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Evidences of early human occupation in the limestone caves of Bastar, Chhattisgarh

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We record the preservation of burnt earth, charcoal and plant remains (both wild and domesticated) in Kotumsar and Dandak caves, Kanger Valley National Park, Bastar district, Chhattisgarh. Radiocarbon dates of the charcoal remains suggest that these caves were dwelling sites for prehistoric man during 6940–4030 yrs BP. The presence of grains and seeds at ~ 7000 yrs BP indicates domestication of plants and initiation of agricultural activity by prehistoric man in the region. Preliminary results reveal that the caves were abandoned around 4000 yrs BP, coinciding with the weakening of the southwest monsoon.

Keywords: Caves, plant domestication, prehistory, radiocarbon, southwest monsoon.

KOTUMSAR and Dandak are cave complexes (19°00′N, 82°00′E) in the spur of the forested hilly area in Kanger Valley National Park, Bastar district, Chhattisgarh (Figure 1). The caves, which are part of the western foothills of the northeast–southwest trending ranges (Kanger limestone of Indravati group of rocks of Upper Proterozoic)[1], were formed by the dissolution of limestone bedrock. The important rock types in the area are limestone, purple shale and quartzite. Speleothems from these caves are being investigated for palaeomonsoon reconstruction[2]. The Kotumsar cave is around 330 m in lateral extent with several well-developed chambers and passages up to 20–70 m wide. The Dandak cave is located within ~ 5 km distance from the Kotumsar cave and has a lateral extent of about 200 m with 15–20 m wide passages. There are two chambers that are connected through a ~ 0.5 m narrow duct. The Kotumsar cave opens in the southeast and the Dandak in the west of the dense reserved forest. These caves are located on two isolated hills. Presently, the area is inhabited by tribal people (Dhurva), who sustain on agrarian economy and minor forest produce. The geomorphological position of the caves and the presence of dense forest suggest an ideal habitat for prehistoric human occupation. During our investigations we came across evidences of controlled fire that was preserved as burnt earth, patches of charcoal mixed with soil and grass, suggesting human occupation.

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This prompted us to decipher the antiquity of human presence in the region and the ambient climatic condition. However, our limited investigation failed to locate any artefacts such as tools, pottery, manmade stone structures or hearth. In both the caves, evidences of fire were found on the floor covered by burnt earth. For radiocarbon dating and palaeobotanical investigation, a ~ 32 cm section was exposed inside the Kotumsar cave, ~ 100 m from the cave mouth and four carbon-rich samples were collected. Similarly, three samples from ~ 14 cm thick section located ~ 120 m inside from the mouth of Dandak cave were collected (Figure 2).

All the samples were subjected to radiocarbon dating using the standard procedures by liquid scintillation spectrometry[3]. Out of four samples collected from the Kotumsar cave, only three yielded the required quantity of organic carbon for dating. Details of the samples, depth and age are given in Table 1. The age ranges from 4030 to 6940 ^{14}C yrs BP (4180–7680 cal yrs BP)[4] in the Kotumsar cave. In the Dandak cave, a solitary sample yielded an age of 4670 yrs BP (5042–5318 cal yrs BP). Based on these ages it can be suggested that the prehistoric humans occupied these caves during 6940–4030 yrs BP.

