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HUMAN OCCUPATION, ADAPTATION AND BEHAVIORAL CHANGE IN THE PLEISTOCENE AND HOLOCENE OF SOUTH INDIA: RECENT INVESTIGATIONS IN THE KURNOOL DISTRICT, ANDHRA PRADESH

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Abstract

This article reports on ongoing archaeological research in the Kurnool District of southern India. The region is well-known for its rich cultural heritage, with previous investigators identifying “Upper Paleolithic” and “Mesolithic” industries in caves, and Neolithic settlements on valley floors. Recent fieldwork in the region has expanded upon these earlier investigations, resulting in the identification of a wider range of archaeological sites (Acheulean through to Early Historic periods) in a variety of depositional contexts (i.e., caves, rockshelters, open-air settings). Survey in the Jurreru River Valley revealed the presence of a volcanic tephra deposit, representing the Young Toba Tuff (YTT) of 74,000 years ago. Middle Paleolithic industries have been located in stratigraphic contexts above and below the tephra, thereby providing a unique opportunity to examine stone tool technology and human responses to this volcanic super-eruption. Although distinct “Upper Paleolithic” blade tool industries have yet to be reaffirmed through our cave investigations, stratigraphic observations indicate that Late Pleistocene stone tool assemblages (flake, blade, bladelet) and faunas are indeed present. Survey results indicate that many hundreds of unrecorded rockshelters are present in the Kurnool District, a significant proportion bearing rock art and surface microlithic industries. Rockshelter test excavations have indicated buried assemblages, with one rockshelter containing dated microlithic assemblages at least 34,000 calibrated radiocarbon years old. The valley floors contain Neolithic, Iron Age and Early Historic period settlements as well as Megalithic burial structures. Contemporaneous mid- to late-Holocene cave and rockshelter settlements are inferred here as representing the activities of foraging populations. The extraordinary wealth of archaeological resources in the Kurnool District indicates that the region can contribute substantive information about long- and short-term changes in human adaptations and social complexity.

INTRODUCTION

The Kurnool District is one of India's most important archaeological regions, with numerous sites identified in the area over the past 150 years. The region is particularly known for its Paleolithic record. Colonial explorers began research in the district in the mid-nineteenth century, investigating the famous cave complex at Billasurgam (Newbold, 1844). The caves were subject to large-scale archaeological excavations, in some contexts reaching depths of 10 meters (Foote, 1884a). These early explorers observed that a "Magdalenian" bone industry was present, and that changes of environment were evident, as indicated by fauna associated with forests, grasslands and swamps (Foote, 1884b; Lydekker, 1886). Later explorers observed that Paleolithic sites of every period were represented in Kurnool (Cammiade, 1927).

The most comprehensive archaeological work in the Kurnool District was conducted in the 1960s and 1970s when systematic survey and excavation efforts began in earnest (e.g., Isaac, 1960; Thimma Reddy, 1968; Murty, 1974; Murty and Thimma Reddy, 1975; Thimma Reddy, 1977). Among the major findings of this research was the identification of blade industries in caves and open-air settings (Murty, 1979). Such findings were thought to fill the temporal and industrial gap between the better known assemblages of the Middle Paleolithic and the Mesolithic (Murty, 1979). Alongside Paleolithic investigations in the region, archaeological research was carried out of Neolithic and Iron Age sites, resulting in the recording of many settlements (e.g., Sarma, 1967, 1968; Murty, 1989). A distinct Neolithic ceramic ware type, known as Pathapadu (or Patpad) ware, was defined from the site of Pathapadu, based on extensive surface collections (Foote, 1916; Allchin, 1962; Sarma, 1968).

This article describes our own recent archaeological research in the Kurnool District. The goal of our first season was to re-identify cave sites, determine the extent of their archaeological deposits, and conduct survey in order to locate new sites. Based on the identification of some significant archaeological sites in the Jurreru River Valley and its vicinity, a second season of field research was concentrated in the valley. A comprehensive list of archaeological sites that were re-visited or identified during the two first field seasons has been compiled (Fig. 1, Tab. 1). In this article, we will begin by examining the regional geology and geomorphology that provides the context for the Pleistocene and Holocene sites discovered in the region. Subsequently, we will examine the archaeological record of the area we have surveyed, looking first at cave sites in the western part of the Cuddapah Basin, then at the Jurreru River Valley open-air and rockshelter sites, and finally at rock art sites. We will conclude with a broad overview of the archaeology of the region from the Pleistocene through the Holocene, presenting some hypotheses for further testing.

REGIONAL GEOLOGY

The study area falls within a distinctive geological terrain known as the Cuddapah Supergroup, a crescent shaped basin of Proterozoic age, surrounded by the Peninsular Gneissic complex (Gupta *et al.*, 2003). The Supergroup consists of a 6,000 meter thick sequence of alternating sandstones, shales and limestones, with evidence for volcanic activity towards the base of the succession, and the intrusion of basic sills (Lakshmi and Babu, 2002). The eastern part of the basin shows the greatest degree of metamorphism and deformation (Saha, 2002). Because of the amount of metamorphism, shales have been turned into slates and sandstones into quartzites, making them prized building materials that are widely quarried today in the region.

Our field project focussed on the relatively undeformed western part of the Cuddapah Basin, consisting of the Kurnool Group, a 500 m thick succession of alternating quartzites, shales and

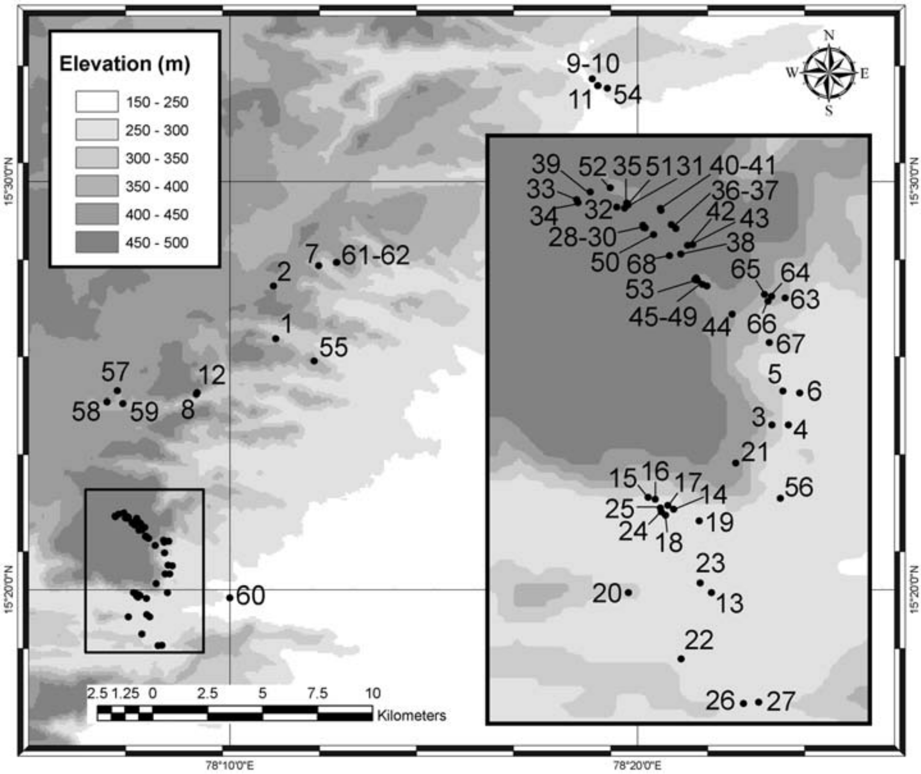

Fig. 1. Location of sites in the Kurnool District (see Table 1). It should be noted that many areas remain unsurveyed, hence many other sites are present in this region

limestones. The landscape is characterised by a gently dipping plateau formed by a resistant caprock, the Panniam Quartzite, which overlies a sequence comprising the Owk Shale, the Narji Limestone, the Banganapalli Sandstone and the Tadipatri Shale, thought to represent transitions between alluvial and intertidal depositional environments (Lakshminarayana *et al.*, 1999). Despite the relatively undeformed nature of the sequence, conjugate fractures are widely developed (Fig. 2), and faulting, albeit with limited displacement, has created a more complex structural pattern in some parts of the basin (Chatterjee and Bhattacharji, 2001). Dipslope channels have cut some major valleys through the Panniam Quartzite, thereby forming major passes through the quartzite plateau. Drainage has followed some of the conjugate fractures, forming steep-sided valleys cut into the quartzite (Fig. 3). Wherever dipslope or fracture-controlled valleys are cut into the quartzite, very large quartzite boulders have moved down the valley sides under the influence of gravity, and many of these tumbled blocks form rockshelters with extensive overhangs that have been suitable for human habitation.

The limestone caves were meanwhile formed by dissolution via subsurface and surface water flow, the cavities often forming along joints and bed surfaces (Fig. 4). Variability in water flow and dissolution processes produced significant differences in the height and width of caves and the number of connected passages. Caves forming in joints tend to be tall and narrow in shape, whereas those forming along bed surfaces tend to be wide along their floors. The caves show the formation of stalagmites, stalagtites, breccias, and sediments. Contemporary fluvial processes are insufficient to account for cave and valley formation, and the contemporary drainage pattern appears to be underfit for the most part. The presence of archaeological material in caves, rockshelters and on hillslopes indicates that the

Table 1

Comprehensive catalogue of Localities Identified in the Kurnool District (2003–2004)

Map No.	Locality	GPS/Elev.(m)	Notes
1	Billasurgum	N15°26.153'; E78°11.122'; Elev. 377	Cave complex with four excavated localities (Charnel House, Purgatory, Cathedral, Chapter House North).
2	Bugganapalle I	N15°27.448'; E78°11.066'; Elev. 448	Rockshelter with unique beak-like overhang form, abundant microliths, rockart
3	Deyyapu Gundu I	N15°20.398'; E78°08.410; Elev. 345	Rockshelter, some lithics, potsherds, rockart
4	Deyyapu Gundu, Ox	N15°20.655'; E78°08.514'; Elev. 273	Rockshelter, some potsherds, wall construction, rockart
5	Deyyapu Gundu, Cross	N15°20.608'; E78°08.479; Elev. 311	Rockshelter, rockart
6	Deyyapu Gundu Habitation	N15°20.595'; E78°08.585'; Elev. 264	Habitation site with abundant ceramics and lithics in plowed field, intact megaliths on hillslopes
7	Dunnapotula Vanka I	N15°27.946'; E78°12.174; 'Elev. 361	Rockshelter in remote valley, central view of valley floor, rockart
8	Genarden's Shelter	N15° 24.788'; E78°09.169'; Elev. 393	Rockshelter, rockart
9	Gundipalle I	N15°32.368'; E78°19.028'; Elev. 264	Rockshelter, rockart
10	Gundipalle II	N15°32.367'; E78°19.017'; Elev. 262	Rockshelter, rockart
11	Gundipalle III	N15°32.529'; E78°18.889'; Elev. 232	Rockshelter, rockart
12	Jinu's Ladder Cave	N15°24.826'; E78°09.195'; Elev. 384	Large cave with stone wall construction (likely for trapping porcupines); tall wooden and thatched ladder in cave chimney for uncertain ethnographic function.
13	Jwalapurum 3, 3A	N15°19.338'; E78°08.029'; Elev. 253	Trenches 3 and 3A placed to obtain composite section below and above ash. This includes thick tephra deposits and significant archaeological deposits; see also Jwalapuram Localities 17 and 21.
14	Jwalapuram 9	N15°19.864'; E78°07.788'; Elev. 266	Central rockshelter along northern slopes, dense concentration of lithics (mostly microlithic), pottery, groundstone tools on surface; 3.4m long profile with ceramic and pre-ceramic deposits, burial pits, rockart
15	Jwalapuram 11	N15°19.939'; E78°07.628'; Elev. 277	Westernmost rockshelter along northern slope, mostly destroyed by quarrying, burials, lithics and potsherds, rockart
16	Jwalapuram 12	N15°19.927'; E78°07.672'; Elev. 281	Rockshelter with moderate surface scatter of lithics (mostly microliths) and potsherds, archaeological deposits, human skeletal parts, rockart
17	Jwalapuram 13	N15°19.888'; E78°07.753'; Elev. 281	Rockshelter with a few stone tools on surface, rockart
18	Jwalapuram 14	N15°19.827'; E78°07.738; 'Elev. 281	Megalithic on surfaces in front of rockshelters
19	Jwalapuram 16	N15°19.790'; E78°07.950'; Elev. 306	Easternmost rockshelter along northern slope, a few lithics and potsherds on surface, rockart
20	Jwalapuram 17	N15°19.337'; E78°07.503'; Elev. 256	Tephra, mined. Stone tools on surface; tests indicated artifacts above tephra
21	Jwalapuram 19	N15°20.156'; E78°08.182'; Elev. 409	Rockshelter under quartzite escarpment, one pictograph
22	Jwalapuram 20	N15°18.918'; E78°07.835'; Elev. 258	Dense concentration of lithics on surface, below limestone raw material source; archaeological deposits with prepared cores, unifacially retouched tools
23	Jwalapuram 21	N15°19.398'; E78°07.957'; Elev. 253	Mined out tephra section with lithics on surface; test with archaeological deposits above ash; see also Jwalapuram 3 and 3A.

Table 1 continued

Map No.	Locality	GPS/Elev.(m)	Notes
24	Jwalapuram 24	N15°19.847'E78°07.711'Elev. 255	Megalith, multiple collapsed cists in a cairn, consisting of quartzite cobbles and boulders. Cists made of limestone slabs
25	Jwalapuram 25	N15°19.873'; E78°07.705'; Elev. 257	Destroyed megalithic structures due to modern soil quarrying, potsherds
26	Jwalapurum Tank	N15°18.637'; E78°08.231'; Elev. 259	Large cutting tools (Acheulean) cemented in calcareous deposit. Lithics along hillslopes and in agricultural fields
27	Jwalapuram Tank East	N15°18.644'; E78°08.327'; Elev. 410	A few large cutting tools in agricultural field
28	Katavani Kunta 1	N15°21.639'; E78°07.609'; Elev. 435	Rockshelter with moderate scatter of microliths, abundant rockart
29	Katavani Kunta 2	N15°21.642'; E78°07.600'; Elev. 435	Rockshelter, no rockart
30	Katavani Kunta 3	N15°21.655'; E78°07.595'; Elev. 435	Rockshelter, rockart with elaborate panel
31	Katavani Kunta 4	N15°21.763'; E78°07.478'; Elev. 472	Rockshelter, potsherds, rockart includes pot depictions
32	Katavani Kunta 5	N15°21.770'; E78°07.429'; Elev. 456	Rockshelter, rockart (one depiction)
33	Katavani Kunta 6	N15°21.818'; E78°07.176; Elev. 453	Rockshelter, rockart
34	Katavani Kunta 7	N15°21.798'; E78°07.184'; Elev. 474	Rockshelter, rockart, modern Hindu shrine
35	Katavani Kunta 8	N15°1.796'; E78°07.493'; Elev. 470	Rockshelter, some microliths on surface, rockart
36	Katavanii Kunta 9	N15°21.659'; E78°07.775'; Elev. 444	Rockshelter, rock art
37	Katavani Kunta 10	N15°21.636'; E78°07.803'; Elev. 445	Rockshelter, rockart
38	Katavani Kunta 11	N15°21.474'; E78°07.834'; Elev. 515	Rockshelter, rockart
39	Katavani Kunta 12	N15°21.866'; E78°07.262'; Elev. 464	Rockshelter, rockart
40	Katavani Kunta 13	N15°21.743'; E78°07.706'; Elev. 444	Rockshelter, rockart
41	Katavani Kunta 14	N15°21.749'; E78°07.709; Elev. 444	Boulder with Hindu linga engraving
42	Katavani Kunta 15	N15°21.530'; E78°07.876'; Elev. 464	Rockshelter, rockart (remnant)
43	Katavani Kunta 16	N15o 21.534' E78°07.909'; Elev. 468	Rockshelter, rockart
44	Katavani Kunta, Pilgrim 1	N15°21.094'; E78°08.158; Elev. 393	Rockshelter, religious rockart, hundreds of Vishnu motifs, shrine with engraved feet slab
45	Katavani Kunta, Pilgrim 2	N15°21.094'; E78°08.158'; Elev. 393	Rockshelter, religious rockart
46	Katavani Kunta, Pilgrim 3	N15°21.272'; E78°07.999'; Elev. 403	Rockshelter, religious rockart
47	Katavani Kunta, Pilgrim 4	N15°21.282'; E78°07.971'; Elev. 401	Rockshelter, religious rockart
48	Katavani Kunta, Pilgrim 5	N15°21.306'; E78°07.941'; Elev. 422	Rockshelter, religious rockart
49	Katavani Kunta, Pilgrim 6	N15°21.322'; E78°07.933'; Elev. 422	Rockshelter, religious rockart
50	Katavani Kunta, Pilgrim 7	N15°21.596'; E78°07.663'; Elev. 424	Rockshelter, religious rockart
51	Katavani Kunta, Pilgrim 8	N15°21.784'; E78°07.500'; Elev. 452	Rockshelter, religious rockart
52	Katavani Kunta, Pilgrim 9	N15°21.893'; E78°07.389'; Elev. 439	Quartzite bedrock with engraving of Nandi's (sacred ox) head

