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PRELIMINARY OBSERVATIONS ON QUATERNARY STRATIGRAPHY AND ASSOCIATED ARTIFACTS OF TWO PREHISTORIC SITES OF DULUNG RIVER VALLEY, WEST BENGAL

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ABSTRACT

The present article is the outcome of the primary investigation on prehistoric artifacts and associated quaternary deposits of two prehistoric sites in Dulung River valley, Jhargram district, West Bengal. Two sites namely Kukrakhonpi (22° 32' N and 86° 48'E) and Sahari (22° 37' N and 86° 47'E) are primarily studied by the author first-time in 2015 and later again in 2019 by means of the understanding surface features, sediments of natural and artificial sections and also the typo-technological attributes of lithic artifacts. For understanding the context of prehistoric cultural remains in Quaternary sedimentary units of the sites a mixed geochronological and archaeological approach is used in the present work. The result of this study shows that in both these sites prehistoric tools can be found from various sedimentary contexts like gravel deposit, ferricrete deposit, as well as in paleosol deposits. Tool types recovered from the sites mostly comprised of various Paleoliths and Microliths. The present study makes the addition of new data in the existing understandings of the Prehistoric culture of West Bengal.

INTRODUCTION

Recent developments of human origin research in India have shown that geographical location, as well as the diverse climatic condition of this country, must have some

vital effects on adaptation as well as the dispersal of Pleistocene hominids in the Old world (Joshi 1985). Presence of various Lower Paleolithic cultural traditions in the Indian subcontinent (Mishra 2007, 2008) and the presence of some of the earliest lower Paleolithic sites (Mishra *et al.* 1995; Paddayya *et al.* 2002; Pappu *et al.* 2011) have proven the above-mentioned fact is true. Furthermore, all this evidence indicates that probably India was inhabited by the earliest members of genus Homo and this form of human developed diverse patterns of adaptation to cope with diverse the climatic condition of this subcontinent.

Evidence of lower Paleolithic culture of India are found from various broad Eco zones, and within these Eco zones lower Paleolithic people probably inhabited a variety of microhabitats location of which are recorded from the Siwalik hill regions of northern India to the Tamilnadu in the south (Misra, 2001, 494). In eastern India evidence of lower Paleolithic culture are found buried in the boulder, pebble and secondary laterite depositions, found in the drainage regions of the rivers like Mahanadi, Subarnarekha, and Damodar etc. Geomorphological as well as geological evidence show that all these aforesaid rivers have their origin at the eastern extension of the archaic erosional landscape of Peninsular India.

Sedimentary deposits and associated prehistoric cultural remains of the Subarnarekha river the valley has been studied since the time of British administrators and continued up to recent times (Ball 1881; Anderson 1917; Mitra 1926; Murray 1941; Sinha 1951; Sen and Ghosh 1960; Sen *et al.* 1962; Ghosh 1966, 1970; Ghosh and Chaudhuri 1991; Chakrabarti 1993). Lower Subarnarekha river valley, which falls within West Bengal, was first studied by A. K. Ghosh (Ghosh 1962; cited in Chakrabarti 1993, 169). Later on, works in this area were extended (Sen *et al.* 1962; Chakrabarti 1986; Datta 1995; Basak 1997; Basak *et al.* 1998;Bhengra 2007; Polley and Ray 2010; Polley 2017) by other archaeologists and anthropologists, which shows great potency of this area in understanding a succession of prehistoric cultures of eastern India.

