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MICROLITHIC INDUSTRY IN THE KHARLA RIVER VALLEY, WESTERN ODISHA: GEO-ARCHAEOLOGICAL PERSPECTIVE

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Abstract: The article is a study of microlithic tools reported from prehistoric sites of the Kharla river valley under Sambalpur district, Kuchinda subdivision, western Odisha. The Kharla river basin developed within Precambrian and Proterozoic rocks have preserved prehistoric sites– mainly microlithic in thin (<10 m) colluvio-alluvial deposits of late Quaternary age. Flake tools/middle palaeolithic artifacts have been discovered in ferricretized cobbly pebbly gravel of the early late Pleistocene age. Geomorphic and palaeo-pedological features indicate a humid climate during the early Pleistocene and early Holocene. The climate was distinctly dry during the later late Pleistocene. Easy availability of raw materials like quartzite, chert, chalcedony etc. and availability of water in plunge pools of waterfalls, even in the dry period, have attracted prehistoric hunter-gatherers almost throughout the Late Quaternary.

Introduction

As most of the river valleys of Odisha being rich in prehistoric settlements, scholars took a keen interest in the study of prehistory (Mahapatra 1962; Mohanty 1992; Basa and Mohanty 2000; Chauley 2008). Prehistory of Odisha can be investigated with the help of stone tool evidences, which are collected mostly from major rivers of the Brahmani and the Mahanadi and their different tributaries (Tripathy 1972; Behera 1989 and Thakur 1990; Sharma 1994; Behera *et al.* 1996; Behera *et al.* 2017) as well as from the rocky pediments (Ball 1876; Chakrabarti and Chattopadhyay 1988). The occurrence of microlithic industry in west Odisha has been reported from Ong valley by S. Panda, in lower Ong (1996) and Suktal by

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S. Gadtia (2000), in lower Jira valley by K. Seth (1988), upper Jira valley by S. Mishra (1998), in the middle Mahanadi valley by A.K. Sethi (1996), lower Bheden valley by J. Naik (2005), Girisul valley by S. Mendaly (2012), Jonk river valley by T. Padhan (2013) and Bhalugarh by Mendaly and Hussain (2015), Raul valley by B. Patel (2002), lower Jira valley (Deep 2018) and its tributaries like Ranj and Datan by S. Deep (2016). In the above-mentioned researchers, explorations have been conducted under the supervision of P.K. Behera and S. Pradhan with the assistance of several MA and MPhil students, in the middle Mahanadi and its major and minor tributaries resulting in the discovery of hundreds of Mesolithic sites as well as rock art sites in western Odisha (Mishra 1998; Panda 1996; Patel 2002; Seth 1998; Sethi1996; Mendaly 2012).

The archaeological potentiality of the study area (Kuchinda subdivision) was earlier reported by S.N. Ratha and D.K. Bhattacharya in 1988 (Ratha and Bhattacharya 1988). Jaya Sankar Naik (2005) in his study on the lower Bheden valley of western Odisha, demonstrated the rich potentiality of the microlithic sites in this area. A review of this archaeological literatures, however, revealed that the region is largely *terra incognita*. Although a few prehistoric sites had been reported earlier, no systematic investigation in the Kharla river valley had been attempted from a regional perspective. Keeping this in mind, the archaeological investigations were conducted for several field seasons in the Kharla basin along with a few students with an aim to know the cultural ecology of prehistoric sites.

The systemic exploration was undertaken in the valley of Kharla river and its tributary Lamdora nala resulted in the discovery of as many as 26 microlith sites, one Acheulian site and one middle palaeolithic site. All these sites have been reported from three distinct geomorphic contexts, viz. along the bank of the rivers and its tributaries of different orders, on the raised surfaces with massive exposure of rocky out-crops, and in the foothill context. Prehistoric sites of all these contexts in this region vary from one to another in the use of raw material and technology. In this article, an effort has been made to a geomorphological background of the Kharla river valley basin (Plate 1).

Study Area and Surrounding Landscape

The area under the present study is concentrated in the north-western part of the district Odisha. Physio-graphically, the Kharla basin lies between the northern uplands and the south-western hilly regions of Odishan highlands. The river has a strategic geographical location, as it flows through a region between the rivers Mahanadi in the west and Brahmani in the east. The river flows from east to west and it receives water from a large number of lower-order seasonal streams and streamlets. Kharla is a third-order tributary of the river Mahanadi (the first-order tributary is the Ib and second-order tributary is the Bheden) in the eastern part of the high-land of Odisha (Plate 2).

