South Asian History, Culture and Archaeology

Vol. 2, No. 1, 2022, pp. 55-67

URL: http://www.esijournals.com/sahca

The Evolution of Stone Tool Technology of Pre-Historic West Bengal: A Renewed Archaeological Approach

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Abstract: *West Bengal has a diverse topography and several natural zones where pre-historic archaeological evidences can be found. Pre-historic stone tools are among them which form an essential part of the study of archaeology in West Bengal. From the Palaeolithic through the Neolithic periods, stone tool technology went through different stages of innovation and experimentation in West Bengal. Several new technologies have emerged that transformed the pre-historic stone tools in many ways. In the light of new archaeological evidences many unknown facts are surfaced which are still unknown. With the help of these new discoveries this paper attempts to demonstrate how the stone tool and its manufacturing techniques evolved in pre-historic West Bengal and what was the factor behind their transformation.*

Keywords: *Palaeolithic, Mesolithic, Neolithic, Stone ToolTechnology, Chopper-biface Tradition, Flake Tradition*

Received : 21 February 2022
Revised : 10 March 2022
Accepted : 17 March 2022
Published : 15 July 2022

TO CITE THIS ARTICLE:

Debnath, G. 2022. The Evolution of Stone Tool Technology of Pre-Historic West Bengal: A Renewed Archaeological Approach. *South Asian History, Culture and Archaeology,* 2: 1, pp. 55-67.

Introduction

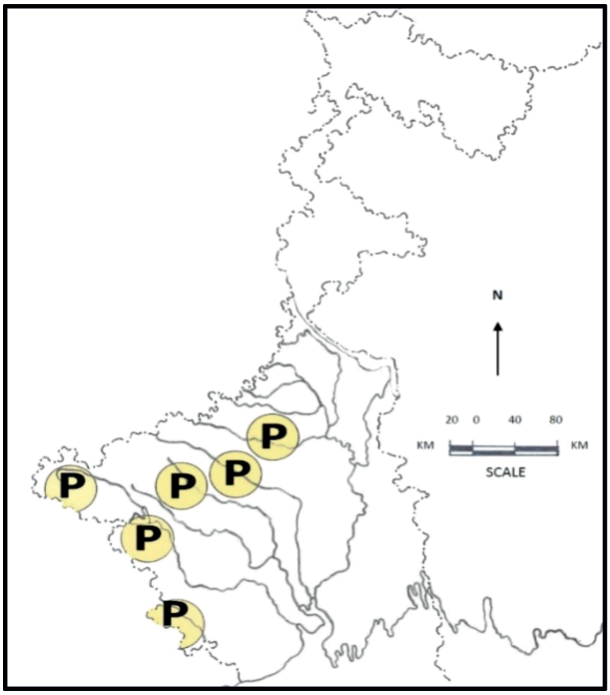
The geological deposition in West Bengal ranges from Archean to modern, with some intermediate quaternary deposition. West Bengal has a diverse topography with several natural zones. The Ganga-Brahmaputra River system, which forms the world's biggest delta, covers the majority of the state. The number of tributaries and sub-tributaries divides this delta into different geo - orbits. The southwest monsoon brings strong rains to the state, promoting abundant vegetation, which yields significant forest resources. Heavy rains andthe fertile alluvium soil are ideal for growing a variety of crops. In these different geo- regions of West Bengal, a variety of sites have been investigated or excavated. These sites are situated in various geographic locations. These locations are largely classed based on item material and prehistoric cultural chronology. The extended section of the Chotanagpur Plateau is highly important for the study of prehistoric cultures in West Bengal, since the older geological formations of

this region supported the earliest establishment of early human settlements in the region as a whole. The plateau-peneplain area of south-central Bengal stretches from 86° - 87° East 22° 30' - 24° North. This entire terrain may be separated into three sub-regions based on landscape structure and elevation: Purulia upland plateau (300m – 150m), piedmont peneplain (150m – 100m), and peneplain (100m – 50m). The red and brown laterite soils that arose from the severely worn basaltic parent materials cover the undulating landscape, which is studded with spurs of hills and monadnocks. Several runnels and cannels, as well as streams, cut through the undulating surface, forming an important drainage system. Mayurakshi, Ajay, Damodar, Dwarakeswar, Rupnarayan, Kangsabati, and Suvarnarekha are the important rivers in this area (Bhattacharya, 1991).

