from Battherma Nala*

Artifact Type				
Variable	**Core**	**Flake**	**Blade**	**Bladelet**
Number of specimens	**192**	**649**	**128**	**127**
Length (mm)				
Minimum	15.15	11.50	13.96	11.02
Maximum	118.15	90.58	73.34	40.32
Mean	33.66	27.59	33.86	20.66
StDev	14.39	10.39	10.96	5.29
Coef Var	42.75	37.64	32.37	25.62
Width (mm)				
Minimum	9.09	8.61	12.10	5.01
Maximum	92.21	77.34	41.23	11.92
Mean	28.06	23.47	16.58	9.40
StDev	13.40	9.90	4.26	1.76
Coef Var	47.75	42.16	25.73	18.68
Thickness (mm)				
Minimum	6.70	2.44	3.14	1.50
Maximum	65.50	36.67	18.12	10.15
Mean	19.21	8.80	7.73	4.51
StDev	10.34	3.92	2.63	1.69
Coef Var	53.84	44.51	34.08	37.48
Weight (gm)				
Minimum	1.00			
Maximum	853.00			
Mean	37.10			
StDev	80.29			
Coef Var	216.43			

Modified Tools

During the explorations in the Battherma nala a total of 105 artifacts has been found as modified for tools out of 1360 artifacts in different categories of tools (Table.7). It includes alternately retouched flakes, awls, backed bladelets, backed fragments, and more, reflecting a diverse range of functional and technological adaptations in prehistoric toolmaking. Flakes dominate the list, with a significant presence in tool categories like denticulate, end scrapers, notches, and side scrapers. This prevalence suggests that flake production was a primary technique, possibly due to the relative ease of producing flakes from cores. Blade and bladelet tools, though less numerous, appear in crucial functional categories such as convex backed blades/points, notches, and backed fragments (Figure.12). The inclusion of geometric items like lunates, crescents, and trapezes suggests microlithic traditions, which are often associated with composite tools during the microlithic phase (Figure.13). At the site of Battherma and Bijapali, the presence of Levallois cores, flakes, and points indicates advanced flintknapping techniques, as the Levallois method is associated with a higher degree of planning and skill, typically linked to Middle Palaeolithic tool industries (Figure.14). This assemblage provides valuable insights into the adaptability, skill, and innovation in prehistoric tool production, shedding light on the behavioural and cultural aspects of the toolmakers.

Raw Material

Lithic material and mobility play an important role in lithic raw materials usage pattern at the site. The selection of raw materials, acquisition, and transport decisions concerning lithic raw materials are the initial stages in any lithic operational sequence. Understanding these processes is a significant step toward comprehending ancient hominins' mobility and settlement patterns. The sourcing of lithic raw material and understanding whether or how different materials were curated and recycled bear important implications for understanding site catchments, site exploitation territories, and hominin land use patterns (Vita Finzi and Higgs 1970; Binford 1979; Bailey and Davidson 1983; Feblot-Augustins 1993; Fernandes *et al*. 2008). The selection and use of a variety of materials reveals the preference, resources, and technical sophistication of prehistoric communities. The lithic artifacts collected from the Battherma nala (Table.8) shows the classification, frequencies and percentages of lithic raw material used in the manufacture of different types of artifacts i.e., core, flake, blade, and bladelet. From the study area Chert is the dominant raw material (78.38%) in all lithic assemblage classes because of shales and sandstone formation in the study area represents nodular cherts, which are common and such nodules are abundantly found in the nala beds of Battherma which has been abundantly used for manufacturing