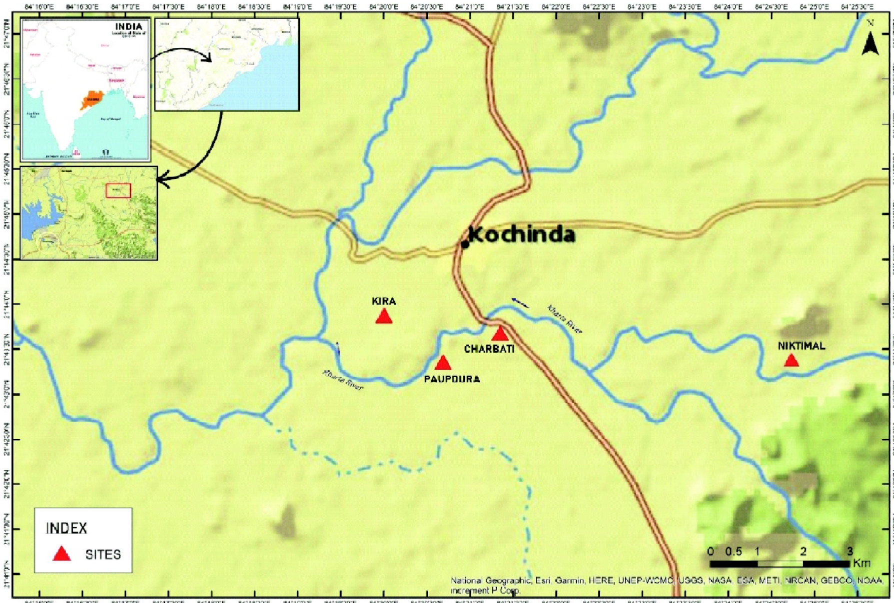


Plate 1: Sites location at Kharla river (*Courtesy*: Meghamala Ganguly)

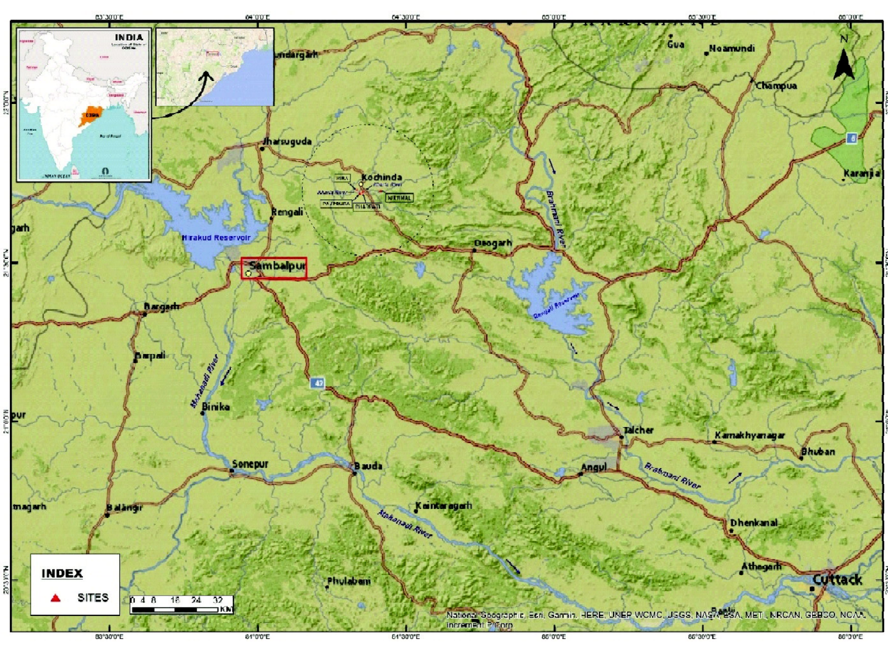


Plate 2: Showing the study area (*Courtesy*: Meghamala Ganguly)

The river Kharla originates near the Kansar-Bonai border (22°49´22.88” N/ 84°40´01.68/ E) of Sundergarh district, running east-west in the valley and enters Kuchinda subdivision under Sambalpur district where it merges with the river Bheden at Lasa (21°43´35.69/ N/84°19´14.49/ E) village and these combined streams ultimately flow into river Ib, a tributary of the Mahanadi. Out of its total length of 65 km, it flows about 56 km in the Kuchinda subdivision. Among the major tributaries, the Lamdora nala joins the Kharla nala near the village of Larh (21°43´1.22” N/84°22´5.11/ E). Kharla river and its tributaries dry up in summer, while during the rainy season they become torrential.

