



Microlithic Remains from the Deo and South Koel River Valleys in the Odisha-Jharkhand Border Region of India: A Preliminary Report

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Abstract

This paper presents a preliminary report on the microlithic assemblages recovered through surface explorations in the Sankh, Deo and South Koel river situated on the Odisha-Jharkhand border. This region, located in the northwestern part of the state, offers information about the spatial distribution and cultural diversity of microlithic traditions in eastern India. The field investigations have identified four prehistoric sites in primary and semi-primary contexts, yielding a variety of lithic artefacts such as core, flake, blade and bladelet, backed blades, scrapers, points, and geometric forms of microliths predominantly prepared from chert, quartz and quartzite. The availability of raw material along riverbanks and the presence of favourable landscapes comprising hills and uplands appear to have influenced prehistoric settlement in this area. While detailed stratigraphic and chronological assessments remain pending, the preliminary findings highlight the archaeological potential of the study area for reconstructing patterns of early human adaptation from the Pleistocene to the Holocene. This report documents site locations, artefact types, and initial interpretations, laying the groundwork for future systematic research.

Keywords: Microliths, Deo River, South Koel River, Odisha, Jharkhand.

Article Type: Research Article

Introduction

The study of microlithic industries across South Asia, and particularly in Eastern India and Odisha, has undergone a dynamic transformation in recent years, through advanced analytical approaches and broaden the scope of regional comparisons (Petraglia *et al.* 2009; Clarkson *et al.* 2018; Patnaik *et al.* 2019). Microlithic industries characterized by the production and use of small, retouched stone tools recognized as a hallmark of prehistoric adaptations to diverse ecological and climatic contexts from the Late Pleistocene into the Holocene.

In South Asia, recent research has emphasized two major debates regarding the origins of these industries: whether microlithic technologies were introduced with the dispersal of *Homo sapiens* from Africa, or whether they represent indigenous technological adaptations by local populations in response to environmental variability (Petraglia *et*

al. 2009; Wedage *et al.* 2019; Clarkson *et al.* 2018; Mellars *et al.* 2013; Sumangala *et al.* 2025). In the broader South Asian context, new multidisciplinary studies, such as the analysis of the Fa-Hien Lena sequence in Sri Lanka, have pushed back the earliest microlithic assemblages to around 48,000-45,000 years BP (Wedage *et al.* 2019; Langley *et al.* 2020; Roberts *et al.* 2022). These findings mark the arrival of advanced lithic technology in the region, linked closely with flexible hunter gatherer strategies that allowed early populations to exploit both rainforest and open habitats effectively. Indian microlithic research has revealed the continuous presence and technological evolution across diverse regions, environments, and time periods in the subcontinent. Early studies viewed microlithic industries as primarily Holocene phenomenon, but recent excavations and improved dating techniques at key sites like Mehtakheri, Dhaba, and Jwalapuram, Purulia Hills have pushed the origins back to at least 45,000-48,000 years ago (Mishra *et al.* 2013; Haslam *et al.* 2012 a, b; Basak *et al.* 2014; 2023).



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Turning specifically to Eastern India and Odisha, prehistoric research has grown rapidly over the last two decades. Odisha, with its rich geomorphological mosaic of hills, plateaus, river valleys, and foothill regions, has emerged as a crucial landscape for reconstructing prehistoric human settlement. Systematic explorations have identified more than 400 microlithic sites (Figure.1) distributed across diverse ecological contexts, riversides, rock shelters, pediments, and even open hill slopes (Padhan 2017).

from region to region. The present study focuses on microlithic remains found along these two rivers in 4 newly discovered sites (Table.1).

Study Area and Its Environmental Settings

Sundargarh is a district located in the far north-west part of Odisha. It is a part of the Chota Nagpur Plateau, known for its hilly and uneven terrain (Figure. 2). The area is a mix of gentle hills, flat-topped plateaus, and broad valleys that run in between. The height of the land ranges from low-lying areas at

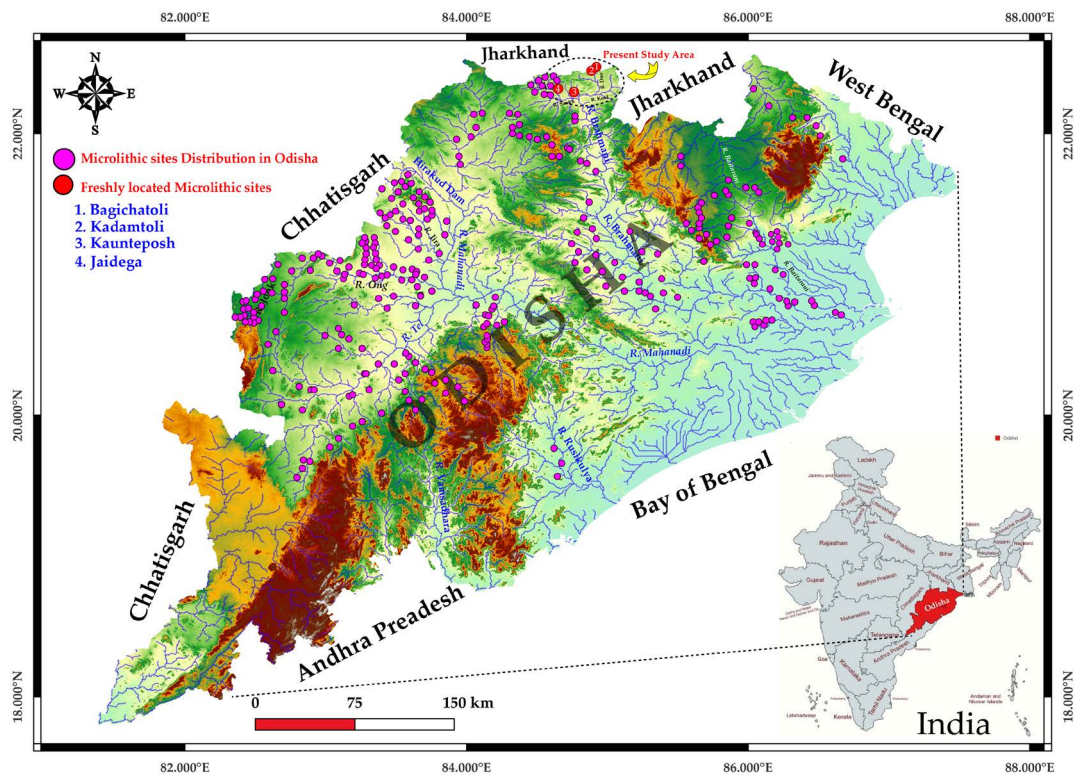


Figure.1: Distribution of Microlithic sites in different river valleys of Odisha (Prepared by author using Q GIS).

Exploration and excavation in different parts of Odisha have yielded microlithic assemblages in association with chopper-chopping tools (Ota 1986; Behera *et al.* 2018; Barik *et al.* 2023). In major part of Odish microlithic are found without chopper-chopping tools (Mohapatra 1962; Tripathi 1972; Nanda 1985; Mohanty 1993; Padhan 2013; Barik and Sabale 2021; Behera and Barik 2022; 2023; Barik 2024). The Sundargarh district, situated in the northwestern part of the Odisha, holds promise because of its unique combination of geological formations, mineral wealth, and river systems makes and makes it a plausible place for prehistoric settlement. Especially in Odisha, the distribution of microlithic assemblages and its characteristics are quite uneven

about 200 metres near rivers, to taller hills that go over 800 metres, like those in the Kumandi and Lahunipara regions. The study area is attached to Santal Parganas of Jharkhand in the north, Chhattisgarh in the west, some parts of Odisha and Jharkhand in the east and interior part of Odisha in south.

Drainage System: Deo and South Koel Rivers

The two most important rivers in Sundargarh are the Deo River and the South Koel River. These rivers play a big role in shaping the land and supporting life in the region. The Deo River starts in the Bishnupur hills and flows about 90 kilometres south before joining the South Koel. The South Koel River begins near a place called Nagri in Jharkhand.