Table.7: *Modified lithic tools from the Battherma nala*

Sl. No	Tool Type BTR	Debitage Type				Total
		Core	Flake	Blade	Bladelet	
1	Alternately Retouched Flake	-	1	-	-	1
2	Awl	-	1	-	-	1
3	Backed Bladelet	-	-	-	1	1
4	Backed Fragment	-	-	-	1	1
5	Bilaterally Retouched	-	-	-	1	1
6	Bipolar Blade and Offset Burin	-	-	1	-	1
7	Borer	-	1	1	-	2
8	Concave Side Scrapper	1	-	-	-	1
9	Convex Backed Blade/Point	-	-	2	1	3
10	Convex Backed/Point	-	1	-	5	6
11	Convex End Scrapper	-	2	-	-	2
12	Convex Side Scrapper	-	2	1	-	3
13	Core Rejuvenating Flake/Bld/Bldt	-	-	1	-	1
14	Crescent	-	-	-	5	5
15	Debordant Blade	-	-	1	-	1
16	Denticulate	-	2	1	-	3
17	Denticulate + Transverse Burin	-	1	-	-	1
18	End Scrapper	-	4	1	-	5
19	Levallois Core	1	-	-	-	1
20	Levallois Flake	-	1	-	-	1
21	Levallois Point	-	4	-	-	4
22	Lunate	-	-	-	1	1
23	Marginally Retouched	-	1	-	-	1
24	Micro Burin	-	1	-	-	1
25	Micro Denticulate	-	-	-	1	1
26	Notch	-	8	9	1	18
27	Notch + Denticulate	-	1	-	-	1
28	Offset Burin	-	1	-	-	1
29	Partially Backed/Point	-	-	1	1	2
30	Partially Retouched	-	8	1	1	10
31	Partially Retouched + Notch	-	1	-	-	1
32	Pseudo Levallois Point	-	1	-	-	1
33	Retouched Butt	-	1	-	-	1
34	Retouched Lateral	-	-	2	1	3
35	Retouched Point	-	-	2	-	2
36	Semi Invasive Retouched Lateral	-	-	-	1	1
37	Side Scrapper	-	6	-	-	6
38	Straight Backed Blade/Bladelet Point	-	-	1	1	2
39	Straight Backed Bladelet	-	-	-	1	1
40	Transverse Burin	-	1	-	-	1
41	Transverse Scrapper	-	2	-	-	2
42	Trapeze	-	-	-	1	1
43	Unilaterally Backed Borer	-	-	-	1	1
44	Unilaterally Retouched Bladelet	-	-	-	1	1
Grand Total						**105**



Figure.12: *Blade and Bladelet remains from Battherma nala*



Figure.13: *Backed tool remains from Battherma nala (1: Convex backed point, 2: Trapeze, 3,4,8,10: Crescent, 5, 7, 9, 12: Convex backed point, 6: Semi invasive flat retouching on ventral, 11: Partially backed point, 13,14: notch, 15: partially backed blade, 16: Point, 17: Bipolar blade and Offset burin).*

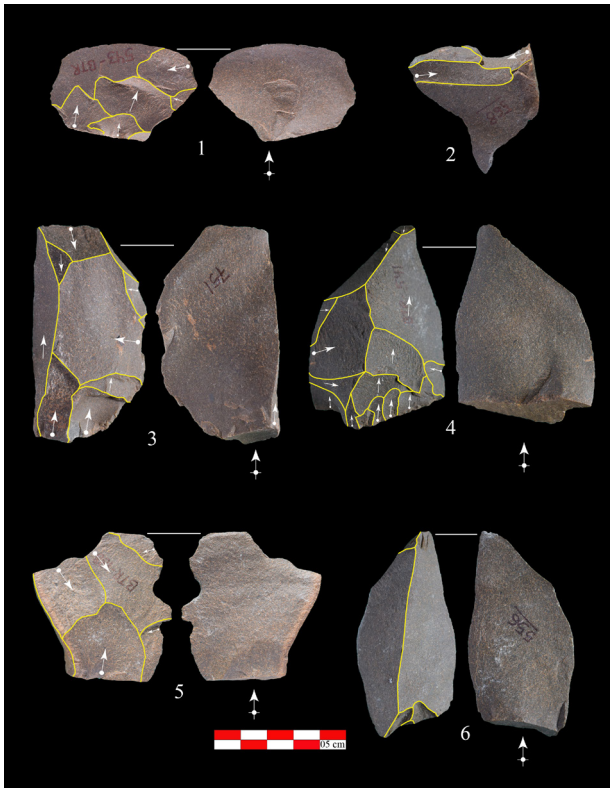


Figure.14: *Middle Palaeolithic artefacts from Battherma site. (1: Levallois flake, 2: Awl, 3,6: Thick flake, 4: Pseudo Levallois point, 5: Notch).*