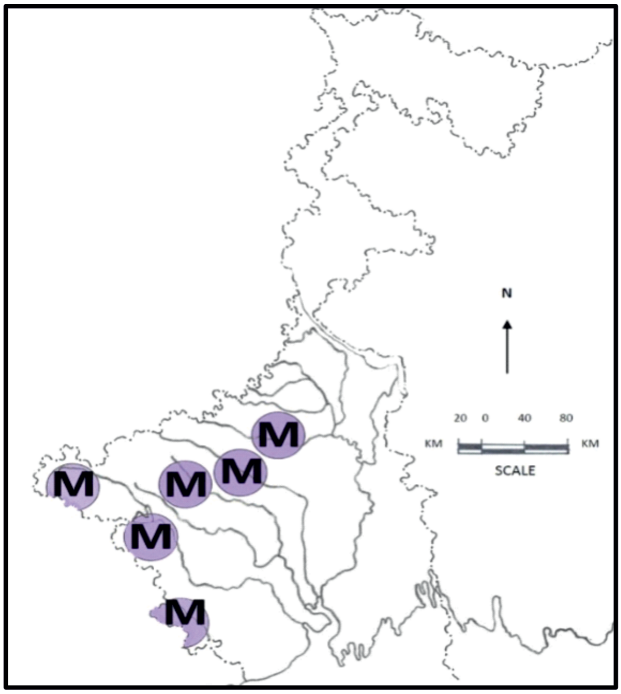
The distribution of sites indicates that the lower Palaeolithic people mostly inhabited the south-western section of West Bengal, which is the state's compact region. Lower Palaeolithic sites may be found largely in the Damodar, Darakeswar, Gandheswari, Kangsabati, Tarapheni, and Subarnarekha River basins.Some sites can also be located along the Ajay and Mayurakshi river valleys. These sites are mostly found in the upper Gandheswari, middle Darakeswar, upper Kangsabati, upper Tarafeni, and middle Suvarnarekha valleys between 87° 10' East and 22° 30' North - 23° 30' North (Bhattacharya, 1991). This area played a significant role in the growth and development of the Palaeolithic culture in West Bengal, because the land elevation of this south-western part varies between 90 and 260 metres above sea level, which is covered with extensive forest, and rainfall is moderate in this zone, providing ideal conditions for the growth and development of palaeolithic culture (Datta, 1995a). The Middle Palaeolithic tool types have been found in less numbers than the Lower and Upper Palaeolithic tool types. Middle Palaeolithic tools have been recovered from various locations in West Bengal, including the Tarafeni valley in Medinipur districts, the old eroded surface of Purulia district, and the upper reaches of the Gandheswari stream in Bankura district, as well as from various runnels and in the eroded old landscape in between adjoining regions of Ranigunge and Durgapur within 10 km of Damodar valley (Bhattacharya, 1991). The Upper Palaeolithic sites in this state are clustered in a limited area, namely the West Bengal periphery (Datta, 1985). The Upper Palaeolithic sites are mostly found in the South-Western portions of West Bengal, with 120 in total. It's still unclear how many Upper Palaeolithic sites there are in West Bengal. The sites are located along the Gandheswari, Tarafeni, and Subarnarekha River valleys. Some sites are also found along the Ajay, Damodar, Darakeswar, and Rupnarayan river basins. These sites are mostly in the districts of Bankura, Medinipur, and Purulia, in West Bengal's south-western compact region.

In West Bengal, Mesolithic sites may be found in two separate ecological zones:The plateau edge or historic deltaic region and the piedmont or current flood plain area are the two biological zones in West Bengal where Mesolithic sites may be identified (Datta, 1995a).Whereas, Neolithic tools have been discovered in West Bengal from two separate zones: i) the mid–north–eastern area, which includes Darjeeling and Kalimpong, and ii) the mid– south–western region, which includes Bankura, Medinipur, Purulia, Bardhaman, and Birbhum, among others (Datta, 1992). Due to the absence of excavated sites in West Bengal, we have no evidence of domesticated variants of any plants or animals from this cultural era (Datta, 1991a). The earlier scholarship on Bengal's pre-historic tool technology comprises eminent scholars like, M. N.Basu, A. K. Ghosh, K. P.Oakley, M.Bhattacharya,A. Datta, R.N.Ghosh, S.Majumder,R. Ray, H. D.Sankalia,Dilip K. Chakrabarti and many others. But in recent times, a profusion of new pre-historic sites and archaeological findings has been discovered in many regions of West Bengal which are needed to be examined with a renewed approach in order to understand the evolution process of this region's pre-historic stone tool technology.

