Late Middle Palaeolithic Red Ochre Use at Torajunga, an Open-Air Site in the Bargarh Upland, Odisha, India: Evidence for Long Distance Contact and Advanced Cognition

Pradeep K. Behera and Neena Thakur

Post Graduate Department of History, Sambalpur University, Jyoti Vihar, Burla - 768 019, Odisha, India (Email: pkbehra@rediff.com)

Received: 16 July 2018; Revised: 08 September 2018; Accepted: 01 October 2018

Abstract: Red ochre or hydrated iron oxide is one of the most common mineral pigments, used by Homo sapiens since the Middle Palaeolithic/Middle Stone Age times or even earlier. Use of red ochre is often considered as important proxy of modern human behaviour, symbolism and increased cognitive and communicative abilities in the prehistoric material records. Our recent investigation at the open-air site of Torajunga in the Bargarh Upland of Odisha, brought to light utilized block/lumps of red ochre with distinct marks of rubbing/grinding on their surface associated with a late Middle Palaeolithic sedimentary context. The lithic assemblage contained a few backed tools, including lunates and points. The nearest source of red ochre lies more than sixty kilometers further north of the site in the Permian-Triassic Kamthi Formation. The present evidence suggests that the late Pleistocene microlith using communities of this area imported red ochre from distant sources, while they exploited locally available chert and other raw material for manufacturing lithic tools. Use of red ochre is frequently attributed to ritualistic and/or non-utilitarian behaviour of the early hominins. This paper considers to discuss the temporal and contextual significance of the occurrence of red ochre in the late Middle Palaeolithic assemblage at Torajunga.

Keywords: Torajunga, Lithic Assemblages, Late Pleistocene, Red Ochre, Late Middle Palaeolithic, Microliths, Modern Human

Introduction

A great deal of discussion has recently been focussed on the nature of human behavioural evolution in the Late Pleistocene period across the world. Very often use of red ochre/iron oxide is considered as one of the indicators of development of early symbolic behaviour among the modern hominins (Chase and Dibble 1987: 263-296, Mellars 1989: 349-385, Chase 1994: 627-629, Klein 2000: 17-36, McBrearty and Brooks 2000: 453-563, D’Errico et al 2005: 3-24, James and Petraglia 2005: 3-27, Marean and Assefa 2005: 93-129, etc.). Red ochre is generally haematite (α-Fe2O3) with a red to red-brown streak and a hexagonal crystal system (Schwertmann and Cornell 1991). Since at
least the early Middle Palaeolithic/Middle Stone Age times these minerals have been used by hominins for various purposes and have been documented at a number of archaeological sites in varied spatio-temporal and cultural contexts, even though their specific function is largely unknown, except in the case of rock art sites. Several Middle Stone Age sites in Africa provided evidence for use of red ochre dating back to about more than 200-300 thousand years onwards (Evans 1994: 63-73, Watts I 2009: 62-92, Watts I 2010: 392-411, Henshilwood and Dubreuil 2009: 41-61, Henshilwood et al 2011: 219-222, Barham 2002: 181-190, McBrearty and Brooks 2000: 453-563, Mackay and Welz 2008: 1521-1532, Gibson et al 2004: 1-11, Lombard 2006: 57-62, Lombard 2007: 406-419, Lombard 2009: 4-12, etc.). In Europe recent studies have shown more than 40 Middle Palaeolithic sites associated with possible red ochre/manganese oxide pigment use between from at least 60-40 thousand years onwards (D’Errico et al 2010: 3099-3110, Soressi et al 2008: 95-132, Tr bska et al 2010: 205-217, etc.). Significantly, the Maastricht-Belvedere site in The Netherlands and the Benzu rock shelter in Spain (Roebroeks et al 2012: 1889-1894) have produced evidence for use of this mineral by the early Neanderthals dating back to about 200–250 thousand years ago. Ethnographic records reveal that iron oxides/red ochre can be used for a variety of purposes, namely, food preservation, preparation of hides, body decoration, mortuary/ritualistic practices, adhesive/glue for lithic hafting, insect repellent and also as medicine (Wadley et al 2004: 661-675, Wadley et al 2009: 9590-9594, Watts 2009: 62-92, Watts 2010: 392-411, Roper 1991: 289-301, Velo 1984: 674, Peile 1979: 214-217, Basedow 1925, etc.).