Table 1: Newly Discovered microlithic sites in the Deo and South Koel basin

Sl. No	Site Name	Latitude	Longitude	Elevation	Context
1	Bagichatoli	22.45833	84.95448	240	Riverbank
2	Kadamtoli	22.44697	84.92323	239	Riverbank
3	Kaunteposh	22.25833	84.79197	196	Riverbank
4	Jaidega	22.3297	84.62891	233	Foothill

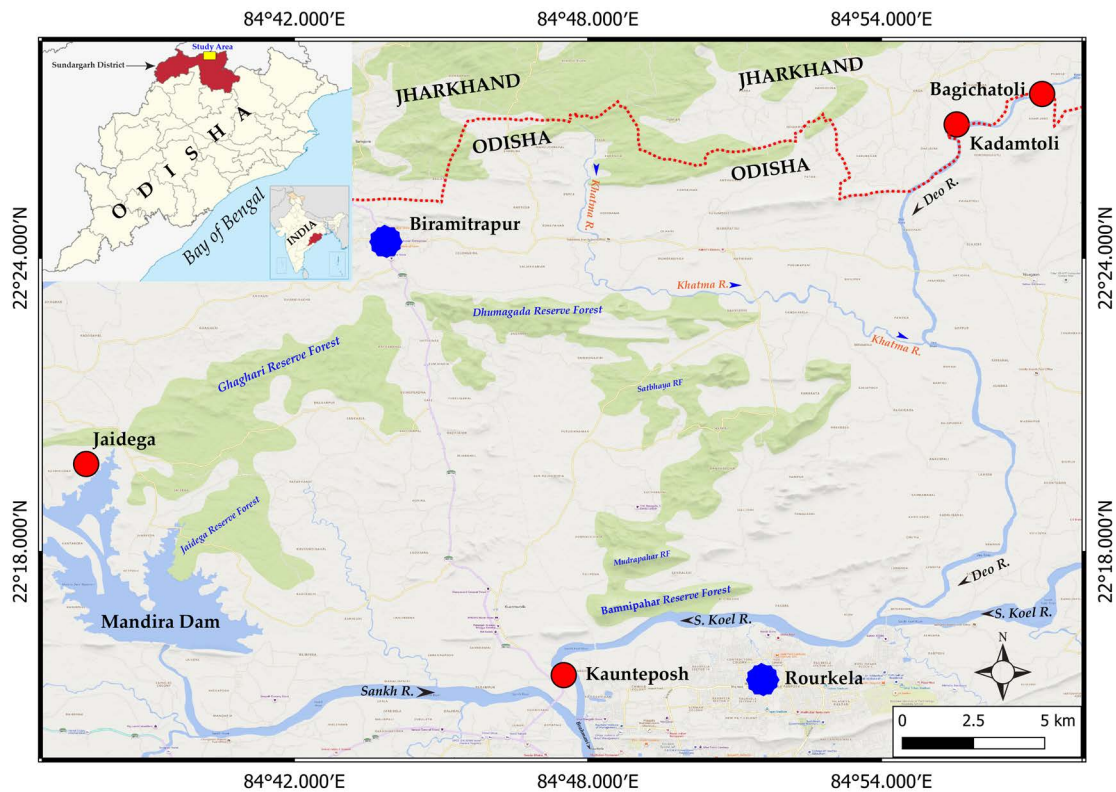
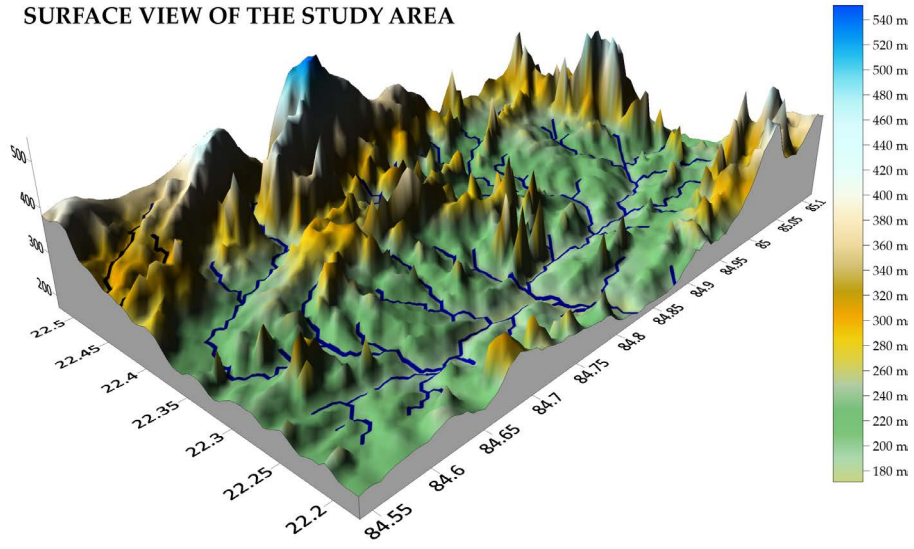


Figure.2: Map showing microlithic site locations, rivers, forests, and key settlements in northern part of Sundargarh district, Odisha (Source-Prepared by author using Q-GIS with Bing Maps).

It enters Odisha from the north and flows through Sundargarh for almost 120 kilometres before it joins another river called the Sankh, forming the bigger Brahmani River (Figure. 3). These rivers form wide, flat areas called floodplains, which sometimes get flooded during the rainy season. Smaller streams also join these big rivers. On the South Koel side, streams like Khairi, Ghaghara, and Bhujakhai add to the water flow. On the Deo side, there are streams like Umar, Basundhara, and Bhaskel. All these together create a wide and complex water network in the area (Figure. 4). When it comes to weather, Sun-

dargarh has a typical tropical climate. It gets most of its rain during the monsoon season, between June and September, with total yearly rainfall between 1300 and 1600 millimetres. The winters can get cool, dropping to about 10 C° in January, while summers can get very hot, going above 45 C° in May (Singh 1971). The district has a mix of forests and farmland. The forests are mostly made up of trees like sal, bamboo, and tendu, which are common in this region. In the flat areas, people grow crops like rice, maize, and pulses.

SURFACE VIEW OF THE STUDY AREA



SURFACE WIRE FRAME VIEW OF THE STUDY AREA

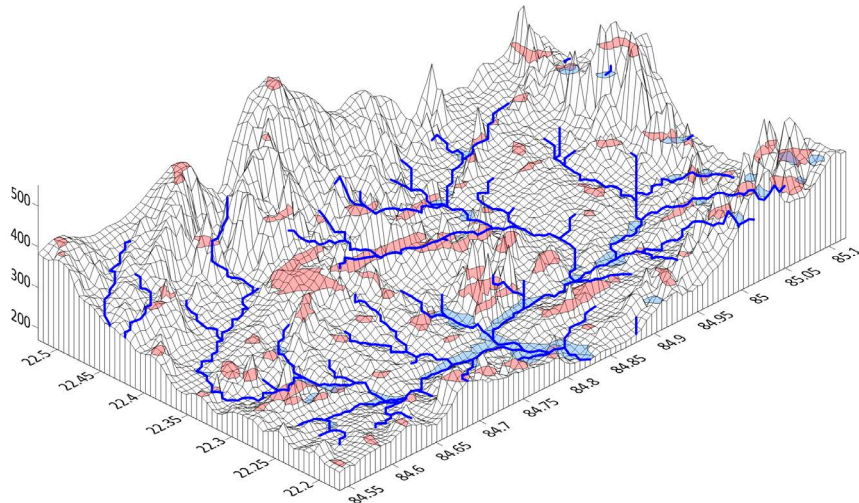


Figure.3: 3D surface and wireframe models displaying the topography and drainage network of the study area (Prepared by the Author using Surfer 21.1.158).

