

SYNOPSIS

Prehistoric Archaeology of the Gundlakamma and Adjoining River Basins, Prakasam District, Andhra Pradesh

Introduction

South Asia is one of the geographically pivotal regions in the hominin dispersal route situated between the complex lithic technologies in the west and simple lithic technologies in the east. The Palaeolithic record of South Asia is diverse and offers enormous potential for understanding the hominin behaviour for the last 1.5 ma. Recent multi-disciplinary approaches to South Asian Palaeolithic sites (e.g., Petraglia et al 2007; Mishra et al 2013; Akhilesh et al 2018) has highlighted the significance of the region in understanding the long-debated topics of hominin migrations and their adaptations to catastrophic climatic events (ex. Toba eruption of 74 ka). The above-mentioned discoveries emphasize the role of chronometric dates and Palaeo-environmental data for a better appreciation of the hominin behaviour in the region. However, very few South Asian Palaeolithic sites give secure chronometric dates and Palaeo-environmental data despite containing a rich Prehistoric record ranging from Lower Palaeolithic to Mesolithic.

Even though modern humans emerged in Africa and migrated subsequently to other parts of the world, the timing of such events, routes that were taken and associated lithic technologies are poorly understood. Absence of fossil record from the pivotal regions in the dispersal route (such as South Asia) and diverse lithic technologies associated with modern humans in some regions (such as Southeast Asia, Australia, China) prevents us from making any generalizations about the nature of these dispersals. The timing and nature of initial modern human presence in South Asia has created intense controversy in the light of recent archaeological and genetic research (Appenzeller 2012). Two conflicting models for the earliest modern human colonization of South Asia (Mellars et al 2013; Groucutt et al. 2015) rest on a slender foundation of archaeological evidence, and no human fossils. The first model states that the modern humans arrived ~50–60 ka, from Eastern Africa along the coastlines of Southern and Southeast Asia, to reach Australia by ~45–50 ka. The second proposes dispersal of modern humans from Africa early as 120–130 ka (Groucutt et al. 2015), reaching southern Asia via the Levant or the south Arabian Peninsula, and well before the Toba “super-eruption” at 74 ka. The Post-Toba model is based on molecular genetics dating, combined with similarities between Indian Late Palaeolithic/Upper Palaeolithic assemblages and Howiesons-Poort-like ones in South and East Africa. Arguments advanced in support of the latter model rest on the

evidence unearthed from Jwalapuram wherein a series of stone tool assemblages have been recovered from locations both underlying and overlying thick deposits of Toba ash-fall, with a series of associated OSL dates ranging from ~77 to ~38 ka (Petraglia et al 2007). However, both the aforementioned models have certain drawbacks. DNA analysis often assumes that modern sampled populations are an accurate reflection of all past populations, which ignores or rarely considers demographic changes (Petraglia et al 2010). On archaeological grounds, both the models are problematic. The Pre-Toba colonization model suggests that the Indian microlithic technology was an in-situ development from local post-Toba Middle Palaeolithic technologies, but technologically transitional industries between 70 and 45 ka are absent. The earliest Indian microlithic technologies are similar to those documented over large parts of the Old World. The Post-Toba model fails to explain the gaps between the genetically estimated age of the initial modern human colonisation of South Asia (50-60 ka) and the earliest directly dated occurrences of typical microlithic industries in South Asia (35 to 45 ka). Human occupation of Australia by at least 50 ka also suggests that earlier sites shall be found in South Asia along the route to Australia. In order to better appreciate these issues, origin and antiquity of Middle Palaeolithic and Microlithic technologies in South Asia has to be comprehended. Securely dated Palaeolithic sites between 400 to 40 ka and detailed typo-technological analyses of lithic assemblages are prerequisite to understand the above-mentioned issues.

The current work focuses on addressing the aforesaid issues by approaching potential Palaeolithic sites with multidisciplinary methods. Generating chronometric ages for the Palaeolithic assemblage will fill significant gaps in our understanding of the cultural evolution of the region. High resolution typo-technological analyses of lithic assemblages can help in understanding the similarities and differences among the assemblages. The Gundlakamma, the Paleru and the Manneru river basins were chosen for investigations due to their rich prehistoric record (Issac 1960; Rao 1979; Kumari 1987; Srinivasulu 2012). In addition, recent surveys by geologists from Geological Survey of India have identified volcanic ash beds and animal fossils along the Gundlakamma River (Reddy and Shah 2004). The study area situated between 15° to 16° north latitudes and 79° to 80° east longitudes, occupies an area of 10,000 Sq. Km. The study area is drained by four rivers namely the Gundlakamma, the Paleru, the Musi and the Manneru which forms a fan shaped basin between the major east flowing rivers, the Krishna in the north and the Pennar in the South. These rivers have their origin in the Nallamalai ridge which forms the western flank of the study area. On the east, it is bounded by the Bay of Bengal. The whole basin politically comes under the Prakasam District of Andhra Pradesh.