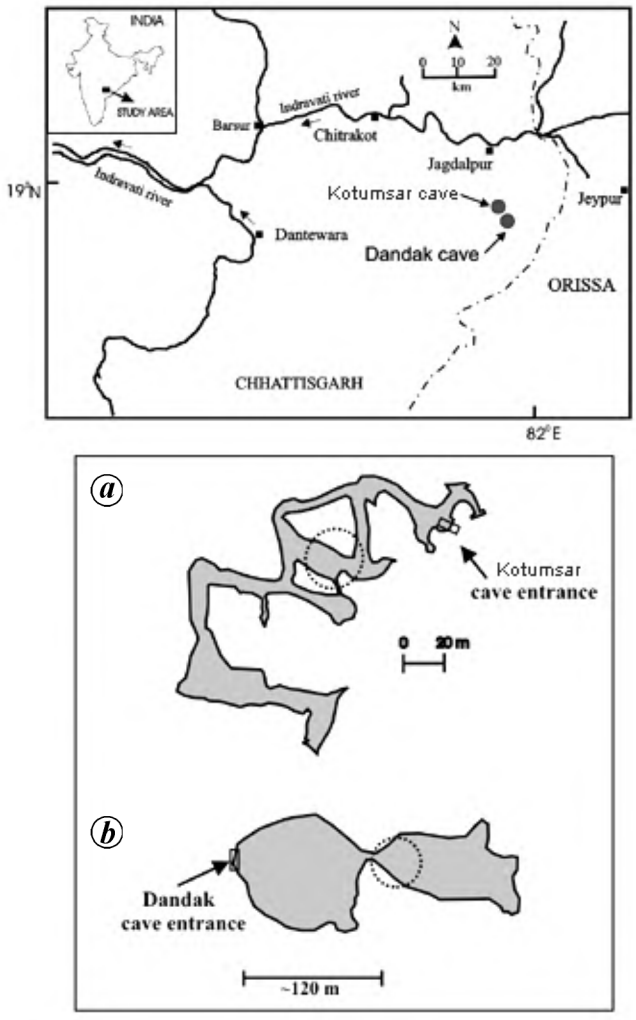

Figure 1. (Top) Map of study area showing cave locations. (Bottom) Sketch of the horizontal cross-sectional view of (*a*) the Kotumsar cave and (*b*) the Dandak cave with dotted circles showing charcoal sampling sites.

Palaeobotanical studies were carried out on samples collected from layers 1, 3 and 4 in Kotumsar cave (Figure 2 *a*). These samples were sorted out under a stereo binocular microscope in order to check the presence of seeds and millet remains. We could identify three grasses and two millets. The grasses identified were Sandbur/Buffel (*Cenchrus* L.), Sirwari (*Celosia argentea* L.) and Panicgrass (*Panicum* L.; Figure 3 *a*, *c* and *d*). The millets (Figure 3 *b*) were identified as foxtail (*Setaria glauca* (L.) and *Setaria pallide-fusca*). Grasses and millets still grow in the area. Additionally, millets found in the layer are still gathered by the tribals in the region for domestic consumption.

In the Kotumsar cave the *Panicum* grain recovered from the lowermost layer-1 (30–32 cm) of the deposit yielded age of 6940 ± 130 yrs BP (Figure 2 *a*). A large number of perennial and annual species of *Panicum* are known from the tropical regions of India. Scrutiny of a split grain, however, did not allow its specific identification. In the overlying layer-3 (14–17 cm) was dated to 4300 ± 90 yrs BP. In this layer grains of foxtail-millet are prominent which were important in prehistoric economy. Some annual species of *Panicum* and *Setaria* belong to minor millets, which are important in sustenance, as observed in the wild plant collection and manipulation by tribal communities and also their non-conventional cultivation[5–10]. The shape of *Setaria* grains has no taxonomic significance at species level. The general morphology of these grains, moreover, appears to be significantly altered during carbonization.

Man-gathered grains of foxtail grass during prehistoric times. This practice still persists among the tribal communities. This grass occurs throughout Central India. It appears that the foxtail-millet was important for the subsistence of Kotumsar cave-dwellers. Their natural stands might have given a respectable yield to prehistoric man. Grains of sandbur grass (*Cenchrus*) and seeds of a herb 'sirwari' (*Celosia argentea*) have fortuitously been found in the top 2-cm thick stratum of the cave floor (layer-4, Figure 2 *a*). *Cenchrus* is a tufted perennial grass, cultivated in some regions for fodder. Sirwari is a diffusely branched and sub-succulent herb, occurring as a common weed in the cultivated and fallow land along water streams and in moist open habitats. The leaves and tender shoots are eaten as a pot-herb. The plant would have been desirable and advantageous for human consumption around the Kotumsar cave. Due to perpetual darkness, these plants must have been found in the surrounding valley and were collected by prehistoric man for sustenance. Further, grains occurring in the layers that contain charcoal suggest burning practice by prehistoric man. Based on palaeobotanical remains it can be inferred that prehis-