Table 1 continued

Map No.	Locality	GPS/Elev.(m)	Notes
53	Katavani Kunta, Pilgrim 10	N15°21.312'; E78°07.923'; Elev. 400	Rockshelter, religious rockart
54	Kolamagalu Rockshelter	N15°32.301'; E78°19.255'; Elev. 258	Rockshelter, microliths, rockart
55	Kottala Polmera Gavi	N15°25.605'; E78°12.063'; Elev. 440	Excavated cave; Reddy 1976 reported stone tools, worked bone tools. Cave is a joint in limestone, very restricted in width, small terrace in front of cave
56	Mogasarayanigondi I	N15°19.934'; E78°08.464'; Elev. 262	Megalithic dolmens along limestone hillcrest. Dolmens suffering looting. Spoil piles contain Iron Age pottery, skeletal remains, burial goods
57	Muchchatla Chintamanu Gavi I	N15°24.879'; E78°07.235'; Elev. 398	Excavated cave; Murty 1979 reported stone tools, worked bone tools. Re-examined in 2003
58	Muchchatla Chintamanu Gavi II	N15°24.616'; E78°06.698'; Elev. 389	Cave with multiple passages. Near MCG I, reported as a Mesolithic site by Murty
59	Muchatla Chintamanu Gavi IV	N15°24.578'; E78°07.369'; Elev. 470	Rockshelter, rockart on limestone
60	Pathapadu 1	N15°19.812'; E78°09.996'; Elev. 239	Classic Neolithic habitation with Pathapadu ceramics (Foote 1916; Allchin 1962; Sarma 1968). Potsherds in plowed fields, no subsurface deposits, site apparently destroyed
61	Sanyasula Gavi, Cave 1	N15°28.026'; E78°12.608'; Elev. 339	Cave with recent habitation; archaeological deposits
62	Sanyasula Gavi, Cave 2	N15°28.025'; E78°12.621'; Elev. 339	Cave with recent habitation; archaeological deposits, distinct micromammal bone bed, ash bed
63	Yaganti 1	N15°1.197'; E78°08.494'; Elev. 366	Rockshelter, potsherds (including Patpad Ware), rockart
64	Yaganti 2	N15°21.207'; E78°08.407'; Elev. 438	Rockshelter and cave, wall constructed in front, rockart
65	Yaganti 3	N15°21.219'; E78°08.364'; Elev. 517	Rockshelter, limestone slab megalith cist burial, rockart
66	Yaganti 4	N15°21.176'; E78°08.385'; Elev. 366	Rockshelter, religious Hindu shrine with snake sculptures, rockart
67	Yaganti 5	N15°20.915'; E78°08.394'; Elev. 320	Rockshelter, rockart
68	Yaganti 9	N15°21.464'; E78°07.762'; Elev. 426	Quartzite boulder with Hindu linga engraving

valleys reached their general morphology prior to hominin occupation.

The region is criss-crossed by a number of river valleys, including the Jurreru River Valley. The Jurreru River Valley is a major valley running in an easterly course through the Kurnool Group, with steep sides but a relatively wide bottom (Fig. 5). At the village of Jwalapuram, a dolerite sill is intruded into the shales on the southern side of the valley, forming a significant ridge. A fault can be inferred beneath the alluvial cover of the valley floor as the geological succession dips to the east to the north of the valley and to the southeast in the south end of the valley. Drainage is strongly controlled by structure, with a major sub-catchment cutting through into the main valley at the Jwalapuram Tank. A strongly indurated carbonate duricrust at the Jwalapuram Tank cements coarse fluvial gravels. North of the main valley, a fracture-controlled valley runs northwest from the Yaganti Temple. This is a steep-sided, V-shaped valley for the southeastern half, but opens out into a wider-bottomed valley with cultivation in its northwestern half. Tumbled quartzite boulders form rockshelters on the valley sides.

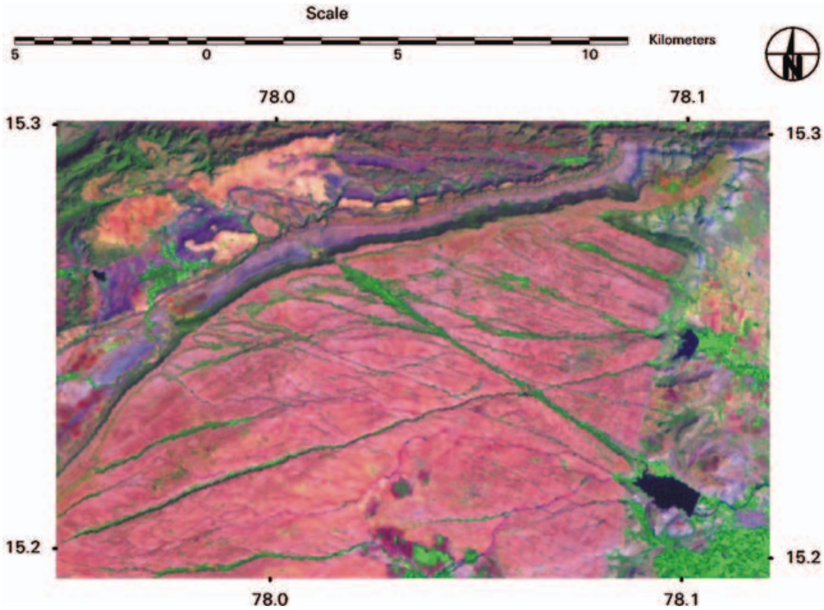

Fig. 2. Conjugate fractures in the Panniam Quartzite. The fractures through the quartzite control the flow of drainage. In addition, retreat of the escarpment in each fracture results in the production of many boulders. It is under these fallen boulders that human habitation occurred

Fig. 3. Example of drainage in the conjugate fractures of the Panniam Quartzite. Steep-sided valleys form in the fractures. Boulders which have fallen from the quartzite bedrock are visible along the slopes

Fig. 4. Limestone caves formed by dissolution, Billasurgam cave complex. This is the main entrance to the caves

Fig. 5. The Jurreru River Valley showing steep valley sides and a relatively wide bottom

CAVE RECORDS

It has been estimated that the thick limestone units of the region may contain more than 100 caves (Prasad, 1996), although most have not been recorded and explored archaeologically. Accordingly, we have made an effort to systematically record some of the best-known caves and to identify new sites. Our regional reconnaissance survey indicated that cave morphologies varied significantly, likely influencing the degree to which these environments were occupied by human populations. The large size and favorable ecological position of some of these contexts suggest that they have potential to yield cultural deposits. Jwalapuram Locality 18, for example, is a very large cave complex with several large entrances situated just above a wide valley floor. Though the cave has sedimentary deposits (as indicated by villager soil quarrying) and several surface potsherds, little else is known about this locality. In other cases, cave morphologies indicate that human activity is probably limited. For example, the Sanyasula Riverside cave is a tall and narrow crevice formed in the joint surface of a quartzitic unit, and the Gollagutta Gavi has a very restricted height, as it is formed along a limestone bed seam. Though such spatially restrictive contexts may not be conducive to human occupation, prior excavations at the Kottala Polimera Gavi, which is a narrow crevice in limestone, indicated that faunal remains and other paleoecological evidence were present (Thimma Reddy, 1977).

The Billasurgam Cave Complex

The Billasurgam cave complex is a very large and impressive cave system with a long history of archaeological investigation. The complex was first excavated by Robert Bruce Foote, and his son, Henry Bruce Foote (Foote, 1884a, 1884b, 1885). Excavations were conducted in three different caves within a single large system: Charnel House Cave, Purgatory Cave and Cathedral Cave (Fig. 6). These early explorers reported a "Magdalenian" bone industry in the caves, and pieces were classed under a variety of categories, including awls, arrowheads, spear and harpoon heads, chisels, and scrapers. Unfortunately, all of the excavated materials were subsequently lost, making re-analysis impossible (Cammiade, 1927: 7). Given the absence of clear archaeological deposits in the caves, it was subsequently argued that the bone objects may have been the result of the activities of "darkness-loving animals" such as porcupines (Cammiade, 1927: 9), which were noted as abundant in the cave system (Foote, 1916: 119).

The nineteenth century excavations were reportedly dug to depths of up to 10 m. Our inspection of cave areas dug out by the Footes indicate that the majority of the deposits were removed within Charnel House and Purgatory Caves, although some remnant deposits may be present on their terraces, under spoil heaps, and in the deeper recesses of the caves[1]. As its name implies, the Cathedral Cave is an impressive cave, massive in size, having a number of archways from a fallen roof, with numerous stalactites along its ceiling. Our visual inspection of Cathedral Cave indicates that the upper deposits were removed in the nineteenth century. However, it appears that substantial deposits remain, based upon inspection of an open excavation trench. The trench appears to be the result of paleontological excavations conducted in Cathedral Cave in the 1960s, which resulted in the recovery of mammalian, reptilian, and avian fossils (Prasad, 1996: 30). The open trench is aproximately 6 m in depth and its walls are well preserved on account of the heavy calcification of the sediments. Inspection of the trench suggests good potential for recovering anthropogenic deposits, fauna and paleoenvironmental information. Although little information is currently available about the formation of the Billasurgam deposits, the brecciated sediments have produced a rich range of fauna (Amphibia, Artiodactyla, Carnivora, Chiroptera, Crocodilia, Insectivora, Lagomorpha, Perissodactyla, Pholidota, Primates, Reptila, Rodentia), indicating wet environments with forests and grasslands (Lydekker, 1886; Prasad and Yadagiri, 1986). The presence of *Theropithecus* in these caves has been interpreted as evidence for a Late Pleistocene expansion of this African species (Russell Ciohon, Terry Harrison, pers. comm.), of potential importance to our understanding of the dispersal of modern humans. Radiocarbon samples reportedly dated some of the faunal remains to 50 kya (Prasad, 1996).

Fig. 6. The Cathedral Cave in the Billasurgam Cave Complex. Note the large size of the cave based on the individuals standing in the cave. Stalagtites and stalagmites are impressive features. The paleontological excavations occurred in the deep recess on the upper right side of this cave

Chapter House North Cave

Renewed archaeological research was undertaken in the Billasurgam Caves in the 1970s by K. Thimma Reddy (1977), who conducted an excavation in an unexplored cave opening onto the northern edge of an area previously designated as the Chapter House (Lydekker 1886; Fig. 7). Thimma Reddy (1977) does not provide a name for this site and it is therefore designated Chapter House North Cave for the purposes this report. The excavations resulted in the first published discovery of stone tools in association with faunal remains at Billasurgam. The excavations at Chapter House North Cave produced a total of 1356 lithic artifacts (Thimma Reddy, 1977). Most of the assemblage consisted of flakes and chips (n = 981, or 73%) although 240 artifacts were identified as tools (e.g., burins, points, borers, scrapers). While an age was not assigned to Layer 1, the deposits were clearly of Late Holocene age as four potsherds were recovered. The recovery of a "blade industry" (160 of 951 lithic artifacts) in Layer 2 (35–155 cm) was interpreted as evidence of an "Upper Paleolithic"' occupation.

The stone tools were reported to be associated with a "bone tool industry", presumably vindicating Foote's assertion that humans were present in the caves. The stone tools, identified as a 'crude' blade industry, were thought to represent occupations that were in an early Upper Paleolithic context. The bone tool industry was collected from two separate cave contexts (i.e., the Chapter House North Cave and the nearby Kottala Polimera Gavi). A total of 147 bone objects were classed as finished forms, worked bones, and bone blanks, and 47 of the finished pieces were

Fig. 7. View of Chapter House North cave entrance. Thimma Reddy excavated in this cave at Billasurgam in the 1970s and identified an "Upper Paleolithic" industry, reportedly consisting of lithic artifacts and bone tools

classified as points, chisel-edge tools, perforators, spatulae, and scrapers. While it is conceivable that some of the bones were the product of human activities, it has been argued, based on review of artifact drawings, that some of the Kurnool bone tools were the result of animal contributions, echoing Cammiade's earlier doubts (Petraglia, 1995: 460). With respect to an interpretation for a natural accumulation, it is instructive to note that that the majority of the recovered faunal remains (n = 910 of 949 items) are from Kottala Polimera Gavi, a cave that is very restricted in size and a context that apparently did not produce stone artifacts.

Upon our visit to Chapter House North Cave, the prior 2 x 3 m excavation trench was re-located and the 3.5 m deep profile was observable, and recorded as four main strata (Strata A–D, closely approximating Layers 1, 2a, 2b, 3 in Thimma Reddy's excavations). The silty sediments of Chapter House North Cave differ in comparison to the calcified deposits of Cathedral Cave, indicating different depositional histories in the same cave complex. Two exploratory 1x1 m units were placed alongside Thimma Reddy's original trench, though we did not reach the lower strata.

Observation of lithic items recovered from the two units indicated that it was sometimes difficult to discriminate natural pieces from genuine cultural artifacts. Sharp-edged limestone spalls sometimes shared attributes of cultural pieces, as observed in other cave contexts (e.g., Nash, 1993). The presence of natural spalls led to the possibility that some of the artifacts recovered from the previous excavations were natural in origin. Indeed, Thimma Reddy reported that some of the artifacts were made of the same material that forms the cave walls and he also indicated that a proportion of the artifacts lacked clear signatures of human production (i.e., bulb of percussion, deliberate secondary retouch). Additionally, the stream bed running through the Billasurgam cave complex contains abundant examples of naturally flaked stone pieces identical to some of those found in the deposits. Nevertheless, a number of the recovered objects displayed flaking characteristics that indicate cultural manufacture. A total of 115 lithic artifacts was recovered from the two units, the majority consisting of flakes and chips. Only six laminar objects were recovered, two bladelets (<2 cm) and four blades in Strata B and C. Other tool types described by Thimma Reddy (e.g., burins, points, borers) were not recovered, although the extent of the test units was limited.

The small faunal assemblage (n = 272) is dominated by microvertebrate remains, mostly rodents, which become relatively more frequent in the upper levels. The few identifiable macrovertebrates are from domestic cattle, panther, and a large felid. A cow incisor indicates that domestic animals were available from the surrounding region; this is the only specimen from a domestic animal identified from the Billasurgam Cave Complex. The carnivore remains might point to non-human predators using Chapter House North Cave as a den, although there is no evidence of gnawing, carnivore young, or other indications of denning activity. Unfortunately, the assemblage is at present too small to unravel its potentially complex taphonomic history in further detail.

The small mollusc assemblage (n = 79) contains only landsnails of the genera *Cryptozona*, *Cyclotopois*, and *Pterocyclus*. There are no indications that humans collected the landsnails; minor temporal shifts in assemblage composition probably reflect changes in the suitability of the cave as snail habitat as well as the snail collecting/consuming activities of non-human predators.

Archaeobotanical evidence from the uppermost deposits (Layer 1) suggest occupation of the cave seasonally by foragers, while the presence of ceramics place these in late Neolithic (mainly after 2000 BC). Flotation samples produced only small quantities of charcoal and no crop plant remains. Charred and uncharred fragments of fruit stones (endocarps) were recovered, including in particular those from *Balanites aegptiaca*, and a few from Indian jujube (*Ziziphus mauretania*). These finds suggest occupation and gathering during the winter or dry season. *Ziziphus* fruit are mainly available from October to February/March and were a common fruit throughout Neolithic South India (Fuller *et al.*, 2001a: 177–178). Although the presence of ceramics implies that these are Neolithic in age, it is possible that these were received in trade by foraging populations, or else seasonal visitors from farming communities.

Ceramics suggest occupation through the Second Millennium BC. In total 33 sherds were recovered. These were studied alongside those from Sanyasula Gavi, Jwalapuram rockshelters 9 and 11 (see below), and two representative Neolithic sites to the Southeast, Rupanagudi (in northern Cuddapah District, near the Kunderu) and Bilajapalle (in Jammalamadufu Taluk, south of the Pennar) (for an introduction to these sites, see Venkatasubbaiah *et al.*, 1992; Venkatasubbaiah, 1998; Fuller *et al.*, 2001b). The ceramics from Chapter House North Cave were a mixture of thick-walled handmade sherds, mainly consistent with a Neolithic to early Iron Age date, and burnished tan/brown surface finishes (Fig. 8). The only recognizable form was an everted rim, neckless jar of a form typical of the Southern Neolithic.

Only a single small sherd of the distinctive black-painted red pottery of Patpad ware was recovered at Chapter House North Cave. It has a distinctive fabric with medium to coarse quartz and fine to medium grog, which does not match the fabric of Patpad ware examples from other studied sites. These comparisons indicate that this painted ware was being produced at several centres in the region of Kurnool and Cuddapah but apparently all east of the Erramalai hills. It should be noted that Patpad ware sites and ceramic occupations in the Kunderu valley to the east and the Pennar to the south have been dated mainly to 1700–1400 cal. BC (Fuller *et al.* 2007).