The study area of the Kuchinda subdivision can be broadly divided into two natural divisions, the hill region and the valleys. The hilly region lies to the north, east and south of the subdivision, covering an area of about 1036 sq. km, while the remaining 1409 sq. km are valley laying on the west and central part of the subdivision. The entire area contains a series of low hill ranges extending towards the valley of the Mahanadi. The average heights of these hills range from 400 to 900 m. Several water-courses originate at these hills and join the others. Finally, these give rise to the numerous tributaries of the Mahanadi and the Brahmani rivers (Senapati and Mahanti 1971).

Geo-Morphological Background

For understanding the landscape, the author is attempting to provide the following aspects of Quaternary geomorphology based on our limited field observations. This account does not involve typical basin analysis/morphometric study of landforms and no laboratory analytical data on Quaternary sediments associated with the microlithic sites.

Kharla basin is primarily an erosional basin carved out of Precambrian and proterozoic rocks at least since the Neogene under monsoonal climate. The Mahanadi acts as the main base level of erosion for main streams like Kharla and Bheden and their low order ephemeral tributaries flowing only during the monsoon period. It is quite likely that geological structure such as faults, folds, fractures, and hard rock lithology might have controlled basin morphology to some extent. This aspect of geologically oriented geomorphology has not been covered in the present study. Briefly, the basin is hilly, ranging from 1,000 m to 2,000 m ASL and the low relief landscape is dominated by valley pediments developed over Precambrian rocks and tors. The regolith consisting of channel gravel, hill slope debris flow gravels, overbank flood sands and silts and foot slope colluvial silts with or without calcretes.

Brief Geo-Morphological History of the Kharla Basin

Post Precambrian and Proterozoic history of the Kharla basin is represented by the ferricrete formation with moderate development of saprolite covering rocky pediments around

Kuchinda town. Well-developed ferricrete (Plate 3) is observed in the north-western direction and around 2–3 km away from the right bank of the river. This ferricrete formation is tentatively placed on the early Pleistocene period when the overall climate in eastern India in general and the middle Odisha, in particular, was distinctly humid to sub-humid (Deo et al. 2017). So far stone artefacts have not been found in the ancient ferricrete.

Plate 3: Well developed ferricrete formation near Kuchinda town

Plate 4: Ferricretized gravel formation with flake artifacts

On the other hand, we discovered a few middle palaeolithic flake artefacts in ferricritized cobbly pebbly gravel resting unconformably on weathered gneiss/schist traversed by pegmatite veins at a height of about 8 to 10 m above the present channel which is 1 km from the site (Plate 4).

The ferricritized gravel with flake tools has a lateral spread of <1 km on the left bank of the Kharla. Tentatively, it is suggested that the river Kharla was flowing a couple of metres above the present channel level sometimes during the early late Pleistocene when the overall climate was humid and the base level of erosion (i.e., of the river Mahanadi) was higher than today due to the global rise in sea level during the last interglacial period (Singhvi and Kale 2009). Future detailed geoarchaeological and geochronological studies not only in the Kharla basin but also in the middle Mahanadi basin will throw interesting light on the chronology and environment of middle palaeolithic cultural sites.

In the upper course, at the Suipoda area, the Kharla river cascades (10-12 m height of waterfall) and has developed a wide and deep-water pool at the foot of the waterfall. This waterfall probably has its origin in tectonic movements of Precambrian and Proterozoic rocks. The present course of the river appears to be superimposed over the geological structure of the Precambrian rocks. The presence of microlithic scatters in the soil regolith is partly connected with perennial sources of water in plunge pools developed at the foot of the waterfall.

Another convincing evidence of the occurrence of microlithic sites with low (2–3 m) waterfalls and associated pools on the Kharla river is noted at Hagrudihi, Cowmaran, and Niktimal area, in the middle course of the river in a low relief landscape.

Cut and Fill Colluvio-Alluvial Surfaces in the Kharla Basin

As mentioned earlier rich microlithic scatters are preserved in semi primary context in silts, sands and gravels of colluvio-alluvial origin and are <15 m thick with a lateral spread of about 1 to 1.5 km on either bank of the Kharla. The older fill forming a high surface (10–12 m above present channel level) consists of reddish or yellowish-brown sandy silt with and without calcareous pellets and nodules. Iron-oxide, manganese-oxide pellets are found throughout the thickness of sandy silts. Calcrete nodules are common in silty clay or clayey silt (Plate 5).