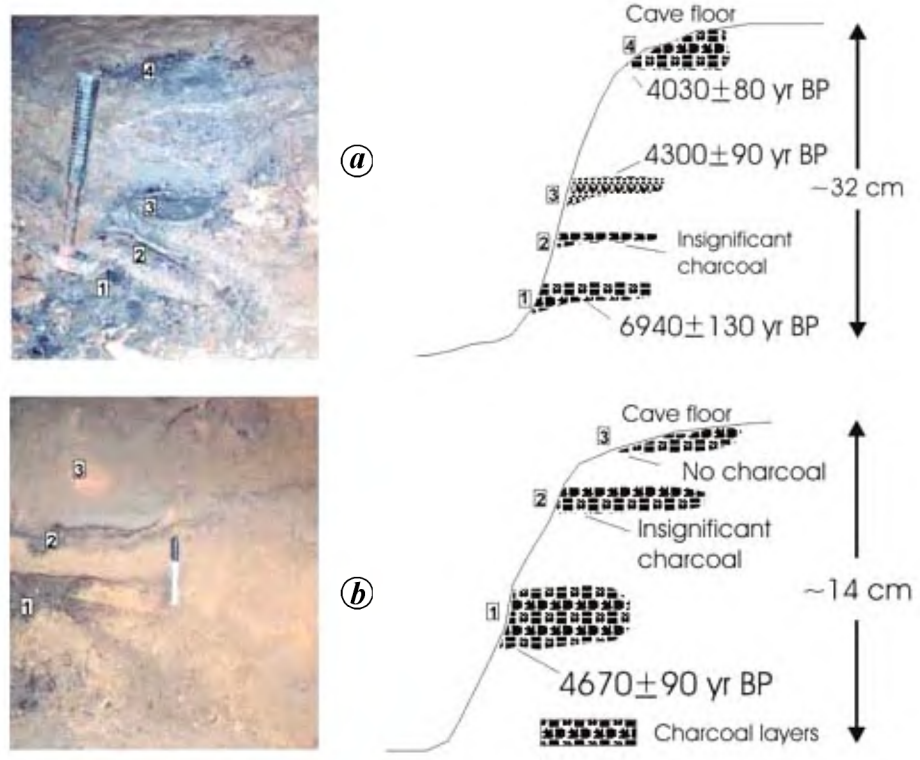

Figure 2. Charcoal layers inside sediments of (*a*) Kotumsar cave and (*b*) Dandak cave.

Table 1. Radiocarbon ages of charcoal layers from Kotumsar and Dandak caves

Sample no.	Depth (cm) (below cave floor)	Material	^{14}C date (yrs BP)	Calibrated age (1σ – cal yrs BP)
Kotumsar cave				
PRL-2261	0–2	Charcoal	4030 ± 80	4183–4498
PRL-2262	14–17	Charcoal	4300 ± 90	4574–4829
PRL-2264	30–32	Charcoal	6940 ± 130	7464–7683
Dandak cave				
PRL-2267	9–14	Charcoal	4670 ± 90	5042–5318

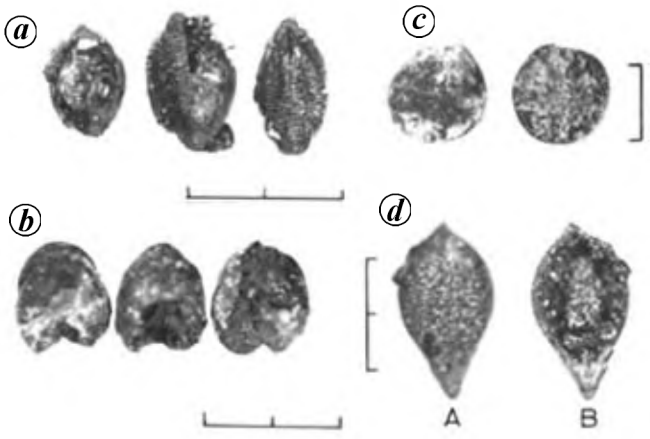

Figure 3. Carbonized grains and seeds: ***a***, Sandbur-grass (*Cenchrus* sp.); ***b***, Foxtail-millet (*Setaria* cf. *glauca/pumila/pallide-fusca*); ***c***, Sirwari (*Celosia argentea*); ***d***, Panic-grass (*Panicum* sp.): (A) Dorsal view with characteristic ornamentation and (B) Ventral view showing depression due to deterioration of grain content (scale in mm).

