A PRELIMINARY SURVEY OF FOSSIL-WOOD TOOLS IN THE HAORA VALLEY, TRIPURA

Dissertation submitted to Jawaharlal Nehru University in partial fulfillment of the requirements for the award of the degree of

MASTER OF PHILOSOPHY

BISWAJIT DEB BARMA

Centre for Historical Studies
School of Social Sciences
Jawaharlal Nehru University
New Delhi- 110067
India

2012

Centre for Historical Studies
Jawaharlal Nehru University
New Delhi-110067, India

Date: 26.07.2012

DECLARATION

I declare that the dissertation **"A preliminary survey of Fossil-wood Tools in the Haora Valley, Tripura"** submitted by me in partial fulfillment of the requirements for the award of the degree of **Master of Philosophy** of Jawaharlal Nehru University is my own work. The dissertation has not been submitted for any other degree of this University or any other University.

BISWAJIT DEB BARMA

CERTIFICATE

We recommend that this dissertation be placed before the examiners for evaluation.

Dr. Supriya Varma
Supervisor
Centre for Historical Studies
School of Social Sciences
Jawaharlal Nehru University
New Delhi-110067

Prof. Bhagwan Josh
(Chairperson, CHS)
CHAIRPERSON

CHS Office Phone : (011) 26704456, 26704457
E-mail : chsjnu@gmail.com

ACKNOWLEDGEMENT

I owe a special debt of gratitude to my supervisor Dr. Supriya Varma. Without her constant help and guidance this dissertation could not have been written. A word of sincere thanks goes to her. I remain indebted to her for her constant encouragement showered upon me, even when I was down trodden with personal problems. I acknowledge her for being immensely helpful in providing me support and getting help from people whom I could never ever imagine to have had from.

I would like to thank Dr. Parth R. Chauhan as without his help I wouldn't have learnt anything about the details of how to document tools. I remain grateful for the knowledge he has shared about the basics of stone tools. For his support and help I convey my sincere thanks. I would also like to state he has been the co-supervisor for my dissertation.

Without the help Dr. Jaya Menon I wouldn't have been able to conduct my survey. I remain indebted to her and my supervisor for allowing me to take part in various field excavations carried out by them. I am also grateful to her for providing me help in my research work.

I would like to thank:

Prof. Paddayya, Deccan College Post-Graduate and Research Institute, Pune, for taking time off to patiently look at the fossil-wood tools that I have collected. His comments on the fossil-wood tools remain a valuable asset for my work.

Prof. Vasant Shinde, Deccan College Post-Graduate and Research Institute, Pune, for providing me help in learning how to draw stone tools.

Prof. Shiela Mishra, Deccan College Post-Graduate and Research Institute, Pune, for spending time in studying the fossil-wood tools and her comments also remain an asset to my work.

Dr. Shrikant Pradhan and Mr. Devadatta D. Phule, Draftsman, Deccan College Post-Graduate and Research Institute, Pune, for teaching me the basics of drawing stone tools.

Prof. Kathleen D. Morrison, University of Chicago, and Prof. Carla Sinopoli, University of Michigan, for allowing me to participate in Kadebakele excavation (February 2009), Karnataka.

Dr. Abu Talib, Associate Professor, Geology Department, AMU, Alligarh, for identifying that the tools are made of fossil-wood.

Dr. Salauddin, Assistant Archaeologist, AMU, Aligarh, for his valuable inputs and his time, looking at the fossil-wood tools.

I owe sincere thanks to University Grant Commission for awarding me scholarship which kept me away from financial worries during my M.Phil Dissertation.

I am also grateful to the staff members of the D.S.A. Library, Central Library of J.N.U., Delhi, Deccan College Post-Graduate and Research Institute, Pune, K.K. Handique Library, Guwahati for allowing me to have access to relevant materials.

I acknowledge Ravindra Deb Barma and Puniram Deb Barma, who helped me immensely during the field survey.

My sincere thanks to my friends and colleagues for they have been a constant support and motivated me throughout the entire period of writing the dissertation. I owe thanks to Preetee Sharma, Ritika Sahu, Deepak K. Nair, Aadil Zubair, Mudit Trivedi, for their moral and academic support throughout, and Bauna, Wangjin, Meren, Graham, Keyho, Tovika, and others for helping me out in one way or the other. My sister Jesmika and my room-mate for their constant support and encouragement, which have helped me, remain stress free. And above all I thank my parents for their constant support and encouragement in all the spheres of my life.

Finally I would also like to add the issue of my laptop hard-disk which crashed soon after my return from the field survey. I lost a great deal of the data and information that was not retrievable at any cost. It therefore hampered the progress of my dissertation work. I would also like to mention that the plasticine I used as an aid for photography of the fossil-wood tools is still visible in some of the photographs, which would be rectified later before I publish my work. While I was able to rectify most of the photographs, due to time constraints some remain unrectified as can be seen in chapter 2.

Any error in this dissertation is solely mine.

BISWAJIT DEB BARMA

J.N.U., NEW DELHI

26.07.2012

CONTENTS

List of Tables

List of Figures

Abbreviations

AD	:	Anno Domini
BC	:	Before Christ
CL	:	Clast
COB	:	Cobble
CR	:	Core
FL	:	Flake
KYA	:	Thousand Years Ago
MYA	:	Million Years Ago

CHAPTER 1

INTRODUCTION

A preliminary survey was carried out by me to study fossil-wood tools in Tripura in 2011, sensing a great potential in terms of doing prehistoric research in Tripura. The credit goes to geologist N.R. Ramesh, who was the first to bring to light about the presence of prehistoric cultural remains in Tripura. Thus, in this dissertation I have made an attempt to document the fossil-wood tools collected during the survey with a view that a great potential lie in the area of prehistoric research work in Tripura. In this chapter an attempt will be made to familiarize about the prehistory of India by taking up various case studies of prehistoric research of India. There will be also a discussion on the prehistoric research work of Northeast India.

1.1. Importance of South Asia for Prehistoric Research

According to Chauhan (2006: 5), "the Indian subcontinent was well-known for its prominent monsoon regime, which has been in existence since Miocene times and, no doubt, must have had major implications on the patterns of human evolution and behavior during the Pleistocene. The physiographic configuration of India causes the behavior of both the Southwest and Northeast monsoons, during summer and winter respectively. The geographical significance of the Indian subcontinent in understanding Old World hominid dispersal patterns cannot be overstated, particularly since it has received less palaeoanthropological attention than most regions in the Old World. It lies directly between Africa to the west and Southeast Asia to the east from where the oldest *Homo erectus* specimens have been reported. Another significant fact is that it straddles the *Movius line* and represents the easternmost domain of *rich* Acheulian localities. Finally, this immensely rich source of prehistoric archaeological evidence plays a central role in understanding the evolution of the genus *Homo* in Asia, knowledge still evading Old World palaeoanthropology." Further, he emphasizes that the Indian subcontinent which comprises of Pakistan, India, Nepal, Sri Lanka, Bangladesh and Bhutan or largely known as South Asia has rich behavioural record of homonin occupation since at least the early Middle Pleistocene.

Misra (2001: 493) emphasized that the first effective colonization of the subcontinent was accomplished by the makers of the Acheulian culture, named after the French site of St. Acheul. The remains of this culture have been found extensively from the Siwalik Hills in the north to areas near Chennai in the South. The areas devoid of the Acheulian occupation were the Western

Ghats and the coastal region running parallel to them, Northeast India and the Ganga plains. Heavy rainfall and dense vegetation in the Western Ghats and Northeast India probably inhibited early humans from colonizing these regions.

1.2. Stone Age and the Divisions

According to Sankalia (1982: 2-3), "The Stone Age in India was sub-divided into Early, Middle, and Late, and a separate category for the Neolithic." He further explains that, "Firstly, the Early Stone Age covered the conventional Lower Palaeolithic types and includes in the Indian context, the main peninsular Chelles-Acheul complex of handaxes and cleavers and the extra peninsular Sohanian and Banganga assemblages. Secondly, the Middle Stone Age covered the widely distributed group of industries consisting of scrapers and blade-flakes, from Nevasa and Maheshwar, Waingana etc. And third, the Late Stone Age covered the range of microlithic industries such as those of the Teris, Singrauli, Birbhanpur, Langhnaj etc. Again he also emphasizes that, in between Palaeolithic and Neolithic came another period, suggesting both a stratigraphic and cultural stage, called Mesolithic. Finally, he opines that in Western Europe and Africa, the Palaeolithic was again sub-divided into Lower Palaeolithic, Middle Palaeolithic and Upper Palaeolithic, which was later, applied in India as well."

1.2A. Studies on Lower Palaeolithic

Since the initial investigations in the late nineteeth century in southern India a large amount of palaeoanthropological data has been accumulated in the form of lithic assemblages, invertebrate and vertebrate fossils, and paleoenvironmental signatures. In addition to surveys and excavations, archaeologists have also employed other multidisciplinary approaches to interpret the prehistoric record: multivariate metrical analyses of lithic assemblages, site-formation processes, hunter-gatherer ethnoarchaeology, and taphonomic observations (Chauhan 2009: 121).

From the detailed work of Chauhan (*ibid*: 123) on the Palaeolithic period we get a very clear understanding of the Palaeolithic tools in the Indian subcontinent. He points out that the South Asian Lower Palaeolithic has been traditionally divided into core-and-flake and Acheulian lithic industries that occur independently as well as in shared geographic and geomorphologic contexts. He further points out that most of the Indian localities have been directly dated through the Uranium-Thorium (^{234}Th-^{230}U) and thermoluminescense (TL) methods and include a predominance of Acheulian sites. The dates for other occurrences such as Riwat, Dina, Jalapir, Pabbi Hills, Morgaon, and Satpati Hill have been estimated using paleomagnetism and geostratigraphic correlations. At Teggihalli, Chirki-Nevasa, and Yedurwadi, the ^{234}Th-^{230}U ages for the Acheulian extended beyond 350 Ka (or 390 at Didwana), the maximum limit of the dating methods, an assessment partly supported by lithic typology.

Further Chauhan (*ibid*: 125) has pointed out that with the exception of Northeast India and parts of Konkan Maharashtra, western Kerala, south of the Cauvery River in Tamil Nadu, and Sri Lanka, Acheulian assemblages were found throughout the Indian subcontinent. The South Asian Acheulian was generally divided into Early or Late developmental phases, based primarily on typo-technological features, assemblage compositions, comparative stratigraphy, and associated metrical analyses.

Firstly, the Early Acheulian phase is typologically and chrono-stratigraphically represented by several occurrences, including in Nepal, the Thar Desert, and parts of Maharashtra, Karnataka, and Madhya Pradesh. From the available geochronological information, comparative geology, and typology, most of these assemblages appear to be older than ca. 400 Ka. He also reiterates that the oldest securely-dated Acheulian evidence comes from the find-spots at Dina and Jalapur in northern Pakistan, the material was dated by Rendell and Dennell (1985) to 700-400 Ka. In the Hunsgi-Baichbal Valleys (Karnataka), systematic surveys and excavations were conducted since the mid 1960s by K. Paddayya, revealing numerous occurrences belonging to all Palaeolithic phases. Probably the most important Early Acheulian site from the Hunsgi complex was Isampur, representing the first known occurrence of in situ artifacts in a quarry context in India. The region of Tamil Nadu, where stone tools were first reported in India, has been studied for over a century by various researchers. The most significant site in the region was Attirampakkam, located in the Kortallayar valley and investigated intermittently for several decades.

Secondly, the Late Acheulian sites in South Asia occur in greater numbers. The distinctive features were like prepared core and Levallois technology which were in the form of discoidal cores and the Victoria West technique, as well as the initial production of large blades at sites such as Bhimbetka. The Rohri Hills in southern Pakistan have few occurrences produced on chert, and assemblages which came from numerous localities comprising of hundreds of artifacts. Most of the South Asian Late Acheulian evidence, however, was located in central and peninsular India, including parts of Rajasthan, Gujarat, Maharashtra, Madhya Pradesh, Bihar, Karnataka, Andhra Pradesh, and Tamil Nadu. The Kaladgi Basin in Karnataka preserves rich evidence of transitional assemblages ranging from the Late Acheulian to the early Middle Palaeolithic. Some of the best-known Late Acheulian assemblages in north-central India came from Bhimbetka, where hundreds of rock-shelters were situated in a hilly and forested area in Madhya Pradesh.

In India Hunsgi valley is the only area known thus far where limestone was employed for making tools by the Stone Age artificer. The variety used by the Acheulian inhabitants of this area was a silicified one and was light to dark grey or cream coloured. It was obtained in the form of handy nodules or blocks from the kankar conglomerates occurring at several places on the valley floor. However the use of other rocks like sandstone, shale, granite, chert, and dolerite was very much present (Paddayya 1982: 40). An attempt was made by Paddayya and Jhaldiyal (2001: 29) in Hunsgi and Baichbal valleys to demonstrate that surface sites can also provide the much-desired chronostratigraphic control or palaeoenvironmental data inspite of the notion that Stone Age sites capable of yielding reliable information about ancient human behavior are necessarily those that occur underneath thick sedimentary cover.

Paddayya and Jhaldiyal (2001: 30) emphasized that, "The Hunsgi and Baichbal valleys, located in the Gulbarga District of Karnataka, constituted an erosional basin of Tertiary age. The sites covered an area of 500 sq. km and are surrounded by low tablelands of shale and limestone which are spread over an additional area of 500 sq. km. Prolonged studies in that area since the 1970s have revealed a rich Stone Age record ranging from the Lower Palaeolithic to the Mesolithic. One of the unique features of the Acheulian culture of these valleys was the use of limestone as the principal raw material. Nearly 200 small and large sites in a variety of depositional contexts on the valley floor have been located during field studies. At most of the sites the cultural material occurred on or very close to surface. Notwithstanding their open-to-sky condition, the cultural material was preserved at a majority of the sites in the form of discrete clusters of artifacts. Hence these sites have been treated as primary occurrences, well suited for reconstructing Acheulian behavioural patterns." Further, Paddayya and Jhaldiyal pointed to the fact that "queries were raised in Europe and North America to the credibility of those sites regarding the sedimentary context of the sites, which seemed obvious. To which, they carried out detailed examination of the sedimentary and topographic contexts of the sites. The site contexts were than studied in relation to topographic settings, sedimentary matrix, local lithology, drainage features, and contemporary land-use conditions. The topographic settings of the Acheulian sites included the foothill/pediment zone of limestone uplands and channel banks and slopes of the interfluves of the valley floor. The cultural record there occurred on hard substrata (weathered and unweathered bedrock and calcretes), on soft sediments (travertine and clayey silt deposit), on the surface of colluvial and fluvial gravels, and, in some cases, within these deposits. These studies also clearly showed that there existed a large variability in the preservational contexts of the sites. These were classified under four categories: a) secondary fluvial sites; b) colluvial sites; c) sites modified by surface runoff; and d) *in situ* or primary sites."

Similar studies were done by Paddayya and Jhaldiyal (*ibid*: 33) at "Mudnur VIII, Kudalgi II, Isampur II, Yediyapur II, and other localities. These surface studies helped in identifying multipurpose sites as well as sites where specific activities like tool caching, food-processing and tool manufacture had taken place. The fresh condition of artifacts and presence of small-size debitage also showed that the assemblages at these sites lay until recently under a sedimentary cover. As part of the above-mentioned work dealing with formation processes of the Acheulian sites of the region, one of the localities at Isampur (Locality II) was taken up for detailed studies including excavation. The site was located in the northwestern corner of the Hunsgi valley and was discovered in 1983 when the Acheulian cultural material was exposed to surface due to quarrying away of the silt deposit (2 to 2.5 m thick) overlying the bedrock by the Irrigation Department. Five seasons (1997-2001) of systematic surface studies and excavation, and a detailed examination of geoarchaeological features of the surrounding area, revealed that this site was one of the richest and best preserved Lower Palaeolithic sites in the world. Careful examination and plotting of the cultural material exposed to the surface, coupled with regular excavation of 5 trenches (159 sq. m) in areas still covered with silt deposit varying in thickness from 10 cm to 50 cm, revealed the following major features of the site: (a) The site covers a total area of about 7200 sq. m. (b) Despite soil quarrying and farming activities a remnant sedimentary cover ranging in thickness from 10 to 50 cm was still left on the site. (c) It was a major workshop-cum-occupation site geared to the exploitation of a weathered limestone bed of siliceous character and containing blocks of suitable shapes and sizes. (d) There existed a variability in the preservation of the Acheulian level, ranging from fluvially transformed situations (Trench 2) to partially modified situations of more recent times due to field channel digging and soil quarrying (Trench 3) to well preserved *in situ* contexts (Trenches 1,4 and 5). (e) The site yielded over 15000 artifacts from the excavated trenches in addition to several thousand artifacts exposed on the surface. The study of this material led to a fresh understanding of the various aspects of Acheulian lithic technology including raw material selection, various reduction strategies and recognition of artifact types other than the commonly occurring bifacial tools."

1.2B. Studies on Middle Palaeolithic

Sankalia (1995: 35-38) claims that, "At Nandur Madhmeshwar in the Godavari valley he found points, scrapers, and simple flakes on fine-grained, chalcedonic material from well-stratified gravel deposits. But that assemblage was quite different from assemblages he had previously investigated in Gujarat. Then, in 1954, he found exactly similar tools, in large numbers, at Nevasa on river Pravara, a tributary of the Godavari. There he also found handaxes, cleavers, choppers, and chopping tools on a fine-grained variety of basalt, occurring as dykes in the Deccan lavas. Since those two industries, differently markedly in type and depending on different raw materials, were stratigraphically separated as well, provisionally he called the handaxe assemblage series 1 and the point-scraper series 2." Further, he points out that, "with the clues supplied by the stratigraphy and tool typology at Nevasa, it soon became apparent that similar successions of industries could be found in many parts of India. Although Kerala, Assam, West Bengal, northern Gujarat and Kashmir valley proper have not been explored from that point of view, but it was clear, nevertheless, that the Middle Stone Age culture has a very wide distribution as wide as that of the Early Stone Age culture. Moreover, owing to the availability of the raw material and the comparative smallness of the tools, as well as to their character, the Middle Stone Age tools appear in greater profusion than the earlier artifacts." He also emphasizes that, "At the type site Nevasa and at Belpandhari, Kalegaon, and Nandur Madhmeshwar on the river Godavari, comparatively small tools (points, borers or awls, and scrapers of various types) of a fine-grained chalcedonic material, as well as chert and jasper, occur in fairly well stratified gravels. These gravels appear grayish white when freshly exposed but on weathering they look dark grey and might be mistaken for basaltic rock itself. In constitution the gravel was more sandy than pebbly and contained nodules of secondary minerals such as jasper, chalcedony, chert, and zeolite, but rarely large pebbles of basalt."

According to Chauhan (2009: 129) the South Asian Middle Palaeolithic has been clearly defined from the large number of occurrences found throughout the region. Middle Palaeolithic assemblages have been first collected in the late 19th century from the Son valley of Uttar Pradesh. The concept of the Middle Palaeolithic as an independent technological system was acknowledged by Indian prehistorians only in the mid 1950s. Sankalia was regarded the first to formally recognize and define the South Asian Middle Palaeolithic from the work at Nevasa. He also remarked that it was important to observe that, though no physical remains of Neanderthal man have been found in India, stone tools very similar to those found with this hominid species in

Europe and other regions were seen occurring widely in the subcontinent. Despite detailed interregional metrical and typological comparisons, the timing and character of the South Asian Middle Palaeolithic phase remain poorly understood in comparison with similar evidence from Africa, Europe, and West Asia. Some well stratified examples as mentioned by Chauhan were Nevasa in Maharashtra, Samnapur in Madhya Pradesh, and the evidence from the Kortallyar Basin in Tamil Nadu.

Chauhan (*ibid*: 30) also argued that in comparison with the South Asian Acheulian, the four features that distinguish Middle Palaeolithic assemblages were: (i) a decrease in size of the artifacts, (ii) a noticeable shift from large Acheulian bifaces to more smaller, specialized tools, (iii) an increase in the prepared-core technique, and (iv) a preference for fine-grained raw material such as quartz, fine-grained quartzite, chert, jasper, chalcedony, flint, agate, crypto-crystalline silica, lydianite, and bloodstone. Some of the new types that either first appear or become prominent in the South Asian Middle Palaeolithic were prepared-cores, discoids, flakes, flake-scrapers, borers, awls, blades, and points.

Corvinus's (2003: 31-34) work in Nepal, deals with a Middle Palaeolithic site in the Deokhuri Valley, Western Nepal. The site was named Arjun 3 (discovered in March 1987), the only Middle Palaeolithic site discovered in over 15 years of work in Nepal. The site was situated on the left bank of the Arjun River. The terrace deposits of the site were made up of a basal fluvial gravel of about 7 m resting on bedrock which was overlain by 6 m of silt followed by 5 m upper gravel lens and then the artifact bearing upper silt of 7 to 9 m thickness. The upper silt was dissected intensively, and the whole surface around the blocks of the terrace remnants was covered with a surface scatter of artifacts. From the surface scatter more than 1350 artifacts were collected from the site. The Arjun 3 assemblage was characterized by the presence of – (a) a well defined blade element, (b) flakes with well-prepared and faceted platforms, and (c) discoidal, prepared cores. The industry was a flake industry, with flake and blade-tools and unretouched but useable flakes. The flakes were not only made from prepared cores but from a number of unprepared cores with cortical platforms. Apart from the flake and blade-tools, there was a characteristic component of large cobble-tools present at Arjun 3 comprising of side, end and round choppers and of a polyhedron, and a few scrapers were made, too, from cobbles or chunks. Ninety one percent of artifacts were made from quartzite, while the remaining was made from "tuff", chert and quartz.

Pappu (2004: 1) emphasizes that the Palaeolithic site of Attirampakkam, Tamil Nadu can be considered as the only site which have been investigated sporadically for over a century. She mentions that the Attirampakkam site forms one of a complex of Palaeolithic sites in the Kortallayar river basin, and occupies an important place in the history of Indian archaeology. She reiterates that it was Robert Bruce Foote who in 1866 first made his observations on the stratigraphy and assemblages, at and around the Attirampakkam gully, which clearly established the science of prehistory in India. A project of examining the prehistory and palaeoenvironments in that region, was initiated in 1999, and Attirampakam was chosen as the first site to be excavated (1999-2004). Preliminary studies were conducted which indicated that Attirampakkam had one of the highest densities of artifacts per unit area in the region, a stratified cultural sequence; and a high percentage of unabraded tools. Further, the discovery of large handaxes and cores from the gully bed, which were moderately rolled, devoid of ferruginous patination found in tools occurring in lateritic deposits, and stained white; indicated the possibility of a chronologically earlier 'pre-lateritic' industry.

Pappu (*ibid*: 9) also points out that the objective of the excavation carried out at Attirampakkam was; (i) to investigate questions related to hominid behavior in the context of changing Pleistocene environments, (ii) to examine the broader geomorphic context of the site as part of a Neogene or Quarternary pediment and floodplain environment; (iii) to date the site, (iv) to study lithic technology and the nature of cultural transitions through time; and (v) to situate these studies within the regional archaeological landscape, and within the context of South Asian prehistory (*ibid*: 1). From the excavation, artifacts of Late Middle Palaeolithic and possible early Upper Palaeolithic phase were noted in Layer 2 (ferruginous gravels) at a depth of 1.15 to 1.80 m. Acheulian artifacts were noted in the ferruginous gravels of Layer 5, comprising tools, cores, debitage and hammerstones. Large boulder cores were discovered, one of which had a hammerstone and two artifacts resting on its surface. A total of 12,765 artifacts (including natural clasts) were obtained. One fossil tooth of *Equus* sp. was recovered from a duricrust block at a depth of 2.8 m below the surface.

In 2003 at a maximum depth of 1.62 m within Layer 2, a total of 3926 artifacts (including natural clasts) were recovered. At a depth of 1.86 to 2.20 m, ferruginous gravel lenses within the clayey-silts of Layers 3 and 4, were noted; with artifacts including Acheulian handaxes and large flakes. In 2004, excavation were continued in Layer 5 (ferruginous gravels) to a final depth of around 3.60 m before reaching the surface of the clay (Layer 6). Clay samples were taken to study clay mineorology of the sediments of Attirampakkam site from which the preliminary results of clay mineral analysis suggested the influence of both provenance and climate during the Pleistocene. The higher $^{87}Sr/^{86}Sr$ (Stontium Isotopes) values suggested chemical weathering of silicate minerals present in the host sedimentsas the predominant source Ca in the calcretes (*ibid*: 10-11).

Ajithprasad (2005: 1-9) studied the Acheulian sites of the Orsang Valley, Gujarat. He points out that archaeological and environmental data collected from the primary and secondary localities have been useful in identifying the depositional processes as well as post-depositional changes in the archaeological record. His study of the nature and contexts of Acheulian sites provided an understanding of various processes involved in the formation and preservation of, and possible past and present disturbances caused to, these occupation sites was essential not only for cultural interpretation of the archaeological data but also for critically evaluating the utility and limitations of the data retrieved from the site.

Ajithprasad (2005: 183-189) also studied the primary Palaeolithic localities belonging to the Acheulian and the Middle Palaeolithic period which have been discovered at the foothills and on the top of hilly ridges in the Sukhi Valley, Gujarat. He studied fifty-nine Palaeolithic localities, among these 32 belonged to the Acheulian and 13 represented the transition phase between the Acheulian and the Middle Palaeolithic. The remaining 12, however, showed a mixed spread of both Upper Acheulian and early Middle Palaeolithic artifacts. In all, 2,734 Acheulian artifacts have been collected from 36 localities from the valley with handaxes, ovates, cleavers, scrapers, knives, retouched flakes and chopping tools as the important artifacts in addition to a number of simple flakes, broken, discarded and unfinished artifacts, exhausted cores and nodule fragments suggesting on site manufacturing of tools. The tools were made on locally available quartzite of different colours.

1.2C. Upper Palaeolithic

Chauhan (2009: 131-132) argued that the South Asian Upper Palaeolithic was not clearly defined as the regions Acheulian or the South Asian Middle Palaeolithic, nor well understood; as a result, it still remains as requiring extensive multidisciplinary research at a large scale. The Upper Palaeolithic tradition in India for several reasons remains in debate and unappreciated: the South Asian blades and burins contained certain non-Eurasian stylistic features; scrapers outnumbered other tool types at many sites; African rather than Eurasian parallels seemed more obvious, and this bias was reinforced to introduce African lithic classification terminology into Indian archaeology. With the recent location of so many upper Palaeolithic sites in India, the European parallels were appreciated to be much more obvious. The dominating and defining features of South Asian Upper Palaeolithic assemblage compositions include a notable increase in the production of blades was known from Late Acheulian levels at a few sites (e.g. Bhimbetka), the behavior became highly prominent, prolific, and technologically consistent and standardized only during the South Asian Upper Palaeolithic. Additional tool types during this technochronological period included flakes, knives, awls, scrapers, cores including cylindrical types, choppers, and bone tools. But the richest and best-known sites and complexes included the Son Valley sites and the Bhimbetka rock-shelters in Madhya Pradesh, the Kurnool caves and several river basins in Andhra Pradesh, the Belan Valley sites in Uttar Pradesh, the Singhbhum region of Bihar, Patne in Maharashtra, Mehtakheri in the Narmada Valley, Vishadi in Gujarat, the Budha Pushkar region in Rajasthan, the Rohri Hills in Pakistan, and Batadomba-lena and Fa Hien Cave in Sri Lanka.

1.3. Mesolithic

Misra (1995: 57) states that, "like most other basic archaeological terms, the term 'Mesolithic' was also borrowed from European prehistory. He further adds that its applicability in the Indian context can be discussed only against the background of its meaning in European prehistoric literature. He further claims that Clark's definition of 'Mesolithic' could be considered as a standard one, in which the following characteristics will seem to be the requirements of the Mesolithic cultures. (i) They are post-Pleistocene and post-Palaeolithic. (ii) They are characterized by a hunting and gathering economy. In this respect although Mesolithic cultures are a continuation of the Palaeolithic economy, yet the emphasis now shifts from big game to small game hunting and catching and gathering. This difference is reflected both in the ecology and technology of the Mesolithic cultures. (iii) Their technology is distinguished by the use of microliths on a large scale. And (iv) They are mostly pre-Neolithic, but occasionally coexisted with the latter in a symbolic relationship."

Regarding the distribution of microlithic findspots in the country Misra (*ibid:* 59-60) points out that by and large they occur all over the sub-continent with the exception of the Indo-Gangetic plains and Assam. He mentions a few sites known in West Pakistan which included the site of Jamalgarhi cave north of Peshawar, Tharro and Jungshahi near Karachi in Sind and a few other sites around Rawalpindi and Campbellpore. No sites were known from the Punjab. He also mentions the microlithic sites in Rajasthan, west of the Aravallis, sites like Barmer, Pali, Jodhpur and Nagaur districts. East of the Aravallis, there is mention of a great concentration of sites in the Banas basin in Mewar and stray finds recorded from Kota and Jhalawar districts further east. Few other sites that were mentioned by him were that of districts of Mandasor, Ratlam, Ujjain, Indore, Khandwa and Nimar, which according to him require more systematic exploration. In Gujarat and Kathiawar, he discusses some 80 sites which have been plotted on the map. He also reiterates that there were many known sites from the caves and rock-shelters of the Vindhya ranges, near Hoshangabad and Pachmarhi and quite a few from northern Madhya Pradesh and south-east Uttar Pradesh in the region of the Kaimur range. From the eastern part of the country a few microlithic findspots were recorded from Chhota Nagpur and some from the valley of the Kansabati in West Bengal. From the south, the Bombay Poona-Ahmednagar region and also most of Mysore were reported to be rich in microlithic sites. Excepting the important *teri* site in the Tinnevelly district and two in Madurai district not much is known from Madras. Kurnool in Andhra Pradesh, as he suggests was also reported to have yielded a large number of sites.

More recently, Dikshit (2000: 1-2) has argued that the Mesolithic culture in India was dominated by microlithic flake/blade with retouch or use of both. The earliest phase was non-geometric microliths followed by geometric varieties and finally geometric microliths with pottery. It was placed between 12,000 B.C. and 1,500 B.C. Further Joshi (1978: 79) also claim that the microlithic industry was based primarily on blades, although the flake and core components were not rare. He points out that the largest number of points, awls and crescents were made on blades, and that the flakes have been utilized mainly for scrapers and points, while the fluted blade cores-most of which may be residual cores-have been turned into steep core scrapers with little retouch. He also emphasizes that the size of the tools varied according to the size of the blades that could be removed from the siliceous nodules, and he also claims that barring the broken tools and a few large-sized tools, the average size of the microliths varied from 25×6×3 mm to 15×4×1 mm.

From the work of Sankalia (1982: 69-79), it becomes clear that there are various types of microliths. These types were determined according to the deliberate shape given to them by humans while fashioning them further by trimming the edges by retouch. Most important and recurrent types were described as-cores and blades, and within blades there were different types. These included (i) single straight-sided; (ii) double straight-sided; (iii) straight but pointed at one end; (iv) straight with one end curved blade. He also argues that it is customary to classify microlithic industries into "geometric" and non-geometric". In the geometric forms there were microliths called "triangle" "crescent" and "trapeze". There are many more types of microliths as mentioned by Sankalia, such as trapezoid, penknife point, transverse arrow-head, tranchet, obliquely blunted point, truncated blade, and micro-burin.

1.4. Neolithic

Thapar (1995: 87) emphasizes that the food-gathering or hunting economy of the Mesolithic forbears of late Pleistocene times gave way to one of deliberate food-production involving husbandary and stock-raising. This change in human economy constituted what has been termed as "Neolithic Revolution". He further adds that early in the post-glacial times, an important change was taking place in human evolution; humans began to control their environments and were thus enabled to settle down in villages effectively. He also claims that the "Neolithic Revolution" represented a stage in economic and technological development, where, with this new way of life other traits began to be associated with grinding and polishing of tools and the manufacture of pottery.

Further, Dikshit (2000: 1-3) states that, "the Neolithic stage in India may be called a stage of techno-socio-economic changes. The use of polished and ground tools began and cultivation started along with the domestication of animals and later on the manufacture of pottery. In India six different geographical regions have been recognized of which one is the northern region of the Kashmir valley. The other regions are the Belan valley (Chopani Mando, Koldihwa and Mahagara), northern Bihar (Chirand), northeastern (Daojali Harding), central eastern, (Kuchai and Golbai) and Peninsular India." He also reiterates that, "the excavations at Burzahom dating back to the beginning of the 3rd millennium B.C. revealed four cultural periods of which, the earliest Periods I and II, were Neolithic. Period I yielded polished stone axes, bone tools and hand-made steel gray ware. Dwelling pits nearly circular on plan, wider at the base and narrower at the top distinguished the habitational pattern. Besides, there were the rectangular to squarish semi-subterranean shelters cut about 0.50 to 1.00 m into the natural soil, found with postholes, hearths, drains and landing steps. The sidewalls were plastered with Karewa mud. In period II, although the habitational pattern had undergone a change, the earlier cultural traits continued, along with evidence for some new cultural contacts. A large rectangular community dwelling-pit with a fireplace in the centre was found in this phase. The pottery of periods I and II was hand-made grey ware of different shapes. The early pottery with types like bowls, vases and stems was usually coarse both in fabric and finish. Period II yielded varieties of fine pottery. The distinctive type was a high necked jar in grey or black burnished ware. On the lower part of the neck were incised oblique notches. Mat impressions formed exclusive designs on thin ware. Other shapes were bowls, globular pots, jars, stems and a funnel shaped vessel."

Furthermore, Singh (2003: 3) pointed out that, "the breeding of selected animals (dogs, cattle, sheep and goat) and the cultivation of selected wild grasses and cereals (barley, wheat, rice, etc.) generated surplus food and brought significant changes in the way of life of prehistoric man. This transition from hunting-gathering to food production has been aptly designated as the Neolithic Revolution. Lahuradeva, situated in district Sant Kabir Nagar of eastern Uttar Pradesh was excavated in 2001-2002. The excavation brought to light a sequence of cultures from the Neolithic to the end of the Kushana Period. This culture sequence has been divided into five periods, the earliest of which has been further sub-divided into sub-Periods IA and IB. The ceramic industries of Period IA comprise cord-impressed red ware and Black-and-Red ware. In both the wares the pots were mostly handmade but some of them were also wheel made. The small burnt clay nodules present in this sub period indicated that the inhabitants lived in wattle-and-daub houses. Period IB continues with the tradition of earlier phase, i.e. a coarse variety of red ware and Black-and-Red ware. Another Neolithic settlement excavated in the year 2000 was Tokwa, located at a distance of 51 km southwest from Mirzapur. It was situated on the confluence of Belan and Adwa rivers. The Neolithic culture at this site comprised cord-impressed pottery and rusticated ware. The artifact inventory comprised querns, mullers, hammerstones and microliths of semi-precious stones and bone arrowheads."

1.5. Northeast

Dani (1960 : 41-42) points out that the prehistory of North-East India starts with the Neolithic culture, in which the present states of North-East India come under the region of Assam with the exception of the states of Tripura and Manipur. He emphasizes that the Neolithic culture of Assam (now divided into number of states), which was his study was thoroughly restricted to the study of stone tools that were collected by different Europeans. He mentions that Sir John Lubbock (1867) was the first person to refer to the find of jade Neolithic implement in Upper Assam. From then on several notable collections of Stone Age artifacts were made in this area, which have been kept as a collection in the Pitt Rivers Museum, Oxford. The collections were materials presented to museum by several persons, among these were the discovery of polished stone axes from Nagaland by Hutton, from Garo Hills by Walkar, from North Cachar Hills by Hutton and Mills and Sadiya frontier tract by Mills, and Pawsay were noteworthy.

Sharma (2007: 11-12) mentions that the prehistoric lithic assemblage of North-East India was distinctive in character. It was a synthesis of two types of cultural traits, Southeast Asian and Indian. Artifacts with Southeast Asian cultural traits were shouldered celts, short axes and chord marked pottery and the Indian cultural traits were the bifaces. She further emphasizes that since Northeast India was situated between the two different environmental systems the monsoonal tropics and the tropical rainforest zone the regional ecology of Northeast India have had a major role in the growth and development of human culture in the area. Affinities between the Neolithic tools of Southeast Asia and Northeast India were very clear, but certain bifacial artifacts were also similar to certain Middle Palaeolithic assemblages from other parts of India.

It was only in 1995 from the Ph.D thesis of Hari Chandra Mahanta entitled 'A study of the Stone Age Cultures of Sebalgiri, West Garo Hills Meghalaya', that the mention of tools belonging to the Palaeolithic period (Upper Palaeolithic or Late Palaeolithic) was made. But from the typological point of view the ages of the tool was assigned to be controversial, since most of them were surface sites. In trying to justify the surface sites an extensive geomorphological study was carried out in the region (*ibid*: 13).

Sharma (1996: 75) also emphasized that in Manipur the Palaeolithic finds came from Songbu cave, district Chandel and open air sites at Singtom, Machi, district Chandel, Nongpok Keithelmanbi localities 2 and 3, district Senapati and Khangkhui cave, district Ukhrul. The representative tool types consist of handaxes, chopper/chopping tools, scrapers, blades, points, borers, and so on. Typo-technologically the Songbu cave culture appeared to be an advanced Middle Palaeolithic culture while the Khangkhui cave culture consisting of bone arrow-heads, blade and perforators and so on, which were found associated with stone tools along with charred animal bones, may belong to the Upper Palaeolithic. Further, he pointed out that tentatively the Palaeolithic culture in Manipur may be assigned to a time period during Late Pleistocene to Terminal Pleistocene.

1.6. Study area

The area of my study includes the Haora Valley of Tripura. The reason why I have chosen this region is because the region has rich prehistoric cultural remains and has great potential in terms of future research work. The numerous presences of prehistoric sites and within this region are enormous. In these sites there is a great quantity of prehistoric cultural remains which are seen scattered all over the sites and that make it a huge potential factor for research applications in the region. Some of the sites I would like to mention are Sonai Bazar, Sumili, Champamura (this particular site has fossil-wood tools of fine quality which are almost chert-like) and Debara Kami. Sonai Bazar site has a large quantity of fossil-wood scatter in terms of prehistoric cultural remains.

1.7. Geography and geomorphology

In this section I will be discussing the geography and geomorphology of Myanmar and Tripura due to similarities in the finds of fossil-wood tools in these two respective regions.

1.7A. Geography and geomorphology of Myanmar

Myanmar has a total area of 678,500 sq. km. It lies between latitudes 9° and 29° N, and longitudes 92° and 102° E.

It is bordered on the northwest by the Chittagong Division of Bangladesh and the states of Mizoram, Manipur, Nagaland and Arunachal Pradesh to the northwest. Its north and northeast border straddles the Tibet and Yunnan regions of China. The length of the Sino-Burman border extends over a distance of 2,185 km. It is bound by Laos and Thailand in the southeast. Myanmar has 1930 km of contiguous coastline along the Bay of Bengal and Andaman Sea to the southwest and the south, which forms one quarter of its total perimeter.

In the north, the Hengduan Shan Mountains form the border with China. Hkakabo Razi, located in Kachin Statem, at an elevation of 5881 metres is the highest point in Myanmar. Three mountain ranges, namely the Rakhine Yoma, the Bago Yoma, and the Shan Plateau exist within Myanmar. The major rivers are the Irrawaddy, Salween (Thanlwin), and the Sittaung.

1.7B. Geography and geomorphology of Tripura

According to Kesari (2011: 78-79) Tripura State lies in the eastern part of India, bordered by Bangladesh to the west, south and north, by Assam to the north-east, and by Mizoram to the east. It is bound by latitudes 22°56'N and 24°32'N, and longitudes 91°10'E and 92°21'E. It has an area of 10,477 sq. km., and is a rugged and geologically a younger terrain. It has a link with Assam and rest of the country through the adjoining Cachar district, lying to the northeast.

Geomorphology

The topography is immature. The major geomorphic celements observed in the area are both structural and topographic 'highs' and 'depressions', 'flats' and 'slopes', sculptured on the topographic surface in a linear and areal fashion. In Tripura the topographic highs and lows are in accordance with the normal first order structural elements.

The state is dissected by a number of broad and long valleys, viz.,Agartala-Udaipur-Sabrum, Khowai-Telimura-Amarpur-Silachari, Kamalpur-Ambasa-Gandachara, Kailashar-Kumarghat and Dharmanagar-Panisagar located between the N-S trending parallel to sub-parallel antiformal hill ranges (topographic highs), such as the Baramura-Deotamura Ranges, the Atharamura Ranges, the Langtarai Ranges, the Shakan Ranges, and the anticlinal ranges. There are a few disconnected open and shallow anticlinal ridges, viz. Gazalia-Mamunbhagna anticline, Sonamura anticline and Agartala dome. Besides, small-scale elements like the spurs, keels, and the moderate gorges are the other geomorphic elements formed.

Drainage

Generally, the valleys are broad and flat with low to moderate Bed Relief Index (BRI), which are separated from the adjacent highs with domes and conical peaks. Some of the peaks of the hills are also flat. The general altitude of the state varies between 16 m to 600 m above mean sea level. The drainage patterns are of 'dendritic', 'parallel' to 'sub-parallel' and 'rectangular' types. The stream channel patterns lie mainly within the 'piedmont', 'straight' and 'meandering' reaches. The 'braided reach' is, however, not noticed along the course of the stream channels. The drainage flows down along north by the Khowai, Dolai, Manu, Juri and Langai Rivers; west by the Gumti River and southwest by the Fenny and Muhari Rivers.

Climate and Rainfall

The climate is generally hot and humid, the average maximum temperature being 35°C and the average minimum 10.5°C. The state has a fairly good annual rainfall (around 230 cm per annum). The monsoon generally starts in the middle of April and continues up to September. Heavy rainfall causes severe floods almost every year, disconnecting the state to the rest of the country.

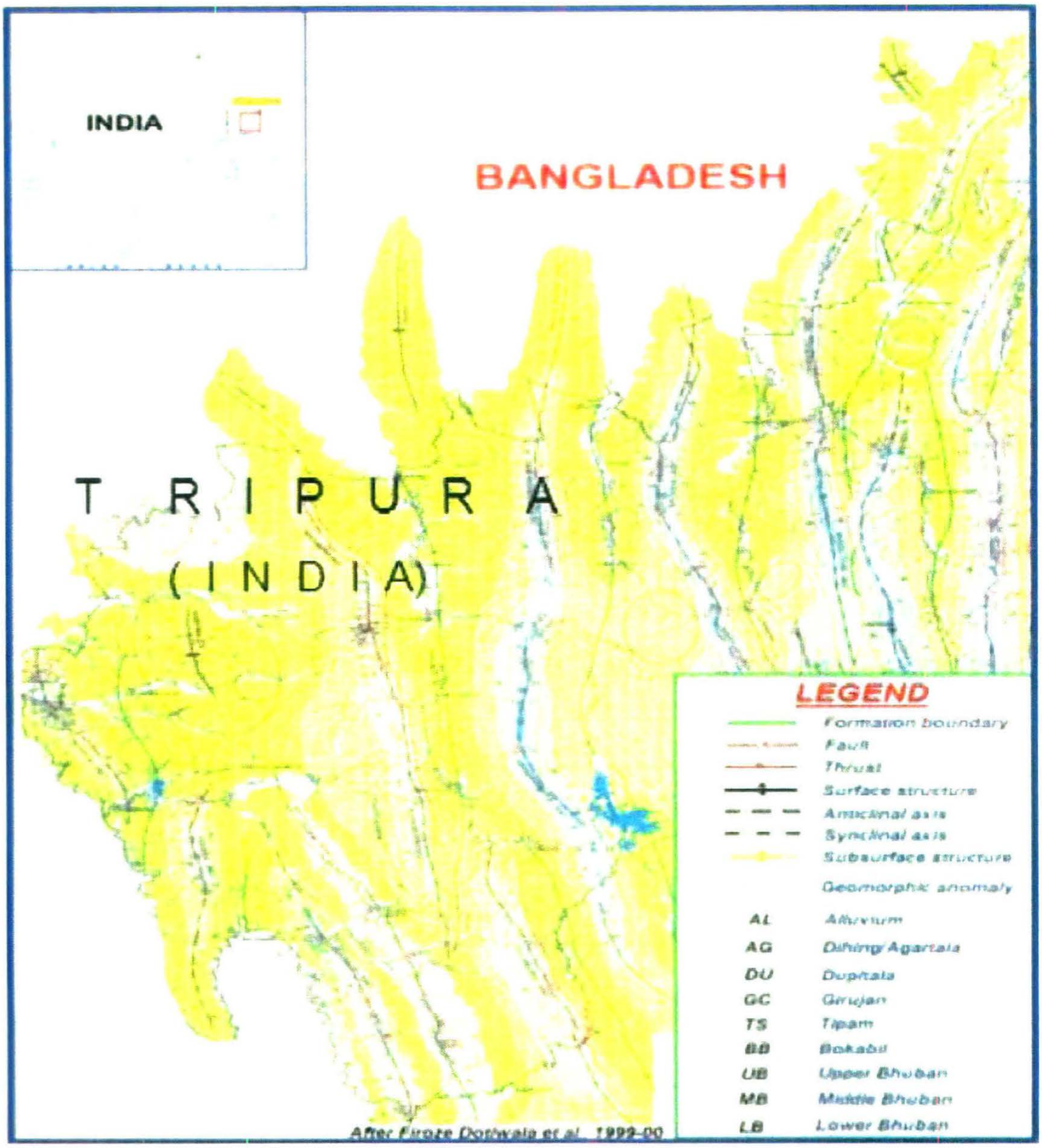


FIGURE 1.1. Geological Map of Tripura (after A.K. Jena., N.C. Das, G.C. Saha, and Asim Samanta 2011: 7) (not to scale)

Geology

The rock formations in Tripura are more or less like those of Assam comprising Tertiary succession. The succession has been studied extensively by several workers. The continuity of sedimentary succession from Assam, has allowed adoption of Assam Tertiary classification and nomenclature for Tripura, as proposed by Evans, (1932), with minor modifications. The major units are Surma Group, Tipam Group and Dupitila Formation.

1.8. Methodology

The dissertation work includes library work, field survey, and documentation of fossil-wood tools.

Library work

Library work was important for my dissertation in writing the historiography and lithic chapter. All important available published literature on prehistory in the form of monographs, research articles, abstracts, review articles, published books; unpublished Ph.D theses (based on my area of research) in India have been referred. The relevant literature on various aspects of prehistory in India which appeared in various journals and books from abroad was also consulted.

Field survey

Field survey is another important aspect and forms an essential part of my dissertation work. I conducted a preliminary survey in Haora Valley of Tripura. I have made a random collection of fossil-wood tools, numbered the tools, photographs were taken of the tools on the surface sites, recorded and noted down the surroundings and GPS points taken.

Documentation of fossil-wood tools

The most important part of my dissertation is the documentation of the fossil-wood tools recovered from the sites surveyed by me. I have made a qualitative as well as quantitative documentation of the tools and various other aspects of the tools' information have been provided in the second chapter of my dissertation.

1.9. Outline of my study

My dissertation will be divided into four chapters. In the first chapter, I have discussed about the historiography of prehistory in India with the help of various case studies of the different Stone Age Periods of India.

The second chapter is an attempt to document the fossil-wood collection made by me during the course of survey in the Haora Valley. The chapter is thematically divided into different sections. In the first section I have made an attempt to provide a brief introduction of survey methods. After that, I have made an attempt to explain the survey methodology I have employed for my survey. I have also discussed how N.R. Ramesh's survey methods differed from that of mine. The rest of the sections have documentation of fossil-wood tools in a detailed manner, arranged in terms of the significance of sites and also depending on tools found from the particular site. I have described in detail about the sites that were mentioned by Ramesh, located and revisited by me during the survey. I have also given details of the new discoveries of sites that were made during the course of my survey. And lastly I have also described details of the sites that were newly located, on the basis of information provided by local informants.

In the third chapter, I have made an attempt to look at lithic technology of India. The focus in this chapter will be mainly on the techniques employed by hominids in making tools. Case studies have been discussed in terms of studying the various techniques that were employed by the hominids.

In the concluding chapter, I will present the summary of the previous chapters. I will discuss about the rich potential that lie in terms of prehistoric research work in the Haora Valley of Tripura.

CHAPTER 2

INTRODUCTION

This chapter will be in two sections. The first section comprises a discussion of the significance of surveys in archaeology and the methodologies that are generally followed. More specifically, the methodologies employed in the context of Tripura by N.R. Ramesh and by myself will be focused on. The constraints that came up in the course of the present survey will also form a part of this section. In the second section of this chapter, I will put forward the results of my survey. Precise locations of sites, descriptions of sites, site damage, if any, the collections made as well as the documentation of the collections will form the core of this section.

2.1. Survey

Survey is a method used to check the possibilities of whether or not there is any potential in further research possibilities by any student of archaeology. It is of great importance in terms of possibilities that provides to assess how far the research can be carried out in the field or area any student chooses to study. Survey also helps in providing a good assessment of future projects possibilities. According to Banning (2002: 1), "Archaeological survey was often the first stage of a long-term archaeological project. At other times it was the principal method for studying some aspect of the past. Survey allowed archaeologists to discover sites they may wish to excavate, to assess potential damage to archaeological resources from construction, road-building or other development, and to assess aspects of past settlement systems and regional economies. Survey can range from very informal exploration to detailed and explicit prospection or sampling strategies designed to maximize the probability of detecting sites or artifacts over a region, or to provide representative samples of cultural materials. It also ranges from visual inspection of fairly obvious features and artifacts on the modern surface, sometimes called "fieldwalking", through dispersed excavations ("shovel testing"), to geophysical remote sensing of buried materials."

Survey over the years has become an integral part of research design in archaeology which adds more quantification of quality research work. We know that the purpose of archaeological fieldwork is to acquire new information within the context of a program of research. Therefore, survey becomes a tool to any student doing research to answer some of the question of probabilities to whether or not the research design would work out for the given area of research he/she chooses. According to Shafer (2009: 21), research design is emphasized as that, and I quote "Archaeologists do not simply go into the field and wander about in hopes of chancing upon some important find. Scientific research projects today range from goal-specific one-day ventures to long-term projects covering many field seasons. These projects are designed to accomplish specific goals or objectives, which may range from the assessment of the data potential or scientific significance of a particular site, geographic locale, or region; to surveys in a geographical or cultural region; to intensive excavations at a site or a series of sites in a region." Furthermore, most importantly he explains that, "The archaeological research design justifies the fieldwork and describes what is to be done; this requires much thought and careful planning."

There are several strategies employed in order to carry out the proposed research design, which defines the goals of the researcher. Some of these will be discussed. According to Shafer (*ibid*: 22-24), there is "a general model of a research design that outlines seven principal stages: formulation, implementation, data acquisition, data processing, analysis, interpretation, and dissemination of the results." By formulation he explains that that the research problems or hypotheses to be tested through the fieldwork were defined in the formulation stage. In this regard he further points out that, "It is always advisable to visit the area of proposed research to investigate and familiarize oneself with the local conditions, initiating local contacts, and assessing the overall feasibility (i.e., field logistics, time and budget constraints, and overall practicality) of the project." He also explains that to implement the fieldwork, the necessary permits (if required), permission, and funding must be in hand, and any problems with field logistics must be resolved, which is what I had to generally do first, before conducting the preliminary survey I undertook. Other aspects like proper field facilities (housing, board, and transportation) were crucial to be resolved before any archaeological field work was carried out.

Among the seven principal stages mentioned by Shafer, data processing accounts for the most important aspect of research methodology in my dissertation work. He clearly points out that "The research design should also specify how the field data will be processed and maintained for analysis and future reference." Therefore, the artifact collection made in my preliminary field survey will be cataloged with field reference numbers, photographs, quantitative analysis, and qualitative analysis, which obviously becomes part of my documentation work in this chapter. Next, I will discuss and explain on why and how a preliminary survey was conducted by me for my dissertation work.