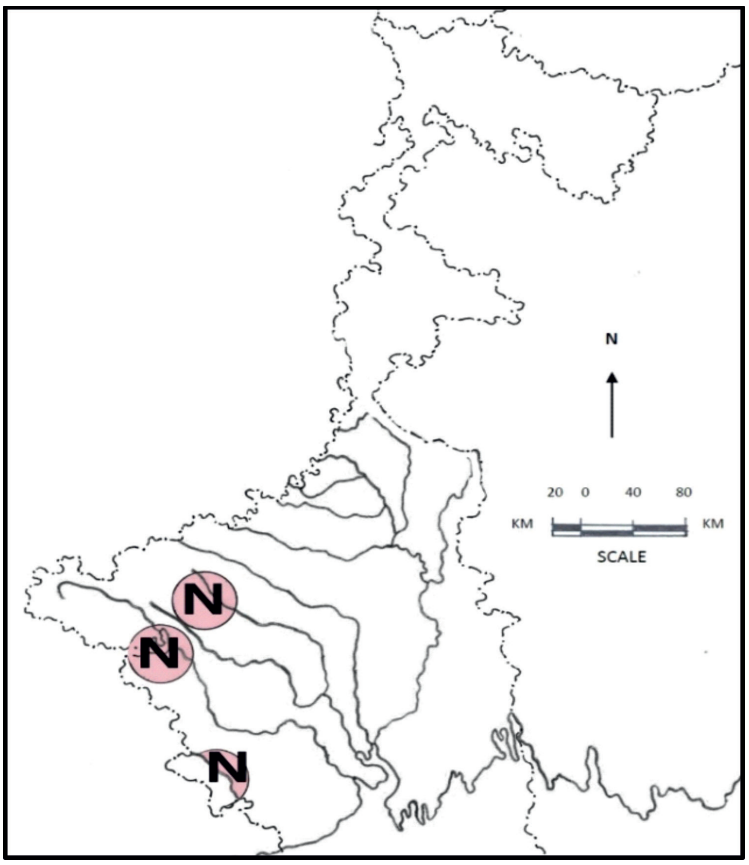
The formation and development of Palaeolithic to Neolithic culture took place in five major river valleys. The sites are located in the Ajay–Mayurakshi river valley, Darakeswar — Damodar River valley, River Gandheswari valley, River Tarafeni valley, and the river valley of Subarnarekha which includes sites like, Chinpai, Hetampur, Jibdharpur, Nalhati, Pochhera from Birbhum. Bamunara Forest, Egaramile, Muktai Chandi Pahar from Bardhaman, Amlakhul, Anardihi, Aduri, Agaya, Amjore, Basantapur, Buddih, Badkul, Bibarda, Biharinath, Bagdiha, Balikhul, Bamundiha, Bankajore, Banskatia, Bansole, Bharatpur, Biribari, Chankdhuakura, Chiadah, Chhatatala, Chhotalachhipur, Damodarpur, Dhaldanga, Dhankora Got, Guniada hill, Gidhuria, Gurquripahari, Hanribhanga, Hapania, Haroka, Jadavpur, Jamthole, Jaypur, Jirra, Jaljali, Karasoli, Krishnangar, Kushadwip, Kankradara, Karkata, Kattro I & II, Kendua, Khajuri, Kuliara, Kultaki, Kushbona, Majuria, Madhavpur, Metala, MurgatholeNamokechanda, Nimerbandh, Nuniabandh, Nadiha, Nangla, Natkamla, Paharbheda, Paharghata, Parulea, Penchasimulia, Phapsa, Ranibandh, Ramnagar, Ramnathpur, Ranagora, Saluni, Simulberia, Sarensarh, Siulibona, Suabasa, Susunia, Uprasol from Bankura. Amruhasa, Arahansa, Balarampur Dak Bunglow, Debha,Hanumata, Inchadih, Jargo, Kanapahar, Korcha, Mangura, Masjor, Matha Forest, Pargo, Simuldanga from Purulia. Astajuri, Amjuri, Bankati, Bansia, Baramania, Baramchati, Bararangamatia, Belidanria, Bhalukhulia, Bhera, Bamandih, Bhedakui, Chakadoba, Chhotatukri, Chuagara, Dhuliapur, Domgar, Dangra,Dhansole, Dumuria, Gorapincha, Guhijasole, Gopalpur, Ganganirmath, Hatibari, Jamdari, Jagannathpur, Jahanpur, Jamri,Jaurisole, Karkata, Kashijhora, Kashmar, Kendrasole, Kakridahi, Kayasole,Kendugaria, Kurchibani, Laljal, Machanbandh, Mahipal, Mahulbani, Makri MohanparSatbati, Muransole, Panbaraj, Patharchaki, Patina, Phulkendu, Pendrasole, Pondapata, Purnapani,Palasbani, Parihati, Rajapahari, Rangamatia, Sahari, Silda, Salgeria, Sasrah, Taldangra, TarafeniReservior from the districts of Medinipur and there are many more like these. This present study is an approach to reconstruct the past stone technologies, which the prehistoricpeople of these regions of West Bengal used for their survival. But before discussing the technologies it is important to have a proper idea of the tool typology of this region.



Map. 1: Distribution of Palaeolithic Sites in WB



Map 2: Distribution of Mesolithic Sites in WB



Map 3: Distribution of Neolithic Sites in WB

Tool Typology of West Bengal: Palaeolithic Period

There are two Lower Palaeolithic culture traditions in West Bengal: the chopper-biface tradition (Acheulian) and the flake tradition. Quartz and quartzite, which are found nearby as river pebbles or outcrops, were primarily employed for tool manufacturing in the region. Secondary laterite deposition yielded chopper biface components. There are three stages to this tradition: early stage, middle stage, and late stage (Ghosh, 1966). Both unifacial and bifacial choppers, as well as primitive hand axes, are seen in the early stages. Bifacial choppers and hand axes on pebble cores distinguish the middle stage. Clactonian flakes, hand axes, cleavers, and choppers dominate the latter period. The early and late stages of the flake tradition are distinct. There are several types of scrapers and developed hand axes created on flakes in the early stages. Small flake scrappers with finer retouch and Levalloisian technology define the later stage. This industry also employs points and borers. Ovale, ovaloied, almond shaped, extended oval, and sub rounded are some of the sub classes of hand axes. The majority of hand axes are produced on cores with both surfaces worked. These tools were most likely made by controlled flaking. The hand axes have a narrow cross section. Axes constructed of flakes were invented subsequently. Subtypes are comparable to those of pebble-made hand axes. In most situations, while using flake hand axes, the dorsal side is treated while the ventral area is left intact. Clactonian method was used to create these flakes. The cutting edge is sinuous and sharp. The butt ends are thick and show no signs of additional working.