In South Asia microlithic industries are fairly widespread in Holocene contexts and have been reported from a wide variety of habitats (Misra 2001: 491-531, Misra and Pal 2002, Sosnowska 2011: 95-139, etc.). However, recent studies at Mehtakheri in the Nimar region of Madhya Pradesh (Mishra et al 2013: 1-14), Jwalapuram in the Jurreru river valley of Andhra Pradesh (Clarkson et al 2009: 326-348) and at Mahadeebbera and Kana in Purulia district of West Bengal (Basak et al 2014: 1167-1171) have pushed back the antiquity of microlithic tradition in India to the late Pleistocene period. By about the same time period (c. 38 thousand years ago) microlithic technologies also appeared in the tropical rain forest of Sri Lanka associated with earliest Homo sapiens fossils, osseous technologies, along with evidence for symbolic behaviour and long-distance exchange (Deraniyagala 2007: 1-96, Perera 2010, Perera et al 2011:254-269, Roberts et al 2015:69-112, Clarkson et al 2018: 37-61, etc.).

The occurrence of microlithic technologies at many different places clearly suggests its versatility and significance, which had an earlier beginning in the sub-continent, hitherto not expected. However, evidence for red ochre/iron oxide use at open air sites in the Late Pleistocene context has not yet been reported from none of the microlith-bearing sites in South Asia. At Jwalapuram, Locality-9 rock shelter, striated red ochre crayon with several grinding facets have been reported from N3, Level 34, Stratum C/D interface, belonging to the late Pleistocene sedimentary context dating back to about 34–33 BP (Clarkson et al 2009). Use of red ochre in the late Pleistocene has also been widely reported from Sri Lanka but, in most of the cases those have been
documented from closed cave and/or rock shelter sites, leaving large gaps in our understanding pertaining to the use of this mineral in the open-air site contexts.

Recent prehistoric investigations at the site of Torajunga in the Bargarh Upland of Odisha has brought to light, for the first time, evidence for systematic use of red ochre from the Late Pleistocene microlith context overlying the typical Middle Palaeolithic deposit, characterised by the occurrence of small to medium-sized handaxes and cleavers (50-100mm), besides blade and Levallois cores, tanged points, discoids, etc. This paper aims to summarize our work at Torajunga with particular emphasis on the early use of red ochre.

Figure 1: Massive Rock Shelter Formations in the Debrigarh-Lohara Massif

The Area and its Environmental Contexts
Spreading over 2690 km² surface area, major part of the Bargarh upland forms of pedimented erosional surface with the general relief varying between 140m and 250m above mean sea level. It is bounded on the west and north-west by eastern massif of Sarangarh and Raipur districts of Chhattisgarh, while on the north, east, south-east, and south by Debrigarh massif of Bargarh district, and uplands of Sambalpur, Subarnapur and Balangir districts of Odisha, respectively. The area lying towards north and north-west of the upland mainly comprises of meta-sedimentary rocks, viz. coarse, earthy, felspathic, and other varieties of quartzite, conglomerate, shale and calcareous shale, belonging to the Chhattisgarh Supergroup (Das et al 1992:). Several massive rock shelters are present in the highly jointed quartzite formations (Figure 1) of the Debrigarh-Lohara massif, a few of which contain rock art.
The rock art consists of human palm forms, patterns, animals and rarely human forms (Figure 2), executed in different shades of red ochre, viz., reddish-orange and dark purple colours (ignca.nic.in/asi_reports/orbargarh008.pdf). The floor of these shelters is strewn with microliths (both geometric and non-geometric) showing different stages of production. The constituent rocks of the upland are a variety of granitic rocks varying in composition from tonalite, medium-grained granodiorite, porphyritic granodiorite, alkaline-granite, etc., referred to as ‘Sambalpur Granite’ by GSI (1997). However the whole granitic unit is referred to as ‘West Orissa Granitic Complex’ by Naik (1995). Older meta-sedimentary rocks occur as enclaves within the granitic rocks, which are intruded at places by dolerite dykes and quartz reef/veins. The area has undergone intense tectonic deformations, as evident by the presence of numerous faults and joints in the granitic rocks. Many of the fault zones are silicified and some are filled with quartz veins. The silicified rocks are massive, fine-grained and are of various colours, from dirty white, yellowish to brown. Thin to thick quaternary deposits overlie the eroded and weathered granitic basement with a prominent unconformity. The Quaternary deposits have undergone large-scale erosion at many places, particularly in the western part of the upland, which is evident from the presence of numerous alluvium filled palaeo-channels that cut across the deposits.

