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Reconstruction of the Past Based on Geo-Archaeological Evidence from 'Rarha' Plain and Coastal Medinipur, West Bengal, India.

Suman Saren

Abstract

Research work was carried out in the 'Rarha' plain (Ancient coast) and the Modern coastal plain of Medinipur for the reconstruction of the past environment through the local geomorphology, paleontology, and archaeology. Research related to the archaeology in this region ranging from the prehistoric Stone Age to the medieval period noted by different early scholars like, Chakraborty (1993 & 2001), Basak (1998), and Dasgupta (1981). The present work is deeply rooted in focus on the past physical conditions and evolution of geographical situations and cultural phenomena from the Pleistocene to the Holocene time. In this consideration geo-archaeology plays a central role, "because the history of human life is about ways of inhabiting the world" (Barrett, 1992).

Keywords:

Prehistory
Geo-archaeological Evidence
PastEnvironment Landscape Evolution

Author correspondence:

Assistant Professor
Department of Geography
Swami Niswambalananda Girls, College, affiliated to the University of Calcutta.

sumans.bapi@gmail.com

1. Introduction

Human settlement subsistence pattern is governed from the ancient era with the enhancement, arrangement, and characterize differences of landscape. The geomorphological environment of any region has already demarcated history of early man's struggle for survival and livelihood, physical surroundings do play an important role in determining human activities, the physical environment permits and at times even restricts the use of resources (Jain, 2014). That is why the history of human life and the geological history of any country are closely related. Knowledge of what has happened to human life support system in the past should be an important component of planning sustainable development in the future, in this context reconstructing the paleo-environment is an inevitable process in the narration of history (Bandopadhyay & Mukhopadhyay, 2015). As post-processual archaeology tends to focus more on the intangible aspects and space is considered one of the tangible sites to read them, several scholars sought to analyze the built environment

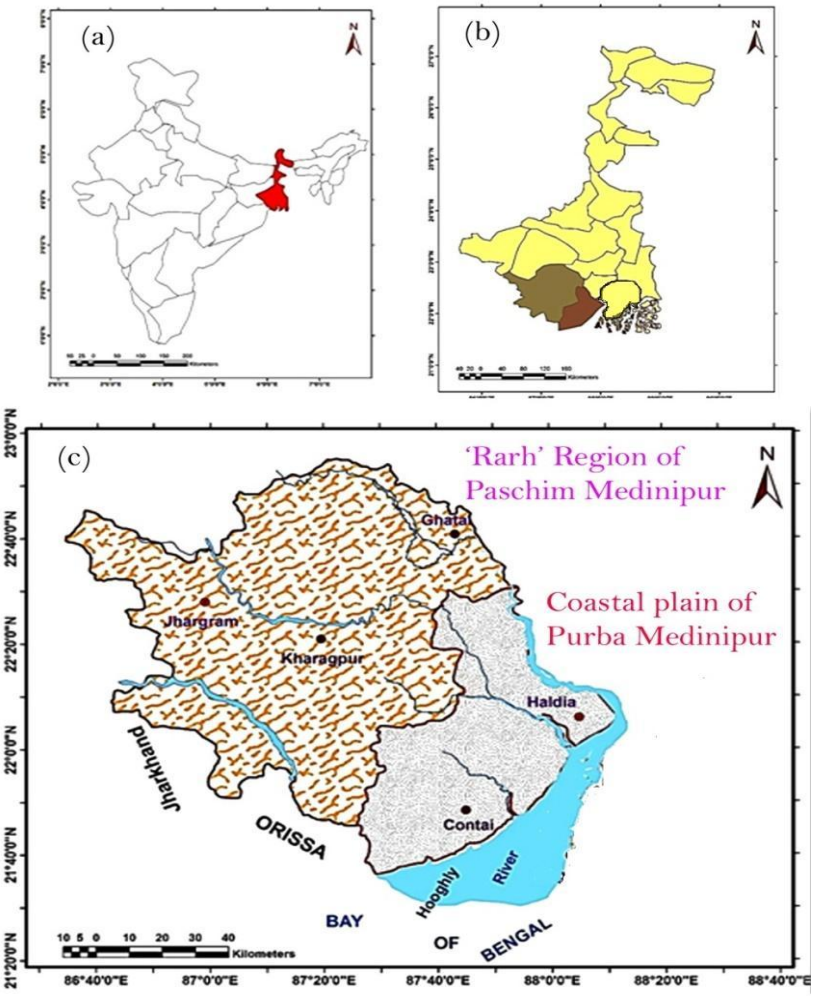

Figure. 1: Map of the study area – (a) location of West Bengal in India (b) District of Paschim Medinipur & Purba Medinipur in West Bengal (c) 'Rarha' region and Coastal plain of Paschim & Purba Medinipur District.