In the background of aforesaid works, fieldwork was carried out in 2015 and again in 2019 and this work brings forward a preliminary study of two different prehistoric sites of the upper Dulung catchment area (part of Subarnarekha drainage system) namely Kukrakhonpi and Sahari (Fig. 1), which falls in Jamboni block and Binpur II block respectively under the administrative division of newly formed

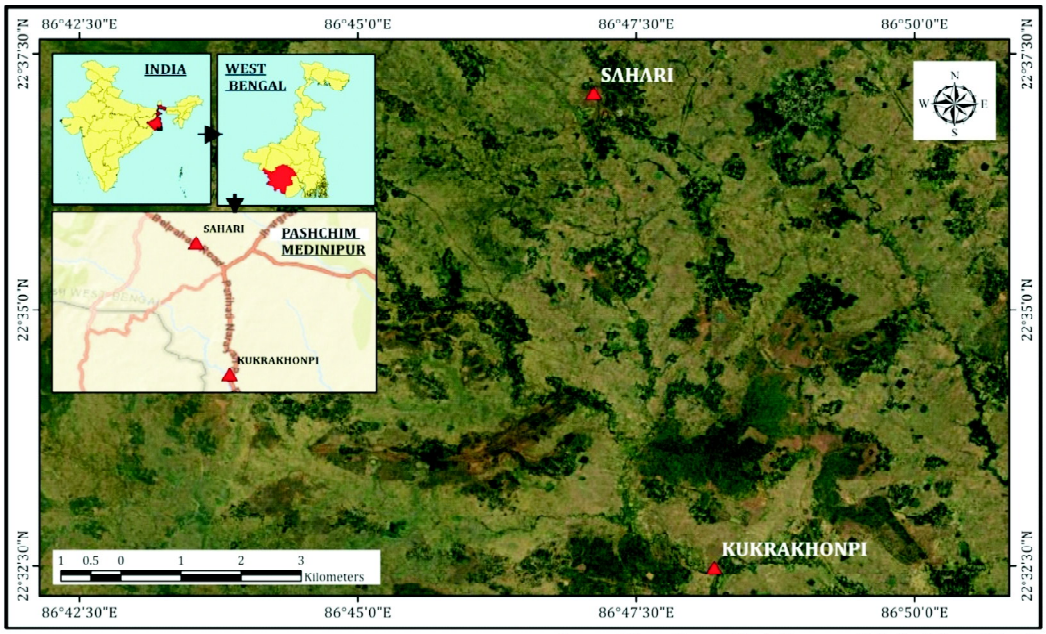

Fig. 1: Map showing location of studied sites in Dulung river valley

Jhargram district of West Bengal. Previously these two sites were explored and investigated by various scholars (Ghosh 1966; IAR 1986-87; IAR 1991-92; also cited in Saren *et al.* 2016, 469-72). Past exploration revealed about both Paleolithic and Microlithic tools from a different context like gravel bed as well as paleosol deposition (Ghosh 1966; IAR 1986-87). Results of this preliminary study bring forward observations of prehistoric artifacts recovered from the said regions in the light of Stratigraphic context; it also makes the addition of Geomorphological data and typo-technological data of lithic tools to the reported prehistoric sites of West Bengal and that of eastern India in the broader context.

METHOD AND MATERIALS

To identify and study sedimentary units of Dulung River and associated cultural remains a purely geochronological and archaeological approach is used in the present work. To study and understand the sedimentological and geomorphological context of the studied sites a classic "Empirical Paradigm" approach (Miall 2010, 5) of geological stratigraphy is used. In this approach study of geomorphic features like

fluvial deposits, calcretes, regolith deposits etc. is used to study physiographic features and sections of geological stratigraphy of the surveyed region. Before going into the field geological and geomorphological maps and reports of the surveyed area are consulted. Besides various 'Earth Observatory Software Applications like Google Earth and ISRO Bhuvan are used to get an idea about geomorphology and morpho-stratigraphy of the study area. GIS tools and software like ISRO Bhuvan, TCX Converter and Quick Grid Viewer are used to understand the geomorphological context of the study area. To study the stratigraphy of Quaternary sediments in the field, methods of descriptive stratigraphy (Miall 2010, 4-6) are used. Studies of the Stratigraphic sections are purposefully selected within the sites and studied accordingly. Selections of the sites were done with the help of a geomorphological map of the region and also with the help of Earth Observatory Software applications like Google Earth. Near-surface sediment characters of the litho-units are studied from the truncated profiles of the river bank and the exposed sections of diverse landforms like levee abandoned channel and point bar deposits (Brown 1997, 63-70). Then a geological survey schedule was developed, following methods of field survey of sedimentary rocks (Lahee 1952; Herz and Garrison 1998, 37-45; Tucker 2003) and was applied to study and interpret sedimentological units in the field. In determining the relative age of the sedimentological units, the rules applied in the present context is the relative position of the sedimentary units in a stratigraphic section and also position of the units in relation to the present-day river channel (Lahee 1952, 115-16;