Choppers are smaller in size and have many flake scars. Pebble, core, and flake are used to make chopper. There are two types of choppers: unifacial and bifacial. Flake scars are present on one surface in unifacial choppers, whereas both surfaces are worked in bifacial choppers. Flake scars are huge

and deep in appearance. These choppers were most likely made using the free flaking technique. The junction of the worked dorsal surface with the unworked ventral surface produces a jagged cutting edge. Chopper/chopping is frequently found in conjunction with handaxes in the same geological horizon, such as gravel conglomerate or secondary laterites. Cleavers are scarce and can be found on both cores and flake. They are usually rather huge. The cross section is biconvex in the cruder variety, and trapezoidal or parallelogram in real cleavers. The cutting edge is convex, and it comes in two shapes: U-shaped and V-shaped. Scrapers with core elements can also be discovered. These scrapers were used on an as-needed basis with little technology (Ghosh & Majumder, 1991). The flake element is prominent in West Bengal's Middle Palaeolithic culture. Flakes were discovered near the intersection of secondary laterite and brown silt layers. Full-fledged flake impalements characterise this stage. Levalloisian technique was mostly used to create flakes. Scrapers come in a variety of sizes and are manufactured from both cores and flakes. Large scrapers are often created from both cores and flakes, whereas tiny scrapers are solely made from flakes. There are two sorts of scrapers: side scrapers and round scrapers.The cutting edge is often convex, however it can alternatively be straight or slightly concave. Sub-triangular, rectangular, trapezoidal, and semioval are the sub kinds. The scraping edge of side scrapers can be found on one or both of the tool's lateral borders. Small scrapers are a product of technical advancement. They're usually produced using flakes.Along the cutting edges, secondary workings can be detected. These were made using a precise approach. Oval, semioval, square, and trapezoidal are the several varieties of side scrapers. The medial region of the cross section is thicker than the cross section.

The points are created on flake and are less in number. Flakes have been removed from the dorsal surface, and two lateral borders have come together to form a point. Lenticular is the cross section. The comparatively slender rear end suggests adequate hafting. Small scrapers and borers were used to find points. Borers are in short supply. Only the pointed end of the flakes is worked when making them. These are made using a precise procedure. The rest of the tool is smooth and appropriate for grasping. The typological characteristics of scrapers formed from flakes demonstrate additional technological progress. Finer retouches have revealed points and borers. Levalloisian technology was primarily used to create these tools (Ray, 1991). The Palaeolithic period ends with Upper Palaeolithic culture. However, the Middle Palaeolithic industry in West Bengal did not progress into an Upper Palaeolithic culture since the development of Middle Palaeolithic tools is completely lacking, indicating that this cultural period is a different migratory one, maybe from beyond West Bengal (Datta, 1991b). The absence of a flake blade in West Bengal's Middle Palaeolithic industry demonstrates that the Upper Palaeolithic industry did not emerge from the Middle Palaeolithic industry (Banerjee, 1987).

Flake and blade industries are the most important aspects of West Bengal's Upper Palaeolithic culture (Datta, 1991d). Though long blades and blade tools originally emerged in Stone Age culture, humanity acquired tremendous technological efficiency during the Upper Palaeolithic period.This is demonstrated by unifacial and bifacial leaf points, as well as end scrapers composed of chert or green quartzite (Datta & Ray, 1989). Blades, knives, scrapers, points, burins, borers, and microliths are some of the most common instruments used in this business in West Bengal. Fluting method was established in this cultural phase for the fabrication of blade tools. This method created blades with parallel sides from specifically prepared cores (Datta, 1991d). Pressure flaking and blade method were commonly utilised in West Bengal during this cultural period. Blades with marginal retouch, backed blades, blades without retouch, blades with steep retouch, pen-knife blades, and blades with serration were among the blades found. Simple points, single-shouldered points, leaf points, and hollow points are examples of different sorts of points. Side scrapers, hollow scrapers, end scrapers, round scrapers,

and scrapers cum borer are all examples of scrapers. West Bengal's Upper Palaeolithic industry is primarily defined by the presence of flake and blade tools.