Constructed by past people to reveal social, cultural, and ideological aspects of past buildings and cities. Scholars like Blanton (1994), Hodder (1984), Martin (2001), and Trigger (1989) inspired by anthropologists and cultural geographers such as Amos Rapoport (1968), Lawrence and Low (1990), Hiller (1996), Hanson (1998) exemplify the tradition. Bruce Trigger (1989) analyses urban landscapes of cities in early civilizations and monumental architectures to focus on the nature of power in early civilizations. The entire study area is divided into two segments, firstly, the 'Rarha' region and secondly the coastal plain. The 'Rarha" region is presently located in Paschim Medinipur district and the coastal plain part is located in Purba Medinipur district of West Bengal (Fig,1) though both were part of the undivided Medinipur district before 1st January 2002 (Chakraborty, 2004). The geomorphic surface of; the Rarha region of Paschim Medinipur and the coastal plain of Purba Medinipur are analysed through different changes from the Pleistocene to the Holocene period. The part of the 'Rarha' region in Paschim Medinipur, is an undulating and rocky lateritic upland. These districts are the continuations of the Chhotanagpur Plateau gradually merging with the Gangetic alluvium. As a general feature, the surface is broken by a succession of undulations roughly from northwest to southeast. In the west, the high ridges of laterite are separated by comparatively narrow and defined valleys whereas in the southeast and east, the valleys gradually merge into Gangetic Delta (Ghosh & Majumder, 1981). The coastal plain in Purba Medinipur District with near swampy land and dense vegetation (Chakraborty 1993) is known as the Contai coastal plain. The coastal dunes near Digha are called Digha dunes and those at Kanthi are called Contai dunes they run parallel to the coast in an east-west direction (Chattopadhyay, Sengupta, and Chakraborty.2005). The northern dunes are much older and grayish (Chattopadhyay, Sengupta & Chakraborty, 2005). The coastal area of Purba Medinipur district consists of sand, silt, and clay covered successively by a beach, a Zone of dunes, and an interdune belt of recent formation. From the archaeological point of view, the western part of 'Rarha' plain belongs to the lower Palaeolithic to Neolithic age and somewhere Chalcolithic also reported by early Scholars like, Basak (1998 &2007), Chakraborty(1993, 1994 & 2001), Dutta(2007) and Maity(2000). This tract of land is the oldest rock formation of the state and constitutes an extension of the Chhotanagpur Plateau. This area of West Bengal under consideration has been contiguous with the adjacent Jharkhand and Orissa states and the

evolved human cultures in this zone were in no way very different. This area, traversed by several rivers and their tributaries originating mostly from the Chhotanagpur Plateau possesses evidence of very old human cultures dating back to Palaeolithic times. Successive cultural phases like Mesolithic, Neolithic, chalcolithic, and Proto-historic have also been recorded from several places within the area. Various archaeological explorations and excavations have proved the occurrence of a rich cultural history of Bengal from the Lower Palaeolithic up to the medieval period. A.K. Ghosh (1961) reported an assemblage of stone tools of Palaeolithic, Microlithic, and Neolithic in nature from several localities like Astajuri, Bamandih, Dhuliapur, Patina, Mohonpur Satbati, etc. around the ragged terrain of Belpahari and neighborhood in the north-western part of Paschim Medinipur District. Though evidence of the Palaeolithic ages is not found in the coastal plain part of the Purba Medinipur district several archaeological evidences of lateral ages (Neolithic, Chalcolithic) were found. The Chalcolithic period in West Bengal began around the second millennium BCE and continued up to c. 400 BCE (Roychoudhury 2011). In this context may be remembered that the result of excavation on the bank of Rupnarayana River has uncovered the Neolithic tools and the related symbol of settlement, dating back to the early to middle of 1000 B.C (Dasgupta,2007). At Tidah near Tamluk (in Purba Medinipur district), K.G. Goswami excavated the Chandpur mound and revealed a brick-built structure belonging to the Gupta period (Chakraborty, 1993). Tamluk is identified with the ancient Tamralipta, famous in literature as a great emporium and a seat of learning, Tamluk has long been known to archaeologists from its yield of coins, terracotta, and potteries, some of unusual shapes, either from the surface of haphazard diggings. Operation at seven places revealed that the town had been in occupation from the Neolithic to modern times with occasional breaks. Fundamental to a successful management strategy is an adequate understanding of the basic physical, chemical, biological, and human properties and processes that affect coast and estuary, including their interaction variability on different time and spatial scales, much can be learned from the sedimentary and archaeological records about how coast and estuary have varied in the past how man has responded to or caused such changes, although the past may not always be the key to the future, it is the key to understanding the present (Pye & Allen, 2000). The present work is deeply rooted in focus on the past physical condition and evolution of geographical situations about historical phenomena from the Pleistocene to the Holocene time. Written record of the past is limited to the last few thousand years and in this situation, Geo-archaeological studies have made it easier to depict general conclusions

about the wider picture of the past. In recent years geo-archaeologists and environmental archaeologists have been urged to bring social science theory into their discipline (Jusseret, 2010). This special issue brings together a set of geoarchaeological studies in the diverse coastal zones of the study area, encompassing a deep history of human occupation from the Pleistocene through the Holocene, different approaches for making sense of the variety of processes that have shaped the archaeological record and influenced human use of these areas over the millennia. Further, these combined works represent multidisciplinary perspectives to fulfill the aim of past reconstruction. It provides many insights into the complexities in human-nature relationships during times of rapid change. It also indicates that closer cooperation between earth scientists, archaeologists, and historians has provided better models of how people and their societies have coped with natural change (Sandweiss & Quilter, 2008). Recognizing the effects of landscape dynamics on the archaeological record, from volcanic eruptions to marine transgressions, few regions on Earth are subject to such a wide range of natural forces. How do these processes potentially deflect the distribution of artefacts, and features in these insular environments?

2. Material and Methods

The present work is deeply dependent on the extensive literature review for the Archaeological identification of places in the study area, especially the information used from different "IAR" (Indian Archaeology: *a review*), published by the Department of Archaeology, Govt. of India. Field study played an important role in examining the present geographical situation of the archaeological sites and tracking GPS records. Fieldwork was conducted during the winter of 2012, 2013 and 2014. The geographic information system (GIS) Technique is used for placing archaeological sites on the present map. District planning maps of Paschim Medinipur and Purba Medinipur published by National Atlas and Thematic Map Organization (NATMO) in 2006 and 2008 are used for mapping purposes and collecting physiographic data (Rainfall, soil & vegetation) of the study area. Images are joined using the mosaic tool of 'Erdas Imagine' 9.1 to get the total coverage of the study area map. The ASTER (Advanced Space Borne Thermal Emission and Reflection Radiometer) elevation data with 30 m resolution (GCS WGS84) of 2011 is downloaded from the website of the Earth Explorer (http://earthexplorer.usgs.gov) and it is also processed through 'Erdas', using AOI and subset tools. All unrectified raster and vector data are projected in UTM (Universal Transverse Mercator) assigning datum of

WGS84 (World Geodetic Survey, 1984) using the project raster tool of ArcGIS 9.3 software to overlap these data accurately. The contours of elevation are generated using ASTER data and the spatial analyst tool of ArcGIS 9.3. Data are used from the website of the Central Groundwater Board (CGWB), Govt. of India (www.cgwb.gov.in), of the district of Paschim Medinipur and Purba Medinipur for a better understanding of the general geology and geomorphology of the study area. In addition to the field, survey collecting of archaeological data and taking photographs of archaeological pieces of evidence from different museums located in the study area was also very helpful.