Some part of silt deposits indicate a hydromorphic environment (as indicated by greyish colour and mottling). Calcrete nodules and pellets have formed in such a hydromorphic environment in which fluctuation in the water table is common. Tentatively we suggest that the climate was relatively dry as indicated by the presence of calcrete nodules in silt deposits.

Plate 5: Calcrete formation in silty clay layer

Plate 6: Microlithic site preserved in sandy clay

It has been suggested that the occurrence of rich microlithic scatters (Plate 6) in over-bank flood silts indicate that floods were occurring with long breaks in two flood events. Such breaks support soil formation and stability of the flood-plain surface. Over these stable surfaces, microlithic activity has taken place during the later late Pleistocene period.

The Pleistocene-Holocene transition phase was climatically very sensitive almost all-over peninsular India due to the strengthening of the Indian monsoon (Kale and Rajaguru 1987). The climate was humid and suitable for high water discharge in rivers and also strengthened the erosive force of water. More or less similar humid climatic conditions prevailed in Odisha, West Bengal in general and in the Kharla basin in particular.

The Kharla river developed an inset alluvial fill surface into the Pleistocene fill. This fill consists of unconsolidated sands and gravels capped by 2–3 m thick yellowish greyish silts without any significant pedogenesis. Microlithic evidence continues to occur within these mid-Holocene alluvial fills, e.g., sites like Niktimal, Cowmaran, Mahuldihi, etc (Biswas and Rajaguru 2019).

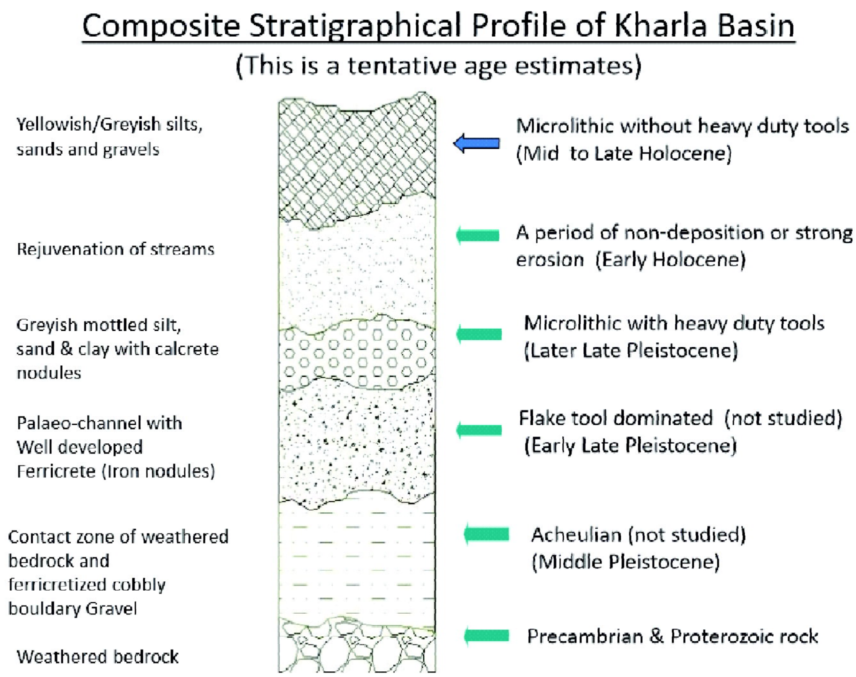
We could find a few Acheulian artefacts in the contact zone of basal cobbly pebbly gravels and the underlying weathered Precambrian gneisses and schists. As our observations on Acheulian sites were highly cursory, therefore, we have not included this aspect in the Kharla basin reported by earlier scholars (Ratha and Bhattacharya 1988).

Briefly, the erosional basin of the Kharla has preserved ferricretes of early Pleistocene age, ferricretized channel gravels with flake tools (middle palaeolithic) of the early late Pleistocene, probably of the last interglacial period with humid climatic and high base level. Microlithic artefacts, however, presumably occur in colluvio-alluvial fills of the later late Pleistocene age when the climate was relatively dry (Rajaguru 1983).

The table below shows a gradual change from sediments resembling the present-day Kharla deposits. It appears that the original sand derived from Precambrian and Proterozoic rocks are being weathered into clay particles. Two episodes of gravel (loose and compact) deposits were observed in the present channel. The presence of calcrete or ferricrete is also very interesting. In arid parts of Peninsular India, calcrete is associated with the dry climatic phase whereas ferricrete is associated with the humid climatic phase (Deo *et al* 2004-2005).