CONTOUR MAP OF THE STUDY AREA

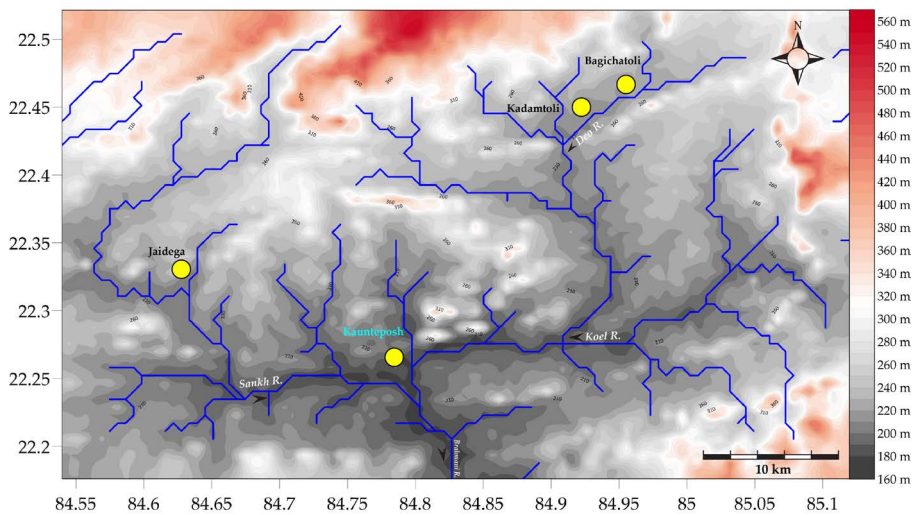


Figure.4: Contour map illustrating elevation, drainage, and key microlithic sites in the study area (Prepared by the Author using Surfer 21.1.158).

Geology and Geomorphology of the Study Area

The area covered by toposheet Nos. 73B/11 and 73B/15 in northwestern Sundargarh District, Odisha, lies within the Precambrian Eastern Indian Shield, specifically along the northern fringe of the Bonai-Keonjhar belt of the Singhbhum Craton. The region is geologically significant for its diverse litho-units ranging from Archean to Proterozoic age, including banded iron formations (BIFs), quartzites, phyllites, schists, and metavolcanics of the Iron Ore Group (IOG). These formations represent a volcano-sedimentary sequence rich in economically important iron and manganese, particularly hematite-bearing BIFs. The terrain has experienced multiple phases of regional metamorphism and tectonic deformation evidenced by folds, faults, and cleavages along with late Proterozoic granitic and gabbroic intrusions (Gupta 1966). Lateritic capping and weathering profiles suggest long-term sub aerial exposure and tropical weathering. The lithological diversity includes carbonaceous phyllite, quartzite, granite, granite gneiss, and laterite (Figure. 5). The north-eastern part of the region, where the microlithic sites of Bagichatoli and Kadamtoli are located, shows alternating bands of quartzite, carbonaceous phyllite, and conglomerates indicative of ancient fluvial depositional environments followed by metamorphism

(Murty and Acharya 1975). The availability of cryptocrystalline quartz, quartz reefs, meta-basic rocks, and hornblende schists further reflects a dynamic geological history, contributing to the region's rugged topography and its potential.

The geomorphological framework of the study area demonstrates a complex interaction of tectonic activity, erosion, and fluvial processes which has shaped a highly diversified terrain. The northern and northeastern parts of the region are dominated by structural uplands and denudational hills, which are remnants of geological formations that have undergone prolonged weathering and erosion. These uplands are often composed of hard crystalline rocks, such as granite and gneiss, which have resisted erosion over geological time. The irregular relief, steep slopes, and rugged terrain in these sectors indicate the influence of both endogenic (tectonic uplift) and exogenic (weathering and erosional) forces. These zones often act as the source region for local drainage systems and influence sediment transport. Moving southward and centrally, the landscape gradually transitions into gently sloping Pedi plains and piedmont zones. These areas represent extensive erosional surfaces where weathered materials from the uplands are deposited. The Pedi plains are relatively stable and flat, providing a suitable setting

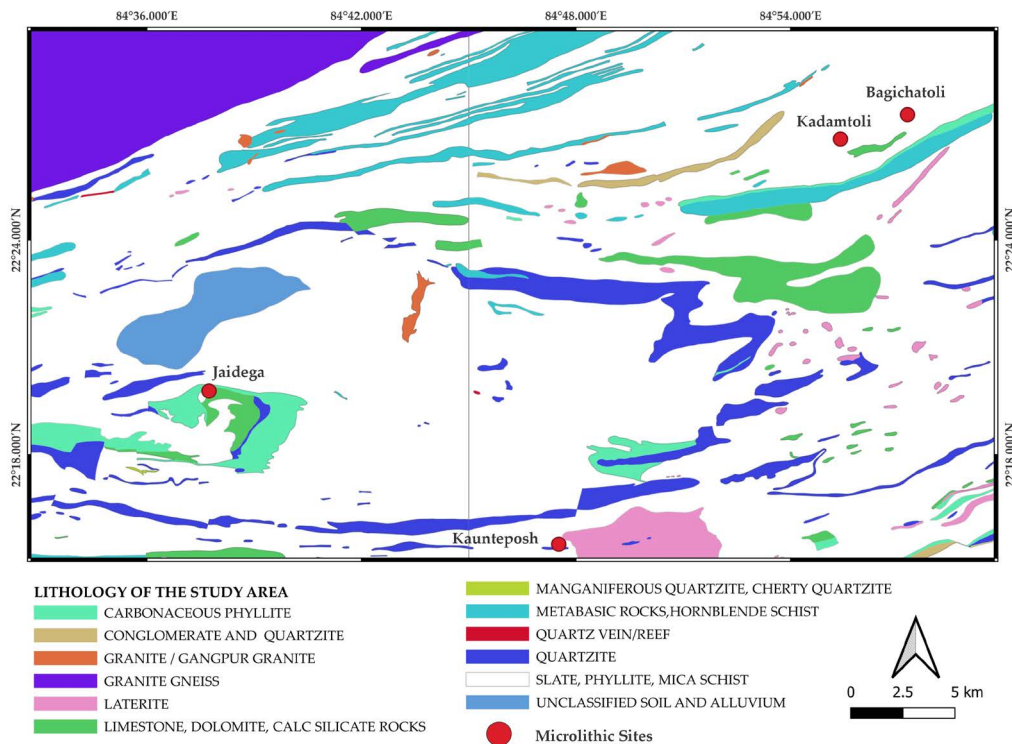


Figure.5: Lithological map depicting geological formations and the distribution of microlithic sites within the study area
(After: Bhukosh, GSI, Prepared by Author using Q-Gis)

for human settlement and agricultural activity. The presence of lateritic capping in some areas indicates a tropical climate influence and prolonged periods of surface stability, during which intense chemical weathering has occurred (Figure. 6). These lateritic uplands are particularly significant as they may conceal archaeological remains due to soil development. Fluvial activity is well expressed in the valley floors and alluvial plains found along the principal river courses. These low-lying regions are composed of recent alluvium deposited by active river systems, forming fertile floodplains. These zones often exhibit seasonal inundations and are critical for agriculture. The alluvial zones also represent dynamic geomorphic units where continuous sedimentation processes may affect site visibility and preservation.

adjoining uplands. The aim was to detect exposed cultural material on the surface, especially lithic artefacts, and to understand their spatial distribution across different geomorphic settings. Each find spot was recorded using Android Mobile app named *GPS Waypoint* developed by *Blue Cover Technologies Devices* with an accuracy margin of less than 3 metres. Deliberate sampling was carried out during the exploration and in high density zones, grid-based collection was employed. The artefacts were collected by following a structured and context sensitive format aimed at preserving both the scientific and archaeological integrity of the site. All observable artefacts on the ground surface were examined in situ before being collected. The artefacts were collected by hand and wrapped individually in labelled zip locks to avoid mixing with another site.

