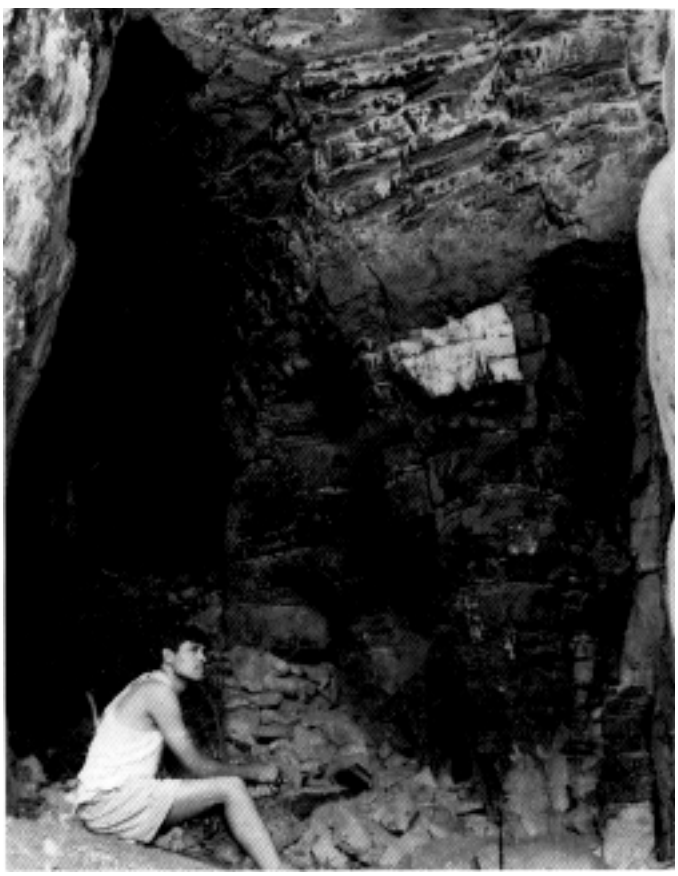
JOURNAL OF CAVE AND KARST STUDIES

April 1996
Volume 58 Number 1
ISSN 0146-9517

The
National
Speleological
Society
Bulletin



THIS ISSUE:

Journal of Caves and Karst Studies

Volume 58 Number 1 April 1996

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The *Journal of Caves and Karst Studies*, formerly *The NSS Bulletin*, (ISSN 0146-9517) is published three times a year by the National Speleological Society, 2813 Cave Avenue, Huntsville, Alabama 35810-4431. The annual subscription fee, worldwide, by surface mail, is $18 US. Airmail delivery outside the United States of both the *NSS News* and the *Journal of Caves and Karst Studies* is available for an additonal fee of $40 (total $55); The *Journal of Caves and Karst Studies* is not available alone by airmail. POSTMASTER: send address changes to the *Journal of Caves and Karst Studies*, 2813 Cave Avenue, Huntsville, Alabama 35810-4431.

Cover: Yerrazari Gavi (left) and Sanyasula Gavi (right). See Prasad, page 30.

PLEISTOCENE CAVE FAUNA FROM PENINSULAR INDIA

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More than one hundred caves are carved out in Precambrian limestones in various parts of Peninsular India. The Kurnool Caves, a grouping of caves near Betamcherla, Andhra Pradesh are significant because they contain teeth and artifacts of early man. Systematic excavations revealed a rich fossil assemblage that has a bearing on past climate, environment, ecology, and migratory patterns of some of the mammalian groups. The existence of thick caves sediments and ideally situated rock shelters, which are three to four meters above ground level, suggest that detailed excavation is likely to yield fossil remains of early man.

In recent years, fossil hominids associated with artifacts in Pleistocene caves led to a marked increase in our knowledge and understanding of the evolution of hominids. Quaternary cave deposits containing Paleolithic tools associated with bone implements are known from many Pleistocene caves in Peninsular India. There are more than one hundred caves in the Tungabhadra River Valley, south of Kurnool in Andhra Pradesh, Peninsular India (Fig. 1). The Kurnool Caves, including the Billasurgam Caves (Fig. 2), are 4.5 km southeast of Betamcherla, a small mining town near Kurnool. These caves have attracted the attention of karst geologists and archeologists since their discovery by Newbold (1844).