Charcoal obtained from flotation samples produced the first chronometric ages for the Chapter House North Cave. Three samples date the upper Stratum A deposits between 1487 and 1708 BP, ca. 250–600 cal. AD (Table 2). The earliest ceramics associate with a date of 3995 BP (2550–2470 cal. BC), although it may be that this charcoal, or the tree it was from, predates any of the ceramics by ca. 500 years. The three dates

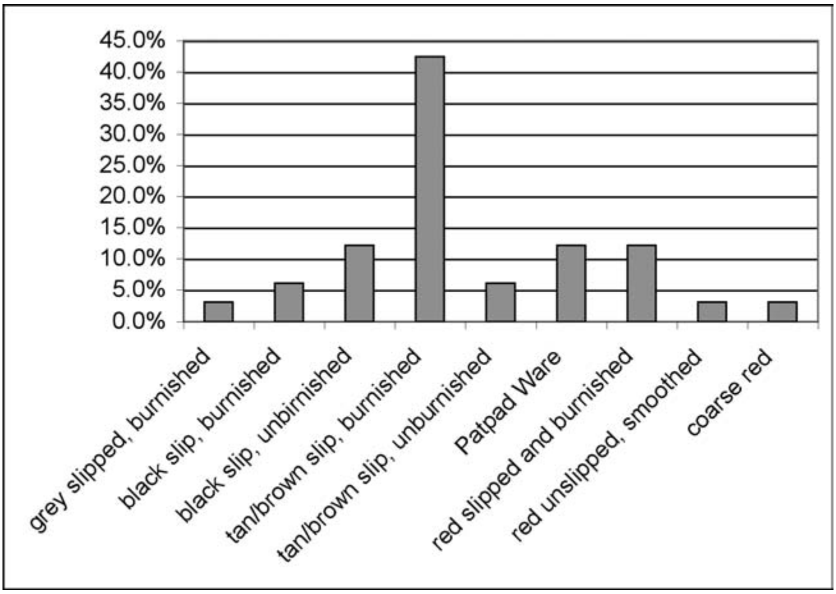

Fig. 8. Relative frequencies of ware classes at Billasurgam, Chapter House North Cave, totalled across all contexts (total no. of sherds = 33)

Table 2

Radiocarbon ages from Stratum A of Chapter House North Cave

Sample	Unit	Stratum	Material	$\delta^{13}C$	Age (BP)
OxA-17359	3	A, Level 2	*Balanites* sp. seed	20.74	1487 ± 27
OxA-17354	3	A, Level 2	*Ziziphus* sp. seed	20.56	1550 ± 28
OxA-17357	1	A, Level 3	*Ziziphus* sp.	22.16	1708 ± 28
OxA-17427	3	A, Level 4	charcoal	25.58	3995 ± 32

from the First Millennium AD suggest continued occupations of this site, although it is unclear which artifactual finds are to be associated with these. Three samples from Stratum B and C produced unexpectedly young ages ranging from modern to 570 BP, likely indicating stratigraphic disturbances and downward migration of charcoal. Unfortunately, at this stage in our dating program the inferred Upper Paleolithic age range of the lower-lying deposits could not be confirmed.

Muchchatla Chinamanu Gavi (MCG)

M.L.K. Murty's (1974) excavation at Muchchatla Chinamanu Gavi represents a pioneering work in Indian prehistoric studies as this was the first cave to be excavated in Kurnool in the modern era, producing stone tools, faunal remains, and a "hearth" with a date coincident with the late Upper Paleolithic. MCG was a prominent site in Murty's (1979) Upper Paleolithic synthesis, which attempted to demonstrate that a blade and bone industry was present in India (Murty, 1979). Surveys of the region around Billasurgum revealed that numerous cave and open-air sites were present (Murty and Thimma Reddy, 1975) including a cave adjacent to MCG, which contained abundant microlithic industries (Murty, 2003).

MCG sits in the escarpment of a small and winding limestone canyon, with three entrances separated by a length of 5 m along the escarpment. The three entrances have passages that eventually join each other at a deeper inner chamber. The passages are narrow (ranging from 0.5 to 1.2 m wide) and even after excavation, the height of the cave from floor to roof was usually no greater than 1.25 m. The thickness of the sediments in the cave ranged from a maximum of 40 to 85 cm. The size constraints of the passages and the dark, interior position of the inner chamber were likely important factors in constraining human activity.

Although extensive excavations were conducted on the terrace in front of the cave, in the passages, and inside the inner chamber, relatively few stone artifacts were recovered, totalling only 223 pieces (Murty, 1974). The stone artifacts were accompanied by 2,003 "bone-tools" and 290 faunal remains. Although a Neolithic bowl was found inside the cave, all other artifacts and material remains were considered to be Upper Paleolithic in age. The Late Pleistocene temporal estimation was confirmed by a thermoluminescence (TL) date of 17,390 ± 10% BP from a "fire place" (Nambi and Murty, 1983). Murty's identification of a bone tool industry has continued to play a role in demonstrating the existence of worked bone in Upper Paleolithic contexts (e.g., Sali, 1989; Raju and Venkatasubbaiah, 2002). However, as is the case in the Chapter House North Cave, it is possible that the bone accumulations resulted from a more complex taphonomic history, including contributions from animals (Petraglia, 1995: 460).

The goal of our initial work at MCG was to place the site in landscape context by conducting a reconnaissance survey of the limestone canyons. Preliminary survey indicated that MCG was not an isolated occurrence. Other caves (e.g., MCG II-III, V) and rockshelters (MCG II, IV) were present in the area. Artifacts were observed on the surfaces of some cave floors and rock art was present along the wall of a rockshelter (MCG IV) and on the inside of one cave (MCG V).

We placed test excavations in one passage of MCG, in a passage described by Murty as "deposit left undisturbed". The stratigraphy was consistent with the three main layers described in earlier excavations. The maximum depth of the deposits was shallow, measuring only 40 cm from the surface to the limestone floor. Artifacts were recovered in only one unit, and consisted of two flakes and a blade, consistent with the relatively low density of cultural materials recovered in the earlier excavations. The results of the trial investigations were in agreement with the well-documented stratigraphic observations and artifact findings described in the MCG publications.

The small vertebrate assemblage (n = 72) contained only three microvertebrate remains; the macrovertebrates include four-horned antelope, hare, and porcupine, and an nilgai-sized ungulate. Landsnail remains are likewise rare. Our species list from MCG1 compares well with that reported by Murty (1985) from MCG II. In contrast to other cave assemblages from the area (Sanyasula Gavi Caves 1-2, Chapter House North), microvertebrate and mollusc remains are extremely rare and limited to the uppermost level (A1). The lack of microvertebrates, in particular bats, is surprising as the cave surface was reported to be covered with bat guano (Murty, 1974: 201; Prasad, 1996: 32).

While MCG provides important information about human occupation in the region, our re-appraisal indicates that more information is needed to determine the age of the caves and to characterize the stone tool technology. While a Late Pleistocene age of the deposits is conceivable, the age of the assemblages can not be confidently pinpointed as only one TL date is available. It is possible that the blades derived from "fluted" cores may date to any time period within the Late Pleistocene or even the Holocene. The recovery of a Neolithic bowl at MCG and the identification of rock art and microlithic industries in other caves and rockshelters suggest that the occupation history may be more complicated. An additional caveat is that while many of the illustrated stone tools are apparently genuine artifacts, some level of caution is warranted in distinguishing cultural and natural pieces. Review of illustrated pieces and preliminary examination of artifacts on display at the Deccan College museum indicate that some pieces may be the result of natural spalling, as may also be the case in the Chapter House North Cave. Evidence that many pieces may be natural in origin is suggested by a number of observations, i.e., most artifacts are made from the limestone that forms the caves, the artifact descriptions do not indicate the presence of distinct technological attributes (e.g., bulb of percussion), flakes detached from 'cores' do not show any evidence of preparation, and few artifacts show secondary retouch.

The Sanyasula Gavi Complex

The Sanyasula localities occur as a cluster of caves situated in a sub-valley, removed from modern villages. The caves are frequently noted in the regional literature, though they have not been previously subject to archaeological investigations. We recorded five caves, consisting of three large caves (Sanyasula Caves 1–3), one cave chimney leading to an inner recess (Sanyasula Chimney), and one formed within a joint surface (Sanyasula Riverside Cave). The caves were situated along a single south facing limestone cliff face, separated from each other by a distance of about 50 m. Upon visitation, it was clear that the caves were being actively used by *saddhus*, or holy men, as indicated by small Hindu shrines and paintings on the Sanyasula Chimney Cave. Sanyasula Caves 1 and 2 were inhabited recently as indicated by hearths and shattered limestone debris on their surfaces (Fig. 9). Interviews with village pastoralists indicated that *saddhus* occasionally visit and live in these remote caves. Ethnographic and ethnoarchaeological accounts indicate that foragers visited the caves in order to trap animals such as porcupines and collect honey from beehives (Murty, 1985).

Following survey of the sub-valley, test excavations were conducted in Caves 1 and 2 in order to determine if any archaeological deposits were present. A 1 × 1 m unit in Cave 1 reached a depth of 1.5 m, but large boulders prevented further excavation. Artifacts in the top 50 cm included ceramics. A total of 116 lithic artifacts was recovered in the pre-pottery levels, and included blades and bladelets. A sandstone quern found in the upper levels of Cave 1 indicates the possibility for plant processing activities. In Cave 2, a 1 × 2 m unit was terminated at 1.6 m depth on account of compact sediment that could not be penetrated in this limited excavation. The most prominent stratigraphic feature in the 1 × 2 m unit was a bone bed, consisting of large quantities of micromammal fauna and an ash layer. As in Cave 1, potsherds were recovered in the uppermost levels of Cave 2. Among the 45 lithic artifacts were blades and bladelets. Radiocarbon samples were obtained from Cave 2, providing estimates of 1159 ± 30 BP for Stratum A and 3515 ± 35 BP for Stratum B (ca. 1900–1800 cal. BC) (Table 3).

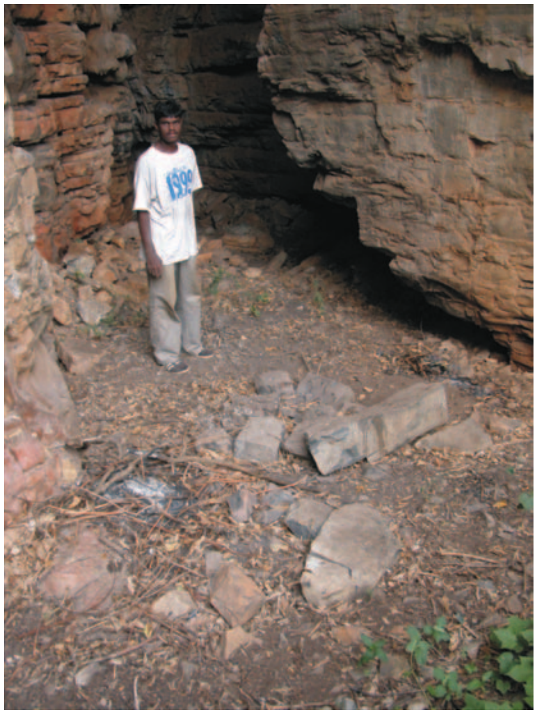

Fig. 9. Sanyasula Cave 1, showing evidence of recent habitation. Note the hearth, with ash and unburned wood and note the arrangement of large limestone slabs around the hearth

Ceramics from the upper units of both caves were similar in having a mixture of Neolithic and later types, although Neolithic types dominated. From both units a total of 269 sherds was recovered and studied, of which a significant number were of the distinctive Patpad painted ware (Fig. 10). A few unburnished black-slipped, red-polished and coarse red ware sherds are likely to be later from late Iron Age or historic times, but most of the pottery fits within a Neolithic assemblage, such as the high number of tan/brown burnished sherds (as at Chapter House North Cave). Forms include typical Neolithic open bowls and a necked jar of later Neolithic type. Of particular note is that the Patpad sherds could be divided into two fabrics, both of which are known from the Neolithic site of Rupanagudi in the Kunderu river valley. At Rupanagudi at least two other Patpad ware fabrics also occur. The inhabitants of these caves

Table 3

Radiocarbon ages for Sanyasula Cave
(from Fuller *et al.*, 2007, Online Supplement Table 4 [http://www.antiquity.ac.uk/projgall/fuller/])

Sample	Context	Level	Material	$\delta^{13}C$	Age (BP)
R 28680/32	Sanyasula Gavi, near top	A-2	Wood charcoal	-29.1	1159 ±30
R 28680/33	Sanyasula Gavi, earliest pottery	B-5	Seed: *Vigna* sp.	-22.58	3515 ±35
BA04397	Sanyasula Gavi, earliest pottery	B-5	Seed: *Ziziphus* cf. *mauretania*	Not reported	3505 ±40
BA04398	Sanyasula Gavi, intrusive fragment	B-6	Black wood, bark	Not reported	MODERN

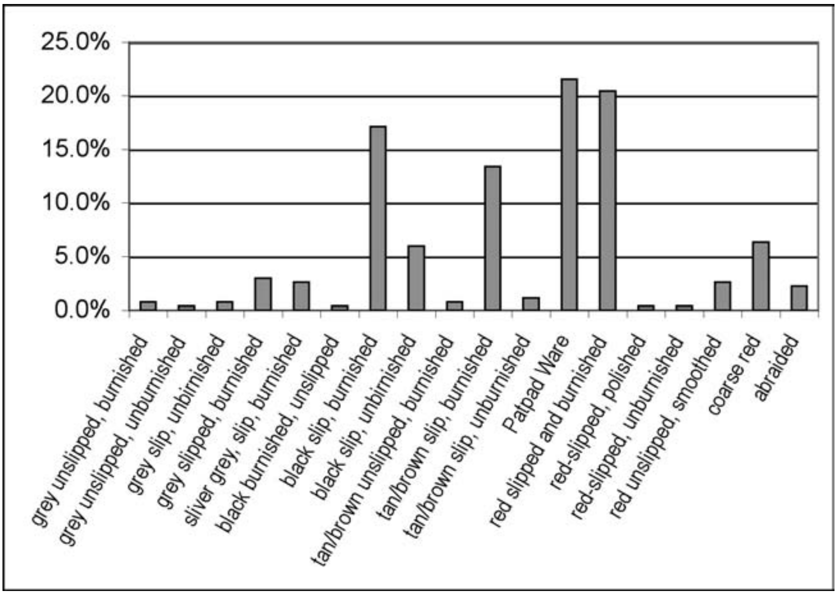

Fig. 10. Relative frequencies of ware classes at Sanysula Gavi, totalled across all contexts (total number of sherds = 269)

presumably obtained ceramics from the valley, and one or two consistent fabrics suggest that they were in contact with only one or a few pottery-producing village communities in the plains. By contrast the Neolithic village communities, like Rupanagudi were obtaining ceramics from a wide network of other communities, represented by a wider range of fabrics. This suggests that the dynamics of social networks were rather different amongst the Neolithic plains communities and between the isolated Erramalai cave-dwellers and adjacent villages. Also of note is a single sherd with a silvery-grey burnished finish and a distinct olive-grey paste with mica and grog temper, a fabric known in quantity from Sanganakallu Neolithic sites in Bellary District (cf. Boivin *et al.*, 2005). This implies that there was some trade to the west, although Kurnool ceramic types predominate.

Of the many vertebrate remains (n = 3836) from the Sanyasula Caves, about 97% are from small-sized rodents (predominant at Sanyasula Gavi 2), bats (predominant at Sanyasula Gavi 1), birds, amphibians, and reptiles. Interestingly, only wild taxa have been positively identified in the small macrovertebrate assemblage – nilgai (*Boselaphus tragocamelus*), sambar (*Cervus unicolor*), four-horned antelope (*Tetracerus qua-*

dricornis), a small bovid, a small fox (*Vulpes* sp.), black-naped hare (*Lepus nigricollis*), mongoose (*Herpestes edwardsi*), bandicoot rat (*Nesokia* sp.), and porcupine (*Hystrix indica*). These sites produced a small landsnail assemblage (n = 303) that includes a mix of the genera *Cryptozona, Cyclotopois*, and *Pterocyclus*.

Using the relative frequency of micro- versus macro-vertebrate remains as a rough index of human occupation, these caves have complementary sequences of human occupation and use. The Sanyasula Gavi 1 was used more regularly during level B at a time when Sanyasula Gavi 2 was primarily a roost, while Sanyasula Gavi 2 was used more intensively by humans during the accumulation of level A at a time when Sanyasula Gavi 1 was little used. We suspect that both sites were occasionally used by local hunter-gatherers who might have exchanged wild products for domestic products from villages.