3. Results and Analysis.

3.1 Relating the Archaeological Remains with the Lithological and Ecological Evidence in the Entire Study Area.

The physical environment is determined by topography, climate, and soil character, which influence the flora, and fauna, the primary sources of livelihood for the early humans. Humans are the component element of the physical environment (Jain, 2014). the artifacts, which are treated as archaeological evidence in the present time are fixed on the Earth's surface, and the stratigraphical and ecological evidence of an area should be mindedly analyzed for the logical confirmation of the characteristics and location of archaeological evidence. The prehistoric environment of an area could be depicted by the geological examination, locational analysis archaeological exploration, etc. (Dasgopta, 1981). The entire study area is divided into two main physical parts for the discussion. Likes, ‘Rarha; region and coastal tract of Purba Medinipur (Fig,1). Those two parts are different from each other in geology, geomorphology, and archaeological aspects. Geologically the ‘Rarha’ region belongs to the Lalgar surface (Fig, 2). As per the geomorphological aspect, it is a lateritic upland. Which has been eroded for a long time, this lateritic upland is mostly covered by hard rock lateritic (Ghosh, 1993) nodular ferret is at places covered by sheet wash materials, and the absolute age of this surface is lower Pleistocene to middle Pleistocene (Chattopadhyay, Sengupta and Chakraborty, 2005). The main rivers of this eroded lateritic part of the ‘Rarha’ region are Kanshabati, Silabati, Terafeni, and Subarnarekha. Substantial archaeological evidence has been discovered from both banks of those rivers. The temporal span of the evidence (Fig.2) ranges from the early Palaeolithic to the Neolithic period (Dasgupta, 1981. Basak, 1998. Chowdhury, 2008. Chattopadhyay, Sengupta and Chakraborty, 2005). Attractive evolution and cultural enrichment of hominids have been found in the Pleistocene period of the Quaternary epoch (Dasgupta,

2007). Most of the Palaeolithic sites of the 'Rarha' region were concentrated on the banks of river Kanshabati, Silabati, Terafeni, and Subarnarekha. Subarnarekha is one of the oldest rivers of India. On the other hand, the flow of Kangsabati began in the 4th ice age (Chowdhury, 2008). Ghorapincha, Machanbandh, Chhotaturki, and Rangametia are the notable sites on the bank of the river. From the exploration of the Subarnarekha cliff at Ghorapincha, it is evident lower lateritic is covered up by a whitish compacted sandy layer, which is an indication of a dry climatic phase (Dasgupta, 2007). A continuous observation proves that the Palaeolithic artifacts discovered in this region are mainly beyond the deep yellow or reddish laterite layer, which is the effect of rich humidity in the Pleistocene period (Dasgupta, 2007). The Palaeolithic peoples of Subarnarekha Valley had to depend on the river-generated pebbles for making stone tools because of the non-appearance of larger hills in this region. A pebble layer deposited in Pleistocene time in the southern part of Subarnarekha Valley is very significant, A Pebble tool was collected from an excavation, that was conducted by the Department of Archaeology of West Bengal at the high elevated zone of Sapkhota Hill and in the pebble formation of Pitanau river in 1962. The tool is made of quartzite and it was unearthed from a secondary laterite

