Mr. H B Foote's Work *at the* Billa Surgam Caves, *by* R Bruce Foote, F G S, *Deputy Superintendent, Geological Survey of India*

Introductory

Although the exploration of the Billa Surgam Caves was not very successful in its earlier stages, it has since then produced results of great interest, both archæologically and zoologically The existence of prehistoric man in that quarter has been most conclusively proved, while much light has been thrown upon the former geographical distribution of some important genera and species of animals no longer existing wild in the south of India. The deeper the excavations have been carried both vertically and laterally into the recesses of the caves the more interesting and valuable have been the finds made

A sketch of the first part of the exploratory work carried out by myself last year was given in the February number of the Records (Vol XVII, Pt I, 1884) At the beginning of the present year (1884), I was called off to other duties, but as His Excellency the Governor of Madras was anxious that the exploration work should not cease, it was entrusted to my son, Mr Henry B Foote, Lieutenant, Royal Artillery, who was temporarily attached to this Department, and took up the excavations where I had left off My son had spent several weeks with me a few months before, and had afforded me great assistance in exploring and excavating different caves, and had therefore gained a knowledge of the country and of the people whom he had to employ in the further explorations This he took up early in March, and carried it on till the end of May, during which time

Mr Henry Foote's work in the Charnel House Cave

he cleared out the remaining half of the Charnel House Cave very nearly to the bottom of the narrow passage to which the cave contracts downward, a passage so narrow that the diggers have difficulty in finding room to work

Mr Henry Foote also commenced excavating the Purgatory Cave, and was

In the Purgatory Cave

thereby enabled to follow it fully 300 feet further into the hill In a rough report of the work done by him, he says "I did not reach the end of this gallery as it was too narrow, but if it were cleared out, it would no doubt be possible to go much further in and also up several branches which were too much filled up to be entered"

When first explored, two pits were found in this long and narrow cave—one some 15—20 feet within its mouth, the other some 10 yards or so further in Nothing certain could be ascertained from the Kotal villagers as to the origin of these pits, which rumour ascribed to treasure hunters, but they were very likely sunk by guano diggers, the soil in the cave being largely made up of dry dusty guano derived from the droppings of the clouds of bats which live in the dark part of the passages On clearing the guano-soil out of the outer pit, Mr Henry Foote found its "further wall composed of a stalagmitic mass," of which he says "I fancied it might form a floor, and so continued the pit down to a depth of about 13 feet, when I reached the bottom of the cave, and found that my surmise was correct, there being a space of about 3 to 4 feet under the stalagmite filled with a red clay, with pieces of stalagmite and limestone forming a sort of breccia As

I had not much time at my disposal I could not then clear out the whole cave systematically, so I proceeded to clear out the earth under the stalagmite floor The floor continued for 9 yards and then gave way to the interstratified earth and bats' dung, and at this point I stopped. Among the finds in this cave were several fine teeth and a few bones I found also, just at the place I stopped at, two small drinking bowls of rough earthen-ware at a depth of 11 feet below the surface They are not of modern shape, but have no very distinctive character"

"As we advanced into the cave, the bats' dung stratum got thinner and disappeared altogether after 200 feet The cave earth is here a wet grey clay" "I fancy that the earth at the bottom (under the stalagmite) is of great age, and once filled the whole cave as in the recesses there are pieces of it adhering to the roof"

In the Cathedral Cave

In the Cathedral Cave, Mr Henry Foote commenced systematic excavation about a month before the end of his time He reports "I could not at first work in it, owing to the numerous swarms of bees which occupied it, but after destroying their nests twice, they retired up the cliff to a safe height, and I commenced work in one corner of the cave, under an overhanging piece of the wall which, being the only place the sun does not reach in the afternoon, was the most suitable for human habitation"[1] "Having cleared away the bats' dung, which was about a yard thick, over a surface of about 50 square feet, I commenced to excavate the beautifully stratified cave earth in layers of one yard in thickness The top layer was very full of bats' dung which gradually disappeared as I got lower, when the earth became a rather stiff red clay" "There were a good many fallen blocks in places, but not so many as in the Charnel House There were also a good many masses of stalagmite, mostly on the edge of my excavation, all *in situ*, and as they were of large size the cave earth underneath them must be of considerable antiquity"