Fig. 2: Geomorphology of the site Kukrakhonpi

Tucker 2003, 194-95). Beside this degree of compaction and paedogenesis are also used to understand relative age of various sedimentary units and climatic condition at the time of their origin. The depositional environment has been deducted on the basis of sedimentological characters of the fluvial deposits (Lahee 1952, 61-115; Tucker 2003, 191-213).

Stone artifacts collected in this exploration are studied in the field and also in the laboratory. Context of the recovered artifacts are recorded in the field and a relative comparison of the spots of artifact recovery is done in the field. In the laboratory, various typo-technological attributes of the recovered artifacts are studied principally by using an empirical approach (Minzoni-Deroche 1985). On the basis of the aforesaid attributes recovered artifacts are categorized according to their probable function.

PHYSIOGRAPHIC CONTEXT

The two different sites Kukrakhonpi (22° 32' N and 86° 48'E) and Sahari (22° 37' N and 86° 47'E) (see Fig. 1) are studied in the present context. Physio-graphically both these sites fall within the easternmost extension of the Chhotanagpur plateau. The area is moderately undulating with an average elevation of 100-150 meters from MSL. Most of the surveyed area has a pediplain like physiography and it can be divided into two distinct landforms:

i) The ferricritized upland and dissected plateau covering by for the largest part of the area and

ii) alluvial terraces to different levels.

The occurrences of ferricrete covered plateaus are higher in number in higher elevations and are most places curved by gullying action. Both of the sites Sahari and Kukrakhonpi are low ferricrete mounds and are dissected by a number of erosional rain gullies. Stone tools of lower Paleolithic culture are found scattered in these erosional rain gullies. In some areas, particularly where the ferricrete are represented in the topmost parts by latosol the intricate pattern of the gullies closely resembles badland topography (Chatterjee 1986). The alluvial terraces are relatively low-lying flat tracts gently sloping towards the trunk channel. Subarnarekha Landform elements present in this part abandoned channels, aggraded channels, meander scars and meander scrolls.

River is the principal agency for shaping the morphology of the area. The sediments derived from the Precambrian to the west were deposited in a fluviatile to Fluvia-deltaic environment. In its middle reaches here, the Subarnarekha is mainly in the phase of transportation. Erosion is confined to the banks particularly on the spur edges. The small tributaries flowing down to Subarnarekha is, however, in a phase of degradation. The secondary dynamic agency is the rainwater leading to the formation of gullies mainly in the ferricrete covered plateaus and in the older alluvial terraces (Chatterjee 1986). Observations in both of the sites indicate that stone tools have become exposed due to the erosional activity of the rainwater at the time of gullying. Since the vegetation in the plateau areas is sparse, sheet wash is also considerably active in the area.

Outcrop of highly decomposed rocks of igneous origin forms occasional low hills of this region, which are found at the western-north western part of this region. These low hills constitute the easternmost extension of the Tata-Dalma range of hills. Regarding the drainage pattern of this region, it can be said that the area falls within the Subarnarekha-Kasai drainage system in general. Tarapheni and Dulung are the important rivers of this region and both of these rivers are fed by rainwater. River Tarapheni is part of the Kasai drainage system and Dulung River falls within the Subarnarekha drainage system. Besides these major rivers, a number of rivulets like Kupon Nod, Simana (tributaries of Dulung) and small canals are present in this region. The flow of the rivers and other rain water-fed canals show that the general slope of the landscape of this region is from North-West to South-East.

