Recent findings on the Acheulian of the Hunsgi and Baichbal valleys, Karnataka, with special reference to the Isampur excavation and its dating

K. Paddayya[†,*], B. A. B., Blackwell[#,‡], R. Jhaldiyal[†], M. D. Petraglia[§], S. Fevrier[‡], D. A. Chaderton II[‡], J. I. B. Blickstein[‡] and A. R. Skinner[#,‡]

[†]Department of Archaeology, Deccan College, Pune 411 006, India
[§]Leverhulme Centre for Human Evolutionary Studies, Department of Biological Anthropology, Cambridge University, Cambridge CB2 3DZ, England
[#]Department of Chemistry, Williams College, Williamstown, MA 01267, USA
[‡]RFK Research Institute, Flushing, NY 11366, USA

Surface survey and excavations for the past five years (1997–2001) at the Lower Palaeolithic (Acheulian) site of Isampur in northern Karnataka, have yielded significant data on the Pleistocene hominid record of the Indian subcontinent. At Isampur, a quarry-cum-workshop site has been identified where all stages in the Acheulian tool manufacturing process at the raw material source (siliceous limestone from the Middle Bhima Series) have been preserved. These data are providing extremely significant insights into hominid cognitive capabilities, their technological organization and landscape usage. Preliminary ESR dating results for two teeth from this site average > 1.2 Ma.

AN amphitheatre-like Tertiary erosional basin measuring about 500 km^2 in extent forms the Hunsgi and Baichbal valleys, which are located in the Shorapur taluk of Gulbarga District, Karnataka. Shale and limestone plateaux and low hills of Dharwar schist and granite enclose the area. The valley floor slopes gently from west to east (from 480 to 420 m amsl), while the surrounding uplands range in elevation from 20 to 60 m above the valley floor.

Located in the semi-arid tract of peninsular India, the valleys receive 500–700 mm of precipitation annually. Shallow streams forming a dendritic pattern drain the basin. These streams come together to form the Hunsgi nullah, which is a small, left-bank tributary of the river Krishna. *Hardwickia-Anogeissus* series thorn-scrub[1] forms the major flora regionally. Until 1985, the area was a dry farming belt with jowar, bajra and groundnut as the major cultivated crops. The newly constructed reservoir for irrigation at Narayanpur on the Krishna (part of the Upper Krishna Project), however, has opened the area to cash crops such as sunflower, chillies and cotton.

Emanating from junctions between the Archaean rocks on the valley floor and sedimentary rocks in the uplands, a number of seep springs occur in the two valleys. Once the rains forming part of the southwest monsoon cease, these springs provide the only perennial water source in an otherwise dry area. Extensive travertine deposits indicate the geological antiquity of these springs. The availability of a perennial water supply from the seep springs appears to be a major factor permitting continuous human occupation in the valleys from the earliest times. The availability of several lithic sources for tool-making, the enclosed nature of the valleys, the gently undulating valley floor, the low heights of the surrounding uplands and the availability of a large variety of plant and animal foods were other factors which promoted this prolonged occupation.

With clues provided by previous archaeological discoveries in the area by workers such as Meadows Taylor, Robert Bruce Foote, Mahadevan, and Mukherjee, Paddayya selected this area for detailed field investigations. Since 1965, his work led to the discovery of many archaeological sites ranging from Acheulian (Lower Palaeolithic) to the Iron Age and the beginning of the early historical period[2,3] (Figure 1). This work thus placed the Hunsgi and Baichbal valleys securely on the archaeological map of India.

In particular, the intensive surveys undertaken by Paddayya since 1974 were located over 200 Acheulian localities, many of which occur in their original depositional contexts (i.e. non-transported). Three such localities, at Hunsgi and Yediyapur, were excavated systematically. Artefacts recovered from these localities include handaxes, cleavers, polyhedrons, scrapers and knives, which are characteristic of the Acheulian Industrial Complex (Figure 2). The Acheulian cultural material in this region is noteworthy, because limestone formed the principal lithic source for tool manufacture, although other raw materials such as granite, gneiss, dolerite, schist, basalt, shale and chert were also used. Some localities also yielded small numbers of wild cattle, horse, elephant and deer fossils.