Stalactites and stalagmites

The Cathedral Cave contains many more stalactites and stalagmites than any of the others, and a great part of its eastern end is filled with an enormous mass, composed of both forms of the deposit, to which the name of the "High Altar" was given from its great resemblance to the sanctuary in a Roman Catholic Cathedral It is impossible to give any closer idea of this remarkable cave without illustrations, which it is hoped will be forthcoming to accompany the final report on the cave work

Traces of prehistoric man

Cut bones

The existence of man at a low stage of civilization was ascertained beyond fear of contradiction by the discovery of a well-made bone gouge and of two pieces of stag-horn which have been cut with some sharp instrument, one indeed has been deeply cut into and shaped into a rude implement These were found in the Charnel House Cave at a depth of 15 and 16 feet below the surface respectively The Cathedral Cave also yielded an implement of bone trimmed by many cuts of a sharp instrument into a rude knife shape Two or three bones also were found show-

[1] The open exposure to the rays of the afternoon sun of a cave in the latitude of Billa Surgam would render the place practically untenantable for several hours The concentration of heat radiated from the high cliffs at the back and around the Cathedral Cave is something tremendous

ing distinct traces of having been scraped with a hard and sharp implement, the marks being such as would be made by a sharp stone flake

A fair number of teeth and bones of various large and medium sized animals was collected, as well as many thousands of those of very small animals, such as squirrels, rats, mice, shrews and bats, also of small birds, snakes, lizards, frogs and toads

Number of bones found

Shells of some of the existing species of landshells were found numerously, particularly those of *Helix nicobarica*, *Nanina tranquebarica* and *Pleurostoma* (*nodifera ?*)

But little could be done towards the specific determination of the bones found, even where the genus was easily recognizable, the osteological collections available in Madras being far too small In the few cases in which specific determination was feasible, the bones were found to belong to living species

Difficulty about determining the bones

The annexed list gives, as far as possible at present, the generic and specific names of the animals whose remains were found in the Billa Surgam Caves —

List of animals found

Mammalia

Presbytis (Semnopithecus) priamus ?
Macacus ? sp
Chiroptera, several
Sorex, sp.
Felis tigris
„ sp
Viverra zibetha ?
Herpestes griseus ?
Canis, sp
Sciurus, 2 or 3 sp
Mus, 2 or 3 sp
Hystrix leucurus ?
Lepus, sp
Rhinoceros, sp (? *javanicus*)
Equus, sp
Sus indicus
Rusa aristotelis
Axis maculatus
Memmna
Antilope bezoartica ?
Portax pictus
Capra ?
Ovis ?
Bos, sp
Gavæus ?

Aves

Several genera belonging to the orders Raptores and Grallatores (?)

Reptilia

Crocodilus
Varanus dracæna
Agama, sp
Lacerta, sp

Amphibia

Rana
Bufo

The remains found all occurred as detached teeth and bones or portions of bones The best specimens are a few rami of mandibles and two or three maxillæ retaining four or five teeth a piece Most of the specimens, however fragmentary, are well preserved for

Condition of the bones.

individual determination Fewwere thickly encrusted with kankar, few also were found in a state of great brittleness, but few also are highly mineralized The number of species already recognized is very large in proportion to the number of bones of the larger animals which were found, but it may be expected to be increased very considerably when the large series of small bones collected shall have been fully examined

The extremely great number of bones of small rodents, birds, reptiles, &c , &c , which were found in the different beds of the cave earth, may be reasonably attributed in great part to a cause which is still in action in these caves and adjoining ones The cause in question is the frequent visits of large birds of prey, such as eagles, kites, hawks, and owls who seek the quiet and retirement of the caves in order to get rid of the undigested hard parts of their prey, in the form of castings Considerable accumulations of such castings were found in the Charnel House and Cathedral Caves as well as in several of the smaller ones Osseous deposits of such character have doubtless often been covered up by the sediments brought into the caves by floods during wet seasons, the feathery and tendinous parts of the castings have decayed and only the bones remained behind