Physiographically, the area is represented by three natural divisions such as, a) the pedeplain with numerous seasonal streams, which form the tributaries of the river Jira, b) the continuous hill range of Saraidamak on the west and north-west which merges...
into the Debrigarh-Lohara massif in the north, and c) isolated inselberg varying in height from 255m to 312m within the upland. The granitic terrain is weathered to varying depths at different places leaving behind isolated patches of unweathered rocks. The massive weathering has given rise to the formation of the extensive pedeplain in the region. The upland is not a leveled tract, but an expanse of undulating country sloping down from the Saraidamak-Debrigarh-Lohara massif in the north-west and north to the Mahanadi valley in the east and south-east. The overall drainage pattern of the area is dendritic in nature with high drainage density, which is characteristic of hard rock terrain with low relief. The Bargarh upland is drained by the river Jira (a fourth order stream) and a network of first, second and third order streams. It originates from near the eastern border of Sarangarh district of Chhattisgarh, and after traversing for about 80 km in the district Bargarh in a south-easterly direction it joins the right bank of the Mahanadi at Brahmani-Turum (21°05'19.87" N and 83°50'23.24" E). Except the Jira most of the streams of this area are ephemeral and retain water during the monsoon and post-monsoon seasons, from July to March.

The natural vegetation, which stands in a variety of landforms, ranging from low lying river valleys to a chain of hills, is sparsely distributed in the area, being mostly confined to the high lands lying towards north, north-west and west of Bargarh upland. The forest of this area is represented by tropical dry-deciduous woodland with predominance of bamboo and its associates. Since the beginning of the last century
intensive human interference has caused large-scale depletion in vegetation cover in the area, which led to massive erosion of the top soil of the pedeplain leaving behind patches of scrubs and erosional surfaces. The climate of this area is characterised by long warm summers and cold winters, with mean annual rainfall of about 1500 mm (Senapati and Mahanty 1971). Despite continued human interference the area still boast a large variety wildlife including small and large game animals, confined mostly to the Saraidamak-Debrigarh-Lohara massif, besides avian and aquatic species.

The Site: Stratigraphy and Lithic Assemblages

The open air site of Torajunga (Lat. 21°29’ 22.70”N; Long. 83°32´ 23.11” E), is located about five kilometers south of the Debrigarh massif and situated some 500 meters west of the right bank of the Danta stream, a third order perennial tributary of the river Jira (Figure 3). Our earlier intensive exploration in the area brought to light a large number of open air sites associated with Late Acheulian-Middle Palaeolithic-Microlithic assemblages in primary/semi-primary sedimentary contexts (Behera et al 1996: 15-26, Behera et al 2015: 1-13, Thakur 2016, Deep 2016). Even some of the sites are found to be associated with large-flake blank (>100mm) production and giant-core technology. Most of these sites are multi-period sites and scatters of microlithic/flake-blade assemblages of cryptocrystalline stones are found at different levels on the exposed erosional surface. In order to understand the stratigraphic contexts of the Late Acheulian-Middle Palaeolithic and microlithic surface assemblages, the site of Torajunga was selected for a detailed probing and documentation.