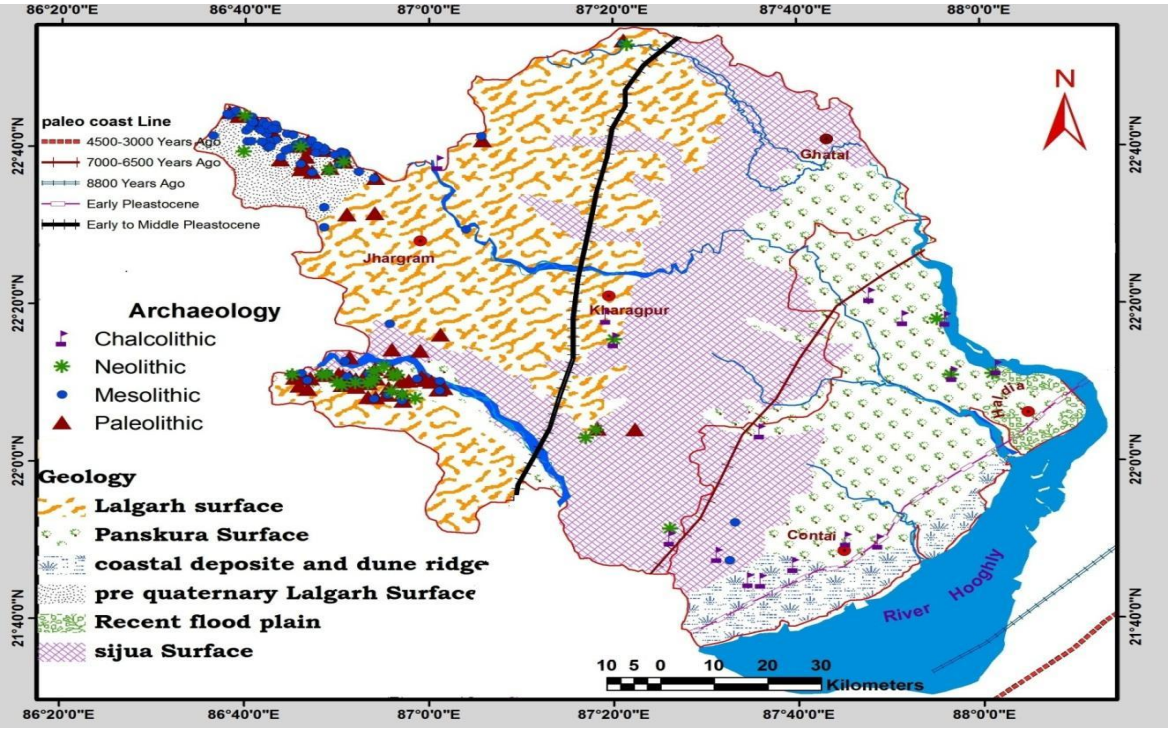

Figure. 2 Shows the Geological maps of Paschim & Purba Medinipur District (*modified after, Chattopadhyay, Sengupta & Chakraborty, 2005*) superimposed by archaeological sites separated by archaeological periods and locations of paleo coastline (*modified after, Banerjee, 2005)* in the different period of entire Medinipur region.

the layer which indicates that the tool was made in a period far past The shape and size of the tools are very similar to the pebbles tools of Africa and east Asia and also to the 'Sohan' of India and the tools of 'Soham' have been related to the early Pleistocene time (Dasgupta, 2007). There is no doubt that the islands of India, China, and West Oceania were part of a nameless continent in the Pleistocene, naturally, it can be said from the perspective of geographical knowledge that a climate existed with the combined characteristics of India-China-Oceania in this region (Dasgupta,2007). Dhuliapur is an eminent archaeological site on the Lalgarh surface, it is clear from this stratigraphic analysis of this place that few Palaeolithic evidence was discovered from a consolidated gravel layer, located above two meters from the Terafeni river bed, and a substantial amount of microliths were unearthed from a colluvium gravel deposit which is located about 5 to 6 meter high from the Terafeni river bed. And the remarkable thing is that the calcrete layer is situated beyond the colluvium gravel layer. In situ, fossils were discovered from a brown and yellowish silty layer, which is located in between concrete and a consolidated gravelly layer. Among those, the jaw fragment of a black Buck (*Antelope Carvicaprs*), the proximal half of a metatarsal of Indian Aurochs (*Bos Indicus*), and a fragment part of the jaw of a *Cheetal* deer (*Axis Axis*) are notable. The *Bos Nomadicas* is one of the most profusely found vertebrate fossils in the Quaternary deposit of India. Temporarily as well as especially its geological range in India starts from the middle Pleistocene and extends to as late as the early Holocene (Basak, 1998). Fossils of *Axis Axis* are found extensively in archaeological sites as well as Pleistocene deposits (Nandy and Paul, 2014), the species can also be traced indigenously from the late Pleistocene deposit (Basak, 1998). The remnants part of the fossil *of Bos Indicas* were found in the valley of Subarnarekha (Dasgupta, 2007). In this way, the existence of Palaeolithic and Mesolithic evidence on the Pleistocene surface of the 'Rarha' region with the presence of fossils (Table 2) of that period proved the logical existence of archaeological evidence. It also uproots any doubt about the antiquity of that region. Despite the fossil mentioned above example, a broken part of the lower jaw of a prehistoric people was also discovered from 'Sijua'(Fig.4) located on the bank of Kanshabati in the year 1978, by C^{14} test it was confirmed that the old fossil of a person of 17 to 23 years old and its age was calculated 10,000 YBP (Dasgupta,2007). This human fossil was discovered at 'Sijua' from a reddish and yellowish sand layer, which is about 13th meters deep from the surface (Table.1), this type of reddish sand layer was formed in the terminal Pleistocene period (Dasgupta, 1981). At test diggings at Sijua revealed a deposit of 1.50 m with a post-Black and Red Ware

level classified as early historic. At Moghalmari a deposit of 1.48 m was unearthed from a single trench, yielding Black and Red Ware and associated wares (Basak. et.al, 2014). The Sijua surface is located after the Lalgar surface region. This morphogenic surface elongated from north to south (Fig, 2) in the eastern end of the 'Rarha' region. A layer of a combination of oxidized sand, silt, and mud has been found above the Lalgar surface (Table 2), and calcrete nodules have been also found in that layer. This physiographic region is known as the Sijua surface, a geologically temporal span of this surface is from the late Pleistocene to the Holocene (Gosh, 1993). From the morphogenic point of view, it is an older alluvium upland (Chattopadhyay, Sengupta, and Chakraborty, 2005). This is located far above the normal flood level and it forms a topographic bench through the river Hooghly. Some Mesolithic, Neolithic, and Chalcolithic evidence has been found on this geological surface but no Palaeolithic evidence has been found like the Lalgar Surface (Fig.3), hence there is a concentration of the

Table 1 Major Characteristics of Geological Surfaces of the Study Area.

Geological Division	**Absolute Age**	**References**	**Morphogenic Surface**	**Lithology**
Lalgarh Surface	Lower Pleistocene to middle Pleistocene	Chattopadhyay, Sengupta and Chakraborty.2005	Lateritic upland	By mostly hard rock laterite (Ghosh 1993). Nodular fericreat is at places covered by a sheet wash materials
Sijua surface	Late Pleistocene to early Holocene	Chattopadhyay, Sengupta and Chakraborty,2005. Ghosh,1993	Older alluvium Upland	Sediment comprises highly oxidized and compact brownish grey sandy and yellowish grey-silty clay, a soil horizon with nodular and compact calcrete.
Panskura Surface	Upper Holocene	Chattopadhyay,Sen gupta and Chakraborty.2005	Newer alluvium plain	Alluvial plain with characteristics of silt, clay, and sand flood plain, delta fan related to the present-day river regime.
Ancient fluvial tidal flat	2920 ± 160 YBP	Chakraborty,1991	Older deltaic alluvium	alteration of clay, silt, and fine sand with mangrove roots
Kanthi Surface	5760 ± 140 YBP	Gangopadhyay.201 3	Older deltaic alluvium	Yellowish brown to high radish brown medium to very fine sand, upper part locally reworked by aeolian activity.