Flotation was carried out on sediments from Sanyasula. Due to the long walking distance to the site and rugged terrain, only relatively small volumes could be carried from the caves, and most samples yielded no identifiable fruit remains and only very small charcoal fragments. Nevertheless at least two crops were positively identified (Table 4), including browntop millet (*Brachiaria ramose*) and mungbean (*Vigna radiata*), two of the predominant staples of the South Indian Neolithic (Fuller *et al.*, 2001a; 2004). A possible barley fragment was also present, as was the Indian jujube fruit. A direct AMS date on the mungbean (R 28680/33; 3515±35 BP) and another on jujube (BA-04397; 3505±40 BP) confirmed the Neolithic association of these crops and put back the Neolithic occupation in these caves to ca. 1900 BC. It should be noted that this represents the earliest Neolithic remains and crop remains in Kurnool or Cuddapah districts, where the widespread Neolithic villages with distinctive Patpad ware have been dated from 1700–1400 BC (Fuller *et al.*, 2007). This suggests that the cave's occupants may have acquired crops and some undecorated, less distinctive pottery initially from established Neolithic farmers to the West of the Erramalai hills, while the bulk of the Patpad ware suggests that continuing interaction shifted to include newly established Neolithic settlements to the east after 1700 BC.

Table 4

Archaeobotanical evidence from Sanyasula Caves

	Sanya. 2.2.B-5	Sanya. 2.2.B-6	Sanya. TR 3/A/2
Flot. vol. (mL)	84	60	80
Flot. weight (g)	43	29.7	30
Vigna radiata (cotyledon)	1		
Vigna sp. (fragment)		1	
Macrotyloma (fragment)		2	
Setaria/Brachiaria/ Echinocloa (grain)		1	
Brachiaria ramose (grain)	3		
cf. *Hordeum vulgare* fragments	1		
fruit/nut indet. fragments			1
Ziziphus sp. fragments	++	3	1
Fruit pedicel			1
Indet small legume	2		
Asteraceae type	1		
cf. Convulvulaceae	1		
Indet. fragments	++	31	
Dung fragments			7

THE JURRERU RIVER VALLEY

Our team visited the Jurreru River Valley based upon a geological publication that noted the presence of volcanic tephra deposits in the valley and 'hominid' remains in the Mogasarayanigondi cave (Rao and Rao, 1992)[2]. Inspection of the area showed that substantial quantities of ash were actively being mined by villagers for commercial purposes (Fig. 11). A reconnaissance around the tephra mining operations revealed the presence of lithic artifacts associated with different sedimentary deposits. Published sources, in fact, indicated the high archaeological potential of the region, including the presence of Paleolithic localities (Cammiade, 1927; Isaac, 1960), the Pathapadu Neolithic mound site (Allchin, 1962)[3], Iron Age megaliths (Krishna Sastry, 2003: 125), and historic period temples, including the 15th century Sri Yagatiswamy Temple at Yaganti. The following overview summarizes some of the most prominent sites identified during survey of the Jurreru River Valley.

Fig. 11. Villagers mining the volcanic ash in the Jurreru River Valley. Mining trenches has exposed the buried volcanic ash. In the background, the piles consist of pure ash which has been screened of its detritus. In the foreground, the piles consist of carbonate and rhizoliths, which have been removed from the ash. This mining activity is leading to the destruction of the ash and associated archaeological sites. Note also the quartzite escarpment and boulders in the background, which form the northern slope of the valley

The Jwalapuram Tank

Survey was performed along the southern hill flanks in the Jurreru River Valley. The reconnaissance was conducted at the break in slope where a river, the Kanigal Eru passed, and where a 1946 tank was constructed. Large Cutting Tools (LCTs) of the Acheulean were found along the base of this north facing hillslope, distributed across an area measuring 1 km east to west. The artifacts were found in unconsolidated 'fanglomerate' deposits and cemented into consolidated calcareous deposits capped by a residual tephra (Fig. 12). The artifacts appear to have been deposited in colluvial settings and in settings characterized by standing pools of water. The artifacts do not appear to be transported by alluvial processes, though the tools are in shallow deposits that are not conducive for study of their original spatial patterns. The LCTs are of different sizes and shapes, conventionally classifiable as handaxes, knives, and choppers (Fig. 13). The tools were made on quartzite and limestone, raw materials that are readily available in the vicinity of the finds. Some of the tools are made on secondary clasts, such as quartzite cobbles, whereas others are manufactured on flakes. One handaxe is manufactured on a large limestone slab, which is reminiscent of the manufacturing technique used in the Isampur Quarry (Petraglia *et al.*, 1999).

Fig. 12. The Jwalapuram Tank deposit showing cementation. The hammer marks the location of a Large Cutting Tool which is in situ

Fig. 13. Large Cutting Tool recovered from cemented deposits at the Jwalapuram Tank. This artifact was manufactured from the nearby limestone beds

Fig. 14. View of an ash section at Jwalapuram exposed by modern quarry operations. Test unit is being placed beneath the ash

Jurreru River Valley Tephra Deposits

The tephra deposits in the valley bottom are impressive sedimentary formations (Fig. 14). The tephra deposits were not observable at ground surface and could only be viewed in section in modern ash quarrying operations. Survey of exposed sections along the Jurreru River indicated that the ash could be found over a distance of approximately 9 km (Fig. 15), with the exposed ash thickness ranging from 15 cm to 2.46 m. The ash was thickest near the village of Jwalapuram, in the central portion of the valley, and shallow along the valley floor margins.

Archaeological field work consisted of systematic surface collection and testing of stratigraphic sections at four main localities in the central portion of the valley (Jwalapuram 3, 17, 21, Well Section). Systematic surface collection from Locality 3 towards the northern quartzitic hillslopes indicated the presence of a continuous scatter of lithic artifacts. The aim of the initial excavations was to determine whether subsurface archaeological deposits were present and to examine their relationship with the tephra. The following descriptions are the main findings of our initial investigations.

Jwalapuram Locality 3

Locality 3 was the location of the deepest ash deposit in the valley, measuring 2.46 m in thickness (Figs 16, 17). Electron probe microanalysis (EPMA) of volcanic glass shards from the Jwalapuram tephra indicated that the ash is a distal deposit of the YTT of 74,000 years ago (Petraglia *et al.*, 2007). Optically stimulated luminescence (OSL) dating from archaeological layers below

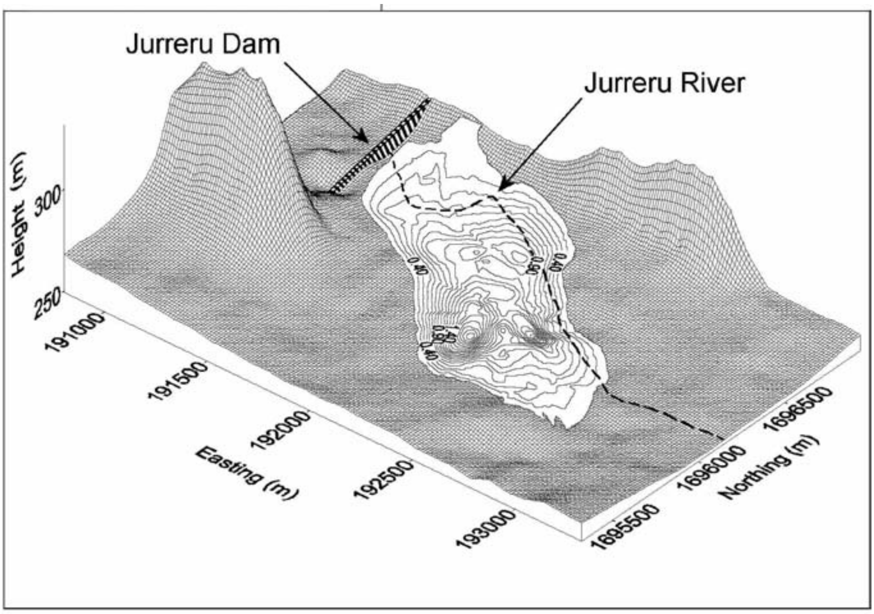

Fig. 15. Depth recordings for volcanic ash in Jurreru River Valley. The depths were recorded from the villagers mining trenches placed across the valley. Note the location of the thickest ash deposits in the south-central area. The modern river cuts through the former ash deposits

(JLP3A-200) and above (JLP-380) the ash returned ages of 77 ± 6 kyr and 74 ± 7, respectively (Petraglia *et al.*, 2007).

Several lines of evidence, notably in the form of sediment deformation structures, suggest that the tephra initially accumulated on a wet clay substrate, probably in a lacustrine setting. A distinct layer of ash, 4–5 cm thick, was identified at the base of the tephra sequence, suggesting that it represented a primary fallout deposit. Above the basal ash layer is a homogeneous layer of light grey ash up to 80 cm thick. This was presumably still being deposited within a water body, but the deposit may have also formed by reaching the pooled water through aeolian or aqueous transport. The ash is too thick to be primary fallout from the volcanic eruption plume, and hence it is considered, with much of the overlying sequence, to be the result of remobilisation and redeposition. There is no evidence, at least on the basis of visual inspection, for incorporation of significant amounts of any material other than ash. The upper boundary of this layer is a very distinct contact with an apparently finer-grained, brown-grey, possibly clay-bearing layer, approximately 20 cm thick. It is overlain by a fining-up laminated sequence of very fine-grained sediment that culminates in a dark horizon forming a prominent and laterally extensive hard band within the section. This is a pattern repeated an additional four times higher up in the section.

A number of features, including mudcracks, and possibly signs of microbial mats, suggest that these represent cycles of desiccation of the lacustrine environment. Structures reminiscent of ripple marks were observed, though these could well be diagenetic features. Numerous roots, both fossilised rhizoliths and unfossilized root casts, were retrieved (Fig. 18). Impressions of what could possibly be small and intricate root networks were clearly seen on the surface of most of the hard horizontal layers. The upper sequence shows an abrupt transition from grey ash to orange-brown sediment, the later apparently an ash-rich silt horizon. This appears to indicate a significant change in depositional regime rather than pedogenesis or diagenesis. The ash-rich nature of these sediments indicates that there is unlikely to be much of a time interval between the two units. A possible interpretation for this ash-rich horizon is

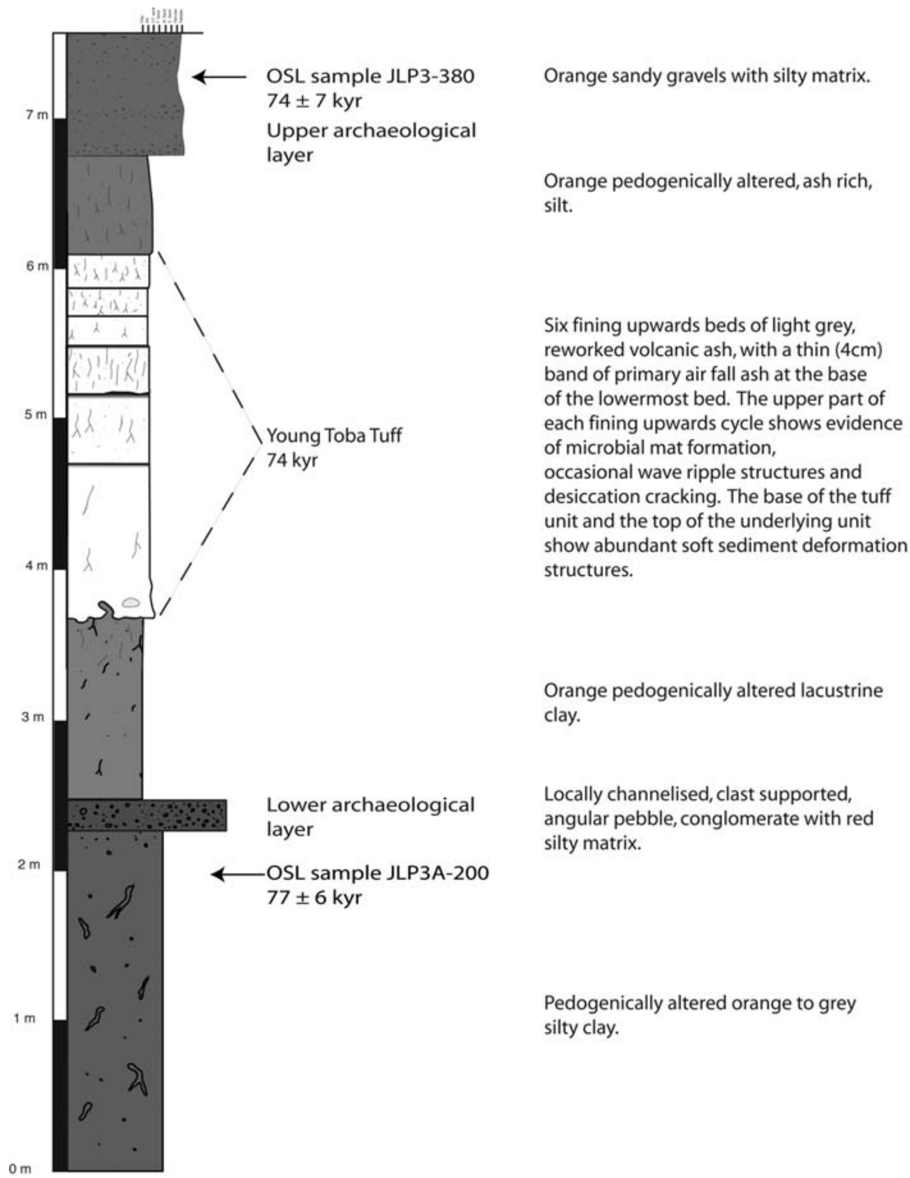

Fig. 16. Composite stratigraphic section of Locality 3. This section demonstrates the existence of an archaeological horizon below the ash, bracketed by the 74 kyr old ash and an OSL sample dating to 77 kyr. Note the thickness of the ash. Primary ashfall exists at the base of the ash section. The bands may represent redeposition events occurring soon after the ash fall. Occupation occurred soon after settling of the ash on the valley floor

a permanent drying up of the lake, perhaps associated with climatic change or the geomorphological/hydrological impacts of the accumulated tephra. The uppermost deposits represent fluvial activities in the form of small pockets of sand and pebbles.

Underlying the ash, we excavated a section measuring 3.6 m in depth (Fig. 19). The deposits were composed of three main strata (Fig. 16). Noteable in this section was a pebble conglomerate with archaeological material, dated by OSL to ~77 kyr BP.

Fig. 17. View of excavated profile in ash, Jwalapuram Locality 3. Note series of hard horizontal bands, which may represent a series of monsoonal events after the ash fall

Fig. 18. Examples of rhizoliths recovered from a trench in Locality 3. The rhizoliths are very abundant in the ash providing information about vegetative communities

Fig. 19. Excavations below the ash at Locality 3. Ash is present along the side wall, above the trench. The lower archaeological horizon was below this ash deposit

Jwalapuram Locality 21

Locality 21 is composed of a 2.3 m deep trench, with six main strata above the ash (Fig. 20). Stratum F is an orange silt deposit, and Strata B–D were recognized on the basis of variations in clay color and calcium carbonate content. Thin bands of gravels are located within the clay indicating some fluvial activity, likely in the form of sheetwash. Localised changes in depositional regime were indicated by silt in Stratum A and sandy clay in Stratum E. OSL ages of ca. 38 kyr BP (JLP21B-80; JLP21B-30) were obtained from this deposit.

Artifact assemblages associated with tephra deposits

Lithic assemblages below the ash were chronologically bracketed by the ~74 kyr BP YTT and the underlying sediments, dating to 77 ± 6 kyr BP. The assemblage contained 215 artifacts as well as a piece of red ochre which shows striations from use. This stone tool assemblage comprises a faceted unidirectional core and numerous flakes made predominantly from limestone (60%), quartzite (22%), and chert (11%). There is moderate preparation of flake platforms through overhang removal (43%) and faceting (8%), suggesting that these flakes were sometimes struck from prepared cores similar to those found at the site. Flakes are typically small at 34 ± 18mm and squat (mean L: W = 1.3) with a single dorsal ridge. The pre-Toba assemblage contains a small number of blades and microblades up to 4 cm in length (2.8%) as well as a crested flake that may have been created to set up ridges on a core. A sizeable proportion of flakes (11%) were retouched into notches, informal scrapers, a heavily retouched blade, and a

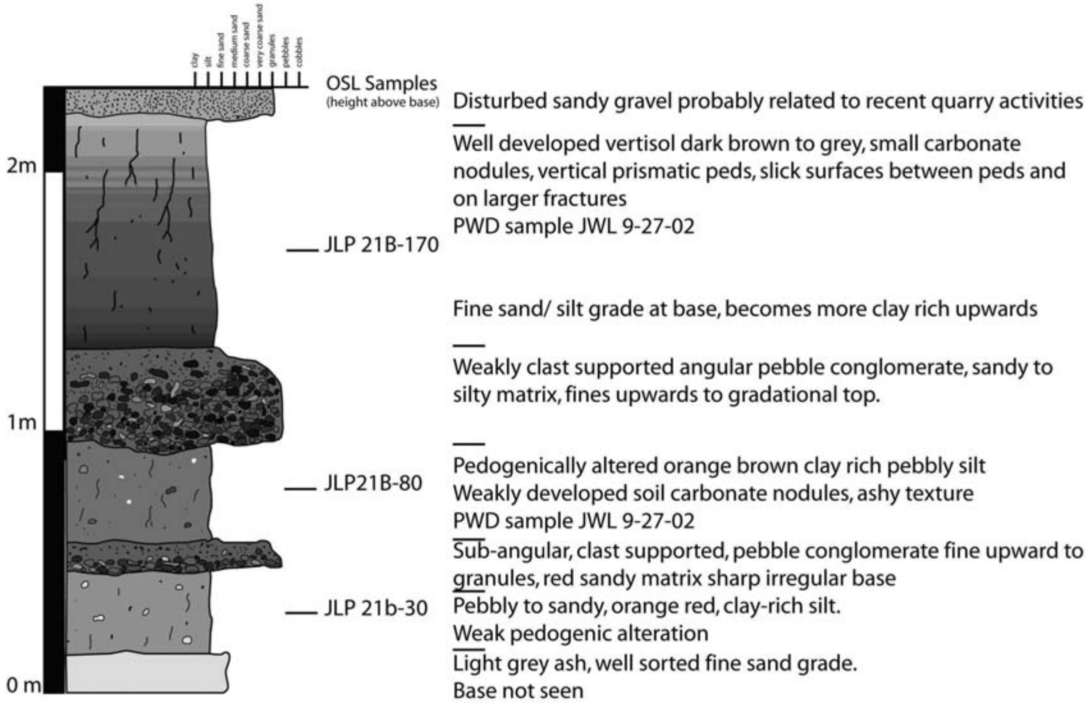

Fig. 20. Stratigraphy of Jwalapuram Locality 21

burin spall. Retouched flakes are typically quite heavily reduced (Kuhn's (1990) GIUR = 0.8, % margins retouched = 80%). In addition to these artifacts, a small number of retouched cortical and tabular pieces of limestone were recovered that bear strong resemblance to pieces recovered from localities elsewhere in the valley (i.e., Locality 20). This assemblage falls within the Indian Middle Paleolithic as identified elsewhere (Misra, 1989, James and Petraglia, 2005).