Comparing the site distribution (dispersed or clustered) with the raw material sources, seasonal or perennial water sources as provided by seep-springs, and wild plant and animal availability as extrapolated from ethnographic data, enabled the Acheulian settlement pattern and annual resource management strategy to be reconstructed. During the wet season, the Acheulian groups in the two valleys dispersed across the valley floor, while heavily relying on plant foods and small game. In the dry season, people lived near perennial water sources and predominantly hunted large game[4,5].

Radiometric dates (Table 1) obtained with $^{230}Th/^{234}U$ suggest that the age of the Acheulian sites in the valleys ranges from 174 to > 350 ka (ref. 6).

Since 1987, the site contexts have been reinvestigated in greater detail in order to understand the natural and cultural processes which led to their formation[7–10]. Adopting this approach has allowed the sites to be

*For correspondence. (e-mail: dakshina@pn2.vsnl.net.in)

classified according to their depositional contexts. For example, fluvial, sheetwash and colluvial deposits, where artefacts have been transported after their initial deposition, can be distinguished from sites on deflationary surfaces where artefacts occur in primary depositional context on the surface of bedrock, calcrete, travertine and silty sediments. Distinguishing behavioural variability among sites has also been possible. Based on the assemblage accumulation time and differences in the types of assemblage and raw material, occupational sites, activity sites created in a single event, food processing sites, and caches have been identified.

As a part of this new study, the Acheulian site at Isampur (16°30′N and 76°29′E) has been selected for detailed field investigation. Located in the northwestern corner of the Hunsgi valley, it was discovered in 1983 when the Irrigation Department had quarried away much of the 1.0–1.5 m thick brown/black silt cover overlying the cultural level. Subsequent geoarchaeological investigations in the area have revealed that the site lay on the weathered limestone along the outer edge of a palaeodrainage tract (2–3 m deep), forming part of the undulating erosional topography on the valley floor. In post-Acheulian times, the drainage tract as well as the valley floor, including the Acheulian site, were covered with 1–3 m thick brown/black silt deposits derived from the surrounding uplands in a series of depositional episodes[11].

Extensive excavations spanning five seasons (1997–2001) have exposed an extremely well-preserved Acheulian