Table.2 The Dated Records (paleontological & Lithological) of The Study Area and Its Ambience.

Evidence	Find Place	Geological Unit	Probable year of Existence	Depth	References
Jaw fragment of black Buck (*Antelope Carvicapra*)	Dhuliapur	Lateritic upland (Upper Lalgar surface	Terminal Pleistocene	1.91m	Basak, et.al1998
Proximal half of a Metatarsal of Indian Aurochs (*Bos Nonmedical)*	Dhuliapur	Lateritic upland (Upper Lalgar surface)	Terminal Pleistocene	1.9m	Basak, et.al1998
Fragment part of the Jaw of Cheetal deer (*Axis Axis*)	Dhuliapur	Lateritic upland (Upper Lalgar surface)	Late Middle Pleistocene	2 – 3 m	Basak, et.al1998
Brocken part of fossilized Human jaw	Sijua	Lateritic upland (Lalgarh surface)		13 m	Dasgupta, 1981. Sur,1989 & 2008
Fossils of plant Leaf with mud rock	Negua	Older alluvium Upland (Sijua surface)	10,000 – 24,000 YBP	13 m	Rajanikanta Museum,2015 Ramnagar
Peat layer	Kolaghat	Newer alluvium (panskura surface)	6500 – 7000 YBP	12 – 13 m	Banarjee,2005
Clay sample	Tengramari	Ancient estuarine deposit	2920 YBP	1 m	Goswami & Chakraborty. 1988
Buffalo skull	South Tentultala	Older deltaic alluvium	3000 YBP	6 m	Rajanikanta Museaum , Ramnagar, 2015

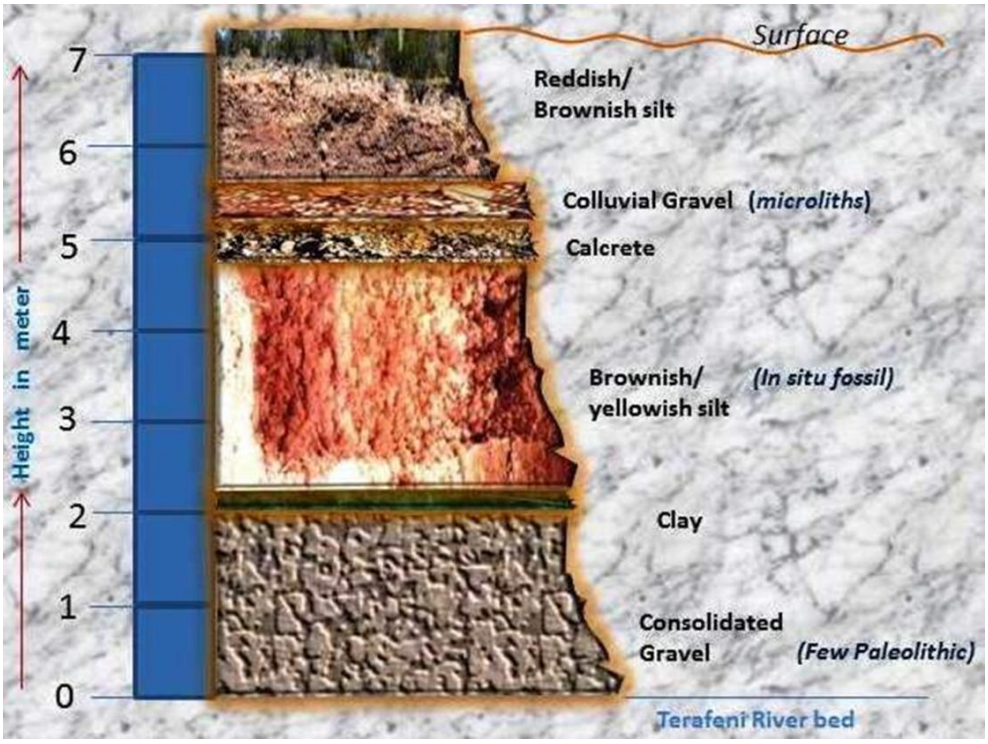

Figure. 3 Stratigraphic profiles of Lalgar geological surface at Dhuliapur (86°47'57.024"E 22°39'44.142" N). Modified after, Basak, et, al.1998.