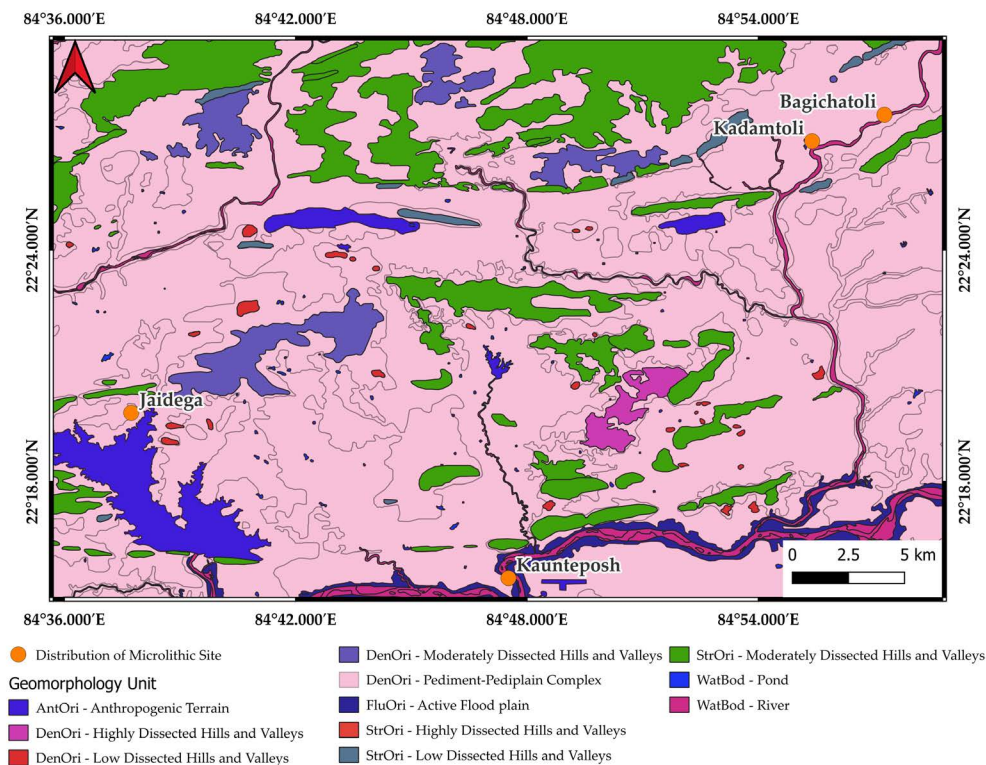


Figure 6: Geomorphological map showing the distribution of microlithic sites relative to landforms in the study area (After: Bhukosh, GSI, Prepared by Author using Q-Gis).

Methodology Adopted

The preliminary survey across the Deo and South Koel River valleys was conducted using systematic transect walks in the selected areas which were identified using Google/Bings maps for a comprehensive examination of the landscape. Transect surveys were carried out parallel and perpendicular to the river channels to cover both floodplains and

Alongside artefacts, field notes were maintained detailing the sediment matrix, surface visibility, and proximity to environmental features like water sources or rock outcrops. The collected artefacts were then transported to the Department laboratory for further cleaning, sorting, and analysis. Digital photographs were taken in the field using scale to preserve spatial context. The initial classification

of the lithic assemblage was based on both typological and technological criteria. Predominantly, chert, chalcedony, and milky quartz were noted, all of which are commonly associated with microlithic traditions. Post collection analysis involved a range of morphometric techniques aimed at understanding technological variability and functional aspects of the assemblage.

Artefacts were cleaned and measured using digital calipers, and data were recorded systematically for variables including maximum length, breadth, thickness, weight and other parameters. Mapping the spatial distribution of microlithic sites and artefacts was a key element of the methodology, helping to reveal settlement dynamics and site formation processes. GPS recorded coordinates were imported into GIS software (QGIS 3.34) to create base maps indicating site clusters, and their relationship with natural features like riverbanks, hillocks, and terraces.

Previous Work in the Study Area

The highland region of Odisha has high potential from prehistoric archaeological perspective. The earliest discoveries in this region date back to 1876, when Vallentine Ball reported prehistoric sites in the Sambalpur and Dhenkanal districts of Odisha (Ball 1876). Later, while exploring northern Odisha, G.C. Mohapatra identified several important prehistoric sites and, for the first time, highlighted the presence of stone age remains in Sundargarh district (Mohapatra 1962). His key discoveries included sites such as Bishalbury on the Sapai river (a tributary of the Ib), as well as Jangra and Satkuta in the Brahmani Valley. Building upon this foundation, P.K. Behera conducted extensive research during his doctoral research in Brahmani valley of Sundargarh district, particularly in the Bonaigarh subdivision. He reported numerous prehistoric sites ranging from the Lower Palaeolithic to the Upper Palaeolithic periods.

His findings also included six painted rock shelters, and notable prehistoric sites documented by Behera includes Bhanjagarh, Bhaludunguri, Bonaigarh, Bisra, Jhirpani, Jagarnathpur, Khadiakudar, Khuntagaon, Tumkelaghat, and Kurhadi (Behera 1989, 1993). Continuing this line of research, Subodha Mendaly expanded the exploration of the Brahmani Valley as part of his doctoral research (Mendaly 2019). He discovered a wide range of

sites dating from the Palaeolithic to the Early Historic period. His study also highlighted raw material sources and identified several sites along the tributaries of the Brahmani basin. Recently, Priyanka Mandal undertook research in the South Koel river basin as part of her Ph.D. work. She reported several microlithic sites that yielded a variety of lithic tools, including cores, flakes, blades, geometric tools, and debitage. These tools closely resemble those found in other microlithic traditions of Eastern India. Her important findings at Mahadebbera, Ghatbera, and near the Balarampur police station provide strong evidence for on-site core rejuvenation and systematic bladelet production (Mandal 2017; 2021 a, b). She also suggests that the raw materials for tool-making were likely sourced from areas beyond the immediate floodplain. Most recently, Sakir Hussain carried out archaeological explorations in the Brahmani basin, particularly in the Bonaigarh subdivision. His work led to the identification of 40 archaeological sites ranging from the Iron Age to the Early Medieval period. Among these, 20 sites represent single cultural phases, 16 exhibit evidence of two occupational phases, and 4 sites display three distinct phases of cultural development (Hussain 2024).

Field Investigation and Site Distribution

The Present research work was carried out as a part of M.A. Dissertation of the first author and the exploration in these rivers were conducted for a week in the month of February 2025. During this time, we explored the study area and found four microlithic sites. Most of these sites are found on the surface of the riverbank and erosional gullies. The names of the newly discovered microlithic sites are 1- Bagichatoli, 2- Kadamtoli, 3- Kaunteposh, and 4-Jaidega. The detailed description on the sites is provided below. A total of 205 lithic artefacts were collected including debris from the study area (Table. 2).

Bagichatoli

Bagichatoli is a village in the Jaldega block of Simdega district, Jharkhand. It is located about 42 km east of the district headquarters at Simdega. It is the border village between Odisha and Jharkhand. The archaeological site is situated on the right bank of the Deo river and on the southern side of the village with an elevation of around 240 meters above sea level. This open-air archaeological site

Table 2: Site wise surface lithic artefacts collection from the study area

Site Name	Core	Flake	Blade	Bladelet	Hammer Stone	Debris	Total
Bagichatoli	9	56	5	-	-	9	79
Kadamtoli	8	38	1	2	3	8	60
Kaunteposh	5	25	2	-	-	6	38
Jaidega	2	13	5	3	-	5	28
Total	24	132	13	5	3	28	205

is marked by gently undulating terrain and sparse vegetation. Quartz microliths are found scattered on the exposed surface. The site features exposed bed-rock and the course of the Deo river, which likely provided essential resources such as water and raw materials. The landscape around the sites shows significant evidence of erosion, with numerous rain gullies and areas filled with angular gravel (Figure. 7). From the surface scatter a total of 79 lithic artefacts were collected for further typo technological analysis. The site represents core (n-9, 7.11%), flake (n-56, 44.24%), blade (n-5, 6.32%), absence of bladelet, hammer stone and debris represent (n-9, 1.11%) of the total assemblage collected from this site.