STRATIGRAPHIC CONTEXT

Quaternary sediments exposed in Kukrakhonpi and Sahari show that they can be roughly divided into two distinct litho-units resting over bedrock. These litho-units are recognized as Unit-I- Consolidated ferricrete deposit and Unit-II- reddish sandy soil. In both sites' deposition of quaternary litho-units begin over the bedrock of pre-Quaternary origin. The bedrock consists of rocks of igneous origin with profound quartz veins in them. Exposure of quartz veins is more found at an increasing rate near Sahari and Belpahari region.

Unit-I consists of red-colored unsorted cobbles and pebbles of different rocks of igneous origin and pisolitic nodules of iron oxide (see Fig. 3). The deposit is consolidated in nature, however, the upper part of this exposed deposit is sometimes

Fig. 3: stratigraphic layers of cobbly-pebbly conglomerate, consolidated ferricrete and silt deposits near Kukrakhonpi

loose and, in some regions, cemented (Fig. 4) and forms a hard crust. It sometimes consists cobble sized clasts of ferricretes with prominent vesicular structures within them. In Kukrakhonpi, sometimes ferricrete can be observed with colluvium context unconformably over the vesicular ferricrete. The presence of subrounded pebbles within the colluvium in some places indicates fluvial action that happened in the time of aggradation. Also, the horizontal iron band in the colluvium indicates the same as water had been logged in that places for some time. The matrix of this unit

Fig. 4: section shows consolidated ferricrete deposit with some pebbles and implement

is formed by fine sands and silts. Also, ferricrete exposure near Sahari shows horizontal iron bands within it. Thickness of this deposit in both sites ranges between 1-2 meters. In Kukrakhonpi, Acheulian artifacts are found exposed in this deposit (Fig. 8) as well as in dried nullahs and rain gullies (Fig. 7). However, in Sahari, no Acheulian artifacts are found from this deposit. In Kukrakhonpi the ferricrete deposition and iron band are highly weathered.

Unit-II consists of almost 0.5-meter-thick unconsolidated sandy silt (Fig. 5), reddish-brown in color and is predominantly sandy in nature. In Sahari, microlithic artifacts are found exposed in this deposit. Sometimes, Microliths are found scattered over the exposed surface of ferricrete, but the presence of these artifacts near the sections of reddish sandy soil indicates that they were washed out of the soil deposit due to rainwater activity.

Fig. 5: section showing sandy silt layer in Sahari

Fig. 6: artifacts on ferricritised silt deposits

Fig. 7: artifacts in erosional rain gullies

Fig. 8: ferricretised context of recovered artifacts.

OBSERVATION ON RECOVERED ARTIFACTS

A total 32 lower Paleolithic artifacts (see Table 1) were recovered from the site Kukrakhonpi and 33 microlithic artifacts (see Table 2) were recovered from the site

Sahari. Lower Paleolithic artifacts, that are recovered from Kukrakhonpi are highly weathered and are made on both quartz (11 nos.) and quartzite (21 nos.) and they can be classified into eight different typological categories, they are- Chopper, Hand Axe, Cleaver, Side Scraper, End Scraper, Side cum End Scraper, Point and Knife (see Table 1). Classification of these different typologies are based on the type of retouch, location of probable working edges, working ends, probable butt/hafting ends and overall shape of the artifacts.