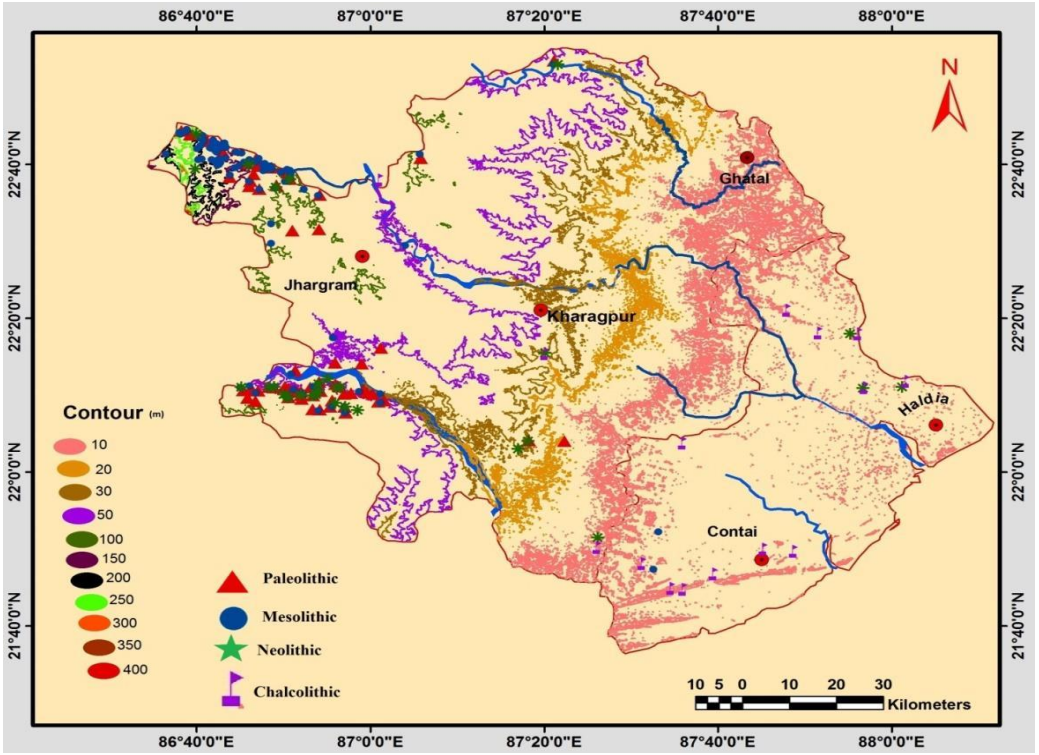

Figure 4: Contour Map of Medinipur (Paschim & Purba) superimposed by archaeological sites separated with archaeological periods, drawn based on SRTM (30m) Data. *Source*: ASTER DEM, 2011.

evidences of Mesolithic or lateral age instead of Palaeolithic evidence. A distinct type of physiographic region of the Purba Medinipur district is the coastal plain (Fig,1). The different geomorphic units can be found in this vast region (Fig.2) like, Panskura, Contai, and the recent floodplain surface. Some parts of the alluvial Panskura surface are homogeneously oxidized which is nothing but brown color soil. Some parts of this region are being flooded almost every time and, in some regions, the presence of sandy alluvium with some caliche nodules can be noticed, this surface is the younger alluvium plain of the Holocene era (Nag, et.al, 2008). Many types of delta fans can be found in the newer alluvium plain of the upper Holocene period, these delta fans are related to the river regime of present days (Chattopadhyay, Sengupta and Chakraborty, 2005). Geomorphologically, it belongs to older deltaic alluvium (Fig.2). The existence of freshwater swamps, coarse drainage density, paleo-delta lobs, and funnel-like paleo-river beds can be observed in this paleo-delta region. There are many archaeological sites situated along the banks of Rupnarayan and Kangsabati on the Panskura surface, for example, Tamluk, Natsal, Raghunathbari, and Mahisadal. The archaeological evidence has discovered that this region belongs to the span of the Chalcolithic to Pal-sena period. I.e. the period of 4000 YBP to 1000 YBP. There is no evidence of Palaeolithic stone tools on this geological surface. All the archaeological evidence (Fig,2) are comparatively younger period (Chalcolithic to Pal-sen). Therefore, there is a similarity between the geological age (upper Holocene) and traces of ancient human settlement (Chalcolithic to Pal-sen). The Ramnagar and Kanthi formations are two main geomorphic units of the part of the coastal plain nearer to the Bay of Bengal and on the west bank of river Hooghly. The Ramnagar formation is characterized by an older beach ridge and dune complex and tidal flat. The lithological structure of the older beach ridge complex is reddish to yellowish brown and fine to medium sand grain overlain by yellowish brown fine sand. The lithology of the older tidal flat is an alternative to dark grey streaky clay with parting of grey silty clay and fine sand (Chattopadhyay, Sengupta, and Chakraborty, 2005). A least number of Neolithic evidence (Plate.1&2) has been discovered from areas like Dharas, Ramnagar, and Debidaspur which are located along the beach ridge of this coastal plain region, but a substantial number of evidence of Chalcolithic to Pal – sena period has been unearthed. These are the witnesses of human existence on the top surface areas of older beach ridge about 3000 years ago. The age of a buffalo skull, which was discovered in a pond in south Tentultala village near Ramnagar town, is mentioned as 3000 YBP (Rajani Museum, 2015). Bahiri is an imminent archaeological site situated on the Kanthi surface has been divided into two distinct

physiographic units like ancient beach ridge complex and the ancient fluvio- tidal flat, the Bahiri is located on the ancient fluvio–tidal flat surface, which constitutes with alternation of clay, silt and fine sand with roots. An absolute c^{14} date of a clay sample was calculated as 2920 YBP, which is collected from a 1-meter depth from the surface of this fluvial-tidal flat (Goswami & Chakraborty, 1988). The site of Bahiri is located within geological deposits dating from the mid-late Holocene period, from c. 5000 YBP to the present (Gangopadhyay, 2013). The geological formation has been classified as Ancient Coastal Deposit (Kanthi or Contai formation). This unit represents the older coastal deposits in the area with sufficiently recognizable coastal landforms. The nature of deposits shows a natural correspondence with the genesis of the following landforms that have been identified as (a) Ancient Beach Ridge/Dune complex: Chain of echelon sandy ridges of varying heights (3 m to 14 m) trending NE-SW and is oblique to the local coastline and (b) Ancient Fluvio-tidal flat: Partially mottled soil profile representing the estuarine flat associated with the formation of the ancient dune complex and the sediment pile dated to 5760 ±140 YBP (Gangopadhyay,2013). This unit corresponds with marine transgression between 5000 - 6000 YBP (Gangopadhyay, 2013). The artifacts that remain from the surface of the site of Bahiri consist of mostly ceramic shreds including architectural ceramics (bricks and tiles). On analysis, it was found that pottery belonged to the early historic and early medieval types. Three cultural periods could be identified at the site, medieval, early medieval, and early historic. This assumption is entirely based on the pottery that occurs at the site along with antiquities (Fig.5).

Plate 1

Platec2

Plate 1: Neolithic Celt from a field visit at Rajani Museaum, Ramnagar,Purba Medinipur, India.
Plate 2: Neolithic Celt from a field visit at Rajani Museaum, Ramnagar,Purba Medinipur, India.