Ramesh (1989: 2) was the first to attempt a systematic study on the Quaternary geology and geomorphology of Tripura with morphostratigraphic approach during the 1980-81 season, in the Khowai Valley of West Tripura District. Subsequently, he continued his investigations for two more seasons during 1981-83, leading to mapping of river valleys such as Khowai, Haora, Sonai Gang, and Buri Gang, Lohar Nadi in West Tripura District, Tripura. From his investigation of the river valleys the mapping demonstrated extensive development of Quaternary fluvial deposits in the intermontane river valleys. Before his work, very little was known on the Quaternary geology and geomorphology of Tripura, although geological work in the State started way back in 1908. He points out that, there was very little systematic account published on the Quaternary of Tripura, except a brief paper entitled 'Pleistocene sediments of Tripura' by Sujit Dasgupta (1979), which was considered to be important from the point of view of evolution of ideas on the stratigraphy of the intermontane valleys of Tripura.

On the basis of his study he suggests that, "Tripura- the southwestern most border state in northeast India situated in the western fringe of the Indo-Burman Ranges and overlooking the deltaic plains of Bangladesh, had hitherto remained prehistorically unknown." But, he emphasizes that, the situation had radically changed now as a result of his discoveries while carrying out systematic Quaternary geological mapping during 1980-83. He discovered pottery sites and some scattered stone implements in course of his surveys in west Tripura during 1981-82 field season. He associated the pottery sites with a lower, younger fluvial terrace at Khas Kalyanpur (Kunjaban) and Seratoli in the Khowai Valley and Kolaghar in the Haora Valley, where the potsherds were found in stratified contexts associated with unaltered Holocene sediments. The peat occurring just below the potsherd layer at Khas Kalyanpur was dated at 1430 ± 80 years B.P. by radio carbon method, indicating that the pottery was likely to date back to proto-historic/historic period. However, the primitive stone implements embedded in the oxidized sediments of the Upper Pleistocene terrace pointed to Palaeolithic age. Further, from his renewed methodical and careful search during 1982-83 season, he claims that the renewed search of his led to the discovery of at least half a dozen very prolific, primary Stone Age sites (besides 16 scattered sites) in Tripura. He then, points out that this discovery in Tripura had revealed the immense archaeological potentialities of the State for the first time, and thus opened up a vast scope for prehistoric research in northeast India. Finally he concludes saying that, it is also perhaps the first attempt in eastern India, wherein the archaeological data were place firmly in their geochronological contexts, supported by absolute dates (*ibid*: 4).

Based on N.R. Ramesh's systematic study on the Quaternary geology and geomorphology of Tripura, I have made the attempt to conduct a preliminary survey in those regions as mentioned by him. The initial approach was a difficult one as the information was based mainly on Ramesh's work. But, as I proceeded ahead with the fieldwork, it became clear that, to carry out a systematic survey is totally impossible given the fact that the sites are located in a densely forested area. There are thick jungles, which made accessibility to these sites almost inaccessible by any layman. While walking all along the river was a way of accessing most of the sites that were mentioned by Ramesh I am not sure as to how he may have carried out a systematic archaeological survey. Using a tape to measure the surface across and lay out a grid on the sites was difficult in the present survey. Among the rest of the sites, some were situated on slopes and hilltops and these were accessible, but still dangerous, as snakes, poisonous insects, and mosquitoes always remained a threat to any surveyor. One had to be fully prepared to face any of the above-mentioned situations during the course of the survey. Transportation was another major factor that impacted on the course of the survey. Reaching the sites is another thing, when transportation was available. But, again, fieldwalking would need a lot of local information about the whereabouts of the sites, which I would discuss in detail in the next paragraph on survey methodology.

2.2. Survey Methodology

Ramesh's survey methodology was based on, "The principle of sequential development of landscape of the alluvial valleys and the techniques of photo geological studies have been adopted in morphostratigraphic mapping. Besides sequential toposheets and black and white aerial photographs, he used LANDSAT MSS imagery (bands 5 and 7), to delineate broad morphotectonic and geological domains. However, his thesis was based mainly on his extensive and intensive field work for 362 days spanning 3 field seasons. An area of avout 3000 sq. km was covered by geomorphological and Quartemary geological mapping, by taking close cross-country traverses along rivers/streams and across jungles, hills and valleys. Innumerable sections exposed along the natural bank scarps of rivers and streams were examined and logged by him for lithological, pedological, palaeontological and archaeological contexts. In addition, sections exposed along roads and in quarries, trenches and ponds, were scanned by him for archaeological data."

The survey methodology that I adopted was mostly fieldwalking on the sites traversing along rivers/streams and across jungles, hills and valleys. Locating sites that were mentioned by Ramesh was a big task at first, as not much information was available on location of the sites. There was no specific detail given on the location of the sites by Ramesh, neither any longitude and latitude points were mentioned. Instead, he has mentioned about where the area of his study falls in Tripura and has provided latitude and longitude of the area. Only after enquiring over and over again from the local people could I then finally manage to locate the sites, except for one i.e., Sonai Bazar, as it was located in the place where Ramesh had mentioned. While, fieldwalking I also discovered some new sites which were not mentioned in Ramesh's work, sites like Buddhu Chaudhary Kami, Champamura Kami, Debara Kami, and Radharam Kami. After locating the sites I had to resort to strategies of randomly (Random Sampling) collecting the fossil-wood tools, as systematic (Systematic Sampling) collection using grid pattern could not be worked out due to the surroundings in which the sites were located. I must admit that this survey was a preliminary one for my dissertation work, and further survey remains a future hope for further research work. So, in some sites walking all along the river/stream worked better in finding the fossil-wood tools. Fossil-wood tools that were collected were photographed on the surface site context, leveled, GPS (Global Positioning System) points taken; sometimes the tools were found in clusters and sometimes found as a single piece. Overall I visited 13 sites of which 8 sites (Baramura, Bairagi Kami, Sonai Bazar, Sonaram Kami, Sumili/Sonai Gang, Kunjaban, Circuit House, and Teliamura) were mentioned by Ramesh, 3 sites (Buddhu Chaudhary Kami, Champamura Kami, and Debara Kami) were discovered by myself, and the remaining 2 sites (Debramthakur, and Radharam Kami) were mentioned by local informants. The tools collected from Buddhu Chaudhary, Champamura, Sonaram, and Sumili all came from the dry riverbed context. In Sonai Bazar, the tools were collected from the hill top, which were found embedded on the surface of the site.

2.3A

In this second section of the chapter, I will discuss the sites located and described by Ramesh (1989) and re-visited in the current survey as well as those sites that were discovered by me and those I was given information about from local informants. The clasts, tools, cores, flakes, and debitage found in the current survey will be documented in relation to each site. Each specimen has been photographed in six views, which have been labeled as a, b, c, d, e and f. These views are: a (ventral view), b (dorsal view), c (lateral side), d (lateral side), e (distal end) and f (proximal end).

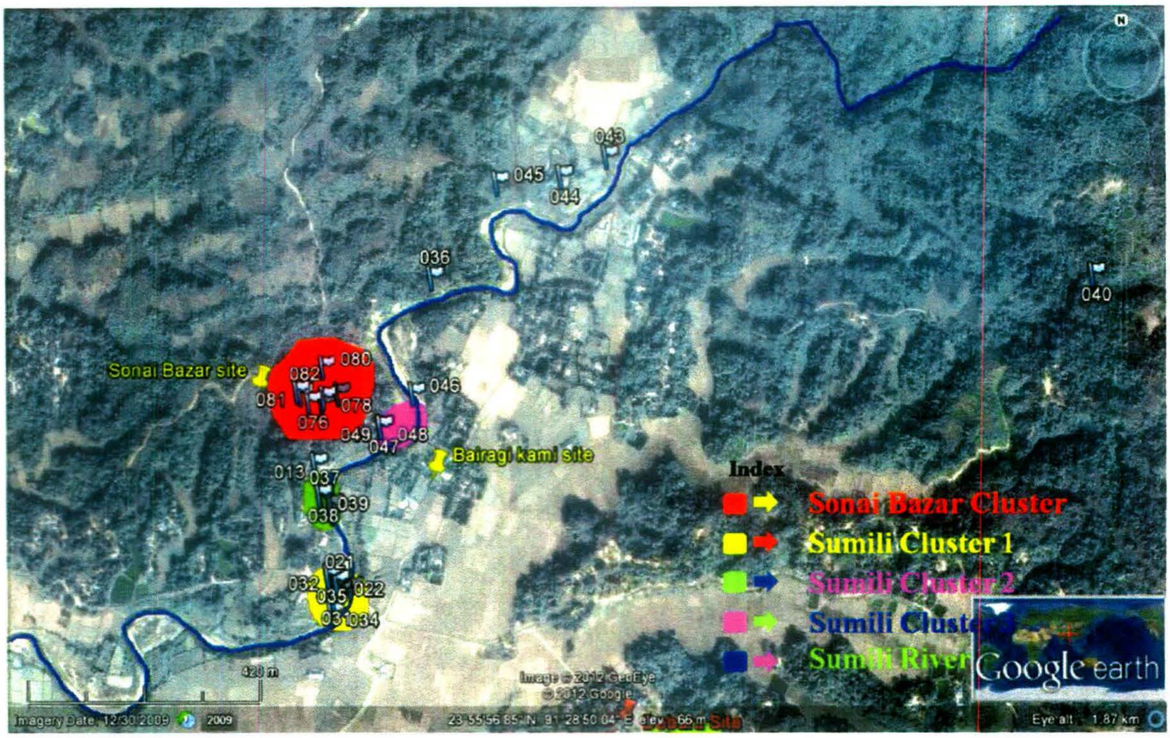


FIGURE 2.1. Location of Sonai Bazar Site

2.3.A.1: Sonai Bazar (23°55'.923"N 91°28'.537"E)

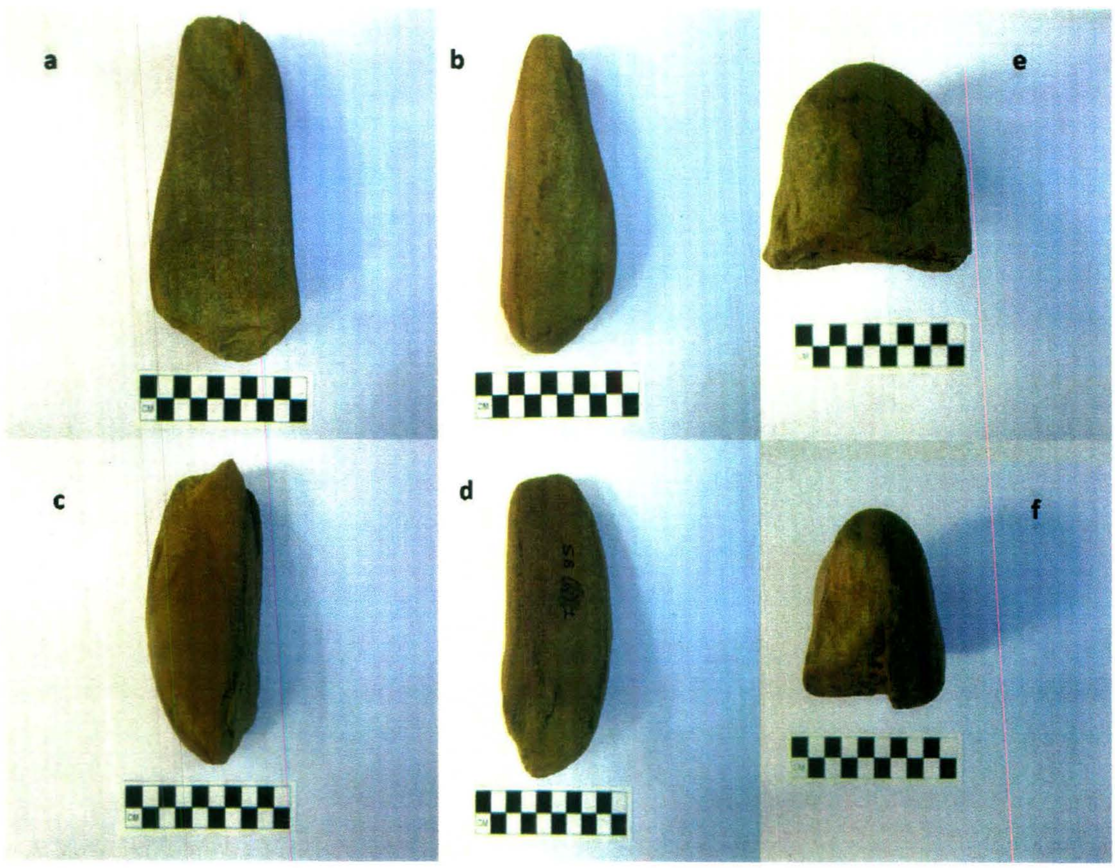
The site is located along the river Sumili in the Baramura Range in the West District of Tripura (see Figure 2.1 for the location of the site). Part of the village of Sonai Bazar is a site with fossil-wood strewn all over the hill tops as well as the paddy fields (see Figure 2.2). The site is covered by trees and shrubs; there are houses of local inhabitants as well. The site seems to be disturbed due to habitation by present day inhabitants. The site is partly on the hill top and partly on plain area. The plain area which has been cleared is the area where a weekly market or *mandi* takes place. There are permanent shops owned by the locals in the *mandi*. When the survey was being conducted in the month of September 2011, a concrete bridge over the river was seen being constructed. This has disturbed the site. Fossil-wood tools can be seen embedded in the surface where the *mandi* is situated. The inhabited area has two families living within the site perimeter, due to which disturbance of the site has taken place. Further, while interacting with the locals it was learned that they have removed the top soil to clear the area for house and road construction for access to this site whereby around 2 to 3 cm deposit of fossil-wood and tools has been removed along with the soil.

FIGURE 2.2. Sonai Bazar Site showing the section facing east

FIGURE 2.3. Sonai Bazar Site showing cluster of tools

The archaeological material picked up from Sonai Bazar was in the form of clasts, cores, tools, flakes and debitage. Tools were collected from select locations or clusters within the site which have been indicated in Figure 2.3. For example, the Sonai Bazar site marked as red in the figure has seven clusters (76, 77, 78, 79, 80, 81 and 82) which were identified and GPS measurements taken. The material collected has been documented as below:

Site: Sonai Bazar Cluster No: 77
Co-ordinates: 23^{0}55’.913’’N 91^{0}28’.559’’E
Artifact No: SB(Q)1 Core/flake/clast/blank: Clast
Basic typology: Chopper Final classification: Chopper
Material: Quartzite
Length (mm):123.5 Breadth (mm): 71.7 Width (mm): 61.5
Weight (g): 669
Condition of the tool: Fresh
Notes: Triangular in shape, partly snapped at the top end.



Site: Sonai Bazar

Cluster No: 78

Co-ordinates: 23°55'.919''N 91°28'.560''E

Artifact No: SB(Q)3

Core/flake/clast/blank: Core

Basic typology: Core scraper (incomplete biface)

Final classification: Tri-hedral core scraper

Material: Fossil-wood

Length (mm): 110.4

Breadth (mm): 46.2

Width (mm): 33.4

Weight (g): 160

No. of flake scars: 5

Invasiveness of flake scars:

Condition of the tool: Fresh

Evidence of use: No

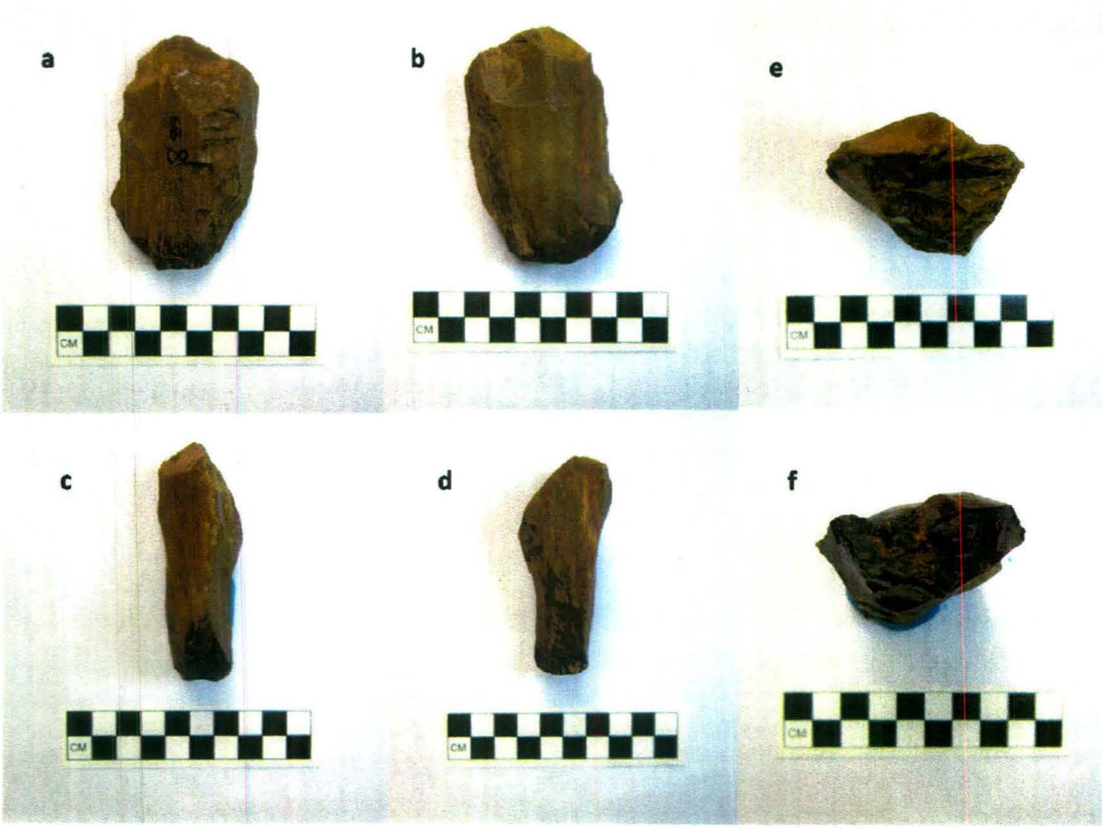
Retouch: No

Retouch Type:

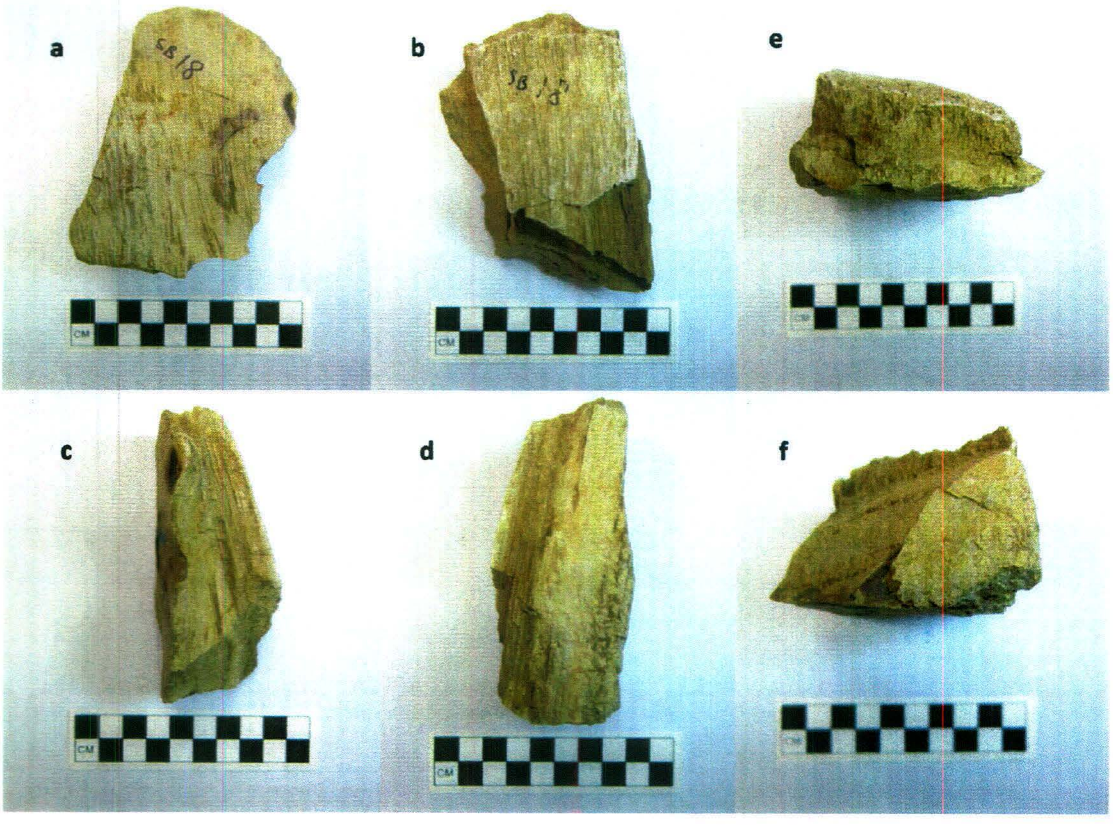
Platform type: Plain

Notes: Elongated in shape.

Site: Sonai Bazar
Cluster No: 81
Co-ordinates: 23°55'.925''N 91°28'.561''E
Artifact No: SB8
Core/flake/clast/blank: Core
Basic typology: Core biface
Final classification: Core Biface incomplete
Material: Fossil-wood
Length (mm): 83.1
Breadth (mm): 54.8
Width (mm): 32.2
Weight (g): 136
No. of flake scars: 12
Invasiveness of flake scars:
Condition of the tool: Fresh
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Plain
Notes: Cushion shaped.



Site: Sonai Bazar | Cluster No: 82
Co-ordinates: 23°55'.923''N **91°28'.537''E**
Artifact No: SB18 | Core/flake/clast/blank: Core
Basic typology: Core biface | Final classification: Core
Material: Fossil-wood
Length (mm): 106.1 | Breadth (mm): 70.2 | Width (mm): 53.8
Weight (g): 349
No. of flake scars: 6 | Invasiveness of flake scars:
Condition of the tool: Fresh | Evidence of use: Yes
Retouch: Yes | Retouch Type: Alternate retouch
Platform type: Plain
Notes: Cortex present at the dorsal side, rectangularin shape.



Site: Sonai Bazar | Cluster No: 82

Co-ordinates: 23°55'.923''N 91°28'.537''E

Artifact No: SB19 | Core/flake/clast/blank: Core

Basic typology: Biface core scraper | Final classification: Core scraper

Material: Fossil-wood

Length (mm): 139.6 | Breadth (mm): 97.1 | Width (mm): 52

Weight (g): 510 | Uniface/Biface: Biface

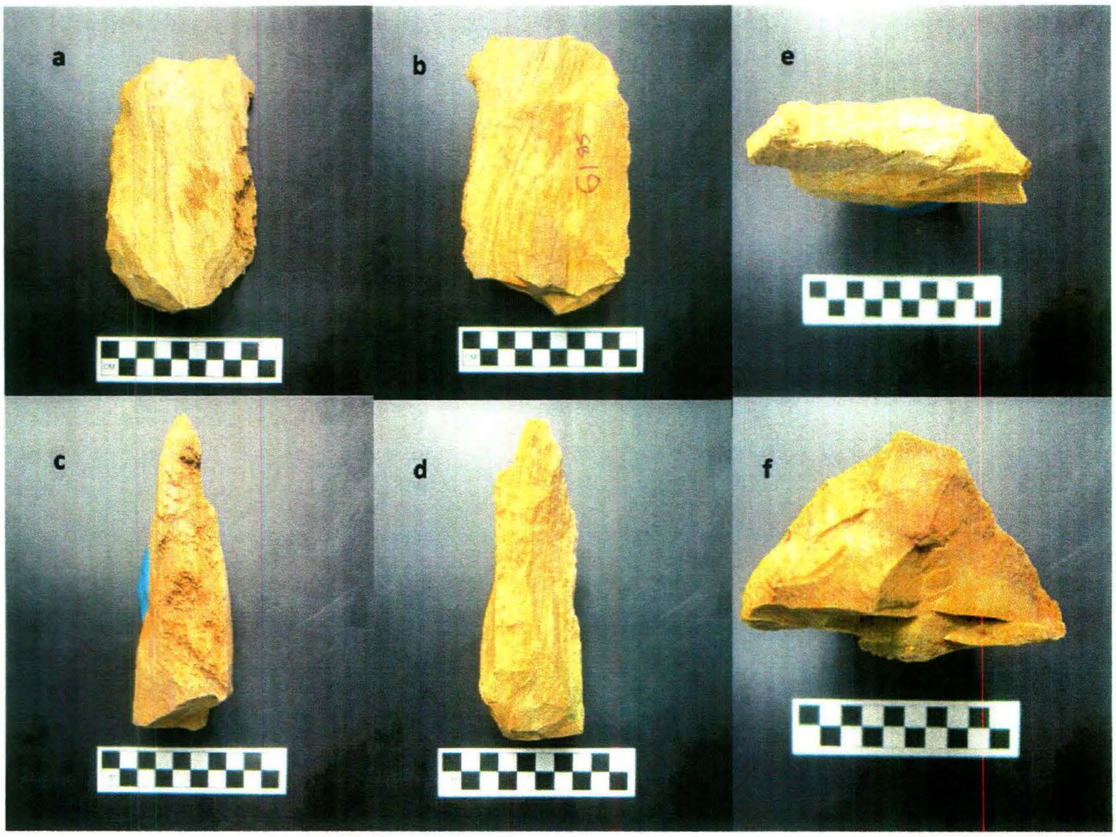
No. of flake scars: 15 | Invasiveness of flake scars:

Condition of the tool: Fresh | Evidence of use: No

Retouch: Yes | Retouch Type: Alterante/Straight

Platform type: Uneven

Notes: Rectangular in shape, cortex present.

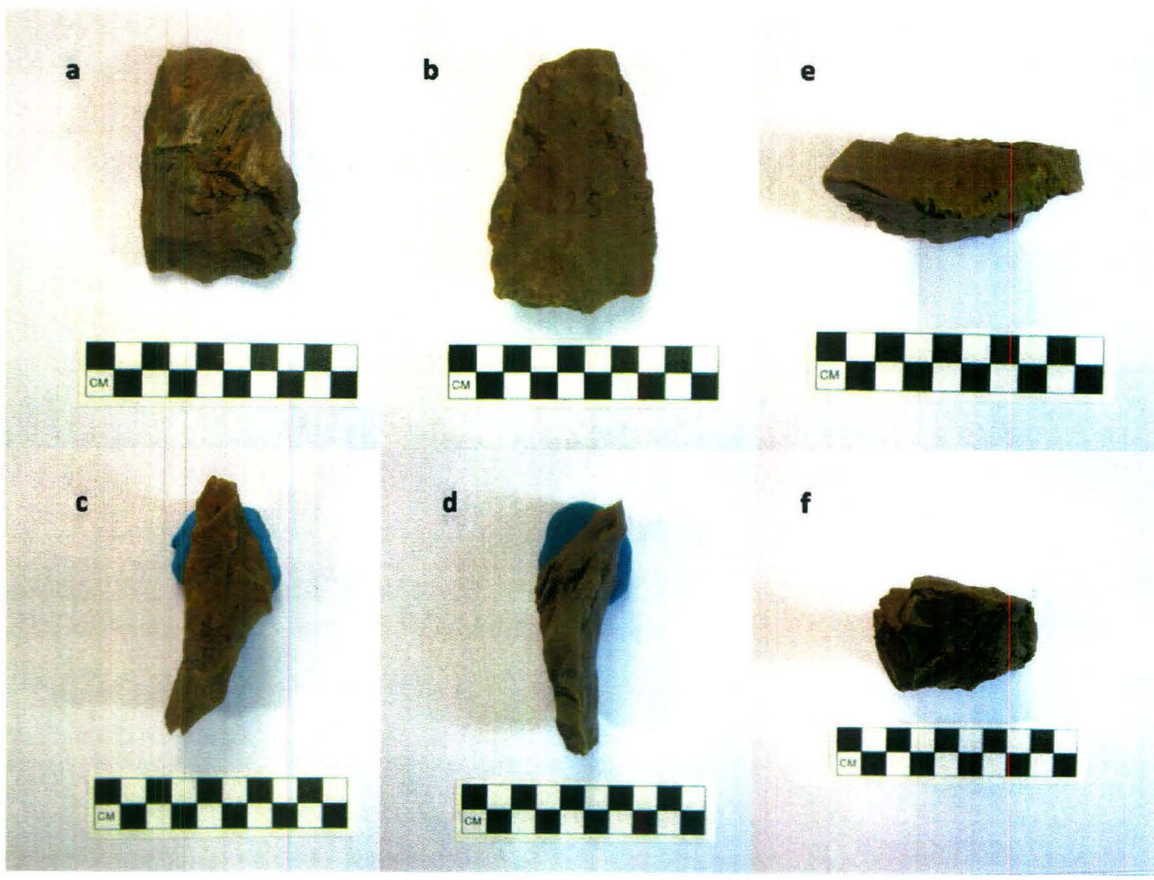


Site: Sonai Bazar | Cluster No: 80
Co-ordinates: 23°55'.946''N 91°28'.561''E
Artifact No: SB20 | Core/flake/clast/blank: Core
Basic typology: Biface core scraper | Final classification: Core scraper
Material: Fossil-wood
Length (mm): 127.3 | Breadth (mm): 95.4 | Width (mm): 51.2
Weight (g): 655
No. of flake scars: | Invasiveness of flake scars:
Condition of the tool: Fresh | Evidence of use: No
Retouch: Yes | Retouch Type: Alternate/straight
Platform type: Facetted
Notes: Rectangular in shape, cortex present at the butt end.

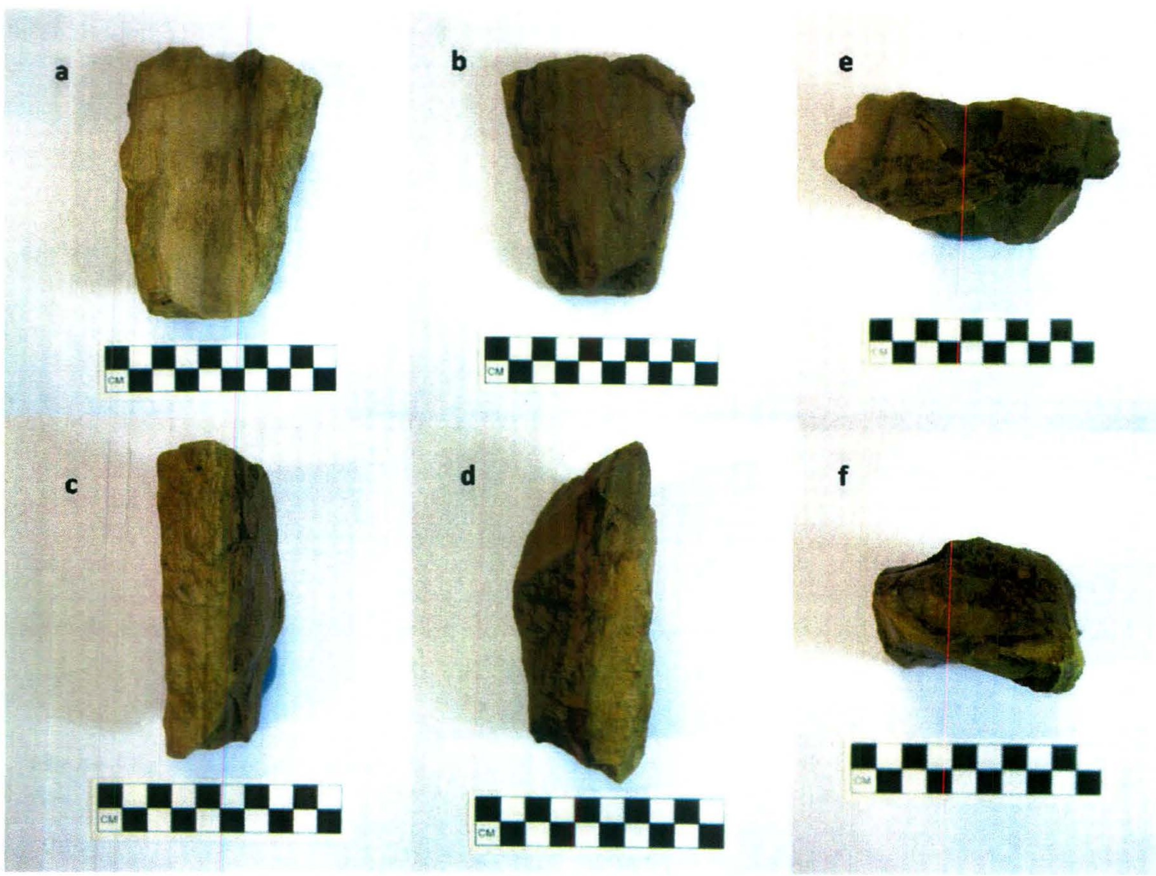
Site: Sonai Bazar
Cluster No: 80
Co-ordinates: 23°55'.946''N 91°28'.561''E
Artifact No: SB21
Core/flake/clast/blank: Core
Basic typology: Core uniface
Final classification: Core (possibly utilized)
Material: Fossil-wood
Length (mm): 102
Breadth (mm): 83.6
Width (mm): 60.8
Weight (g): 321
No. of flake scars: 7
Invasiveness of flake scars:
Condition of the tool: Fresh
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Facetted
Notes: Cortex present on one side, triangular in shape.

Site: Sonai Bazar
Co-ordinates: 23°55'.946''N 91°28'.561''E
Artifact No: SB25
Basic typology: Biface atypical cleaver-like
Material: Fossil-wood
Length (mm): 86.7
Breadth (mm): 55.6
Width (mm): 31.9
Weight (g): 123
No. of flake scars: 7
Condition of the tool: Fresh
Retouch: No
Platform type: Plain
Notes: Trapezoid in shape.

Cluster No: 80
Core/flake/clast/blank: Core
Final classification: Atypical cleaver-like core thinning
Invasiveness of flake scars:
Evidence of use: No
Retouch Type:



Site: Sonai Bazar
Cluster No: 80
Co-ordinates: 23°55'.946''N 91°28'.561''E
Artifact No: SB26
Core/flake/clast/blank: Core
Basic typology: Adze (Biface)
Final classification: Adze
Material: Fossil-wood
Length (mm): 99.6
Breadth (mm): 74.3
Width (mm): 45.8
Weight (g): 326
No. of flake scars: 15
Invasiveness of flake scars: High
Condition of the tool: Fresh
Evidence of use: No
Retouch: Yes
Retouch Type: Straight retouch
Platform type: Uneven
Notes: Trapezoid shaped.



Site: Sonai Bazar
Cluster No: 81
Co-ordinates: 23°55'.925''N 91°28'.561''E
Artifact No: SB27
Core/flake/clast/blank: Core
Basic typology: Pointed tri-hedral core (Biface)
Final classification: Pointed tri-hedral core fragment (possibly pick?)
Material: Fossil-wood
Length (mm): 114.1
Breadth (mm): 56.3
Width (mm): 37.1
Weight (g): 183
No. of flake scars: 13
Invasiveness of flake scars:
Condition of the tool: Fresh
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Plain
Notes: Triangular in shape, cortex present.

Site: Sonai Bazar
Co-ordinates: 23°55'.925''N 91°28'.561''E
Artifact No: SB33
Basic typology: Core biface
Material: Fossil-wood
Length (mm): 106
Breadth (mm): 56.4
Width (mm): 29.5
Weight (g): 177
No. of flake scars: 18
Condition of the tool: Fresh
Retouch: Yes
Platform type: Facetted
Notes: Trapezoid in shape.

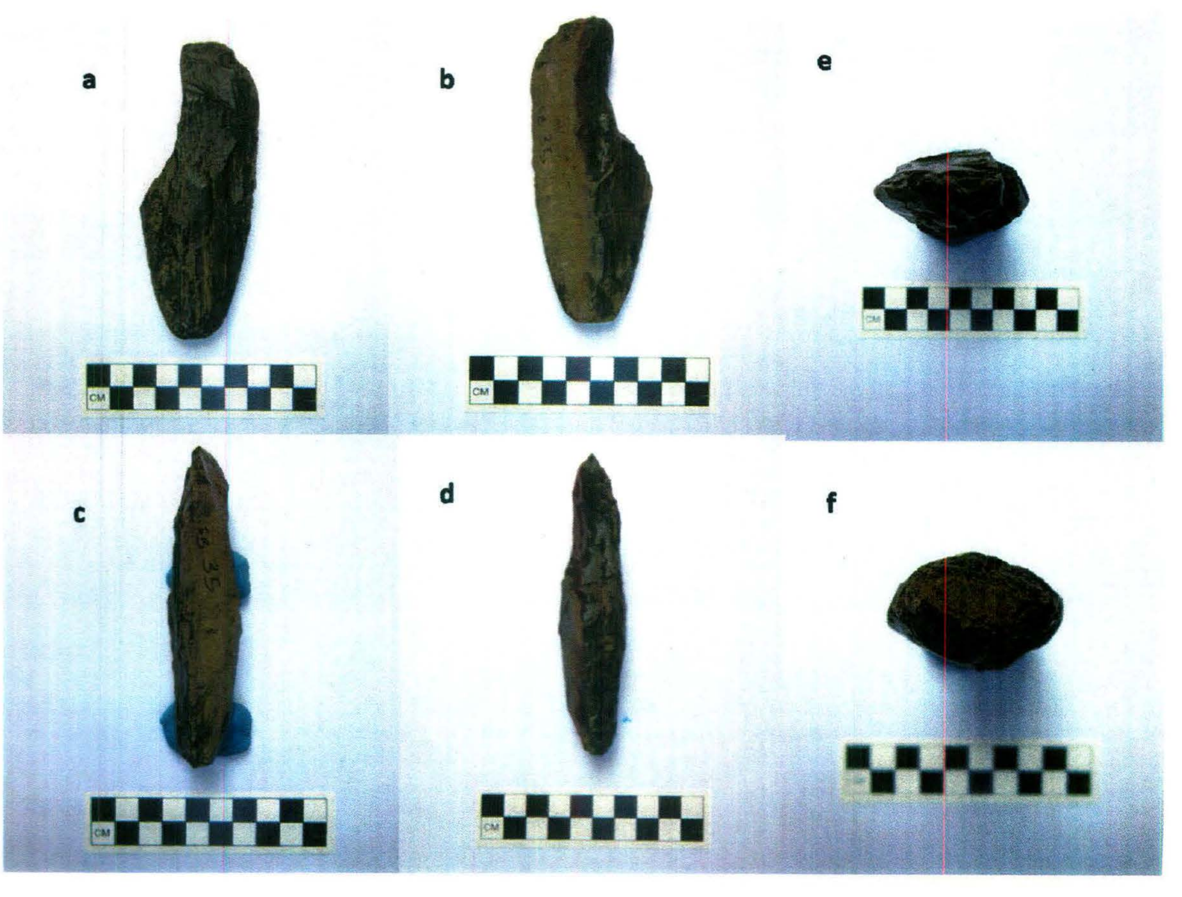
Cluster No: 81

Core/flake/clast/blank: Core
Final classification: Pick? Adze?

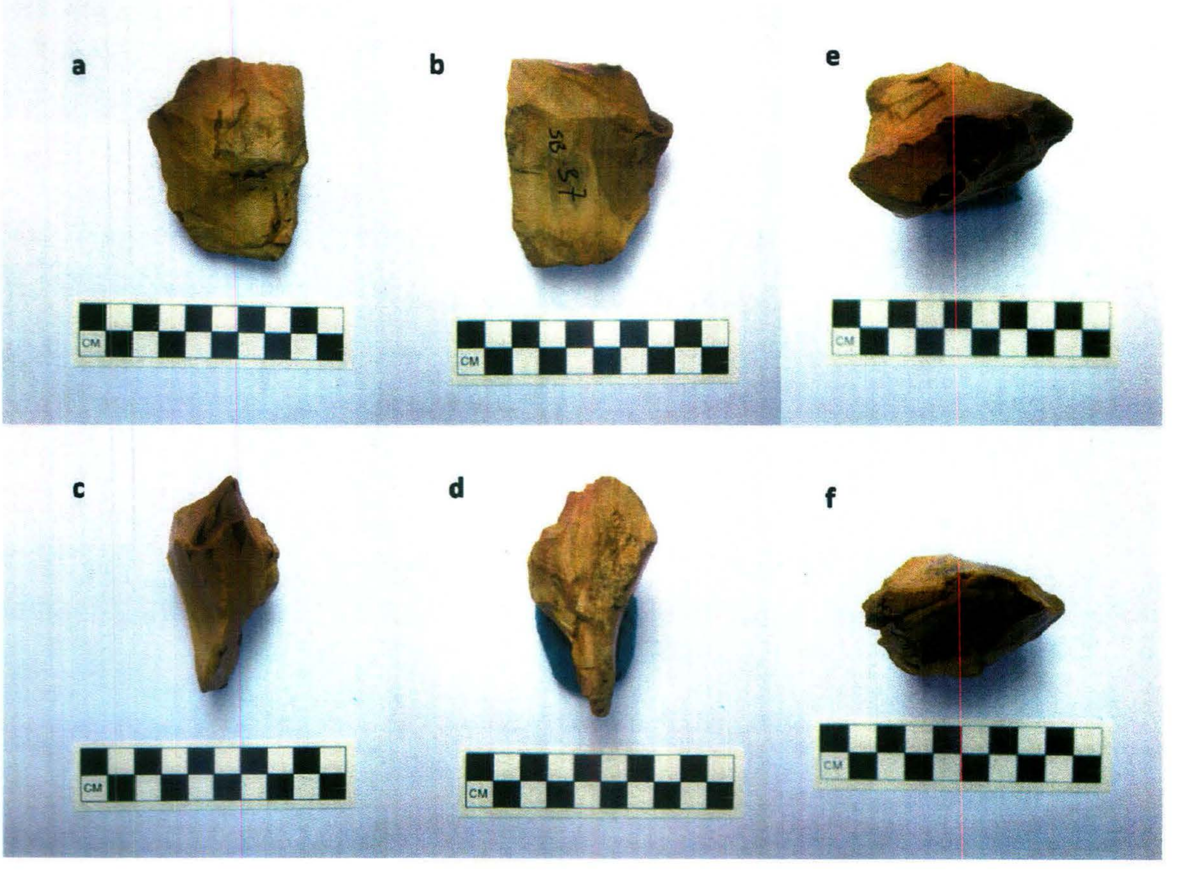
Invasiveness of flake scars: High
Evidence of use: Yes
Retouch Type: Alternate retouch

Site: Sonai Bazar
Cluster No: 80
Co-ordinates: 23°55'.946''N 91°28'.561''E
Artifact No: SB34
Core/flake/clast/blank: Core
Basic typology: Elongated biface
Final classification: Pick? Side scraper?
Material: Fossil-wood
Length (mm): 121.8
Breadth (mm): 41.7
Width (mm): 30.9
Weight (g): 181
No. of flake scars: 10
Invasiveness of flake scars: High
Condition of the tool: Fresh
Evidence of use: Yes
Retouch: Yes
Retouch Type: Alternate retouch
Platform type: Plain platform butt end
Notes: Tapered baguette in shape, cortex retained.

Site: Sonai Bazar   Cluster No: 80
Co-ordinates: 23°55'.946''N 91°28'.561''E
Artifact No: SB35   Core/flake/clast/blank: Core
Basic typology: Biface   Final classification: Unpolished axe
Material: Fossil-wood
Length (mm): 121.9   Breadth (mm): 46.5   Width (mm): 28
Weight (g): 148
No. of flake scars: 16   Invasiveness of flake scars: High
Condition of the tool: Fresh   Evidence of use: Yes
Retouch: Yes   Retouch Type: Alternate retouch
Platform type: Plain
Notes: Snapped at one side at the top (from mid-section to the top), linear in shape.



Site: Sonai Bazar
Cluster No: 80
Co-ordinates: 23°55'.946''N 91°28'.561''E
Artifact No: SB37
Core/flake/clast/blank: Core
Basic typology: Biface core scraper
Final classification: Core scraper
Material: Fossil-wood
Length (mm): 55.3
Breadth (mm): 69.5
Width (mm): 39.8
Weight (g): 121
No. of flake scars: 8
Invasiveness of flake scars: High
Condition of the tool: Fresh
Evidence of use: No
Retouch: Yes
Retouch Type: Straight retouch
Platform type: Facetted
Notes: Trapezoid in shape.



Site: Sonai Bazar
Cluster No: 79
Co-ordinates: 23°55'.922''N 91°28'.575''E
Artifact No: SB(Q)2
Core/flake/clast/blank: Flake
Basic typology: End scraper
Uniface/Biface: Biface
Final classification: End scraper
Material: Fossil-wood
Length (mm): 96.5
Breadth (mm): 42.8
Width (mm): 27.3
Weight (g): 97
Flake type: VI
No. of flake scars: 5
Invasiveness of flake scars: Medium
Condition of the tool: Fresh
Evidence of use: Can't say
Retouch: Yes
Retouch Type: Alternate retouch
Platform type: Rough
Symmetrical/Asymmetrical: Asymmetrical
Notes: Elongated three sided tool; two sides at the dorsal and flat ventral side, elongated lateral sides, curved vertically, no bulb.

Site: Sonai Bazar | Cluster No: 80

Co-ordinates: 23°55'.946''N 91°28'.561''E

Artifact No: SB1 | Core/flake/clast/blank: Flake

Basic typology: Debitage | Uniface/Biface: Uniface

Final classification: Debitage | Material: Fossil-wood

Length (mm): 66 | Breadth (mm): 86 | Width (mm): 25

Weight (g): 100 | Flake type: II

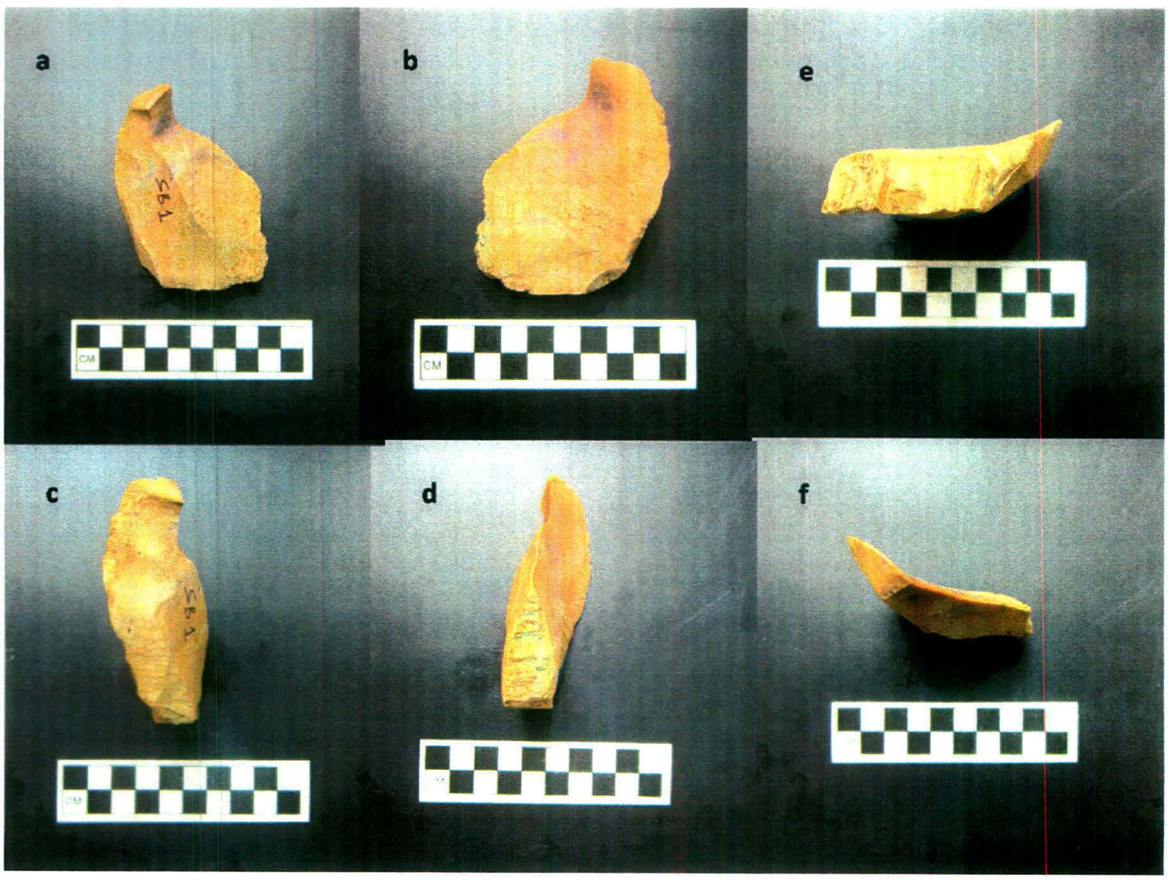
No. of flake scars: 0 | Invasiveness of flake scars:

Condition of the tool: Fresh | Evidence of use: No

Retouch: No | Retouch Type:

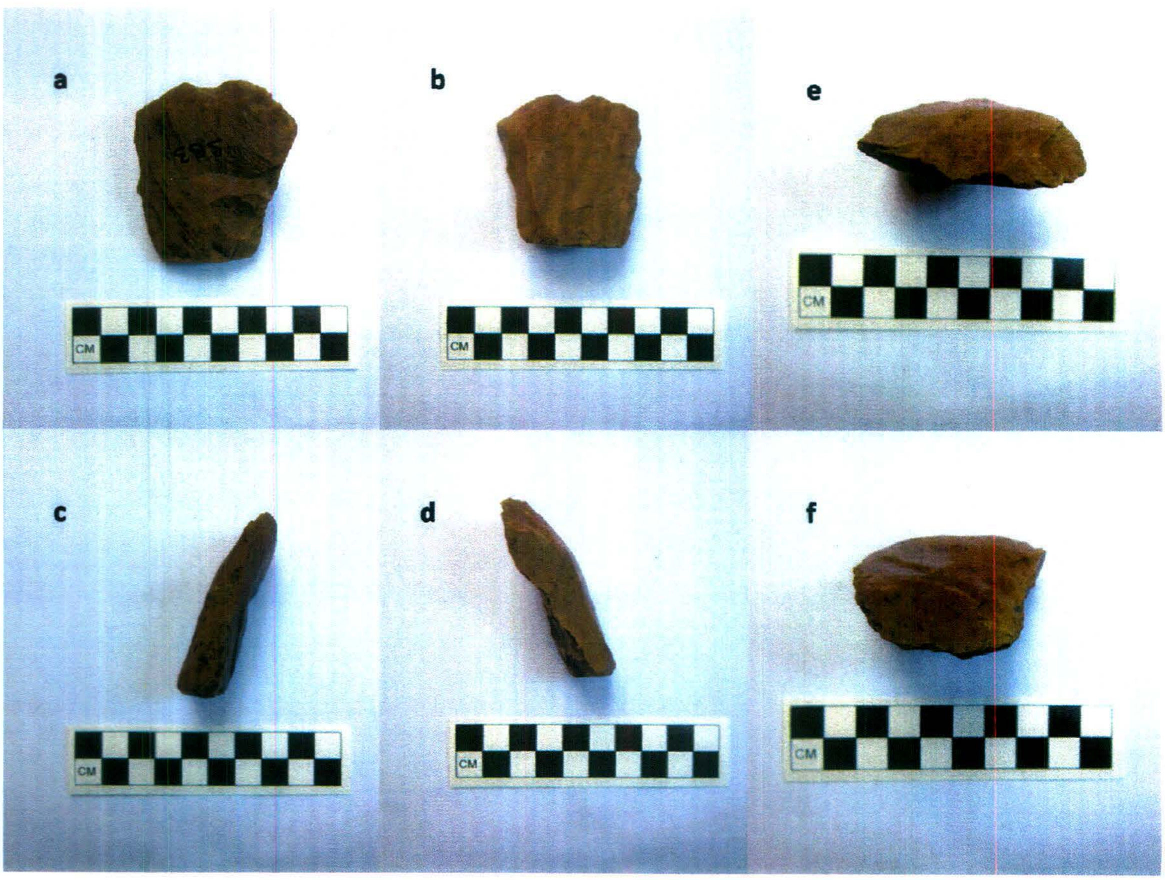
Platform type: Facetted | Symmetrical/Asymmetrical: Asymmetrical

Notes: Elongated mango shaped ventral and dorsal sides, elliptical lateral sides and tilde shaped cross-section.