Total two Handaxes have been collected from the site Kukrakhonpi. These tools are made of Quartzite and these are made on the core. Working ends are very pointed. The tools are made mainly by primary flaking. Probably hard hammer technique was used for the tool making. The tools are patinated and weathered by weathering. A total of two cleavers have been collected from the site Kukrakhonpi. These are made of both Quartzite and Quartz. The tools have a broad working edge and made by primary flaking also some secondary flaking is found on the working edge. The hard hammer technique was used for making a cleaver. The tools are patinated. A total of five Choppers have been found from the site. Two of them are elongated and the other three are round shaped. Four Choppers are made of Quartzite and another one is made of Quartz. The cutting edge of these tools is zigzag-shaped. Large primary flake surfaces are present on both dorsal and ventral surfaces in three choppers. In two choppers, there is no flake surface on the surfaces. These two have primary flake surfaces only on the cutting edge. The choppers were made with block-on-block technique. Total thirteen side scrapers have been collected from the site Kukrakhonpi. Total five tools are made of Quartz and others made of Quartzite. The tools are made on both Clactonian and Levalloisian flakes. So, there are main flake surfaces and striking platforms on many side scrapers. The primary flake surface is present on the dorsal surface. Secondary flake surfaces are seen on the working edge. Working edges are more or less straight and broad. Both Clactonian and Levalloisian technique was used for the tools making. On nine Side Scrapers, there are marks of Levalloisian technique. The other four scrapers were made with the Clactonian technique. Only one end scraper has been collected from the site Kukrakhonpi. It is made of quartzite. Working edge is present on the end of the tool. The working edge is made by secondary flaking. The tool is made on a Levalloisian flake. The tool is patinated. Total three side-cum-end Scrapers have been found from the site Kukrakhonpi. One tool is made of quartzite and the other

two are made of quartz. The tools are made by primary flaking. These tools have many working edges. One is on the distal end of the tool and the others on the lateral margins. Both Levalloisian and Clactonian technique was used for these tools making. Two of them are made on Levalloisian flake and another one is made on Clactonian flake. The preservation condition of these tools is fresh. A total of five points have been found from the site Kukrakhonpi. All points are triangular shaped. The tools are made on a flake that was detached from the prepared core. All tools have a main flake surface and a striking platform. A midrib is present on the dorsal surface of all points. The working end is pointed. The tools are made on both Levalloisian flakes and large unprepared flakes. The marks of the Levalloisian technique are found on four points when the other one is made with the free flaking technique. Only one knife, made of quartzite has been collected from the site Kukrakhonpi. One lateral edge of the tool is sharp and another lateral edge is blunt. The tool has a patination mark on its surface.

All the tools were recovered from the exposed ferricritized bed, sometimes from ferricrete duricrust and sometimes from the upper surface of loose ferricrete pellets near small nullahs and rain gullies. Some of the tools are highly weathered and brownish patination can be noticed on the surfaces of the tools.

Microliths are recovered only from the site Sahari and they are 33 in number (see Table 2). All the microliths are also highly weathered and are made of quartz. On the basis of the type of retouch, location of probable working edges, working ends, probable butt/hafting ends and overall shape of the artifacts, recovered Microliths can be classified into 12 different tool categories- Side Scraper, End Scraper, Side-cum-End Scraper, Notched Scraper, Thumbnail Scraper, Point, Micro-burin, Microblade, Awl, Lunate, Triangle and Trapeze (see Table 2).

A total of three Side Scrapers have been found from the site Sahari. All tools are small in size. Secondary flake surfaces are present on both dorsal and ventral surfaces. Retouching is seen on the working edge. These tools are made on the flake. Total four End Scrapers have been recovered from the site. The tools are also made on the flake. Working edge is seen on the end of the tools. Working edges are sharpened by retouching. Only one small-sized Side-cum-End scraper has been found from here which is made on a flake. A total of four points has been collected as well. The tools are small to medium in size. All tools have a striking platform and the main flake surface. The working end of all points is pointed and sharp. The

Table 1: Showing tool typology, no. of tools and its metric valuesobserved from Site Kukrakhonpi

