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# Scope of Geoarchaeology in depicting the Early Hominin Environments in the Gandheswari River Basin of Bankura district, West Bengal

Sayantani Neogi

The relationship between natural and cultural factors has long been debated, and many authors correlate these, even if under different perspectives, environmental and cultural conditions. Multi- and interdisciplinary studies, which allow researchers to gather data from different fields and compare natural and cultural phenomena under an integrated and diachronic point of view, are critical to improve our knowledge on these topics. In this sense, geoarchaeology is a mean to interrelate the dynamics of the physical environment and that of the human groups. The disciplines of geology and archaeology find a natural interface here, both contributing to, and benefiting from one another. Bankura district of the modern state of West Bengal has immense potential for such geoarchaeological studies.

Keywords: interdisciplinary studies, georarchaeology

## Introduction

This paper presents the scope of soil micromorphological description in elucidating the Quaternary geoarchaeology of the Gandheswari river valley in Bankura district in the state of West Bengal, India. Bankura is one of the few districts in West Bengal, which has yielded rich prehistoric cultural materials. The Gandheswari river valley also documents sites from Acheulian culture onwards. If an approach could be developed by using soil micromorphology and basic cartography, then there is a possibility of mapping the geomorphological terraces/ fringes (if any) of the river Gandheswari. These geomorphological units are associated with prehistoric lithic assemblages which could be interesting in finding out the mode of interaction between man and environment. Also, the soils and paleosols are a source of information for palaeoecology and human occupations and can furnish us with amazing details of early hominin environmental conditions of this part of West Bengal.

## The Study Area

Gandheswari river is a tributary of Dwarakeswar river, which originates in the north-western part of Chatna police station, covering a length of 32 km from source to mouth. It passes through Chatna and Bankura before merging with Dwarakeswar in Bankura (Fig. 1).

Geomorphologically the district of Bankura can broadly be divided into three units viz. the hilly country of the west, the undulating red soil area of the center and the alluvial flat plains in the east.

The hilly areas of the west are the relics of denudation of the Chotonagpur plateau. There are also some residual flat-topped low hills of Precambrian age which are deeply weathered forming lateritic crust at the top. These are surrounded by an erosional plain surface developed over the denuded Precambrian rocks and Jurassic Rajmahal trap. There are older rocks of the Archaean system like dolerite, granite, gneiss, schist, quartzite, and limestone etc. while the Gondwana system includes sandstone and shalestone. The Pleistocene activities are recorded in the form of laterite and gravel formations while the recent deposits are alluvial soil.

## Review of Earlier Researches

The Gandheswari river valley was first explored by P.C.Dasgupta in 1964. Dasgupta (1967), discovered no less than forty palaeolithic sites and the artifacts collected from those sites amount to few thousand pieces, most important being Susunia. Dasgupta did not pay much attention to the geo-stratigraphy of the region. However, it was mainly due to his persistent efforts that Susunia came into limelight. More than 55 Acheulian sites have been identified

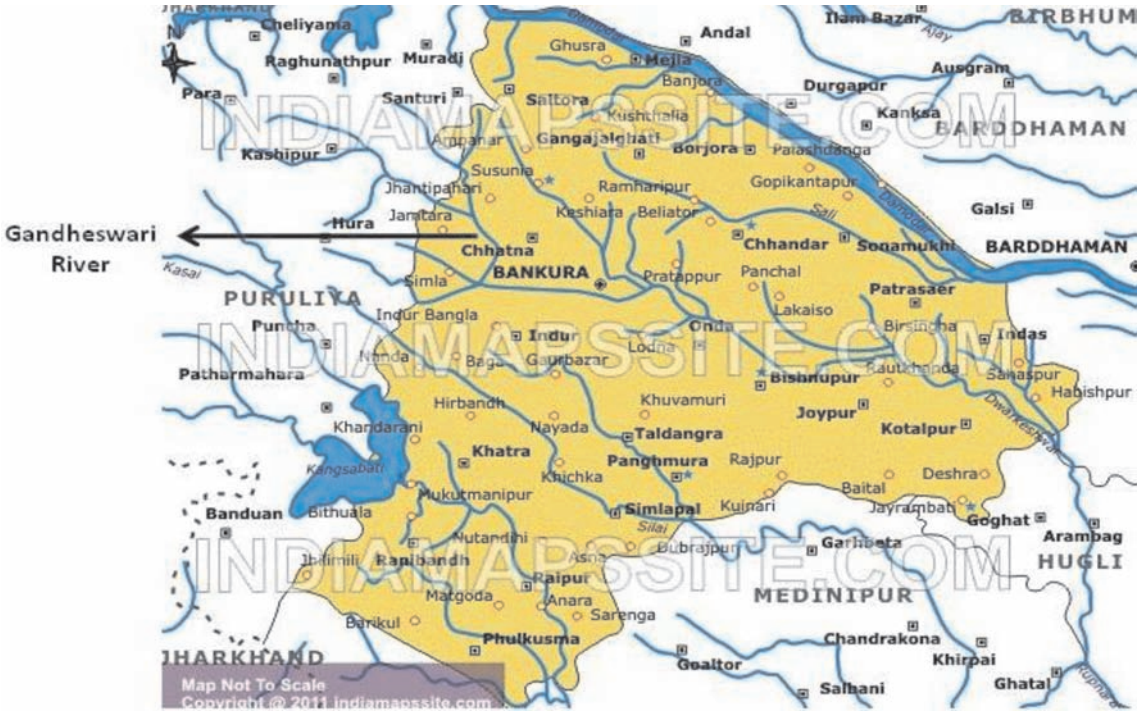


Fig 1. Map showing the Gandheswari River Valley

in the Susunia hill region (23° 22' 30'' N: 86° 58' 20'' E) which occupies an area of 24 square km.