Access to the Kurnool Caves is difficult due to the dissected terrain, rubble, and vegetation overgrowth. Other caves, such as Yaganti, Yerrazari Gabbi (Fig. 3), and the most famous cave in this region, Sanyasuli Gavi (Fig. 4), lie close to Billasurgam (Gabbi and Gavi, in vernacular, both mean cave). These caves were explored by Bruce Foote, of the Geological Survey of India, and his son, Henry Foote, in 1884. They gave special names to these caves such as Charnel House Cave, Cathedral Cave, and Purgatory Cave.

One of the early attempts to explore the caves by Prasad and Verma (1969) resulted in the collection of a large number of fossil samples of mammalian, reptilian, and avian groups. Murthy (1974, 1975) explored some of the Kurnool Caves, including Muchchatla and Chintamani Gavi, and brought out significant material. The mammalian material collected by Murthy was examined by Prasad in 1974 and a checklist was prepared for evaluation of the different groups. Besides the fauna, cave sites yielded a number of artifacts of prehistoric man (Badam, 1979).

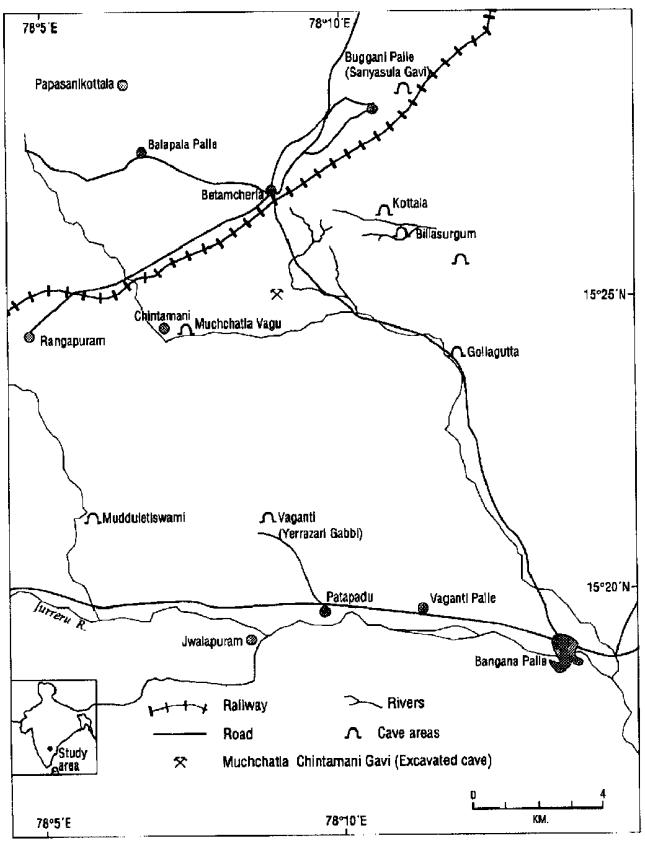

Figure 1. Map showing cave areas around Betamcherla, Kurnool District, Andhra Pradesh, S. India.

GEOLOGICAL SETTING

The caves are in the Precambrian Narji Limestones and belong to the Jammalamadugu Group of the Kurnool Supergroup. The limestones are bluish gray, fine-grained, and well-bedded. The underlying Cuddapah Supergroup also crops out near Betamcherla. It is overlain by sandstones, quartzite, and conglomerates of the Banganapalli Group, which is overlain by the Narji Limestone. The Auk Shale overlies the Narji Limestone (Table 1).

ORIGIN OF LIMESTONE CAVERNS

The caves formed by the dissolution and corrosion of subsurface and surface water above the water table. The galleries

Figure 2. A Billasurgam Cave.