Pottery is found in layer 2. However, it is possible that they originally occurred in layer 1 from which they may have moved down due to processes of bioturbation (Basak, et.al, 2014). A serious of dunes is found in the entire Kanthi surface region. These dunes are parallel located through the present shoreline, in this way, a logical existence of many settlements of the Chalcolithic to early medieval period can be observed in the Purba Medinipur coastal plain region.

3.2. Reconstructing the Ancient Landscapes of Medinipur Region.

The flow of human civilizations has been directed by the flow of rivers and the location of shorelines from the prehistoric period to the modern period. Human civilization has been flown in multiphase at different times in different countries under the impact of geographical surroundings. The shoreline in the 'Rarha' region of Paschim Medinipur and the coastal plain area was never fixed in any particular region but has been shifted in different places at different times. According to the concept of geophysics, the Tethys Sea existed in place of the 'Rarha' region about 10 to 12 crore years ago (Chowdhury, 2008). Human existence initiated in the entire Medinipur region from the Early Pleistocene to the middle Pleistocene period (Dasgupta, 1981 & Basak, 1998), The location of shorelines has changed several times from early Pleistocene to the modern age. The location of human settlement has been evaluated with the hands of sea transgression and regression process. The shoreline was extended up to Garbeta in the early to middle Pleistocene time (Fig.2), which was evident from the observation of *ichnofossil* and certified plant fossils (Sarkar & Sen, 2014). According to the analysis of the geographical distribution of the prehistoric sites (Fig.2), it is known that the Palaeolithic sites have been located on the upper region(Fig.4) of the shoreline. The geological age of the 'Rarha' region has been extended from the lower Pleistocene to the middle Pleistocene era (Table.1). On the other hand, the Palaeolithic evidences, unearthed from the 'Rarha' region mostly belong to the middle Pleistocene time (Dasgupta, 2007). That means prehistoric people lived on the upper region up to which the shoreline was extended at that time (Fig,2&4) afterward in the late Pleistocene period sea regressive phase started then the shoreline regressed toward the present sea (Fig.2). At that time the existence of Neolithic and Chalcolithic sites was noted on both the surface of Sijua (lower Pleistocene to upper Holocene) and Panskura (upper Holocene) surface. The Neolithic culture may be regarded as one Stone Age culture associated with food production, along with the practice of agriculture as well as animal husbandry. The Neolithic implements were mainly axes, wedges, chisels, perforated tools,

shouldered hoes, hammer stones, pounders, fabricators, etc. (Ghosh, 1961). In the western part of West Bengal, namely, in the districts of Paschim Medinipur, Puruliya, Bankura, Bardhaman, Birbhum quite a good number of Neolithic artifacts have been recovered from places.

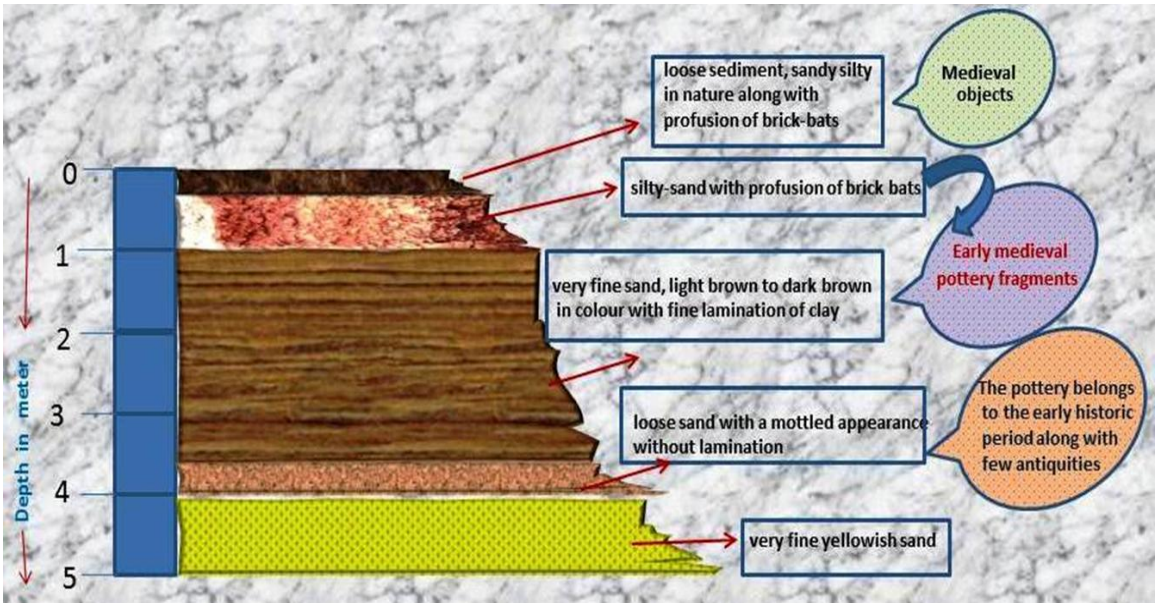

Figure. 5 Stratigraphic sections of the trench -1 at Bahiri (87°48'40.334"E 21°49'49.452" N) On Kanthi Surface, (modified after, Gangopadhyay,2013).