The post-Toba layer at Locality 3, optically dated to 74 ± 7 kyr BP, contains an assemblage of 108 stone artifacts that occur throughout the orange sandy stratum. The assemblage comprises multiplatform cores, faceted single platform cores and core fragments. Limestone makes up a smaller proportion of the assemblage than below the ash (32%), around double the amount of chert is found above the ash than below it (25%), chalcedony appears for the first time (23%), while quartzite is around half as abundant as below the ash (12%). Like the assemblage from below the ash, flakes are small (21 ± 16mm) and squat (L: W = 1.5), typically with a single dorsal ridge, frequent overhang removal (25%) and rare platform faceting (1.6%). Retouched items also make up a sizeable portion of the assemblage (16%), including burins and side- and end-scrapers, and notches. Overall reduction intensity is low for retouched items (Kuhn's GIUR = 0.05, % margins retouched = 37%). A single blade and four microblades are also present in the assemblage (4.6%).

A total of 131 artifacts were recovered at Locality 21 from a similar post-ash matrix to that seen at Locality 3, although as noted the Locality 21 sediments date to ~38 kyr BP. The Locality 21 assemblage differs in some important respects from Locality 3 which is to be expected given more than 35,000 years between them. Chalcedony dominates the assemblage (35%), followed by chert (29%) and limestone (27%). Complete flakes are once again small (19 ± 9 mm) and squat (L: W = 1.3), with an average of one dorsal ridge, little cortex coverage (7%) and little platform preparation (6% faceting and 10% overhang removal). A very high proportion of flakes are re-

Fig. 21. View of Jwalapuram Locality 20. Test excavations in southern core are being placed in the plowed fields. Note the hillslopes to the north, which are composed of quartzite boulders which served as rockshelters (e.g., Jwalapuram Locality 9)

touched into side- and end-scrapers (38%) of various kinds, as well as burins and notches. Retouched flakes overall show low levels of reduction (GIUR = 0.04, % margin retouched = 45%). The Locality 21 assemblage contains two blades and two microblades, suggesting very low levels of production for these kinds of artifacts.

Jwalapuram Locality 20

Jwalapuram Locality 20 was identified during surface survey along the southern hill slopes of the Jurreru River Valley (Fig. 21). The locale is approximately 1 km west of the break in slope present at the Jwalapuram Tank. An aerially extensive scatter of artifacts was found along the base of the colluvial hillslopes, measuring a distance of over 200 m east to west. From the base of slope, the surface artifacts were found in plowed fields extending 100 m to the north. Surface artifacts in the western portion of the site were situated in an acacia forest along colluvial hillslope surfaces and a pediment.

The large concentration of surface artifacts present at Locality 20 was related to the presence of a plentiful raw material supply. A siliceous outcrop is present at the mid-slope of the hill, consisting of a distinctive dark greenish-gray limestone (Fig. 22). From the mid-slope to the base of the hill, a continuous scatter of angular and blocky clasts of the weathered bedrock was present. The majority of the artifacts appeared to have been produced from the secondary clasts rather than directly from the limestone outcrop.

A pedestrian surface collection (Transect 1) was performed to retrieve a sample of the surface

Fig. 22. Source of siliceous limestone bedrock on the southern hillslope at Locality 20. It is from this bedrock deposit that weathered tabular pieces form. Tabular and angular pieces commonly served as cores in the Middle Paleolithic

artifacts. Transect 1 was about 10 m in width and placed in an east to west direction, 50 m in the plowed fields and 50 m along the forested hillslope. A series of 1 × 1 m units were then placed in a cross-pattern across the site (i.e., north-south, east-west) to examine variations in landscape features and stratigraphy.

A total of 272 artifacts was collected from Transect 1, the majority of which were flakes (61% or n = 167). This high flake percentage is accompanied by a relatively high total number of flake cores (n = 34). Blades and blade cores are present, though rare in overall assemblage proportion. Several cores show radial flaking patterns on dorsal and ventral surfaces and some show bidirectional flaking. Only one laminar flake core was recovered along Transect 1, the piece showing parallel arises along its central ridge. The most common platform type was plain (n = 32; 71%), followed by faceted forms (n = 12; 27%) and a single dihedral platform. Of the formed tools recovered during surface walkover, the great majority are unifacially retouched, with all the unifaces made on flakes with the exception of a single piece made on a round pebble.

Subsurface contexts

A total of 15 units (comprising eight trenches) was excavated in Locality 20, most of which were excavated to bedrock. On the basis of their stratigraphic differences and variable landscape contexts, the excavation units and their subsurface artifacts were subdivided into three main groups: a northern core, a southern core and a foothills zone (Fig. 23). Lithostratigraphic diagrams for the northern and southern cores are provided in Figures 24 and 25. Two OSL determinations have been obtained from sediments in the northern core, dating to a minimum of 21 kyr BP (JLP 20B-215) and to ~34 kyr BP (JLP 20B-60). However, these ages cannot yet be definitively related to other parts of Locality 20 and further dates are required to clarify their significance.

The northern core produced a small sample of 50 artifacts, which, on the basis of stratigraphy, can be divided into a lower (NC lower; n = 40) and upper (NC upper; n = 10) collection. In contrast, a total of 430 artifacts was recovered from the southern core. These artifacts may be divided into three subsurface subdivisions; a lower assemblage (SC lower; n = 187) in a matrix of silty clay that overlies weathered bedrock, a middle assemblage (SC middle; n = 192) that is separated from the former by a gravel lens, and an upper assemblage (SC upper; n = 51) consisting of a relatively poor concentration of artifacts. The foothills zone (SF) comprises two relatively shallow excavations where bedrock was reached after ~23 cm in unit 4 and ~90 cm in unit 3. A total of 95 artifacts was retrieved from these foothill excavations, however, differences in stratigraphy prevent reliable integration of these artifacts within the three southern core assemblages, though they are components of the surface assemblages described above.

The vast majority of artifacts from Locality 20 are made from limestone (97%) and the remainder are made from other raw material types such as quartzite, dolerite, quartz crystal, chalcedony and chert.

The NC lower and SC lower assemblages are predominately made up of retouched tabular pieces (60% and 49% respectively)[4]; a few cores, flakes and retouched flakes form the remainder of these collections. The small NC upper assemblage is composed entirely of flakes, of which several are retouched, and both unretouched and retouched flakes numerically dominate the SC middle, upper and foothill assemblages.

The SC has varying frequencies of artifact types in lower, middle and upper levels, though their technological characteristics are generally similar. Large numbers of cores and associated flake products were retrieved, and contain a relatively high number of retouched items made on

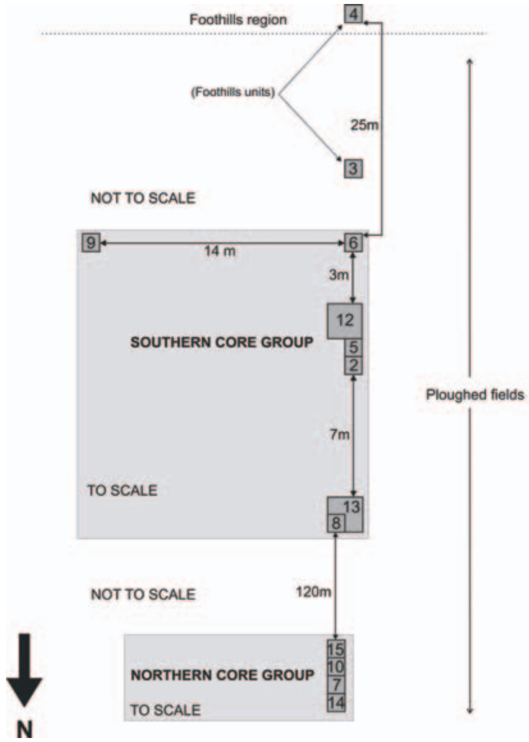

Fig. 23. Plan of Jwalapuram Locality 20 excavations, indicating the location of the northern core, southern core and foothill groups

flakes, flaked pieces and tabular pieces. The foothills assemblage also has a relatively large number of cores accompanied by numerous retouched items, indicating the general similarity of the near surface and subsurface assemblages.

The majority of the cores excavated from Locality 20 are single platform (n = 29 from a total of 66). Multiplatform cores are the next most common (n = 16), followed by bidirectional cores, bipolar cores and a unidirectional core. Multiplatform cores are found in all assemblages except for NC upper, where no cores were found. Bidirectional cores were excavated from SC lower and SC middle and bipolar cores from SC lower and the foothills.

Several different retouched flake types were recovered and are found in different frequencies in all six assemblages. Side retouched flakes are the most common, followed by side and end retouched flakes, double side retouched flakes, end retouched flakes and double side and end retouched flakes. One notched Levallois flake was

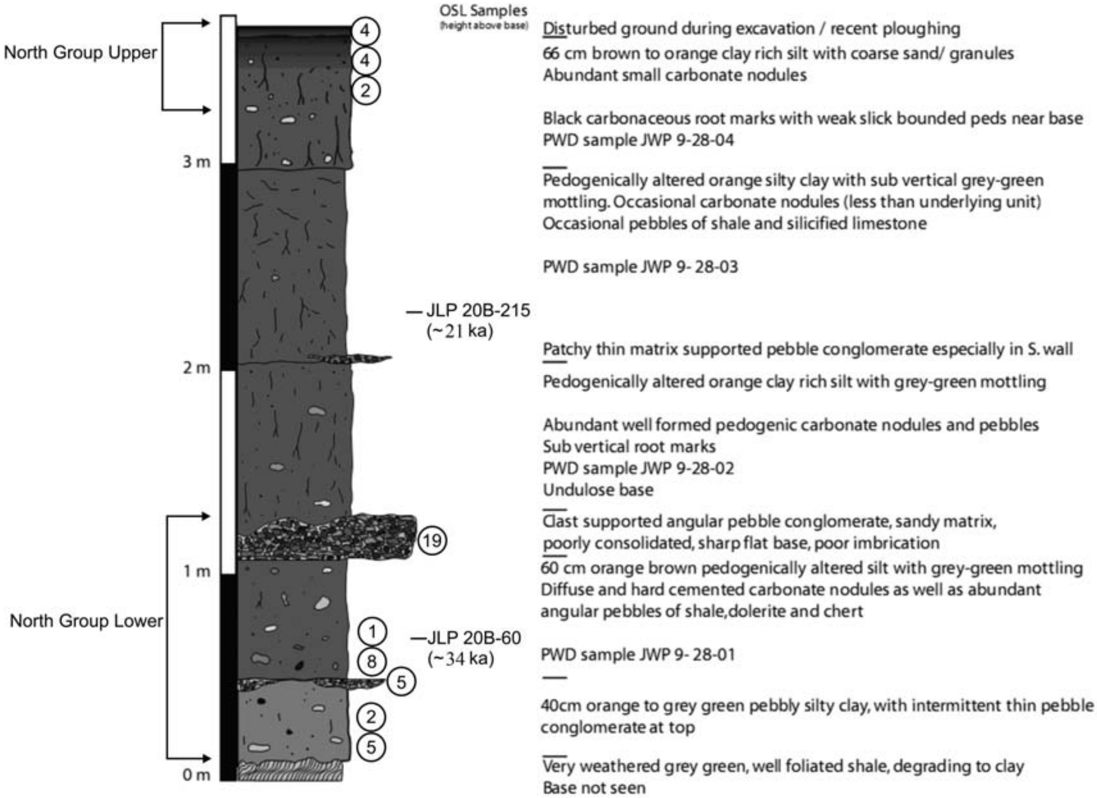

Fig. 24. Composite stratigraphic diagram of the northern core group, indicating the location of artifacts (artifact counts in circles) in the NC lower and NC upper groups. The stratigraphic positions of recent OSL dates are also provided

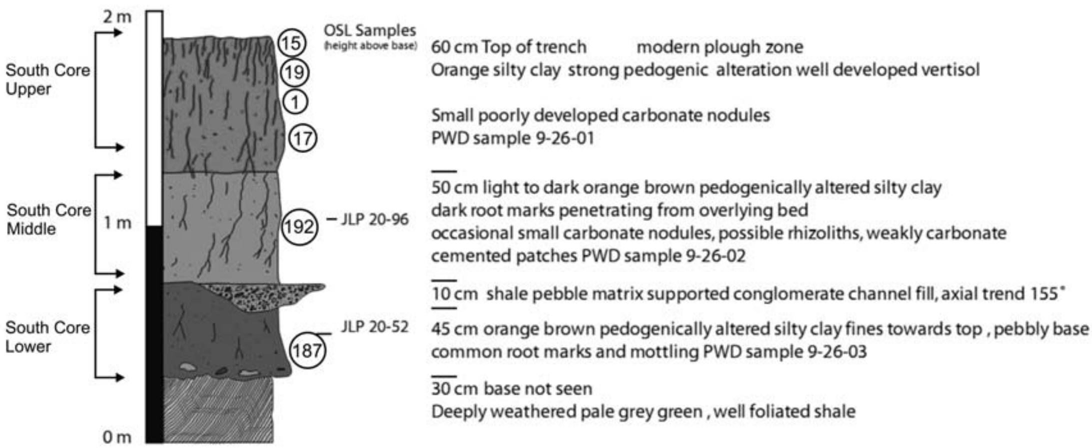

Fig. 25. Composite stratigraphic diagram of the southern core group, indicating the location of artifacts (artifact counts in circles) in the SC lower, SC middle and SC upper groups

recovered from SC lower. Blades comprise a very small percentage of the Locality 20 artifacts, and microliths are similarly uncommon, where all are unretouched and found in SC lower, SC middle and NC upper (the latter two artifacts are classified as microblades).

Although the northern and southern core assemblages do differ, there exist more similarities between these than there are statistically significant differences. In particular, there are a number of similarities between the NC lower and SC lower groups, and to a slightly lesser extent between NC lower and the foothills artifacts. In contrast, there are several noteworthy differences that exist *within* the southern core assemblages. Foothill flakes are significantly heavier than those in all three southern groups, whereas there are no differences in weight between the southern groups. SC upper flakes are significantly flatter that those from SC middle. SC middle flakes preserve both more cortex and a lower dorsal scar count when compared to all other assemblages (including the northern group). This suggests that, as a whole, those flakes in SC middle represent a relatively earlier stage in the core reduction process when compared to the other assemblages.

Unidirectional flaking is more common than bidirectional or radial flaking when considering all Locality 20 artifacts. Larger flakes were selected for retouch in SC lower, SC middle and foothills assemblages, yet particular flake sizes were not favored in any other groups. The geometric index of unifacial reduction (Kuhn, 1990) is significantly higher for SC middle and foothills flakes when compared to SC lower and SC upper, although there is no difference between these groups in the invasiveness of retouch when applying the index of invasiveness (Clarkson, 2002).

As borne out by these detailed artifact studies, Locality 20 was a locus of raw material procurement and reduction. The weathered limestone clasts were clearly targeted for core-flake production. The high incidence of cortex on cores and debitage indicate that primary flaking occurred on site. However, there is also a high frequency of retouch in all Locality 20 assemblages, particularly when compared to other Middle Paleolithic sites in the valley (e.g., Localities 3 and 21). This is perhaps indicative of relatively high occupation intensity at Locality 20. The assemblage consists of prepared cores, a variety of unifacial forms, and rare blades and microliths. In spite of the occurrence of the latter amongst the subsurface artifacts, the Locality 20 assemblage as a whole can be defined as later Middle Paleolithic.