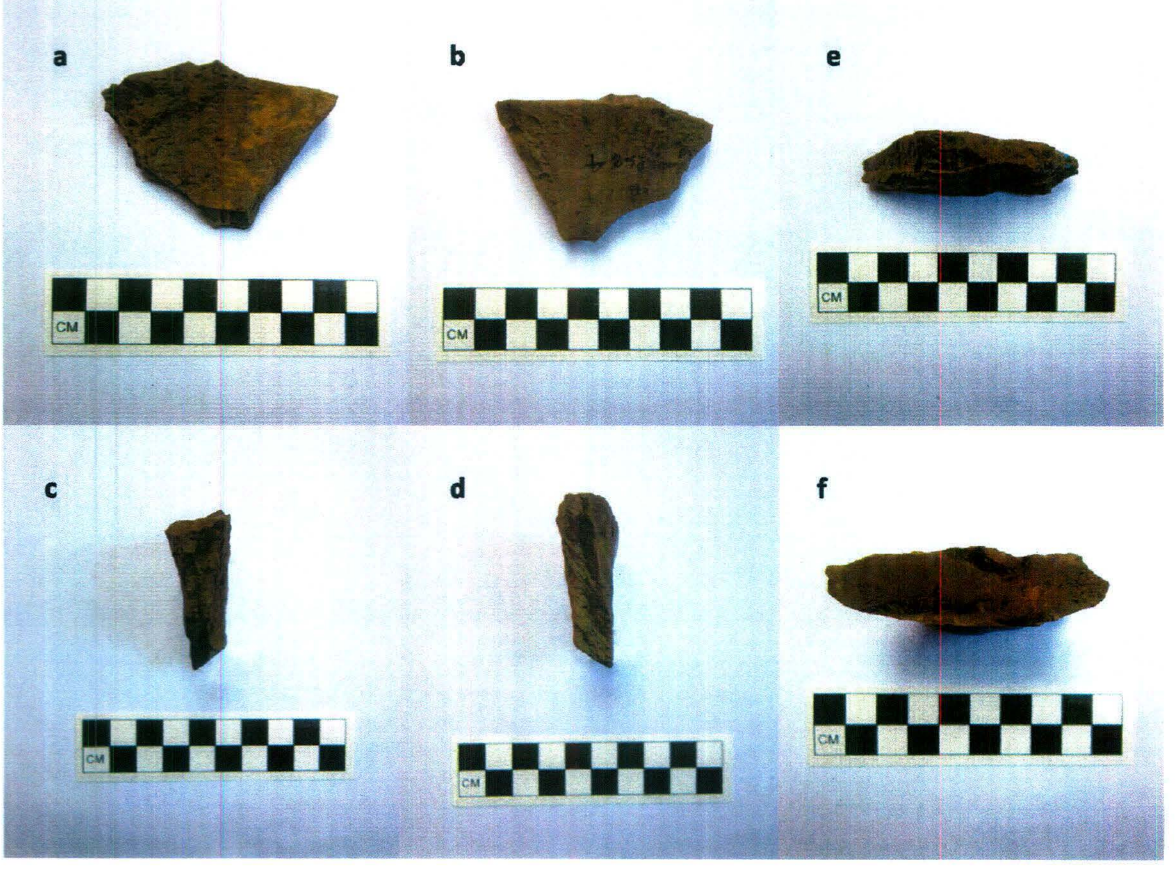


Site: Sonai Bazar
Cluster No: 80
Co-ordinates: 23°55'.946''N 91°28'.561''E
Artifact No: SB2
Core/flake/clast/blank: Flake
Basic typology: Adze
Uniface/Biface: Biface
Final classification: Adze
Material: Fossil-wood
Length (mm): 62.4
Breadth (mm): 51
Width (mm): 17.1
Weight (g): 64
Flake type: VI
No. of flake scars: 9
Invasiveness of flake scars: Medium
Condition of the tool: Fresh
Evidence of use: Yes
Retouch: Yes
Retouch Type: Straight retouch
Platform type: Uneven
Symmetrical/Asymmetrical: Asymmetrical
Notes: Snapped at the top end, trapezoid ventral and dorsal sides, rectangular lateral sides and cross-section, no bulb.

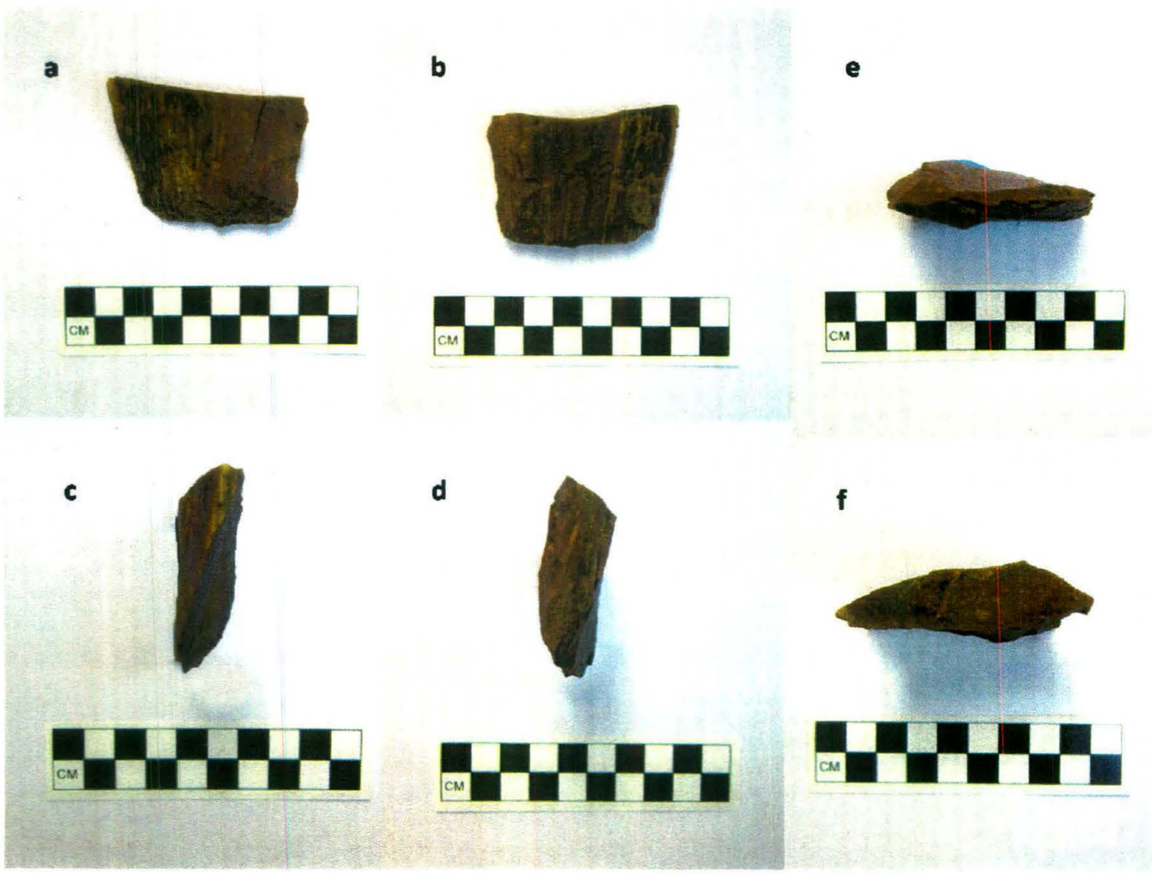
Site: Sonai Bazar | Cluster No: 82
Co-ordinates: 23°55'.923''N 91°28'.537''
Artifact No: SB3 | Core/flake/clast/blank: Flake
Basic typology: End scraper | Uniface/Biface: Biface
Final classification: End scraper | Material: Fossil-wood
Length (mm): 60 | Breadth (mm): 51 | Width (mm): 24.7
Weight (g): 67 | Flake type: VI
No. of flake scars: 8 | Invasiveness of flake scars: High
Condition of the tool: Fresh | Evidence of use: Yes
Retouch: Yes | Retouch Type: Alternate retouch
Platform type: Plain | Symmetrical/Asymmetrical: Asymmetrical
Notes: Pentagon ventral and dorsal sides, elliptical cross-section and triangular lateral sides.



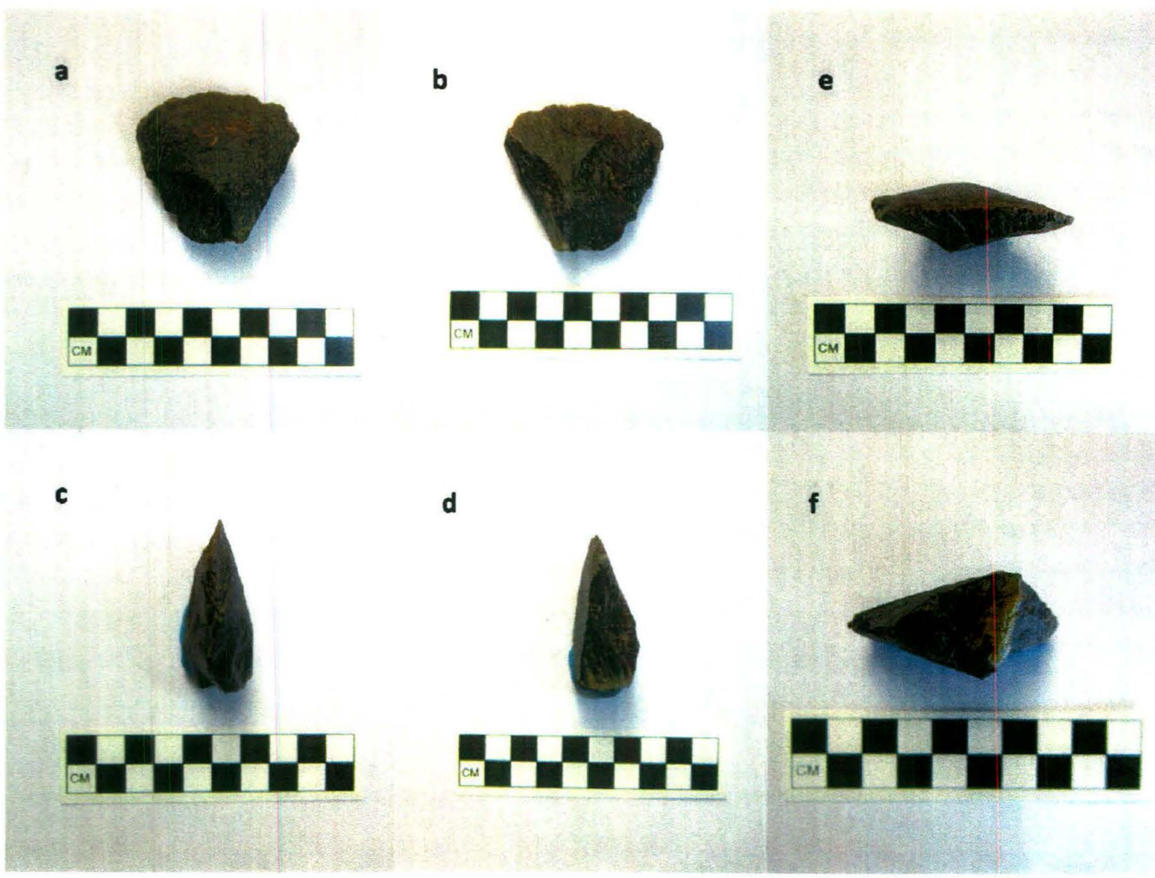
Site: Sonai Bazar | Cluster No: 82
Co-ordinates: 23°55'.923''N 91°28'.537''
Artifact No: SB4 | Core/flake/clast/blank: Flake
Basic typology: Flake | Uniface/Biface: Can't say
Final classification: Debitage | Material: Fossil-wood
Length (mm): 47.3 | Breadth (mm): 68.1 | Width (mm): 19.5
Weight (g): 67 | Flake type: VI
No. of flake scars: 0 | Invasiveness of flake scars:
Condition of the tool: Weathered | Evidence of use: No
Retouch: No | Retouch Type:
Platform type: Plain | Symmetrical/Asymmetrical: Symmetrical
Notes: Triangular ventral and dorsal sides, elliptical cross-section, tapered baguette lateral sides, snapped at the top.



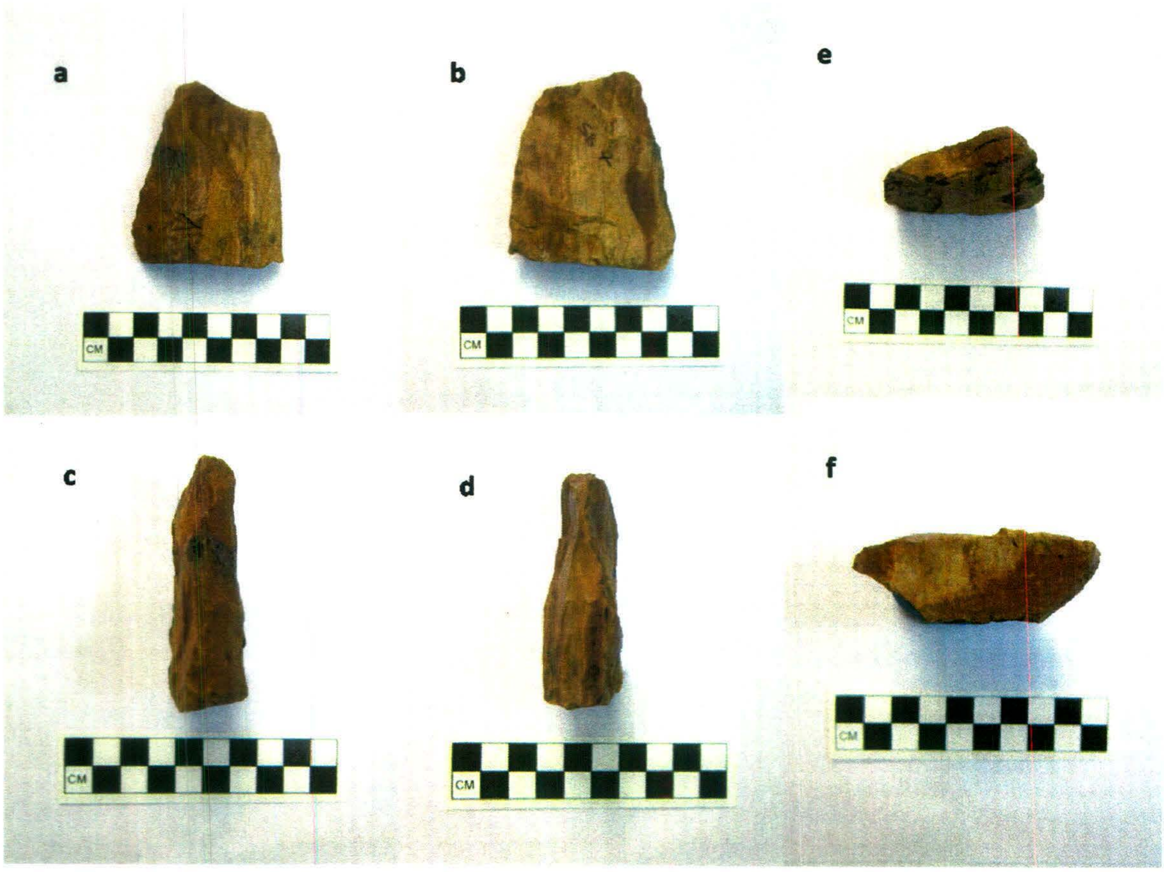
Site: Sonai Bazar | Cluster No: 81
Co-ordinates: 23°55'.925''N 91°28'.561E
Artifact No: SB5 | Core/flake/clast/blank: Flake
Basic typology: End scraper? Cleaver-like | Uniface/Biface: Biface
Final classification: End scraper? Cleaver-like | Material: Fossil-wood
Length (mm): 48.2 | Breadth (mm): 63.4 | Width (mm): 20.4
Weight (g): 51 | Flake type: VI
No. of flake scars: 7 | Invasiveness of flake scars: High
Condition of the tool: Fresh | Evidence of use: No
Retouch: Yes | Retouch Type: Alternate retouch
Platform type: Plain | Symmetrical/Asymmetrical: Asymmetrical
Notes: Snapped at the top end/incomplete, inverted trapezoid in shape ventral and dorsal sides, triangular lateral sides, elliptical cross-section, no bulb.



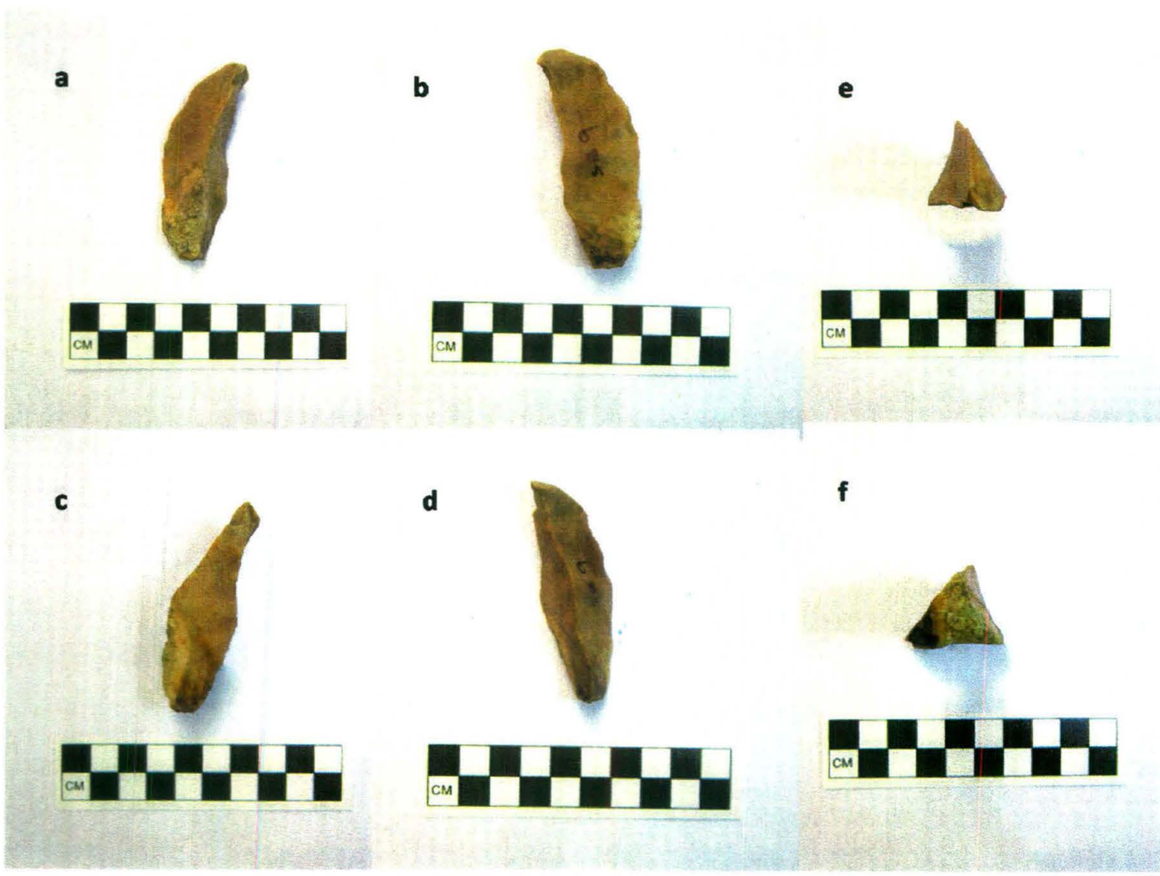
Site: Sonai Bazar
Cluster No: 81
Co-ordinates: 23°55'.925''N 91°28'.561E
Artifact No: SB6
Core/flake/clast/blank: Flake
Basic typology: Side scraper
Uniface/Biface: Biface
Final classification: Side scraper
Material: Fossil-wood
Length (mm): 51.8
Breadth (mm): 54.5
Width (mm): 22.2
Weight (g): 44
Flake type: VI
No. of flake scars: 4
Invasiveness of flake scars: High
Condition of the tool: Fresh
Evidence of use: Yes
Retouch: Yes
Retouch Type:
Platform type: Missing
Symmetrical/Asymmetrical: Asymmetrical
Notes: Pentagon ventral and dorsal sides, triangle lateral sides, elliptical cross-section, no bulb.



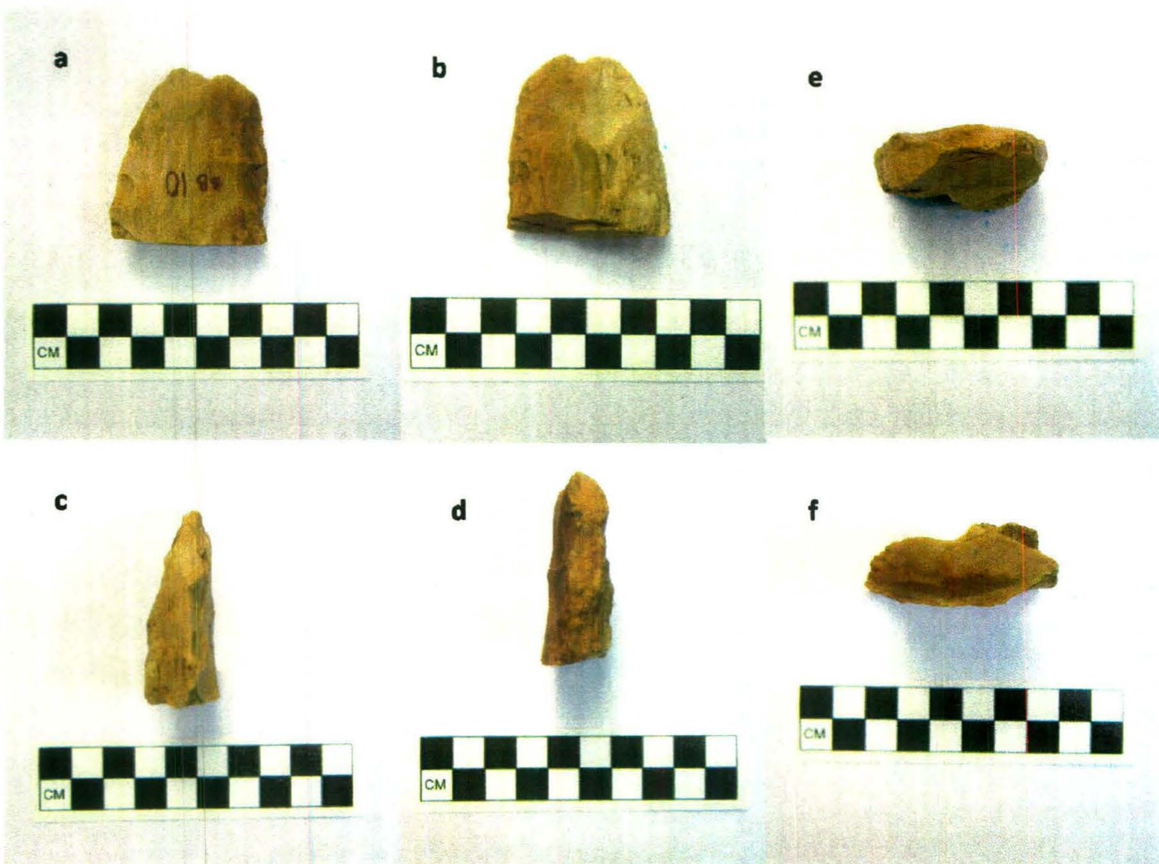
Site: Sonai Bazar | Cluster No: 82
Co-ordinates: 23°55'.923''N 91°28'.537''
Artifact No: SB7 | Core/flake/clast/blank: Flake
Basic typology: Side scraper | Uniface/Biface: Biface
Final classification: Side scraper | Material: Fossil-wood
Length (mm): 75.5 | Breadth (mm): 64.9 | Width (mm): 25.7
Weight (g): 106 | Flake type: VI
No. of flake scars: 7 | Invasiveness of flake scars: Medium
Condition of the tool: Fresh | Evidence of use: Yes
Retouch: Yes | Retouch Type: Alternate retouch
Platform type: Plain | Symmetrical/Asymmetrical: Asymmetrical
Notes: Snapped at the bottom end, inverted trapezoid ventral and dorsal sides, elongated rectagular lateral sides, semi-circle cross-section, no bulb.



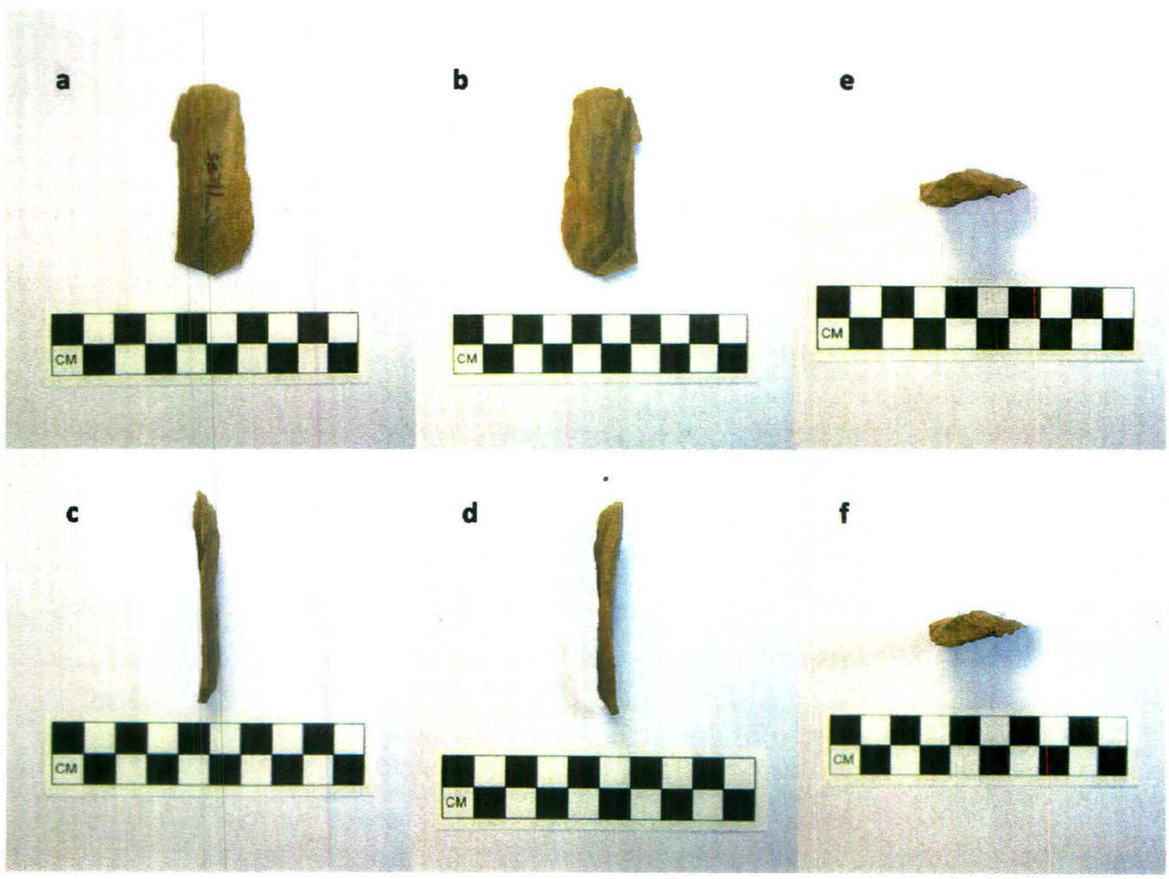
Site: Sonai Bazar Cluster No: 82
Co-ordinates: 23˚55’.923’’N 91˚28’.537’’
Artifact No: SB9 Core/flake/clast/blank: Flake
Basic typology: Knife-like Uniface/Biface: Uniface
Final classification: Knife-like Material: Fossil-wood
Length (mm): 71.2 Breadth (mm): 26.2 Width (mm): 21
Weight (g): 24 Flake type: II
No. of flake scars: 3 Invasiveness of flake scars: Low
Condition of the tool: Fresh Evidence of use: No
Retouch: No Retouch Type:
Platform type: Facetted Symmetrical/Asymmetrical: Asymmetrical
Notes: Three sided falcate shaped, triangular cross-section, cortex present at bottom corner on one side, no bulb.



Site: Sonai Bazar | Cluster No: 82
Co-ordinates: 23°55'.923''N 91°28'.537''
Artifact No: SB10 | Core/flake/clast/blank: Flake
Basic typology: Pick | Uniface/Biface: Biface
Final classification: Pick | Material: Fossil-wood
Length (mm): 50.8 | Breadth (mm): 45.3 | Width (mm): 19.4
Weight (g): 49 | Flake type: V
No. of flake scars: 7 | Invasiveness of flake scars:
Condition of the tool: Fresh | Evidence of use: Yes
Retouch: Yes | Retouch Type: Straight retouch
Platform type: Plain | Symmetrical/Asymmetrical: Asymmetrical
Notes: Snapped at the bottom, deltoid shape ventral and dorsal sides, triangular lateral sides, elliptical cross-section, no bulb.

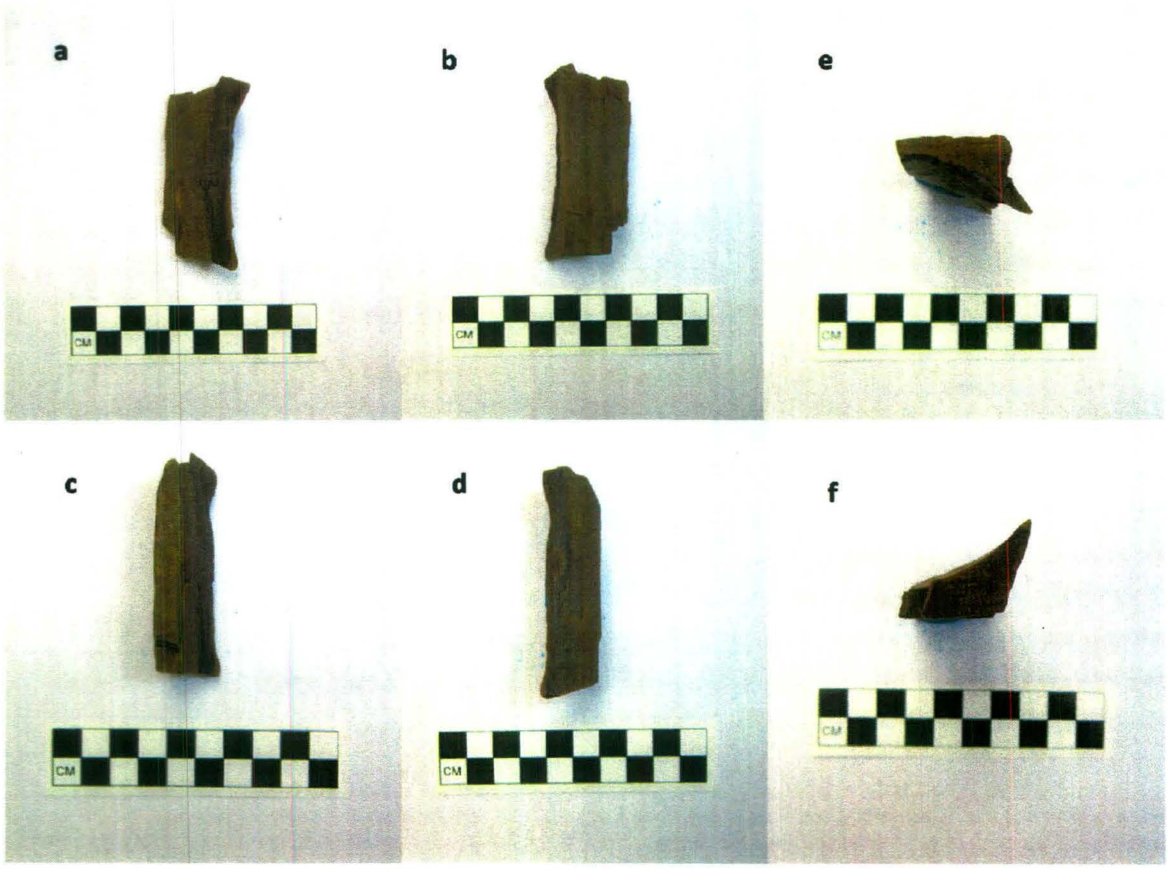


Site: Sonai Bazar | Cluster No: 81
Co-ordinates: 23°55'.925''N 91°28'.561E
Artifact No: SB11 | Core/flake/clast/blank: Flake
Basic typology: Blade-like | Uniface/Biface: Uniface
Final classification: Blade-like | Material: Fossil-wood
Length (mm): 62.1 | Breadth (mm): 30.1 | Width (mm): 7.1
Weight (g): 11 | Flake type: VI
No. of flake scars: 0 | Invasiveness of flake scars:
Condition of the tool: Fresh | Evidence of use: No
Retouch: No | Retouch Type:
Platform type: Plain | Symmetrical/Asymmetrical: Asymmetrical
Notes: Baguette ventral and dorsal sides, linear lateral sides, triangular cross-section, no bulb.

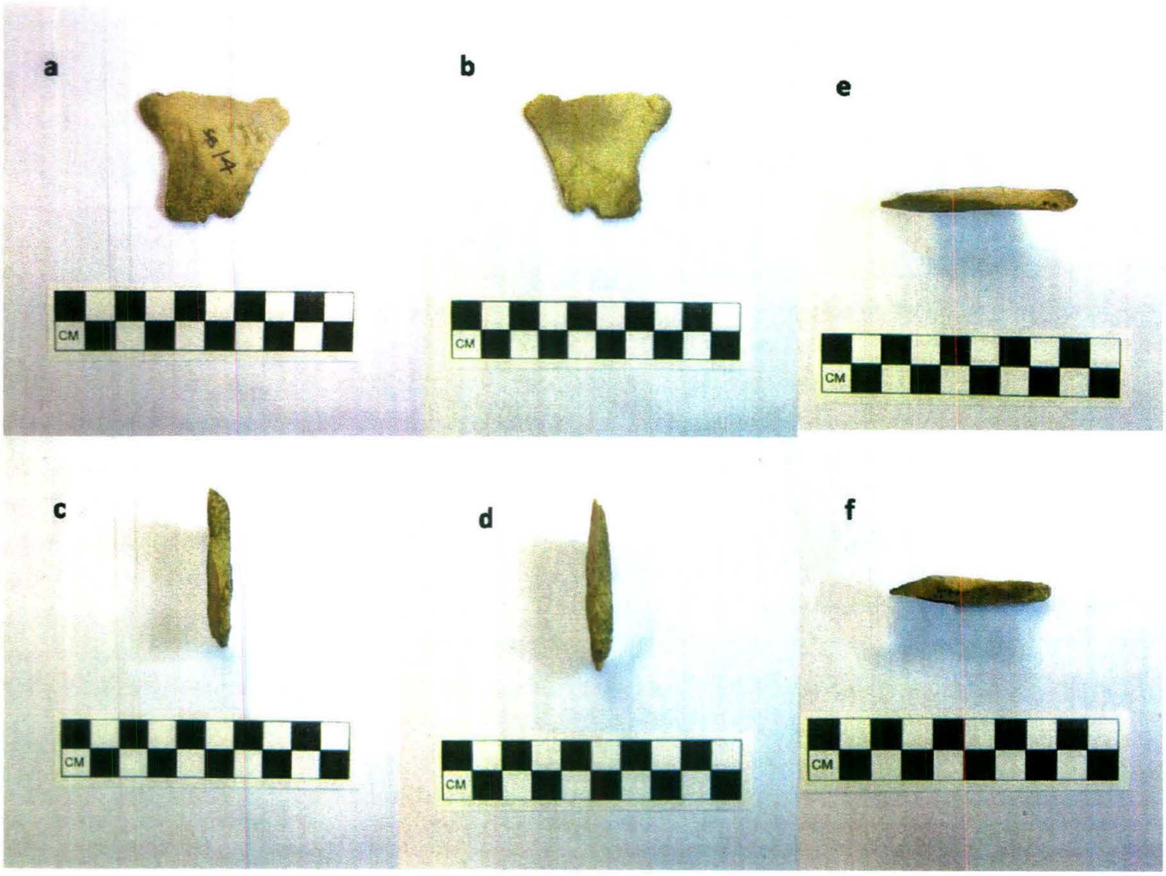


Site: Sonai Bazar
Cluster No: 80
Co-ordinates: 23˚55’.946’’N 91˚28’.561’’E
Artifact No: SB12
Core/flake/clast/blank: Flake
Basic typology: “Point” possible adze
Uniface/Biface: Biface
Final classification: “Point” possible adze
Material: Fossil-wood
Length (mm): 80.8
Breadth (mm): 43.7
Width (mm): 24.2
Weight (g): 55
Flake type: V
No. of flake scars: 14
Invasiveness of flake scars: High
Condition of the tool: Fresh
Evidence of use: Yes
Retouch: Yes
Retouch Type: Alternate retouch
Platform type: Plain
Symmetrical/Asymmetrical: Asymmetrical
Notes: Elongated pointed biface, oblong ventral and dorsal sides/lateral sides, elliptical cross-section.

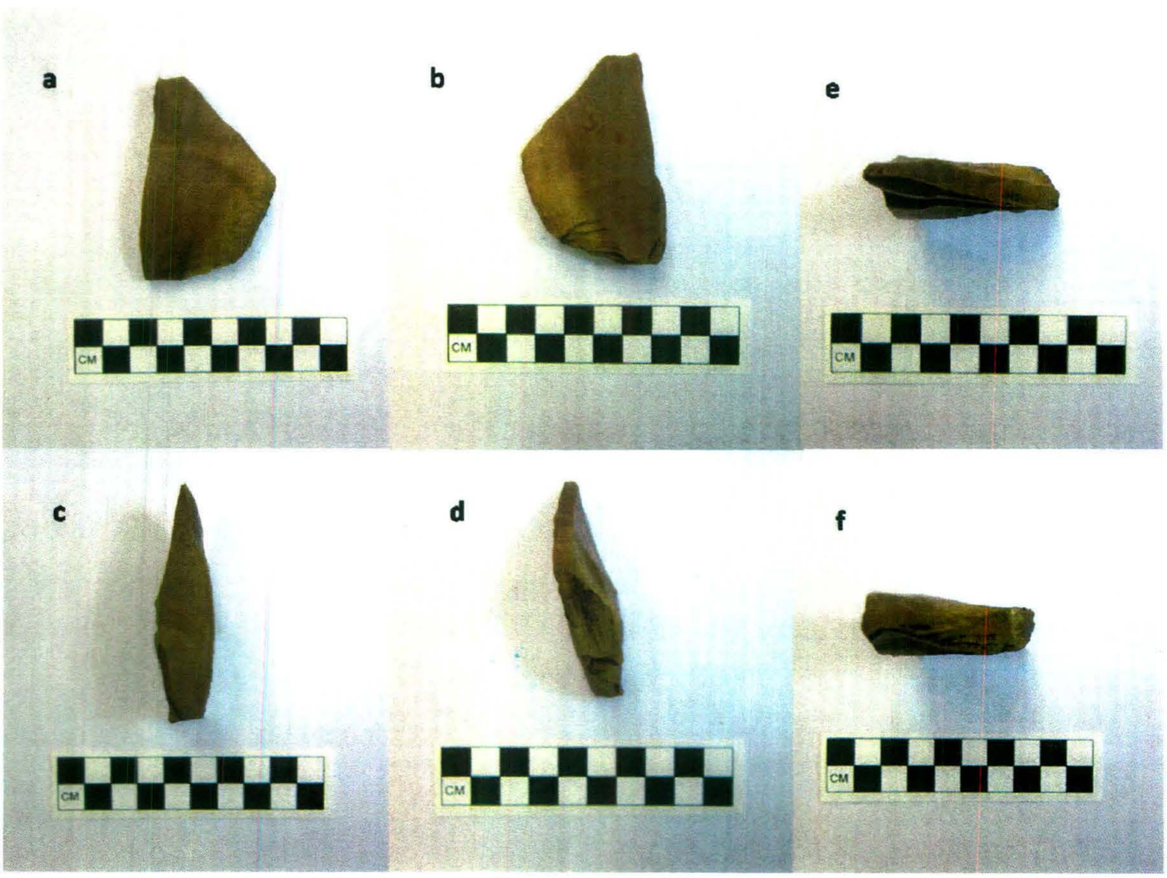
Site: Sonai Bazar
Cluster No: 80
Co-ordinates: 23°55'.946''N 91°28'.561''E
Artifact No: SB13
Core/flake/clast/blank: Flake
Basic typology: Flake blade
Uniface/Biface: Uniface
Final classification: Flake blade
Material: Fossil-wood
Length (mm): 26.6
Breadth (mm): 75
Width (mm): 28.6
Weight (g): 43
Flake type: VI
No. of flake scars: 0
Invasiveness of flake scars:
Condition of the tool: Fresh
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Plain
Symmetrical/Asymmetrical: Asymmetrical
Notes: Baguette ventral and dorsal sides, linear lateral sides, triangular cross-section, no bulb.



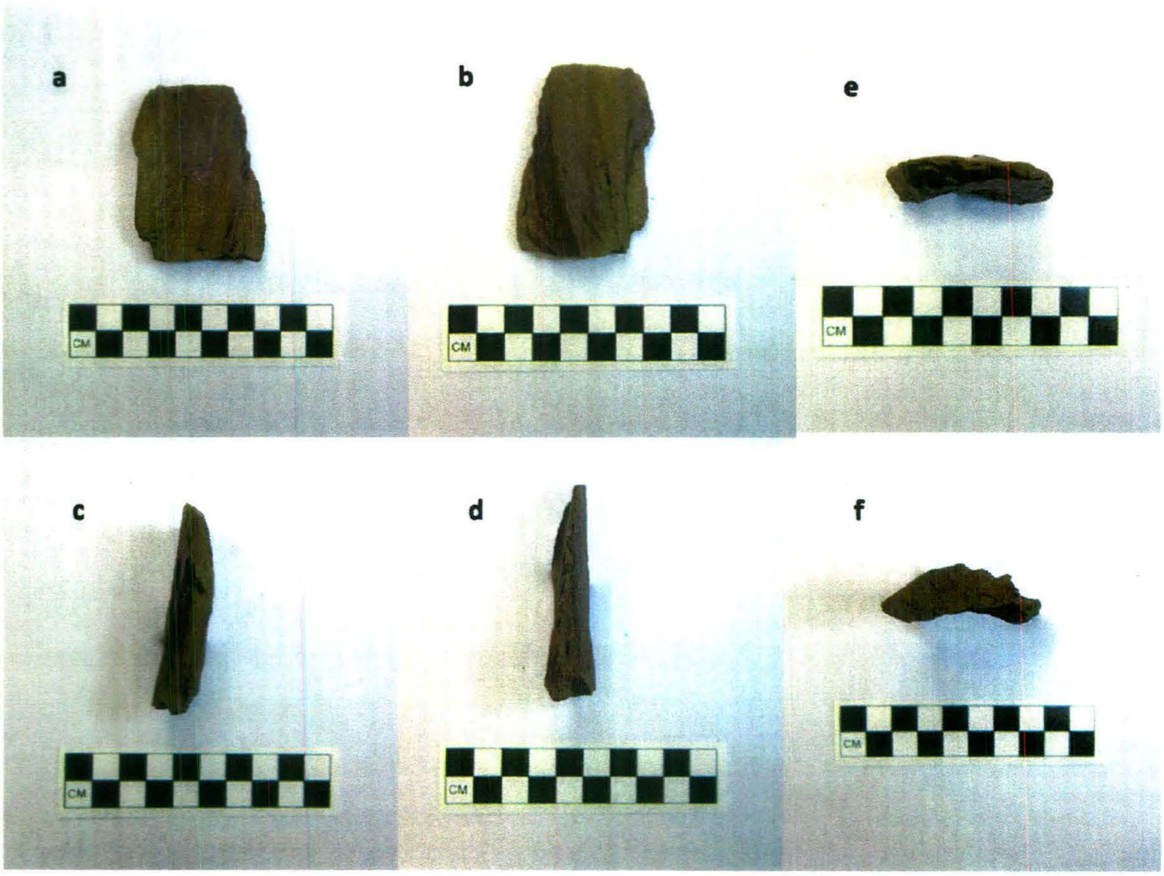
Site: Sonai Bazar | Cluster No: 82
Co-ordinates: 23°55'.923''N 91°28'.537''
Artifact No: SB14 | Core/flake/clast/blank: Flake
Basic typology: Debitage | Uniface/Biface: Uniface
Final classification: Debitage | Material: Fossil-wood
Length (mm): 42.4 | Breadth (mm): 50 | Width (mm): 7.3
Weight (g): 13 | Flake type: V
No. of flake scars: | Invasiveness of flake scars:
Condition of the tool: Weathered | Evidence of use: No
Retouch: No | Retouch Type:
Platform type: Facetted | Symmetrical/Asymmetrical: Asymmetrical
Notes: Trapezoid shape ventral and dorsal sides, linear lateral sides and cross-section, no bulb.



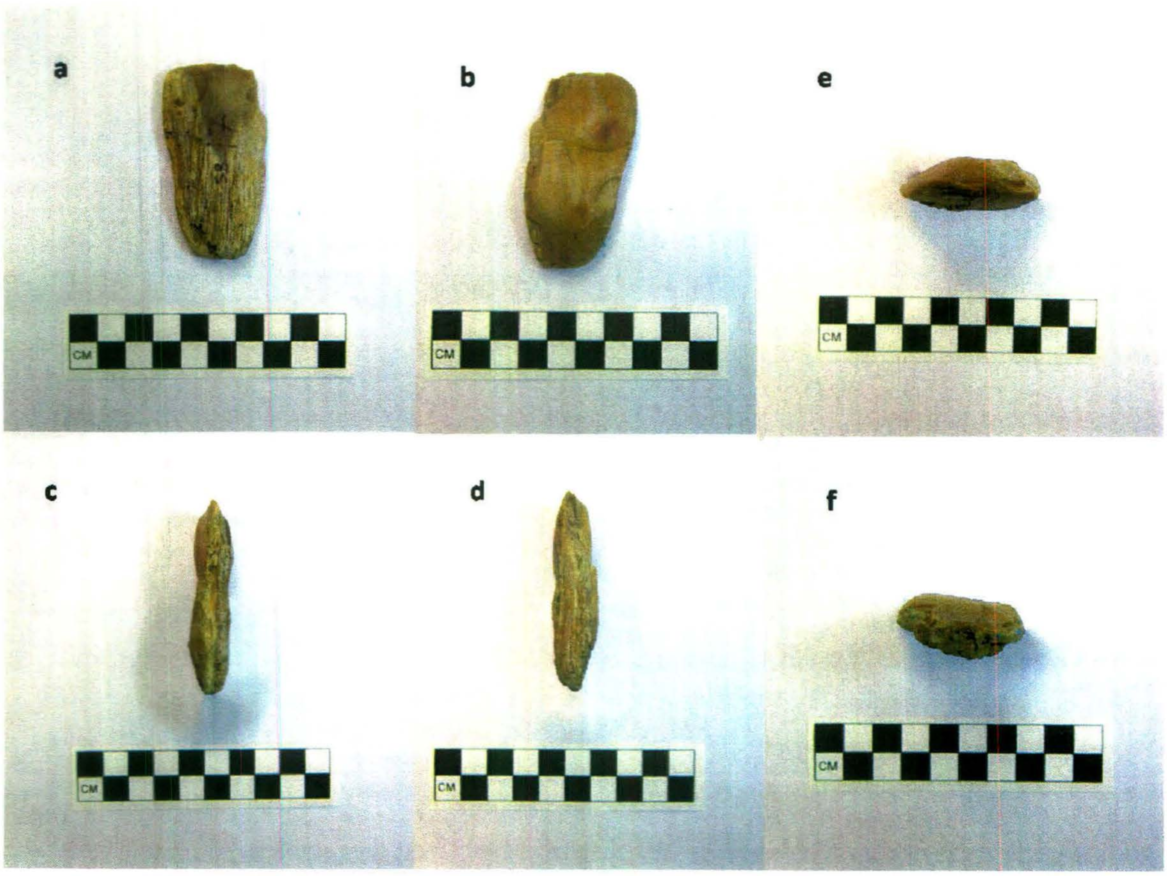
Site: Sonai Bazar Cluster No: 82
Co-ordinates: 23°55'.923''N 91°28'.537''
Artifact No: SB15 Core/flake/clast/blank: Flake
Basic typology: possibly utilized Uniface/Biface: Uniface
Final classification: possibly utilized Material: Fossil-wood
Length (mm): 69.5 Breadth (mm): 46.9 Width (mm): 20.8
Weight (g): 56 Flake type: VI
No. of flake scars: 5 Invasiveness of flake scars: Medium
Condition of the tool: Fresh Evidence of use: No
Retouch: Yes Retouch Type: Straight retouch
Platform type: Facetted Symmetrical/Asymmetrical: Asymmetrical
Notes: Split on one side, side turned trapezoid shape ventral and dorsal sides, tapered baguette cross-section, linear lateral sides, bulb present.



Site: Sonai Bazar Cluster No: 80
Co-ordinates: 23°55'.946''N 91°28'.561''E
Artifact No: SB16 Core/flake/clast/blank: Flake
Basic typology: End/Side scraper Uniface/Biface: Biface
Final classification: End/Side scraper Material: Fossil-wood
Length (mm): 65.7 Breadth (mm): 47.1 Width (mm): 18.3
Weight (g): 43 Flake type: VI
No. of flake scars: 8 Invasiveness of flake scars: High
Condition of the tool: Fresh Evidence of use: Yes
Retouch: Yes Retouch Type: Alternate/straight retouch
Platform type: Rough Symmetrical/Asymmetrical: Asymmetrical
Notes: Snapped at distal end, square shaped ventral and dorsal sides, triangle lateral sides, linear cross-section, no bulb.