Tool Typology of West Bengal: Mesolithic Period

The size of the tools was further reduced throughout this cultural period, according to an investigation of the implements. On the other hand, using blade technology, a wide variety of enhancements, increased sophistication, and customization of toolkits was explored. In reality, the blade technology was first brought to the Upper Palaeolithic people of West Bengal. The Mesolithic people, on the other hand, completely used and improved this blade technology. The post-Pleistocene period's altering environmental patterns had a significant impact on the people's cultural makeup (Datta, 1991c). West Bengal's microlithic industry was mostly a non-geometric industry. Blades, points, scrapers, lunates, burins, borers, flakes, and cores are the most common tools used throughout this time period. Blunted-back blades, parallel-sided blades, pen-knife blades, and truncated blades are some of the blade types found at Mesolithic sites. Side scrapers, end scrapers, hollow scrapers, and thumb nail scrapers are examples of scrapers. There have been both geometric and non-geometric microliths discovered. Triangle, lunate, and trapeze are geometric microliths. A symmetrical triangular leaf-shaped instrument with noticeable mid-ridge and an asymmetrical triangular tip have been identified.Symmetrical points can have a straight, hollow, or convex base, as well as a rudimentary tang. There are also several unidentified tools, waste flakes, and cores. Conical cores, oblique ending cores, flat based cores, and blade cores are all examples of core tool typology. According to a careful investigation of the materials of the time it can be said that, the blade and points were the most common form of tool in this industry. Traditional geometric shapes such as the trapeze and triangle were completely missing in West Bengal. The cryptocrystalline silica group of materials was widely employed throughout this cultural period (Datta, 1995b).

Tool Typology of West Bengal: Neolithic Period

The Neolithic, or New Stone Age, is the final era of Stone Age culture. The presence of new technologies, such as stone chipping, grinding, and polishing, characterises this cultural period.Different sorts of artefacts have been discovered in West Bengal from various Neolithic zones. Adzes, celts, facetted tools, chisel, pestle, pointed butt axe, polisher, perforated celt, triangular celt, socked celt, elongated pick, flat celts, wedge blades, harvester, knife are some of the tools used in the Mid-North-Eastern area. The region's stone tool assemblage is dominated by adzes and celts. The form of cross sections can be used to separate adzes and celt.Lenticular, plano-convex, rectangle, and oval are the four types. Planoconvex cross section is the most frequent kind in adzes, whereas lenticular is the most common type in the celt family. The form of the cutting edge of adzes and celts can be characterised as rounded, concave, oblique, straight, or convex. In both tool types, the convex cutting edge is the most common. Celt, adze, shouldered celt, splayed edged axe, bar celts, chisel, ring stone, pestle, hammer stone, and saddle quirn have all been discovered in the South-Western zone. Celts and adze are the most common varieties in this area. Celts are classified into five categories according on their cutting edges: round cutting edge, concave cutting edge, straight cutting edge, oblique cutting edge, and convex cutting edge. The cutting edge is primarily oblique. These categories are further separated into subclasses. Celts are classed again based on the geometry of their cross sections. Oval, plano-convex, lenticular, rectangular, and oblong are examples. The lenticular cross section is the most common (Datta, 1992).

The growth of technology is also linked to talent uniqueness. Through the use of tools, an organism adapts to a certain condition (environment). It begins with the trial-and-error technique of

learning, also known as insightlearning. It necessitates a high level of neural system organisation and acute sensory experience. It is only conceivable if the creature possesses a prehension organ, such as a hand or trunk. The relationship between visual acuity and competent conduct is very significant. Four elements influence skill evolution: sensory perception power, capacity to coordinate sensory impressions, physical capacities of the organism, and environmental demand (Oakley, 1954). Through the use of technology, man has adapted to his surroundings. By procuring the environment, technology allows man to meet his fundamental needs such as food, shelter, and clothes. His technology represents his material culture, which comprises the stuff he creates and uses to survive and improve their life. "Technology is the mixture of technics and methods common to a group developed by man for his life on this world," according to Basu&Basu (1975). Tools, implements, and machines are referred to as technics, whereas techniques refer to skill. As a result, methods and technics are mechanical, symbolic, and organisational, and they are important economic elements. Grasp culture requires a thorough understanding of technology. The material foundation of social existence is essential to comprehending human group behaviour.

Throughout the Stone Age in West Bengal, changes in tool typology and technology have been observed. Prehistoric humans were forced to create new tool technology due to the usage of various raw materials, as well as various sorts of environment and economics. The tool typology and accompanying technology have a direct link. The diversity of raw materials utilised is also connected to technology. The hardness of the raw materials had a crucial role in the methods' application. Different techniques evolved throughout time, and in later phases, early techniques were not completely abandoned; rather, older techniques were utilised for primarily shaping the tools and in other essential circumstances, while later techniques were employed for final retouching of the tools. Both approaches were essentially present at the same time. Although there is no technical continuity across the sequence, it may be identified within a certain phase (Ghosh, 1966). Ghosh (1966) described stone tool production processes in West Bengal during the Palaeolithic period. The present study examined the typological and technical characteristics of stone artefacts from the Palaeolithic to the Neolithic Period discovered in various locations of West Bengal. The research also demonstrates a comparable technical growth tendency in the entire prehistoric period.

Tool Technology of West Bengal: Palaeolithic Period

The free-flaking method, which was utilised by prehistoric humans in West Bengal, is one of the earliest ways for manufacturing stone tools. Choppers and bifaces, primarily hand axes and cleavers, were made using this technique. The stones chosen for tool manufacturing were smaller in size. The stone hammer method was prominent in free flaking. Small cores were inappropriate for this method because small cores could not be held effectively to throw the necessary blow over them. Prehistoric inhabitants in West Bengal also understood the technique of Block on Block, which was normally employed on very big cores. In this process, a core is hit against a pointed, huge stationary block of stone or anvil to make flakes (Sankalia, 1964). After the early stages of free flaking, this method arose. This method was not widely used throughout the state, although it was used in a few regions. The flakes that arise are huge and deep, and they may be found all around the tool. This approach was also used to give the instrument its basic form. The tool maker would normally hold the pebble or nodule in the right or left hand, or on the right or left knee, and blow at the edge or perimeter of the bigger pebble and at a place near the edge with a stone of suitable size and weight, and the flake would be removed. To remove another flake from the stone's surface, the tool maker would turn to the side of the core and strike it with a similar blow as before (Sankalia, 1964).