Tentative Composite Quaternary Stratigraphy in the Kharla river basin

Approximate Age	*Nature of Geomorphic Evidence*	*Climate*	*Culture*
Mid to Late Holocene	Yellowish/greyish silts, sands and gravels	Sub-humid	Microlithic without heavy-duty components
Early Holocene	Rejuvenation of streams	Humid	Period of non-deposition or strong erosion
Later Late Pleistocene	Reddish/Yellowish mottled silts, sands & clay with calcrete nodules	Dry	Microliths with or without heavy-duty component
Early Late Pleistocene	Ferricretized channel pebbly cobbly gravels above present channel level	Humid	Flake tool culture (Not studied in this article)
Middle Pleistocene	Contact zone of weathered rock and ferruginised cobbly bouldery gravels	?	Acheulian (Not studied in this article)
Early Pleistocene	Ferricrete or Precambrian or Proterozoic rocks	Humid	Without any stone artifacts



Discussion

The artefactual remains are spread over an area of about half to one sq. km and occur in the form of small to large clusters. Each of which contains a varying number of cores, core dressing flakes, blades, bladelet, finished and semi-finished tools, and a good number of unmodified raw materials and huge debris (chips/chunks). Most of the microlithic tools are smaller in their measurements and the ratios indicate that these are small in their form and dimensions (Biswas 2013 and 2018). The microlithic assemblage composition of the reported sites reveals that all the microlithic industries of the investigated area contain a varying proportion of retouched tools and implements. The analysis demonstrated (Biswas and Rajaguru 2019) that flakes (57.25%) are a predominant part of the blank form. However, the maximum number of available cores belongs to the category is flake cores (40%). This indicates that the majority of the available flakes might have been detached during the process of core dressing. Equally remarkable is the very rare occurrence of blade-bladelet cores (14%) in the lithic assemblages. The availability of a sizable proportion of blade indicates that the core reduction process was in use at some sites. This means that a nodule or a pebble was first utilized to detach flakes from it and then when it was reduced in size, blades were taken off from it after preparing one or multiple platforms at suitable places. Thereafter, when the core was further reduced in size it was utilized for detaching bladelet after necessary preparation. One of the classic examples comes from the assemblage composition of the Paupdura site (Biswas and Rajaguru 2019). Chunks are another predominant blank form of the collected artefacts and in the lithic assemblage, thin, sub-angular, and angular flakes come under this category. The large quantity of chunks present at the site also denotes manufacturing activities. The initial preparation of raw material nodules to make them into a core produces a large number of chunks. A good number of fragmented artefacts were also recorded of these sites. Besides microliths, a few sites have also yielded heavy-duty artefacts, like handaxes, chopper-chopping tools, large scrapers, large cores, etc. but are not discussed in this article. Patination and ferric encrustation are also present on some of the artefacts which vary from site to site. Almost all the exposed artefacts are in mint condition and have not undergone any major post-depositional disturbance. It is to be noted that assemblage analyses of these sites have been done only on groundwork based on a large collection (Biswas and Rajaguru 2019).

Stratigraphically, these artefacts have been found associated with erosional surfaces covered by loose silty-sandy-clay of reddish-brownish colour associated with ferruginous lateritic pellets or calcrete nodules. Easy accessibility to the abundance of raw materials for tool production and suitable environmental conditions attracted the attention of the prehistoric peoples to inhabit the riverside for a lengthy period. Despite some amount of site displacement through some natural processes, most of the investigated sites appear to be in their original sedimentary contexts.

Conclusion

The ongoing discussion on the lithic assemblages from the Kharla river valley may be broadly considered to be belonging to the microlithic cultural phase in view of the general presence of micro-flakes, typical microlithic forms, viz. blade, bladelet and cores in various types such as flake core, blade-bladelet core, and different types of backed tools in various proportions. Chert is the principal raw material followed by quartz and chalcedony used by the prehistoric group for tool production. The raw material selection and techno-typological analysis of the assemblages have provided clues to understanding the behavioural pattern of microlithic using community.

Thus, the Kharla basin can be categorized as a favourable geo-environmental nitch/pocket for early man's activity almost throughout the late Pleistocene and, therefore, provide additional knowledge on the cultural ecology of microlithic sites which are prolific in the middle Mahanadi basin of Odisha. This area has a high potential to refined this hypothesis by using modern methods of luminescence dating, stable isotopes of pedogenic carbonate and ferruginous nodules and detailed excavations of promising microlithic sites.

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