Regional stratigraphies have been built by correlating different sections (Ghosh, 1998). In the main river a thick deposit of mottled clay is found sometimes directly resting on bedrock succeeded by a highly lateritized boulder conglomerate bed. A silty clay bed succeeds this and is overlain by a loose angular gravel bed succeeded by silt and recent alluvium. However, the tributaries show a different stratigraphy. Immediately above the bedrock there is huge deposit of secondary laterite, which is often implementiferrous. This bed is succeeded by a silty bed covered by recent alluvium (Ghosh, 1998).

The Palaeolithic or the Acheulian artifacts in West-Bengal are found either in the gravel bed of the main river or in the detrital laterite bed of the tributaries of the main rivers. But no attempt has been made by any scholar to correlate these deposits through systematic survey and mapping. However these sediments yielded a large number of fossil vertebrates that roughly belonged to Upper Pleistocene (Ghosh, 1998).

The major rivers are often subjected to flood, thereby destroying the archaeological materials. But in sharp contrast the tributaries are not often subjected to seasonal flood and thereby preserve the archaeological materials more often. Thus tributaries offer potential scope to reconstruct the cultural life of the people who lived along its bank. Gandheswari a tributary of Dwarakeswar, could be selected for geoarchaeological study keeping in mind this perspective. "There is a proven and valuable geo-archaeological and palaeoenvironmental potential within the Gandheswari river valley and so this impressive Palaeolithic legacy should not be overlooked" (Ghosh, 1998). It is hoped that an attempt can be taken to study the effect of Quaternary climatic and geomorphological changes by studying the stratigraphy and soil micromorphology of the river at different exposed sections, correlating these deposits and studying the changing human adaptations according to the Quaternary climatic shifts.

## Scope of Geoarchaeological studies in this area

**a) Objectives**

- To undertake thematic mapping of the study area and the related archaeological sites by Quaternary cartographic means.
- The Quaternary stratigraphy of the basin shall be reconstructed as the main focus

of this study. Knowledge of detailed stratigraphy gained from site specific explorations will lend plausibility to the interpretation of landform genesis and evaluation of the history of an area.

- To identify the sedimentary environments of the archaeological sites in the basin area and outline a detailed depositional history of these sites.
- Explaining the micro-environmental conditions during human occupation by means of palaeo-pedology and petrography.
- To distinguish between natural sedimentary and anthropic processes in the formation of archaeological levels.
- To carry out some dating at suitable sites to get a better idea of the chronological development of the area.
- To study the effect of Quaternary environmental change and the changing human adaptations.

**b) Methodology**

The geoarchaeological study can be undertaken using a descriptive approach including a geomorphological survey of the surroundings, the stratigraphic study of the site and micromorphological analysis. The priority goals can be diachronic reconstruction of environmental change and an understanding of the relationships between anthropic and non-anthropic dynamics, paying special attention to site formation processes.

The first work to be carried out is mapping. Primarily cartographic techniques are to be applied to successfully carry out mapping. Surface geomorphology maps, including landforms and drainage patterns can be prepared to study the nature of surficial sediments, tectonic activity and geomorphology. Regional landform maps shall also be made to provide indication of the geological history of the area, while more localized maps can be made to study the distribution of microenvironments. Such maps may serve as an analog for the diversity of resources and can help to recreate the geographic context of an area over time and assist in interpreting artifact distributions. Finally superimposing the localities of known archaeological sites on a geomorphic map may yield distinctive patterns of site distribution in association with particular landforms.

Actualisation of background Quaternary data is another important aspect of the study in order to make out what works have been done till date. The study of geological survey reports, bore hole data, information from irrigation wells, canals, etc can be undertaken to get preliminary background information for carrying out further detailed study and identifying suitable areas for further exploration. For this purpose topographic and geological maps of the Survey of India and Geological Survey of India can also be consulted to identify suitable locations for further study.

Systematic exploration and extensive field work is of utmost necessity. Test excavation can also be carried for further understanding of stratigraphy at suitable sections. This will enable stratigraphic description and micromorphological and petrographic sampling of sediments providing microenvironmental details for the hominin occupation contexts and to investigate site formation issues.

## Conclusion

Soil forming process helps us to reconstruct the past by indicating the past bioclimatic environment. According to Jenny (1941), soils and their properties are the product of the different soil-forming factors (climate, organisms, relief, parent material and time) that control the degree of soil development, as indicated by comparisons with the parent material (Harden, 1990). Because the soil-forming factors also govern geomorphic processes, landscape evolution is intimately related to soil development (McFadden and Kneupfer, 1990). Over time, soil-forming factors, especially climate and vegetation, may change in such a way that many old soils, palaeosols, are not related to the present climate and vegetation. Properties of the different soil horizons have also been used to determine the age of soils (Levine and Ciolkosz, 1983; Harrison et al., 1990) and thus the approximate age of the landforms (Semmel, 1989). For this reasoning to be valid, climatic conditions must remain relatively stable over the entire soil-forming period, for only then do the soil properties increase constantly with

time (Birkeland, 1990). However, dating becomes complex on surfaces subject to long-term climatic fluctuations. This can be solved if relationships between specific soil properties and climatic fluctuations are known.

This work, therefore can leave scope for reconstructing palaeoenvironment of the archaeological sites and related geographic domain. In future, a fine knowledge of soil forming processes can led to invoke a more detailed environmental reconstruction.

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