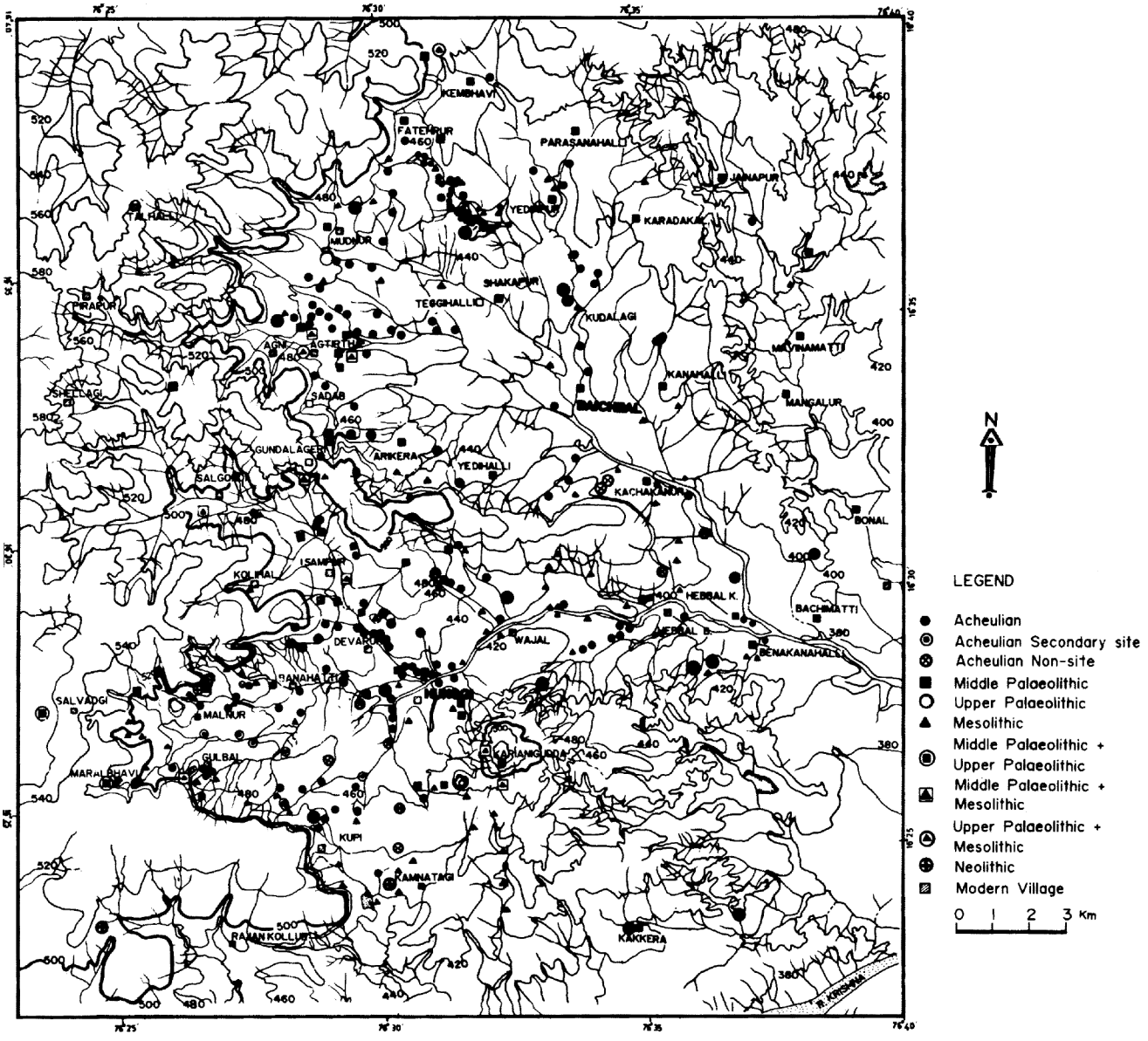

Figure 1. Map showing distribution of prehistoric sites in the Hunsgi and Baichbal valleys.

level (20–30 cm thick) set in a well-cemented matrix of brownish calcareous silt. Located on a geological limestone outcrop (Rabanpalli Formation/Middle Bhima Series), the site contains suitably-sized limestone blocks, hammerstones, cores and artefacts in various stages of manufacture or reduction. The occurrence of various classes and kinds of waste products ranging up to less than a centimetre in size, and the low proportion of finished tools such as handaxes and cleavers compared to cores and débitage, all indicate that Isampur was a true quarry-cum-manufacturing centre[11–13]. A small number of bovid, equid, and cervid remains and turtle-shell fragments found in excavation may suggest that the hominids were also engaged in subsistence activities.

The large quantity of lithics (> 15,000 artefacts) has enabled us to reconstruct the entire lithic reduction process used at Isampur. The lithic assemblage contains hammerstones and débitage corresponding to all the reduction stages:

(i) Suitable limestone slabs were selected and, in some rare cases, even pried from the outcrop. Slabs were prepared into cores by chipping-off irregular projections from sides or corners.
(ii) Large flakes 20–25 cm across were removed and transformed with a minimum of secondary chipping into knives and chopping tools.
(iii) Some flakes were shaped into bifaces, handaxes and cleavers, through elaborate secondary flaking and chipping.