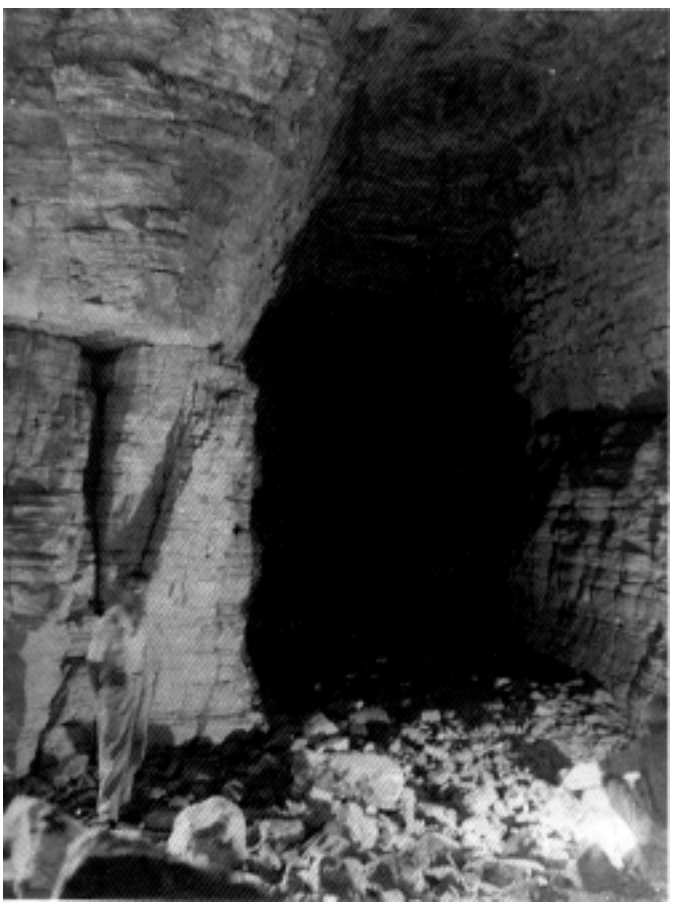

Figure 3. Yerrazari Gavi.

of the caverns developed successively at different levels. The highest passages formed by graded water table streams, which widened by lateral erosion. The several caves studied are located in steep hill slopes ~21 m above the valley floors. If the caves were coeval and dissolved by streams, it would be possible to estimate downcutting rates by streams in various caves.

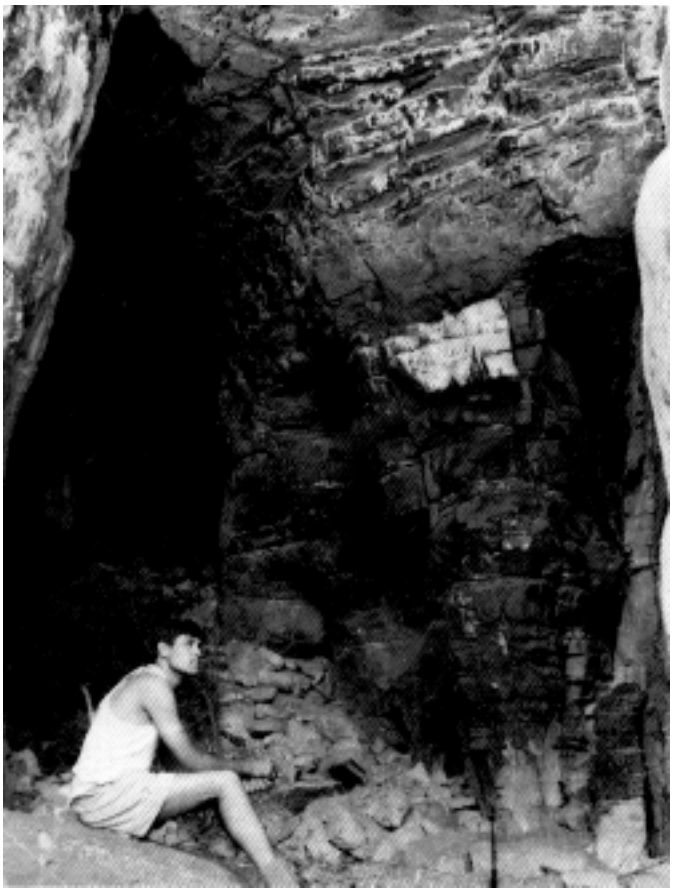

Figure 4. Sanyasula Gavi.

Table 1.