of lithic artifacts. This indicates high availability, excellent knapping characteristics, and overall suitability for tool making. Quartz is the second most common material mostly found in the form of vein and reef in the study area (17.17%), indicating that it is a suitable alternative where chert is scarce. Quartzite (3.00%) is rare, perhaps because of its availability. The quartzite formation in the Jhanj-Malaikhaman range is found at an altitude of 400 to 500m amsl which makes it difficult to access. The low quality or hardness also makes it less desirable for fine tools. The other materials, such as crystal, silicified, jasper, chalcedony, and Banded Hematite Red Jasper (BHRJ), make up a relatively small proportion of the tools collected, indicating limited use.

Evidence of Red Ochre

Another interesting finding from the study area is the availability of used/rubbed red ochre from open air sites and close to these sites no such cave formations or rock shelter containing rock art are noticed. Ochre is a general term applied to any ferruginous earth, clay, minerals or rock having sufficient haematite (iron oxide or iron hydroxide)

Table.8: *Raw Material types from Battherma nala*

Raw Materials Types	Core		Flake		Blade		Bladelet		Total	
	N	%	N	%	N	%	N	%	N	%
Chert	139	72.40	507	77.64	118	91.47	99	77.95	863	78.38
Quartzite	5	2.60	26	3.98	2	1.55	-	-	33	3.00
Quartz	43	22.40	112	17.15	8	6.20	26	20.47	189	17.17
Crystal	-	-	2	0.31	-	-	-	-	2	0.18
Silicified	2	1.04	5	0.77	-	-	1	0.79	8	0.73
Jasper	2	1.04	-	-	1	0.78	-	-	3	0.27
Chalcedony	1	0.52	-	-	-	-	1	0.79	2	0.18
BHRJ	-	-	1	0.15	-	-	-	-	1	0.09
Total	**192**	100.00	**653**	100.00	**129**	100.00	**127**	100.00	**1101**	100.00

which produce a red or yellow streak (Bateman 1950, Jercher *et al*. 1998). In India the early evidence of red ochre comes from the stratified context at Jwalapuram, in Jureru valley dated back to 74,000 years old (Petraglia *et al.* 2007). Recently from the site of Dhaba, in the middle Son valley of central India has evidenced for use of red ochre from the stratified context dated to 74,000 years old (Clarkson *et al*. 2020). In Odishan context for the first time the use of red ochre in an open air and stratified context was reported at Torajunga from late middle palaeolithic context where, used red ochre lumps along with quern were noticed (Behera and Thakur 2018). During the present field survey, the site of Battherma and Bijapali were encountered with red ochre associated with microliths were collected from the surface (Barik 2022). As per geological formation the nearest source of red ochre lies more than a hundred twenty kilo metres further north of these sites in the Permian-Triassic Kamthi Formation, near Jharsuguda district of Odisha in Himgir forest region. The present evidence suggests that the microlith using communities of this area have imported red ochre from a long distance (Barik and Sabale 2021).