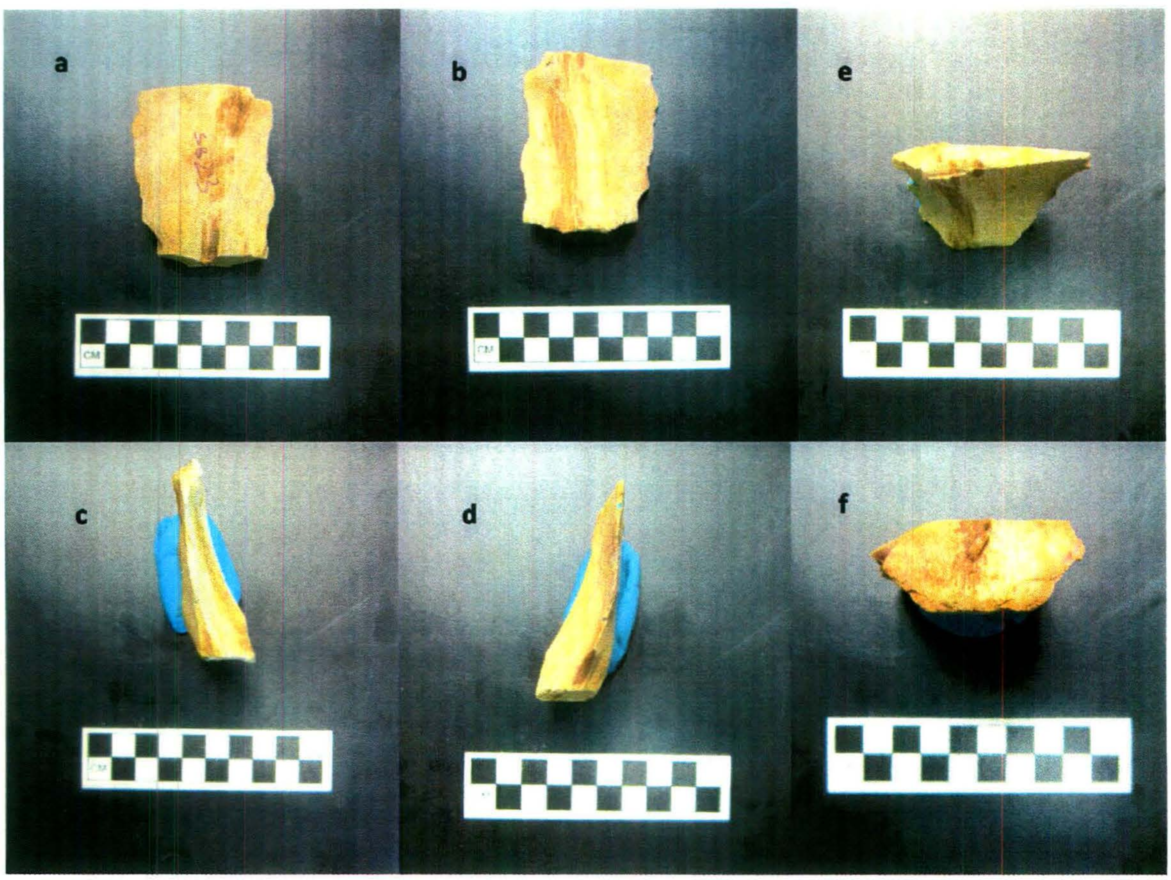


Site: Sonai Bazar
Cluster No: 82
Co-ordinates: 23°55'.923''N 91°28'.537''
Artifact No: SB17
Core/flake/clast/blank: Flake
Basic typology: Side scraper
Uniface/Biface: Biface
Final classification: Side scraper
Material: Fossil-wood
Length (mm): 68.5
Breadth (mm): 38.9
Width (mm): 15.8
Weight (g): 40
Flake type: II
No. of flake scars: 12
Invasiveness of flake scars: High
Condition of the tool: Fresh
Evidence of use: Yes
Retouch: Yes
Retouch Type: Alternate retouch
Platform type: Facetted
Symmetrical/Asymmetrical: Asymmetrical
Notes: Cortex present on the dorsal side, tapered baguette shape ventral and dorsal sides, linear lateral sides and cross-section, no bulb.



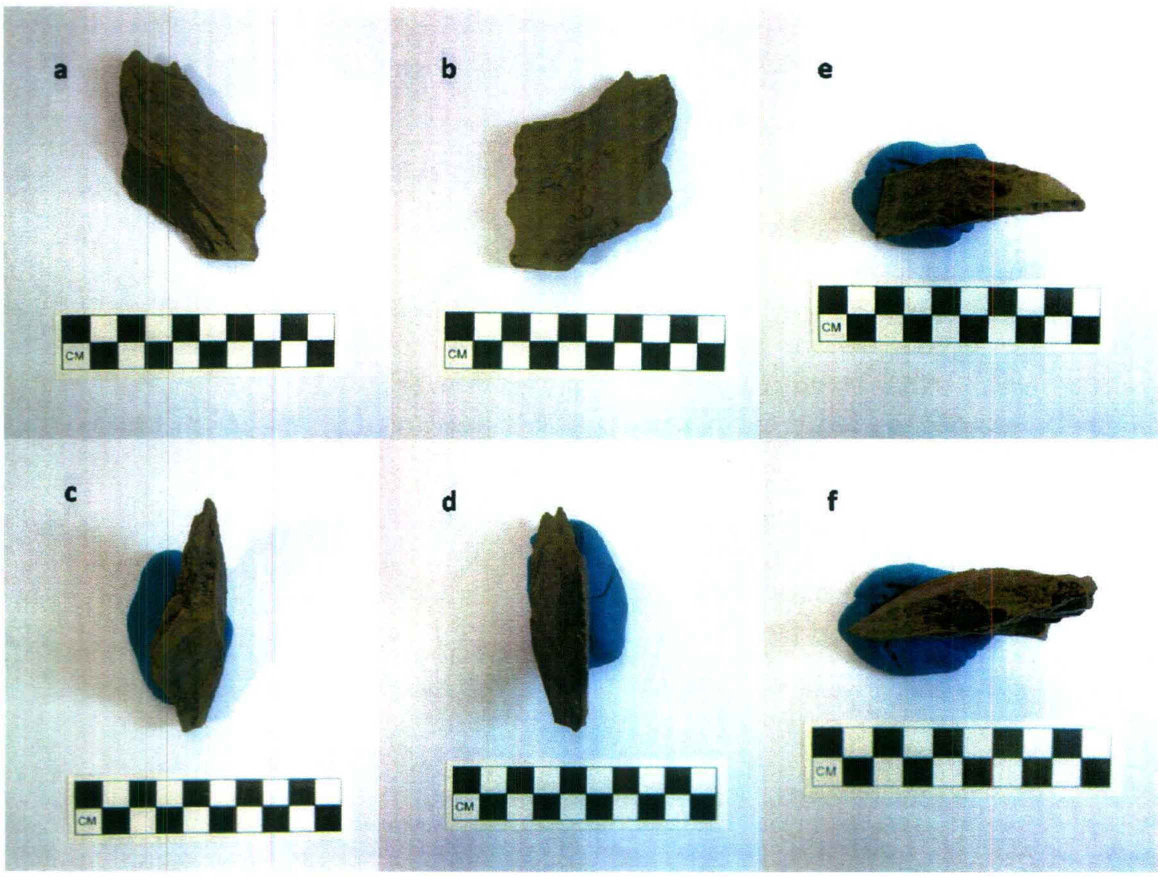
Site: Sonai Bazar
Cluster No: 81
Co-ordinates: 23°55'.925''N 91°28'.561''E
Artifact No: SB22
Core/flake/clast/blank: Flake
Basic typology: Side scraper
Uniface/Biface: Uniface
Final classification: Side scraper
Material: Fossil-wood
Length (mm): 78.6 Breadth (mm): 83.4 Width (mm): 33.9
Weight (g):130
Flake type: II
No. of flake scars: 5
Invasiveness of flake scars: High
Condition of the tool: Fresh
Evidence of use: No
Retouch: Yes
Retouch Type: Straight retouch
Platform type: Plain
Symmetrical/Asymmetrical: Asymmetrical
Notes: Trapezoid ventral and dorsal sides, triangular cross-section, rectangle lateral sides, bulb present.

Site: Sonai Bazar
Cluster No: 81
Co-ordinates: 23°55'.925''N 91°28'.561''E
Artifact No: SB23
Core/flake/clast/blank: Flake
Basic typology: Flake
Uniface/Biface: Uniface
Final classification: Flake
Material: Fossil-wood
Length (mm): 70.3 Breadth (mm): 54.1 Width (mm): 35
Weight (g): 69
Flake type: VI
No. of flake scars: 0
Invasiveness of flake scars:
Condition of the tool: Fresh
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Plain
Symmetrical/Asymmetrical: Asymmetrical
Notes: Rectangular ventral and dorsal sides, triangle lateral sides, elliptical/linear cross-section, bulb present.



Site: Sonai Bazar
Cluster No: 81
Co-ordinates: 23°55'.925''N 91°28'.561''E
Artifact No: SB24
Core/flake/clast/blank: Flake
Basic typology: Debitage
Uniface/Biface: Uniface
Final classification: Debitage
Material: Fossil-wood
Length (mm): 69.5
Breadth (mm): 85.9
Width (mm): 60.4
Weight (g): 206
Flake type: V
No. of flake scars: 0
Invasiveness of flake scars:
Condition of the tool: Fresh
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Plain
Symmetrical/Asymmetrical: Asymmetrical
Notes: Triangular in shape.

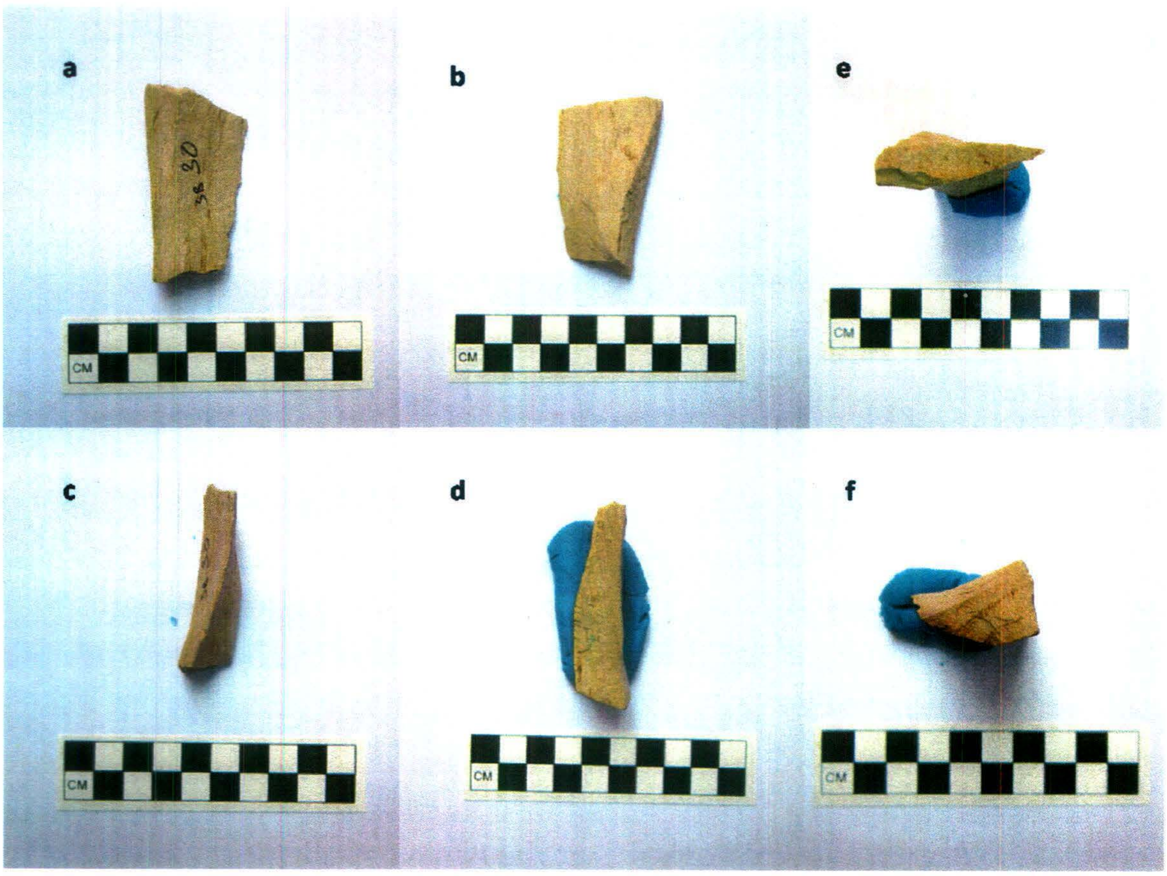
Site: Sonai Bazar Cluster No: 81
Co-ordinates: 23°55'.925''N 91°28'.561''E
Artifact No: SB28 Core/flake/clast/blank: Flake
Basic typology: Scraper Uniface/Biface: Biface
Final classification: Scraper flake Material: Fossil-wood
Length (mm): 71.1 Breadth (mm): 56.2 Width (mm): 17.1
Weight (g): 55 Flake type: VI
No. of flake scars: 9 Invasiveness of flake scars: High
Condition of the tool: Fresh Evidence of use: Yes
Retouch: Yes Retouch Type: Straight retouch
Platform type: Plain Symmetrical/Asymmetrical: Asymmetrical
Notes: Rhomboid ventral and dorsal sides, elliptical lateral sides, triangle cross-section, no bulb.



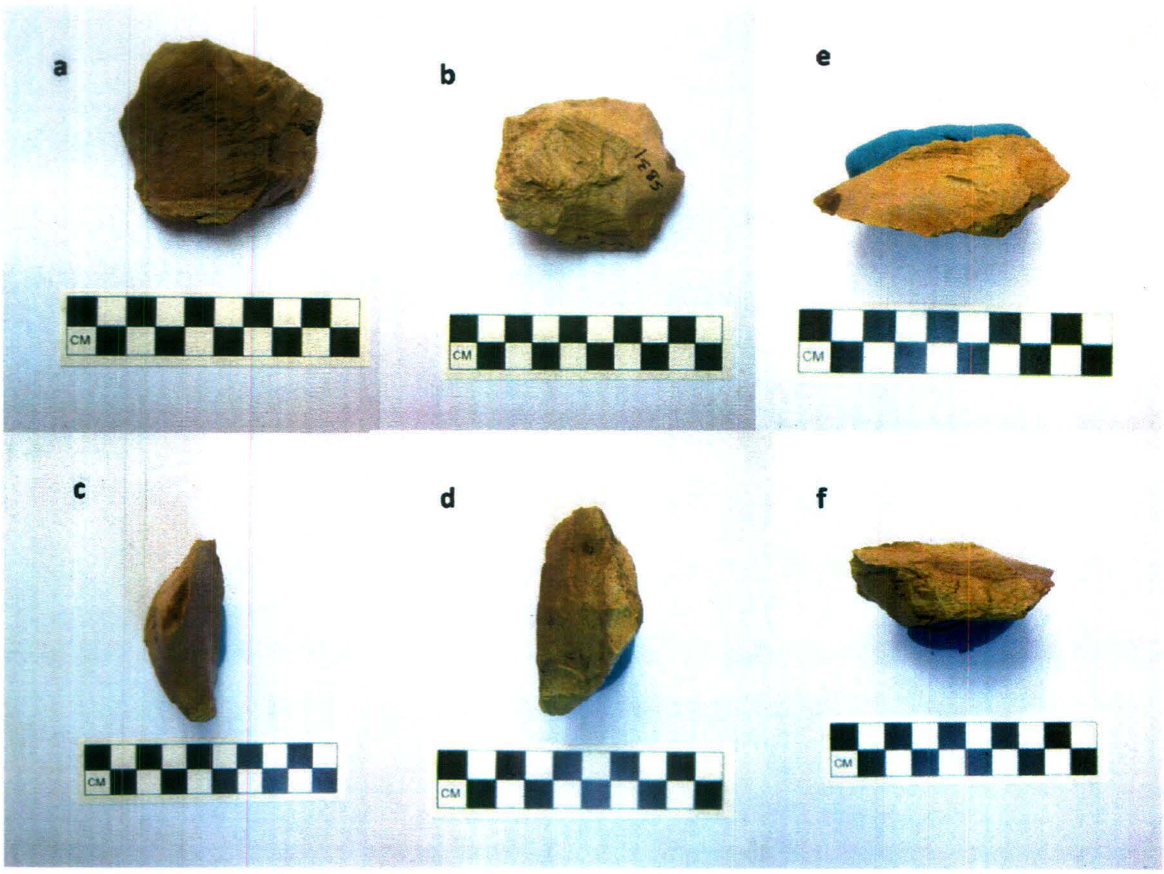
Site: Sonai Bazar | Cluster No: 81
Co-ordinates: 23°55'.925''N 91°28'.561''E
Artifact No: SB29 | Core/flake/clast/blank: Flake
Basic typology: Blade-like | Uniface/Biface: Uniface
Final classification: Blade-like | Material: Fossil-wood
Length (mm): 99.6 | Breadth (mm): 57.4 | Width (mm): 41.4
Weight (g): 102 | Flake type: III
No. of flake scars: 5 | Invasiveness of flake scars: High
Condition of the tool: Fresh | Evidence of use: Yes
Retouch: Yes | Retouch Type: Straight retouch
Platform type: Plain | Symmetrical/Asymmetrical: Asymmetrical
Notes: Rectangular ventral and dorsal sides/lateral sides, triangular cross-section, bulb present, cortex present at the top end, possibly backed blade-like.

Site: Sonai Bazar
Cluster No: 81
Co-ordinates: 23°55'.925''N 91°28'.561''E
Artifact No: SB30
Core/flake/clast/blank: Flake
Basic typology: Blade-like backed (possibly)
Uniface/Biface: Uniface
Final classification: Blade-like backed (possibly)
Material: Fossil-wood
Length (mm): 34.8
Breadth (mm): 63.7
Width (mm): 24.5
Weight (g): 31
Flake type: VI
No. of flake scars: 0
Invasiveness of flake scars:
Condition of the tool: Fresh
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Plain
Symmetrical/Asymmetrical: Asymmetrical

Notes: Trapezoid ventral and dorsal sides, triangle lateral sides, cross-section-triangle/elliptical, no bulb.

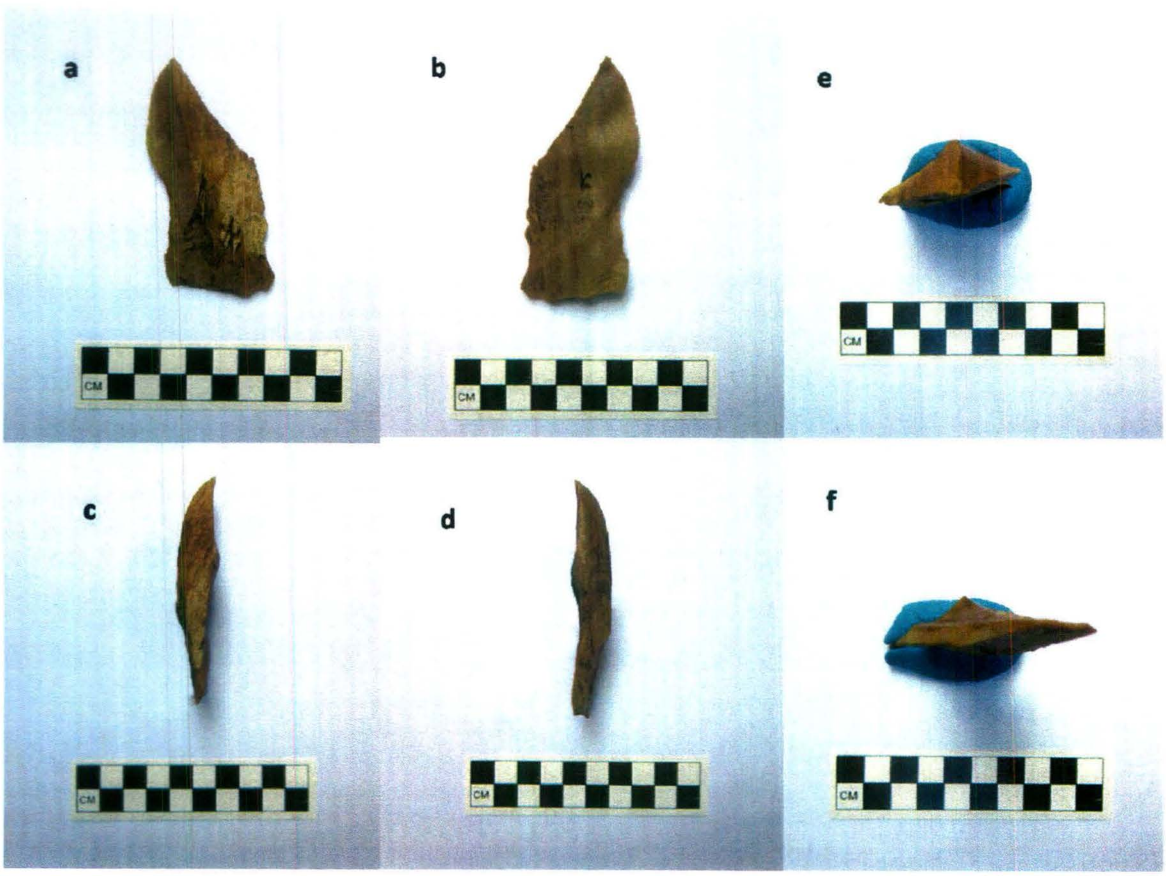


Site: Sonai Bazar
Cluster No: 80
Co-ordinates: 23°55'.946''N 91°28'.561''E
Artifact No: SB31
Core/flake/clast/blank: Flake
Basic typology: Flake (core thinning)
Uniface/Biface: Biface
Final classification: Flake (possibly utilized)
Material: Fossil-wood
Length (mm): 54.9
Breadth (mm): 63.4
Width (mm): 31.9
Weight (g): 85
Flake type: V
No. of flake scars: 5
Invasiveness of flake scars:
Condition of the tool: Fresh
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Uneven
Symmetrical/Asymmetrical: Asymmetrical
Notes: Circular in shape ventral and dorsal sides, crescent shape on one side and semi-circular lateral side on the other, elliptical cross-section, bulb present.



Site: Sonai Bazar Cluster No: 80
Co-ordinates: 23°55'.946''N 91°28'.561''E
Artifact No: SB32 Core/flake/clast/blank: Flake
Basic typology: Atypical cleaver-like Uniface/Biface: Biface
Final classification: Atypical cleaver-like Material: Fossil-wood
Length (mm): 97.7 Breadth (mm): 70.3 Width (mm): 36.6
Weight (g): 192 Flake type: V
No. of flake scars: 8 Invasiveness of flake scars:
Condition of the tool: Fresh Evidence of use: No
Retouch: No Retouch Type:
Platform type: Facetted Symmetrical/Asymmetrical: Asymmetrical
Notes: Curvilinear triangle ventral and dorsal sides, marquise lateral sides, tilde cross-section, no bulb, cortex present on the dorsal side.

Site: Sonai Bazar
Cluster No: 80
Co-ordinates: 23°55'.946''N 91°28'.561''E
Artifact No: SB36
Core/flake/clast/blank: Flake
Basic typology: Debitage
Uniface/Biface: Uniface
Final classification: Debitage
Material: Fossil-wood
Length (mm): 87.2
Breadth (mm): 54.5
Width (mm): 16.3
Weight (g): 40
Flake type: VI
No. of flake scars: 0
Invasiveness of flake scars:
Condition of the tool: Fresh
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: No platform
Symmetrical/Asymmetrical: Asymmetrical
Notes: Kukri knife shaped ventral and dorsal sides, elliptical lateral sides, triangle cross-section, no bulb.



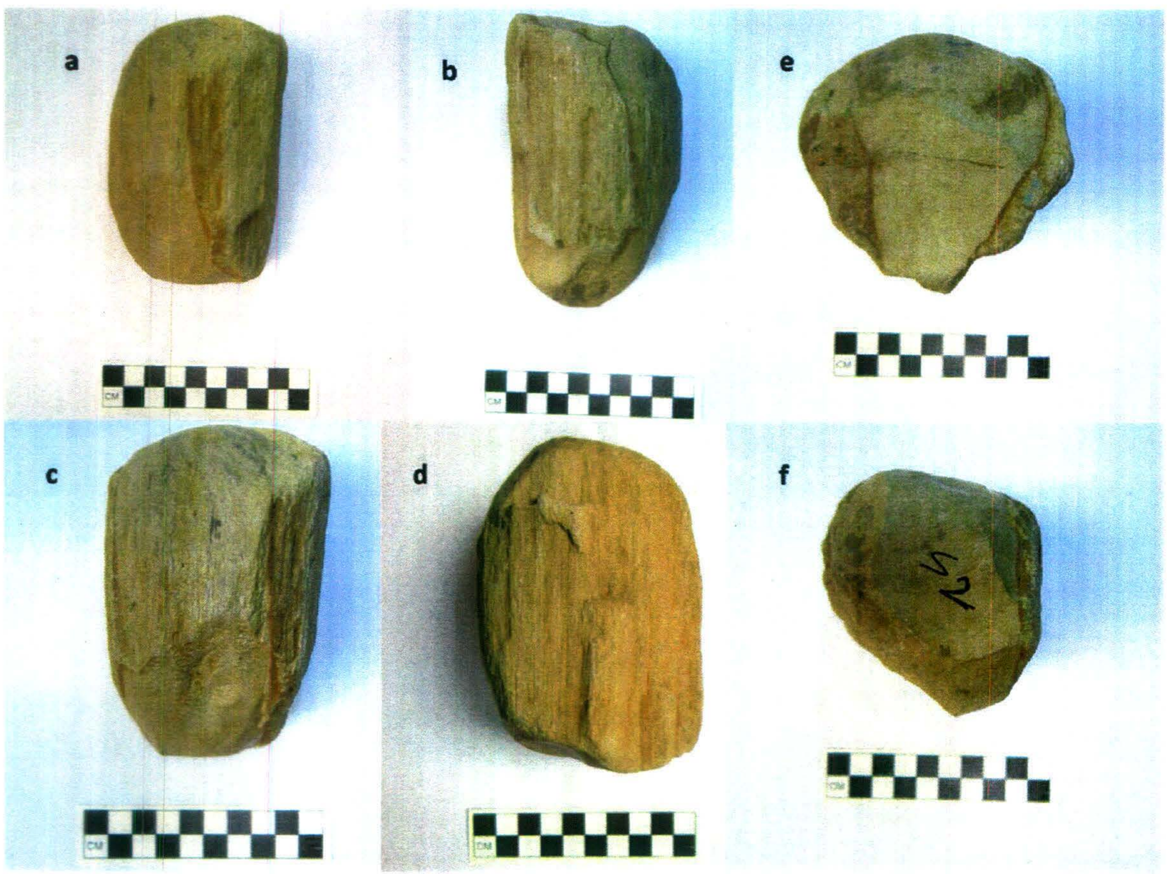
2.3.A.2: Sumili (23°55'.755''N 91°28'.555''E)

The River Sumili has fossil-wood deposits in its dried up bed on either sides of the river bank. Fossil-wood trunks, which would be about 2 to 3 metres long were seen embedded in the section of the river, which seems to have become exposed due to shifting of the river's course of flow over time. The river has a wooden bridge, which acts as a lifeline for people on either side to commute for their day-to-day life activities. There is a concrete bridge whose construction is in progress (see Figure 2.4). The Sumili River runs in between the Sonai Bazar site and Bairaigi Kami site (see Figure 2.1). This site was discovered by N.R. Ramesh.

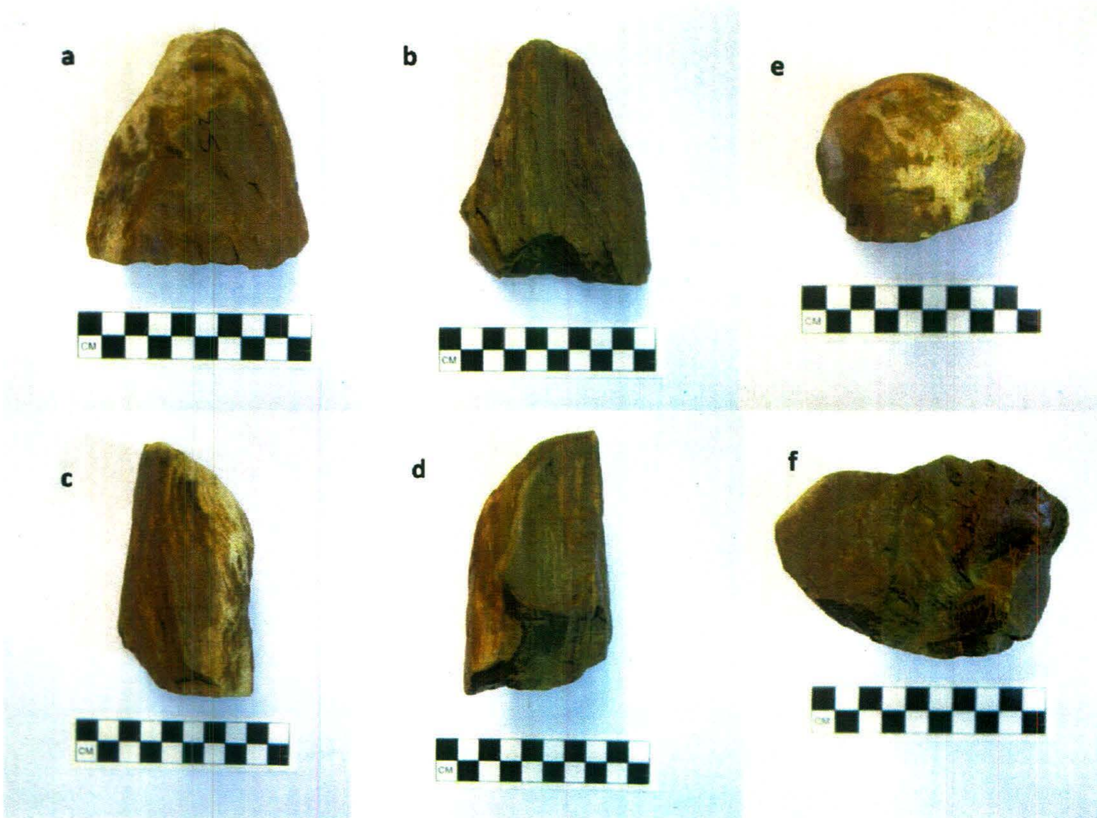
FIGURE 2.4. The Sumili River

Several collection points were noted along the Sumili River. These were 13 – 47. Tools recovered were 13, 14, 15, 16, 37, 38, 39 (grouped as cluster 2, see Figure 2.1), 17-35 (grouped as cluster 1, see Figure 2.1), 46, 47 (grouped as cluster 3, see Figure 2.1) and 36, 43, 44, 45.

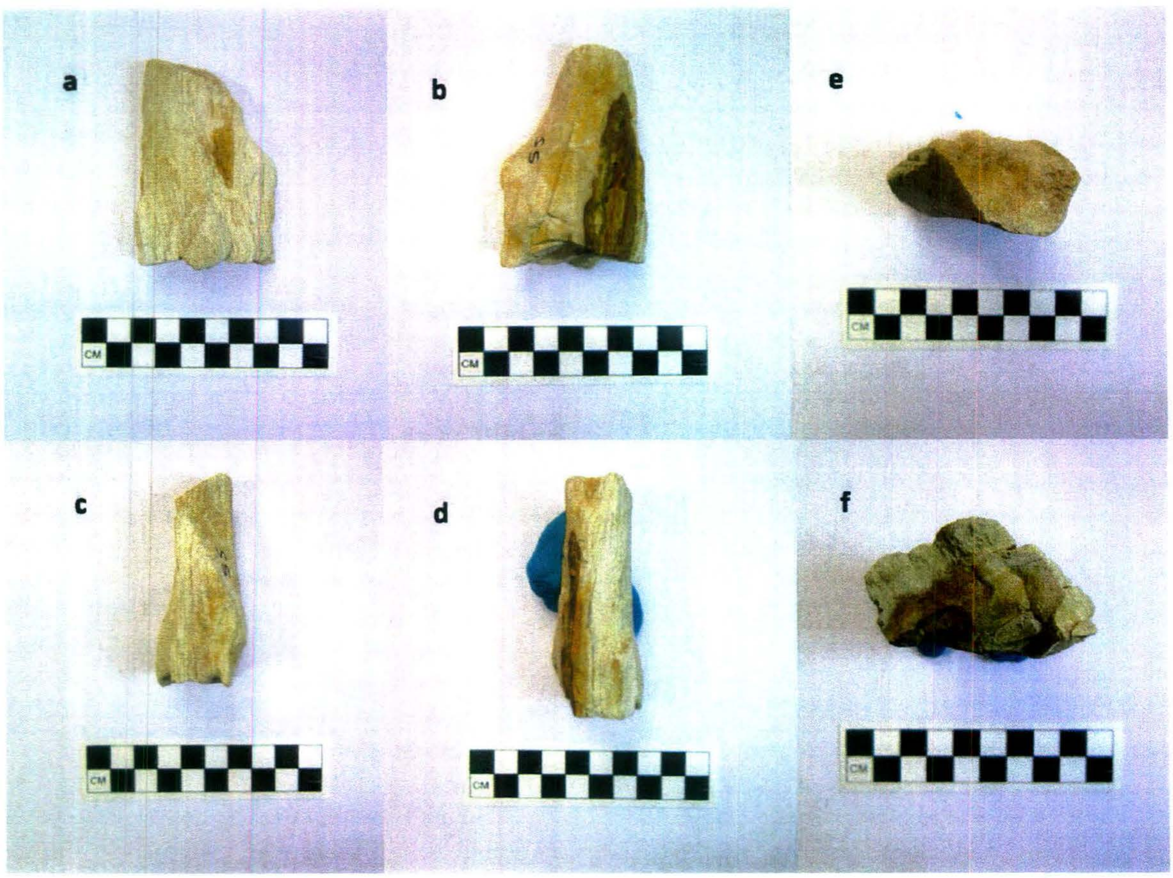
Site: Sumili Cluster No: 46
Co-ordinates: 23^{0}55'.919''N 91^{0}28'.652''E
Artifact No: S2 Core/flake/clast/blank: Clast
Basic typology: Clast Final classification: Clast
Material: Fossil-wood
Length (mm): 111.5 Breadth (mm): 77.5 Width (mm): 74.3
Weight (g): 826
Condition of the tool: Rolled
Notes: Cortex retained, oblong in shape, snapped at both ends.



Site: Sumili Cluster No: 46
Co-ordinates: 23^{0}55’.919’’N 91^{0}28’.652’’E
Artifact No: S3 Core/flake/clast/blank: Clast
Basic typology: Semi-coble/rolled clast Final classification: Chopper
Material: Fossil-wood
Length (mm): 89.9 Breadth (mm): 79.9 Width (mm): 52.2
Weight (g): 437
Condition of the tool: Rolled
Notes: Triangular in shape.

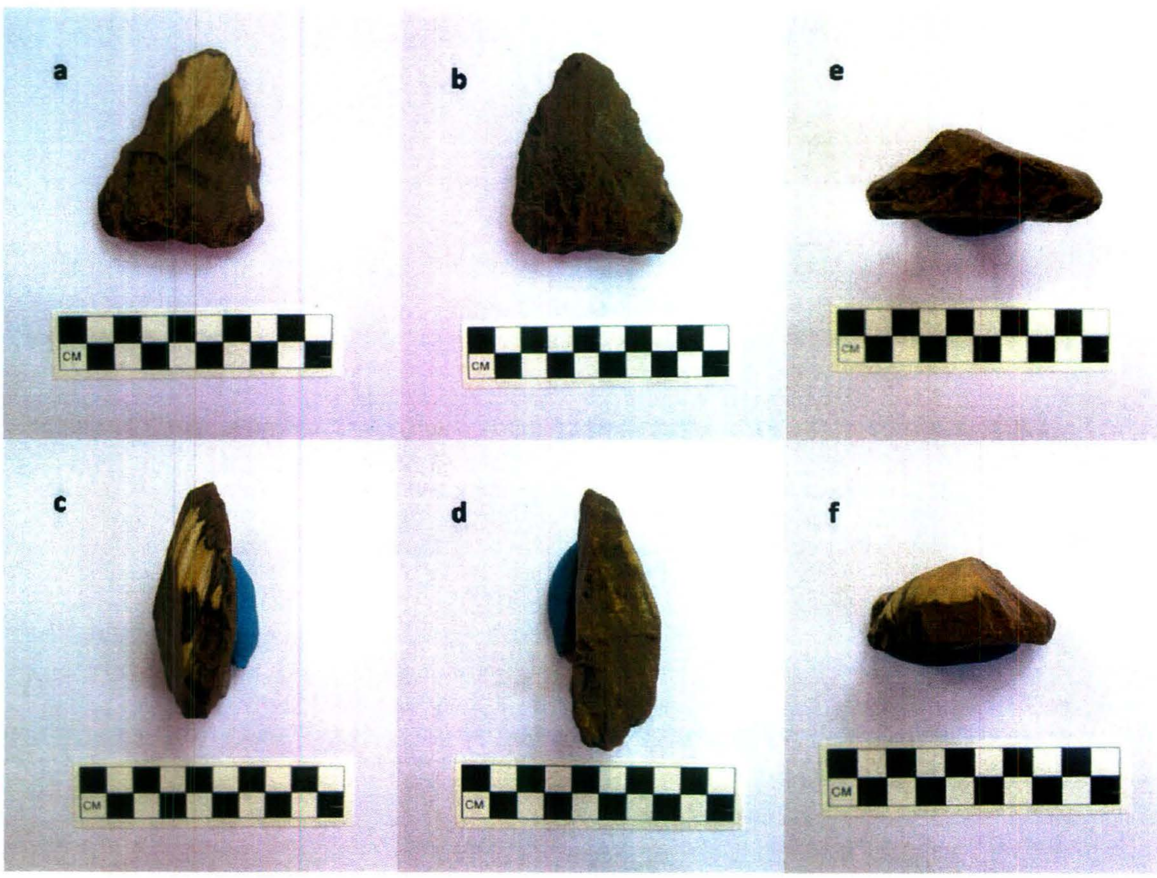


Site: Sumili
Cluster No: [1]
Co-ordinates:
Artifact No: S5
Core/flake/clast/blank: Core
Basic typology: Core uniface
Final classification: Core
Material: Fossil-wood
Length (mm): 81.5
Breadth (mm): 67.4
Width (mm): 34.5
Weight (g): 138
No. of flake scars: 1
Invasiveness of flake scars:
Condition of the tool: Rolled
Evidence of use: Can't say
Retouch: No
Retouch Type:
Platform type: Plain
Notes: Trapezoid like.



[1] For certain specimens from some of the sites, I am unable to provide details of cluster number and precise GPS coordinates as my computer hard disc crashed soon after my field survey and I lost a substantial portion of my data including photographs. I hope to rectify this during my doctoral research.

Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S6
Core/flake/clast/blank: Core
Basic typology: Side scraper biface
Final classification: Side scraper
Material: Fossil-wood
Length (mm): 71
Breadth (mm): 58.7
Width (mm): 26.4
Weight (g): 100
No. of flake scars: 19
Invasiveness of flake scars: High
Condition of the tool: Rolled
Evidence of use:
Retouch: Yes
Retouch Type: Alternate/straight retouch
Platform type: Plain
Notes: Triangular in shape.



Site: Sumili | Cluster No:

Co-ordinates:

Artifact No: S7 | Core/flake/clast/blank: Core

Basic typology: Core biface | Final classification: Core (possibly utilized)

Material: Fossil-wood

Length (mm): 65.5 | Breadth (mm): 86.5 | Width (mm): 46.6

Weight (g): 271

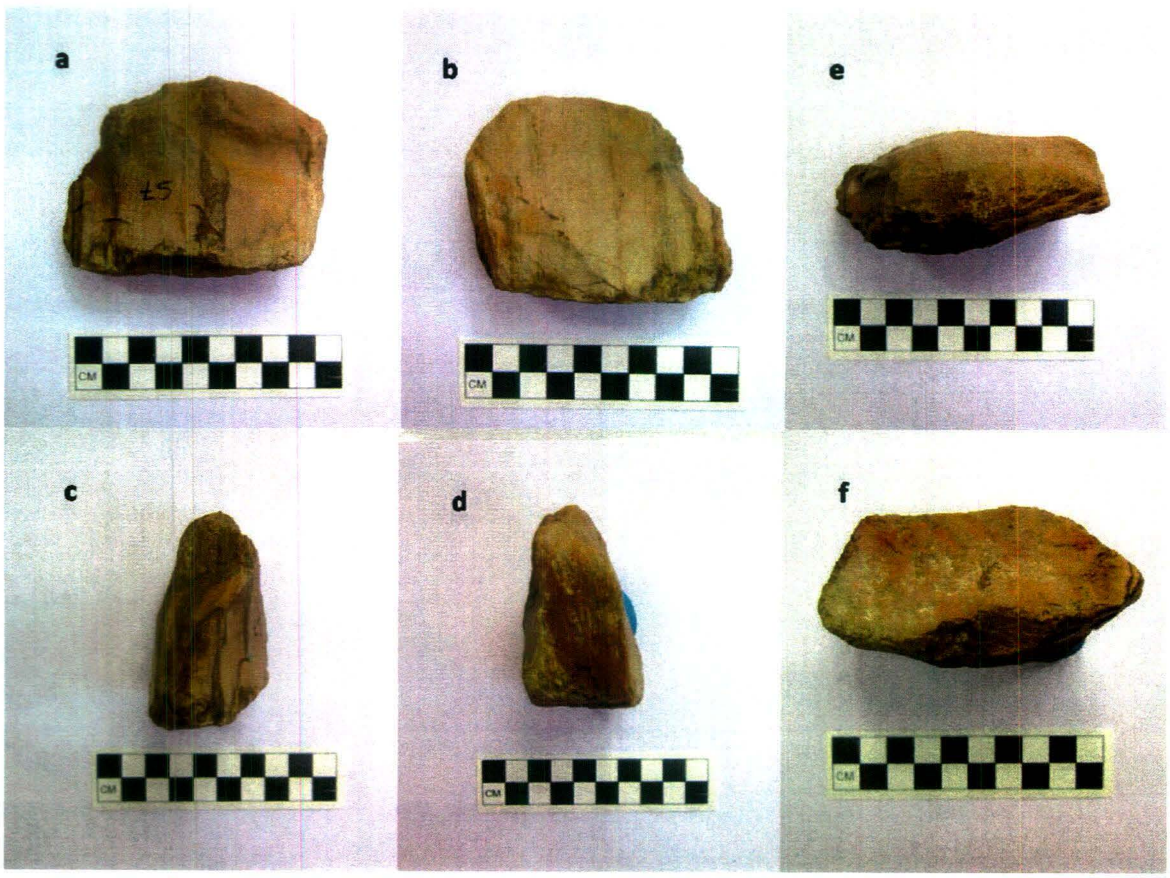
No. of flake scars: 2 | Invasiveness of flake scars: Medium

Condition of the tool: Weathered | Evidence of use: No

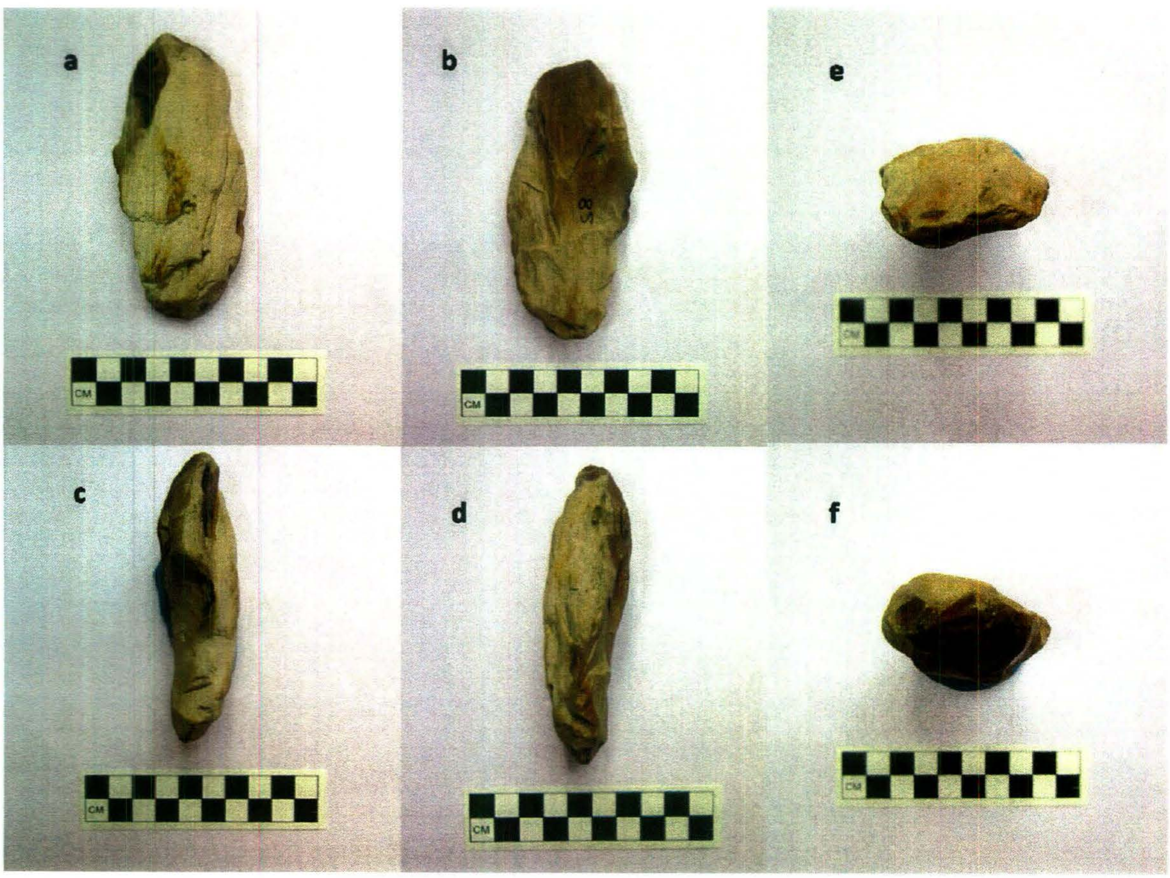
Retouch: Yes | Retouch Type: Straight retouch

Platform type: Plain

Notes: More or less semi-circular in shape, split at the top right corner.



Site: Sumili
Co-ordinates:
Cluster No:
Artifact No: S8
Core/flake/clast/blank: Core
Basic typology: Biface
Final classification: Indeterminate
Material: Fossil-wood
Length (mm): 52.6
Breadth (mm): 109.6
Width (mm): 33
Weight (g): 158
No. of flake scars: 4
Invasiveness of flake scars: High
Condition of the tool: Rolled
Evidence of use: No
Retouch: Yes
Retouch Type: Alternate retouch
Platform type: Can't say
Notes: Elliptical in shape.



Site: Sumili | Cluster No:

Co-ordinates:

Artifact No: S10 | Core/flake/clast/blank: Core

Basic typology: Core flake uniface | Final classification: Core flake

Material: Fossil-wood

Length (mm): 89 | Breadth (mm): 64.2 | Width (mm): 33.6

Weight (g): 177

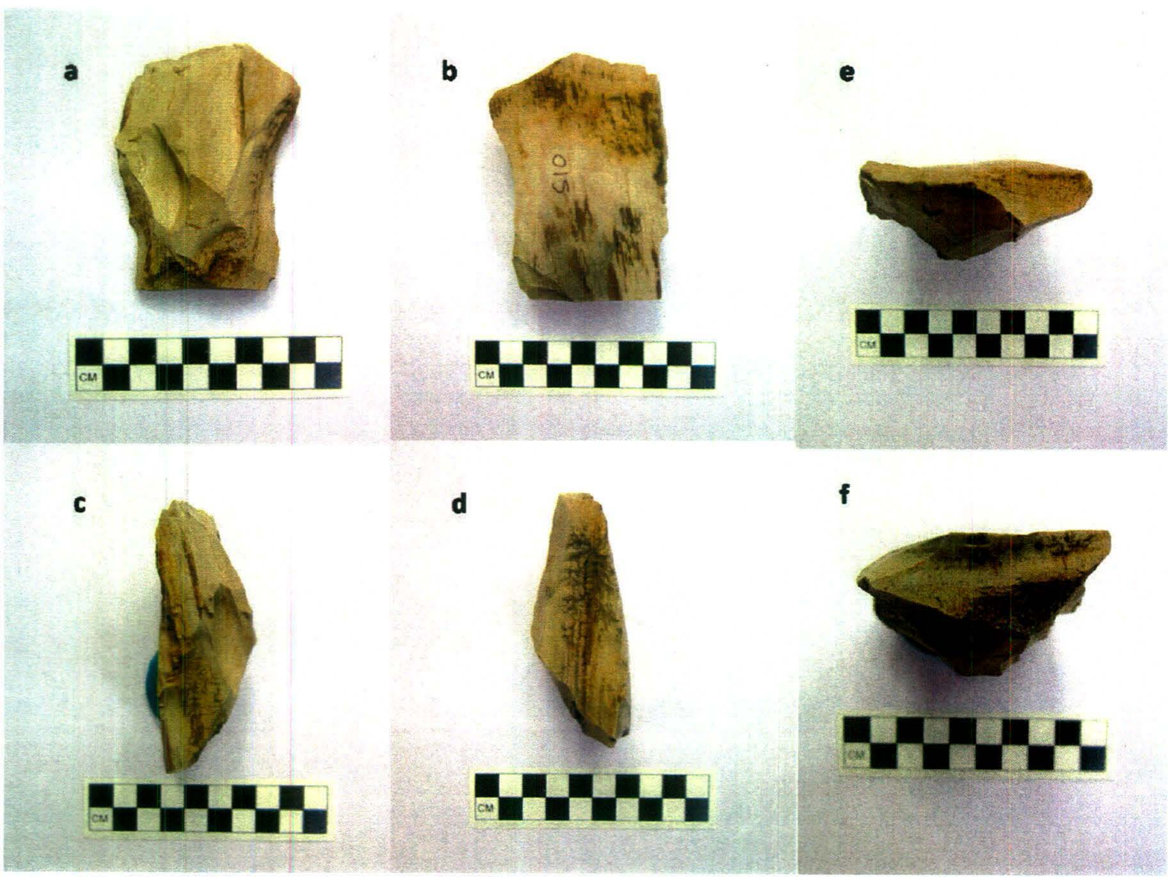
No. of flake scars: 2 | Invasiveness of flake scars:

Condition of the tool: Fresh | Evidence of use: No

Retouch: Yes | Retouch Type: Straight

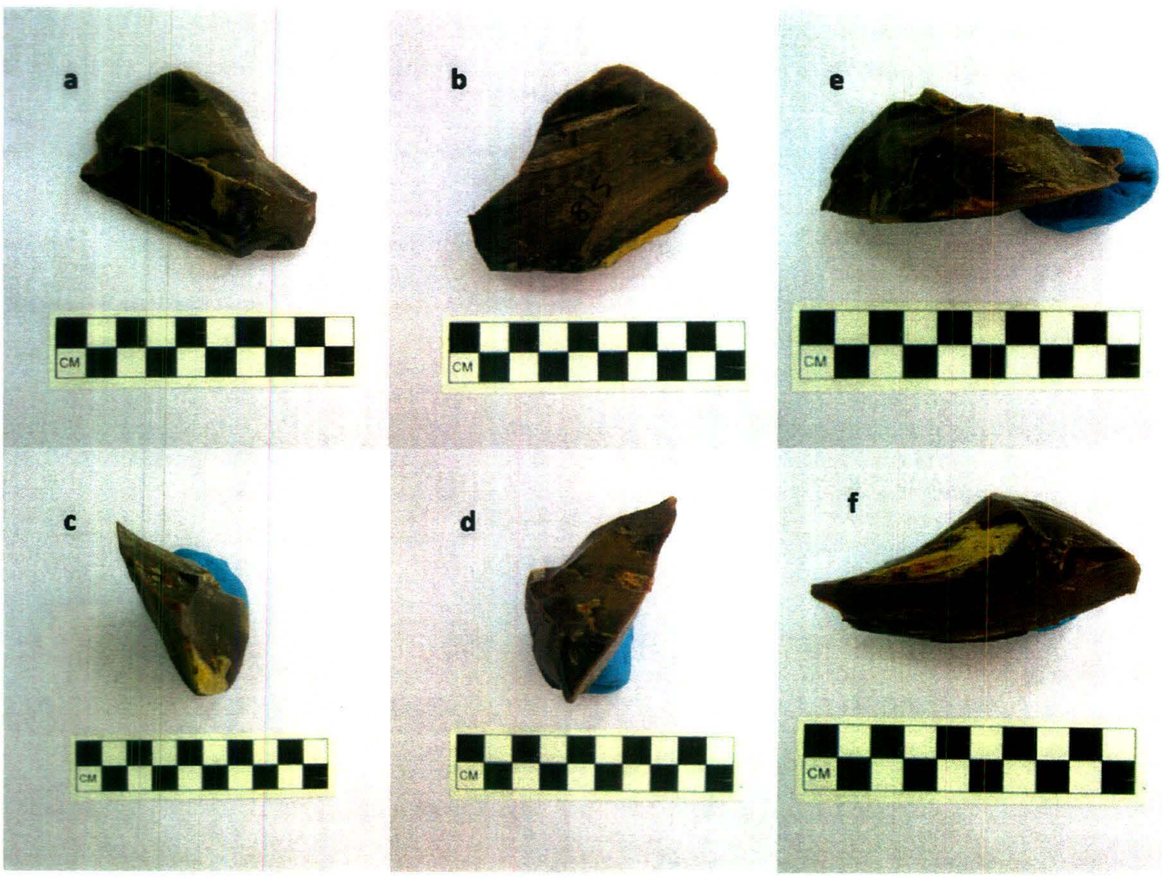
Platform type: Plain

Notes: Pentagon shaped.