THE KURNOOL SYSTEM

Groups	**Formations**
Kundair	Nandyal Shales
	Koilkuntla Limestone
Paniam	Pinnacled Quartzite
Jammalamadugu	Auk Shale
	Narji Limestone
Banganapalli	Banganapalli Sandstone

ENVIRONMENT

The caves are located in limestone escarpments. Passages as low as a meter in height extend deep into the limestone. The floors are characterized by thick sediments of clays, stalagmites, stalactites, and cemented limestone blocks forming breccias. The plateau and hill slopes have a grass and xerophytic cover of deciduous type representing a semi-arid environment. Modern fauna are confined to animals such as *Hystrix*, *Vivvera*, *Lepus*, *Felis*, and *Manis*.

Fossil Remains of the Kurnool Caves

Foote's (1884) excavations in the Billasurgam Caves yielded 4000 dental and osteological remains of late Pleistocene age. These fossil elements were grouped under mammals, aves, amphibians, and reptiles. In addition, the cultural material recovered, including awls, barbed arrowheads, spears, and scrapers, were assigned by Foote to *Homo sapiens*. The artifacts confirmed the presence of man in these caves. The fossils also threw light on the former geographical distribution of some fauna presently in the Ethiopian region of Africa that no longer exist in this region. The caves lack ash, charcoal, and bone fragments (food refuse) and appear to have been temporary abodes. Deep trenches were required to recover samples, which were emplaced in the stalagmatic floors.

Table 2 provides the stratigraphic sections described from two of the Kurnool Caves, identified by Lydekker (1886) and Prasad and Yadagiri (1986).

Table 2.

Charnel House Cave		**Cathedral Cave**	
AI:	surface beds	C:	surface bed
A:	rubble (human dentition)	C:	gray sandy bed (stalagmite)
B&C:	red clay, sandy	Ca:	reddish cave sands
D,E,F&G:	rubble	Cb:	red clay
H:	reddish cave earth	Cc:	stiff red clay
I:	mottled cave earth	Cd:	reddish clay
J:	brown clay	Ce,Cf&Cg:	marl, dark
K&L	red sands, limestones (implements)	Ch:	loamy marl
M,N,O,P:	stiff marly clay	Ci&Cj:	gray marl

In addition to mammalian remains, the Kurnool Caves yielded late Pleistocene bone tools, flakes, and scrapers. Carbon-14 (C^{14}) dates have established an age of 50,000 years BP for the artifacts. Radiometric dating was carried out at the Physical Research Laboratory, Ahmedabad, in 1979 and subsequent years. Stone Age Man has left his relics in the form of lithic and bone tools. Mammals, such as *Equus*, *Rhinoceros*, *Sus*, and the Catarrhine monkeys *Presbyti*s, *Papio*, and *Procynocephalus*, had wide distribution in Siwaliks and Peninsular India. The *Rhinoceros* is now confined to Assam and Terrai Regions in the sub-Himalayas. The others are now confined to the Ethiopian and other regions of Africa and are absent in the Peninsula. Amongst the Catarrhines, only *Presbytis* has survived and is now widely distributed. The combined faunal assemblages from the Kurnool Caves are quite significant, as they provide notable information about the environment and ecology during the Pleistocene in Southern Peninsular India.

Fauna of the Kurnool Caves

A rich assemblage of vertebrate fauna was recovered by Henry Foote from excavations in the Billasurgam caves. The collection was examined by Lydekker (1886). The revised names (Prasad & Yadagiri, 1986) are used in Table 3.

Table 3.

MAMMALIA

FAMILY	***Genus species***
INSECTIVORA	*Sorex sp.*
CHIROPTERA	*Taphozous saccolaemus*
PHOLIDOTA	*Manis gigantea*
LAGOMORPHA	*Lepus* cf. *nigricollis*
RODENTIA	*Sciurus sp.*
	Bandicota indica
	Hystrix crassidens
PRIMATES	*Presbytis entellus*
	Papio sp.
CARNIVORA	*Panthera tigris*
	Felis rubiginosa
	Crocuta sp.
	Canis sp.
	Viverra karnuliensis
	Herpestes sp.
	Melursus sp.
ARTIODACTYLA	*Boselaphus tragocamelus*
	Gazella benneti
	Antelope cervicapra
	Sus cristatus
	Sus karnuliensis
PERISSODACTYLA	*Equus asinus*
	Rhinoceros karnuliensis
REPTILIA	*Crocodylus sp.*
	Varanus dracaena
AMPHIBIA	*Bufo melanosticus*