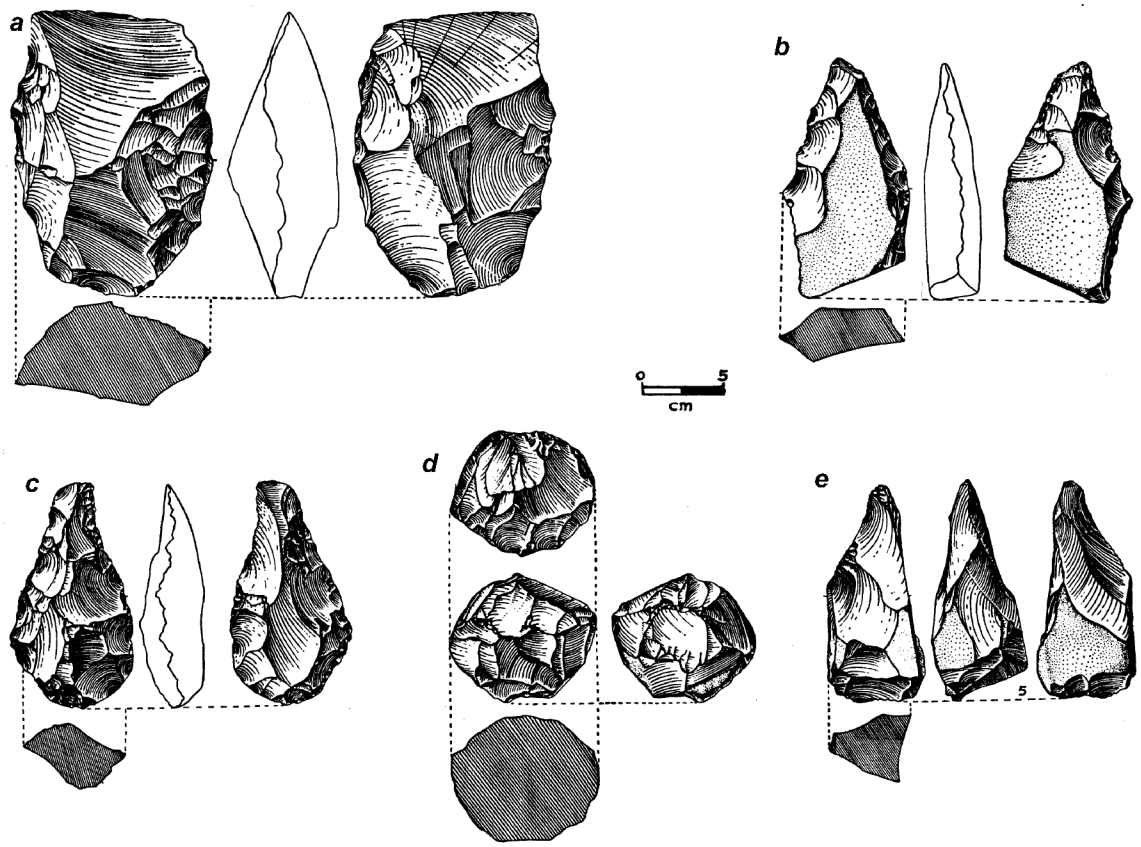

Figure 2. Important lithic artefact types of the Acheulian of the Hunsgi and Baichbal valleys. ***a***, Cleaver; ***b, c***, Handaxe; ***d***, Polyhedron; ***e***, Pick.

Table 1. $^{230}Th/^{234}U$ dates for the Acheulian of the Hunsgi and Baichbal valleys

Site	Sedimentary context of Acheulian cultural material	Material dated	Date (ka)
Kaldevanhalli-I	On the surface of travertine	Travertine (1 m below surface)	174.0 ± 35.0
Sadab	On brown clay developed on granite-gneiss	*Elephas* sp. molar	$290.4^{+21.0}_{-18.2}$
Teggihalli	On brown clayey silt capped by black silt	*Bos* sp. molar	$287.7^{+27.2}_{-22.4}$
Teggihalli	On brown clayey silt capped by black silt	*Elephas* sp. molar	> 350.0 (minimum age)

(iv) Some thinner limestone slabs, ranging from 2 to 6 cm in thickness, were used directly for making bifaces.