Geologically, these districts are part of the Chhotanagpur plateau (Narain, 1979). According to Narain (1979) location of the Neolithic spots revealed that the Neolithic people preferred high plateaus and terraces, above flood plain of the rivers for their dwellings. Chakrabarti (1998) stated that Period I of Pandu Rajar Dhibi, Bardhaman, was the earliest agricultural settlement in West Bengal. According to him, Pandu Rajar Dhibi may be later than the beginning of occupation at Bharatpur, Bardhaman, and Mahisdal in Birbhum. The radiocarbon dating of Bharatpur indicates the beginning of the second Millennium B.C. as the time of the culture. Though no definitive remains of animals are obtained. Mahisdal yielded a good quality of burnt rice indicating that rice was cultivated by the human folk. Krishnaswami (1960) traced the origin of the culture in Southeast Asia which entered India through Myanmar (Burma), Recognition of a Chalcolithic phase in the archaeology of Eastern India. According to Misra (1970), in large part, the Neolithic culture was succeeded by the NBP Ware culture leading to the emergence of urban consciousness, planned settlement, developed architecture, newer arts, and bigger trades. The Neolithic and Chalcolithic mound in central Anatolia was settled from about 7200 to 6000 B.C. The Pre-Pottery Neolithic population then settled in the West Mound, in which

occupation continued through the Chalcolithic and during historic periods, the site is located in the middle of a large alluvial fan in the western Konya Basin (Daniella. et.al, 2010). In later phases of 7000 – 6500 YBP, almost every coastal region on the Earth has been flooded for the outset of the de-glaciation phase due to global warming (Sarkar & Sen, 2014). That means the transgressive phase has been initiated and the shoreline covered the coastal plain region and elongated up to the eastern end of the 'Rarha' region. Later about 4000 – 3000 YBP (Fig, 2) sea shoreline retreated again up to the present Sundarban, at this time human civilization of the early historic to medieval period had been building up on the Ramnagar and Kanthi surface. In the entire Medinipur region, the sea has advanced towards land and sometimes retreated towards the sea from the early Pleistocene to the upper Holocene period (Fig.2). Regression of sea, southwards movement of coastline, and seaward advancement of delta in the Bengal basin took place due to rapid siltation during 6175–5000 YBP (Banerjee, 2005), and in this way, human subsistence pattern has been changed with the concomitant sea level changes. The existence of Palaeolithic people's settlements was located on the upper region of sea level at that time. Hence there is a logical relationship noticed between the location of the shoreline and areas of ancient human settlement (Fig.2). Topographically a low-lying depositional surface would be demarcated behind the Contai-Paniparul dune landscape from aerial photography of 1950 and Landsat images of 1972 representing a wide extension of backwaters bodies in the form of coastal lagoon that was connected with the open sea environment by tidal inlets through the paleo channel of modern Contai across the dunes (Paul, 2011). This feature is known as Dubda basin topography (Paul, 2011A) and was extended from Egra, Mohonpur, Paniparul, Bhagabanpur Baliaghai, Satmail, etc. places behind modern Contai in the form of low-lying surfaces frequently inundated by sea water encroachment and monsoonal rainwater storage. Recently, in one of the excavation sites of Erenda (Basak, et. al, 2014) in the Egra sub-division, a lakeshore region is explored with a collection of archaeological tools and habitation sites with the structure of floors. The habitation sites of early peoples were excavated from a depth of 1.5 meters from the local surface over the Sijua formation(Table.2) at its easternmost boundaries. The Dubda basin, in front of the excavation site, was filled up with floodplain alluviation by Kansabati, Kaliaghai, and Subarnarekha River floods and lag deposition of sediments with the signature of paleo tidal basin sedimentary layers. During that period, seawater usually encroached into this basin from the southeastern shoreface and Hooghly estuarine banks (Paul, 2002). There is also evidence of tidal sand depositions with storm events and tidal waves over the basin

sediment. The Contai dune surface up to Junput beach ridges and Bahiri beach ridges were extended in the form of barriers, spits, islands, and bars over which the habitations were developed for marine trades and communications (Paul, 2011).

4. Conclusion

There are ample geomorphic signatures of past shorelines of the Holocene and late Holocene periods in the coastal plain of Contai Subarnarekha delta. The archaeological tools and their dating records, lithological records as well as peat records, and dating of marine shells prove the similar fluctuation of sea level during the Holocene and late Holocene phases, among them the beach ridge canneries of eleven segments and six segments are during the regressive phases of sea levels in and around Subarnarekha delta and Kanthi coastal plain. Among the beach, several workers (Niyogi, 1975; Paul, 2002) have identified ridge chenniries of the region in six numbers of shorelines. The Panskura formation of estuarine floodplain deposition and ancient tidal basins are gradually advanced towards the east of the Bengal Basin by deltaic fan deposit of Kangsabati (Haldi) river and Rupnarayan river system of the study area during the Holocene transgressive phase of sea level. The shoreline was located towards the west through the fringe of the Sijua formation during 10000 YBP (Paul, 2002). The late Pleistocene to early Pleistocene shorelines were also extended up to the Sijua and Lalgarh formation of western Medinipur highlands. From the Lalgarh and Sijua surfaces various archaeological artifacts are available from different layers of geological formation (Fig.2), they are dated as 2.3 m.y.a. to 40000 YBP. So, the concomitant fluctuation of sea levels as well as the advancement of the deltaic fans has produced the natural landscape of the study area. Lalgarh formation occupies the highland parts of Medinipur that have been eroded by sub-aerial processes over the geological period and the sediments derived from these surfaces have been deposited in the Sijua surface towards the east of Lalgarh formation. There are several valley cuts and valley fill surfaces have been observed across the lateritic planation surfaces of western Medinipur during the warm-humid phases (Nandy & Paul, 2014) Such evolution proves that the natural landscape system has been changed over the geological period and the early habitation made by ancient people also shifted from west to east following the advancement of land and retreat of the sea for their livelihood practices in the past. Such evolution proves that the natural landscape system has changed over the geological period and the early habitation made by ancient people also shifted from west to east following the advancement of land and retreat of the sea for their livelihood practices in the past.

Overall findings of the present research prove that the natural landscape history of highland Medinipur, lowland, and coastal plain Medinipur have changed over the geological period in this region of the Bengal basin. Gradually the local environment of the natural landscape systems has changed over geological time and the ancient people, who made their habitations in different parts of the land surface based on their stability and also following the livelihood of different parts of the environment, have gradually shifted from west to the east directions with the advancement of the natural landscape.

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