Kadamtoli

The Kadamtoli is a village located in the Jal-dega block of Simdega district, Jharkhand. It lies about 42 km east of the district headquarters, simdega. The present village is also located close to the Odisha Jharkhand border. The site is situated on the right bank of the Deo river, west of a hill, and near the border between Odisha and Jharkhand. The site shows a semi-arid landscape with sparse vegetation and scattered deciduous trees. The site has pronounced rain gullies and a gravelly surface, indicating active water erosion, marked by both sheet and rill erosion. The rocky outcrop with quartz veins highlights the local raw material procure-

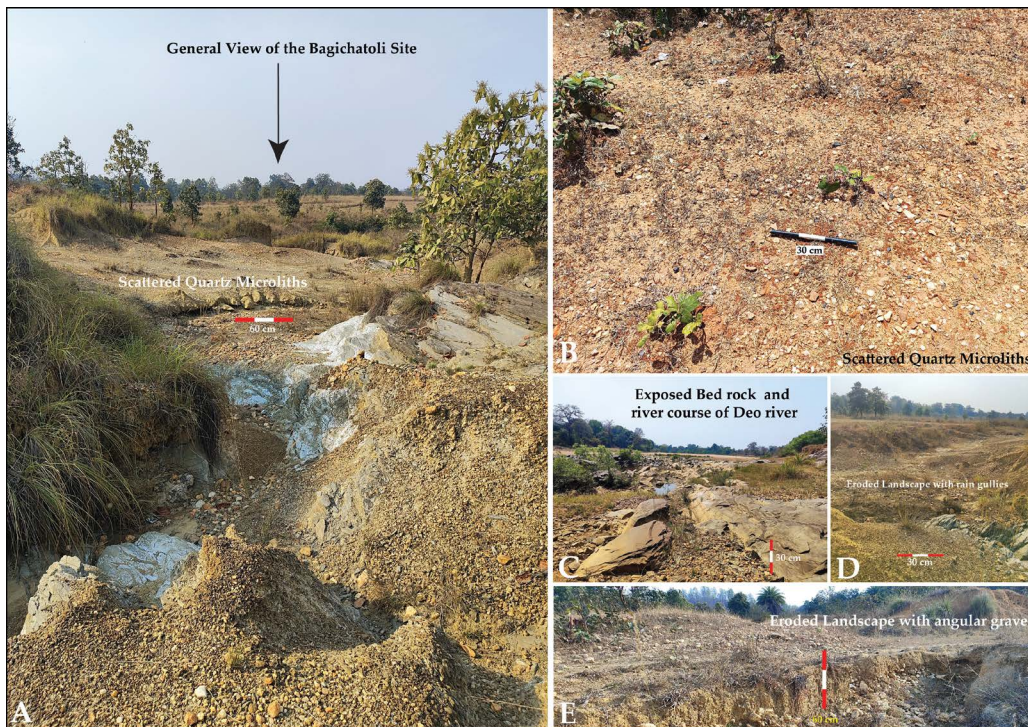


Figure 7: General view of the Bagichatoli site, illustrating quartz microlith scatter and erosional landscape features

ment for lithic manufacturing (Figure. 8). Artefacts were collected for further techno-typological study, and a total number of 60 artefacts were collected from the site. The lithic assemblage is dominated by flakes, which constitute (n-38, 63.33%) of the total 60 lithic assemblage. Cores and debris, each representing (n-8, 13.33%). Hammer stones are present in moderate quantity (n-3, 5%), indicating their role in tool-making processes. Blades and bladelets appear only (n-1, 1.67%) and (n-2, 3.33%) of the total assemblage collected from the Kadamtoli site.

scapes shaped by seasonal runoff and sheet erosion. In the Kaunteposh assemblage, flakes are the largest proportion (n-25, 65.79%) of the total lithic artefacts. Cores account for (n-5, 13.16%), while blades represent (n-2, 5.26%). Bladelets are absent from the assemblage and debris constitutes (n-6, 15.79%) of the Kaunteposh sample.

Jaidega

Jaidega is a village located in the Kuarmunda block of Sundargarh district, Odisha. It lies about 14



Figure. 8: General view of the Kadamtoli site, highlighting rain gullies, gravelly surfaces, and quartz rich rocky outcrops

Kaunteposh

The village Kaunteposh is on the outskirts of Rourkela township in the Baragaon block of the Sundargarh district. It is situated 104 km southeast of district headquarters Sundargarh. The present site is located on the right bank of the South Koel river close to the south of the Chainpur foothill. Artefacts were collected for further techno typological study, and a total number of 38 artefacts were collected from the site. The site has gently undulating plains, largely devoid of dense vegetation, indicating significant lateritic exposure and ongoing erosional processes (Figure. 9). The exposed stone substrates and gravelly compact surfaces along with the scarcity of topsoil, a typical characteristic of lateritic land-

scapes shaped by seasonal runoff and sheet erosion. In the Kaunteposh assemblage, flakes are the largest proportion (n-25, 65.79%) of the total lithic artefacts. Cores account for (n-5, 13.16%), while blades represent (n-2, 5.26%). Bladelets are absent from the assemblage and debris constitutes (n-6, 15.79%) of the Kaunteposh sample. The Jaidega assem-



Figure 9: View of Kaunteposh site, featuring river landscape, microlithic scatter, and closeups of lithic artefacts

blage, where flakes are the most common artefacts (n-13, 46.43%) of the total sample of 28 specimens. Blades and debris are equally represented, each accounting for (n-5, 17.86%), suggesting blade production and presence of manufacturing waste. Bladelets form (n-3, 10.71%) of the collection, while cores are the least frequent at the Jaldega site (n-02, 7.14%).

Assemblage Composition

The lithic assemblage from the study area includes cores, flakes, blades, and bladelets, a total of 177 lithic artefacts were collected during the exploration out of which core represent (n-24; 13.56%), flake (n- 132; 74.58%), blade (n-13; 7.34%), bladelet (n-5; 2.82%) followed by Hammer stone (n-3; 1.69%) from the study area (Table. 3)).

Core Analysis

The core assemblage comprises a total of 24 specimens. In terms of completeness, the majority are complete (n-17; 70.83%), while the rest exhibit varying breakage patterns, including proximal (n- 2; 8.33%), distal (n- 4; 16.67%), and lateral breakage