The other caves of importance are the Muchchatla and the Chintamani Gavi (Fig. 5). These were explored by Murthy (1974, 1975) and Prasad and Yadagiri (1986). The caves are 15 m up a 35 m escarpment. The stalagmitic floors have an assortment of limestone slabs and boulders as well as weathered shale. The caves are small and narrow, ranging from 0.5 m to 1.5 m wide. Narrow entrances restrict movement. However, average passage is 9 m high, on two sides, and has galleries 15 m long, which narrow down to corridors less than 1.5 m wide.

Surfaces of the Muchchatla and Chintamani Gavi floors are covered with excreta of bats. Sediments in these caves appear to be shallower than in the Billasurgam Caves. The section

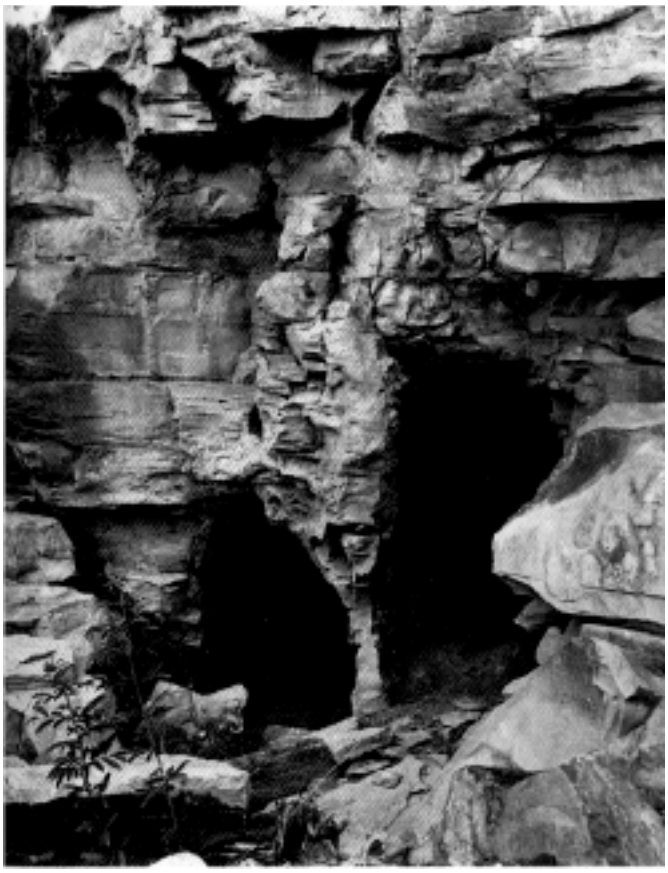

Figure 5. The entrance to Chintamani Gavi.

observed at Chintamani Gavi is as follows:

TOP D. Clay: 25 cm
C. Clay with limestone blocks: 35 cm
B. Red marl: 50 cm
A. Massive limestone

Table 4 illustrates the forms which have been identified in the collection from Chintamani Gavi, close to the Billasurgam Caves.

The cave floors were divided into three layers by Murthy (1974, 1975). These layers contain cultural elements (Table 5).

Based on the artifacts, the lithic industry from Chintamani Gavi indicates the utilization of flakes, blades, cores, and hammerstones. The bone tool assemblage is made up of chisels, scrapers, and barbs. They exhibit an Upper Paleolithic tradition and the layers do not show any typological or evolutionary variation.

Chandrapalle Cave

One of the largest caves in this region is the Chandrapalle Cave, ~12 km east of Peapally and ~50 km south-southeast of Bangana Palle. The cave is in Precambrian Cuddapah Limestones. The roughly 1 m wide cave entrance is ~24 m up a cliff face. The passage widens about 15 m into the cave and the roof is well over 18 m high. A stalagmitic floor with permanent water pools lies beyond. A well-preserved specimen of an *Ursus* bear skull (Fig. 6) was collected from this cave by the Archeological Department of Andhra Pradesh and was examined by the author. Two fossil species of Ursus are known from India: *Ursus theobaldi* from the Siwaliks of Kangra, Himachal Pradesh, and *Ursus namadicus* from Narmada Basin, Central India. The Chandrapalle Cave specimen has been described as a new species of *Ursus footei* (Prasad and Yadagiri, 1986).