Major Objectives of the Research

1. Conducting intensive surveys in the basin area to locate Palaeolithic sites and also revisiting the previously explored sites.
2. To conduct section scrapings and test pits at potential Palaeolithic sites to recover sediment and lithic samples from secure contexts.
3. To reconstruct the chronological framework of the region using Optically Stimulated Luminescence dating method to date sediments containing lithics and fossils
4. To conduct sedimentological analysis such as particle size, Mineral magnetism, Loss on Ignition to understand the site formation process.
5. To analyse the lithic assemblages typologically and technologically by recording several attributes. These attributes will be used to understand the reduction strategies including raw material preferences, patterns in biface production, core preparation, flake production and tool production.
6. The present study will also examine the spatial and temporal variation in prehistoric material culture at the Gundlakamma basin. The investigations will focus on questions concerning the manufacture and transportation of chipped stone artefacts, the economics of procurement and the mechanisms which produced assemblage variation. The objective is to not only describe the chipped stone technology of prehistoric occupants, but also to determine their response to environmental changes as reflected in the material culture.
7. Reconstructing the prehistory of the study area and the resulting inferences are used to address general issues of prehistoric technology, settlement pattern and hominin adaptations and dispersals.

Outline of the thesis

Chapter 1: Introduction

This chapter presents how the current research draw inspiration from existing scholarship in prehistoric archaeology and other associated disciplines. It also discusses why the topic is important to the discipline, the gap in knowledge and the need to generate more systematic data. The chapter reviews previous work done on this topic, by citing relevant literature and also includes an overview of the objectives of the present work.

Chapter 2: Study Area: Physiographic and Cultural Setting

This chapter gives an introduction to the physiographic setting of the region followed by cultural framework of the region. The objective of the chapter is to place the prehistoric evidence in the geological and geomorphological background of the region to understand the site distribution and settlement patterns.

Chapter 3: Research Methods

This chapter discuss the methods employed in the data collections and their limitations. The chapter elaborates the survey strategies such as the the reading of the topographic sheets, satellite images; Optically Stimulated Luminescence dating techniques to date the sediments and the methods used lithic artefact and faunal analysis. It further includes the classification of the data and methods exercised in analysing the data recovered using multiple methods.

Chapter 4: Results

This chapter presents the results of the current research. The chapter starts with presenting the results of the field surveys undertaken and distribution of sites in the background of region's physiography. Among the reported sites potential sites were investigated in detail and this chapter discuss these sites by presenting their geological context, sedimentology, OSL ages and nature of lithic assemblages.

Chapter 5: Discussion

This chapter discuss the interpretation of the data presented in the previous chapter with an aim to fulfil the aims and objectives of the current research. Further the chapter presents how the results of the current research are used to shed significant insights on various issues such as Youngest Toba Tuff beds in South Asia as a Late Pleistocene chronological marker? Nature of Lithic Assemblages before and after the Toba super-eruption of 74 ka; Late Acheulian to Middle Palaeolithic transitions in South Asia; Nature of post Middle Palaeolithic cultural evolution in South Asia; Initial Modern Human Colonization of South Asia and Archaic Hominin & Modern Human interactions in South Asia. The chapter aims to address the aforesaid issues through the data collected from multidisciplinary approaches.

Chapter 6: Conclusion

The concluding chapter of the thesis summaries the crucial aspects of the current research in appreciating hominin migrations and their adaptations in South Asia. It further emphasises the

significance and limitations of the current research and the future scope in the field of prehistoric archaeology.

STATEMENT – I

(Statement showing the particulars, on which the work is based, the discovery of new facts and of new relationships between facts observed by others and how the work tends to help the general advancement of knowledge.)

South Asia shows rich evidence of hominin occupation starting from at least 1.5 ma. Evidence belonging to all the three major phases of the Palaeolithic period are reported from the region. However, lack of secure chronometric ages and hominin fossil remains from South Asian Palaeolithic record hinder our understanding of the nature of hominin behavioural traits in the region. Current archaeological data from South Asia neither supports nor disproves the two models (Pre-Toba model of Petraglia et al 2007 and Post-Toba model of Mellars 2006) that explain the initial modern human presence in the region (Appenzellar 2012, Mellars et al 2013, Blinkhorn and Petraglia 2014,). This is primarily due to the aforesaid models being based on a very few excavated and well dated sites and many un-dated sites, surface collections, and the paucity of Pleistocene hominin fossils from South Asia. The study in particular is expected to provide a better chronologically controlled model for understanding the modern human spread into South Asia. Further, the the research is particularly significant in the context of South Asia because, as of today, only very few palaeo-anthropological investigations are carried out with a multidisciplinary approach. Besides generating chronometric dates for the findings, the proposed study addressed issues pertaining to human dispersals and their subsequent adaptations to local environments, site formation processes by involving a combination of landscape approaches, geo-chemical analyses of the sedimentary deposits and lithic analysis.