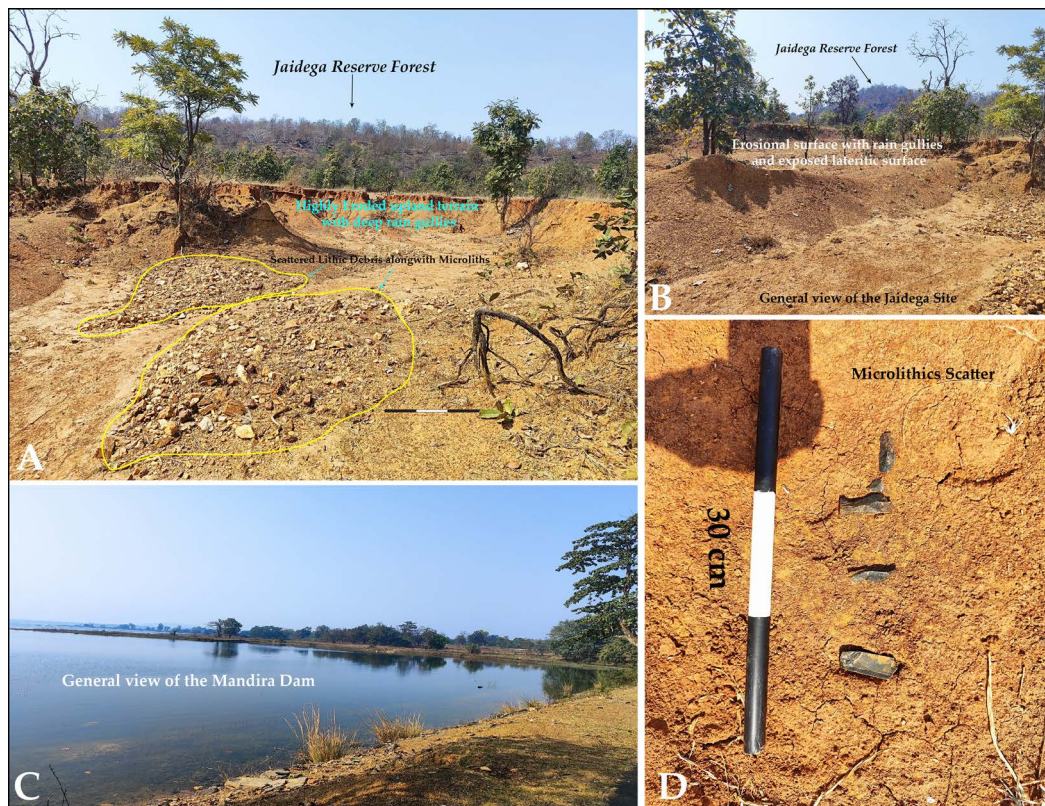


Figure 10: View of the eroded, microlith-rich landscape of the Jaldega site and a general view of the Mandira Dam

Table 3: Lithic assemblage composition from the study area

Artefact Category	Total n	Percentage (%)
Core	24	11.71
Flake	132	64.39
Blade	13	6.34
Bladelet	5	2.44
Hammer	3	1.46
Debris	28	13.66
Total	205	100.00

(n-1; 4.17%). Assessment of physical condition indicates that most cores are rolled (n - 15; 62.5%), indicating substantial post-depositional movement and surface abrasion, whereas the fresh specimens (n - 9; 37.5%) display minimal weathering and less transport (Figure. 11).

The core blank forms indicate that the assemblage is predominantly based on chunks (n - 12; 50.0%), followed by flakes (n- 7; 29.2%) and round nodules (n- 4; 16.7%). No cores were found prepared from angular nodules, while a small proportion (n- 1; 4.2%) could not be confidently assigned to a specific blank type and were categorised as indeterminate. This distribution suggests a primary reliance on irregular and readily available chunk forms, supplemented by flake and rounded nodule blanks, reflecting flexibility in raw material selection. The platform flaking pattern of the cores reveals a strong predominance of the single-platform, unifacial configuration (n- 17; 70.83%), indicating a preference for unidirectional core exploitation. A minimal proportion exhibits single-platform, all-round face flaking (n- 1; 4.17%). opposed-platform cores are less common, with flaking either on the same face (n- 2; 8.33%) or on opposite faces (n- 4; 16.67%). The flake cores dominate the assemblage (n- 12; 50.00%), followed by bladelet cores and flake/bladelet cores (n- 3 each; 12.50% each). Flake/blade cores and blade/bladelet cores are present in

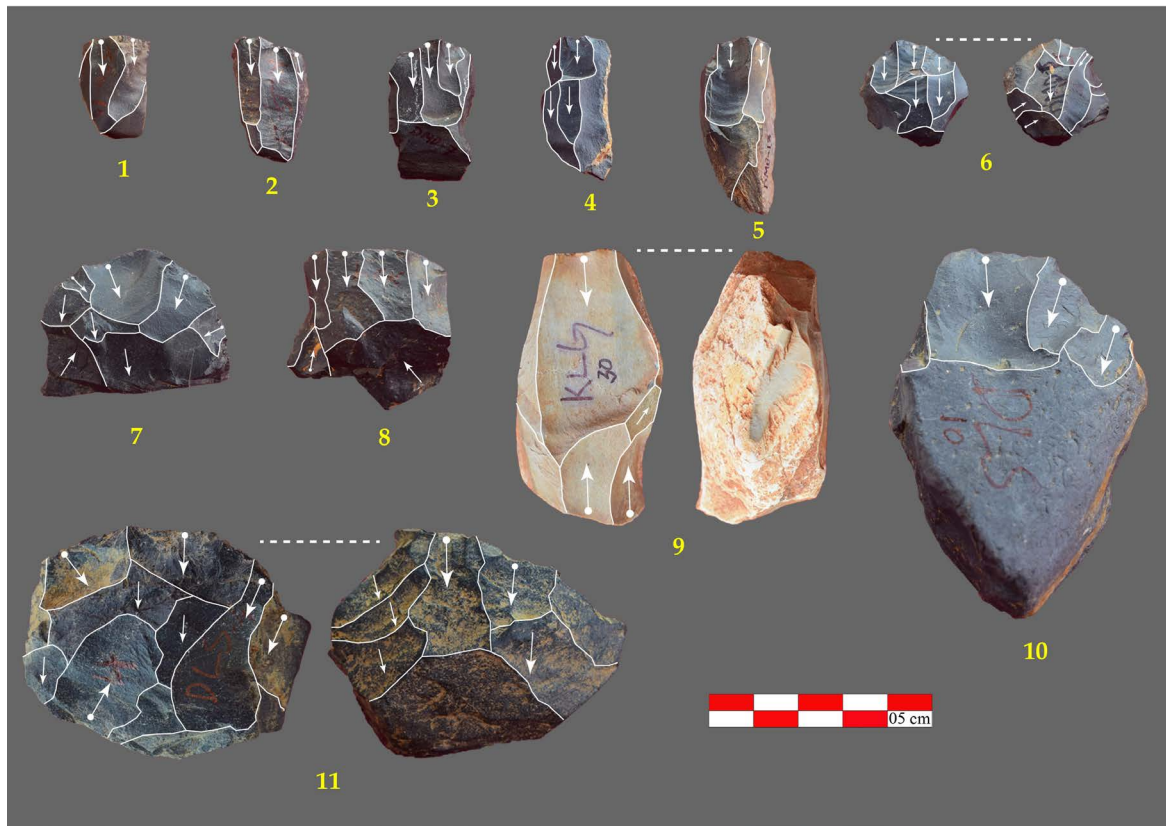


Figure 11: Lithic artefacts from the study area (1-11: Microolithic Core from the Deo-South Koel valley)

equal proportions (n- 2 each; 8.33%), while blade cores and unfinished cores are least represented (n- 1 each; 4.17%). The core assemblage reveals a predominance of prepared platforms (68.00%) followed by faceted platforms (20.00%) and cortical platforms are very rare (12.00%), reflecting initial reduction stages. The blank removal surface of the core provides a clear preference for efficient flake termination, with feather terminations (54.29%), step terminations (31.43%) and followed by hinged terminations (14.29%) (Figure. 12).