The extremely fresh condition of the artefacts and their occurrence at the raw material source, and the recovery of a large number of small-sized débitage fragments suggest that the limestone assemblage from Isampur was not exposed to erosion and weathering for a prolonged time, before being buried under colluvially deposited silt derived from the surrounding uplands.

From both the surface indications and excavated features, the site appears to have consisted of four contiguous localities, each measuring 300–400 m^2, and containing weathered blocks of limestone, artefacts in various stages of manufacture, cores, and débitage (Figures 3 and 4). In Trench 1 (70 m^2 in extent), seven chipping clusters have

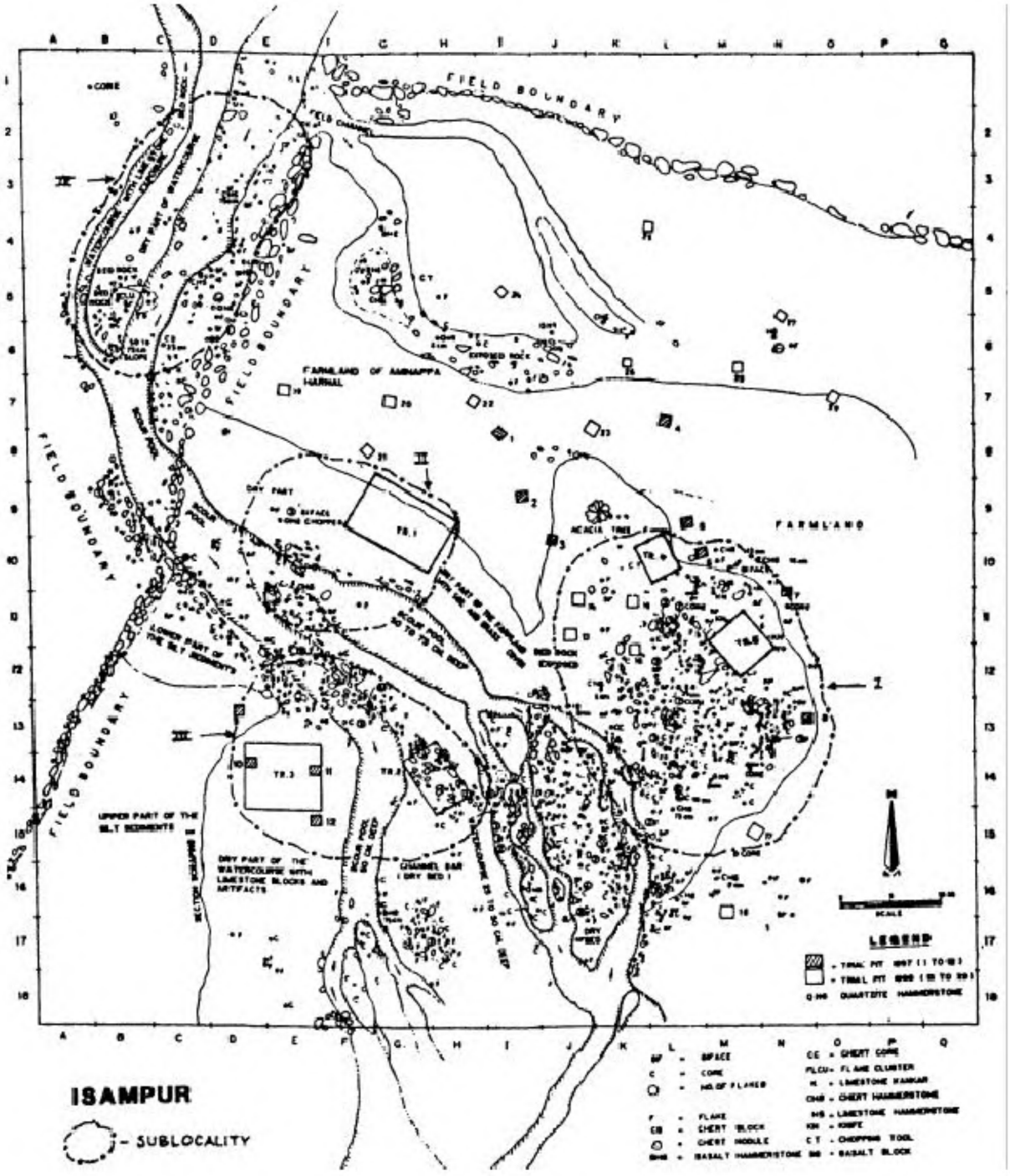

Figure 3. Map of the Acheulian site of Isampur with four sub-localities (I–IV), surface distribution of limestone blocks and various categories of artefacts.

been identified, which are spatially defined by a concentration of cores, large flake blanks, great quantities of débitage and hammerstones (Figure 5). Each cluster (6–8 m^2 in area) has an arrangement of large limestone slabs, which may have served as seats used while knapping the limestone cores. These inferences regarding site structure are based upon observations made during the excavation, examination of photographs and spatial orientations of the excavated material (Figure 6).

This work at Isampur has also permitted inferences about the Acheulian settlement system and organization. Considering that ten sites (small sites and non-sites) were found within 5–6 km around Isampur, one may infer that Isampur probably served as a localized hub for manufacturing and occupation activities, from where the hominids radiated onto the uplands and across the valley floor during their daily foraging activities.