toric man inhabited the caves during early to mid Holocene.

The Kotumsar cave has a narrow entrance (~ 0.5 m wide) and at present requires descending stairs to about 20 m below ground level. The Dandak cave is about 200 m wide, and charcoal is found in the inner chamber where the approach is difficult (requires crawling). These caves are totally dark and presence of prehistoric humans in these difficult locations suggests that early man was innovative and had exploratory abilities to venture into such places. In limestone caves there is ceaseless leaching of carbonate from the overlying bedrock strata. In due course of time, the fissures in the bedrock become carbonate-free and therefore, eventually fall down or get washed out as fine detritus. This is one of the major sources of sediments in the caves. We have not seen any painting or rock art in the interiors of these caves, possibly due to the following reasons:

(i) Slow weathering of cave walls that might have destroyed any such signatures; wetness of the cave interior surfaces during the rainy season coupled with high pCO_2 environment which might have resulted into slow acidic dissolution.
(ii) High humidity and suffocating environment that did not support human stay along with fire activity for long durations.
(iii) Irregular walls sometimes covered with flowstones (calcium carbonate deposits) that are unsuitable for painting or carving work.

Charcoal specks (dated between 6940 and 4030 yrs BP) embedded in four layers encountered in a 32 cm thick deposit in Kotumsar cave reveal that they probably represent four different occupational periods. However, this would remain speculative till detailed investigations are carried out. Alternatively, it can be argued that these caves were used as temporary shelters during rituals or as protection from unusual weather conditions.

Caves have been used by prehistoric man, particularly hunter-gatherers. There are reports of middle Palaeolithic (37 to 11 kyrs BP) man occupying caves in Madhya Pradesh; for example in the Bhimbetka Hills and in Kurnool district of Andhra Pradesh[11]. The Mesolithic (possibly between 10 and 20 kyrs sBP) culture also existed in close vicinity of the Chhattisgarh cave sites (e.g. at Chitrakoot falls within ~ 10 km distance), however, its precise age is not available[12]. Comparing the ages from the Chhattisgarh caves with other archaeological evidences from the Indian subcontinent, it appears that people who occupied these caves were probably of the Mesolithic to Neolithic period, and extended well into the Harappan times. They were involved in gathering and some sort of agricultural activity as well. In the Indian context, the Neolithic activity and the beginning of agriculture was dated between 7000 and 5000 BC[11]. Climatically, this was a period of improved southwest monsoon, as suggested by the peat bog record from southern India[13], Indo-Gangetic plains[14], and the Central Himalaya[15]. Ceramic and charcoal remains have also been found in Lake Lukansar, Thar Desert around 4230 yrs BP, suggesting no water on the lakebed due to aridity[16]. This coincides with the decline of the Harappan civilization around 4200 yrs BP[17]. It also marks the period of mid Holocene aridity in the Indian sub-continent[18]. Our radiocarbon dates of the caves under study (Figure 2 *a*) also indicate that prehistoric man abandoned these caves around 4 ka probably in response to the increased aridity in the region. More detailed analysis of these sites is needed to reconstruct the cave occupation history with respect to changing climate of the Holocene.

There are several other known caves in the valley and therefore detailed investigations of these sites may shed light on temporal changes in archaeobotany, palaeomonsoon and entrapped imprints of cave biology[19]. We know as yet nothing about the technological–typological details of artefactual contents of the culture, but are convinced that with first-hand excavated material of age ~ 4030 to 6940 yrs BP, further archaeological investigations would substantiate our findings.

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