The site of Torajunga is a multi-period Palaeolithic settlement spreads over an area of about 400m x 300m and oriented roughly northwest-southeast (Figure 4). On the central part of the site an elongated dyke of silicified rock is exposed to a length of
about 150 meters. While the eastern part is well preserved, the western part is badly eroded and deflated through rain gullies formed due to absence of vegetation cover (Figure 5). The site is presently surrounded by agricultural fields. Earlier, exploration conducted at the site revealed dense scatters of lithic artefacts of the Late Acheulian/Middle Palaeolithic and microlithic traditions on the exposed surface lying on the western part of the site (Figure 6 and 7).

Figure 5: The Western Part of the Site Showing Massive Erosional Surface

Figure 6: An Elongated Medium-sized Handaxe of Quartzite Found on the Eroded Surface of the Site with Angular Clasts
As stated earlier, with a view to determining the stratigraphic context of the exposed artefacts belonging to the Late Acheulian-Middle Palaeolithic-Microlithic traditions, exploratory section scraping and trial excavations were carried out near the eroded surface of the site between 2015 and 2017. In 2015 an exposed section located on the western part was scraped, which revealed five distinct sedimentary units from top to bottom. The upper level of the second unit consisted of slightly compact, reddish-brown, sandy-silty-clay mixed with loose ferricrete pellets, yielded a few microliths in fresh condition, while the lower forth unit contained a fresh-patinated triangular-shaped handaxe of medium size. An OSL date of 12.8±2.8 (TBO-1) was obtained from the upper level of second unit. In 2016 another small trench was made near the scrapped section, which brought to light eight sedimentary units, of which the lower level of fourth unit yielded two moderately patinated and ferruginous-stained flakes of black chert in fresh condition, while the fifth sedimentary unit of fine rubble in lateritic matrix yielded three flakes of fine-grained quartzite. During 2017 season two more exploratory trenches were made in the western part of the site near the eroded surface to confirm the occurrence of microliths in early sedimentary context, as detected in Trench-I. True to our expectations, microliths were observed in the lower sedimentary levels (Litho unit-3 in Trench-II and Litho unit-4 in Trench-III), overlying the fine rubble deposit in lateritic matrix (Figure 8). Depth-wise frequency distribution of microlithic assemblages from Trench-II and III is shown in figures 9 and 10. The figures
show predominance of flakes and bladelets in both the trenches. The available cores engaged in the production of blanks are dominated by micro-blade cores and are mostly single-platform unidirectional types. The mean length, width and thickness of the microlithic artefacts from both the trenches are given in the Table 1. The mean values show typical microlithic size-range, (i.e., below <50mm). Retouched tools from these trenches include, core-end scraper, burins, notches, backed points, and lunates/crescents. The raw materials employed for manufacturing lithic artefacts at Torajunga, are dominated by quartz (including quartz crystals) and chert of different colours. These presumably were extracted from several primary dykes/veins sources. However, raw materials like chalcedony and agate, though sparsely used in tool production at the site, may have come about 30 kilometers away, possibly from the bed-load of the river Mahanadi. The detailed techno-typological and other attendant features of the microlithic assemblages will be discussed elsewhere.

Figure 8: Showing Excavated Sections in Section Scraping, Trench-I, II and III at Torajunga
### Table 1: Mean Values of Microlithic Artefacts from the Trenches

<table>
<thead>
<tr>
<th>Artefact Category</th>
<th>Mean Value</th>
<th>Length</th>
<th>Breadth</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td></td>
<td>30.97</td>
<td>24.77</td>
<td>15.39</td>
</tr>
<tr>
<td>Flake</td>
<td></td>
<td>20.72</td>
<td>18.99</td>
<td>6.49</td>
</tr>
<tr>
<td>Blade</td>
<td></td>
<td>36.90</td>
<td>19.20</td>
<td>7.96</td>
</tr>
<tr>
<td>Bladelet</td>
<td></td>
<td>17.28</td>
<td>8.37</td>
<td>4.10</td>
</tr>
</tbody>
</table>