Following are the major findings of the work:

1. The current study was successful in identifying 68 new prehistoric sites in the region. These include Lower and Middle Palaeolithic sites, Microlithic sites, Youngest Toba Tuff sites.
2. Lithic assemblages and sediment samples were collected from secure geological contexts through systematic test excavations and section scrapings from potential sites.
3. Optically Stimulated Luminescence ages were obtained for artefact bearing horizons which provided a robust chronological framework for the sites in the region.
4. High resolution Sedimentary analyses shed significant insights on the site's formation processes and on post depositional alterations of archaeological material.

5. Detailed typo-technological analyses of lithic assemblages generated data sets that will be crucial in understanding the lithic technological evolution and the spatial and temporal variations among the lithic assemblages.

6. All the above mentioned data collected through multidisciplinary methods have been intelligibly synthesised in this thesis. The new datasets, besides filling the significant gaps in our knowledge regarding the hominin evolution in South Asia, have revealed the significance of multidisciplinary approaches in prehistoric investigations.

STATEMENT – II

(Statement indicating the sources of information and the extent to which the thesis is based on the works of others and the portion of the thesis claimed as original.)

The current research is based on the Prehistoric sites reported through extensive explorations and systematic test excavations conducted in the Prakasam district, Andhra Pradesh between 2018-2020. The study aims at constructing the chronological and technological framework for the lithic assemblages and addressing various aspects of the hominin evolution in the region. The prehistoric studies in the region were initiated by several scholars such as Issac (1960); Rao (1979); Kumari (1987); Srinivasulu (2012) and Reddy and Shah (2005). Further extensive studies on initial modern human colonization of South Asia and the climatic impacts of 74 ka Toba super-eruption are available from adjacent region viz. Kurnool and elsewhere (Petraglia et al 2007; Petraglia et al 2012; Clarkson et al 2020).

The portion of the thesis claimed as original include the reporting new prehistoric sites; generating Luminescence ages for the artefact bearing horizons; high resolution palaeo-climatic and sedimentological analyses to study site formation processes; detailed typo-technological analyses of lithic assemblages and the analyses of animal fossil remains. All these analyses are used in reconstructing the cultural history of the region during the prehistoric times.

The following is the list of references which formed the basis for the formulation of concepts used in the thesis.

Buylaert, J.-P., Murray, A.S., Thomsen, K.J., Jain, M., 2009. Testing the potential of an elevated temperature IRSL signal from K-feldspar. *Radiat. Meas.* 44, 560–565.

- Clarkson, C., Harris, C., Li, B. *et al.* (2020). Human occupation of northern India spans the Toba super-eruption ~74,000 years ago. *Nature Communication* **11**, 961. <https://doi.org/10.1038/s41467-020-14668-4>.
- Clarkson, C., M. Petraglia, C. Harris, C. Shipton, and Norman, K. 2018. The South Asian Microlithic: Homo sapiens Dispersal or Adaptive Response? In Erick Robinson and Frédéric Sellet (Eds), *Lithic Technological Organization and Paleoenvironmental Change Global and Diachronic Perspectives*, Springer, Switzerland, pp. 37-62.
- Issac, N. 1960. *The Stone age Cultures of Kurnool*. Unpublished Ph.D. thesis. Pune: University of Poona.
- Jones, S. C. 2012. Local- and regional-scale impacts of the ~74 ka Toba supervolcanic eruption on hominin populations and habitats in India. *Quaternary International* 258 (0): 100-118.
- Kumari, A. 1987. *Palaeolithic Archaeology of the Gundlakamma basin, Andhra Pradesh*. Unpublished M.Phil. thesis. Guntur: Acharya Nagarjuna University.
- Mishra, R. and V. Singaraju 2009. Quaternary Geological Studies of Inland Dunes of Prakasam District, Andhra Pradesh. *Unpublished progress report of Geological Survey of India* 2004-05.
- Petraglia, M.D., P. Ditchfield, Jones. S, Korisettar. R and Pal. J.N. 2012. The Toba volcanic super-eruption, environmental change and hominin occupation history in India over the last 140,000 years. *Quaternary International* 258: 1-16.
- Petraglia, M.D., R. Korisettar, N. Boivin, C. Clarkson, P. Ditchfield, S. Jones, J. Koshy, M.M. Lahr, C. Oppenheimer, D. Pyle, R. Roberts, J.L. Schwenninger, L. Arnold and K. White. 2007. Middle Palaeolithic assemblages from the Indian subcontinent before and after the Toba super-eruption. *Science* 317: 114-16.
- Rao, V.V.M. 1979. *Stone Age Cultures of Prakasam District, Andhra Pradesh*. Unpublished Ph.D. thesis. Viskhapatnam: Andhra University.
- Reddy, M.K and B.M. Shah. 2005. Quaternary Geological Studies with Special Emphasis on Volcanic Ash and Neotectonism in Gundlakamma River Basin of Guntur And

Prakasham Districts, Andhra Pradesh. *Unpublished progress report of Geological Survey of India 2003-04.*

Srinivasulu, K. 2012. The Stone Age Cultures of the Manneru Valley. Unpublished Ph. D. thesis. Srisailem: P.S. Telugu University.