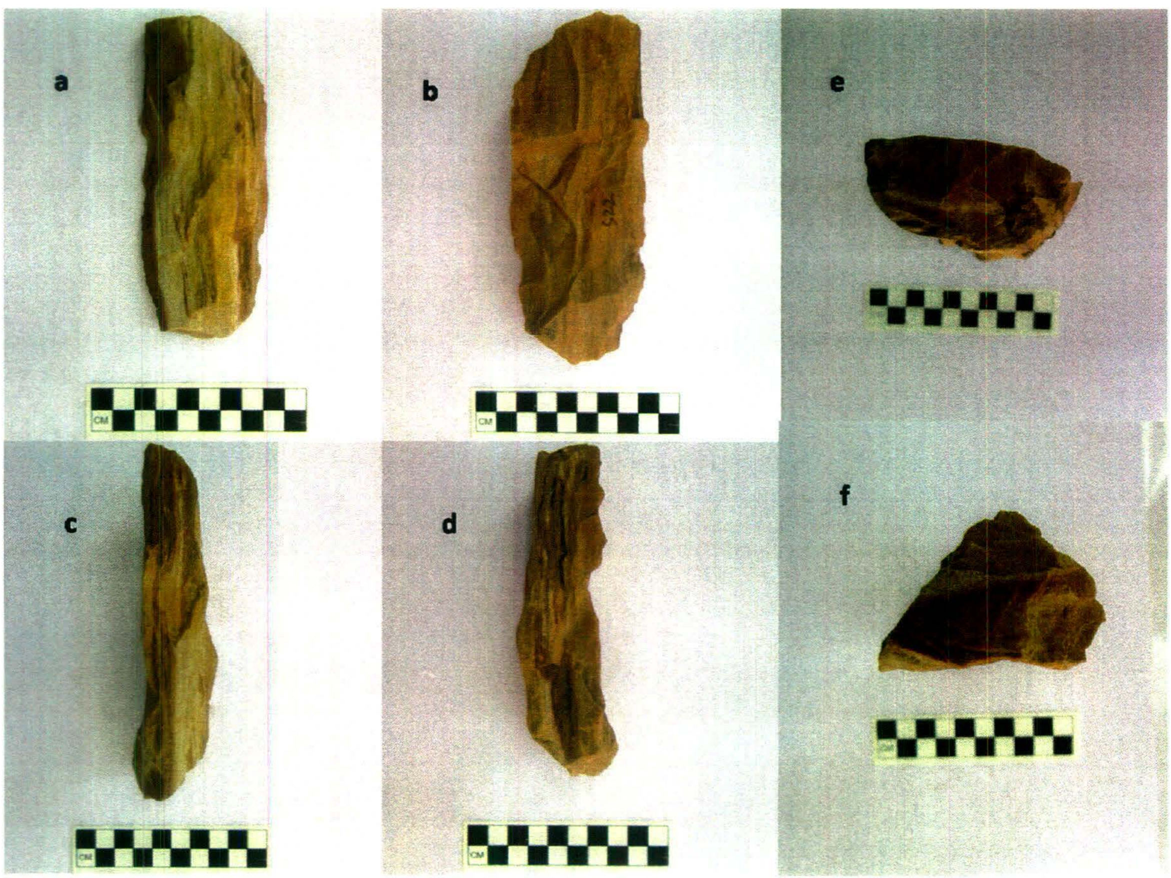


Site: Sumili | Cluster No:
Co-ordinates:
Artifact No: S16 | Core/flake/clast/blank: Core
Basic typology: Core scraper biface | Final classification: Core scraper
Material: Fossil-wood
Length (mm): 82.6 | Breadth (mm): 69.8 | Width (mm): 43.3
Weight (g): 251
No. of flake scars: 13 | Invasiveness of flake scars: High
Condition of the tool: Fresh | Evidence of use: No
Retouch: Yes | Retouch Type: Straight retouch
Platform type: No platform
Notes: Snapped at two sides, triangular in shape.

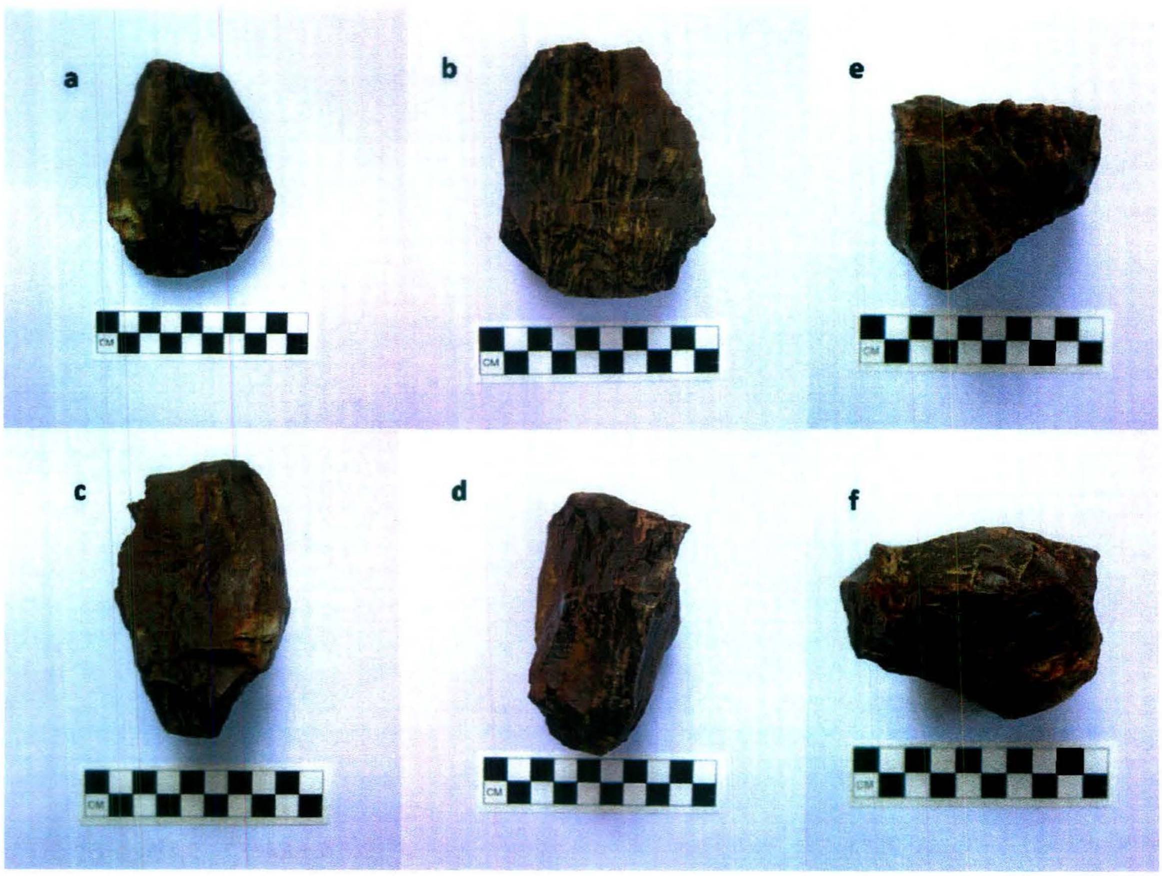
Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S18
Core/flake/clast/blank: Core
Basic typology: Core flake uniface
Final classification: Core flake
Material: Fossil-wood
Length (mm): 55.9
Breadth (mm): 75.7
Width (mm): 40.5
Weight (g): 96
No. of flake scars: 1
Invasiveness of flake scars:
Condition of the tool: Fresh
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Plain
Notes: More or less trapezoid like shape.



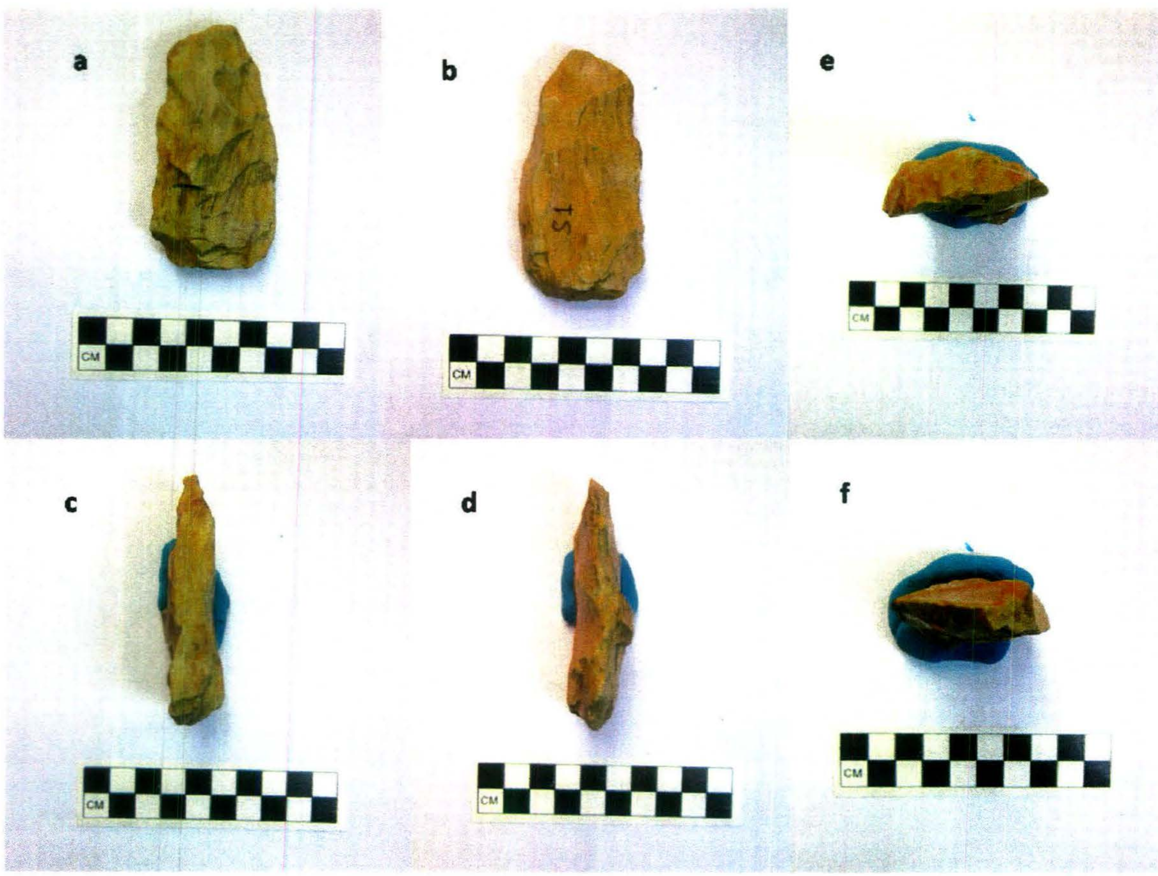
Site: Sumili | Cluster No:
Co-ordinates:
Artifact No: S22 | Core/flake/clast/blank: Core
Basic typology: Core biface | Final classification: Core
Material: Fossil-wood
Length (mm): 147.5 | Breadth (mm): 58.7 | Width (mm): 42.7
Weight (g): 313
No. of flake scars: 3 | Invasiveness of flake scars: High
Condition of the tool: Fresh | Evidence of use: No
Retouch: Yes | Retouch Type: Alternate retouch
Platform type: Uneven
Notes: Split on one side, elongated.



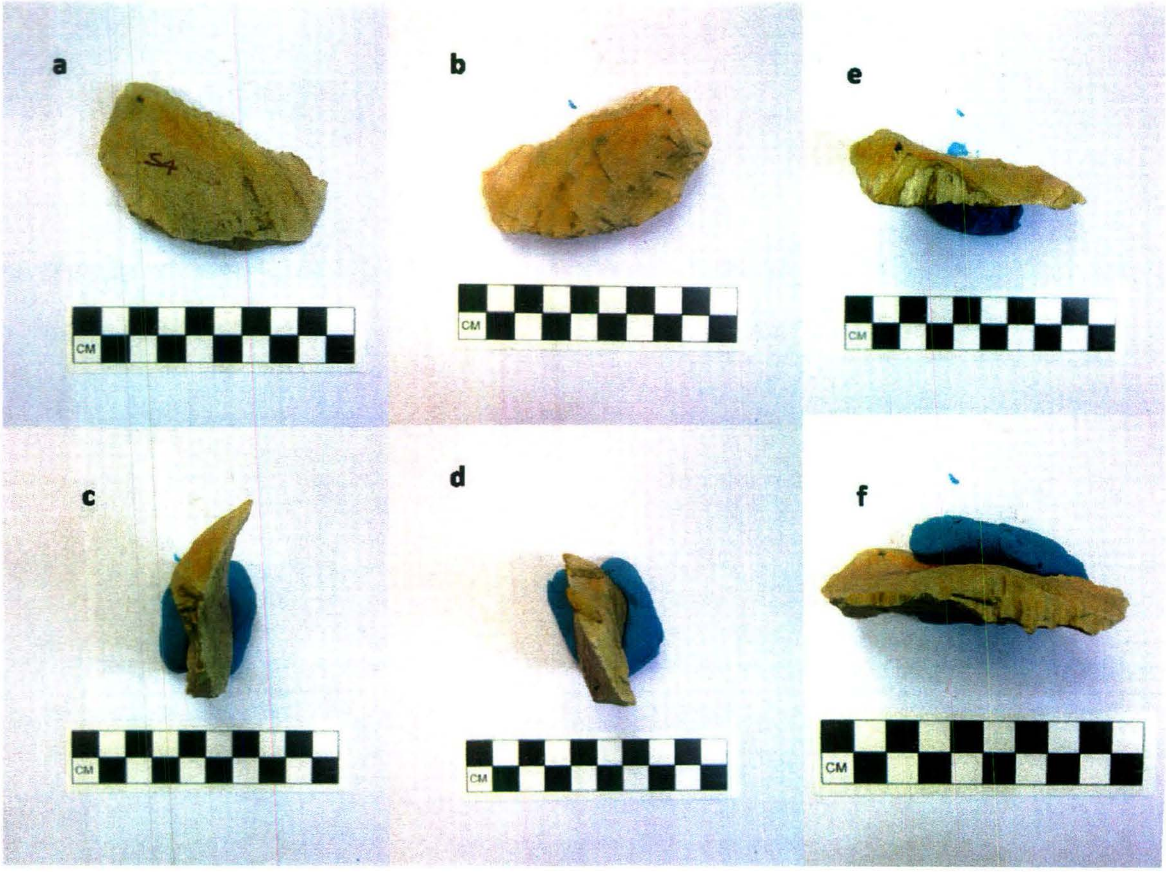
Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S28
Core/flake/clast/blank: Core
Basic typology: Core biface
Final classification: Core (possibly utilized?)
Material: Fossil-wood
Length (mm): 87.7
Breadth (mm): 69.8
Width (mm): 55.4
Weight (g): 389
No. of flake scars: 1
Invasiveness of flake scars:
Condition of the tool: Fresh
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Plain
Notes: Ovate shaped.



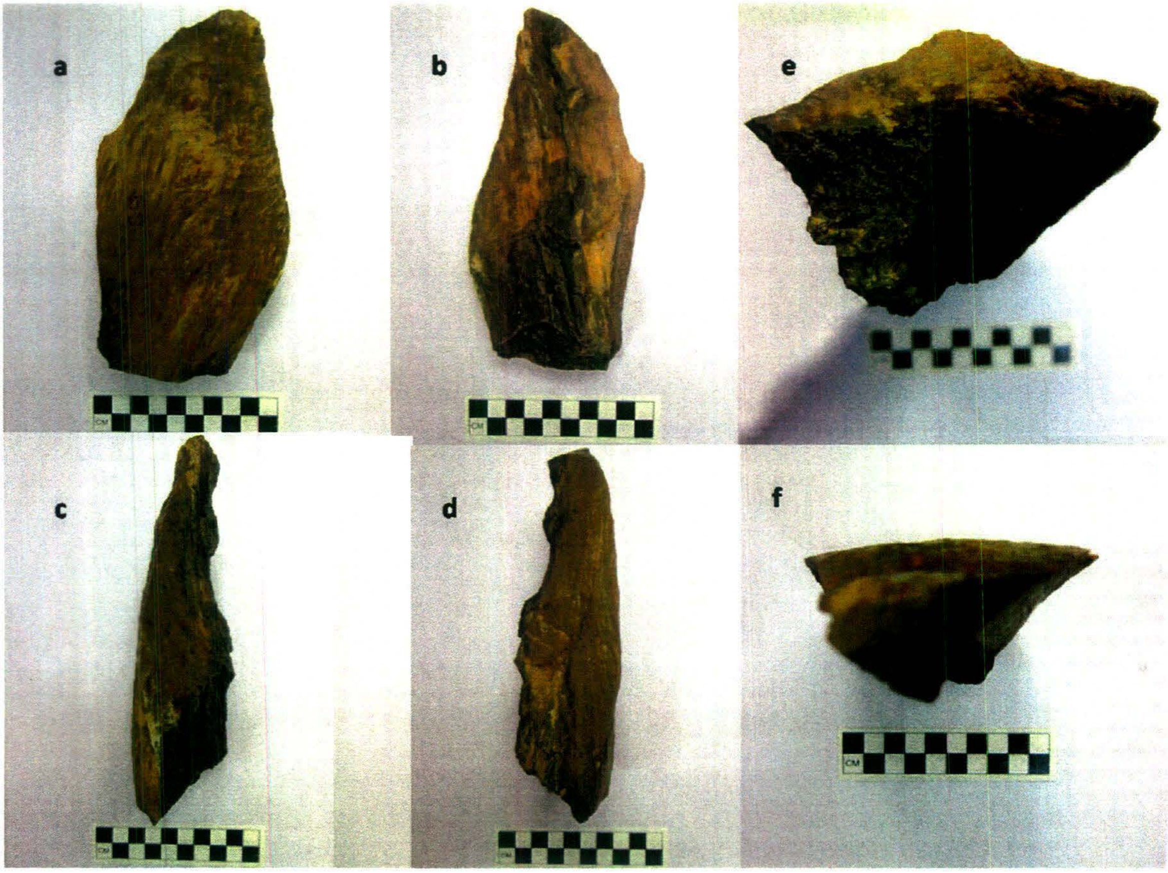
Site: Sumili | Cluster No:
Co-ordinates:
Artifact No: S1 | Core/flake/clast/blank: Flake
Basic typology: Handaxe-like | Uniface/Biface: Biface
Final classification: Handaxe-like | Material: Fossil-wood
Length (mm): 86.7 | Breadth (mm): 42.7 | Width (mm): 21.9
Weight (g): 75 | Flake type: VI
No. of flake scars: 14 | Invasiveness of flake scars: High
Condition of the tool: Rolled | Evidence of use: Can't say
Retouch: Yes | Retouch Type: Alternate retouch
Platform type: Uneven | Symmetrical/Asymmetrical: Asymmetrical
Notes: Trapezoid ventral and dorsal sides, triangle lateral sides, rectangle cross-section, no bulb.



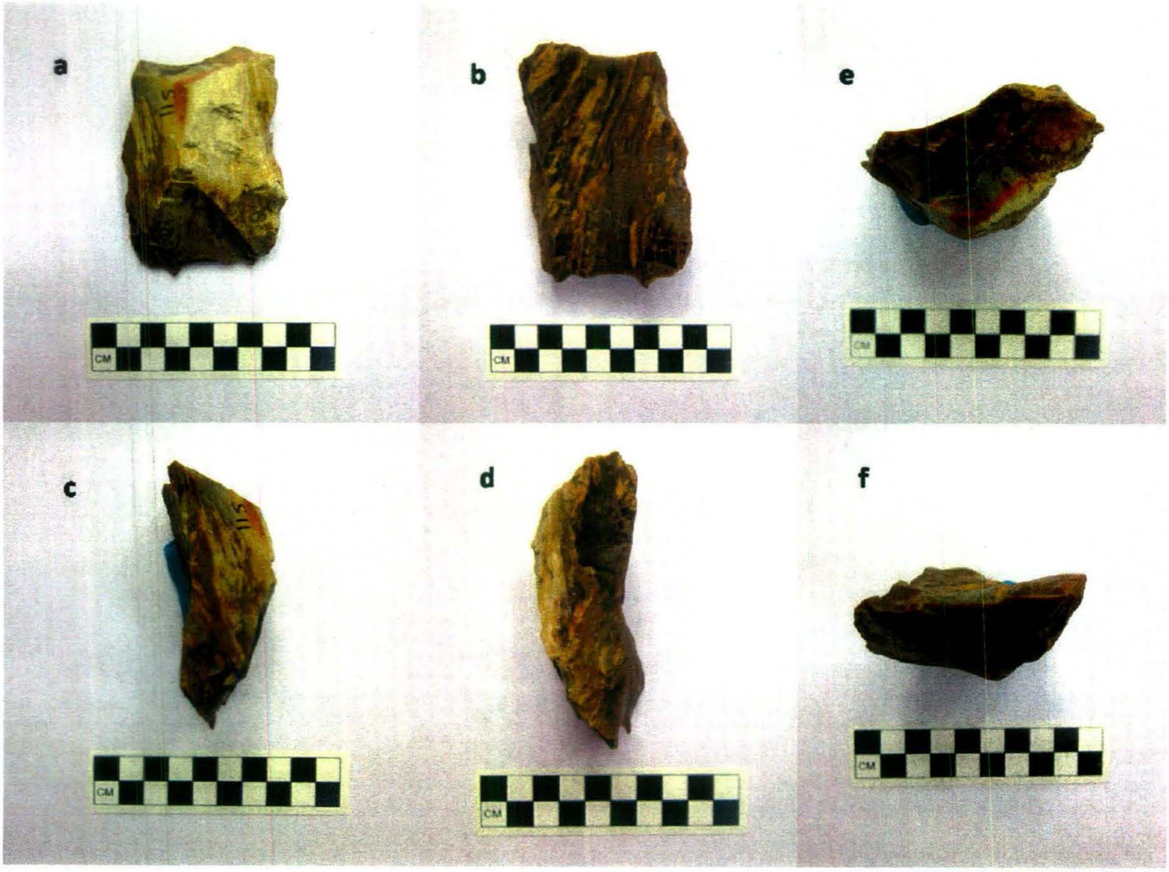
Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S4
Core/flake/clast/blank: Flake
Basic typology: Side scraper
Uniface/Biface: Uniface
Final classification: Side scraper
Material: Fossil-wood
Length (mm): 50.6
Breadth (mm): 74.3
Width (mm): 33.3
Weight (g): 43
Flake type: III
No. of flake scars: 4
Invasiveness of flake scars: High
Condition of the tool:
Evidence of use: No
Retouch: Yes
Retouch Type: Straight retouch
Platform type: Facetted
Symmetrical/Asymmetrical: Asymmetrical
Notes: Semi-circle ventral and dorsal sides, S-shaped lateral sides, tilde cross-section, bulb present.



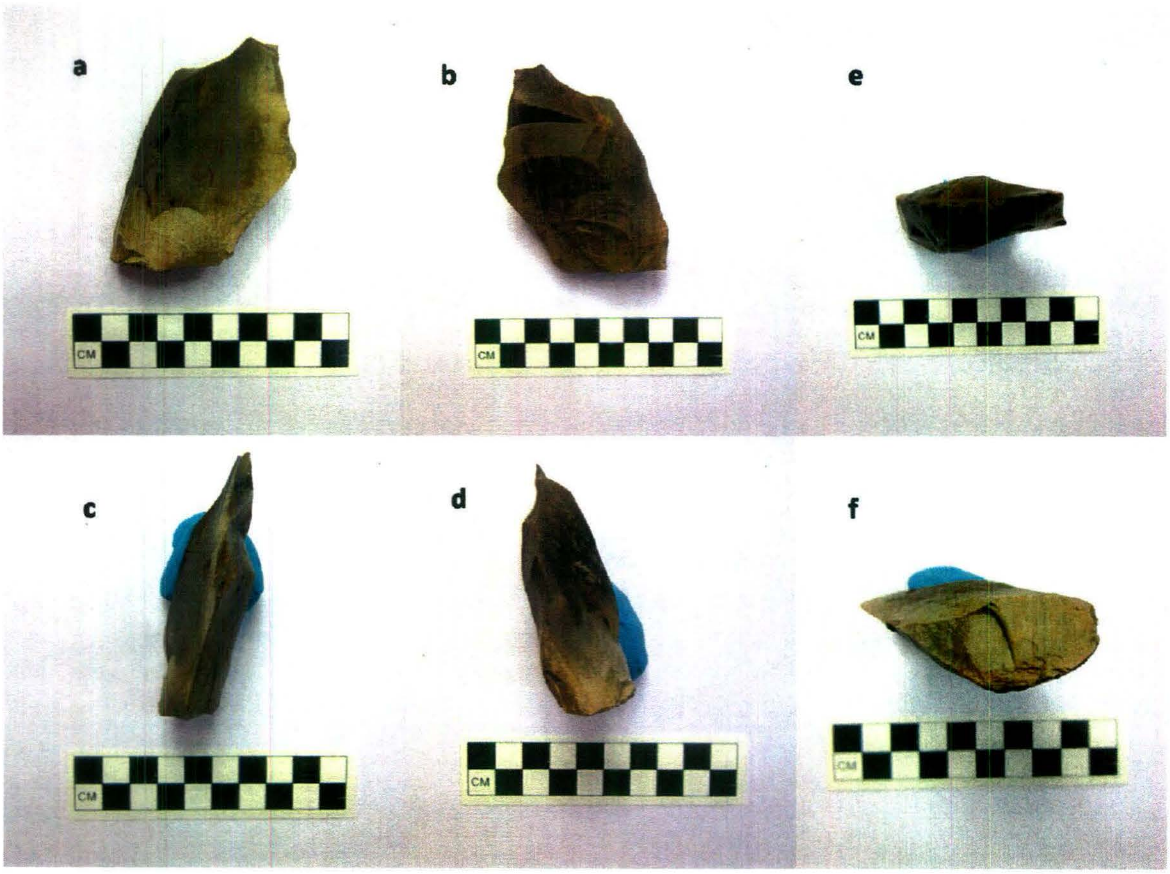
Site: Sumili | Cluster No:
Co-ordinates:
Artifact No: S9 | Core/flake/clast/blank: Flake
Basic typology: Flake (incomplete) | Uniface/Biface: Uniface
Final classification: Flake (incomplete) | Material: Fossil-wood
Length (mm): 175 | Breadth (mm): 90.1 | Width (mm): 50.2
Weight (g): 594 | Flake type: VI
No. of flake scars: 2 | Invasiveness of flake scars:
Condition of the tool: Fresh | Evidence of use: No
Retouch: No | Retouch Type:
Platform type: Rough | Symmetrical/Asymmetrical: Asymmetrical
Notes: Kukri knife shaped ventral and dorsal sides, triangle lateral sides/cross-section, bulb present.



Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S11
Core/flake/clast/blank: Flake
Basic typology: Cleaver-like
Uniface/Biface: Biface
Final classification: Cleaver-like
Material: Fossil-wood
Length (mm): 80
Breadth (mm): 92
Width (mm): 51.5
Weight (g): 172
Flake type: VI
No. of flake scars: 1
Invasiveness of flake scars:
Condition of the tool: Fresh
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Plain
Symmetrical/Asymmetrical: Asymmetrical
Notes: Parallelogram ventral and dorsal sides, triangle lateral sides/cross-section, bulb present.



Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S12
Core/flake/clast/blank: Flake
Basic typology: Flake
Uniface/Biface: Biface
Final classification: Flake
Material: Fossil-wood
Length (mm): 80.9 Breadth (mm): 59.9 Width (mm): 25
Weight (g): 92
Flake type: VI
No. of flake scars: 1
Invasiveness of flake scars:
Condition of the tool: Fresh
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Plain
Symmetrical/Asymmetrical: Asymmetrical
Notes: Tilted pentagon shaped ventral and dorsal sides, linear lateral sides, elliptical cross-section, bulb present.



Site: Sumili

Cluster No:

Co-ordinates:

Artifact No: S13

Core/flake/clast/blank: Flake

Basic typology: Flake (utilized)

Uniface/Biface: Uniface

Final classification: Flake (utilized)

Material: Fossil-wood

Length (mm): 92.8 Breadth (mm): 77.6 Width (mm): 22.2

Weight (g): 152

Flake type: II

No. of flake scars: 1

Invasiveness of flake scars: Medium

Condition of the tool: Fresh

Evidence of use: Yes

Retouch: Yes

Retouch Type: Alternate

Platform type: Facetted

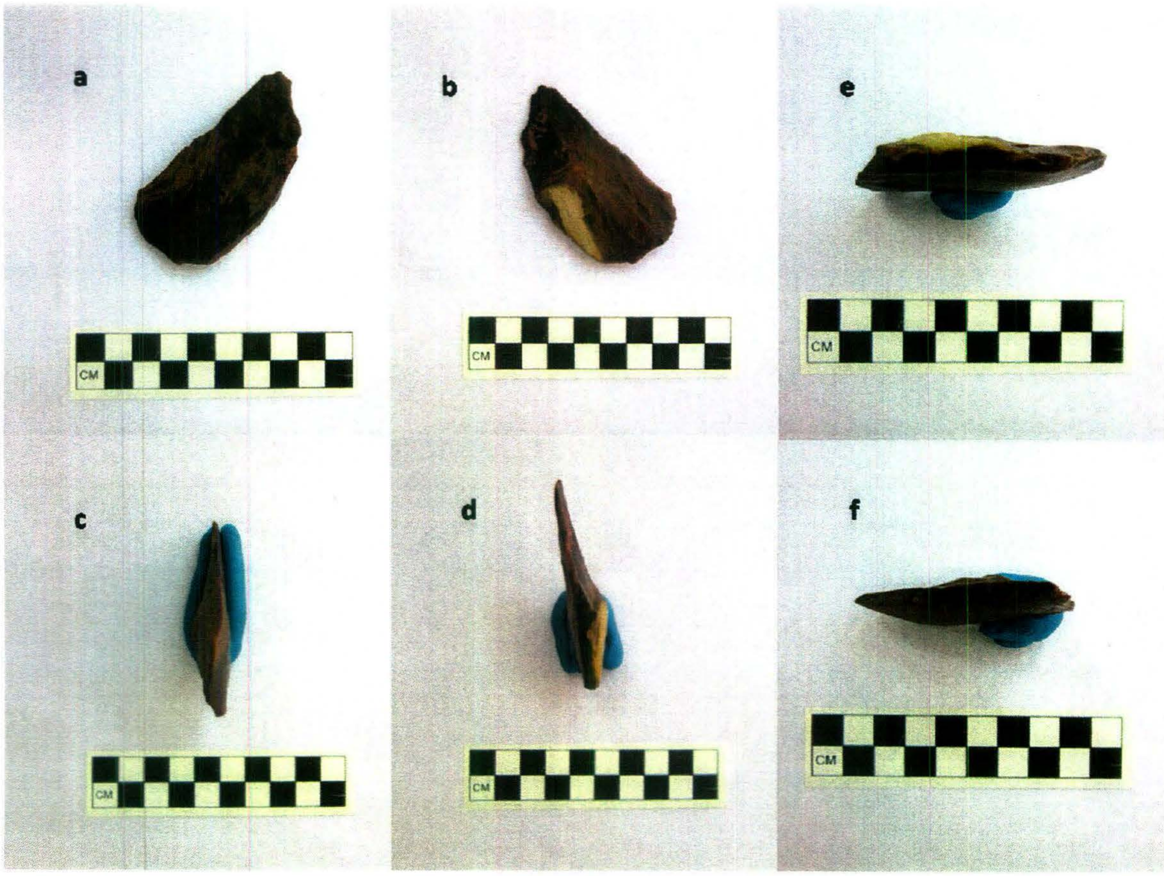
Symmetrical/Asymmetrical: Asymmetrical

Notes: Triangular shaped ventral and dorsal sides, baguette lateral sides, rectangle cross-section, no bulb.

Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S14
Core/flake/clast/blank: Flake
Basic typology: Side scraper
Uniface/Biface: Uniface
Final classification: Side scraper
Material: Fossil-wood
Length (mm): 82
Breadth (mm): 36.2
Width (mm): 14.8
Weight (g): 47
Flake type: V
No. of flake scars: 3
Invasiveness of flake scars: High
Condition of the tool: Rolled
Evidence of use: Can't say
Retouch: Yes
Retouch Type: Straight retouch
Platform type: Uneven
Symmetrical/Asymmetrical: Asymmetrical
Notes: Lanceolate ventral and dorsal sides, linear lateral sides, elliptical cross-section, no bulb.

Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S15
Core/flake/clast/blank: Flake
Basic typology: Debitage
Uniface/Biface: Uniface
Final classification: Debitage
Material: Fossil-wood
Length (mm): 60.4
Breadth (mm): 45.8
Width (mm): 20.6
Weight (g): 60
Flake type: V
No. of flake scars: 0
Invasiveness of flake scars:
Condition of the tool: Weathered
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Plain
Symmetrical/Asymmetrical: Asymmetrical
Notes: Trapezoid ventral and dorsal sides, triangle lateral sides, rectangle cross-section, no bulb.

Site: Sumili | Cluster No:
Co-ordinates:
Artifact No: S17 | Core/flake/clast/blank: Flake
Basic typology: Adze | Uniface/Biface: Uniface
Final classification: Adze | Material: Fossil-wood
Length (mm): 82.6 | Breadth (mm): 56.3 | Width (mm): 13.7
Weight (g): 35 | Flake type: V
No. of flake scars: 1 | Invasiveness of flake scars:
Condition of the tool: | Evidence of use: Yes
Retouch: No | Retouch Type:
Platform type: Plain | Symmetrical/Asymmetrical: Asymmetrical
Notes: Snapped on edges, vertically semi-circular ventral and dorsal sides, triangle lateral sides, elliptical cross-section, bulb present.



Site: Sumili
Cluster No:

Co-ordinates:

Artifact No: S19
Core/flake/clast/blank: Flake

Basic typology: Flake (utilized)
Uniface/Biface: Uniface

Final classification: Flake (utilized)
Material: Fossil-wood

Length (mm): 79.1
Breadth (mm): 64.8
Width (mm): 23.8

Weight (g): 79
Flake type: VI

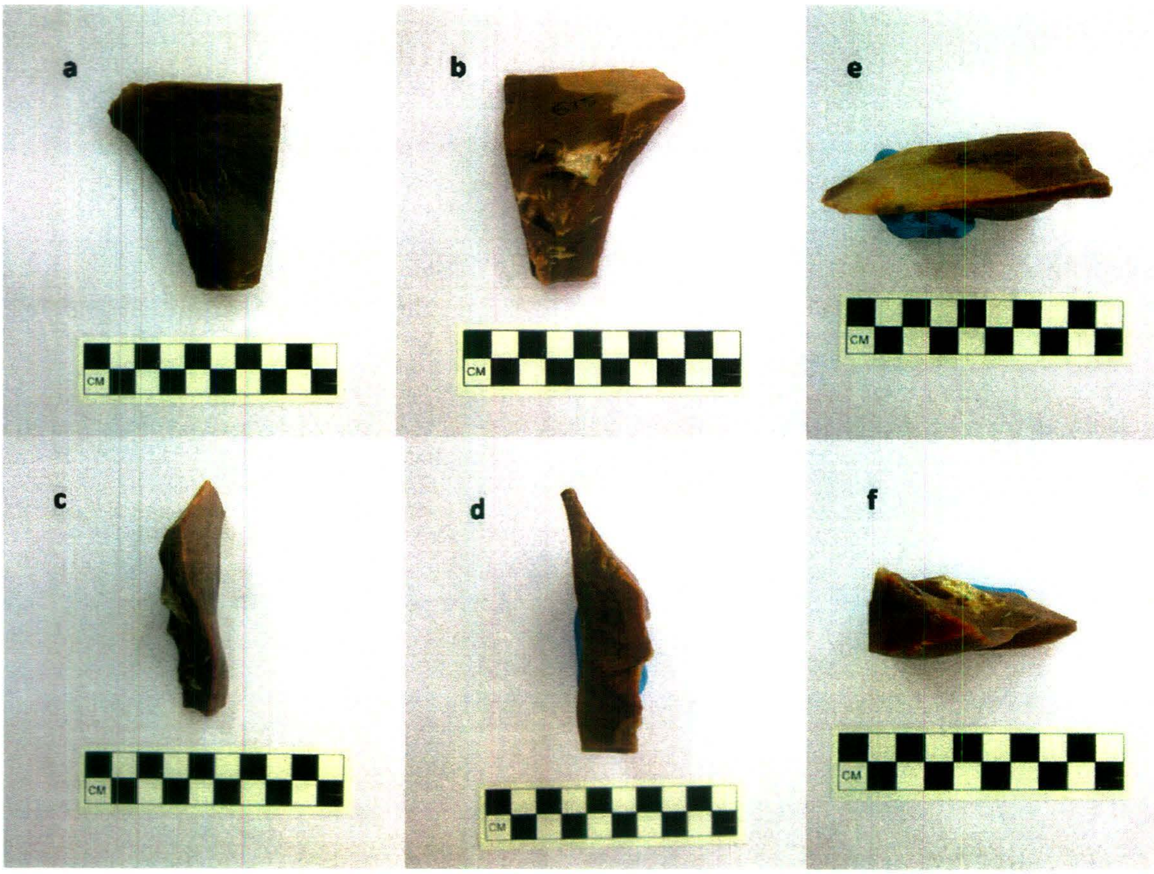
No. of flake scars: 0
Invasiveness of flake scars:

Condition of the tool:
Evidence of use: Yes

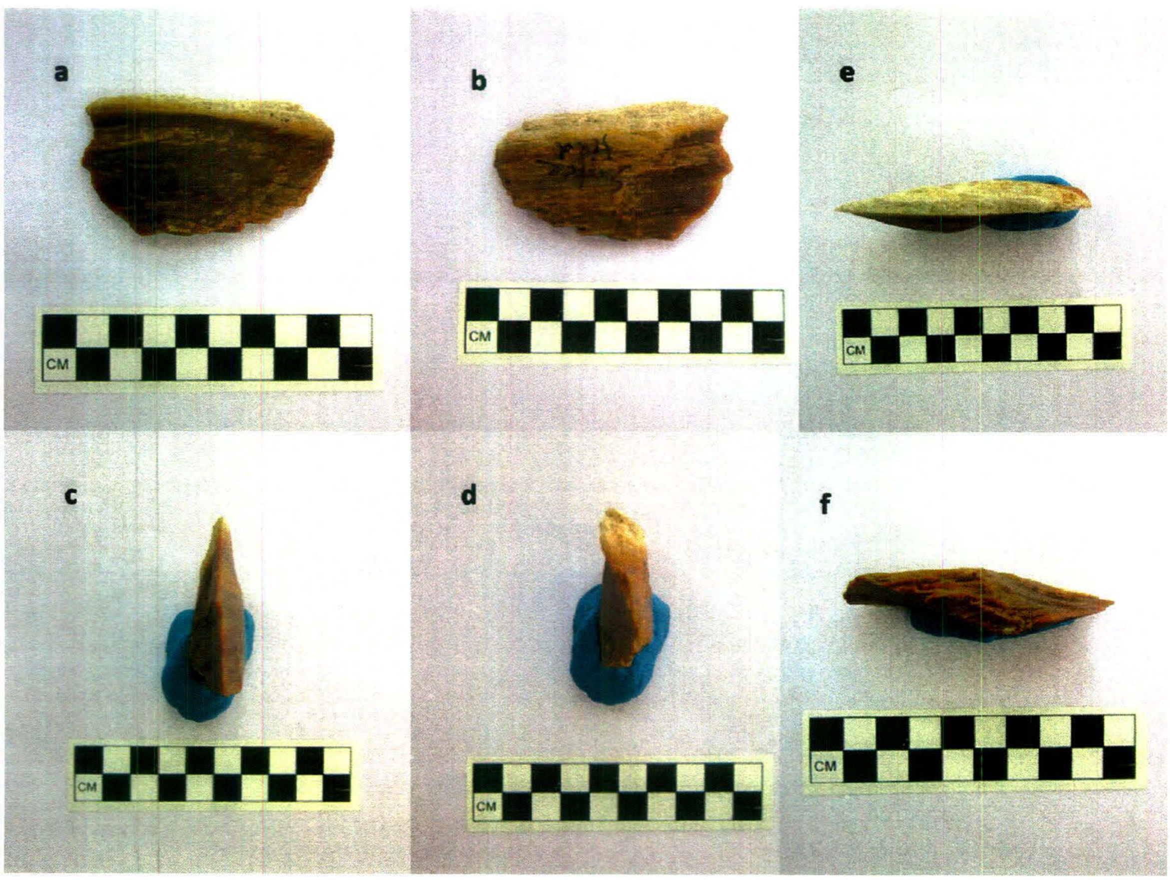
Retouch: No
Retouch Type:

Platform type: Plain
Symmetrical/Asymmetrical: Asymmetrical

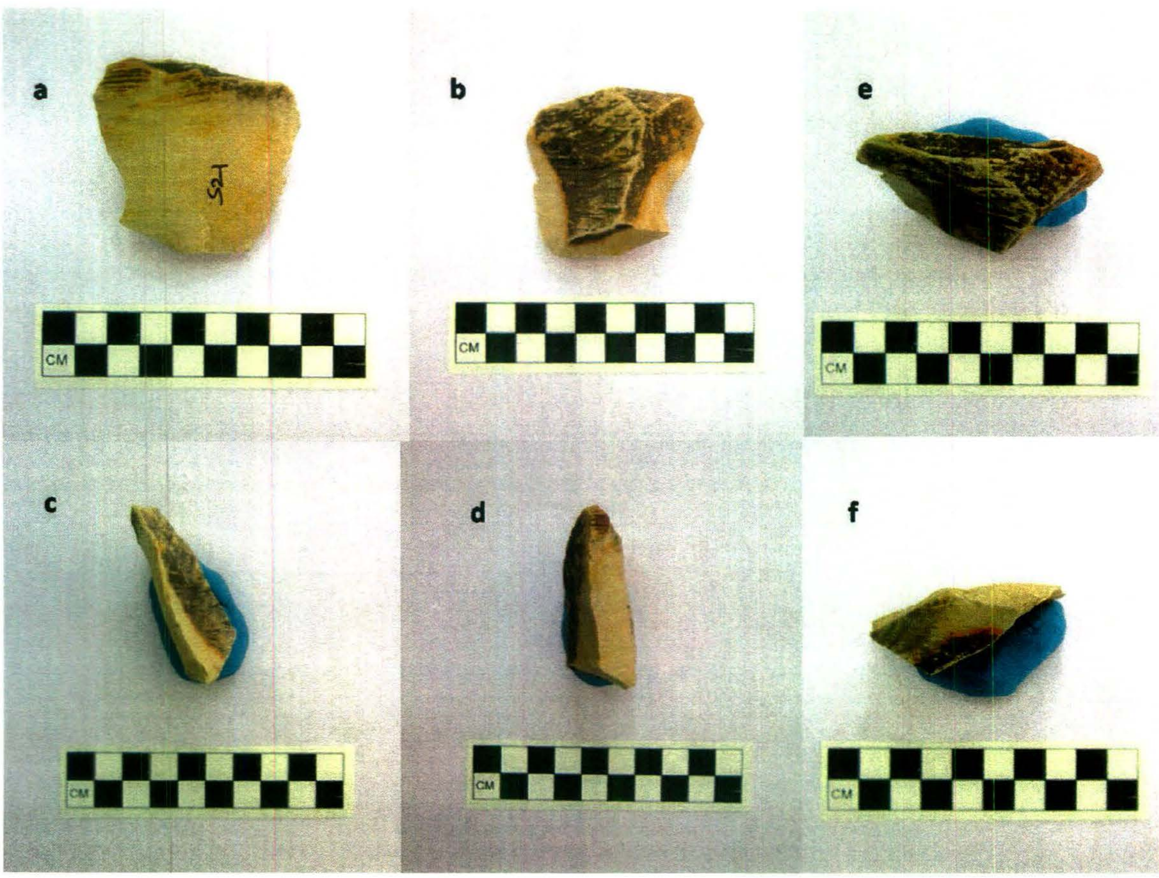
Notes: Trapezoid ventral and dorsal sides, elongated pointed lateral sides, triangle cross-section, bulb present, fine quality material.



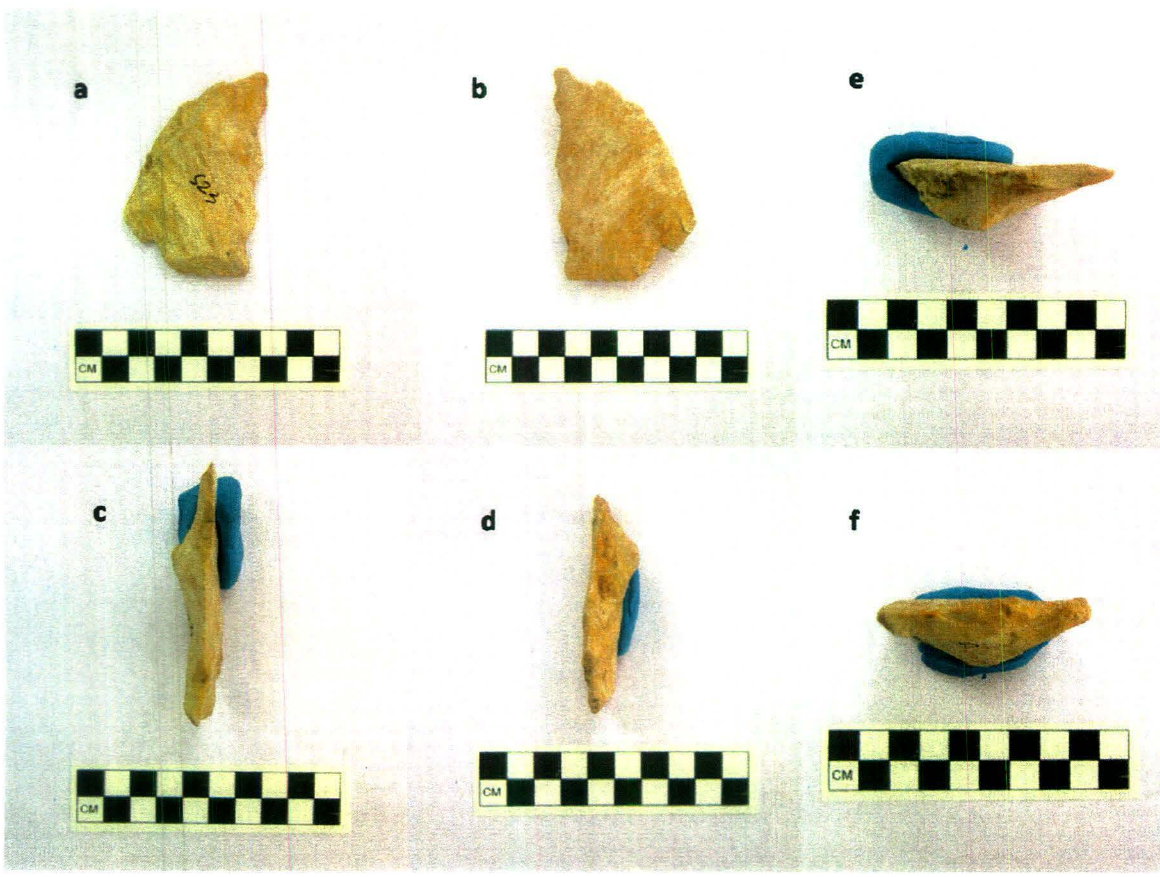
Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S20
Core/flake/clast/blank: Flake
Basic typology: Debitage
Uniface/Biface: Uniface
Final classification: Debitage
Material: Fossil-wood
Length (mm): 43
Breadth (mm): 73.4
Width (mm): 14.9
Weight (g): 42
Flake type: III
No. of flake scars: 0
Invasiveness of flake scars:
Condition of the tool: Weathered
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Facetted
Symmetrical/Asymmetrical: Asymmetrical
Notes: Semi-circular ventral and dorsal sides, elliptical lateral sides/cross-section, bulb present, cortex intact.



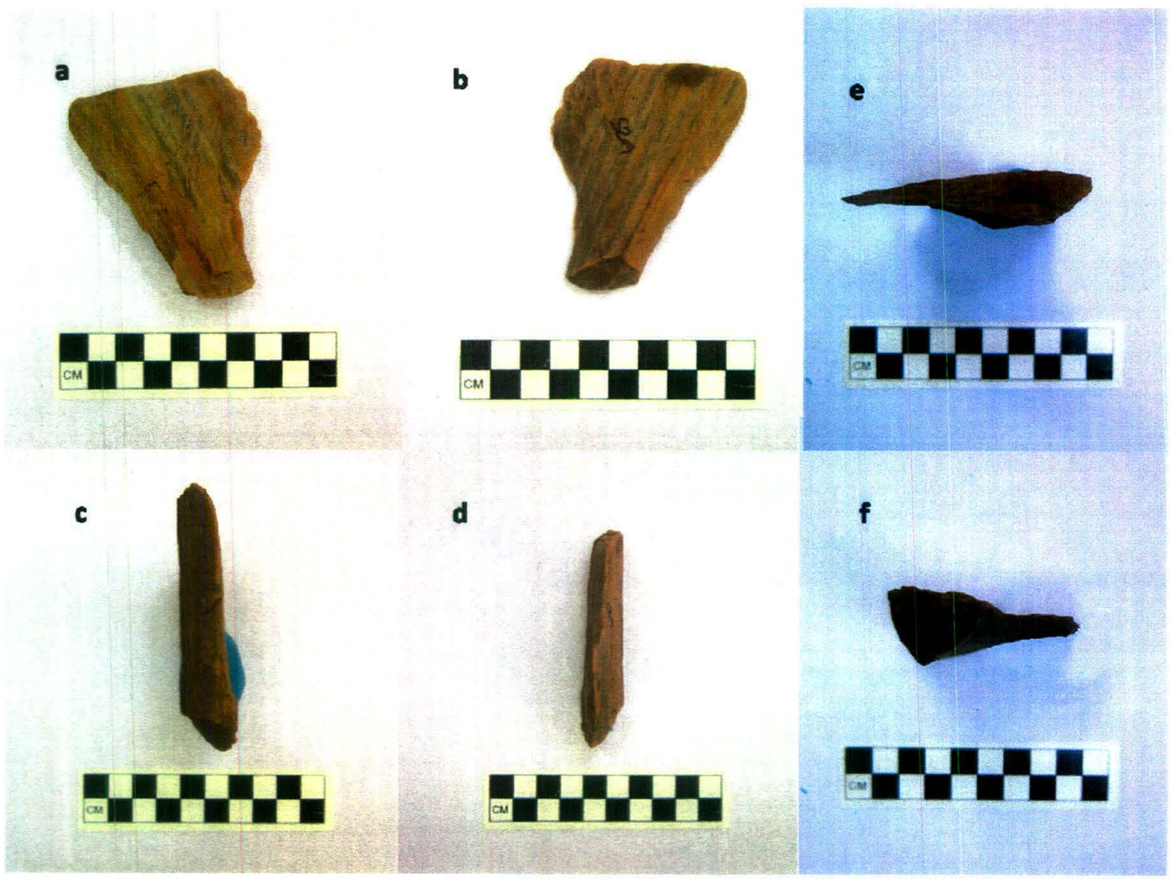
Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S21
Core/flake/clast/blank: Flake
Basic typology: Debitage
Uniface/Biface: Uniface
Final classification: Debitage
Material: Fossil-wood
Length (mm): 53.1
Breadth (mm): 57.8
Width (mm): 17.9
Weight (g): 45
Flake type: V
No. of flake scars: 0
Invasiveness of flake scars:
Condition of the tool: Rolled
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Plain
Symmetrical/Asymmetrical: Asymmetrical
Notes: Trapezoid ventral and dorsal sides, baguette lateral sides, triangular cross-section, bulb present.