JURRERU RIVER VALLEY ROCKSHELTERS

The northern slopes of the Jurreru River Valley are formed by a quartzitic escarpment overlying limestone beds. During slope retreat, large quartzitic boulders detached from the quartzite units, coming to rest on the slopes to form natural shelters towards the base of the hill (Fig. 26). Five rockshelters with evidence of human occupation were identified on the slopes, each with rockart and surface scatters of microliths, groundstone tools, and pottery. Test excavations were conducted to further discern the nature of the stratigraphy and occupations of these sites.

Jwalapuram Locality 11

The Jwalapuram Locality 11 rockshelter is formed by one of the largest boulders laying on the northern slope. Unfortunately, the rockshelter deposits on the eastern side of the boulder were extensively disturbed as a result of modern soil quarrying operations. Although the deposits were largely removed, remnant stratigraphic profiles were present and examination of crevices beneath the boulder faces indicated the possibility for archaeological deposits.

In one crevice along the southeastern face of the boulder archaeological material was eroding from a shallow deposit. The top layer (Level 1) was subdivided into three lateral units. In the western unit, disarticulated and highly fragmented human bones, probably from an adult, were recovered together with pottery sherds, lithic artifacts, and small pieces of ochre. Skeletal disarticulation and high bone fragmentation likely indicate secondary burial processes prior to the interment. The central unit of the top layer yielded a disturbed juvenile skeleton and pottery. The bones appear to be much less fragmentary than those of the adult, and these may have represented a nearly complete skeleton. The underlying unit consisted of a two-meter deep deposit with shallow, dark brown sandy sediment and numerous

Fig. 26. The quartzite boulder forming the rockshelter at Jwalapuram Locality 9. Note the large size of the boulder based on the individuals standing here. This rockshelter has rock art and stratified deposits, with an abundant microlithic assemblage, symbolic pieces, and fauna

quartzite rocks. The deposit contained potsherds, cattle bone and tooth fragments, and one large, pressure-flaked blade core of black chert. The vertebrate assemblage (n = 396) contains many reptile bones (perhaps from a single snake), and infrequent remains of domestic (two cattle teeth) and wild (10 hare remains and three langur remains) animals. A fair number of landsnails were also present (n = 95) as well as a single, freshwater bivalve. This deposit rested on top of quartzite spalls and a compact calcrete. A total of 96 ceramic sherds from Level 1 was studied, with more than a quarter of these badly abraded. Amongst the rest are a great many thin-walled, mainly hand-made, sherds that suggest paddle-and-anvil construction. Wheelmade or wheel-finished sherds account for only about 2% of the assemblage, which is otherwise similar to that from Jwalapuram 9 (see below), with a predominance of black-slipped and red-slipped burnished surfaces as well as grey-slipped and burnished sherds that suggest continuity from the earlier thick-walled Neolithic pots of this region. The burials are probably associated with the early/proto-Megalithic phase, perhaps from ca. 1200 BC and their presence suggests that other intact burials may be located in undisturbed crevices along the perimeter of the boulder. Disturbed limestone slabs along the boulder surfaces also indicate that other Megalithic burials may be present[5].

Jwalapuram Locality 12

Locality 12 is a large boulder providing shelter along its western side, where a relatively wide, flat terrace is present. A large crevice formed within the west face of the boulder, creating a cave-like structure approximately 1 m in height and 1 m in width and extending into the boulder for at least 10 m. The interior walls of the crevice were blackened by soot from fires. Apparent on the surface of the terrace and the hillslope was a moderate-density artifact scatter, consisting primarily of microliths with occasional finds of ground and battered stone. Several limestone slabs were in disturbed positions on the terrace surface, perhaps originally associated with Megalithic burials.

A single test unit was placed on the terrace in front of the crevice entrance during the 2003 season. Stratum A contained pottery, bladelets, flakes, as well as charcoal and shell fragments. Stratum B consisted of a large concentration of quartzite clasts whereas the lower half of the stratum contained larger boulders. Stratum B, which was devoid of ceramics, contained the majority of the stone tools, including microliths. Stratum C consisted of a calcium carbonate rich deposit, which also contained microliths, although the frequency of the artifacts was lower in comparison to the upper strata. Excavation was terminated at a depth of 1.1 m, though it is probable that the archaeological deposits extend deeper, as in Jwalapuram Locality 9. Human bone, consisting of three hand phalanges, and three possible arm bone fragments, were also recovered from Stratum B.

Only a very modest faunal assemblage (43 vertebrate remains and 85 mollusc shells) was recovered. In contrast to Jwalapuram 11, no remains of microvertebrates were found. Only 8 teeth could be more specifically identified; they come from small-sized ungulates (including sheep-goat-gazelle), medium-sized ungulates (including a deer), and porcupine. There is little basis for interpreting the taphomomic history of the assemblage. Some remains, in particular the land-snails, may have been introduced as burrow deaths. The freshwater molluscs and macrovertebrates were certainly introduced by other agents, of which humans seem most likely even though we have little direct evidence of their intervention. The taphonomic history of the human remains is equally unclear. Jwalapuram 12 contributes to the emerging pattern of an association between disarticulated human remains and rockshelters with rock art.

Jwalapuram Locality 9

Jwalapuram Locality 9 is a large rockshelter in a central and low-lying position along the hillslopes. A dense concentration of surface artifacts was present on the southern side of the boulder, extending more than 25 m from the shelter wall (Fig. 26). A block of 12 units was placed at the base of the rockshelter. Two of the units reached a depth of 3.15 m (Fig. 27), and seven distinct stratigraphic layers were identified. Stratum B contained two pit features with ceramics, whereas Strata C–F are pre-ceramic levels with abundant stone artifacts. A series of calibrated radiocarbon samples date the site from 34 kyr BP towards its base to 12 kyr BP in layers below ceramic-yielding horizons.

Feature B1 is a pit containing lithic and ceramic artifacts, and was filled with quartzite spalls and limestone slabs. Feature B2 was at the rear of the shelter and consisted of a pit that was filled with compact sandy-silt sediment. Feature B1 contained a moderate number of artifacts and the remains of what appears to be partly collapsed stone cairn structures, perhaps in association with human burials. Large pieces of burnt or mineralized human bone and ceramic sherds were found in close vertical and horizontal proximity to these stone structures. Feature B1 overlies B2 and the fill appears to be at least partly comprised of new and old artifacts and rubble that was perhaps obtained from the slope in front of the shelter.

More than 15,000 stone artifacts were recovered from the three deepest units. A total of 23 categories of artifacts are represented, including forms that result from distinctive kinds of flaking, breakage and heat damage. Artifact discard rates vary significantly over the depth of the site. A pronounced peak in stone artifact discard centered on around 150 cm depth in Stratum C, with some smaller subsidiary peaks on either side of the central one. The bottommost artifacts are found at a depth of 280 cm, around 35 cm above the base of the excavation. A smaller discard peak occurs beneath the main peak at around 210 cm depth in Stratum D, and another at around 50 cm depth in the rubble filled pit feature of Stratum B1 which appears to contain many old artifacts gathered up from the slope in front of the shelter. Artifact numbers in Feature B2 closely mirror those at equivalent depth in Stratum C.

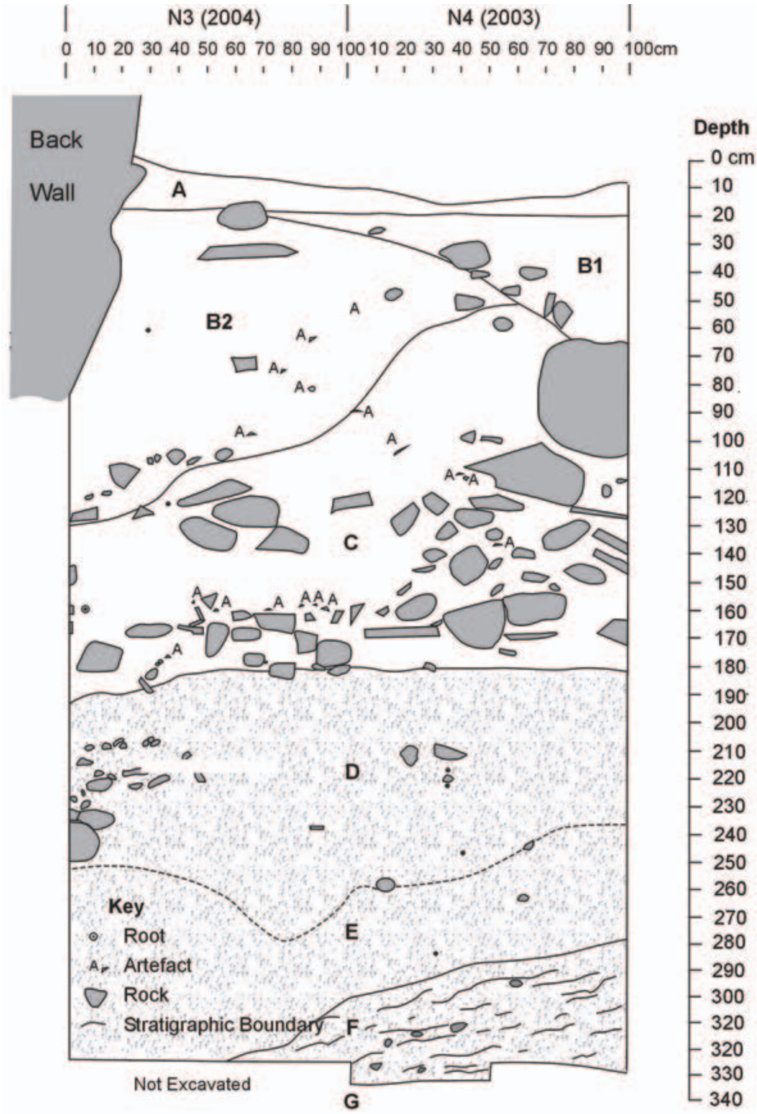

Fig. 27. Stratigrapy of Jwalapuram Locality 9. Note the burial pits at the top of the section. A stratigraphic hiatus occurs between Strata C and D

A series of broad technological/typological changes are noted to take place over the span of human occupation. There appear to be a series of shifts in emphasis on various technological procedures. Retouching is most prevalent in the earliest period of occupation, represented in sediments below 250 cm in depth, followed by a rapid decline with decreasing depth. Blades greater than 2 cm in length (as opposed to microblades defined as being shorter than 2 cm) also peak below 250 cm and decline in abundance fairly rapidly, though they continue to make up a small proportion of the assemblage throughout the rest of the deposit. Backing of small flakes to create symmetric and asymmetric forms makes its first appearance at a depth of around 240 cm, just above the decline in retouching and the decline in the frequency of larger blades. Backing remains at high frequency until just before the peak in artifact discard takes place between 130–180 cm as

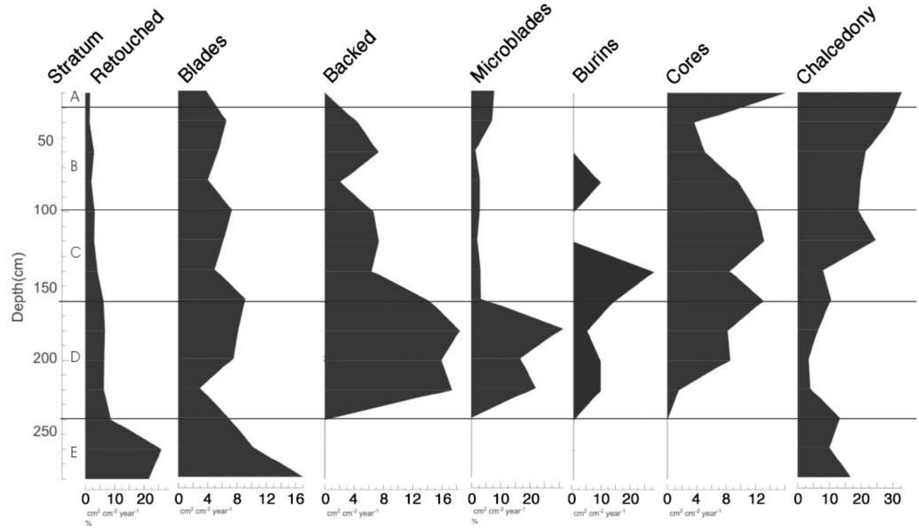

Fig. 28. Lithic technological changes, Jwalapuram Locality 9

shown in Figure 28. Microblades also make their first appearance at this time, and similarly persist at high frequencies until around the time total artifact discard rates peak. Burins make their first appearance alongside microblades, but peak later during the period of greatest artifact discard. This may simply be a byproduct of sample size effects, however, as commonly occurs when rare items are only found in larger assemblages. Cores of various kinds then rise to prominence once burins begin to decline. Finally, the use of high quality chalcedony rises to prominence in the last 150 cm, peaking in the last spit. Artifacts of worked bone, shell, and other materials were recovered throughout the Locality 9 deposit, including worked iron in the upper levels and a number of bone and shell beads associated with the microlithic artifacts.

Ceramics came only from the upper feature B1, which appears to have been a burial pit. A total of 983 sherds were recovered and examined. Most sherds are thin walled, and might have been made by paddle-and-anvil technique rather then the coil methods considered more typical of Neolithic ceramics. Among these a small percentage (6.5%) show evidence of rilling suggesting that they were made, or at least finished, on a wheel or turntable, a technique that came into use at the very end of the Southern Neolithic and the transition to the Megalithic period (Allchin, 1960; Boivin *et al.*, 2005; for dating, see Fuller *et al.*, 2007). There is a complete absence of Patpad Ware Neolithic types. This suggests a generally post-Neolithic date but perhaps earlier than the classic megalithic when wheel finished types would be expected to dominate. The profile of wares (Fig. 29) when compared to the Neolithic cave deposits indicates a difference in emphasis on burnished black-slipped types, which is more in keeping with an Iron Age date. A small number of red-slipped polished sherds are indicative of a Megalithic time horizon. A few recognizable forms are also of Iron Age types, including an open bowl form with inturn rim (Allchin, 1960, Form Class B2), and a narrow-neck evert rim jar (Allchin, 1960, Form Class B25). Both of these forms can be regarded as evolving from Neolithic antecedents (Form Classes A7 and A27, respectively) and to occur rather earlier than more elaborately rimmed jars and carinated bowls which are more typical of the Classic Megalthic period. Taken as a whole, and in contrast to open air classic megalithic sites, such as Mogasarayanigondi I (see below), this site can be suggested to date to the early part of the Iron Age, which in the Kurnool District can be suggested to start from ca. 1200 cal. BC (Fuller *et al.*, 2007: Fig. 6), continu-

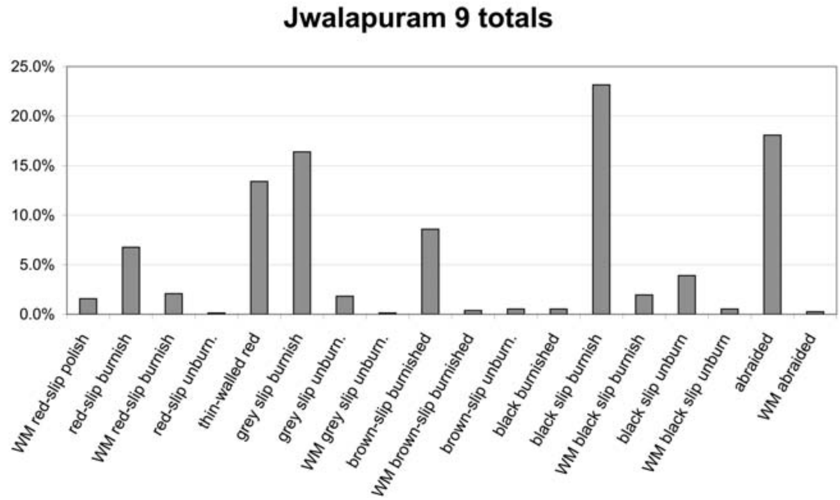

Fig. 29. Jwalapuram Locality 9 representation of ceramic wares based on total sherd counts. Smaller sherd fragments may overestimate the significance of a given ware. Sherds are dominated by slipped burnished types, mostly handmade but thin-walled. This coupled with the presence of small proportions of red-polished ware suggests a date towards the early 1st millennium BC and the transition from the Late Neolithic to the Iron Age

ing to perhaps the mid-first millennium BC. As such we might regard burials within these rock shelters as early "megaliths" that took advantage of naturally prominent stones as markers. That this site might have been visited over some period of time during the Megalithic period is suggested by an apparent trend in which wheelmade sherds are somewhat more frequent towards the surface.