Discussions and Conclusion

The exploration of the Battherma nala in the southern Bargarh upland of western Odisha has revealed significant insights into middle palaeolithic and microlithic settlement in the study area. The middle palaeolithic culture in India from the site of Attirampakkam in Tamil Nadu dated to 385,000 years (Kumar *et al*. 2018), Hanumanthunipadu in the valley of the Paleru river Andhra Pradesh dated to 247,000 years ago (Devara *et al*. 2022). Jwalapuram dated to 71,000 years ago along with Young Toba Tuff in the Kurnool district of Andhra Pardesh includes typical middle palaeolithic stone tools (Haslam *et al*. 2012a). The site of Dhaba in the Son valley also exhibits rich middle palaeolithic stone tools made from locally available quartzite and chert (Haslam *et al*. 2012b). Other sites where such tools and artefacts have been found include Sandhav in Kutch, Katoati in Rajasthan (Blinkhorn *et al*. 2013; Blinkhorn *et al*. 2019). In Odisha particularly Bargarh upland represents two distinct middle palaeolithic sites such as Torajungha in the Danta river valley a tributary of Jira River (Behera and Thakur 2019) and Kundakhai in Ong valley, Odisha (Behera and Barik 2022). The Kundakhai site is located very close to the Battherma nala but raw materially both are different from each other. Kundakhai represent only middle palaeolithic tools prepared on silicified rock but the site of Battherma and Bijapali represents on fine grain quartzite (Behera and Barik 2022). The present study area also represents very few middle palaeolithic artifacts found mixed with microliths collected from the surface exploration but the horizon of the middle palaeolithic and microlithic are different but such stratigraphic section was not visible close to the sampling area at the site which makes it difficult to ascertain its layer. The middle palaeolithic artifacts are made from fine grain quartzite and the microliths are prepared on cryptocrystalline materials. The site of Battherma where a section is available, microliths are found at the top part of the layer and a single middle palaeolithic artifact was noticed embedded with high level gravel prepared on fine grain quartzite

material (see Figure.3B). The microliths industries are extensively spread throughout South Asia (Clarkson *et al*. 2018). The important microlithic sites in India like Mehtakheri in the central Narmada basin of Nimar district, Madhya Pradesh, produced an early date of 45,000 BP (Mishra *et al*. 2013). In Eastern India, new evidence of the early occupation of Microlithic inhabitants in Ayodhya hills in Kana and Mahadebbera in Purulia district of West Bengal has been dated to 42-25ka (Basak *et al*. 2023). Jureru Valley in South India has been dated to 35,000 BP (Clarkson et al. 2009). Recently in the state of Odisha in-situ fossil remains of a ruminant found associated with microlithic industries dated to 17,875 B.P from the site of Pratappur in the Mayurbhanj district (Patnaik *et al*. 2019). The site of Torajunga in the Bargarh upland has two microlithic level and the early level has been dated to 21kyr and later level 12±2.8kyr. The earlier level microlith from the site of Torajunga found associated with red ochre lumps with milling stone and grinding pestle. The surface exploration in the present study area has also resulted in discovery of such red ochre from the surface associated with microliths. This present study mainly focused on analyzing lithic materials found in different geomorphic contexts from Battherma nala. The lithic assemblage reflects a rich prehistoric activities and technological adaptation, showcasing a variety of core, flake, blade, and bladelet production strategies. The assemblage of the Battherma nala predominates microliths and very few middle palaeolithic artifacts were found but it has significant role to understand the transition from middle palaeolithic to microlithic phase in this area. The study significantly contributes for understanding prehistoric human behaviour in the Bargarh upland and the analysis of assemblages enhances the understanding of lithic production and use. For further study in this area a systematic excavation is required at the site of Battherma and Bijapali, which will definitely shed light on the chronological horizon of middle palaeolithic, microlithic and the use of red ochre in the study area.

Acknowledgement

I would like to express my gratitude to the two unanimous reviewers for their valuable suggestions and queries regarding the manuscript. I am also thankful to the Chief Editor of the Iranian Journal of Archaeological studies for his strong interest in this article. I am deeply grateful to Prof. P.K. Behera from the P.G. Department of History, Sambalpur University who accompanied me in the field during exploration and provided invaluable insights, expertise, and comments. My thanks also go to Prof. P.D. Sabale , Deccan College PGRI, Pune for his valuable comments on the geological and geomorphological aspects of the study area. I extend my appreciation to Dr. Tosabanta Padhan, Dr. Sudam Jhankar, and Mr. Churamani Rana for their support and companionship in the field during the hot summer across different field seasons. Additionally, I thank the Archaeological Survey of India and Sambalpur University for granting permission and providing cooperation for the exploration of the area.

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