Considering the technological and typological features seen in the Isampur lithic assemblage, which were primitive compared to those found at the sites dated by $^{230}Th/^{234}U$ (Table 1), the age for Isampur was estimated to be approximately 0.5–0.6 Ma (ref. 13).

This suspected early age for Isampur has now been confirmed by electron spin resonance (ESR) dates performed on two fossil herbivore teeth found associated with the Acheulian assemblage, encased in the hard carbonate matrix[14]. In the associated sediment, external dose rates averaged 447 ± 72 μGray/y, while U concentrations in the enamels are near 3 ppm, and those in the dentine range from 12 to 21 ppm. With accumulated doses averaging near 2.0 kGray, ten independent determinations from the two teeth yielded a mean age of 1.27 ± 0.17 Ma, assuming linear U (LU) uptake. The early U uptake (EU) ages set the minimum age for the site at 730 ± 100 ka, while the recent uptake (RU) ages set its maximum possible age at 3.12 ± 0.40 Ma. In calibration tests at other Middle Pleistocene sites, LU has proven the most reliable uptake model[15].

The significance of the Isampur site lies in the critical data it has provided about hominid behaviour, especially

Figure 4. General view of the excavated Acheulian surface, Trench 1 at Isampur.

Figure 5. Close-up of a chipping cluster showing dense concentration of artefacts and limestone blocks in Trench 1 at Isampur.