### Table 2: Preliminary Details of the Unused and Used Haematite/Red Ochre Pieces in Trench-III at Torajunga

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Sp. No./Depth (in cm)</th>
<th>Length (in mm)</th>
<th>Width (in mm)</th>
<th>Thickness (in mm)</th>
<th>Weight (in gm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>III-105/100</td>
<td>35.61</td>
<td>36.67</td>
<td>21.56</td>
<td>47</td>
<td>Unused, tabular, slightly rolled, pebble of haematite.</td>
</tr>
<tr>
<td>2</td>
<td>III-122/100</td>
<td>29.28</td>
<td>25.25</td>
<td>12.06</td>
<td>17</td>
<td>Unused, broken half, rolled pebble of haematite.</td>
</tr>
<tr>
<td>3</td>
<td>III-H-1/110</td>
<td>100.88</td>
<td>65.01</td>
<td>29.13</td>
<td>188</td>
<td>The dorsal face contains grinding facets; ventral face partly broken during the contemporary period, probably during use; slightly patinated.</td>
</tr>
<tr>
<td>4</td>
<td>III-H-2/110</td>
<td>86.45</td>
<td>74.92</td>
<td>38.46</td>
<td>223</td>
<td>Both dorsal and ventral faces contain striated grinding marks; no sign of breakage on the faces; slightly patinated.</td>
</tr>
<tr>
<td>5</td>
<td>III-H-3/103</td>
<td>168.41</td>
<td>141.79</td>
<td>94.09</td>
<td>3330</td>
<td>Heavy, roughly rectangular shaped; probably quarried from the source area; dorsal face shows elongated-shallow depression at the center, caused due to grinding; ventral face was not used; slightly patinated; most likely it was used as quern/milling stone.</td>
</tr>
</tbody>
</table>
Figure 9: Depth-wise (in cm) Frequency Distribution of Microlithic Artefact Types in Trench - II

Figure 10: Depth-wise Frequency Distribution of Microlithic Artefact Types in Trench - III

Sedimentary Context of Red Ochre at Torajunga
During the trial excavation of Trench-III at Torajunga in 2017, at a depth of 103cm (Lower level of litho unit-4), overlying the fine rubble deposit in lateritic matrix, two unused nodules of haematite/red ochre and three used (Figure 11), one block with shallow-elongated striated grinding marks and two thick-ovaloid lumps of red ochre pieces with striated ground facets were recovered along with microliths (Table 2). All the five pieces give distinct deep purple streak on hard rock. The block was most likely
used as quern/milling stone for producing red ochre powder. Interestingly, the two used ovaloid-shaped red ochre pieces were found buried just under the quern, seems intentionally done by the user. Evidence for red ochre could not be documented either from the section scrapping or from Trench-I and II.

Figure 11: Dorsal and Ventral Views of Unused (1 and 2) and Used (3, 4 and 5) Haematite/Red Ochre Pieces from Trench - III at Torajunga
Provenance of Red Ochre

Although samples of red ochre retrieved from the excavated contexts are submitted to different laboratories for chemical characterization through X-ray diffraction, X-ray fluorescence and electron probe microanalysis studies to determine the possible source(s) of red ochre in the region from where the hominins procured these minerals for use at Torajunga, a study of geological maps of Bargarh and its adjoining districts, viz., Jharsuguda, Sundargarh and Sambalpur of Odisha, besides several seasons exploration in these regions suggest that the nearest source of red ochre lies in the Jharsuguda-Sundargarh area where there is a huge concentration of rock art sites with ochre paintings belonging to the Prehistoric-Protohistoric-Early Historic periods (Behera 1992-93: 1-18, 2001: 1-11, Pradhan 2001, etc.). Deposits of haematite/red ochre are found inter-bedded with ferruginous sand stone of Kamthi facies of Gondwana Super Group belonging to the Permian-Triassic Age (GSI 2002) and lying in the south-western and western part of Sundargarh and Jharsuguda districts, respectively (Figure 12). Though formations of quartzite and chert of different colours and grades are abundantly found in the Debrigarh-Lohara massif in the Bargarh upland, the nearest source of haematite/red ochre lies across the massif in the south-western and western parts of Sundargarh and Jharsuguda districts, respectively. It seems likely that the microlith using hominins at Torajunga were procuring lumps of red ochre from these areas, either through regional exchange or direct access.
Concluding Remarks

