LETTER

doi:10.1038/nature25444

Early Middle Palaeolithic culture in India around 385–172 ka reframes Out of Africa models

Kumar Akhilesh[1], Shanti Pappu[1], Haresh M. Rajapara[2,3], Yanni Gunnell[4], Anil D. Shukla[5] & Ashok K. Singhvi[3]

Luminescence dating at the stratified prehistoric site of Attirampakkam, India, has shown that processes signifying the end of the Acheulian culture and the emergence of a Middle Palaeolithic culture occurred at 385 ± 64 thousand years ago (ka), much earlier than conventionally presumed for South Asia[1]. The Middle Palaeolithic continued at Attirampakkam until 172 ± 41 ka. Chronologies of Middle Palaeolithic technologies in regions distant from Africa and Europe are crucial for testing theories about the origins and early evolution of these cultures, and for understanding their association with modern humans or archaic hominins, their links with preceding Acheulian cultures and the spread of Levallois lithic technologies[2–20]. The geographic location of India and its rich Middle Palaeolithic record are ideally suited to addressing these issues, but progress has been limited by the paucity of excavated sites and hominin fossils as well as by geochronological constraints[1,8]. At Attirampakkam, the gradual disuse of bifaces, the predominance of small tools, the appearance of distinctive and diverse Levallois flake and point strategies, and the blade component all highlight a notable shift away from the preceding Acheulian large-flake technologies[9]. These findings document a process of substantial behavioural change that occurred in India at 385 ± 64 ka and establish its contemporaneity with similar processes recorded in Africa and Europe[2–8,10–13]. This suggests complex interactions between local developments and ongoing global transformations. Together, these observations call for a re-evaluation of models that restrict the origins of Indian Middle Palaeolithic culture to the incidence of modern human dispersals after approximately 125 ka[19,21].

The end of the Lower Palaeolithic Acheulian culture and beginnings of the Middle Palaeolithic, or Middle Stone Age, involved processes that marked substantial changes in hominin behaviour. The legacy of these changes, placed at approximately 300–200 ka[2–8], is expressed primarily through technological transformations that involve a gradual decline in Acheulian large flake and core tools[9], including bifaces; a proliferation and diversity of Levallois flake- and point-reduction strategies; and the evolution of blade technologies[3–7,10,11]. The behavioural processes that underpinned the transition from the Acheulian to the early Middle Palaeolithic or Middle Stone Age were variable and complex through space and time. This is evident at several Middle Palaeolithic and Middle Stone Age sites from the continuation of biface production—characteristic of Acheulian cultures —in small numbers amidst diverse Levallois- and blade-reduction sequences, and from the Acheulian roots of the Levallois concept[8,10,13–17] (see Supplementary Information). The co-occurrence of Middle Palaeolithic or Middle Stone Age artefact sequences with not only modern humans[2] but also other archaic species—with which modern humans could potentially interact—complicates investigations considerably[7,8,14] (see Supplementary Information).

Despite the presence of numerous Middle Palaeolithic sites in South Asia, the age and origin of this cultural phase remain poorly documented[8,18] (see Supplementary Information). Important features of the Middle Palaeolithic in India include the continuation of bifaces (albeit occurring less frequently or smaller in size than their Acheulian analogues); a predominance of small flake tools; the presence of Levallois and blade technologies and occasional points; and in some regions, depending on availability, an increased preference for fine-grained cryptocrystalline raw materials[8,18] (see Supplementary Information). Radiometric ages have so far placed Indian Middle Palaeolithic cultures at approximately 140–46 ka[1,20], potentially overlapping with a possible Late Acheulian occurrence at approximately 140–120 ka[19]. Regional variants and evolutionary trajectories of the Indian Middle Palaeolithic, and its association with modern humans or other archaic species and with the origins of Levallois technology, continue to be debated[8,21]. Patterns of hominin dispersals inferred from correlations between genetic, fossil and archaeological records are likewise unclear[8]. One theory[22] links the Middle Palaeolithic in India with modern human dispersals out of Africa during and after Marine Isotope Stage 5 (130–80 ka), with populations surviving the catastrophic Toba volcanic eruptions at around 74 ka, whereas a contrasting theory[20,23] associates the Indian Middle Palaeolithic with coexisting archaic species and advocates that the arrival of modern humans—ushering in microlithic blade assemblages and other cultural features—did not occur before Marine Isotope Stage 4 or 3 (71–57 ka). These gaps in our understanding of cultural transformations in South Asia arise from the scarcity of radiometric ages at excavated sites and of hominin fossils.

Here we present chronological and archaeological evidence from Attirampakkam (ATM), a Lower and Middle Palaeolithic site situated on the banks of a tributary stream of the Kortallaiyar River[24] (Fig. 1, Extended Data Fig. 1). Excavations to depths of between 4 and 9 m in different trenches have revealed an alluvial sequence deposited by a small stream transporting a sediment load derived from shale, sandstone and laterite outcrops. From the base upwards, layers 8 to 6 are clay-rich and contain exclusively Early Acheulian assemblages (dating to approximately 1.7–1.07 million years ago (Ma))[24]; the overlying layers 5 to 1 contain the Middle Palaeolithic assemblages and form a sequence of clay-rich silt alternating with ferruginous gravel (Fig. 2, Extended Data Fig. 2). The mineral magnetic record[25] indicates a seasonally dry tropical climate that was wetter during the deposition of layers 4 and 3, which are low-energy overbank silt deposits, and drier during the deposition of layers 5 and 2, which are gravel beds, with aridity persisting through layer 1 (see Supplementary Information).

Our description of the composition of the Middle Palaeolithic assemblage is based on the contents of three adjoining trenches (T7A, T7B and T7C) and involves the systematic analysis of 7,261 artefacts excavated from trench T7A (Figs 3, 4, Extended Data Figs 2–8, Supplementary Table 1). Like their Acheulian predecessors[24], Middle Palaeolithic populations used locally available quartzite for making tools: other siliceous rock sources are absent in the region[26].

[1]Sharma Centre for Heritage Education, 28 Ist Main Road, C.I.T. Colony, Mylapore, Chennai 600004, Tamil Nadu, India. [2]Department of Physics, Electronics and Space Science, Gujarat University, Navrangpura, Ahmedabad 380009, India. [3]AMOPH Division, Physical Research Laboratory, Navrangpura, Ahmedabad 380009, India. [4]Université de Lyon, Department of Geography, UMR 5600 Environnement Ville Société, 5 Avenue Pierre Mendès-France, F-69696 Bron, France. [5]Geosciences Division, Physical Research Laboratory, Navrangpura, Ahmedabad 380009, India.

© 2018 Macmillan Publishers Limited, part of Springer Nature. All rights reserved.