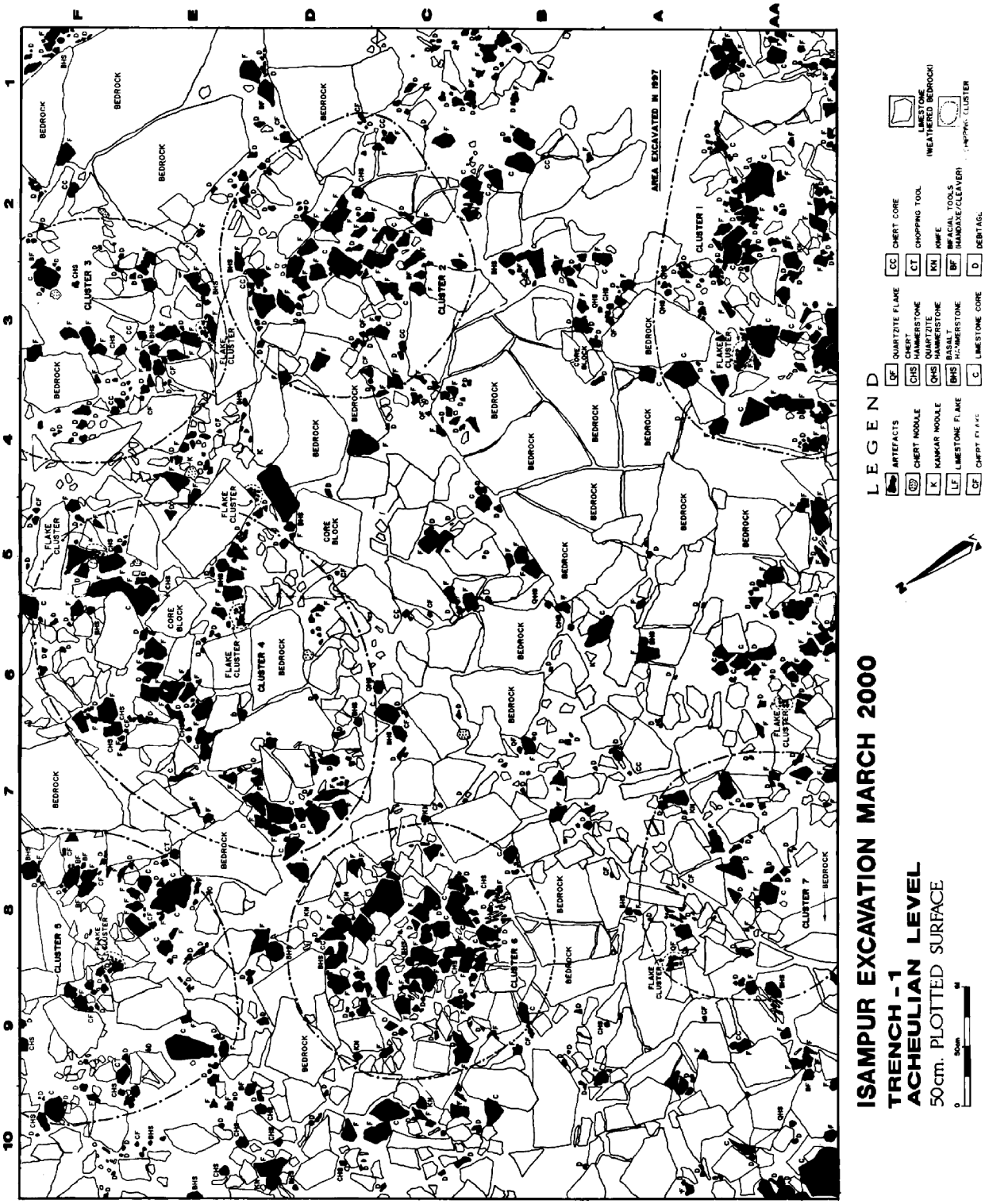

Figure 6. Trench 1, 50 cm plotted surface showing chipping clusters at Isampur.

the lithic technological processes and the settlement system. The ESR dates make Isampur the oldest known site in India and push the antiquity for the Lower Palaeolithic on the subcontinent beyond a million years. Comparatively, the available dates for sites like Bori, Didwana, and Yedurwadi range from 0.4 to 0.7 Ma (refs 16–18). Future research will focus on placing Isampur into early human colonization and dispersal models.