Table 4.

MAMMALIA

FAMILY	***Genus species***
PRIMATES	*Presbytis entellus*
RODENTIA	*Nesokia bandicota*
	Hystrix crassidens
PERISSODACTYLA	*Equus sp.*
	Equus asinus
ARTIODACTYLA	*Boselaphus tragocamelus*
	Bos sp.
	Antelope cervicapra
	Sus cristatus
CARNIVORA	*Viverra karnuliensis*
	Felis sp.

Table 5.

FLOOR DATA	LAYER 1	LAYER 2	LAYER 3	TOTAL
Cultural Elements				
Lithic Industry	13	23	187	223
Bone Tool Industry	125	621	1257	2003
Fauna				
Dental	23	54	140	217
Osteological	7	15	51	73
Total	168 (6.7%)	713 (28.3%)	1635 (65.0%)	2516

Paleoecology

The area around Betamcherla presently is semi-arid with scanty vegetation and few rivers. However, the excavated fauna indicate that the moderately hilly terrain was covered with trees in the late Pleistocene. Rivers and streams in the basin support the forest. Tall grass prevailed in the plateau country.

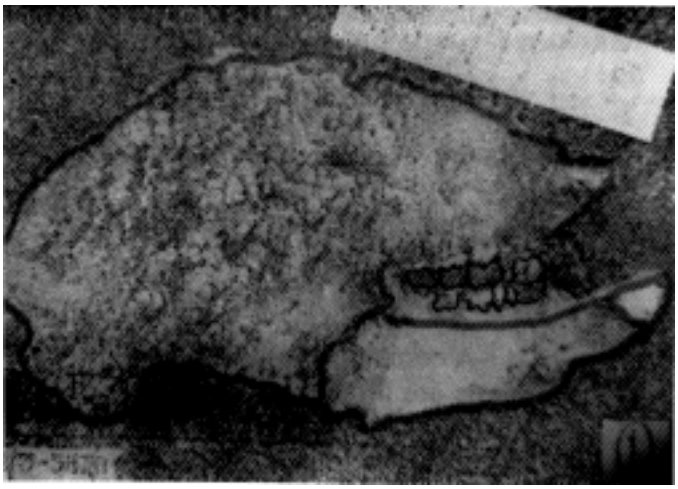

Figure 6. Ursus footei skull from Chandrapalle Cave.

The presence of *Antelope*, *Gazella*, *Cervus*, *Ursus*, and *Boselaphus* suggests that forest conditions existed on hill slopes. *Bubalus* and *Bos* thrived on forested regions, which was broken up by streams with open grasslands on the banks. The presence of *Presbytis entellus*, the arboreal Hanuman Langur, indicates a deciduous forest vegetation. They moved in groups and inhabited rocks and cliffs. The convincing proof of low forested hills and swamps having abundant vegetation is in the occurrence of *Rhinoceros karnuliensis*. *R. karnuliensis* is now absent in Peninsular India and is confined to the rain forests of Assam.

Conclusions

The study of the Kurnool Caves fauna is important. Sediments are as much as 25 m thick in some of the caves and their stratigraphy reveals considerable information on the Pleistocene history of the caves. The presence of rock shelters provides a basis for exploration of fossil remains of early man. So far, a portion of a jaw with dentition and an isolated tooth have been recovered from the cave floors. They may be assigned to *Homo sapiens*.

Acknowledgments

I would like to thank my former colleagues, Dr. C.V.N.K. Rao and Dr. P. Yadagiri, of the Geological Survey of India and Dr. G.L. Badam of Deccan College, Pune for helpful discussions. Thanks are due to the Geological Survey of India, Madras and Calcutta, for library facilities and examination of earlier collections. The research was supported by the Boise Fund, Oxford University. I thank Dr. George N. Huppert and Betty Wheeler, both of the Department of Geography and Earth Science, University of Wisconsin-La Crosse for kindly editing the paper and seeing it through the press. Appreciation is also expressed to Dr. Greg Chu, of the same department, for computer drafting the map.

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