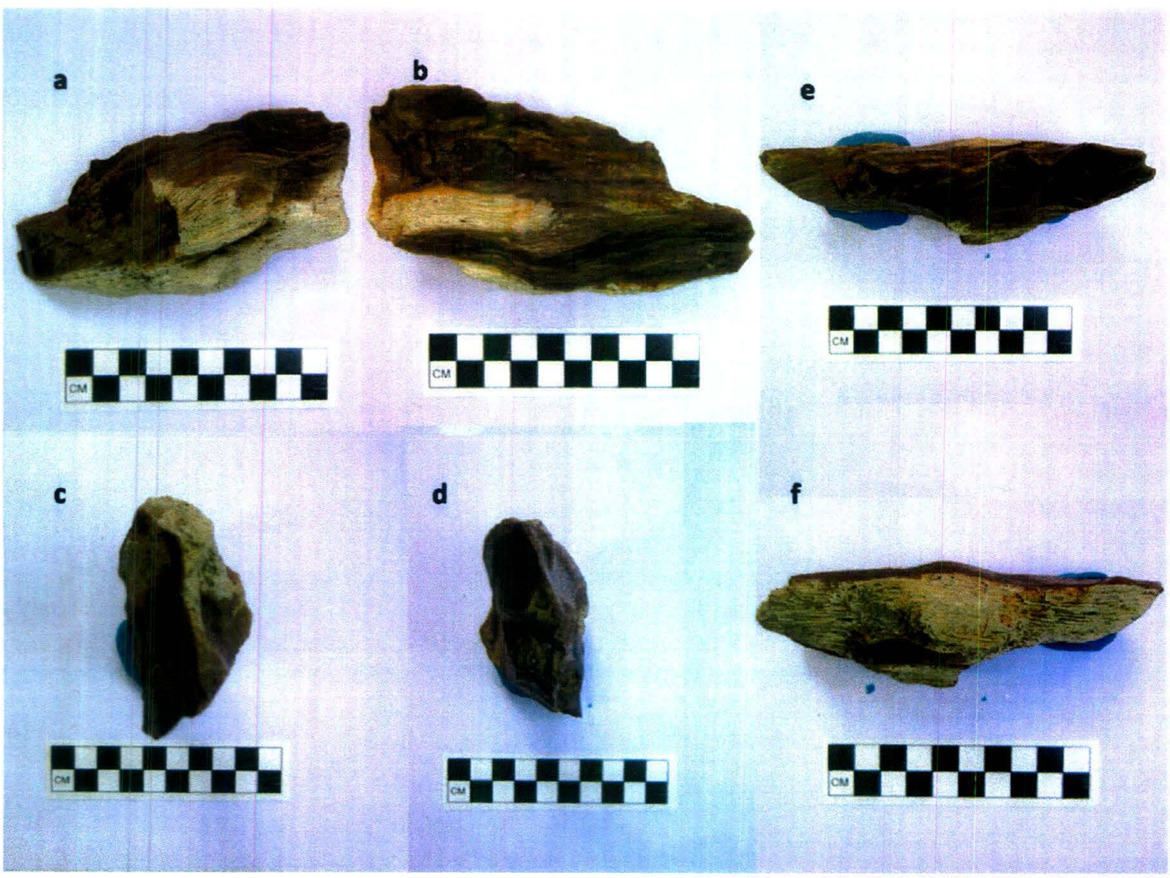
Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S23
Core/flake/clast/blank: Flake
Basic typology: Flake (possibly utilized)
Uniface/Biface:
Final classification: Flake (possibly utilized)
Material: Fossil-wood
Length (mm): 77.1
Breadth (mm): 60.1
Width (mm): 16.7
Weight (g): 43
Flake type: VI
No. of flake scars: 1
Invasiveness of flake scars:
Condition of the tool: Rolled
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Plain
Symmetrical/Asymmetrical: Asymmetrical
Notes: Triangular ventral and dorsal sides, triangle lateral sides and cross-section, no bulb.



Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S24
Core/flake/clast/blank: Flake
Basic typology: Blade-like (backed possibly)
Uniface/Biface: Uniface
Final classification: Blade-like (backed possibly)
Material: Fossil-wood
Length (mm): 82.7
Breadth (mm): 61
Width (mm): 17.9
Weight (g): 61
Flake type: VI
No. of flake scars: 0
Invasiveness of flake scars:
Condition of the tool: Fresh
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Uneven
Symmetrical/Asymmetrical: Asymmetrical
Notes: P-shaped ventral and dorsal sides, linear/baguette lateral sides, triangle cross-section, no bulb.

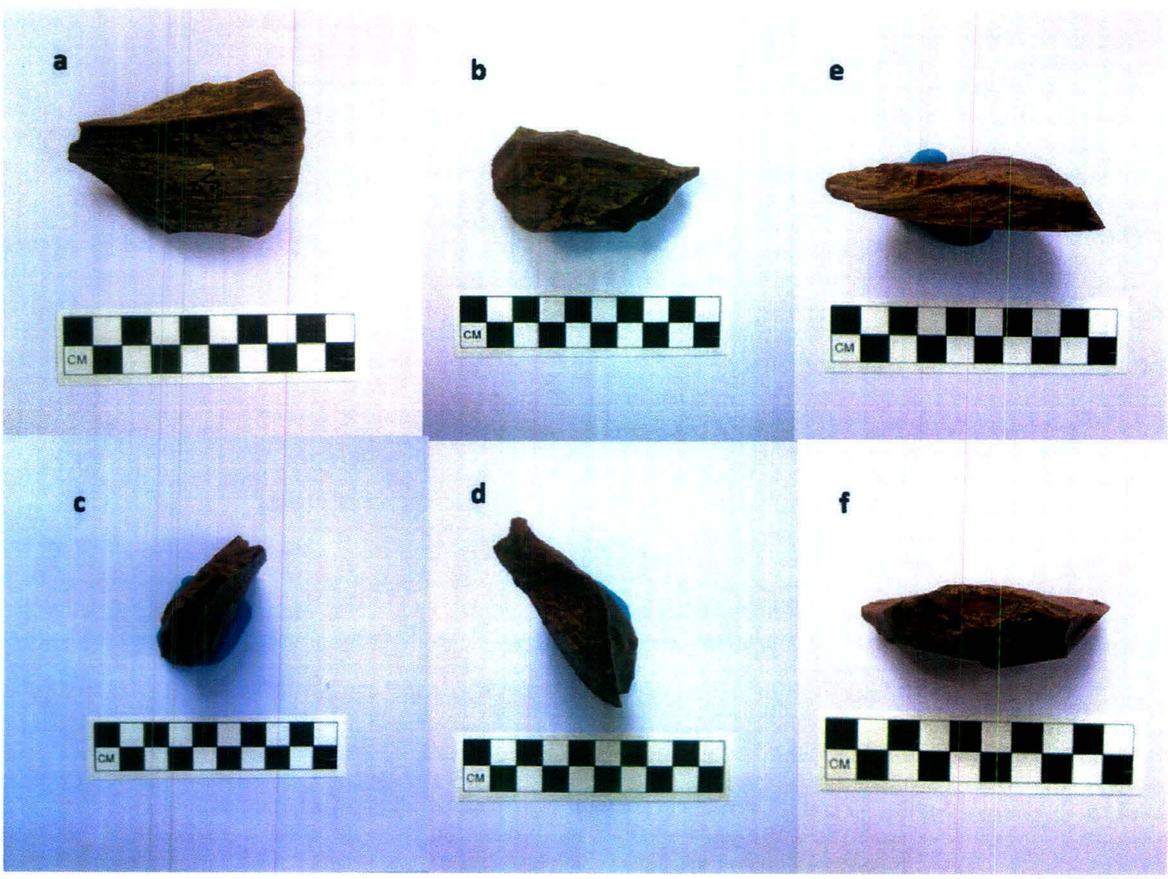


Site: Sumili | Cluster No:
Co-ordinates:
Artifact No: S25 | Core/flake/clast/blank: Flake
Basic typology: Side scraper | Uniface/Biface: Biface
Final classification: Side scraper | Material: Fossil-wood
Length (mm): 124.5 | Breadth (mm): 61.5 | Width (mm): 37.7
Weight (g): 213 | Flake type: V
No. of flake scars: 4 | Invasiveness of flake scars: High
Condition of the tool: Weathered | Evidence of use: Can't say
Retouch: Yes | Retouch Type:
Platform type: Facetted | Symmetrical/Asymmetrical: Asymmetrical
Notes: Elongated ventral and dorsal sides, triangular lateral sides and cross-section, no bulb, cortex present on one lateral side.



Site: Sumili | Cluster No:
Co-ordinates:
Artifact No: S26 | Core/flake/clast/blank: Flake
Basic typology: Flake | Uniface/Biface: Biface
Final classification: Flake | Material: Fossil-wood
Length (mm): 103.8 | Breadth (mm): 44.5 | Width (mm): 23.7
Weight (g): 92 | Flake type: VI
No. of flake scars: 1 | Invasiveness of flake scars:
Condition of the tool: Fresh | Evidence of use: Yes
Retouch: Yes | Retouch Type: Alternate retouch
Platform type: Uneven | Symmetrical/Asymmetrical: Asymmetrical
Notes: Elongated ventral and dorsal sides, linear lateral sides, triangle cross-section, no bulb.

Site: Sumili | Cluster No:
Co-ordinates:
Artifact No: S27 | Core/flake/clast/blank: Flake
Basic typology: Debitage | Uniface/Biface: Uniface
Final classification: Debitage | Material: Fossil-wood
Length (mm): 43.3 | Breadth (mm): 72.5 | Width (mm): 36.8
Weight (g): 77 | Flake type: VI
No. of flake scars: 0 | Invasiveness of flake scars:
Condition of the tool: Fresh | Evidence of use: No
Retouch: No | Retouch Type:
Platform type: Plain | Symmetrical/Asymmetrical: Asymmetrical
Notes: Trapezoid ventral and dorsal sides, tilted tapered baguette lateral sides, elliptical cross-section, no bulb.



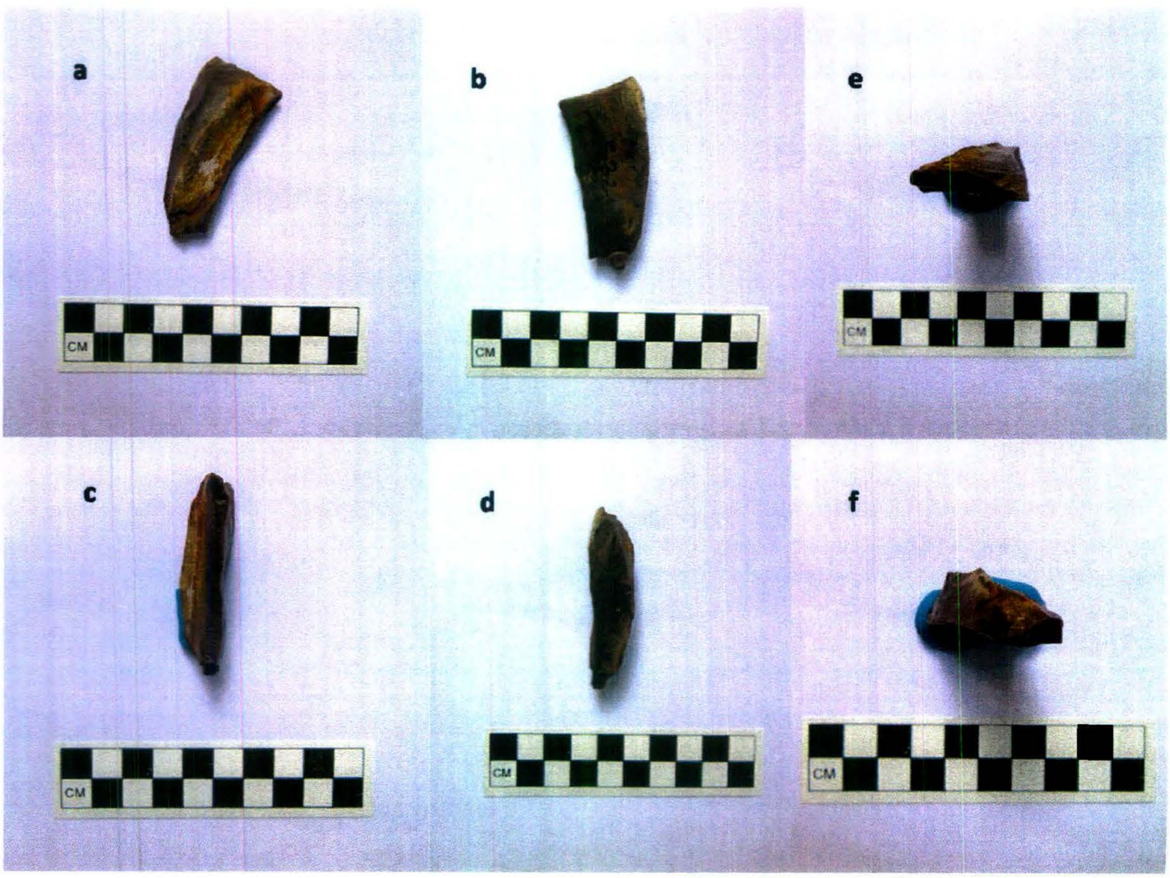
Site: Sumili	Cluster No:
Co-ordinates:	
Artifact No: S29	Core/flake/clast/blank: Flake
Basic typology: Flake	Uniface/Biface: Uniface
Final classification: Flake	Material: Fossil-wood
Length (mm): 80.2 Breadth (mm): 100.5	Width (mm): 29
Weight (g): 190	Flake type: VI
No. of flake scars: 0	Invasiveness of flake scars:
Condition of the tool: Fresh	Evidence of use: No
Retouch: No	Retouch Type:
Platform type: Plain	Symmetrical/Asymmetrical: Asymmetrical

Notes: Semi-circular ventral and dorsal sides, elliptical lateral sides.

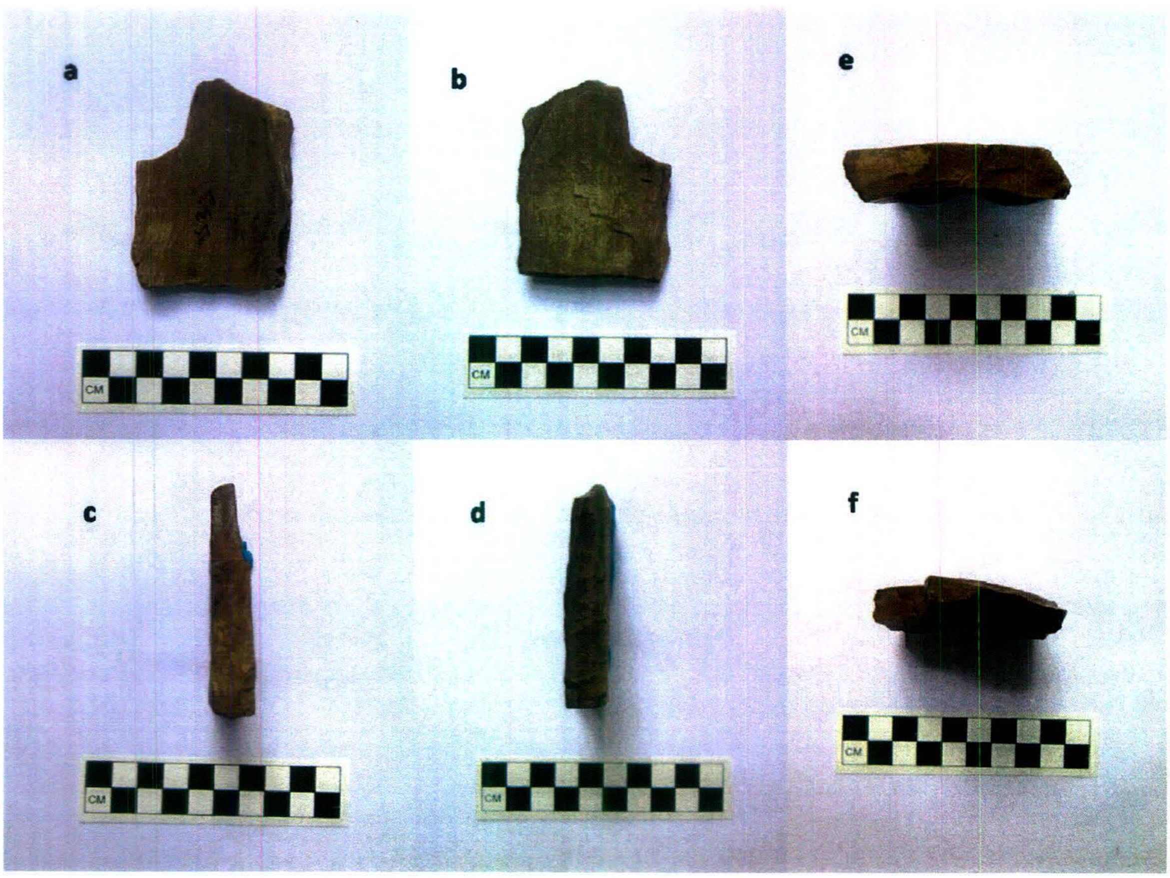
Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S30
Core/flake/clast/blank: Flake
Basic typology: Flake
Uniface/Biface: Uniface
Final classification: Flake
Material: Fossil-wood
Length (mm): 63.9
Breadth (mm): 59.7
Width (mm): 73.3
Weight (g): 91
Flake type: III
No. of flake scars: 0
Invasiveness of flake scars:
Condition of the tool: Weathered
Evidence of use: Can't say
Retouch: No
Retouch Type:
Platform type: Facetted
Symmetrical/Asymmetrical: Asymmetrical
Notes: Trapezoid ventral and dorsal sides, curved pointed at the distal end lateral sides, elliptical cross-section.

Site: Sumili | Cluster No:
Co-ordinates:
Artifact No: S31 | Core/flake/clast/blank: Flake
Basic typology: Pick? (possibly utilized) | Uniface/Biface: Uniface
Final classification: Pick? (possibly utilized) | Material: Fossil-wood
Length (mm): 97.7 | Breadth (mm): 61.2 | Width (mm): 30.2
Weight (g): 137 | Flake type: V
No. of flake scars: 0 | Invasiveness of flake scars:
Condition of the tool: Weathered | Evidence of use: No
Retouch: No | Retouch Type:
Platform type: Uneven | Symmetrical/Asymmetrical: Asymmetrical
Notes: Triangular ventral and dorsal sides, slightly curved pointed at the distal end lateral sides, elliptical cross-section.

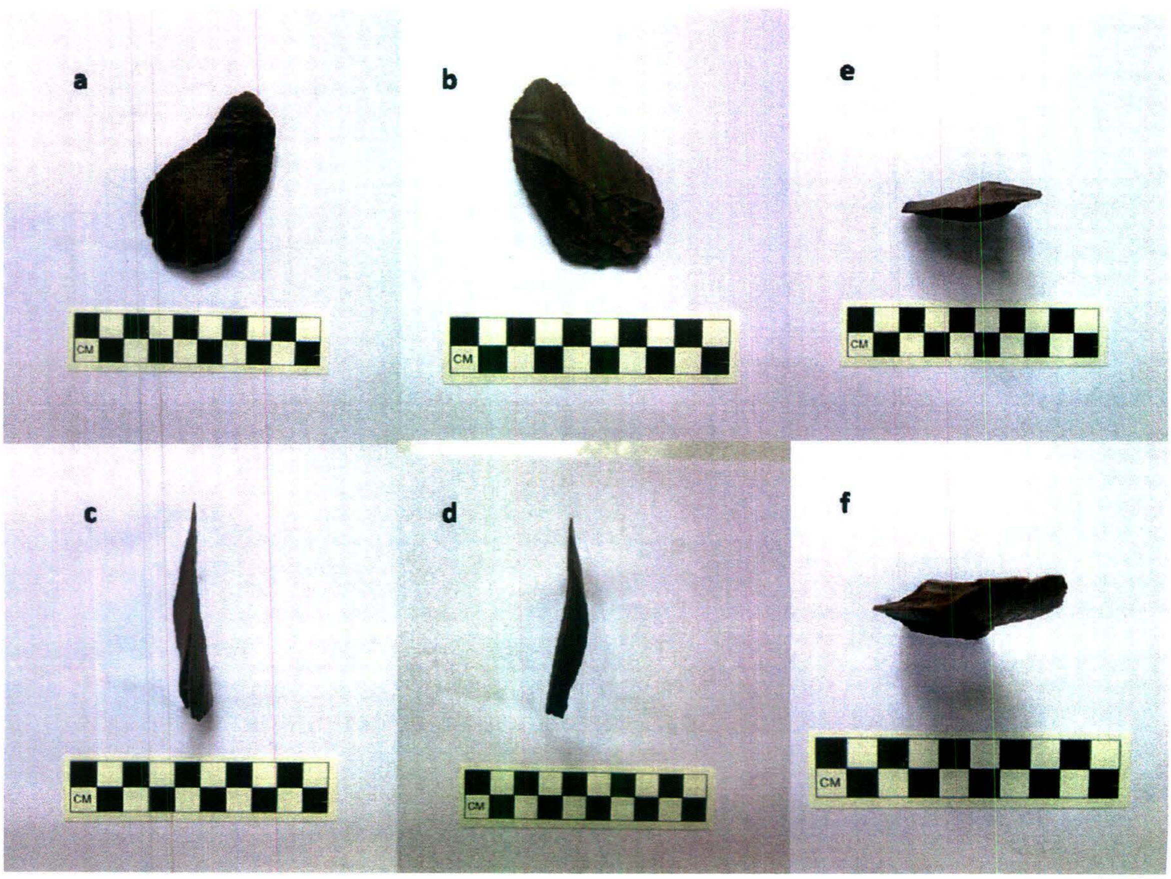
Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S32
Core/flake/clast/blank: Flake
Basic typology: Flake blade
Uniface/Biface: Uniface
Final classification: Flake blade
Material: Fossil-wood
Length (mm): 62.1
Breadth (mm): 31.6
Width (mm): 15.9
Weight (g): 24
Flake type: V
No. of flake scars: 0
Invasiveness of flake scars: High
Condition of the tool: Weathered
Evidence of use: No
Retouch: Yes
Retouch Type: Straight retouch
Platform type: Uneven
Symmetrical/Asymmetrical: Asymmetrical
Notes: Curved tapered baguette ventral and dorsal sides, elliptical lateral sides, triangle cross-section, bulb present.



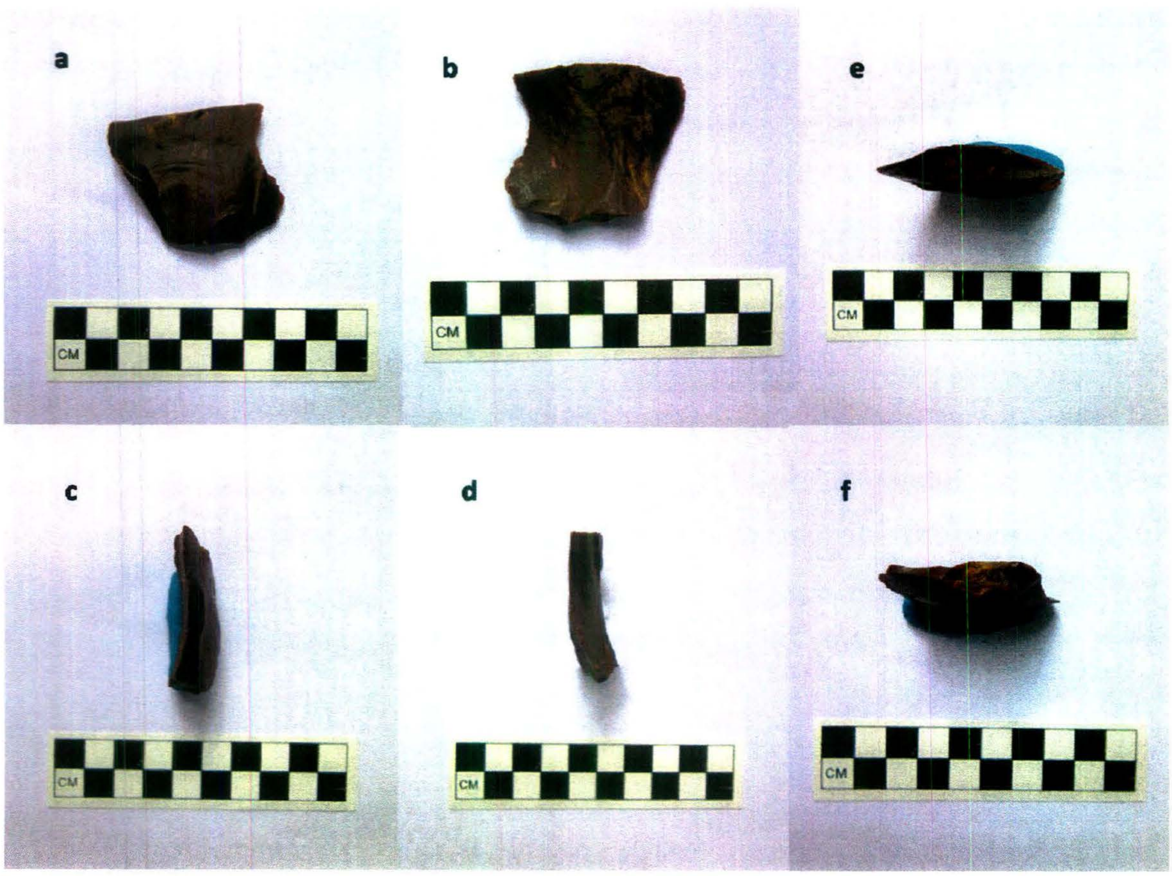
Site: Sumili Cluster No:
Co-ordinates:
Artifact No: S33 Core/flake/clast/blank: Flake
Basic typology: Natural flake Uniface/Biface: Uniface
Final classification: Natural flake Material: Fossil-wood
Length (mm): 77.5 Breadth (mm): 57.9 Width (mm): 13.6
Weight (g):88 Flake type: VI
No. of flake scars: 3 Invasiveness of flake scars: High
Condition of the tool: Weathered Evidence of use:
Retouch: Yes Retouch Type: Straight retouch
Platform type: Plain Symmetrical/Asymmetrical: Symmetrical
Notes: Pentagon ventral and dorsal sides snapped at the top corner, baguette lateral sides/cross-section, natural flake used as tool after secondary flaking.



Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S34
Core/flake/clast/blank: Flake
Basic typology: Flake (possibly utilized)
Uniface/Biface: Uniface
Final classification: Flake (possibly utilized)
Material: Fossil-wood
Length (mm): 68.4
Breadth (mm): 53
Width (mm): 11.4
Weight (g): 24
Flake type: VI
No. of flake scars: 0
Invasiveness of flake scars: Low
Condition of the tool: Fresh
Evidence of use: Yes
Retouch: Yes
Retouch Type: Straight retouch
Platform type: Thin and plain
Symmetrical/Asymmetrical: Asymmetrical
Notes: Mango shaped ventral and dorsal sides, curved linear lateral sides, elliptical cross-section, bulb present.



Site: Sumili
Cluster No:
Co-ordinates:
Artifact No: S35
Core/flake/clast/blank: Flake
Basic typology: Notch scraper
Uniface/Biface: Uniface
Final classification: Notch scraper
Material: Fossil-wood
Length (mm): 42.8
Breadth (mm): 51.7
Width (mm): 17.9
Weight (g): 25
Flake type: VI
No. of flake scars: 1
Invasiveness of flake scars: Low
Condition of the tool: Fresh
Evidence of use: No
Retouch: Yes
Retouch Type: Straight retouch
Platform type: No platform
Symmetrical/Asymmetrical: Asymmetrical
Notes: Parallelogram-like curved on one side ventral and dorsal sides, curved lateral sides, elliptical cross-section, bulb present.



2.3.A.3: Bairagi Kami(23°55'.820''N 91°28'.562''E)

The site was discovered by N.R. Ramesh. The part of the site that is not under habitation is covered with paddy fields. There are around approximately ten or more families living on top of the site. The site is situated next to the River Sumili. No tools were collected from this site even though there were scatters of fossil-wood.

2.3.A.4: Buddhu Chaudhary Kami (23°56'.003''N 91°29'.368''E)

The site, surrounded by mountains and dense forest (see Figures 2.5 & 2.6) was discovered in the course of the present survey. The site is located next to the village. Wild plants and shrubs grow densely, which made access to this site quite difficult. The fossil-wood tools were found on a tributary of the Sumili river. The stream itself is a gorge, which has parallel sides that stood at least around 6-7 m. high. The site was surrounded by mountains.

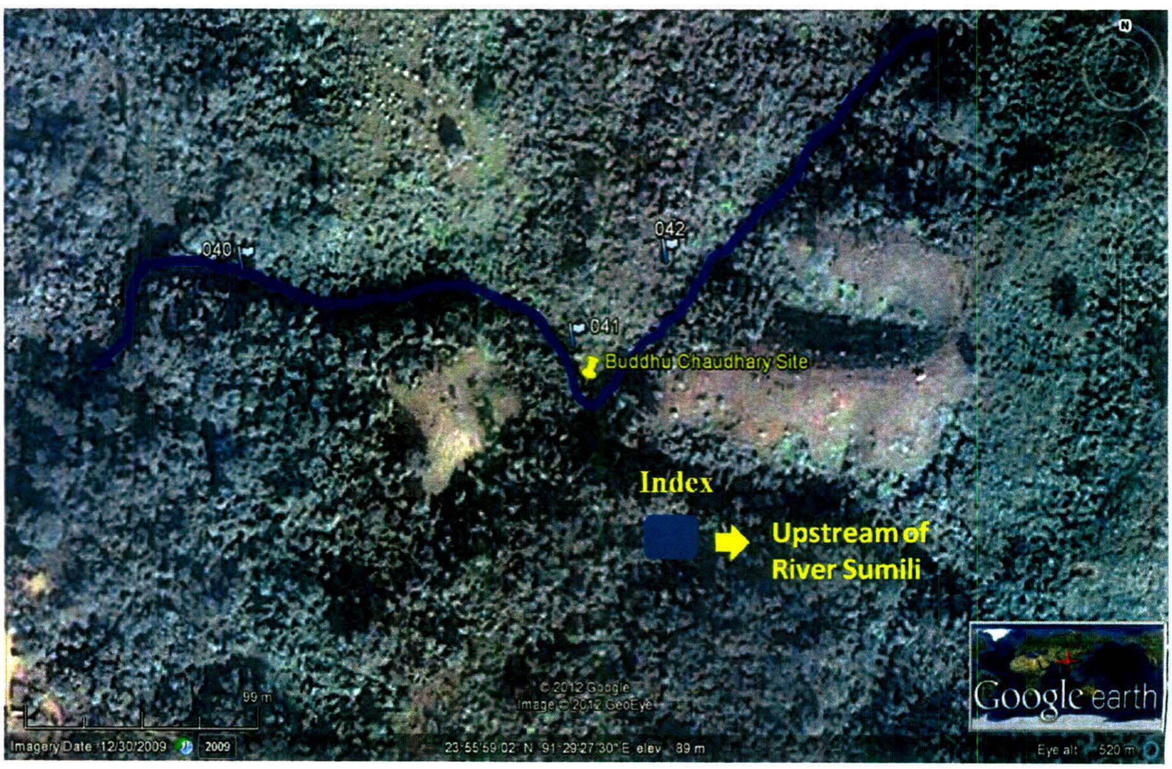


FIGURE 2.5. Google Image of Buddhu Chaudhary site

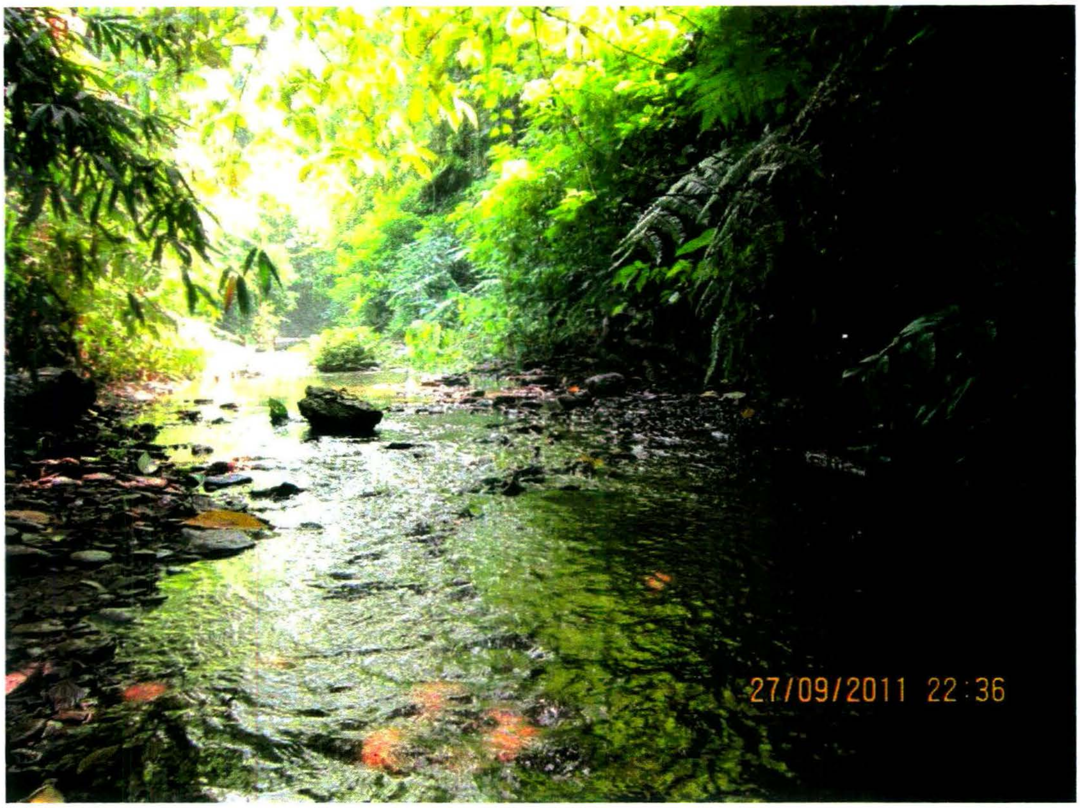
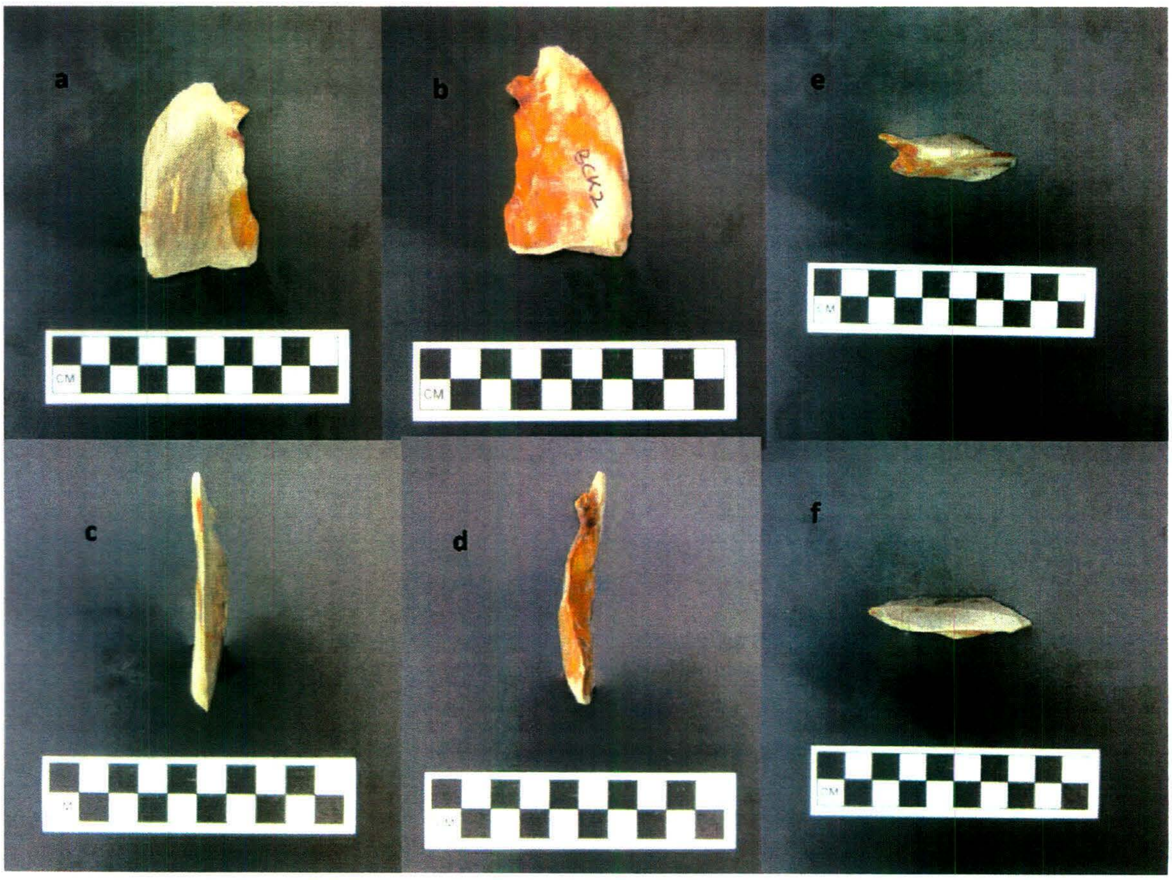


FIGURE 2.6. Buddhu Chaudhary site

Site: Buddhu Chaudhary | Cluster No: 41
Co-ordinates: 23°55'.991''N 91°29'.452''E
Artifact No: BCK3 | Core/flake/clast/blank: Clast
Basic typology: Cortex | Final classification: Clast cortex
Material: Fossil-wood
Length (mm): 61.5 | Breadth (mm): 49.3 | Width (mm): 16.2
Weight (g): 49
Condition of the tool: Rolled
Notes: Triangular in shape.

Site: Buddhu Chaudhary
Cluster No: 42
Co-ordinates: 23°56'.010''N 91°29'.475''E
Artifact No: BCK1
Core/flake/clast/blank: Flake
Basic typology: Side scraper
Uniface/Biface: Biface
Final classification: Side scraper
Material: Fossil-wood
Length (mm): 112.3
Breadth (mm): 67.8
Width (mm): 21.5
Weight (g): 197
Flake type: VI
No. of flake scars: 3
Invasiveness of flake scars: High
Condition of the tool: Rolled
Evidence of use: Can't say
Retouch: No
Retouch Type:
Platform type: Plain
Symmetrical/Asymmetrical: Asymmetrical
Notes: Rectangular flattish sided both ventral and dorsal sides, rectangle cross-section, no bulb of percussion.

Site: Buddhu Chaudhary
Cluster No: 41
Co-ordinates: 23°55'.991''N 91°29'.452''E
Artifact No: BCK2
Core/flake/clast/blank: Flake
Basic typology: Flake
Uniface/Biface: Biface
Final classification: Debitage
Material: Fossil-wood
Length (mm): 41.2
Breadth (mm): 67.1
Width (mm): 10
Weight (g): 28
Flake type: VI
No. of flake scars: 1
Invasiveness of flake scars:
Condition of the tool: Rolled
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: No platform
Symmetrical/Asymmetrical: Asymmetrical
Notes: Triangular ventral and dorsal sides.



2.3.A.5: Teliamura (latitude and longitude not taken)

The site is mostly plain area and surrounded by hills of Baramura and Atharamura ranges. No tools was recovered from the site, only chunks of fossil-wood were seen lying all over the place (see Figure 2.7). The site covers a vast plain area and Khowai River flows through the site. The site is inhabited by large group of families. It also falls next to NH 44 of Tripura.

FIGURE 2.7. Fossil-wood scatter in Teliamura site

2.3.A.6: Baramura (latitude and longitude not taken)

This site is located next to NH 44 (National Highway) of Tripura. Haora River flows through this valley. The site is mostly covered by thick dense jungle, since it falls under Forest Preservation Act. The valleys are mostly paddy field area and scatters of fossil-wood can be seen strewn all over the valley. Locals have accounted that they used to find fossil-wood tools when they do jhum cultivation in the hill slopes of Baramura and also when they plough paddy fields in the site. My visit to this site did not yield any tools during my survey, except for a piece of flake tool. During my survey the site was covered by growing paddy all over the valley. Locals grow rice plant in the valley. Since the valley is inundated regularly by Haora River it makes the irrigation possible all round the year. Description of a flake collected during the survey is given below:

Site: Baramura Cluster No:
Co-ordinates:
Artifact No: B1 Core/flake/clast/blank: Flake
Basic typology: Debitage Uniface/Biface: Uniface
Final classification: Debitage Material: Fossil-wood Uniface/Biface:
Length (mm): 53.9 Breadth (mm): 111.3 Width (mm): 24.1
Weight (g): 115 Flake type: II
No. of flake scars: 0 Invasiveness of flake scars: 0
Condition of the tool: Fresh Evidence of use: No
Retouch: No Retouch Type:
Platform type: Facetted Symmetrical/Asymmetrical: Asymmetrical
Notes: Elongated, ripple marks on the dorsal side, cortex present on one side of the cross-section.

2.3.A.7: Debara Kami (23°55'.755''N 91°28'.617''E)

This site is also densely inhabited by the local population. There are around 20 or more families inhabiting this site. Houses in this site have been constructed by leveling up the surface, and while doing so the locals have removed deposits of fossil-wood tools. The site is a slope which rises as high as approximately 10 meters from the ground level. There is a school building in the middle of the site and a church as well. There are trees of different species, especially trees that bear fruits like jackfruit trees, mango trees, arecanut trees, coconut trees, berry trees, guava trees, and various trees of other species in the site. The site is surrounded by paddy fields on one side the other side being the rising hills (see Figure 2.8).

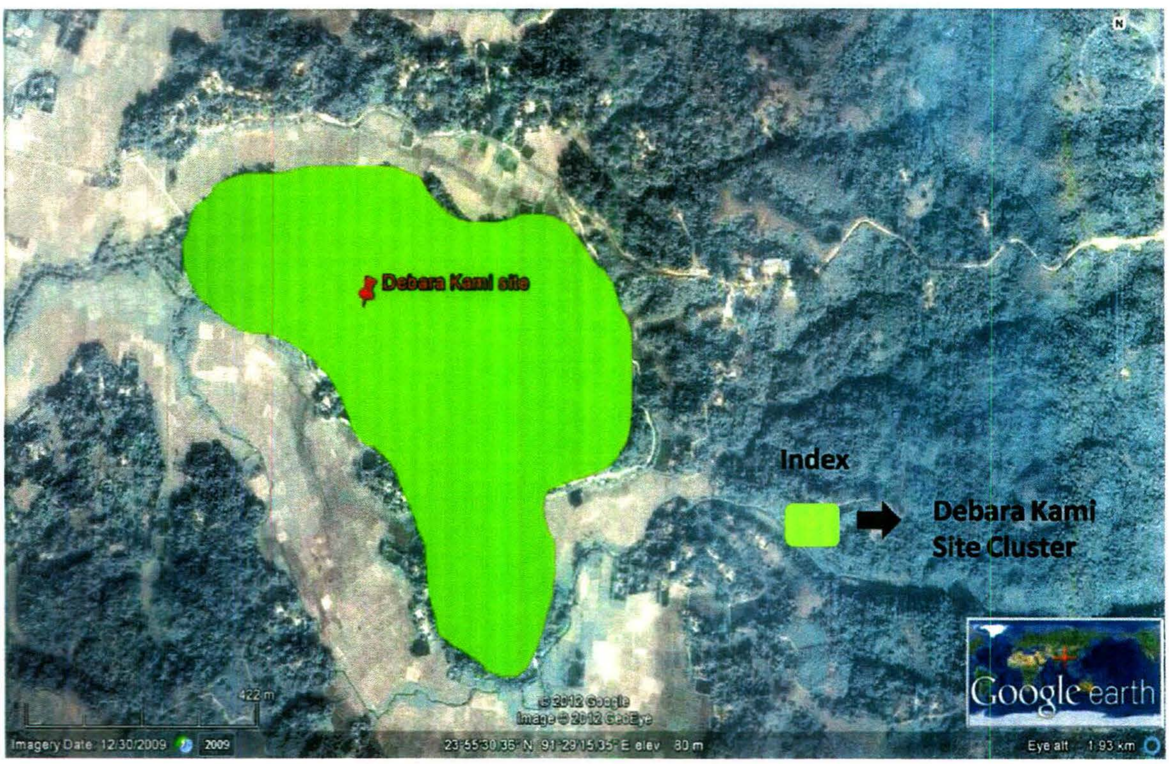


FIGURE 2.8. Google image of Debara Kami site

Site: Debara Kami | Cluster No: 48
Co-ordinates: 23°55'.890''N 91°28'.617''E
Artifact No: DK1 | Core/flake/clast/blank: Flake
Basic typology: Cleaver-like? | Uniface/Biface: Biface
Final classification: Cleaver-like? | Material: Fossil-wood
Length (mm): 111.6 | Breadth (mm): 62.6 | Width (mm): 27.8
Weight (g): 196 | Flake type: V
No. of flake scars: 11 | Invasiveness of flake scars: High
Condition of the tool: Fresh | Evidence of use: No
Retouch: No | Retouch Type: No
Platform type: Facetted | Symmetrical/Asymmetrical: Asymmetrical
Notes: Rectangular ventral and dorsal sides, snapped at the top end, incomplete?, linear/elongated lateral sides, elliptical (distal end)/semi-circular (proximal end) cross-sections.

Site: Debara Kami
Cluster No: 48
Co-ordinates: 23°55'.890''N 91°28'.617''E
Artifact No: DK2
Core/flake/clast/blank: Flake
Basic typology: Handaxe-like
Uniface/Biface: Biface
Final classification: Handaxe-like
Material: Fossil-wood
Length (mm): 107
Breadth (mm): 66.7
Width (mm): 36.4
Weight (g): 220
Flake type: V
No. of flake scars: 10
Invasiveness of flake scars: High
Condition of the tool: Fresh
Evidence of use: No
Retouch: Yes
Retouch Type: Alternate retouch
Platform type: Uneven
Symmetrical/Asymmetrical: Asymmetrical
Notes: Oblong shaped ventral and dorsal sides, trigular lateral sides, elliptical cross-sections, cortex present on the dorsal side.

Site: Debara Kami — Cluster No:
Co-ordinates:
Artifact No: DK3 — Core/flake/clast/blank: Flake
Basic typology: Debitage — Uniface/Biface: Uniface
Final classification: Debitage — Material: Fossil-wood
Length (mm): 74.1 — Breadth (mm): 78.4 — Width (mm): 27.8
Weight (g): 107 — Flake type: VI
No. of flake scars: 0 — Invasiveness of flake scars:
Condition of the tool: Fresh — Evidence of use: Can't say
Retouch: No — Retouch Type:
Platform type: Plain — Symmetrical/Asymmetrical: Asymmetrical
Notes: Circular ventral and dorsal sides, rectangular/triangular lateral sides, triangular cross-section, bulb present.

Site: Debara Kami
Cluster No:
Co-ordinates:
Artifact No: DK4
Core/flake/clast/blank: Flake
Basic typology: Flake
Uniface/Biface: Uniface
Final classification: Flake
Material: Fossil-wood
Length (mm): 100.2
Breadth (mm): 100.3
Width (mm): 43.2
Weight (g): 305
Flake type: V
No. of flake scars: 0
Invasiveness of flake scars:
Condition of the tool: Fresh
Evidence of use: No
Retouch: No
Retouch Type:
Platform type: Uneven
Symmetrical/Asymmetrical: Asymmetrical
Notes: Circular ventral and dorsal sides, triangular lateral sides, elliptical cross-section, bulb missing.

2.3.A.8: Champamura (23°46'.733''N 91°27'.446''E)

The site is densely forested (see Figures 2.9 & 2.10). Access to this site is quite difficult. The site is located approximately around 5 km away from a place named Champaknagar situated on the National Highway 44 of Tripura. There is a village near to the site. In fact the whole area including the village Champamura has fossil-wood tool scatter all over, which according to the locals was of less use. The locals have some beliefs related to the fossil-wood that it was formed by the "Thunder Gods" in the sky. The locals even believe that among these fossil-wood tools there are some which had life and others which were considered without life. The site has a river named Champa which flows through the mountainous village. This river acts as a lifeline for the villagers. They transport bamboo trees by floating them down on this river. The villagers also use the River Champa to travel outside their village. Due to the density of vegetation and mountaineous terrain, the villagers use the bank of the Champa River for movement on daily basis for day-to-day activities.

FIGURE 2.9. Champamura site

FIGURE 2.10. Google image of Champamura site

Several collection points were noted along the Champa River. These were 51 – 75. Tools recovered were 52, 55, 56, 57, 58, 61, 62, 63, 64, 65, 66, 69, 70, and 71.