1. Gaussen, H., Legris, P. and Viart, M., *International Map of Vegetation and of Environment Conditions – Sheet Bombay*, Indian Council of Agricultural Research, New Delhi, 1965.
2. Paddayya, K., *Bull. Deccan Coll. Postgrad. Res. Inst.*, 1987, **46**, 77–100.
3. Paddayya, K., *Investigations into the Neolithic Culture of the Shorapur Doab South India*, E. J. Brill, Leiden, 1973.
4. Paddayya, K., *The Acheulian Culture of the Hunsgi Valley, Peninsular India: A Settlement System Perspective*, Deccan College, Pune, 1982.
5. Paddayya, K., in *Human Roots – Africa and Asia in the Middle Pleistocene* (eds Barham, L. and Robson-Brown, K.), Western Academic and Specialist Press Ltd, Bristol, 2001, pp. 235–258.
6. Szabo, B. J., McKinney, Curtis, Dalbey, T. S. and Paddayya, K., *Bull. Deccan Coll. Postgrad. Res. Inst.*, 1990, **50**, 317–321.
7. Paddayya, K., in *Natural Formation Processes and the Archaeological Record* (eds Nash, D. T. and Petraglia, M. D.), BAR International Series, Oxford, 1987, 352, pp. 74–85.
8. Paddayya, K. and Petraglia, M. D., in *Formation Processes in Archaeological Context* (eds Goldberg, P., Nash, D. T. and Petraglia, M. D.), Prehistory Press, Madison, 1993, pp. 61–82.
9. Paddayya, K. and Petraglia, M. D., in *Quaternary Environments and Geoarchaeology of India* (eds Wadia, S., Korisettar, R. and Kale, V. S.), Geological Society of India, Bangalore, 1995, pp. 333–351.
10. Jhaldiyal, R., unpublished Ph D thesis, University of Pune, 1997.
11. Paddayya, K., Jhaldiyal, R. and Petraglia, M. D., *Man Environ.*, 1999, **24**, 167–184.
12. Petraglia, M. D., LaPorta, P. and Paddayya, K., *J. Anthropol. Res.*, 1999, **55**, 39–70.
13. Paddayya, K, Jhaldiyal, R. and Petraglia, M. D., *Antiquity*, 2000, **74**, 751–752.
14. Blackwell, B. A. B., Fevrier, S., Blickstein, J. I. B., Paddayya, K., Petraglia, M. D., Jhaldiyal, R. and Skinner, A. R., *J. Hum. Evol.*, 2001, **40**, A3.
15. Blackwell, B. A. B., Rosenwasser, N. L., Mass, S. V., Blickstein, J. I. B. and Skinner, A. R., in *The Excavations at Treugol'naya Cave, Northern Caucasus, Russia* (ed. Doronichev, V. B.), Laboratory of Prehistory, St. Petersberg, (in press).
16. Kale, V. S., *Trop. Geomorphol. Newsl.*, 1990, **10**, 4–5.
17. Raghavan, H., Rajaguru, S. N. and Misra, V. N., *Man Environ.*, 1989, **13**, 19–22.
18. Mishra, S., Venkatesan, T. R., Rajaguru, S. N. and Somayajulu, B. L. K., *Curr. Anthropol.*, 1995, **36**, 847–851.

Received 18 March 2002; accepted 17 July 2002

MEETINGS/SYMPOSIA/SEMINARS

IAPT XVII Annual Convention

Date: 14–16 November 2002
Place: Gulbarga

Special Theme: Physics of biomedical instrumentation. *Subthemes*: Optical instrument, Electronics/electrical instruments, Radiation instruments. *Associate Theme*: Innovation in physics teaching (theory and practicals). *Subthemes*: Low cost experiments (lab and demo), computer interfaced experiments, theory teaching (Prizes to be awarded for outstanding contributions under this theme).

Contact: Dr M. S. Jogad
Convener, XVII IAPT Convention
Department of Physics
Sharanabasaveshwar College of Science
Gulbarga 585 103
Tel: Off. 08472-21941; Res. 08472-437817
E-mail: mahjogad@rediffmail.com

Symposium on Cyanobacteria and Plants under Environmental Stress: Responses, Defence Strategies and Biotechnological Prospects

Date: 25–27 February 2003
Place: Varanasi

Themes include: Morphological, ecological, physiological, biochemical, molecular and genetical responses under stress; Biomonitoring of stressed environments; Stress-specific proteins and metabolites; Bioremediation, cell immobilization, biofertilizers, biofuels, drugs and pharmaceuticals, single cell protein; Stress-tolerant transgenics.

Contact: Prof. L. C. Rai
Convener of the Symposium
Department of Botany
Banaras Hindu University
Varanasi 221 005
E-mail: lcrai@bhu.ac.in