The foregoing accounts of recent investigations at Torajunga in the Bargarh upland of Odisha, provide new insights on the late Pleistocene modern human behaviour in the region. The microlithic assemblages recovered from Trench-II and III, though limited in quantity, clearly suggest extensive exploitation of locally available lithic sources like chert and quartz in primary/secondary contexts, besides procurement of very fine quality of lithic raw materials like chalcedony and agate from distant sources by way of regional exchange and/or direct access, suggesting increased foraging range. Significantly, we documented a clear departure from the earlier practice of using local lithic resources like quartzite and quartz during the Middle Palaeolithic/Late Acheulian stage to preference for fine-grained siliceous materials like chert, quartz, crystal, chalcedony and agate in the later stage of the Middle Palaeolithic period. In this context it may be pointed out that, though fine-grained raw material like silicified stone in the form of dyke occurs on the site, there is no evidence for its exploitation in stone tool making. Mallol (1999) has rightly pointed out that palaeoeconomic strategies can be detected in the archaeological record by examining spatio-temporal relationships between lithic raw material selection and technological traditions. Presence of backed points and lunates/crescents in the microlithic assemblage at Torajunga further attests to the adoption of new types tools and technology suggesting thereby behavioural modernity and advanced cognition during the later stage of the Middle Palaeolithic period (Ambrose 2002: 9-29, Foley and Lahr 1997: 3-36, 2003: 109-122, etc.).

As stated earlier, though the use of red ochre has been reported from a large number of excavated rock art sites from rockshelter and/or cave contexts in South Asia, we do not have yet evidence for its use at open air sites in late Pleistocene microlithic context. The site of Torajunga, for the first time, provides unambiguous evidence for systematic use of red ochre, procured from distant sources, in an apparent late Pleistocene sedimentary context. Use of red ochre is considered as one of the major archaeological signatures of modern human behaviour (McBrearty and Brooks 2000: 492) and can be attributed specifically to hominin cognitive and cultural capabilities. Presence of grinding block of red ochre with a shallow striated depression on the centre and two ovaloid pieces of red ochre with grinding facets (Figure 11:3-5) suggests systematic production of ochre powder at Torajunga.

As regards to the use of red ochre, their use in rock shelters and caves may be attributed largely to production of pictographs, while red ochre in open-air sites context, as at Torajunga, might indicate a use in hafting microliths for manufacture of composite tools, body decoration, hide processing, etc. At several late Middle Stone Age sites in northeastern Africa, tools with traces of ochre have been reported and interpreted as remains of adhesive used for hafting (Rots et al 2011: 637–64). While there is a wide range of potential applications of red ochre in ethnographic records, no such specific purpose can be attributed to the used red ochre at Torajunga in view of the limited nature of the present investigation and scientific studies. However, the
present evidence clearly suggests that the late Pleistocene microlith using communities of this area procured red ochre raw material from distant sources, while they exploited locally available chert and other raw material sources for manufacturing lithic tools. Use of red ochre is frequently attributed to ritualistic and/or utilitarian behaviour of the modern hominins. Future investigation from multidisciplinary perspectives will definitely shed more light on the symbolic as well as cognitive abilities of late Middle Palaeolithic hominins of the Bargarh upland of Odisha.

Acknowledgements
The authors gratefully acknowledge the financial support from the Sambalpur University and to the Archaeological Survey of India for providing license that allowed conducting fieldwork at Torajunga in different field seasons. We would like to extend hearty thanks to research scholars and Post Graduate students of the P.G. Department of History, Sambalpur University for their unflinching help and cooperation during the fieldwork without which this paper could never have been completed.

References


Gibson, N.E., L. Wadley and B.S. Williamson 2004. Microscopic Residues as Evidence of Hafting on Backed Tools from the 60 000 to 68 000 Year-Old Howiesons Poort Layers of Rose Cottage Cave, South Africa. Southern African Humanities, 16: 1–11