Tool type	*Totalno*	*Measurement*	*Range (in cm)*	*Mean (in cm)*
Handaxe	2	Length	13.2 - 15.5	14.3
		Breadth	9.1 - 9.2	9.1
		Thickness	3.7 - 4.5	4.1
Cleaver	2	Length	11.3 - 13.2	12.2
		Breadth	8.4 - 8.9	8.6
		Thickness	3.4 - 3.9	3.6
Chopper	5	Length	7.4 - 9.9	9.3
		Breadth	6.6 - 8.9	7.8
		Thickness	5.3 - 6.7	5.9
Side Scraper	13	Length	5.7 - 14.8	9.0
		Breadth	3.9 - 7.7	6.2
		Thickness	1.3 - 4.3	2.7
End Scraper	1	Length	7.8	7.8
		Breadth	7.8	7.8
		Thickness	2.9	2.9
Side-cum End Scraper	3	Length	7.8 - 10.7	9.5
		Breadth	5.8 - 11.4	8.6
		Thickness	2.0 - 2.9	2.4
Points	5	Length	6.0 - 12.1	8.2
		Breadth	4.8 - 6.1	5.3
		Thickness	2.2 - 3.4	2.7
Knife	1	Length	10.9	10.9
		Breadth	5.0	5.0
		Thickness	2.3	2.3
Total	32	–	–	–

preservation condition of all tools is fresh. A total of seven Micro-blades have been collected from this site. All Micro-blades (see Table 2) are very small in size. Retouching is found on the working edges. The preservation condition of the tools

Table 2: Showing tool typology, no. of tools and its metric values observed fromsite Sahari

Tool type	*Total no*	*Measurement*	*Range (in cm)*	*Mean (in cm)*
Side Scraper	3	Length	2.7 - 5.4	4.1
		Breadth	1.8 - 3.9	3.0
		Thickness	0.6 - 2.0	1.2
End Scraper	4	Length	2.3 - 8.8	5.4
		Breadth	2.1 - 8.4	5.1
		Thickness	0.8 - 2.4	1.7
Side-cum-End Scraper	1	Length	3.1	3.1
		Breadth	2.4	2.4
		Thickness	1.0	1.0
Point	4	Length	2.8 - 5.1	3.5
		Breadth	1.9 - 4.0	2.6
		Thickness	1.0 - 1.3	1.1
Notch Scraper	2	Length	2.3 - 3.7	3
		Breadth	1.4 - 3.2	2.3
		Thickness	1.0 - 1.5	1.2
Microblade	7	Length	1.3 - 1.8	1.6
		Breadth	1.0 - 1.8	1.3
		Thickness	0.4 - 0.7	0.5
Micro-burin	3	Length	2.1 - 3.2	2.8
		Breadth	1.2 - 2.0	1.6
		Thickness	0.5 - 0.8	0.6
Thumbnail Scraper	2	Length	1.7 - 2.0	1.8
		Breadth	1.9 - 2.1	2.0
		Thickness	0.6	0.6
Awl	2	Length	1.9 - 2.9	2.4
		Breadth	1.2 - 2.4	1.8
		Thickness	0.9 - 1.2	1.0

Lunate	1	Length	3.0	3.0
		Breadth	1.6	1.6
		Thickness	0.6	0.6
Triangle	2	Length	1.7 - 1.8	1.7
		Breadth	1.5 - 1.9	1.7
		Thickness	0.4 - 0.5	0.4
Trapeze	2	Length	1.5	1.5
		Breadth	1.5 - 1.7	1.6
		Thickness	0.5 - 0.7	0.6
Total	33	–	–	–

is fresh. Total three Micro-burins have been collected from the site. These are made on a small blade. The working end of these tools is screw-shaped and long elongated. Two small-sized awls have been found from the site Sahari. These tools have a very sharp pointed working end. A total of two triangles have been found from the site Sahari. These are made on a small flake which was after the blade technique. A total of two trapezes are found from this site. These Microliths are made after blade techniques. Only one lunate has been found from the site. A total of two Thumbnail scrapers have been observed from the site Sahari. The proximal end of the tools is thick and the distal end is more or less thin. The working edge lies on the distal end. The working edge is broad and very sharp. The working edge is sharpened with small retouching. Levalloisian technique was used for tool making. The state of

Fig. 9: Artifactsrecovered from site Kukrakhonpi

Fig. 10: Microlithsrecovered from site Sahari

preservation of the tools is fresh. Total two Notch Scrapers have been collected from this site. These are small to medium-sized flake tools. These are formed after detaching from the prepared core. The notch is found on the lateral edge of the tools. The preservation condition of the tools is fresh.