Jwalapuram Locality 9 provides a relatively large faunal assemblage of 2732 non-human vertebrate remains and 1644 mollusc shells. To these totals we can add a further 24 fragmentary human remains. Of the 2669 macrovertebrate fragments present, only 8.6% were identifiable. At least 19 taxa are present, including the following: horse/ass (*Equus* sp.), buffalo (*Bubalus bubalus*), goat (*Capra hircus*), pig/boar (*Sus* sp.), nilgai (*Boselaphus tragocamelus*), blackbuck (*Antilope cervicapra*), gazelle (*Gazella gazella*), four-horned antelope (*Tetracerus quadricornis*), sambar (*Cervus unicolor*), chital (*Axis axis*), muntjac (*Muntiacus muntjak*), pangolin (*Manis gigantea*), jungle cat (*Felis chaus*), a dog/wolf/jackal (*Canis* sp.), mongoose (*Herpestes edwardsi*), black-naped hare (*Lepus nigricollis*), hedgehog (*Erinaceus* sp.), langur (*Presbytis entellus*), and porcupine (*Hystrix indica*). Many "identifiable" remains were only identifiable to body-size categories or to one of several genera (e.g. *Gazella/Tetracerus*). Confirmed remains of domestic animals (horse/ass, buffalo, buffalo/cattle, goat) were extremely rare and restricted to phases B1 and B2 (megalithic age). Remains of wild animals were present throughout the sequence. The small microvertebrate assemblage (NISP = 63) includes a diverse range of taxa including rodents, birds, reptiles, amphibians, and fish. Microvertebrates are rare throughout the sequence, never accounting for more than 3% of the assemblage.

The relatively large mollusc assemblage (n = 1306 shells) is in some ways more interesting than the vertebrates. First, they show that the collecting of molluscs, particularly freshwater bivalves (n = 381), was not a minor or incidental practice, but a systematically used strategy during all phases of site use. A significant decrease in bivalve size over time (between phases C and B2) may have been caused by sustained predation pressure (Fig. 30). Large landsnails (*Cryptozona* sp.) appear to have been collected and consumed during the earlier phases (D, C, and perhaps B2); they dropped out of the diet during the later phases of occupation. The smaller landsnails and the freshwater snails probably accumulated at the site during periods of less intensive human occupation – their frequency varies inversely with the frequency of

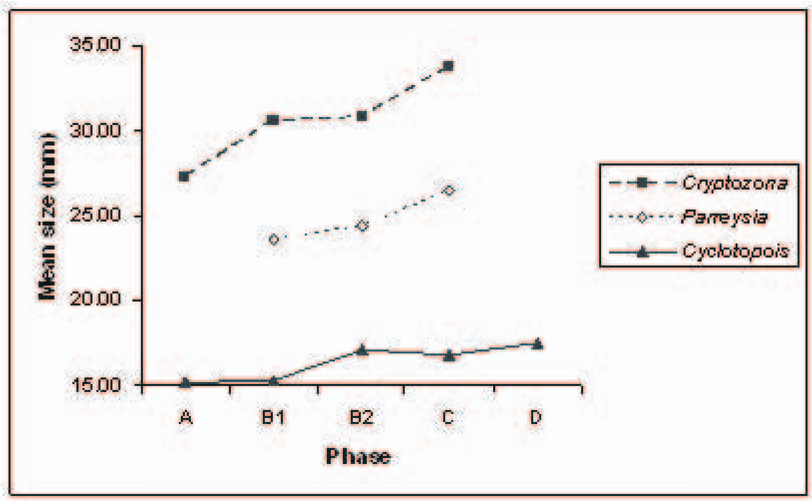

Fig. 30. Mean shell size in landsnails (*Cryptozona* sp., N = 30) and freshwater bivalves (*Parreysia* sp., N = 79, and *Cyclotopois* sp., N = 18) at Jwalapuram Locality 9

macrovertebrate remains; the intensity of human use of Jwalapuram 9 decreased between phase C and B2. Temporal shifts in the size of the landsnails (*Cryptozona* and *Cyclotopois*) are more difficult to interpret, but probably reflect as yet unknown environmental factors.

Fragmentary human remains are present throughout the sequence. The few burned cranial fragments and isolated teeth from phase C may have been scattered from a disturbed burial, or they may represent deliberate depositions/inclusions by people visiting the site. In the latter event, they might provide clues of ways in which people maintained/created links among different places, peoples, and events. Human remains from the megalithic use of the site are more complete than those from the earlier occupations and now include only postcranial remains and a few isolated teeth. Particularly significant is a concentration of fragmentary long bones from a single context in phase A; these remains may represent a secondary inhumation – "natural" megalithic burial.

Neolithic to Historic Era Localities

Substantial open-air habitations, burial features and historic structures are present in the Jurreru River Valley. Surface survey resulted in the identification of four large sites with pottery on surface (i.e., Pathapadu I and II, Mogasarayanigondi II, Deyyapu Gundu Habitation). The Pathapadu I locality was located near the classic Neolithic site (e.g., Allchin, 1962; Sarma, 1968). Pathapadu II occurred at the base of the southern hillsopes and was notable for its scatter of pottery and chipped stone artifacts. The site occurs below a distinctive limestone outcrop, and it appears that some of the chipped stone artifacts were produced from the same material[6]. The surface collections from Mogasarayanigondi II were limited and derived from a location where recently upturned soils produced a small number of potsherds, bone fragments, and chipped stone artifacts. The Deyyapu Gundu habitation site appeared to be recently plowed, and consisted of a dense concentration of artifacts, including large potsherds and chipped and ground stone artifacts. Several megalithic structures were found near the Deyyapu Gundu habitation site, consistent with the Iron Age sherds identified on-site. Later occupation in the Early Historic period is indicated by ceramics and a diagnostic coin. With the exception of the Deyyapu Gundu site, each of the sites was tested for subsurface remains. Two exploratory units were placed in each of the three sites, but none of the explorations produced intact deposits. Strati-

Fig. 31. Mogasarayanigondi I dolmen on the hillcrest. This dolmen is accompanied by many others on this hillcrest and along the northern slopes of the valley. The large upright limestone slabs were obtained from the surrounding hillslopes. These dolmens and other megalithic structures are being actively looted. Skeletal remains, pottery and other artifacts are commonly found in spoil piles

graphic profiles indicated that the archaeological deposits were primarily confined to the uppermost black clays, which have been subsequently tilled. Modern expansion of agricultural fields and construction of irrigation canals at Pathapadu I apparently destroyed the habitation mound that was reported by earlier investigators.

The Jurreru River Valley and its environs contain a large number of megalithic burial structures (e.g., Mogasarayanigondi I, Deyyapu Gundu habitation, Jwalapuram Locality 14). Although particular locations have been recognized, the megalithic structures form an aerially extensive landscape and occur along many of the hillslopes on the north side of the valley. Mogasarayanigondi I is a concentration of at least 25 dolmens on a small hillcrest (Fig. 31). The dolmens are of different sizes, though many are rectangular in shape and contain slabs in an upright position. The limestone that outcrops on-site appears to be the material used for dolmen construction. The surrounding agricultural fields contain a few examples of the more substantial cairns and cists, but the great majority of these structures appear to have been disassembled by farmers. Prior looting of the dolmens has revealed fragmentary skeletal elements, cremated human remains interred in ceramic wares, and burial goods such as Iron Age ceramic pots, jars, and bowls and copper rings. Cleaning of the spoil piles of one of the looted dolmens revealed the presence of multiple ceramic wares in undisturbed deposits. These consisted of slipped black and red finished types, either burnished or polished to high shine, inclu-

Fig. 32. Construction of modern Hindu shrine at the rockshelter of Katavani Kunta 7. This shrine is an example of the modern use of rockshelters by devotees

ding many of the black and red ware bowls with carinated profiles and elaborately rimmed jar sherds that are typically associated with the South India megalithic (cf. Wheeler, 1948). The predominance of these classic megalithic types associated with typical cist burials suggests that Mogasarayanigondi I is a Classic Megalithic cemetery from the latter half of the first millennium BC and presumably later than the burials in the rockshelters (Jwalapuram Localities 9 and 11).

A large number of intact cairns and cists occur below the rockshelters (i.e., between Jwalapuram Localities 11 and 16). The megalithic structures are hidden from view as they are in acacia-dominated landscapes and on hillslopes that are currently unproductive for farming. Jwalapuram Locality 25 is one location where modern soil quarrying occurred, thereby destroying a couple of structures that contained Iron Age ceramics. The rubble forming the cairns are made from the local quartzite cobbles and boulders whereas the upright burial chambers are made from local limestone slabs.

The Jurreru River Valley and surrounding areas contain evidence for Medieval and Historic period structures, including nearby 12th century temple structures and the 17th century fort at Banaganapalle. The temple at Yaganti is a Saivite temple known as the Sri Yaganteshwara Swamy Temple or Temple of Uma Maheshwar. It was built in the 15th century by the first Vijayanagara kings, and is associated with a natural spring and number of notable natural limestone caves, all of which have been incorporated into the temple complex. The presence of the spring and caves suggests that the locality likely had a sacred significance prior to the building of the current temple. The temple at Yaganti is a place of pilgrimage, with pilgrims passing through the Katavani Kunta Valley (traditionally on foot) when travelling from the Sri Maddileti Narasimha Swamy Temple in Rangapuram village, south of Bethamcherla. The latter is apparently a Vaishnavite temple, and abundant Vaishnavite *namalu* symbols mark several large boulders in the Katavani Kunta Valley, above the Yaganti temple complex. Both Vaishnavite and Saivite imagery is found within the Yaganti temple complex, relating to attempts to reconcile the rival sects during the Medieval period. The hillslopes on the eastern side of the Yaganti temple contain many rockshelters formed by large quartzite boulders. Survey of some of the boulders indicated that the shelters have been used for religious purposes, as indicated by painting of Hindu symbols on shelter walls and by construction of small shrines (Yaganti 4, Katavani Kunta 7) (Fig. 32). Archaeological deposits older than the temple complex are present within the shelters, as shown by microlithic industries in rockshelters (e.g., Katavani Kunta 1) and by megalithic structures in other sites (e.g., Yaganti Locality 3).

ROCK ART AND ROCKSHELTER LOCALES AND LANDSCAPES

A total of 50 rock art sites were located during two seasons of survey. The rock art sites form a significant feature of the archaeological landscape of the Kurnool District, but have not been traditionally reported by archaeologists working in the region. Based on the presence of thousands of unsurveyed boulders in the region, it is probable that there are many hundreds of rockshelters with rock art still to be found. With the exception of a single limestone rockshelter (MCG IV), all rock art is only known from the walls of quartzite boulders. Forty of the fifty rock art sites were closely inspected and recorded at Jwalapuram, Yaganti and Katavani Kunta. While most of the sites bear solitary images or assemblages of individual images, one of the rock art sites is composed of a spectacular panel (Fig. 33).

A total of 27 of the 40 rock art sites have images in red ochre (ferric oxide) pigment. Of these 27 sites, nine also have depictions in white pigment (kaolin and/or lime), and of these nine bichrome sites, two also have black (charcoal) pigment in addition to the red and white. Three shelters have red or yellow ochre depictions. The other 13 sites can be differentiated as relatively recent and/or contemporary Hindu sites in the Katavani Kunta Valley, many apparently related to the activities of pilgrims traveling a pilgrimage route between two temples. The 13 Hindu sites primarily include depictions in white of religious symbols, and these show a significant degree of super-positioning, with pilgrims continuing to paint symbols on the rock surfaces up to the present day.

The 27 rockshelters bearing red images contain in total up to 400 identifiable paintings on the shelter walls. The number of paintings ranges from only one identifiable painting in several rockshelters to a maximum of 79 paintings in a single shelter. A total of 10 of the 27 shelters have super-positioning, but usually only one or two figures have been added over previously painted images. Many of the paintings are isolated and the lack of composite imagery seems deliberate. Of the 27 sites with red images, 13 contain archaeological remains, including four shelters with microlithic artifacts, two shelters with potsherds, five shelters with both microlithic artifacts and potsherds, and one with a megalithic cist.

The 400 paintings, most of which are solid or outlined red, include anthropomorphic figures (often shown in profile with a bent leg and raised arm) (Fig. 34), lizard-like therianthropes (surreal creatures comprising both animal and human features), animals (e.g., deer, goats, boars, monitor lizards, carnivores, an elephant, a cow, a snake, fish), geometric figures (e.g., V-shapes, sets of concentric circles, zigzags, sets of dots, Vishnu symbols), hands, handprints, pairs of feet, and containers. Although scenes are generally rare, one spectacular panel occurs at Katavani Kunta 3, drawing together a variety of anthropomorphic figures, animals (fish, snake), lizard-like therianthropes, and geometrics. The fish depictions (together with freshwater shellfish in archaeological deposits) occur in an environment that is presently dry, perhaps indicating a change in environment. Several pot-like containers are drawn at Katavani Kunta 4 – if these are indeed pots, they represent artifacts that are rarely depicted in global rock art.

Though the rock art is difficult to date, it appears likely that the images have been produced

Fig. 33. Rock art panel at Katavani Kunta Locality 3. The rock art is made with red ochre pigment. This panel consists of anthropomorphic figures, therianthropes, and various animals

over a substantial period of time. Test excavations underneath the painted shelter at Jwalapuram Locality 9 revealed more than three metres of deposits, the overwhelming majority of which were aceramic and dominated by microlithic assemblages with calibrated radiocarbon dates from 12–34 kyr BP. Other rockshelters with rock art feature significant microlithic scatters, suggesting that testing of these other shelters might yield similar findings. It is likely that the shelters where rock art is found were in use for a long period of time, and it is possible that some portion of the rock art is pre-ceramic. It is, of course, important to bear in mind that 'tribal' groups living a foraging lifestyle have long inhabited the more remote areas of Andhra Pradesh, and that some of the microlithic levels might well be historical in date (or indeed Neolithic or Iron Age).

It is clear that the Hindu religious symbols are less than ca. 2,000 years old (the beginning of the 'modern' Hindu religion), and many are almost certainly less than 500 years old (based on our understanding of the age of the Yaganti temple). Such rock art is generally distinguishable not only by its content but also the pigments used to create it, which are generally thick, white and well-preserved, or artificial. White depictions have been reported inside dolmens, hence some may be as old as the Iron Age (K. Rajan, personal comm., 2005). Ethnographic enquiries also indicate that the white depictions are still being produced today. The vast majority of this later and contemporary rock art relates to Hindu religious practices, and includes marks made during *puja* (worship) and, in the Katavani Kunta Valley, marks made by passing pilgrims.

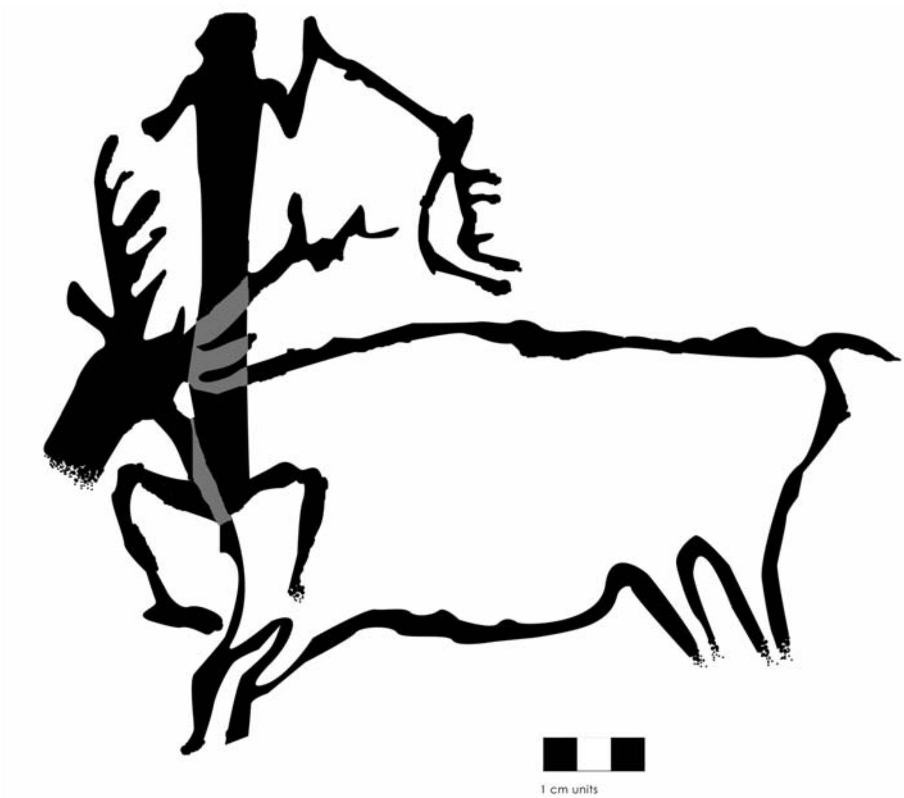

Fig. 34. Example of rock art image, anthropomorph over deer at Katavani Kunta Locality 1

DISCUSSION

The Kurnool District contains a range of archaeological sites that provide an opportunity to obtain new information about the history of human activities in southern India. The two seasons of exploratory research represent a relatively small effort compared to the large archaeological potential of the region. Nevertheless, our recent work provides some insights into regional prehistory that will form the basis of more detailed study in the near future. The following discussion presents some working hypotheses based on current information to date.