Fig. 1: Hand Axe, Palaeolithic Period, West Bengal
Image Courtesy: Department of Anthropology, University of Calcutta

Hard raw minerals like quartz and quartzite were not suitable for the cylinder hammer method. Prehistoric men in West Bengal used tiny, elongated stone hammers instead of bone or wood (Ghosh, 1966). The flakes that arise are shallow and uneven in shape. This technology was mostly used to make chopper and hand axes. These two methods were utilised to get sharper cutting edges. The creator must manage the force of his stroke when flaking a pebble or a block of stone with another hammer stone in this technique. In this procedure, the tool maker holds the flaked pebble in his left or right hand and uses his hammer to pound the pebble's perimeter carefully and efficiently (Sankalia, 1964). Free flaking was used to make choppers and primitive hand axes in West Bengal during the early Lower Palaeolithic era, and subsequently regulated flaking techniques were developed. Controlled flaking was used to create bifacial instruments. Later on, a finer controlled flaking method arose, and clactonian techniques were used to create flake implements. The purposes of various sorts of tools vary. Choppers, for example, were used for chopping and cutting. For cleaving and cutting, cleavers were utilised. Hand axes were versatile tools that could be used for digging, chopping, and scraping. After hafting with a shaft, handaxes were also utilised as throwing weapons (Sankalia, 1964).

Flake tools were discovered in conjunction with core tools in West Bengal until the end of the Pleistocene, when they were replaced by blade-bladelet elements in the early Holocene era (Ray, 1991). With improved retouching techniques, flakes-based implements are finer. Scrapers, points, borers, and cores make up the majority of flake tools. Flake tools are also discovered alongside core tools in West Bengal. Flakes were made using both Clactonian and Levalloisian procedures, with the Clactonian technique dominating.

Fig. 2: Side Scraper (Left) & Chopper (Right), Palaeolithic Period, West Bengal
Image Courtesy: Department of Anthropology, University of Calcutta

Clactonian occurred later in the West Bengal example, producing huge flakes. This technique was used to separate big flakes off a core by using an uneven platform and a vertical blow. The striking platform and the primary flake surface create an obtuse angle. In the instance of West Bengal, a set of flakes with all of these characteristics was discovered, which were larger in size and thicker. This approach was used in some areas of West Bengal when appropriate stones or cores were hard to come by. To save time and labour, this method was used to separate bigger flakes, and then the other technique or procedures were used to shape them into tools. The next flaking procedures converted the flakes into tools because they were huge and thick. Because both surfaces were fully worked, there were no signs of any striking platform, bulb of percussion, or the primary ventral surface, it might be difficult to distinguish between core and flake tools. However, a close examination of both implements reveals that flake implements are smaller in size and thickness than core tools.

In the category of flake technology, Levallosian technology can be called the most developed, creative, and skilled method (Sankalia, 1964). This is a prepared core technique that involves recovering and defining flakes and cores of this type. Middle Palaeolithic industry is characterised by Levallosian technology. The cores were precisely and effectively pre-shaped or prepared before striking the flakes, which was the technique's key distinguishing feature. The sides of the core were first roughly trimmed, and then the cortex of the upper surface was removed in such a way that the flake scars generally met in the middle. This method prepared the core for subsequent treatment by removing any imperfections and uneven surfaces and giving it a rounded or semi-rounded form. The tool maker then gripped the prepared core in his left or right hand and struck the prepared surface with a sharp and narrow pointed tool, either directly or through an intermediate tool. The blow was delivered practically at right angles to the tool's platform or axis, resulting in a comparably thinner flake with an almost triangular or oval shape that was removed (Sankalia, 1964). Although, this method was not widely used. In the Subarnarekha and Tarafeni river valleys, a few implements constructed of Levalloisian flakes have been discovered. This technique came later in West Bengal, when it was used on smaller flake tools. This method was largely discovered to be used on materials other than quartz and quartzite. The existence of the Levallosian method in West Bengal stratigraphy offers a link to the technological

evolution's continuing developing pattern (Ghosh, 1966). Clactonian technique was used to make flake tools in West Bengal, and later stage Levalloisian technology was used. Flake tool technique was also used to make hand axes. Scrapers are very common in West Bengal, and their use is also common. Scraping and cutting were done with it. There is no gradual transition from the Middle to the Upper Palaeolithic periods. Blade - bladelet implements were discovered as part of a migrating Culture during the Pleistocene epoch. Punch or pressure techniques for removing blades were adopted during this cultural period. Additionally in this period, pressure flaking methods were combined with blade technique (Datta, 1991d).