Microlithic assemblage in this site includes some tool types which generally represent upper paleolithic occurrence although these are in the form of small size. All the tools are very fresh by means of preservation.

DISCUSSION

The eastern part of India mainly comprises four different states, which include Bihar, Jharkhand, Orissa and West Bengal. This broad part of the Indian sub-continent has yielded a number of prehistoric sites, distributed throughout extensive ecological niches (Ghosh *et al.* 1991). K ukrakhonpi and Sahari both sites fall within the aforesaid cluster of prehistoric sites. A study of the physiography and Quaternary sedimentological units of the surveyed region indicates that the surveyed region is presently underlain by pre-Quaternary metamorphic and igneous rocks (probably Dharwarian in nature). Besides this, deposits believed to be of late Tertiary are found on the hilltops of this region in the form of hardpan deposits or duricrusts. The Pleistocene deposits of this region are primarily characterized by the erosional activities in the hills and uplands and by the deposition and redisposition of this erosional debris along the pathways of present-day rivers or river valleys. Seeing the quality and quantity of data found from this region Ghosh *et al.* (1991) put this region as one of the most significant paleo-ecozone of eastern India.

Quaternary sedimentary units found both in Kukrakhonpi and Sahari has a morpho-stratigraphic and litho-stratigraphic similarity with Lalgarh formation (Chatterjee 1986; Ghosh and Majumdar 1991). A number of scholars have reported lithostratigraphically similar deposit from the middle part of the Subarnarekha basin (Chatterjee and Chottopadhyay 1986; Chatterjee 1986) and dated this deposit to the middle Pleistocene. In the present context, prehistoric artifacts recovered from sedimentary unit 1 are designated to the lower and middle paleolithic culture and this finding supports the claim of the previous scholars also. The sandy silt deposit or unit 2 was probably developed by residual weathering of sedimentary unit 1 and probably belongs to the later period than unit 1. The reason behind this claim is the presence of microlithic artifacts in this unit. The presence of microliths in sedimentological unit 2 indicates that it can be dated to the end of the Pleistocene to early Holocene.

Implements show a great variety in terms of tool typology but not in forms of raw material in these sites. Quartz and quartzite had been used for tool manufacturing which was exploited from the river bed in the forms of pebbles and cobbles and also chunks from colluvium context and from the quartz vein of exposed bedrock outcrop in places where microliths are made only of quartz. The implements observed in Kukrakhonpi made on core and flake while flake-made tools observed in Sahari. Implements and context of the tools show ecological diversity as well as typo-technological variation in this region. Ferricretized formation has a great potency to occupy the early stone age implements, mostly found in rain gullies of ferricrete bed as well as the microliths consisting in ferruginous-silty context. Study shows human activity near to river bank when water was in aggradational mode also in the degradational phase near the waterlogged area.

Microlithic assemblage mostly found by earlier researcher in alluvium and colluvium context of the arid and semi-arid zone of Purulia and Medinipur and other places. It is known that not only the alluvium context (Ghosh 1970; Basak *et al.* 1998, 731-40; Bhattacharyya 2011), also colluvium (Basak 2013, 83-84; Basak *et al.* 2014) contains Microliths. Finding of prehistoric artifacts of Kukrakhonpi and Sahari with all its limitations show that the watershed regions of middle Subarnarekha river valley may provide significant information in the field of prehistory of Eastern India.

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