Site: Champamura

Cluster No: 65

Co-ordinates: 23°46'.822''N 91°32'.194''E

Artifact No: CMK7

Core/flake/clast/blank: Clast

Basic typology: Clast

Final classification: Polished

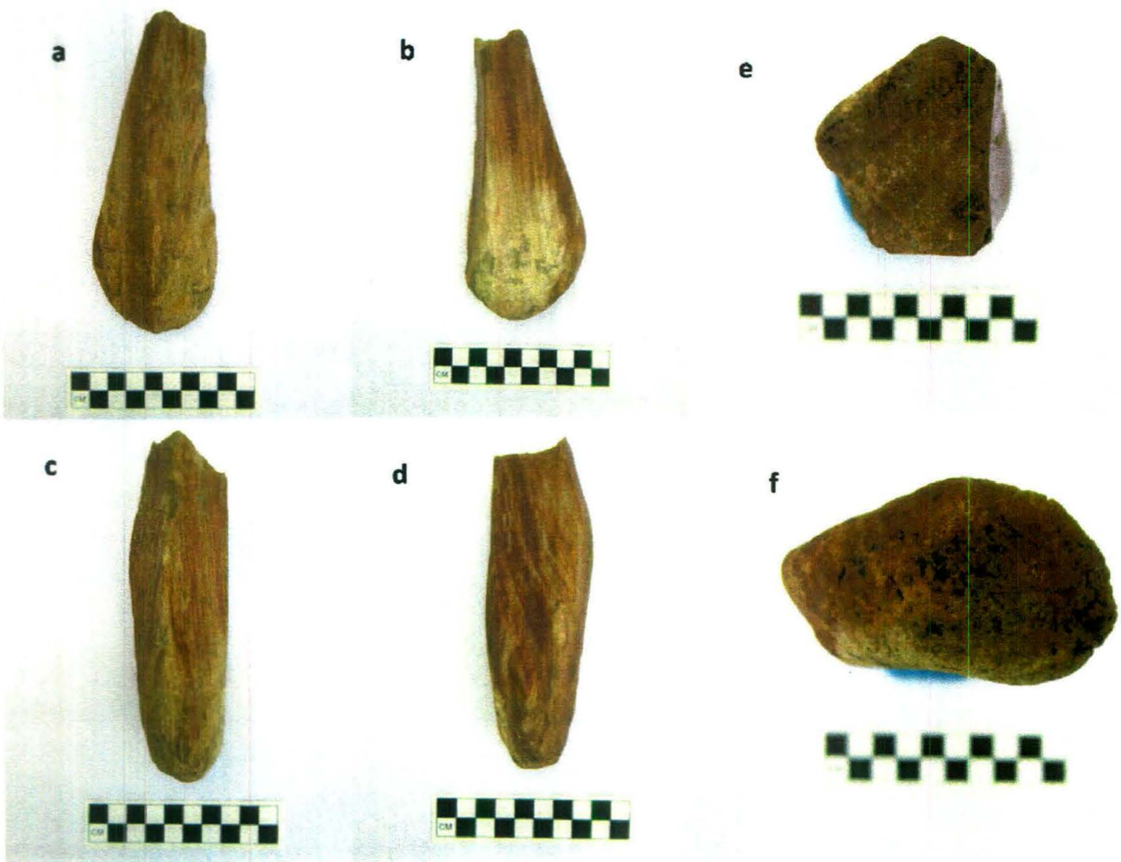
Material: Fossil-wood

Length (mm): 150.2 Breadth (mm): 63.6 Width (mm): 45.9

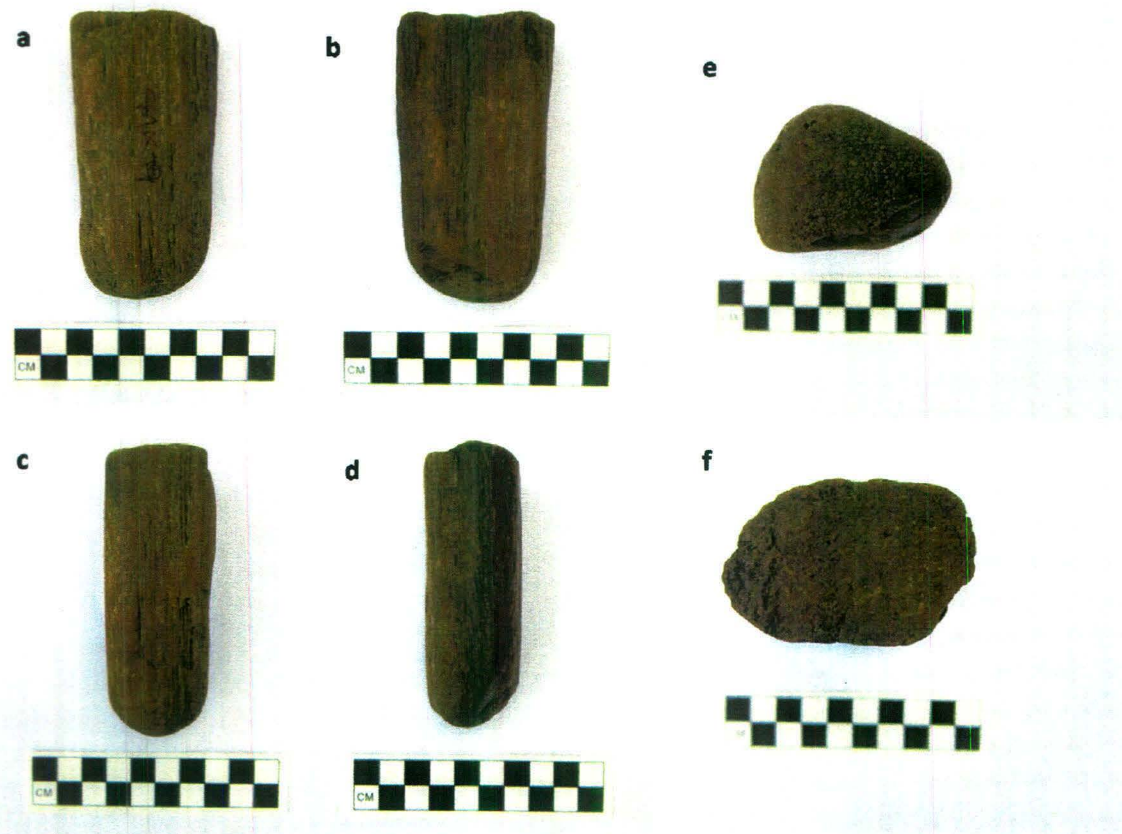
Weight (g): 439

Condition of the tool: Fresh

Notes: Snapped at one end, elongated, cross section- 5 sides, all sides possibly polished, one end snapped for processing.

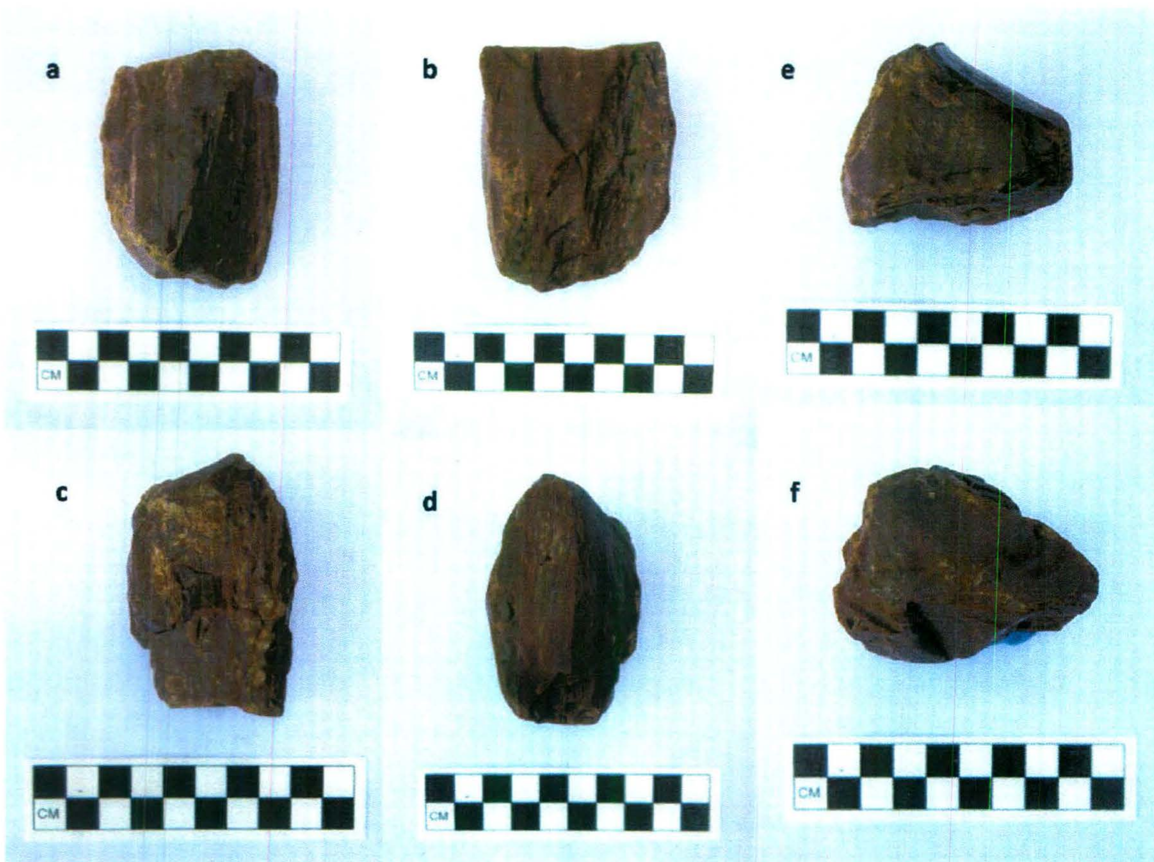


Site: Champamura Cluster No: 64
Co-ordinates: 23°46'.809''N 91°32'.202''E
Artifact No: CMK9 Core/flake/clast/blank: Clast
Basic typology: Clast Final classification: Clast
Material: Fossil-wood
Length (mm): 96.2 Breadth (mm): 51.3 Width (mm): 36.5
Weight (g): 288
Condition of the tool: Rolled
Notes: Snapped at one end, elongated or cylindrical in shape.



Site: Champamura | Cluster No: 62
Co-ordinates: 23°46'.733N 91°32'.138''E
Artifact No: CMK3 | Core/flake/clast/blank: Core
Basic typology: Core flake biface | Final classification: Core flake
Material: High quality fossil-wood almost chert-like
Length (mm): 80.2 | Breadth (mm): 54.4 | Width (mm): 21.6
Weight (g): 77 | Uniface/Biface:
No. of flake scars: 4 | Invasiveness of flake scars: Low
Condition of the tool: Fresh | Evidence of use: Yes
Retouch: Yes | Retouch Type: Alternate retouch
Platform type: Facetted
Notes: Elongated oblong tri-hedral in shape, working edge retouched, cortex present, triangular cross-section.

Site: Champamura | Cluster No: 63
Co-ordinates: 23°46'.789''N 91°32'.184''E
Artifact No: CMK6 | Core/flake/clast/blank: Core
Basic typology: Core biface | Final classification: Core
Material: Fossil-wood
Length (mm): 65.7 Breadth (mm): 53.7 Width (mm): 44.4
Weight (g): 185 | Uniface/Biface:
No. of flake scars: 0 | Invasiveness of flake scars:
Condition of the tool: Rolled/weathered | Evidence of use: No
Retouch: No | Retouch Type:
Platform type: Plain
Notes: Squarish, snapped at one end, has four sides.



Site: Champamura Cluster No: 66
Co-ordinates: 23°46'.869''N 91°32'.126''E
Artifact No: CMK1 Core/flake/clast/blank: Flake
Basic typology: Celt Uniface/Biface: Biface
Final classification: Celt (Side scraper) Material: High quality fossil-wood almost chert-like
Length (mm): 140 Breadth (mm): 49.1 Width (mm): 20.1
Weight (g): 111 Flake type: VI
No. of flake scars: 7 Invasiveness of flake scars: High
Condition of the tool: Fresh Evidence of use: Yes
Retouch: Yes Retouch Type: Alternate retouch
Platform type: Plain Symmetrical/Asymmetrical: Symmetrical
Notes: Elongated tapered baguette tool, both ventral and dorsal has smooth flake scars with patchy rough surface.

Site: Champamura | Cluster No: 56

Co-ordinates: 23°46'.658''N 91°32'.301''E

Artifact No: CMK2 | Core/flake/clast/blank: Flake

Basic typology: Polished axe | Uniface/Biface: Biface

Final classification: Polished axe | Material: Fossil-wood

Length (mm): 66.5 | Breadth (mm): 38 | Width (mm): 18

Weight (g): 43 | Flake type: III

No. of flake scars: 5 | Invasiveness of flake scars: High

Condition of the tool: Fresh | Evidence of use: Yes

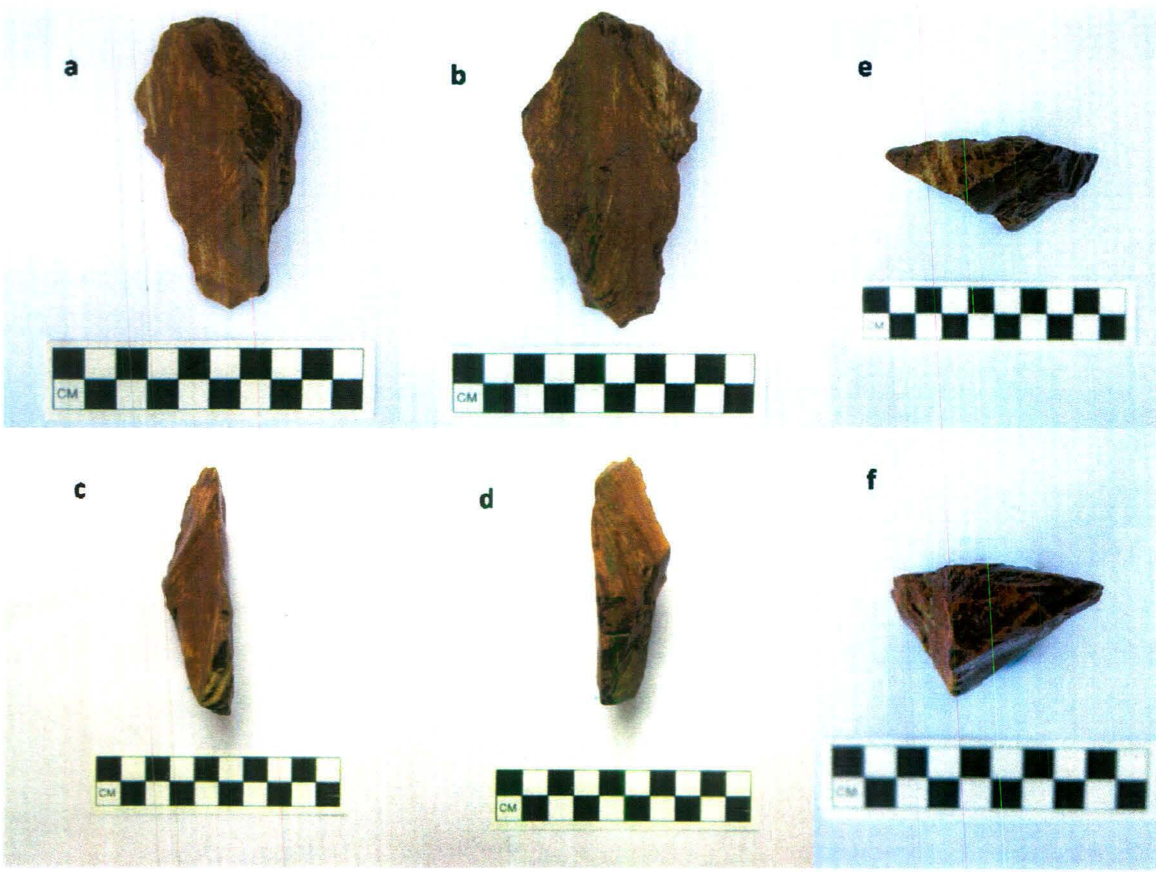
Retouch: Yes | Retouch Type: Alternate retouch

Platform type: Facetted | Symmetrical/Asymmetrical: Symmetrical

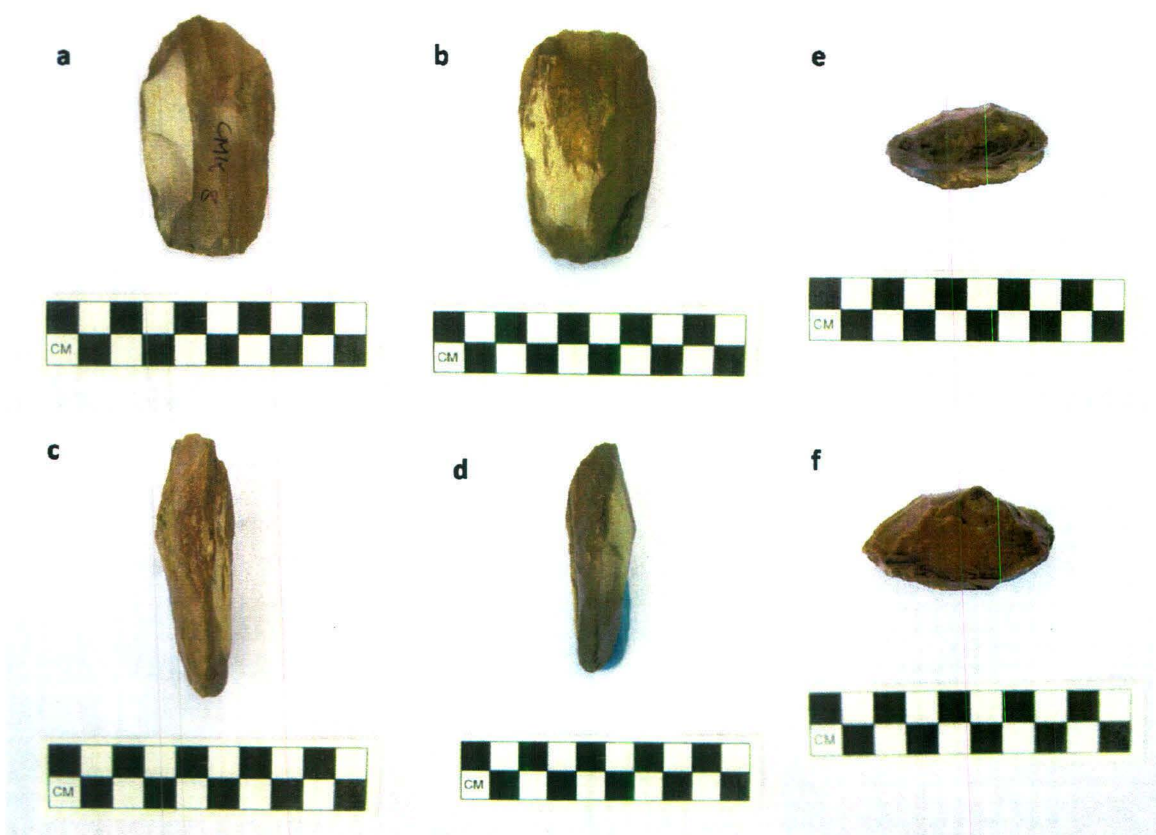
Notes: Triangular convex working edge, Triangular lateral sides and cross-section, cortex present at the butt-end.

Site: Champamura Cluster No: 55
Co-ordinates: 23°46'.659''N 91°32'.301''E
Artifact No: CMK4 Core/flake/clast/blank: Flake
Basic typology: Side scraper Uniface/Biface: Uniface
Final classification: Flake side scraper Material: Fossil-wood
Length (mm): 76.6 Breadth (mm): 67.5 Width (mm): 13.1
Weight (g): 59 Flake type: V
No. of flake scars: 5 Invasiveness of flake scars: Low
Condition of the tool: Fresh Evidence of use: Yes
Retouch: Yes Retouch Type: Alternate retouch
Platform type: Facetted Symmetrical/Asymmetrical: Asymmetrical
Notes: Oblong elongated snapped at the top, cortex present on the ventral side (top corner), bulb present, linear lateral sides.

Site: Champamura
Cluster No: 57
Co-ordinates: 23°46'.648''N 91°32'.292''E
Artifact No: CMK5
Core/flake/clast/blank: Flake
Basic typology: Utilized flake
Uniface/Biface: Biface
Final classification: Utilized flake
Material: Fossil-wood
Length (mm): 82.9
Breadth (mm): 56.5
Width (mm): 25.1
Weight (g): 84
Flake type: VI
No. of flake scars: 3
Invasiveness of flake scars: Low
Condition of the tool: Fresh
Evidence of use: Yes
Retouch: Yes
Retouch Type: Alternate retouch
Platform type: Uneven platform
Symmetrical/Asymmetrical: Asymmetrical
Notes: Pointed triangular shaped.



Site: Champamura Cluster No: 58
Co-ordinates: 23°46'.637''N 91°32'.261' E
Artifact No: CMK8 Core/flake/clast/blank: Flake
Basic typology: Miniature atypical handaxe-like Uniface/Biface: Biface
Final classification: Miniature atypical handaxe-like Material: Fossil-wood
Length (mm): 69.1 Breadth (mm): 41.7 Width (mm): 21.5
Weight (g): 64 Flake type: VI
No. of flake scars: 8 Invasiveness of flake scars: Medium
Condition of the tool: Fresh Evidence of use: Yes
Retouch: Yes Retouch Type: Alternate retouch
Platform type: No platform Symmetrical/Asymmetrical: Symmetrical
Notes: Rectangular shaped both ventral and dorsal sides, elliptical cross-section.



2.3.A.9: Sonaram (24°02'.529''N 91°27'.446''E)

The site is situated northwest of Tripura bordering Bangladesh (see Figures 2.11 & 2.12). Goireng River flows through the site. The site is mostly on the hills and slopes, with paddy cultivation taking place in the valleys. The Goireng River is a stream that runs through a gorge, which flows in between mud-rock walls standing parallel on both sides of the stream at least 15 m high. During the survey only a clast (pick-like) was collected from the site. Although fossil-wood scatter was seen in abundance on hill slopes and stream alike.

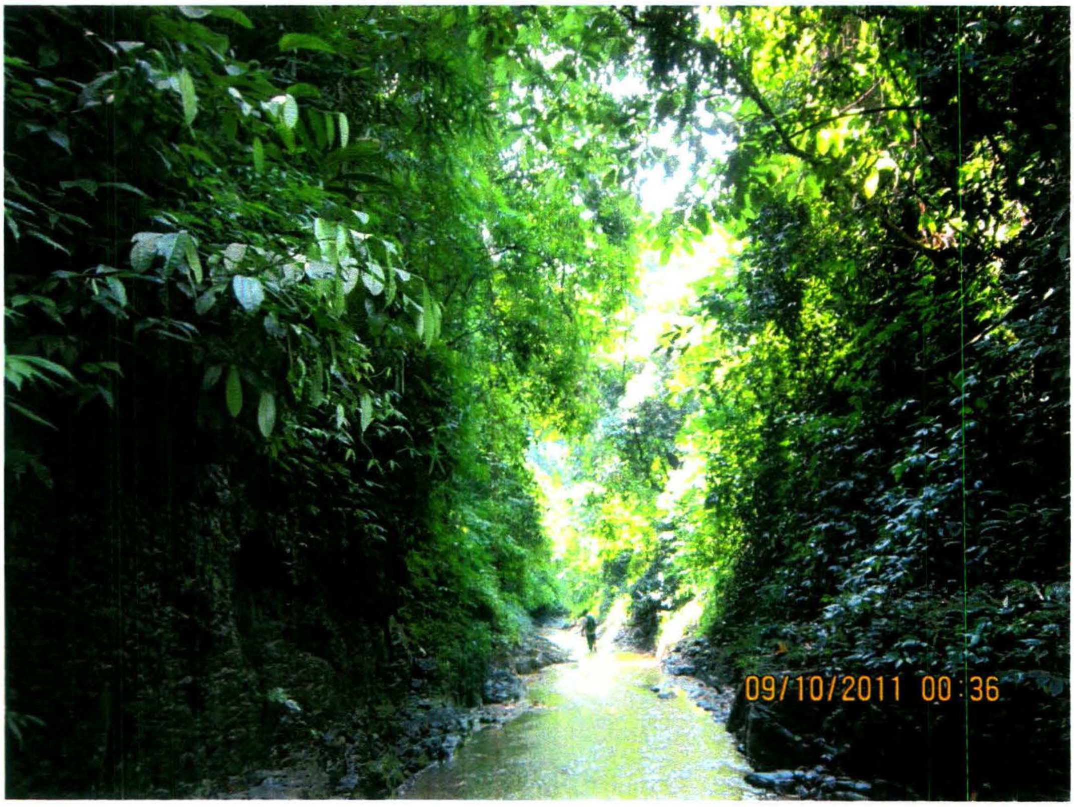


FIGURE 2.11. Sonaram site

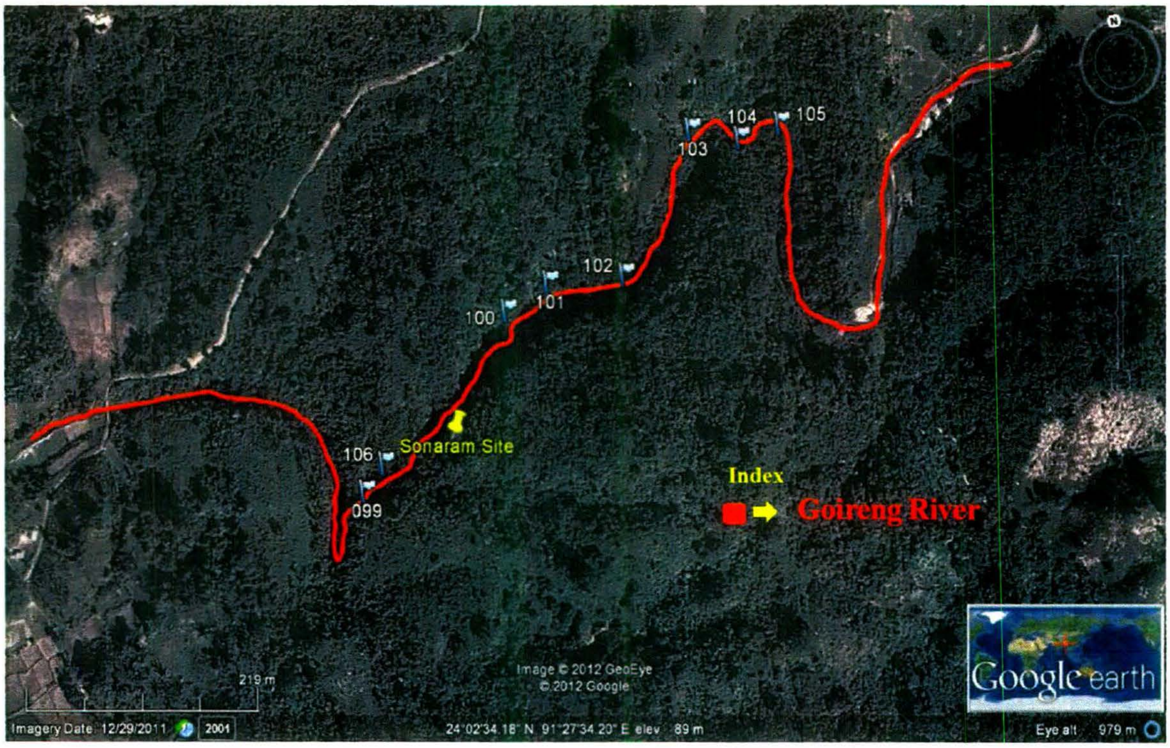


FIGURE 2.12. Google image of Sonaram site

Though Figure 2.12 shows several collection points, most of these comprised only blocks of fossil wood, which have not been documented here.

Site: Sonaram — Cluster No: 102
Co-ordinates: 24°02'.604''N 91°27'.599''E
Artifact No: SO1 — Core/flake/clast/blank: Clast
Basic typology: Clast — Final classification: Pick?
Material: Fossil-wood
Length (mm): 161 — Breadth (mm): 76.4 — Width (mm): 45.4
Weight (g): 455
Condition of the tool: Rolled
Notes: Triangular in shape.

2.3.A.10: Kunjaban (latitude and longitude not taken)

The site is mostly under construction area of new township (see Figures 2.13 & 2.14). This site is already totally disturbed due to leveling of soil for construction purpose. As the site situated within the confinement of Agartala Township, it has been completely destroyed and only buildings could be seen standing all over the site area (if this is the same Kunjaban as mentioned by Ramesh).

FIGURE 2.13. Kunjaban site

FIGURE 2.14. Google image of Kunjaban site

2.3.A.11: Circuit House (23°51'.087''N 91°17'.013''E)

The site has completely disappeared as only buildings stand in this area, due to massive expansion of Agartala Township. The site is situated within Agartala Township area (see Figure 2.15). There is an Army Cantonment opposite to this site and also Governor House stands just next to the site. This site has disappeared as office buildings, residential buildings and shops have taken over this locality.

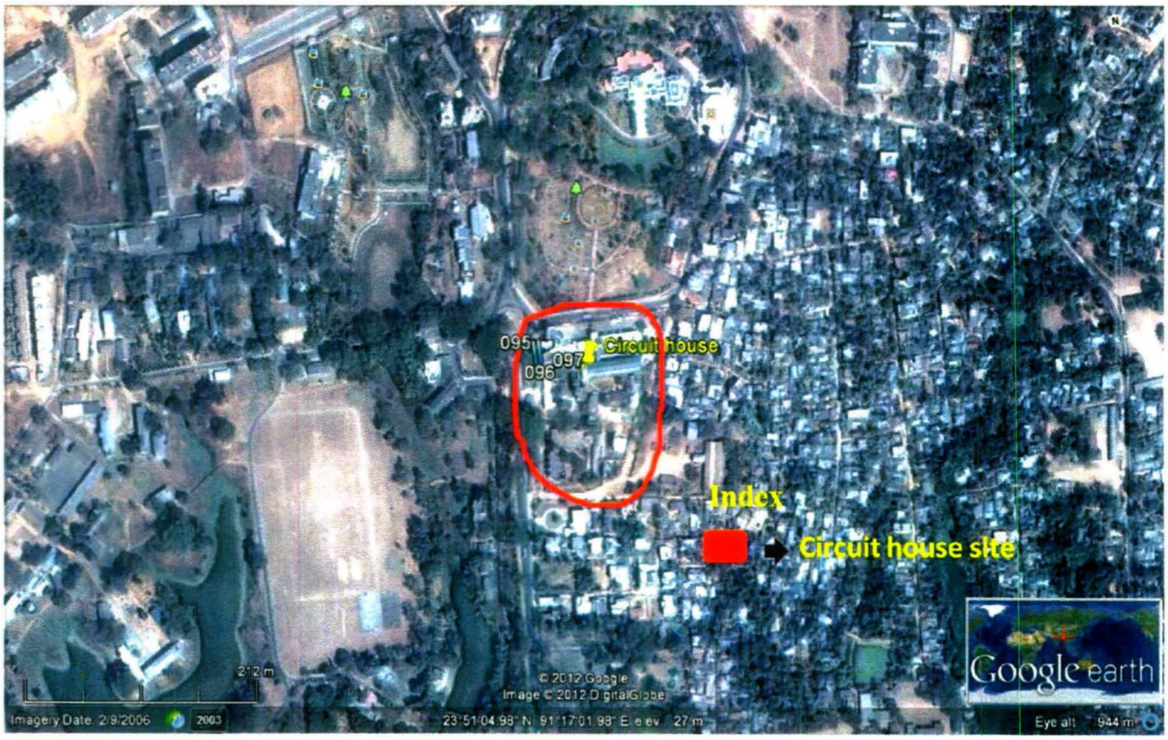


FIGURE 2.15. Google image of Circuit House

2.3.A.12: Debramthakur (23°52'.531''N 91°18'.797''E)

This site is also disturbed. Nothing much is left in this site except for a few chunks of fossil-wood seen here and there. The site has been bulldozed for leveling of ground for construction purpose, and filling-up ponds of the Agartala Town (see Figure 2.16). Now, the site remains barren with only few cattle grazing at the site. There are four families residing in the site.

FIGURE 2.16. Debramthakur site

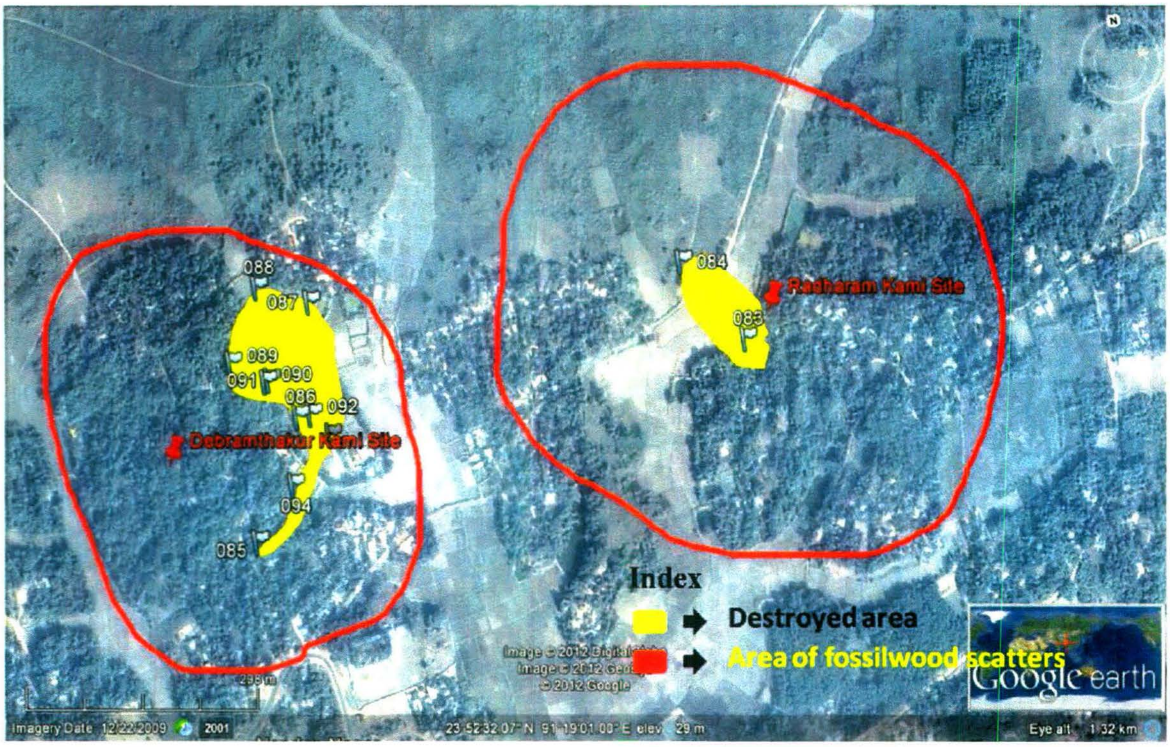


FIGURE 2.17. Google image of Debramthakur and Radharam Kami sites

2.3.A.13: Radharam Kami (23°52'.529''N 91°19'.142''E)

The site is situated around 5 km away from Agartala Town area. It is a village where there are families residing within the site area. The site is also in a way disturbed by the habitation of local population. The site comprises partly of vegetation area and inhabited area. The vegetation area has a playground where the locals play various games, which is more of recreational ground so to say. Fossil-wood scatter was observed in this site. The site was located by getting information from local informants.

FIGURE 2.18. Radharam Kami site

CONCLUSION

The focus of my study was on the sites Sonai Bazar, Debara Kami, Sumili, and Champamura Kami. The reason I chose these sites is because unlike other sites the density of fossil-wood tools present in these sites seen to be more than the rest of the sites. Accessibility is another major factor that made me choose these sites, except for the site Champamura, where accessibility is difficult, but the quality of material used for tool making from Champamura was seen to be of fine quality, which is why I chose the site. Sonai Bazar, Debara Kami and Sumili fall under same area. These sites are situated next to each other. Sonai Bazar particularly looks like a quarry site, where fossil-wood scatter is seen in abundance, along with tools, cores, flakes, and debitage. The documentation I have done in this chapter is mostly of the tools that were collected from these sites.

Thus, to conclude I must say this documentation of fossil-wood tools was based on a preliminary survey. There is a huge potential for future prehistoric research work in Tripura. Although the region might be densely forested area, with thick jungles still it remains an area of great potential for investigating prehistoric sites in the region. This area has unique tools made of fossil-wood, which was confirmed through personal communication by Dr Abu Talib, Associate Professor, Geology Department, Aligarh Muslim University. These specimens of fossil-wood tools were mostly surface finds, hence, one could claim that there is great scope for furthering the research work as excavations might reveal more details regarding the usage of fossil-wood as a material for tool making in the region.

Sr. no.	Site	Classification	Typology	Max. Length (in mm)	Max. width (in mm)	Max. Thickness (in mm)	# Scars	Weight (in grams)
1	Baramura	fl	debitage	53.9	111.3	24.1	0	115
2	Buduchaudhary	fl	side scraper	112.3	67.8	21.5	3	197
3	Buduchaudhary	fl	debitage	41.2	67.1	10	1	28
4	Buduchaudhary	cortex	rolled	61.5	49.3	16.2	0	49
5	Champamura	fl	celt (biface)	140	49.1	20.1	7	111
6	Champamura	fl	polished axe	66.5	38	18	5	43
7	Champamura	cr	flake	80.2	54.4	21.6	4	77
8	Champamura	fl	side scraper	76.6	67.5	13.1	5	59
9	Champamura	fl	flake	82.9	56.5	25.1	3	84
10	Champamura	cr	core	65.7	53.7	44.4	0	185
11	Champamura	cl	clast (polished)	150.2	63.6	45.9	0	439
12	Champamura	fl	biface	69.1	41.7	21.5	8	64
13	Champamura	cl	clast (snapped)	96.2	51.3	36.5	0	288
14	Debara	fl	flake biface	111.6	62.6	27.8	11	196
15	Debara	fl	flake biface	107	66.7	36.4	10	220
16	Debara	fl	flake	74.1	78.4	27.8	0	107
17	Debara	fl	flake	100.2	100.3	43.2	0	305
18	Sonai Bazar	cl	chopper	123.5	71.7	61.5	3	669
19	Sonai Bazar	fl	end scraper	96.5	42.8	27.3	5	97
20	Sonai Bazar	cr	core scraper	110.4	46.2	33.4	5	160
21	Sonai Bazar	fl	flake	66	86	25	0	100
22	Sonai Bazar	fl	adze	62.4	51	17.1	9	64
23	Sonai Bazar	fl	end scraper	60	51	24.7	8	67
24	Sonai Bazar	fl	debitage	47.3	68.1	19.5	0	51

Table 1: Detailed measurements of fossilwood tools

Sr. no.	Site	Classification	Typology	Max. Length (in mm)	Max. width (in mm)	Max. Thickness (in mm)	# Scars	Weight (in grams)
25	Sonai Bazar	fl	end scraper	48.2	63.4	20.4	7	51
26	Sonai Bazar	fl	side scraper	51.8	54.5	22.2	4	44
27	Sonai Bazar	fl	side scraper	75.5	64.9	25.7	7	106
28	Sonai Bazar	cr	core biface	83.1	54.8	32.2	12	136
29	Sonai Bazar	fl	knife-like	71.2	26.2	21	3	24
30	Sonai Bazar	fl	pick	50.8	45.3	19.4	7	49
31	Sonai Bazar	fl	blade-like	62.1	30.1	7.1	0	11
32	Sonai Bazar	fl	point	80.8	43.7	24.2	14	55
33	Sonai Bazar	fl	flake blade	26.6	75	28.6	0	43
34	Sonai Bazar	fl	flake	42.4	50	7.3	0	13
35	Sonai Bazar	fl	flake	69.5	46.9	20.8	5	56
36	Sonai Bazar	fl	end/side scraper	65.7	47.1	18.3	8	43
37	Sonai Bazar	fl	side scraper	68.5	38.9	15.8	12	40
38	Sonai Bazar	cr	core	106.1	70.2	53.8	4	349
39	Sonai Bazar	cr	core scraper	139.6	97.1	52	11	510
40	Sonai Bazar	cr	core scraper	127.3	95.4	51.2	14	655
41	Sonai Bazar	cr	core (possibly utilized)	102	83.6	60.8	7	321
42	Sonai Bazar	fl	side scraper	78.6	83.4	33.9	5	130
43	Sonai Bazar	fl	flake	70.3	54.1	35	0	69
44	Sonai Bazar	fl	flake	69.5	85.9	60.4	0	206
45	Sonai Bazar	cr	cleaver-like	86.7	55.6	31.9	7	123
46	Sonai Bazar	cr	adze	99.6	74.3	45.8	15	326
47	Sonai Bazar	cr	pick (possibly)	114.1	56.3	37.1	13	183
48	Sonai Bazar	fl	scraper	71.1	56.2	17.1	9	55

Table 2: Detailed measurements of fossilwood tools

Sr. no.	Site	Classification	Typology	Max. Length (in mm)	Max. width (in mm)	Max. Thickness (in mm)	# Scars	Weight (in grams)
49	Sonai Bazar	fl	blade-like	99.6	57.4	41.4	5	102
50	Sonai Bazar	fl	blade-like	34.8	63.7	24.5	0	31
51	Sonai Bazar	fl	flake	54.9	63.4	31.9	3	85
52	Sonai Bazar	fl	atypical cleaver	97.7	70.3	36.6	8	192
53	Sonai Bazar	cr	pick? Adze? Biface	106	56.4	29.5	18	177
54	Sonai Bazar	cr	elongated biface pick?	121.8	41.7	30.9	10	181
55	Sonai Bazar	cr	unpolished axe biface	121.9	46.5	28	16	148
56	Sonai Bazar	fl	debitage	87.2	54.5	16.3	0	40
57	Sonai Bazar	cr	core scraper	55.3	69.5	39.8	8	121
58	Sonaram	cl	pick-like	161	76.4	45.4	0	455
59	Sumuli	fl	biface (handaxe-like)	86.7	42.7	21.9	14	75
60	Sumuli	cl	clast	111.5	77.5	74.3	0	826
61	Sumuli	semi-cob/cl	chopper	89.9	79.9	52.2	1	437
62	Sumuli	fl	side scraper	50.6	74.3	33.3	4	43
63	Sumuli	cr	core	81.5	67.4	34.5	1	138
64	Sumuli	cr	side scraper	71	58.7	26.4	19	100
65	Sumuli	cr	core	65.5	86.5	46.6	2	271
66	Sumuli	cr	intermediate	52.6	109.6	33	4	158
67	Sumuli	fl	flake	175	90.1	50.2	2	594
68	Sumuli	cr	core flake	89	64.2	33.6	2	177
69	Sumuli	fl	cleaver-like	80	92	51.5	1	172
70	Sumuli	fl	flake biface	80.9	59.9	25	1	92
71	Sumili	fl	flake	92.8	77.6	22.2	1	152
72	Sumili	fl	side scraper	82	36.2	14.8	3	47

Table 3: Detailed measurements of fossilwood tools

Sr. no.	Site	Classification	Typology	Max. Length (in mm)	Max. width (in mm)	Max. Thickness (in mm)	# Scars	Weight (in grams)
73	Sumili	fl	debitage	60.4	45.8	20.6	0	60
74	Sumili	cr	core scraper	82.6	69.8	43.3	13	251
75	Sumili	fl	adze	68.3	56.3	13.7	1	35
76	Sumili	cr	core flake	55.9	75.7	40.5	1	96
77	Sumili	fl	flake	79.1	64.8	23.8	0	79
78	Sumili	fl	flake	43	73.4	14.9	0	42
79	Sumili	fl	flake	53.1	57.8	17.9	0	45
80	Sumili	cr	core	147.5	58.7	42.7	3	313
81	Sumili	fl	debitage	77.1	60.1	16.7	1	43
82	Sumili	fl	blade-like	82.7	61	17.9	0	61
83	Sumili	fl	side scraper	124.5	61.5	37.7	4	213
84	Sumili	fl	flake	103.8	44.5	23.7	1	92
85	Sumili	fl	flake	43.3	72.5	36.8	0	77
86	Sumili	cr	core	87.7	69.8	55.4	1	389
87	Sumili	fl	flake	80.2	100.5	29	0	190
88	Sumili	fl	flake	63.9	59.7	73.3	0	91
89	Sumili	fl	pick?	97.7	61.2	30.2	0	137
90	Sumili	fl	flake-blade	62.1	31.6	15.9	0	24
91	Sumili	natural fl	flake	77.5	57.9	13.6	3	88
92	Sumuli	fl	utilized flake	68.4	53	11.4	0	24
93	Sumuli	fl	notch scraper	42.8	51.7	17.9	1	25

Table 4: Detailed measurements of fossilwood tools

CHAPTER 3

INTRODUCTION

In this chapter I have made an attempt to discuss in detail the techniques of stone tool making as well as the type of raw material used for making tools. I have also tried to discuss the use of fossil-wood especially in Tripura for making tools. I have drawn on various case studies on lithics in an attempt to discuss the technological aspects of tool making in this chapter. I have also tried to cover various regions of India in an attempt to bring about the knowledge of region specific differences in techniques employed by the hominin groups. Although, similarities in techniques remain a prevalent factor but differences does appear to be seen in some cases.

3.1. Types of stones used for making tools

According to Paddayya (2009: 4), the entire gamut of evidence for studying the Palaeolithic and Mesolithic phases was constituted by lithic artifacts. Lithic technology continued into the succeeding Neolithic-Chalcolithic stages. He further mentioned that it is now clear that in different parts of the country the Stone Age groups utilized a wide variety of locally available rocks obtained either as river pebbles or as nodules from the landscape. In most parts of the country quartzite was indeed preferred by the Lower Palaeolithic groups, but it was by no means the only medium worked upon. On the contrary, various other rocks were utilized. For example, in the Deccan region basalts or dolerites from dykes were used. At sites like Lalitpur in Jhansi district of Uttar Pradesh granite was exploited. In Hunsgi and Baichbal valleys of lower Deccan silicified limestone was worked upon. Quartz and schist were also used in some other parts of the country.

He further emphasized that from the succeeding Middle Palaeolithic phase onwards, while the use of quartzite continued in some regions, the Stone Age groups also began to work upon a variety of crypto-crystalline silica materials comprising chert, chalcedony, jasper, and agate. At places like Choli and Dongargaon (Middle Palaeolithic) and Salvadgi and Maralbhavi (Upper Palaeolithic) in north Karnataka extensive workshops developed on chert veins exposed in geological formations, thereby revealing that the Stone Age groups now acquired a more intimate knowledge of the landscape and its contents. When we come to the Mesolithic stage, even highly intractable materials like quartz were used for tool-making (*ibid*: 11).

3.2. The use of fossil-wood for making tools

Dani (1960: 9-10) emphasizes that south-east Bengal, extending east of river Meghna, rivers rise from the eastern Tertiary Hills of Tipperah and Chittagong, and flow in a west or south-west direction. He mentions that the three important river valleys in that region cut through the Tertiary ranges. The Surma Valley, incorporating the district of Sylhet, separates the Tipperah Hills from a fringe of the Tertiary rocks bordering the southern edge of the Shillong Plateau. The Gomati River, rising in Tipperah Hills, encircles the lateritic deposit of the Lalmai-Mainamati Hill on three sides. Further he mentions that the important feature in that area was the abundant occurrence of fossil wood, which were completely silicified and found lying in horizontal beds. Furthermore, from the conclusion of fossilwood prehistoric tools found in Tripura and that found in Lalmai Hills, near Comilla in Bangladesh, Chakrabarti (1998) had described the identical character of these two industries as the Lalmai-Tripura prehistoric fossilwood industry.

A.K. Sharma (1996: 77) points out that the artifacts from Tripura showed close affinity with the late Anyathian and Neolithic tools from Irrawaddy valley of Myanmar as (i) silicified fossil wood was the dominant raw material at both the places, (ii) in view of the identity of material, the technology of flaking has been adopted in both cases, resulting in the production of similar type of implements, (iii) the Upper Anyathian assemblage was characterized by the presence of true scrapers, points, hand-adzes and pick-like implements. This was similar to the Tripura assemblage.

3.3. Techniques of making stone tools: a global perspective

According to Sankalia (1964: 18-43), the earliest tools were made from stone since the conceivable period of hominids was known to exist. He points out that the earliest tools so far known consisted of pebbles, one side of which had deep hollows or flake scars. From the observation and experiments by prehistorians, it has been found that such deep scars resulted either by:

(i) Striking a block of stone against another (stationary stone known as anvil); or
(ii) Striking a block of stone or pebble in one's left hand with another block or pebble in the right hand.

These techniques were better known as- "Anvil or Block-on-Block Technique" and "Direct Percussion or Stone Hammer Technique". Among the two above techniques it was debated that the latter was the most common method that was employed in making of tools. There are various other techniques that were observed and studied of the Early Stone Age over the ages by prehistorians. They are:-

(iii) Clactonian technique

Tools which were made out of the large and small flakes that were detached from a pebble or nodule while making tools came to known as the "Clactonian technique", where the traces of flaking called "fracture scars" left on the flake and the core or the nodule, the method by which these or any other flakes were made could be reconstructed.

(iv) Step or Controlled Technique

The technique was called Step or Controlled Technique because while trying to flake a pebble or a block of stone with another stone (i.e. hammer) the maker has to control the force of the stroke.

(v) Cylinder Hammer or Wood-or Bone Hammer Technique

This technique was observed from St. Acheul in France where tools discovered showed an unusually smooth and even surface unlike the earlier handaxes from Abbeville.

(vi) Levallois Technique

This technique was considered a more advanced, artistic and skillful method of preparing flakes and cores. It was first noticed in flakes found from Levallois Perret, a suburb of Paris. Hence the technique has been often described as 'Levalloisian'. In this method instead of straight away hitting one flattish pebble or core with another pebble, firstly, the core was carefully prepared by initially roughly trimming the sides and then from the upper surface the cortex was removed in such a manner that the flake scars usually meet in the centre. In this way all irregularities, uneven surfaces-were removed, and the core assumed more or less, not smooth, but rounded or semi-rounded appearance. Secondly, a flattish place called "striking platform" was prepared, by removing very small flakes, on the core along the margin, where the two surfaces of the core intersect. This may be anywhere, but was preferably at the shorter end or in the middle of the longer side and perpendicular to the longer or shorter axis. Thirdly, the blow was then given by a (possibly sharp or narrow pointed) tool either directly or through an intermediary tool known as "punch" on this prepared surface (platform) by holding or supporting the core with the left hand (or right hand as the case may be) in such a way that the blow was almost at right angles to the platform or the axis of the tool. The result was that a comparatively thin flake, roughly triangular or oval in outline, came out. It had a clean undersurface and a part of the prepared platform forming an angle of about 80^0-90^0 with the undersurface (*ibid*: 26-27).

(vii) Discoid Core or Mousterian Technique

This technique is another method related to or comparable to the Levallois technique of flake manufacture known as "Discoid Core" or "Mousterian" technique.

(viii) Chellian

The technique was called 'Chellian' after the handaxes that were found were seen to have deep flake scars and irregular outline with a heavy butt at the site of Chelles on the junction of the rivers Seine and Marne in France.

(ix) Abbevillian

This technique was named after the site Abbeville along the Somme River in France. This technique was used to refer in preference to Chellian described above. It was realized that Abbeville gave a better sequence of handaxe cultures than Chelles, and was stratigraphically the earliest and thus the oldest handaxe industry. Though the tools showed the same features as at Chelles, and therefore both the terms-Chellian and Abbevillian- are now used for describing handaxes with deep flake scars and irregular outline indicating an earlier stage in the handaxe industry.

(x) Acheulian

The technique came to be called as "Acheulian" after the handaxes found at St. Acheul in the Somme Valley from where stone tools were discovered by Boucher de Perthes in about 1836 for the first time in France. In this technique it was observed that that the handaxes from this site were much finer than those found at Chelles or Abbeville. Further, from the careful observation and experiments it was seen that such fine surfaces with biconvex or lenticular section and regular outline- was achieved by a light cylindrical hammer, either of wood, bone or stone. Hence the term Acheulian came to signify a very advanced stage in the development of handaxe culture, as it stands for symmetry of form produced by a certain technique. however prehistorians emphasizes that outside France its use has little chronological significance, even though it was seen that in India and Africa handaxes had a gradual improvement which may correspond with the Abbevillian and Acheulian (*ibid*: 31).

In the Middle Stone Age all the above techniques singly or simultaneously seem to have been employed, and a new method called the "Blade Technique" also seems to have come into use, for blade-like flakes have been reported from several sites of this period in India as well as in Western Europe and Africa. Though it was observed that the technique was a late introduction which started by the Late Stone Age onwards and seen to have continued thereafter in the Neolithic and Chalcolithic times not only in India, but elsewhere, right upto the modern times.

(xi) Blade Techniques

For this technique Sankalia (*ibid*: 32) points out that "every 'blade' is a flake but all flakes are not blades". He explains that a 'blade' by its very connotation is thin and slender as opposed to thick or broad. And this rules out a large number of flakes from inclusion in the category of blades.