Blades and blade tools were constructed using the Punch process, which involves transferring the blow to the stone through an intermediary punch composed of bone, wood, or antler. The cores were normally cylindrical in shape, and the cores were not impacted directly with the other material in this procedure. The specimen was put against an intermediate and impulsive pressure was applied to it in various ways. A thin, narrow flake was separated from the core during this operation. The blades ranged in length from long to short, depending on the nature of the raw materials and the tools' requirements (Sankalia, 1964).In this technique, the knapper holds the fabricator and places its end on the blade's edge, then applies pressure to the blade. Little flakes are pushed off quite quickly throughout this process. A rapid push across the blade's edge was used to dislodge a little flat flake. The pressure flaking technique is divided into two categories: basic method and sophisticated method. The worker held the flaking tool in one hand and the specimen to be flaked in the other. A direct push was delivered over the specimen in the basic approach(Leakey, 1954). The pressure flaking instrument was fixed to a wooden shaft with a cross piece on top, and the worker held the shaft with both hands and the cross piece against his chest while holding the specimen to be flaked between his feet in the complicated way. After arranging everything, the worker pressed the tool's point on the flake's edge to be trimmed and applied impulsive pressure to the specimen, resulting in a lengthy flake (Sankalia, 1964). Pressure cutting or mild percussion retouching were used for blurring retouches.

Tool Technology of West Bengal : Mesolithic period

Blade-bladelet manufacture is a feature of West Bengal Mesolithic culture. West Bengal's microlithic assemblage comprises triangular, crescent, rhomboidal, trapezoid, and elongated fine point shapes. Blades, lunates, points, borers, burins, and scrapers have all been discovered. Flake-blades, blades, and bladelet tools are examples of Mesolithic manufacturing. Chert was the most common raw material. West Bengal also employed quartz, agate, and fossil woods to create microliths. Blade-making technique predates the Mesolithic period and is still in use today. Fluting was used to make the blades. Microliths are created in three phases. First, depending on the shape of the microliths to be manufactured, notches are cut into the blades' edges. The blade is then knapped using the notches as a guide. Microliths of various shapes, such as parallelograms and triangles, are produced by the segments. Pressure retouch was used to create different forms for the microliths. Microliths range in size from 10 millimetres to 50 millimetres.

Blades were usually used, and there was no additional labour. However, there were two more techniques: bluting (or retouching) and notch (or cutting). The notch method was frequently employed to construct geometric forms. The blade is put on an anvil and a deep notch is produced with a stone hammer in this blade forging procedure. The blade is divided into two halves during this operation. Two notches are prepared on opposing sides of the blade when making lunate, triangle, or trapeze, whereas two notches are created on opposite sides of the blade when making rhomboidal (Sali, 1990). Although, because these small tools are impossible to use by hand, there is no archaeological evidence

Fig. 3: Microlithic Tools, Mesolithic Period, West Bengal
Image Courtesy: Department of Anthropology, University of Calcutta

of their use. A number of microliths may have been placed in a groove carved into the bone shaft or wood to serve as a compound tool.

Tool Technology of West Bengal : Neolithic Period

The Neolithic period is the last stage of Stone Age culture, and it is marked by numerous inventions and discoveries. Not only did new types of stone tools emerge, but also new technology. The principal tool types of this time include celts (both axes and adzes), wedges, chisels, perforated tools, and pounders, along with microliths and bone tools. Ground and polished stone industry and bone industry are two sorts of industries that may be generally defined. Sandstone, quartz, slate, basalt, granite, epidorite, schist, siltstone, lime stone, chert/chalcedony, flint, and shale are some of the raw materials used to make Neolithic tools. Chipping, grinding, and polishing are three separate procedures that have been employed singly or in combination to create these instruments (Datta, 1992). The surfaces of tools were polished and occasionally rendered gleaming using these newly created methods. Workers usually choose the best nodules, pebbles, and chips, which may be quickly changed into a sharp–edged tool or a thick–sided axe with a sloping edge of the required size and shape (Sankalia, 1964). After selecting the appropriate nodules, pebbles, or chips, the worker used direct or indirect percussion to mould them into the proper shape.

The Neolithic technology is divided into three stages: chipping, grinding, and polishing. These three phases of preparation are usually necessary for the fabrication of a completely polished Neolithic tool. After the tool's shape had been roughed out, the uneven rough surfaces were removed and smoothed off with a cylindrical or discoid hand hammer. Pecking is the term for this approach (Allchin, 1957).

Fig. 4: Shoulder Celt(Left) & Grinder (Right), Neolithic Period, Medinipur, West Bengal
Image Courtesy: Prof. F. Chakraborty, Vidyasagar University

In the third stage, a concave or grooved shaped rock or chunk of stone was chosen for rubbing the instrument. The tool was then pushed up and down in the groove, constantly for some time, with the assistance of some coarse material such as sand or similar other material and a little amount of water that worked as an abrasive (Sankalia, 1964). This was a lengthy procedure, and it took over three months to complete a completely polished tool at times (Burkitt, 1929). To circumvent this time-consuming operation, Neolithic people polished only the half edge of their instruments (Datta, 1992).