Such patterns are consistent with controlled knapping and post-depositional stress rather than random damage (Inizan *et al.* 1992; Andrefsky 2005). The platform analysis shows a clear predominance of prepared types (47.10%), supported by thinned (14.49%) and modified (8.70%) variants, indicating deliberate strategies for precision and standardized blank production, while cortical (10.87%) and faceted (10.14%) examples point to early stage of reduction sequence (Misra, 2001; Clarkson *et al.* 2012) (Table. 5). The patination pattern reveals a majority

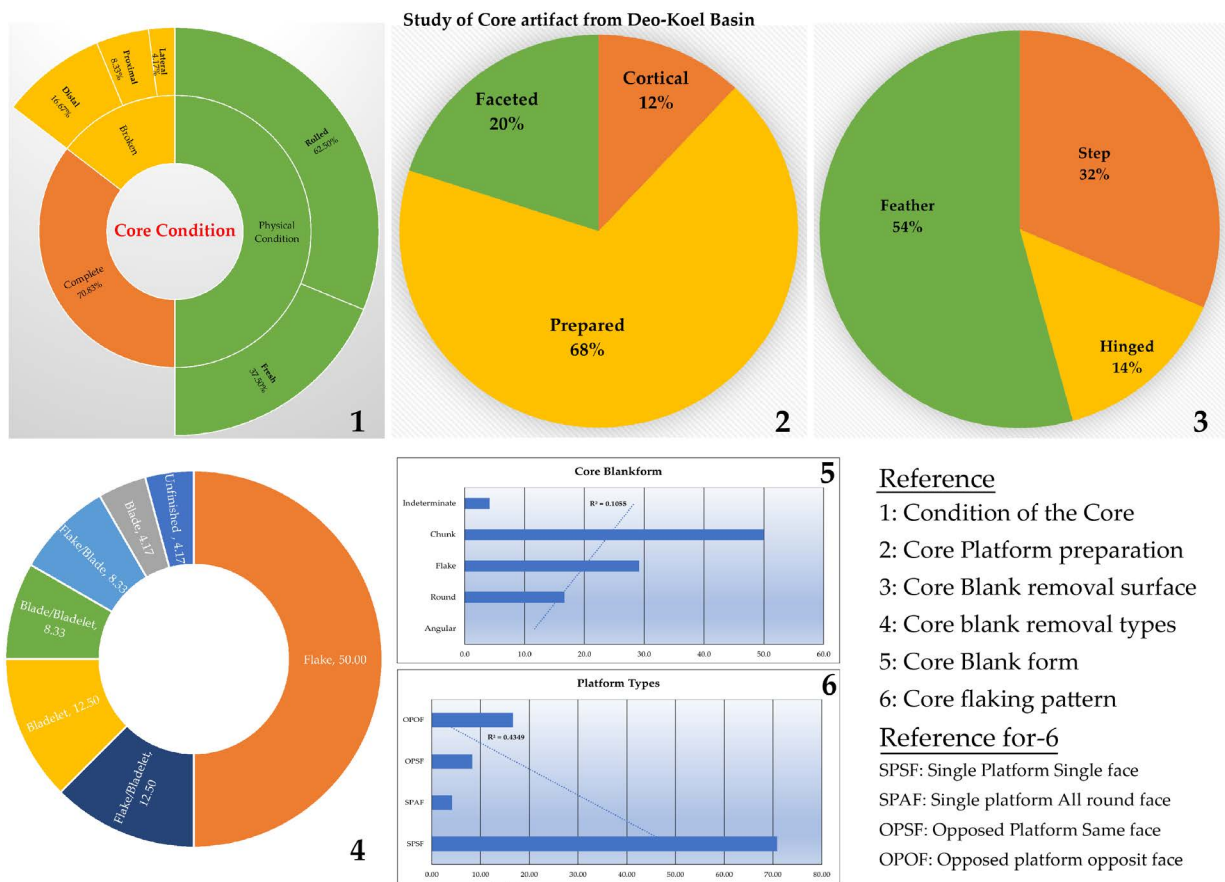


Figure. 12: Core artefact analysis from the Deo-South Koel Basin

Debitage Analysis and Technological Observations

A total of 150 debitage (including flake, blade and bladelet) has been deliberately collected from the surface exploration (Figures. 13 and 14). The debitage assemblage reflects a strong degree of fragmentation, with distal (47.25%) and lateral (38.46%) fractures dominating across artefact types, while proximal breaks are comparatively fewer (14.29%). Blades are particularly prone to distal breakage, whereas bladelets exhibit both proximal and distal breaks equally (Table. 4).

of unpatinated pieces (56.90%), with low to moderate patination (42.53%) implying variable exposure, and rare deeply patinated artefacts (0.57%) indicating long-term weathering (Paddayya and Yogesh 2008; Petraglia *et al.* 2009) (Table. 6) Thickness distribution further highlights proximal thickening (44.00%) and distal emphasis (34.67%), particularly in bladelets, reflecting conscious morphological control (Ghosh 1970; Clarkson 2007) (Table. 7). Bulb analysis reinforces technological variability, with simple and diffused bulbs dominating in flakes (73.19%), characteristic of hard-hammer percus-

Reference

- 1: Condition of the Core
 - 2: Core Platform preparation
 - 3: Core Blank removal surface
 - 4: Core blank removal types
 - 5: Core Blank form
 - 6: Core flaking pattern
- Reference for-6
 SPSPF: Single Platform Single face
 SPAF: Single platform All round face
 OPSF: Opposed Platform Same face
 OPOF: Opposed platform opposite face

Table. 4: Debitage breakage pattern from the study area

Breakage Pattern	Artefact Type							
	Flake		Blade		Bladelet		Total	
	N	%	N	%	N	%	N	%
Proximal	12	14.81	-	-	1	50.00	13	14.29
Distal	36	44.44	6	75.00	1	50.00	43	47.25
Lateral	33	40.74	2	25.00	-	-	35	38.46
Total	81	100.00	8	100.00	2	100.00	91	100.00



Figure. 13: Microlithic flake from the study area
 (2,5,12- Notch; 3,6,7,9- Side Scraper; 16 and 17- End Scraper; 11- Denticulated)



Figure 14: Blade and Bladelet from the study area (1-5: Bladelet; 5- Backed bladelet; 6-12: Blade)

sion, while blades and bladelets more frequently exhibit pronounced bulbs, often with incipient fissures, suggesting the use of softer hammer or pressure techniques for elongated blanks (Barham and Mitchell, 2008; Inizan *et al.* 1992) (Table. 8). Three hammer stones of sandstone pebbles having battering marks were collected during the exploration (Figure. 15). The debitage analysis from the study area demonstrate a sophisticated reduction system with variability in fracture, platform preparation, and percussion techniques, situating the assemblage within the broader technological complexity of South Asian microlithic traditions.

Lithic Raw Materials

The microlithic raw material procurement strategy in South Asia reflects a clear preference for fine-grained, cryptocrystalline silicates such as chert, chalcedony, and agate, along with quartz and jasper, due to their probable fracture properties

and suitability for microlithic production (Andrefsky 1994; Wilson 2007; Garvey 2015; Stepanchuk 2013; Kind 2006; Ambrose 2002; Lewis 2015). The inhabitant employed a combination of embedded procurement strategy by collecting nodules and cobbles opportunistically from river gravels and colluvial slopes and direct, targeted access to primary outcrops. In Eastern India, including Odisha, this strategy is evident in assemblages from river valleys such as the Ong valley (Barik 2022), Jonk Valley (Padhan 2013), Jira valley (Thakur 2015; Deep 2016), Baitarani (Dwibedi 2023), Brahmani (Behera 1989; Mendaly 2019), and Koel (Mandal 2021b), Tel Valley (Rana 2017) where chert, chalcedony, agate, and quartz dominate, sourced from alluvial contexts and nearby bedrock. Odisha's microlithic record shows a recurring pattern of local embedded collection for expedient cores and short-range procurement of higher-quality materials for microliths. In Odisha and Jharkhand border,

Table. 5: Types of flatform found on debitage from the study area

Types of Platforms	Flake		Blade		Bladelet		Total	
	N	%	N	%	N	%	N	%
Cortical	13	10.8	1	7.69	1	20.00	15	10.87
Prepared	55	45.8	7	53.85	3	60.00	65	47.10
Faceted	14	11.7	-	-	-	-	14	10.14
Pointed	7	5.8	1	7.69	-	-	8	5.80
Thinned	18	15.0	2	15.38	-	-	20	14.49
Dihedral	4	3.3	-	-	-	-	4	2.90
Modified	9	7.5	2	15.38	1	20.00	12	8.70
Total	120	100.00	13	100.00	5	100.00	138	100.00



Figure.15: Sandstone Hammer with battering mark (marked in White) from the Deo-South Koel valley.

the procurement strategy was strongly shaped by its diverse geological setting, which lies at the confluence of the Bonai-Keonjhar Belt of the Iron Ore Group, Archaean Proterozoic metamorphic terrains, and Gondwana sedimentary basins.