3.4. Techniques of making tools: specific case studies

Core-and-flake assemblages or Mode 1 technology in the Indian subcontinent were found in diverse geographical, ecological, and temporal contexts. Almost all of this evidence, from both the sub-Himalayan region and peninsular India, exhibits broad morphological similarities to other such assemblages in the Old World. They consist of the standard Mode 1 tool-types such as varieties of cores, discoids, choppers, core-scrapers, flakes, scrapers, notches, polyhedrons, sub-spheroids, unifaces, occasional *atypical* bifaces, debitage, and so forth and demonstrate a moderate diversity in knapping technique and tool-typology. The use of rounded quartzites reflects on homonin technological proficiency and associated cognitive levels which have major implications on their ability to reduce and shape unwidely clasts or blanks in order to obtain suitable striking platforms. For example, to produce choppers, pebbles and cobbles were specifically selected with one flattish face, allowing easier primary-flake detachment. For the most part, artifact assemblages produced on pebbles-cobbles show minimal cortex removal. The distribution, accessibility and morphology of rounded quartzite clasts appear to have been the principal factors in determining settlement location, inter and intra-regional mobility, and associated assemblage compositions and subsistence behaviours. Locations with a high density of quartzite clasts occasioned intensive exploitation of such sources, possibly represented by multiple visits for clast procurement. Core-and-flake assemblages that ultimately prove to be contemporary with but were spatially and ecologically separated from Acheulian assemblages in the subcontinent deserve a proper examination to explain this behavioural dichotomy (Chauhan 2010: 2).

3.4A. North India

From north India two case studies have been used as an attempt to discuss on the techniques of making tools.

3.4A.1. Siwaliks

Chauhan (2006: 11) reiterates that the Lower Palaeolithic record in the Siwalik region was essentially represented by open-air sites belonging to the Acheulian or the Soanian, a non-biface tradition. Soanian artifacts were primarily manufactured from quartzite pebbles, cobbles, and occasionally boulders. The assemblages generally comprised varieties of choppers, discoids, scrapers, cores, and numerous flake types, all occurring in varying typo-technological frequencies at individual sites. The raw material utilized for the production of both Siwalik Acheulian and Soanian artifacts was the same-quartzite pebbles, cobbles, and boulders. However, general field observations revealed that quartzite pebbles and cobbles were much more abundant than boulders in the Siwalik ecozone. Emphasis was laid on the low density of artifacts at all Siwalik Acheulian localities, the reason being that the bifaces were manufactured elsewhere but utilized and abandoned in the Siwalik region. This observation was confirmed by the absence of debitage, biface-thinning flakes, and cores. Factory/workshop sites of the Acheulian have not yet been reported from anywhere in the Siwalik region. Chauhan (*ibid*: 12) cites that, in contrast, high density factory sites of the Soanian tradition have been observed by de Terra and Paterson. Chauhan makes a point that the difference in artifact density may be explained in part through a change in the availability of raw materials and emphasizes that prior to the formation of the Boulder Conglomerate Formation, the availability of suitable raw material in the Siwalik region was minimal. Furthermore, he cited that archaeologists have demonstrated through feasibility experiments that different tool-types were utilized by early hominids to achieve different tasks. And interestingly, all activities mentioned by de Terra and Patterson, including hide slitting and scraping, heavy and light-duty butchery, bone breaking, nut cracking, and heavy and light-duty woodworking, can be accomplished through the use of bifacial and/or non-bifacial tool types. Further he reiterates that although de Terra and Patterson have compared the Oldowan with the

Acheulian in East African palaeological and archaeological contexts, such concepts may be applicable to the Soanian.

For instance, Soanian bifacial and bimarginal choppers could functionally replace Acheulian handaxes. Large flakes from boulders and unifacial and unimarginal choppers may be able to replace Acheulian cleavers in the same manner. Further, Chauhan points out that infact the Siwalik Acheulian may have chronologically overlapped with the Soanian at one point in time before the latter became the predominant lithic tradition in the region. In addition, both Soanian sites and late Acheulian assemblages in general, appeared to share advanced tool-types such as Levallois flakes/cores and distinct scraper types.

3.4A.2. Garhwal

Assemblages produced from quartzite and jasper and recovered from the Garhwal Himalaya in the Alaknanda valley in northern India reflect hominin adaptations to high altitude environments during the South Asian Middle Palaeolithic period. Some of the new types that either first appear or become prominent in the South Asian Middle Palaeolithic were prepared-cores, discoids, flakes, flake-scrapers, borers, awls, blades, and points. A consistent geoarchaeological feature of Middle Palaeolithic sites in South Asia was that they were often found near sources of raw material, such as gravel or conglomerate beds (Chauhan 2006: 12).

3.4B. West India

Two case studies will be discussed in this section. They are the following-

3.4B.1. Rajasthan

In Rajasthan, from near the freshwater lake of Budh Puskar (Alwar District), a Middle Palaeolithic industry comprising scrapers, chopping tools, cleavers, blades, burins and prepared flakes have been reported. These tools belonged to the weathered soil horizon representing, it was believed, a wet phase. Slender blades and cores of the Upper Palaeolithic tradition have also been found in the limestone hills of Sojat and from the Luni valleys (Agrawal and Kharakwal 2002: 63-64). In Mewar (Middle Palaeolithic site) the tools were smaller than the Early Palaeolithic ones, made largely of fine-grained material like agate, jasper and chert. Handaxes and cleavers were observed to have become rare, while chopper-chopping tools have become absent altogether, whereas the Levallois and discoidal core techniques were observed to have become more predominant. The assemblage comprised a variety of scrapers, borers and points besides flakes and blades. In the Luni valley, a greater variety of material was observed to have been employed, such as silicified wood, rhyolite, and porphyry. Handaxes and cleavers were reported to have still persisted and the Levallois technique was more dominant. The assemblage there was observed to have evolved clearly out of the Acheulian.

3.4B.2. Gujarat

Ajithprasad (2007: 89) reports that in Gujarat the Acheulian assemblages of the primary sites were dominated by handaxes, scrapers, simple retouched flakes and cleavers, all made of locally available quartzite and quartz. These surface assemblages showed both lower and upper Acheulian typological features with no stratigraphic distinction. The artifacts from Laphni, Mosavar, Baskario, Haveli, Uchhet and Dori Dunker were generally thick with irregular cross-sections, uneven surfaces and sinuous edges, thereby indicating a lower Acheulian character. On the other hand, the assemblages from Sagdhara, Uchhet, Baskario, Pipiya and Dori Dunger have yielded a majority of upper Acheulian artifacts. Thin and regularly shaped ovates and lanceolates and an abundance of fine scrapers characterized these assemblages.

He has emphasized that the Acheulian industry in the Orsang Valley of Gujarat was characterized by a preponderance of handaxes followed by scrapers. About seventy percent of the artifacts collected were finished tools. Other tools like cleavers, knives and picks were poorly represented. Another category of artifacts that occurred abundantly were the retouched or used flakes. The artifact assemblage included large, boldly flaked and crudely shaped bifaces and regularly worked ones showing delicate and refined crafting skill. Although he claims that, since, all the artifacts occurred on the surface of the primary localities, it was difficult to place them in a proper chronological perspective (Ajithprasad 2005: 3-6).

He further mentioned that except a few isolated artifacts made of chert recovered from the Unch-Orsang alluvial plain, no typical Middle Palaeolithic site was found in the middle Orsang valley. However, within the occupation zone of the Acheulian localities in the northern Piedmont, six distinctive localities of the early Middle Palaeolithic period were discovered during the survey. These localities, just as in the case of the Acheulian localities, were identified on the basis of characteristic tool assemblages consisting of miniature handaxes, a number of small, thin scrapers, points and a few retouched flakes. Except for the miniature handaxes other types like the scrapers, pointstand retouched flakes were generally made from small flakes struck from prepared cores. He also states that a trend in the preference for the use of locally available fine-grained quartzite to make artifacts was apparent in the assemblages from the upper Acheulian onwards, and it culminated in the transition phase when the tools were made entirely of fine-grained quartzite. The use of fine-grained chert and jasper for making Middle Palaeolithic tools, presumably at a later stage was also indicated by the discovery of a few artifacts of these materials as isolated finds in the Orsang-Unch alluvial plain (Ajithprasad 2005: 6).

More reports of Ajithprasad (2005: 189) from the Sukhi Valley in Gujarat revealed that the Palaeolithic localities were found as discrete clusters of artifacts including both finished ones and the debitage of the industry in the foothill regions as well as on the hilltop of the valley. The localities also showed considerable variation in the number of artifacts exposed on the surface. A relatively high density of artifacts was reported from Raypur Locality IX in the foothill region and from Jogpura Locality V at the top of the hill. A total of 2734 Acheulian artifacts have been collected from 36 localities in the valley with handaxes, ovates, cleavers, scrapers, knives, retouched flakes and chopping tools as the important artifacts in addition to a number of simple flakes, broken, discarded and unfinished artifacts, exhausted cores and nodule fragments suggesting onsite manufacturing of tools. The tools were made of locally available quartzite of different colours. Fine-grained milky quartz was also used for making Acheulian bifaces. The tools represented both roughly made, thick bifaces showing bold flaking as well as extremely well-made artifacts, which were thin and had a regular shape and uniform cross-section.

3.4C. Central India

Narmada Basin

At both Mahadeo-Piparia and Durkadi, a high frequency of unusually large non-biface artifacts, including cores, choppers, flakes and other formal tool types were recovered in stratified contexts. While Mahadeo-Piparia has yielded Acheulian bifaces, Durkadi continued to be enigmatic, despite report of 1 'proto-cleaver', 6 'proto-handaxes' and 1 'Abbevillian' or evolved Durkadian handaxe. These eight specimens do not conform to the current typo-morphological definition of Acheulian bifaces as they lacked bilateral and planform symmetry and adequate bifacial reduction. They also do not appear to resemble typical early development stages of the Acheulian as known from, for example, Olduvai Gorge, Konso-Gardula, Peninj and 'Ubeidiya'. In sum, neither Mahadeo-Piparia and Durkadi, nor any other site in the Indian subcontinent, showed any convincing stratigraphic evidence for a technological transition from an Oldowan-type into the more sophisticated Acheulian technology.

The Mahadeo-Piparia and Durkadi assemblages have been recovered from within and over-lying the high-energy gravels of the Narmada River and many artifacts at both sites were in relatively fresh condition. This signified the use of the conglomerate surface through multiple visits for clast acqauisition and stone tool production prior to the surface's burial by fine-grained sediments. This was a key geo-archaeological context at many Palaeolithic sites in the subcontinent. Durkadi was interpreted to be about 1 Mya in age. Considering the geological contexts of these sites, it was plausible that the preponderance of Mode 1 tool-types was linked to the predominant availability of size delimited river-worn clasts over tabular material. Large tabular blocks were more suitable for detaching the flake blanks necessary for the production of bifaces, specimens which most core-and-flake sites were lacking (Chauhan 2009:64-65).

3.4D. Deccan

Hunsgi and Baichbal valleys

From the excavation work of Paddayya (2009: 17) at the site of Isampur (16^0 30' N and 76 ^{0} 29' E), one among a large group of 200 Acheulian sites found in the Hunsgi and Baichbal valleys (located in the Gulbarga District of Karnataka) of lower Deccan, he found out that subsequent land modification activities and soil erosion led to an increased exposure of both finished tools and much waste material including limestone raw material blocks, cores, hammerstones, and flakes and chips. The systematic surface studies and excavation (1997-2001) and detailed examination of geoarchaeological features of the surrounding area revealed that this can be numbered among the very few Lower Palaeolithic sites with excellent spatial integrity.

He emphasizes that after nine stratigraphical cuttings (6 to 8 m^2 in extent) and 30 trial pits (1 m^2) the site revealed that it was associated with a weathered outcrop of silicified limestone, made up of triangular, rectangular and square blocks measuring 30 to 40 cm across and 10 to 12 cm thick. These blocks were an attraction to Acheulian knappers, because of the closeness of the spot to the edge of a 2 to 3 m deep palaeochannel which probably held a perennial body of water, from where, they could have an excellent view of the surrounding uplands and the valley floor, and the movement of game and hominid groups on these surfaces.

Furthermore, from the excavation of five large additional trenches (covering a total area of 159 m^2) by Paddayya, it was observed that a well preserved, 20 to 30 cm thick Acheulian level in a well-cemented matrix of brownish calcareous silt was overlain by 10 to 50 cm thick recently reworked soil. From the detailed description given we can read thus; "the site covered a total area of three-quarters of a hectare, divisible into four dense patches (called sub-localities I to IV) of cultural material comprising cores, debitage, finished tools, and hammerstones of local chert, basalt and quartzite. The patches were separated from each other by diffuse scatters of lithics. The area was described as a major quarry-cum-workshop geared to the exploitation of a weathered bed of silicified limestone comprising blocks of shapes and sizes suited to the needs of Acheulian knappers. Small quantities of dental and bone remains of bovids and cervids, and turtle-shell fragments food-processing and food-consumption. In Trench 1 (70 m^2 in extent) excavated in sub-locality I, seven chipping clusters (6 to 8 m^2 in extent) made up of cores, large flake blanks, finished tools, hammerstones, and debitage were identified. Each cluster had an arrangement of large limestone slabs that may have served as seats for the knappers" (*ibid*: 18).

Paddayya mentions that from the Isampur excavation over 20,000 artifacts were yielded and they were relatively undisturbed sample which have provided new insights into quarrying and lithic reduction strategies adopted by Acheulian groups. He further describes that suitable limestone slabs were selected and, in some cases, even pried from the outcrop. Slabs were prepared into cores by chipping off irregular projections from sides or corners. Large flakes (20-25 cm across) were removed and transformed with a minimum of secondary chipping into knives and chopping tools. Some flakes were shaped into handaxes and cleavers, through more elaborate secondary flaking and chipping. Some thinner limestone slabs, ranging from 2 to 8.5 cm in thickness, were used directly for making handaxes.

Some of the noteworthy features of the assemblage were the occurrence of knives as a regular type, the proportions of scrapers and modified utilized pieces, the overwhelming majority of debitage authenticating on-the-spot chipping, and the presence of perforators (large zinken-like artifacts) and he also concluded that that the occurrence of large hollow scrapers and perforators implied the use of organic materials like wood for making artifacts. Further conclusion was made by Paddayya (*ibid*: 20) that the work at Isampur also permitted refinements in the inferences about the Acheulian settlement system organization. Considering that ten other sites (small sites and non-sites), yielded artifacts of limestone identical to that of Isampur, were found within a radius of 5 to 6 km from Isampur, one may therefore infer that Isampur served as a localized hub for manufacturing and occupation activities, from where the hominids radiated onto the uplands and across the valley floor as part of their daily foraging activities.

Further, from the Hunsgi and Baichbal valley the finding of extremely well preserved Acheulian culture by Paddayya and Jhaldiyal (2001: 38) proved to be very useful for understanding several aspects of the Acheulian culture including tool typology and reconstruction of tool reduction sequences. A detailed attribute analysis of over 262 artifacts forming the plotted surface assemblage was reported from the sub-locality of Hunsgi and Baichbal valley.

The artifacts were classified on the basis of morphological features and metrical attributes such as length, breadth, thickness and weight. Other features like raw material, flaking angle, planform, cross-section, number of flake scars, platform characteristics and cortex percentage were also recorded. The study brought to light a large variety of shaped tools, cores and flakes. A total of 64 shaped tools were recorded of which 21 were made on flakes, 3 on cobbles and the remaining ones on slabs of limestone. The shaped tools included handaxes (45), chopping tools (9), cleavers (7), scrapers (2), and knife (1), hammerstones (12) of chert, limestone, basalt and quartzite were also documented. The surface documentation also brought to light three large discoidal limestone blocks showing steep flaking around the circumference and was thus classified as anvils. Cores were also found in a large number, a majority of which were on limestones blocks (52), while two were on limestone flakes and another two on chert cobbles.

Most of the limestone blocks used as core ranged in thickness from 8 to 17.5 cm. besides shaped tools, cores, hammerstones and anvils, 127 flakes were to have been studied. While many of the flakes were clearly blanks detached for manufacture of artifacts, there were several flakes which appeared to have been used directly for cutting/chopping purposes. The large number of flakes exposed to surface facilitated the identification of variability in the forms and types of flakes. This variability clearly indicated that most of the flakes were removed with systematic prior planning, which helped the hominids to replicate flake types. Furthermore, Paddayya and Jhaldiyal (2001: 39) conclude that these studies amply prove that surface sites, once these are approached with a repertoire of field documentation techniques (for mapping of cultural and other features, sampling and collection, and excavation) could yield a significant body of information.

3.4E. South India

The work of Petraglia and Noll (2001: 64-65) brings to light the technological assessment of tools collected from peninsular India. Some of the bifaces collected from Poondi and Pennar showed relatively sharp edges and highly distinguishable flake facets, whereas others were in poor condition, with rounded edges or heavy material weathering. Those that occur in laterites with non-rounded edges suggested that relatively intact sites were present in Poondi and Pennar valleys, similar to the findings from other South Indian sites with quartzite assemblages, such as those from the Cuddapah region, the Kortallayar Basin and the Malaprabha Valley.

They further cited that given their characteristic styles, sizes, and flaking attributes, the bifacial artifacts were characteristic of the Acheulian. Of the 74 measurable bifaces, handaxes predominated, followed by cleavers, picks and knives. The average length of the bifaces was 128 mm and the average breadth was 79 mm, although there was some degree of variability in these dimensions. The knives and picks were the largest items in length, with the least variability in size attributes; whereas handaxes had the greatest standard deviations in length and breadth, with both small and large items present. The length to breadth variation was lowest for cleavers which tended to be wide.

They claimed that these trends may, in part, be related to the primary form, as picks were mostly made from flakes, both knives were on cobble/boulders, whereas handaxes were made in a variety of clast types, and cleavers made on large and wide flakes. The majority of the bifaces had from 10-34 negative flake scar counts, with a generally high average of 18 flakes per biface. The cleavers tended to be the most flaked pieces, indicative of heavy trimming on both sides of these primary flake forms. The high retouch frequency, the shaping attributes, and the similarity to forms the eastern part of Peninsular India, correspond with soft hammer manufacture characteristic of the late Acheulian stage.

3.4E.1. Vishakhapatnam Coast

Alok Rath and others (Alok Rath, K. Thimma Reddy and P. Vijaya Prakash 1997: 31-33) have typo-technologically analysed a total of 2349 Middle Palaeolithic artifacts from Ramayogi Agraharam in the red sediments on the Vishakhapatnam coast, of these 2113 were found on the surface and 236 from the trench. They comprise 227 cores, 659 flakes, 579 chips, 107 core flakes, 26 blade flakes, 79 unfinished tools, 116 broken tools, and 1 anvil and 555 finished/shaped tools.

The cores were reported to have different shapes ranging from cylindrical to conical and were well standardized, while the flakes range in shape from triangular to squarish. Many of the cores had retained a patch of cortex, while most of the flakes had a positive bulb of percussion. In that study they had classified chips as those which were not detached for any specific purpose. Core flakes were flakes from which further flaking was made for tool making. Similarly, blade flakes were those which had the outline of a blade. Unfinished tools were the ones which had probably not been used owing to an under-development of a working/cutting edge, and the broken tools were those which were broken to such an extent that they were unidentifiable as any particular tool type. The anvil was a large boulder pebble with both tips in the longer axis battered.

A majority of the specimens were reported to be made from quartzite (88.0%), some from chert (9.0%) and few from khondalite (3.0%). Most of the quartzite artifacts were fresh, while the khondalite specimens were weathered and those made from chert were reported to be patinated because of their contact with the oxidized red soil.

The finished tools included handaxes, a cleaver, choppers, discoids, scrappers, points, knives and borers. Among these, the handaxes have been grouped into sub-types such as oblong, ovate, pear-shaped and lanceolate. Sub-types among the scrapers were side scrapers, double-side scrapers, convex scrapers, concave scrapers, round scrapers, plano-scrapers, concavo-convex scraper, keel scrapers, end scrapers and two scraper-cum-points. Sub-types among points have been identified as simple points, leaf-shaped points, tanged points and point-cum-scrapers. The most interesting tool type in the assemblage was said to be the knife made on a blade-like flake. Knives in such large numbers have not been reported from any other Middle Palaeolithic assemblage in India.

The presence of tool types such as lanceolates, round scrapers, leaf-shaped and tanged points and knives on blade-flakes, suggest the assemblage to be of an advanced Middle Palaeolithic cultural phase. In fact, shallow flaking and retouching, indicators of an advanced technology were common in the Ramayogi Agraharam assemblage. All the handaxes were manufactured by applying advanced Acheulian technology while the Levallois technique was used to produce the majority of scrapers.

The tool production involved at the beginning, the selection of a flat-based nodule. A striking platform was prepared at the edge by vertical or horizontal chipping of the cortical surface. Force was directed from the platform and flakes detached almost all along the periphery.

And intermediary, in the form of a punch, was used to detach the flakes. The flakes were further retouched along the edges/sides to convert them into finished forms. The detached flakes (Levallois flakes) appear in some cases to have been used directly as tools with little retouch. Step flaking was also reported to have been observed on some specimens, specially the handaxes. Most of the tools were worked exclusively on both surfaces as well as around the edges. As a result, the outline became perfectly regular. In section, tools were also produced from irregular cores and flakes.

3.4E.2. Attirampakkam

Pappu and others (Shanti Pappu, Yanni Gunnel, Maurice Taeib and Kumar Akhilesh 2004: 1) emphasizes that the excavations at the Palaeolithic site of Attirampakkam (Tiruvallur district, Tamil Nadu) indicated that the site had one of the highest densities of artifacts per unit area in the region, a stratified cultural sequence; and a high percentage of unabraded tools. Further, the discovery of large handaxes and cores from the gully bed, which were moderately rolled, devoid of ferruginous patination found in tools occurring in lateritic deposits, and stained white; indicated the possibility of a chronologically earlier 'pre-lateritic' industry.

Pappu (1996: 11) emphasizes that an attempt was made to study the manufacture, use, transport, reuse and discard of tools to provide information on hominid socio-economic organization. They mentioned that a classification system was adopted and stress was laid on identifying the complete lithic reduction sequence. Sites were gridded, artifacts plotted and randomly sampled. A total sample of 2400 Acheulian, Middle Palaeolithic and possibly Upper Palaeolithic to Mesolithic artifacts were analysed. From the analysis, it was reported that the Acheulian artifacts were found buried in ferricretes and ferricritised gravels. The sample mainly came from the sites of Mailapur and Parikulam. With respect to raw materials, a definite preference for quartzites at Parikulam and quartzitic-sandstones at Mailapur was noted. At Mailapur (Kortallayar basin, Tamil Nadu), raw material was obtained from a distance of upto 3-4 km. Cores were few in number and the studies pointed to the preliminary off-site trimming and import of partly reduced cores and tools into the sites, following which further reduction and trimming were carried out. Cores were amorphous flake cores, with one prototype of a blade core. All were minimally utilized and often divided into chopping tools and bifaces. Finished tools included chopping tools, discoids, sub-spheroids, bifaces (with minimum symmetry), cleavers, knives and scrapers. Debitage consisted largely of non-cortical flakes, with a few biface trimming flakes. One quartzite hammerstone was also noted.

She reiterated that raw materials were derived from pebbles, cobbles and boulders from the weathering and reworking of bedrock which were the principle stones utilized. These included quartzites (further classified as per colour and texture), quartzitic-sandstones and quartz. Choices exercised in raw material selection were evident, and thought to be governed by transport costs, quality and requirements for technology. No site was more than 4 km away from raw material sources. Increasing use of fine grained quartzites, from the Acheulian to the Late Middle Palaeolithic was also evident (*ibid*: 15).

A clear distribution in the nature of blanks (cobbles, pebbles, thermal fracture flakes, cortical flakes, non-cortical flakes, prepared core flakes, flake-blades, blades, debitage, older tools) was noted, with a predominance of the first four types in regions close to sources of raw material. In general, artifact size decreases in accordance with distance from such sources, with sites located along the foothills, on the slopes of the Allikullis and on the sediment surfaces which have larger artifacts in accordance with larger available clast sizes. In the case of sites in sheet flood and stream flood deposits, artifacts fall well within the size range of the clasts available locally. Sites having smaller natural clasts also displayed a lower frequency of the Levallois technique and a greater number of naturally backed flakes, a similar point that was observed to be noted in Southwest French and Levantine Near Eastern Middle Palaeolithic sites. At sites located close to abundant raw material sources, a relatively smaller range of rock types were exploited as compared to a great diversity in types in areas further away from such sources.

Further she also emphasized that cores such as modified cobbles and trimmed nodule, were represented as early stages in reduction. Some were subsequently utilized as hammerstones or crude chopping tools. No site bearing the evidence of only preliminary raw material trimming and core reduction was noted. Cores were few in number and comprised Levallois cores some of which were unstruck, discoidal cores, irregular flake cores (single platform, multiple platform, opposed flatform or ninety degree cores), flake-blade and blade cores. Flake-blade cores, both pyramidal (single or opposed platform) and irregular were minimally exploited. Causes for discard of cores include exhaustion, step-fractures and defects in raw material. Broken/exhausted cores have been subsequently rechipped and converted into chopping tools or core-scrapers.

On the point of debitage, she lay emphasis to the percentage and position of the cortex, and the dorsal flake scar pattern. She further points out that in general, debitage representative of the preliminary stages of core reduction was noted at a few sites only. Most sites exhibited a predominance of late-stage debitage, while Attrambakkam and Aryathur were exceptional exhibiting almost equal percentages of early and late stage debitage. In general it was seen that cortical debitage tends to be larger at sites where raw material was easily available and had a chunkier aspect to it. Utilized flakes were considerably longer and wider and in general were non-cortical. Prepared core flakes were concentrated at Attrambakkam and were less in areas close to raw material sources. Unretouched blades and flake-blades fell into a continuum with length versus breadth ratios ranging from large (1.78) to medium (1.67) and small, tending towards true blades (1.94) (*ibid*: 16).

3.4F. Northeast India

From the work of A.K. Sharma (1996) on stone tools of Northeast India there are various detailed descriptions of stone tools discovered during the exploration from different states in the Northeast.

3.4F.1. Arunachal Pradesh

From Arunachal Pradesh (A.K. Sharma 1996: 69), on the basis of typology and cross-section the tools were classified into categories like choppers, proto-handaxe, ovates, cleavers, and side-scrapers on flakes, points, flakes and cores. These tools were highly rolled and weathered.

The choppers consisted of two types: unifacial and bifacial. The unifacial chopper was prepared on a flat and roundish pebble. A deep and large flake removed from the upper surface to form a roughly broad concave cutting edge, the butt end semi-circular and thin rolled made of quartzite. The bifacial chopper was prepared on an oval shaped flat pebble. From the upper surface, along the margin, two large flakes removed forming a concave chopping edge. From the lower surface a large and deep flake was removed obliquely near the tip. The butt end was roundish and was made of crystalline lime-stone.

The proto-hand-axe was made of an oval pebble flake; two large flakes removed from the upper surface forming an irregular mid-ridge. The primary flake surface was plain and slightly concave. Near the upper margin three flakes were removed to form a pointed working edge.

Cortex retained on butt end was thicker, cross-section scalene, weathered and made of biotite gneiss (*ibid*: 70).

The ovates were prepared possibly on an oval flake and the bulb was not visible. Thin flakes have been removed along periphery from the upper surface; flake scars on the under-side were shallow. Due to alternate flaking, one side was slightly zigzag. It was pointed at one end and the butt end was thin and roundish. In cross-section it was bi-convex, weathered, and made of biotite gneiss. There were two descriptions of cleavers: i) one was prepared on a rectangular end flake from the lump of a meta-dolerite rock. The intersection of the slopping upper and under-surface forms straight cutting edge. The sides were flaring, without any working and the butt was round and thick, while the section was parallelogrammatic. ii) The other was also fashioned on a rectangular end flake from meta-dolerite lump. The inter-section of the upper sloping and under-surface forms a broad and straight cutting edge. Sides were flaring but one of the sides was plain and retained cortex. The other side has been worked alternatively to form flaring sides, with the butt worked, slightly roundish and thin. The upper surface shows some irregular depressions due to uneven texture of the rock and the section was parallelogrammatic, slightly weathered and rolled (*ibid*: 71).

There were five side-scrapers on flakes. One was prepared on a rectangular side-flake. Along one of the longer sides was evidence of secondary flaking, forming the scraping edge. The other side was thicker, but no further working was done. It was highly rolled and weathered and made of meta-dolerite. The second was similar to the above but comparatively smaller in size and was prepared on an oval side flake. Along one of the thinner concave edges, alternate flakes have been removed to form scraping edge. While the other side was thick and blunt and highly rolled, weathered and made of biotite-gneiss. The third side scraper was prepared on an oval flake. Along one of the thinner concave sides fine alternate flaking have been done along the periphery from both the sides to form a beautiful scraping edge. The other side was thick and blunt and made of quartzite. The fourth scraper was prepared on a sub-oval thick flake. Along one of the concave margins few flakes have been removed along the periphery to form scraping edge. The other convex side have been worked alternately and made of quartzite. The fifth was a concave side scraper worked on an irregular thick pebble. Alternate flaking has been done on one of the thinner concave sides. The flake scars were small and deep and made of quartzite. There were two points-on-flakes. One was a simple triangular point made on end flake. The upper surface showed bulged mid-ridge. Along one of the sloping side one or two flakes have been removed.

Primary flake surface was plain and the platform plain and broad. The concave side scraper was made of quartzite (*ibid*: 72).

The flakes were prepared on a broad sub-rectangular end flake. Medial ridge was prominent on the upper surface. Along one of the longer sides it was worked to form a saw-like working edge. Primary flake surface was plain. It was possibly a flake of Stone Age but the serrations on the sides preclude its inclusion in the Early Stone Age types made of gneiss.

There were two types of cores. One was discoidal core prepared from a lump of dyke rock and a few flakes have been removed alternatively, resulting in a zigzag marginal edge around the circumference. The other was a medium size cylindrical chunk of metadolerite rock. After preparing the platform on the top of the flat surface, two large flake blades were removed, one from the upper face and the other from the lower face (*ibid*: 73).

3.4F.2. Assam

The tools collected from Assam on technological grounds were classified as belonging to the Neolithic period. They were- (i) Edge-ground, (ii) Pecked and ground, (iii) Fully ground and (iv) Miscellaneous. Further, descriptions of the edge-ground were thus: except grinding on the cutting edge, the rest of the surface was marked by rough deep flake scars. According to the size and shape, four sub-groups may be made. In the first three the material was sandstone, and in the fourth perhaps fossil wood. The sub-groups were: (a) parallel side axe was bifacially chipped, and the butt and the side trimmed, the latter square, triangular or rectangular in form, roughly flaked, and convex, (b) large axe was roughly flaked all over, including the sides and butt, the edge-ground and convex, (c) short axe was square, triangular rectangular in form, roughly flaked, and ground at the cutting edge. The pebble tools were reported to be elongated pebbles of fossil wood with cutting edge made by bifacial grinding and the rest completely unworked (A.K. Sharma 1996: 80).

3.4F.3. Naga Hills

The description of pecked and ground tools was thus: pecking was always employed to produce the form, and grinding primarily for preparing the cutting edge. Eight sub-types were recognized. Like quadrangular axes, Naga hill axes, Naga hill tanged celts, notched axe, shoe-last celts, wedge-shaped celts, rounded adzes, and rounded chisels (A.K. Sharma 1996: 80).

3.4F.4.Garo Hills

From the work of Sukanya Sharma (2007: 40) in the Garo Hills, the celt assemblage, core tool assemblage and the flake-blade assemblage find special mention. Numerous artifacts were collected for a thorough study and analysis from various sites like Gawak Abri, Didami, Rpmgram, Ida Bichik, Bibragiri, Missimagirik, Selbal Bichik, Mokbol Bichik and Chitra Bichik. From the analysis the celt assemblage was thus typologically classified as (1) flat celts or hoe blades and (2) the tanged or shouldered celts. Further the assemblage was typologically divided into three sub assemblages. They were: (i) fully ground and polished celts, (ii) partially ground celts, and (iii) chipped celts. The technique of manufacturing celt assemblage has been described by Sukanya Sharma. According to her these celts were manufactured out of either flakes or flat pebbles. The tools were usually modified such that original blank type was impossible to ascertain. But the different types of celts like the chipped celt, the partially ground celt and the fully ground celt very well indicated different stages of manufacture. On that basis the reduction sequence could be ascertained. Dolerite dyke fragments or pebbles of suitable size were selected and roughly flaked. Flakes were mainly removed from the edges to achieve the desired shape. Round river pebbles found most often with these celts were propably used as hammers. Edges were ground or rough parts were smoothened in the next stage. Many tools have been left at that stage maybe because it was the desired type. Flat celts with sharp working edges were produced when the tool was fully ground and polished. Grinding was usually done on stationary blocks preferably near the river. Sand with water was probably used as an abrasive for grinding and polishing. Two adjacent short corners were ground at times to produce a pair of curvilinear shoulders for the convenience of hafting. Polishing increased with use and resharpening. These flat celts were discarded very often when the edges wear out and the celt was reduced in size. These celts might have been hafted into wooden or bamboo handles for use but no handles have been recovered.

Ground and polished tools were the characteristic tool types of the Neolithic period but edge ground, partially ground and chipped celts have been reported from a slightly earlier context in Southeast Asia. During the Pleistocene-Holocene transition period (12000-10000 B.P.) in parts of Southeast Asia certain wild food exploiting cultures developed of which the best known was the Hoabinhian. The most convincing evidence of slightly earlier origin of the edge ground and chipped celts has come from the Spirit Cave in northern Thailand and from certain sites in Vietnam.

The core tool assemblage includes two sub assemblages. They are: (i) Pebble tools and (ii) the Bifaces.

3.4F.5. Manipur

H.C. Sharma (2003: 18) reiterates that typo-technologically, the cultural materials from Napachik in Manipur can be divided into two phases: (i) Edge-ground knife of the Hoabinhian character, and (ii) the fully-ground celts and hand-made cord-marked pottery and tripod wares of the Neolithic period. The archaeological remains discovered from three locations in Nongpok Keithelmanbi were divisible into Palaeolithic, Hoabinhian, corded-ware and curved paddle-impressed ware cultures.

CONCLUSION

In conclusion I would like to briefly summarize the discussion saying that in trying to study lithic technology one could delve into aspects of lithics in varied understanding from the available studies. From these studies I could find that there is sufficient write-up on lithics, but when we talk of practicality in trying to grapple with the actual idea of how the tools were made it becomes clear that only through experiments can one better understand lithic technology. There are many areas where in I could not grapple with the elaborate analyses of stone tools. But in trying to get to the subject matter of my understanding of lithic technology I could figure out atleast that there were techniques employed in shaping the desired tools by the homonins for their hunting-gathering strategies. What raw materials they used in making their tools, how they procured and so forth. Furthermore one realizes that while a number of studies have been undertaken on the lithics from several parts of India, the region of Northeast remains largely under studied especially with regard to lithic and fossil-wood tools and technology.

CHAPTER 4

CONCLUSION

Geographically, the Haora Valley forms the north-western portion of Tripura State and includes the area drained by the Haora, Dolai, Manu, Juri, Langai and Sumili Rivers in their upper and middle reaches together with the area drained by their tributaries. The Baramura range, Atharamura range and Longtrai range form the major hill ranges of Tripura. The topography is immature. The major geomorphic celements observed in the area are both structural and topographic 'highs' and 'depressions', 'flats' and 'slopes', sculptured on the topographic surface in a linear and areal fashion. In Tripura the topographic highs and lows are in accordance with the normal first order structural elements. Heavy rainfall causes severe floods almost every year, thus cutting off the state from the rest of the country.

The fossil-wood of Tripura is of a fine quality, because of their high rate of silicification, some specimens of fossil-wood have assumed the character of flint or chert and for this reason it was possible to use them for detaching fine flakes and blades (Ramesh 1989: 133). The artefacts are mostly fresh in condition, which reveals that the tools do not come from secondary deposits. The majority of the implements have retained the wood structure which is visible in all the tools except for the fine quality, which have attained the character of flint or chert. This basic nature of the raw material is of vital importance as it has controlled the typology of the fossil-wood implements, most of which were made of tabular fragments from logs of silicified wood embedded in the Tipam (stratigraphic layer of Quarternary deposit) formations. Ramesh (1989: 134) rightly points out that fossil-wood in addition to silicified tuff, have been extensively employed by the Palaeolithic (Anyathian) hominins in Myanmar. He cites, "Mr. William C. Darrah of the laboratory of Palaeobotany, Havard Botanic Museum, who has studied the fossil-woods from Myanmar who pointed out that these woods mainly belonged to Diptrocarpoxylon Burmese and Palmoxylon, that, there was a consistent relationship between degree of petrification and the suitability for flaking; the more complete the degree of mineralization the more the likely the specimen would be selected for use by hominins." To which, he claims that this holds good for Tripura also. "The palm (monocots) woods are much better and more easily worked than the dycotyledon woods (Movius 1943: 350 cited by Ramesh 1989: 134). Mr. William has made two important observations that (i) the fossil palm wood, owing to the peculiarities of its mode of growth, can be worked in any manner, (ii) the dycotyledonous wood on the other hand can only be worked satisfactorily across the grain, if the conditions of preservation are all good." From this, Ramesh emphasized that the observations were tenable for Tripura also as this area lies in the western periphery of the same fold mountain ranges (Indo-Burman Ranges) extending from Burma to Tripura and having the same geographic and climate setting and supporting the growth of Dipterocarpaceae and other fossil-woods referable to Mesua, Gluto, Cynometron and Callophyllum (Jaswal 1976: 58 cited by Ramesh 1989: 134).

The origin of fossil-wood (Ramesh 1989: 137) was "due to colloidal material associated with waters laying down the deposits in which it is preserved, the lithology of the Tipams in Tripura supports such an origin. Both mechanical and chemical weathering must have favoured the formation of the colloids, some of which seem to have been changed into crystallloidal forms later on. This evidence seems to point to the climate being a dry one in Tripura."

Summary findings

In the first chapter, I have tried to provide insights about prehistory of India. The understanding that prehistory of Northeast India still remains under studied holds true, and this is what I have realized after the attempts made in the discussion on the prehistory of the Northeast. In the chapter, I have taken up case studies to discuss about the prehistory in India. I have also made an attempt to try and explain why the documentation of tools in the second chapter required further information on the geography and geomorphology of the region I have chosen to work.

In the second chapter, I have made an attempt to do the documention of fossil-wood tools collected randomly during my field survey. During the course of documentation I have come to realize that, much more emphasis had to be put in terms of describing the tools. Due to lack of enough information on fossil-wood tools, the work remains a bright prospect in bringing new elements of studying tools of different raw material used. Not many sites in India have tools made from fossil-wood.

In the third chapter, I have made an attempt to discuss about the various techniques employed by the hominins with the help of case studies from different regions of India. I have basically tried to focus on the various techniques of stone tool making in India and worldwide. I have also forayed into the region specific descriptions in the chapter to discuss the various aspects related to lithic technology.

Future research prospects

The Haora Valley region of Tripura remains a huge potential area in terms of prehistoric research in the region. As of now, only N.R. Ramesh can be counted as the only scholar who has forayed into the prehistoric cultural remains of Tripura that too, his work dates way back to 1989. His work, I believe, was more of studying the geomorphological Quarternary geology of the region and it can be said that his chancing upon the prehistoric cultural remains was indeed an accidental discovery as he himself explains this the fact. Thereby, I am of the view that great potential lies at hand for future research work in the Haora valley of Tripura, where fossil-wood tools remains a great source in understanding the prehistoric past of the region. As to my knowledge no excavation as of now has been carried out in studying the prehistoric cultural remains of Tripura yet. Further, as regards the prehistory of the Northeast, not much has been dealt with in terms of studying the prehistoric chronology of the region. So, lastly, I conclude saying that the prehistoric cultural remains of Haora valley have a huge potential factor for future research work.

BIBLIOGRAPHY

Agarwal, D.P., and J.S. Kharakwal, 2002, *Archaeology of South Asia-I, South Asian Prehistory- A Multidisciplinary Study*, Aryan Publishers, New Delhi.

Ajithprasad, P., 2005, Early Middle Palaeolithic: a transition phase between the Upper Acheulean and Middle Palaeolithic cultures in the Orsang Valley, Gujarat, *Man and Environment*, Vol.XXX, No.2, pp.1-11.

Ajithprasad, P., 2005, Palaeolithic cultural sequence in the Sukhi Valley, Gujarat, in K.K. Chakravarty, and G.L. Badam ed., *River Valley cultures of India*, pp.188-198.

Ajithprasad, P., 2007, Formation Processes of the Acheulian sites of the Orsang Valley, Gujarat, in K. Paddayya, ed., *Formation Processes and Indian Archaeology*, Deccan College Post-Graduation and Research Institute, Poona, pp.79-92.

Andrefsky, W., 1998, *Lithics -Macroscopic Approaches to Analysis*, Second edition, Cambridge University Press, Cambridge.

Badam, G.L., 1979, *Pliestocene Fauna of India*, Deccan College Post-Graduation and Research Institute, Poona.

Banning E.B., 2002, *Archaeological Survey*, Kluwer Academic/ Plenum Publishers, New York.

Bhattacharya, D.K., 2005-2006, Interpretations in Indian Stone Age Archaeology: A reappraisal, *Puratattva*, Vol.36, pp.12-23.

Chakrabarti, D.K., 1998,*The Issues in East Indian Archaeology*,Munshiram Manoharlal, Delhi.

Chattopadhyaya, B.D., G. Sengupta and S. Chakrabarty ed., 2005, *An Annotated Archaeological Atlas of West Bengal: Vol I: Prehistory and Protohistory*, Centre for Archaeological Study and Training Eastern India, Kolkata.

Chauhan, P.R., 2003, *An overview of the Siwalik Acheulean and Reconsidering its chronological relationship with the Soanian-A Theoretical Perspective*, Stone Age Institute& CRAFT Research Centre, Indiana University, Indiana.

Chauhan P. R, 2004, Human origins studies in India: position, problems and prospects, paper presented at the *National Conference on Human Origins, Genome, and Peoples of India,* organized by The Anthropological Survey of India on March 22-24, at India International Centre, New Delhi. Retrieved from internet on 26th March 2010.

www.google.comURLhttp://web.mac.com/kbolman/IndiaPrehistoric/05Human_origins_studies_in_India%3A_position,_problems_and_prospects*_.html.

Chauhan, P.R., 2009, The Lower Palaeolithic of the Indian sub-continent, *Evolutionary Anthropology*, Vol.18, pp.62-78.

Chauhan, P.R., 2009, The South Asian Palaeolithic Record and its potential for transitions studies, in Camps M, and P. Chauhan ed. *Sourcebook of Palaeolithic Tranistions*, Age Institute& CRAFT Research Centre, Indiana University, Indiana, pp. 121-139.

Chauhan, P.R., 2010, Core-and-flake assemblages of Central and Peninsular India, in C.J. Norton and D.R. Braun eds., *Asian Paleoanthropology: From Africa to China and beyond, Vertebrate Paleobiology and Paleoanthrolopogy*, Springer Science.

Dani, A.H., 1960, *Pre- history and Proto-History of Eastern India*, Firma K.L.Mukhopadhyay Publishers, Calcutta.

Deo, S.B. and K. Paddaya, 1985, *Recent Advances In Indian Archaeology*, Deccan College Post-Graduation and Research Institute, Poona.

Ghosh, A.K. and D. Chaudhary, 1988-89, On Flake- Blade Element in India, *Puratattva*, Vol. 19, pp.31-37.

Ghosh, A., ed., 1989, *An Encyclopedia of Indian Archaeology*, Vol.I, MunshiramManoharlal, Delhi.

Dennell R.W., The Early Stone Age of Pakistan: a Methodological Review, *Man and Environment*, Vol.XX, No.1, pp.21-28.

Dikshit K.N ed., 1985, *Indian Archaeological Perspective of India Since Independence*, D.K. Printworld, New Delhi.

Habib, I., 2001, *Prehistory People's History of India,* Vol.1, Tulika Books, New Delhi.

Hester, T.R, H.J. Shafer and K.L.Feder,2009,*Field Methods in Archaeology*, 7th edition, Left Coast Press, California.

Jena, A.K., N.C. Das, G.C. Saha, and AsimSamanta, 2011, Exploration in Synclinal Areas of Tripura Fold Belt, India: A Re-found Opportunity, *Search and Discovery Article*, pp. 1-20.

Joshi R.V., 1978, *Stone Age cultures of Central India*, Report on the excavation of of rock-shelters at Adamgarh, Madhya Pradesh, Deccan College Post-Graduation and Research Institute, Poona.

Kesari, G.K., 2011, Geology and Mineral Resources of Manipur, Mizoram, Nagaland and Tripura, *Geological Survey of India*, No. 30 Part IV, Vol. 1 (Part-2), Miscellaneous Publication, Delhi.

KanungoA.K.ed., 2012, *Studies in Prehistory and Ethno-archeology of South Asia*, Research India Press, New Delhi.

Kooyman, B.P., 2000, *Understanding Stone Tools and Archaeological Sites*, University of Calgary Press, Calgary.

Korisettar, R.,1994, Quaternary Alluvial Stratigraphy and Sedimentation in the Upland Region, Western India, *Man and Environment*,Vol.XIX, No.1-2, pp.29-41.

Lewin, R., 1984, *Human Evolution- An illustrated Introduction*, Blackwell Publishing, Malden.

Mishra V.D.,2007, Stone Age cultures, their chronology and beginning of Agriculture in North-Central India, *Man and Environment*, Vol.XXXII, No.1, pp.1-14.

Mishra V.N., 1975-1976, The Acheulian Industry of Rock shelter III F-23 at Bhimbetka, Central India: A Preliminary Study, *Puratattva*, Vol. 8, pp.13-36.

Mishra V.N., 2001, Prehistoric human colonization of India, *Journal of Bioscience*, Vol.26, No.4, pp.491-531.

Mishra V.N. and M. Nagar, 2009, Typology of Indian Mesolithic Tools, *Man and Environment*, Vol .XXXIV, No.2, pp.17-45.

Mishra V.N. and M.S. Mate ed.,1995, *Indian Prehistory:1964*, Deccan College Post-Graduation and Research Institute, Poona.

Medhi, D.K., 1980, Quaternary History of the Garo hills, Meghalaya, Unpublished Ph.D.thesis, Deccan College, Poona.

Paddayya, K., 1982, *The Acheulian Culture of the Hungsi Valley (Peninsular India)- A settlement system perspective*, Deccan College Post-Graduation and Research Institute, Poona.

Paddayya, K., and Jhaldiyal R., 2001, role of the Surface sites in Indian Palaeolithic Research: A case study form the Hunsgi and Baichbal Valleys, Karnataka, *Man and Environment*, Vol.XXVI, No 2, pp.29-32.

Paddayya, K. ed, 2007, *Formation Processes and Indian Archeology*,Deccan College Post-Graduation and Research Institute, Poona.

Paddayya, K., 2009, *Lithic Studies: An Overview*, Centre for Archaeological studies and Training in Eastern India, Kolkata.

Pappu, R.S., 1974, *Pleistocene Studies in the Upper Krishna Basin*, Deccan College Post-Graduation and Research Institute, Poona.

Pappu, R.S., 1994, *Man-land relationships during Paleolithic times in the Kaladgi Basin, Karnataka,* Deccan College Post-Graduation and Research Institute, Poona.

Pappu, R.S., 2001, *Acheulian culture in Peninsular India- An Ecological Perspective*, D.K. Printworld (P) Ltd., New Delhi.

Pappu, S., 1996, Reinvestigation of the Prehistoric Archeological record in the Kortallayar basin, Tamil Nadu, *Man and Environment*, Vol.XXI, No.1, pp.1-23.

Pappu, S., Y. Gunnell, M. Taieb and K. Akhilesh, 2004,Preliminary Report on excavations at the Paleolithic site of Attirampakkam, Tamil Nadu (1999-2004), *Man and Environment*, Vol.XXIX, No.2, pp.1-17.

Petraglia, M. and N. Michael, 2001, Indian Paleolithic Collections in the Smithsonian Institution: International Exchanges and their Archeological Potential, *Man and Environment*, Vol.XXI, No.1, pp.57-68.

Rajan K. and M.S. Ramji, 2009, Paleolithic sites in Kaveri River Valley of Ariyalur Region, Tamil Nadu, *Man and Environment*, Vol.XXXIV, No.1, pp.1-10.

Ramesh, N.R. 1989, A study on Geomorphology, Quaternary Geology and Associated Cultural remains of West Tripura District, Unpublished Ph.D. thesis, Guwahati University, Guwahati.

Rath, A, R.T. Reddy and P.V. Prakash, 1997, A Middle Palaeolithic Assemblage from RamayogiAgraharam in the Red Sediments on the Visakhapatnam Coast, *Man and Environment*, Vol. XXII, No.1, pp.31-38.

Ray, R.,1987, *Ancient Settlement Patterns of Eastern India- Pre-historic period,* Pearl Publishers, Kolkata.

Sankalia, H.D.,1952,*The Godavari Palaeolithic Industry*, Palaeolithic Industry Deccan College Post-Graduation and Research Institute, Poona.

Sankalia, H.D., 1974, *Prehistory and Protohistory of India and Pakistan*, University of Bombay, Bombay.

Sankalia, H.D,1977, *Pre-history of India*, MunshilalManoharlal Publishers Pvt. Limited, Delhi, pp.138-170.

Sankalia, H.D,1982 (2nd edition), *Stone Age tools- Their Techniques, Names and Probable Functions*, Deccan College and Post-graduate Research Institute, Poona.

Sharma, A.K., 1996, *Early Man in Eastern Himalayas (North-east India and Nepal)*, Aryan Publication House, Delhi.

Sharma, H.C., 1972, Pre-historic Archaeology- Stone Age Cultures of the Garo hills, Unpublished Phd thesis, Guwahati University, Guwahati.

Sharma, H.C., 2003, Pre-historic Archaeology of North-East, in Subba T.B., and G.C.Ghosh ed.,*The Anthropology of North-East India,*Orient Longman, Delhi, pp.11-32.

Sharma, S., 2002, Geomorphographical contexts of the Stone Age Record of the Garol and Rongram valleys in Garo hills, Meghalaya, *Man and Environment*, Vol. xxvii, No. 2, pp. 15-29.

Sharma, S., 2006, Settlement Patterns of the Prehistoric Inhabitants of the Ganol and Rongram River Valleys: An Ethnoarchaeological Analysis, in G. Sengupta, S. Roychoudhary and S. Somed., *Past and Present Ethnoarchaeology in India,* Pragati Publications, New Delhi, pp.163-178.

Sharma, S., 2007, *Celts, Flakes and Bi-faces- The Garo hills story*, British Archaeological Reports, Oxford.

Sharma, T.C., 1974, Recent Archaeological Discoveries in North-Eastern India, *Puratattva*, Vol..7, pp.17-19.

Singh, J.P., and G. Sengupta eds., 1991, *Archaeology of North Eastern India*, Northeast India History Association, Shillong.

Singh, O.K., 1983, Archaeology in Manipur, NabaChik: A Stone Age Site in the Manipur Valley, Imphal: State Archaeology, Government of Manipur.

Sinha, P., 1991, *Model for Land-Use in Late Acheulian Tradition (Satna District, M.P.)*, PrayagPustakSadan, Allahabad.

Sonowal, M., 1987, Studies on the Flake and Blade industries of the Garo hills, Meghalaya, Unpublished Phd thesis, Guwahati University, Guwahati.

Varma, R., 1997, Prehistoric research in India: an Assessment, *Man and Environment*, Vol. xxvii, No.2, pp.15-29.

Zeuner, F.E., 1951, *Prehistory in India*, Deccan College and Post-graduate Research Institute, Poona.