The next step in the tool-making process was polishing, which was not considered a separate stage. It is not known if Neolithic people used any form of grease or oily material to shine the tools' smoother surfaces or whether it was just due to rubbing that the instruments shone so brightly (Sankalia, 1964). Polishing is a separate procedure for the ultimate preparation of Neolithic implements, according to Datta (1992). The differences between two tools may be seen if we study the fully ground and polished tool attentively. Thus, from the Palaeolithic through the Neolithic periods, stone tool technology went through different stages of innovation and experimentations in West Bengal. With the demands of time, accompanied By Changing Environmental Factors, new technologies emerged. However, no technology was totally supplantedby a newer one; ratherit continuedtoresurfacein different forms. For example, the Palaeolithic stone hammer technology was adapted and utilised to make Neolithic tools, similarly palaeolithic flake tool technology was carried over into the Mesolithic period. It can be noted that Microlithic technology was used welluntil the early historical period in West Bengal. With newer occupations and environmental changestechnology too underwent major changes. it is clear that Microlithic tools were not adequate for tilling soil and other cultivation-related operations when Neolithic people of this region took to farming. Hence technology had to constantly adapt itself to the changing times. All these archaeological evidences indicate that, through a complex and diverse process, the stone tool and its manufacturing techniques evolved in pre-historic West Bengal without any set watertight division of time and technology.

References

Allchin, F. R. (1957). The Neolithic Stone Industry of The North KarnatakRegion. Bulletin School of Oriental and African studied, 19.

Banerjee, K. D. (1987). Stone Age Migrations in India. In B. M. Pande, & B. D. Chattapadhyaya (Eds.), Archaeology and History, Essays in memory of Shri A. Ghosh, 1. New Delhi.

Basu, M. N., &Basu, M. N. (1975). A Study on Material Culture. Kolkata: World Press Private Limited.

Bhattacharya, M. (1991). Palaeohistory of West Bengal: Palaeolithic Stage. In D. Mitra & G. Bhattacharya (Eds.), Aksayanivi. Delhi: Sri Satguru Publications.

Burkitt, M. C. (1929). Our Early Ancestors: An introductory Study of Mesolithic, Neolithic and Copper Age Cultures in Europe and Adjacent Regions. Cambridge: Cambridge University Press.

Datta, A. & Ray, D. K. (1989). Kattara, An Upper Palaeolithic Site in The Mid-Kasai Valley, District Midnapur, West Bengal. In M. Mitra & G. Bhattacharya (eds.), Studies in Art & Archaeology of Bihar-Bengal. Delhi: Sri Satguru Publications.

Datta, A. (1985). Cultural Zones in Palaeolithic West Bengal, In Indian Museum Bulletin, 20. Calcutta: Indian Museum.

Datta, A. (1991a). An Appraisal of Chalcolithic Culture InWest Bengal. In Indian Museum Bulletin, 16. Calcutta: Indian Museum.

Datta, A. (1991b). Cultural Migration in West Bengal. In A.Dutta (Ed.), Studies in Archaeology. New Delhi. Books & Books.

Datta, A. (1991c). Blade &Blade Tool Assemblages of Upper Palaeolithic AndMesolithic Periods - A Case Study From The Mid-Kasai Valley in the Jhargram Sub-Division of Midnapur District West Bengal. In V. N. Misra & S. Wadia (Eds.), Man and Environment, 16 (1). Pune: Indian society for prehistoric & quaternary studies.

Datta, A. (1991d). Upper Palaeolithic Culture in West Bengal – A distinct regional development. In A. Datta (Ed.), Studies in Archaeology. New Delhi: Books and Books.

Datta, A. (1992). Neolithic Culture in West Bengal: With Special Reference to South and South-East Asia. Delhi: Agam Kala Prakashan

Datta, A. (1995 a). Black and Red Ware Culture in West Bengal. Delhi: Agam Kala Prakashan.

Datta, A. (1995b.). Upper Palaeolithic Culture in Midnapur; An Appraisal. In A. Datta, A. K. Ghosh and C. Margabandhu (Eds.), India at the Dawn of History. Delhi: Agam Kala Prakashan.

Ghosh, A. K. (1966). The Stone Age Cultures of West Bengal. Unpublished Doctoral thesis, University of Calcutta.

Ghosh, R.N. & Majumder, S. (1991). Geology & Morpho Stratigraphy of West Bengal: A data base for Archaeological exploration. In A. Datta (Ed.), Studies in Archaeology. New Delhi: Books & Books.

Leakey, L. S. B. (1954). Working Stone, Bone and Wood. In C. Singer, E. J. Holmyard, & A. R. Hall (Eds.), A History of Technology, I. Oxford: Clarendon press.

Oakley, K. P. (1954). Skill as a Human Possession. In C. Singer, E. J. Holmyard, & A. R. Hall (Eds.), A History of Technology, I. Oxford: Clarendon press.

Ray, R. (1991). Middle Palaeolithic Culture in West Bengal – An appraisal. In A. Datta (Ed.), Studies in Archaeology. New Delhi: Books & Books.

Sali, S. A. (1990). Stone Age India. Aurangabad: Shankar Publishers.

Sankalia, H. D. (1964). Stone Age Tools – Their Techniques Names & Probable Functions. Pune: Deccan College, Post Graduate & Research Institute.