The most ancient deposits with archaeological associations are seen at the Jwalapuram Tank. The Large Cutting Tools found at this locality are typical components of the Acheulean technocomplex, which is found in other basins across southern India (e.g., Paddayya, 1982; Raju, 1988; Pappu and Deo, 1994; Petraglia, 1998, 2006; Korisettar, 2007). The selection and use of quartzite and limestone for stone tool manufacture complements findings in nearby areas. These raw materials were procured in the site vicinity, from readily available clasts, such as gravels or weathering outcrops. The tools are of various types, sizes, and shapes. The LCTs of Jwalapuram Tank have not been transported from their original contexts and occur along paleofans at the base of hillslopes and in palludal contexts. Their shallow burial and localized reworking, however, preclude behavioral interpretation from a spatial perspective. Based on the presence of long sedimentary profiles in the Jurreru River Valley (e.g., at the Jwalapuram Dry Well), it is probable that Acheulean assemblages are also deeply buried underneath alluvium.

The identification of well-preserved tephra deposits in the Kurnool District is of major significance to our potential understanding of regional environmental changes and its impact on hominin populations. Although tephra deposits have previously been found in the subcontinent (e.g., Acharyya and Basu, 1993; Williams and Clarke, 1995), their association with archaeological materials has remained controversial (e.g., Mishra and Rajaguru, 1994, 1996; Jones, 2007). The depositional position of the tephra in the Jurreru River Valley, together with new chronometric and geochemical evidence, indicates that the ash is a product of the 74,000 year old YTT event (Petraglia *et al.*, 2007). The recovery of Middle Paleolithic assemblages in dated deposits below and above the ash provides the first firm archaeological association, helping to resolve some of the uncertainty about archaeological associations in India. The recovery of Middle Paleolithic industries without major technological changes after the ashfall, indicate that populations survived the super-eruption. We have suggested, based on a variety of datasets, that modern humans were present in the Indian subcontinent before the super-eruption, and that these populations survived this event (Petraglia *et al.*, 2007). This is not to suggest that there were not effects on environments and populations as a result of the Toba super-eruption, however; in fact, field observations indicate that the tephra marks some changes in the immediate site environment. We have argued that the ponded environments that existed prior to the ashfall were no longer present after the event. Indeed, the deposition of thick ash units in the central valley would have clogged river channels and polluted fresh water sources. Hence, it is probable that landscape alterations would have presented adaptive difficulties for human populations, as plant and animal communities would have been negatively impacted by geomorphic changes in the valley. Alterations in tool type frequencies and changes in raw materials may be signs of some adaptive differences in pre- and post-Toba situations.

The Middle Paleolithic is well represented in the Jurreru River Valley. Locality 3 has yielded well-dated Middle Paleolithic assemblages, beneath and above the ash, at 77 and 74 kyr BP, respectively. The Locality 3 assemblage consists of 323 artifacts, where 215 were recovered from beneath the ash and 108 from above the ash. Locality 21, which has been dated to ca. 38 kyr BP, consists of 176 artifacts, with the majority (n = 82) concentrated in the upper 20 cm. Excavations at Locality 17, the most northern excavated ash site, produced a small assemblage of 37 artifacts. A total of 575 artifacts were recovered from several excavations at Locality 20 and the majority of these are from the southern core area (n = 430) with relatively few from the northern core (n = 50) and southern foothills (n = 95).

Considering all cores recovered from excavations at localities 3, 17, 21 and 20 (excluding the foothills assemblage), multiplatform cores are the most common (n = 22), followed by single platform cores (n = 18), bidirectional cores (n = 4), bipolar cores (n = 2), unidirectional cores (n = 1) and microblade cores (n = 1). Levallois and blade cores are absent. Platform preparation is present in the form of overhang removal and faceting, where the former is considerably more common. The cores show 32% overhang removal, 6% faceting, 13% a combination of overhang removal and faceting and 49% of cores show no preparation. Flakes preserve evidence of preparation; 33% exhibit overhang removal, 5% are faceted, 1% show both and 61% show none. Blades are present but rare, comprising 2.1% of all artifacts compared to 7.2% at Locality 9. Microliths are even rarer, making up 0.9% of all artifacts, compared to 5% at Locality 9 (n = 64, of which 44 are backed). No retouched microliths are encountered in the Middle Paleolithic assemblages. Burins are also rare, making up 0.3% of all artifacts, compared to 1.1% at Locality 9. However, several different types of retouched flakes form a significant part of the Middle Paleolithic assemblage, classified according to the location of retouch. Retouch is characteristically informal and unstandardized. Of all Middle Paleolithic artifacts excavated, 15.4% are retouched flakes (n = 129, of which n = 27 are notched). Side retouched flakes are the most common form, making up 4.3% of all artifacts. These are followed by side and end retouched flakes (2.8%), double side and end retouched flakes (2.5%), end retouched flakes (2.2%) and double side retouched flakes (1.9%). Other forms of retouched flakes only constitute a small proportion.

Two other characteristics of the Middle Paleolithic of the valley are important to note. A piece of red-ochre which shows signs of use was recovered during excavations below the ash at Locality 3. Second, retouched tabular pieces make up 15.2% of all artifacts and are found almost exclusively at Locality 20. They occur in the lower, middle and upper levels of the excavated deposits and therefore represent a tradition that persisted for some time. The predominance of this type at Locality 20, where sources of limestone from which they are made are abundant, suggests a “least-cost” or opportunistic behavior: retouching small tabular pieces for the purpose of obtaining a suitable cutting or scraping edge is less labor-intensive than producing flakes for retouch via core preparation and reduction. The fact that these types persist throughout the depth of the Locality 20 deposits, and that this behavior was therefore not temporally isolated, is particularly interesting.

The Middle Paleolithic of the Jwalapuram valley consists of core-flake technologies with atypical scrapers as well as notched flakes forming the majority of retouched types. Burins are rare, as are blades and microliths. Bipolar technologies exist but again, these are uncommon. In contrast, the archaeological deposits of Locality 9 show a notable increase in microblade cores, blades (and the appearance of blade cores), microliths (and microblades) and the first occurrence of backed varieties of these. Consequently, the frequency of retouched flakes declined (comprising only 2% of the Locality 9 assemblage, in contrast to 15% for the Middle Paleolithic) as backing became more commonplace.

Though the Kurnool District is famous for its Upper Paleolithic assemblages, it remains difficult, based on our current research, to verify the existence of classic tool types normally associated with such an industry, such as prismatic blade cores, laminar blades, blade tools (e.g., burins, endscrapers) and worked bones. Our limited test excavations in MCG and Chapter House North Cave produced low artifact counts, mostly flakes and chips with rare finds of blades, though Murty (1974) indicated that blades were plentiful in the stone tool assemblages (41%), and Thimma Reddy (1977), on the other hand, indicated that blades were rare (12%). With respect to the presence of blade industries, the only observation that we can make is that Jwalapuram Locality 9 has yielded a higher frequency of laminar items (>2 cm) at the base of the 3 m section, datable to 34,000 calibrated radiocarbon years and older. While it is probable that the caves contain blades of Late Pleistocene age, larger samples sizes and radiometric dates are needed to determine how these cave industries fit into an overall technological sequence. Moreover, though many of the previously identified worked bones may be the result of animal contributions, the range of fauna in the caves is important for Indian prehistory, as firm evidence for Late Pleistocene faunal assemblages has been lacking.

Localities with microlithic industries form the most abundant sources of archaeological evidence in the region. Current research indicates that microliths are certainly associated with ceramic assemblages (e.g., Jwalapuram Locality 9, Sanyasula Gavi, Caves 1 and 2), though we have observed that core types in later industries can be characterized as fluted cores. Microlithic industries, however, pre-date ceramics, extending into the Early Holocene and Late Pleistocene. Abundant microlithic evidence was derived from the stratified deposits of Jwalapuram Locality 9, one of the best stratified microlithic sites in India. AMS dating of microlithic levels indicates a calibrated age range from 12 to 34 kyr BP. The age of Jwalpuram 9 is therefore comparable to the Sri Lankan caves where microliths range from the Late Holocene to 28.5 kyr BP (Deraniyagala, 1992). Microlithic assemblages at Jwalapuram 9 are associated with decorative pieces, such as beads and worked bones, including harpoon and possible awl fragments. Though no dates are currently available for the prolific rockart at Jwalapuram 9 and other rockshelters, it is possible that some of the paintings extend into the Late Pleistocene. The recovery of human cranial remains, associated with a calibrated radiocarbon date of between 12 and 14 kyr at Jwalapuram 9, is intriguing, suggesting the potential for hominin remains from rockshelters and caves. The thickness of the cranial remains may indicate the presence of humans with robust skeletons, comparable to those of the Early Holocene in the Ganga Plain (Lukacs, 2007).

With respect to diet, a range of terrestrial and aquatic fauna was utilized. The relatively large mollusc assemblage, particularly freshwater bivalves, indicates that collection of these resources was not a minor practice, but a systematic strategy during all phases of site use. There is a significant decrease in bivalve size over time, perhaps associated with sustained predation pressure.

Contemporary with open-air settlements from the Neolithic to the Early Historic, the caves (Chapter House North Cave, Sanyasula Gavi, Caves 1 and 2) and rockshelters (Jwalapuram Localites 9, 12) show evidence for human activity. Patpad Neolithic potsherds, microliths and charcoal-bearing levels were present in Chapter House North Cave and the two Sanyasula Caves. A quern at Sanyasula Cave 1, an ash bed in Cave 2, and radiocarbon ages on domesticated mungbean and wild seeds between of 3,995 to 1487 BP indicate plant processing and burning activities in the Holocene. Of interest is the fact that the earliest dates associated with Neolithic deposits in these caves, including the direct AMS date on mungbean from Sanyasula caves (ca. 1900–1800 BC), predate the established Neolithic open air villages in the Kunderu river valley to the east by at least one or two centuries (cf. Fuller *et al.*, 2007). This may suggest that the Neolithic occupations at these caves are important for understanding the process of Neolithization in this region. Previously, it was proposed that the Neolithic in Kurnool District might be seen in terms of a "static frontier" model in which local hunter-gatherers adopted food production from their established Neolithic neighbors to the west (Fuller *et al.*, 2001b; Fuller, 2006: 53). We might now consider whether the occupants of the caves in the Erramalai Hills were at the forefront of interactions with the Neolithic to the west or could have been "pioneer" farmers who moved into the area from the west, with an initial shift to an increased reliance on gathered and hunted resources. In either case, the occupations at these caves continued through the establishment of open air agricultural settlement further east, characterized by Patpad Ware from ca. 1700 cal. BC.

Much of the Holocene fauna from the caves also appears to have been hunted, despite the presence of some livestock. Taken together, such evidence indicates the use of caves and rockshelters by foragers who were conducting activities in highlands, some distance from settled villages. Historical and ethnographic information indicates that foragers were increasingly circumscribed from the Neolithic onwards, but that they were in exchange with settled populations for long periods of time (Murty, 1981, 1985; Morrison, 2007). Rock walls at the entrances of caves (e.g., Jinu's Ladder) may indicate the use of the Kurnool caves by hunter-gatherers, who have been observed to block off the entrances of caves for porcupine hunting and trapping (Murty, 1974, 1985). We suggest that mobile hunter-gatherers, in contact with settled communities, used these caves based upon the presence of ceramic sherds (representing only a few vessels), the absence of other artifacts typical of agricultural communities, the sporadic nature of site use (including depositional hiatuses between strata), and the distant location of the caves from lowland settlements. Based upon our results, we have modelled this situation, indicating the movement of peoples from lowland to highland contexts (Fig. 35). In addition to the possibility for foragers, it is clear that the caves and rockshelters have been used by religious figures. Modern habitation is present in the Sanyasula Caves, where hearths and limestone chipping was documented. Indeed, the marking of rockshelters with Hindu symbols is a tradition that probably extends back many hundreds of years, especially in the rockshelters near Yaganti Temple.

In closing, it is incumbent upon us to report that many of the archaeological sites in the Kurnool District are being entirely obliterated or seriously impacted by modern economic development. Dam and irrigation canal projects, intensified agricultural expansion, commercial quarry operations, and site looting are all actively contributing to the alteration and destruction of archaeological sites and the wider landscape. To make matters worse, no heritage management study has been conducted to catalogue and document the range of the region's archaeological sites. In just several years of working in the Kurnool District, we have witnessed the destruction of a number of significant archaeological sites, and have noted that many more are under threat. Commercial limestone quarrying threatens the Billasurgam caves, and soil mining has already destroyed some rockshelters, such as Jwalapuram Locality 11. Agricultural activities appear to have obliterated the famous Pathapadu Neolithic site and its habitation mound. Construction of rice paddy fields has completely erased some of

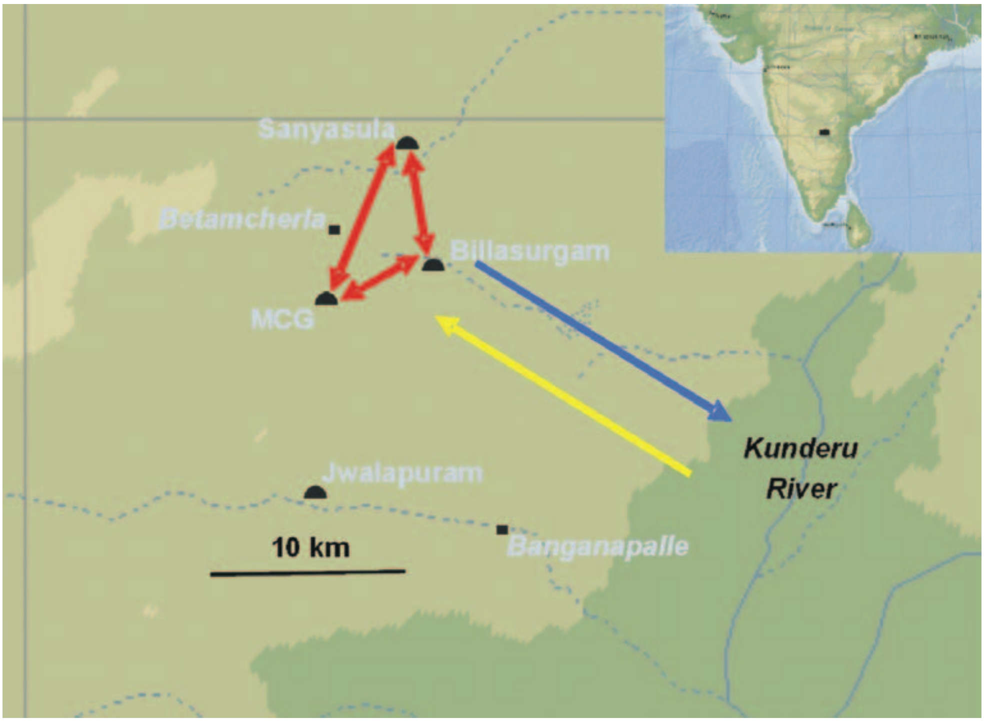

Fig. 35. Hypothetical foraging range of hunter-gatherers in the Kurnool District. Arrows depict foragers moving among the caves in uplands. Other arrows represent transfers between foragers and agropastoralists settled along the Kunderu river

our newly recorded archaeological sites in the Jurreru River Valley. Road construction, agricultural field development, and looting have contributed to the destruction of megalithic structures and even entire Megalithic cemeteries. In an attempt to combat this adverse situation, we have initiated a public outreach and education program that aims to raise awareness concerning the region's archaeological record. We have held discussions with village headmen, villagers, and school children, highlighting the region's rich cultural heritage. We have begun to conduct interviews with local and regional newspapers and we have developed a brochure (in English and Telugu) addressing the archaeology of the local area. In light of the reality of the rapid pace of economic development, and the lack of implementation and enforcement of cultural resource regulations, it is apparent that public outreach and education is a way to help protect the region's rich cultural heritage.

Notes

1. We conducted limited survey in a tunnel-like passage inside Purgatory Cave. The passage was narrow (1–2 m in width, 1 m in height) though long (extending for >0.5 km), requiring crawling in places. A few artifacts (i.e., a hammerstone, historic period ceramics) and fresh bone were collected on the surface of the floor.

2. The authors of the publication reported finding cranial and dental fragments of a "hominid" in the cave excavations. No age was indicated for these human remains. Our inspection of the Mogasarayanigondi cave and nearby ones indicated that they were unlikely living areas as they were very high up from the valley floor and the caves themselves were small open joints in the limestone. Given that Iron Age burials are common on the valley floor, we suspect that the "hominid" bones are not ancient, and probably date to the Holocene.

3. Survey of the area did not identify the Pathapadu habitation or any associated features. Neolithic artifacts were spread across agricultural fields in the vicinity of the site, but no intact deposits were identified

through testing. It appears that modern agricultural activities led to site destruction.

4. Retouched tabular pieces consist of flat and angular pieces of weathered limestone derived from the bedrock found on the hillslope. The tabular pieces often display cortex and patination on their surfaces. Relatively fresh flake scars along the perimeter are often easily discernable.

5. The limestone slabs were in a disturbed position, lying on the surface, as was also the case in Jwalapuram Locality 12. Intact megalithic cists on the slopes often contain upright limestone slabs, often placed in a parallel or rectangular pattern. The Yaganti Locality 3 rockshelter contains an intact megalithic limestone cist.

6. This is the same limestone bedrock unit that occurs to the west, as documented at Jwalapuram Locality 20.

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