The banded iron formations (BIF) of the Bonai Keonjhar Belt contain abundant chert bands and silicified horizons, providing fine-grained raw materials suitable for precision knapping, while the surrounding metamorphic complexes yield quartz and quartzite. Additionally, the major river systems the Brahmani, South Koel, Sankh, and Ib transported chert, chalcedony, agate, and quartz into secondary contexts in the form of channel bars and terraces, which could be easily exploited through embedded procurement. This combination of rich primary outcrops and abundant secondary gravels would have allowed prehistoric groups in the study area to maintain a flexible raw-material acquisition system, alternating between immediate local sources and targeted visits to high-quality chert beds in their vicinity. From the explored site, four different types of raw materials have been found utilized for lithic productions (Table. 9). The raw materials are chert (69.76%), quartz (26.83%), sandstone (1.46%), and agate (1.95%).

Table 6: Patination pattern of the artefacts from the study area

Patination	Core		Flake		Blade		Bladelet		Total	
	N	%	N	%	N	%	N	%	N	%
Deep	1	4.17	-	-	-	-	-	-	1	0.57
Moderate	3	12.50	15	11.36	4	30.77	-	-	22	12.64
Low	16	66.67	22	16.67	9	69.23	5	100.0	52	29.89
Un patinated	4	16.67	95	71.97	-	-	-	-	99	56.90
Total	24	100	132	100	13	100	5	100	174	100

Table 7: Maximum thickness of the blank debitage

Maximum Thickness	Flake		Blade		Bladelet		Total	
	N	%	N	%	N	%	N	%
Proximal	57	43.18	8	61.54	1	20.00	66	44.00
Medial	28	21.21	4	30.77	-	-	32	21.33
Distal	47	35.61	1	7.69	4	80.00	52	34.67
Total	132	100	13	100	5	100	150	100

Table 8: Different types of bulbs on the debitage from the study area

Bulb Type	Flake		Blade		Bladelet		Total	
	N	%	N	%	N	%	N	%
SB	41	34.17	4	30.77	1	20.00	46	33.33
SB+IF	55	45.83	-	-	-	-	55	39.86
PB	-	-	6	46.15	2	40.00	8	5.80
PB+IF	24	20.00	3	23.08	2	40.00	29	21.01
Total	120	100	13	100	5	100	138	100

Modified Tool

The total sample comprises 18 artefacts, distributed across many tool classes. Among these, the side scrapers and notches are the most dominant, each accounting for (n-5, 27.78%) of the assemblage. This marked presence of retouched flake-blade based tools suggests a core-flake-blade reduction system. Hammer stones constitute (n-3, 16.67%) of the collection, representing the primary implements associated with core reduction and flake detachment. Their presence signifies active lithic production at the site rather than mere utilization. The end scrapers (n-3, 16.67%) and the backed bladelet (n-1, 5.56%) are technologically significant as micro-lithic components along with flake tools. (Table.10)

Discussion

The microlithic assemblages from the Deo and South Koel river valleys exhibit close techno-typological and raw material affinities with those recovered from the Jira, Ong, Jonk, Tel, and Mahanadi valleys of Western Odisha. It also reflects broader cultural and technological connections with Central Indian (Joshi 1978) and Chotanagpur Plateau microlithic traditions (Ghosh 2007). In all these regions, the dominance of non-local siliceous materials such as chert, chalcedony, agate, and jasper provides understanding for raw material quality and selective procurement strategy for producing microlithic tools. However, the Deo-South Koel assemblage shows a distinct preference for micro-crystalline varieties of chert and quartz, suggesting localized adaptations to resource availability.

Table. 9: Site wise raw material distribution from the study area

Raw Material	Core		Flake		Blade		Bladelet		Hammer Stone		Debris		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Chert	20	83.33	91	68.94	12	92.31	5	100.00	-	-	15	53.57	143	69.76
Quartz	3	12.50	41	31.06	1	7.69	-	-	-	-	10	35.71	55	26.83
Sandstone	-	-	-	-	-	-	-	-	3	100.00	-	-	3	1.46
Agate	1	4.17	-	-	-	-	-	-	-	-	3	10.71	4	1.95
Total	24	100.00	132	100.00	13	100.00	5	100.00	3	100.00	28	100.00	205	100.00

Table. 10: Modified tools from the Deo-South Koel river valley of Odisha.

Sl. No	Tool type from Deo-Koel Valley	Debitage Type				Hammer Stone	Total	
		Core	Flake	Blade	Bladelet		N	%
1	Hammer Stone	-	-	-	-	3	3	16.67
2	Notch	-	5	-	-	-	5	27.78
3	Backed Bladelet	-	-	-	1	-	1	5.56
4	End Scraper	-	2	1	-	-	3	16.67
5	Side Scraper	-	5	-	-	-	5	27.78
6	Denticulated	-	1	-	-	-	1	5.56
Grand Total							18	100.00

Technologically, the Deo-South Koel microliths demonstrate a Flake-blade based reduction strategy involving prepared platform cores, often prismatic or pyramidal in form, to produce parallel-sided blades and microblades. Similar technological patterns are observed in the Ong and Tel valleys. The Mahanadi valley assemblages, however, show a higher proportion of geometric tools. Morphologically, the Deo-South Koel microliths are marked by elongated flakes and blades along with retouched backed tools. Those from Central India particularly from the Son, Narmada, and Betwa valleys show a broader typological diversity including notched points, lunates, and composite tool forms. In contrast, the Chotanagpur Plateau microliths are generally cruder, often made on locally available quartzite. Overall, the Deo-South Koel assemblage bridges the technological continuum between the microlithic traditions of central India and the eastern India, showing both regional variability and adaptive convergence.

Conclusion

The present study from the Deo and South Koel river valleys offer vital information about the cultural and technological variability of prehistoric communities in northwestern Odisha. The discovery of four new sites such as Bagichatoli, Kadamtoli, Kaunteposh, and Jaidega broadens our understanding of microlithic settlement distribution within the region. The concentration of artefacts along riverbanks, erosional gullies, and lateritic uplands demonstrates the strong role of geomorphic settings in site formation and preservation, while also suggesting the significance of these environments in prehistoric land use strategies (Behera 1989; Behera *et al.* 2017; Mandal 2021b). The assemblage, dominated by flakes with fewer blades, bladelets, and cores, reflects a production system revealing a flexible technological choice responding to raw material constraints and functional needs. However, due to deliberate sampling, which introduces bias by selectively collecting certain artefact types or contexts, the assemblage does not represent the original variability and composition. In the wider South Asian context, microliths were once thought to be only Holocene tools, but research from Sri Lanka and India now shows their use as early as 45,000-48,000 years ago, linked to modern human dispersal and survival in different environments.

The study establishes the Deo and South Koel valleys of Sundargarh as archaeologically significant landscapes that contributed to the broader microlithic tradition of Eastern India. The lithic assemblages not only reveal technological strategies of flexibility and resourcefulness but also highlight the role of geomorphology and raw material distribution in shaping prehistoric settlement patterns. While the present findings are limited to surface explorations and typological observations, they underline the urgent need for systematic more exploration, excavations to understand the stratigraphic context of lithic artefacts. Absolute dating may be applied to integrate Sundargarh into the South Asian microlithic chronology. Future multidisciplinary approaches combining techno-morphometric analysis, raw material sourcing, GIS based spatial modelling, and paleoenvironmental reconstruction will be helpful for contextualizing these assemblages within regional and interregional frameworks.

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