Source whence the small bones were derived

The evidence obtained so far goes to prove that the caves were not continuously inhabited either by man or predatory animals The greatest number of bones found in the Charnel House Cave, for example, occurred in, or close to, the mouth of the small tunnel-like gallery opening into the cave at its upper extremity These bones seem all to have been washed in from above by the stream which flowed out of this gallery in wet seasons, and which formed the several beds found in the upper end of the cave The beds which occur at the mouth of the cave and which were formed by the main stream flowing through the several cañons, are remarkable for their poverty in fossil remains How the bones entombed in the Cathedral Cave and in Purgatory reached their places of rest it would be premature to say till the excavations have proceeded considerably further

No signs of continuous residence of man or predatory animals

There are no accumulations of Album græcum in any of the caves, such as would inevitably have been formed had they ever been long occupied by carnivorous animals, nor are there any considerable deposits of ashes and charcoal with fragments of bones and other indications of man's continued residence which formed such interesting accumulations in many other bone-caves

No stone implements of any kind have been discovered in connection with the Billa Surgam Caves, excepting perhaps a minute triangular splinter of rock crystal which might have served as a drill

No stone implements found

Of the broken bones which occurred in considerable numbers some bear distinct tooth marks, others, and more especially fragments of the thick and massive bones of large animals, appear broken with great violence, as if with a hammer or heavy stone, not splintered, as if bitten

Bitten and broken bones

The great majority of bones whether unbroken or broken before being buried, as a very large number evidently were, retain their form distinctly and

show no signs of having been rolled far, which agrees with the inference that they were washed into the cave from only a very short distance

Of the crushed and broken bones which were found in all the three caves explored, many had been reduced to that condition by the falling of heavy masses of limestone from the roof No burnt bones were noticed in any of the caves

Occurrence of the genera Equus and Rhinoceros

A very interesting fact and one adding materially to our knowledge of the geographical distribution of the perissodactyle ungulata of India within the human period is the occurrence so far south in the Peninsula of the genus Equus and of a second species of Rhinoceros The living Indian representative of the first named genus is *Equus onager*, the wild ass of Kutch, which occurs also in Gujerat and the countries west of the great Indian desert, but is quite unknown in the peninsula Of the two Indian species of Rhinoceros now living, *Rh indicus* is reported by Lydekker[1] to have been procured from "the turbary of Madras" The remains of rhinoceros found by Mr Henry Foote belong to a smaller species with a very different dentition, being very markedly brachydont

The Billa Surgam Rhinoceros

The remains of rhinoceros found in the Charnel House Cave at Billa Surgam consist of a right upper molar (probably $\underline{m\ 1}$), a right lower molar (probably $\overline{m\ 1}$), and of a fragment of a right upper molar (probably $\underline{m\ 3}$) Of the first only the crown remains, but is in good condition The lower molar retains the greater part of the fangs, and the crown is in good condition (one little chip out of the anterior part excepted) The two were not found together, and the lower molar may probably have belonged to a larger individual than the upper The fragment of the upper molar ($\underline{m\ 3}$) must have belonged to a very much smaller individual than either of the others It shows but small signs of wear and could only have been cut a very short time before the death of its possessor The other two teeth are greatly worn and must have belonged to fully adult or old individuals

The upper molar is very characteristic in shape, and quite unlike any of the fossil Asiatic rhinoceroses already described It is also quite unlike the molars of *Rhinoceros indicus*, but bears considerable resemblance to the molar of *Rh sondaicus* (*javanicus*) figured by Owen in plate 138 of his Odontography

The Billa Surgam horse

The remains of Equus found were the following —

1	A molar (lower, left)	Charnel House Cave	
2	A metatarsal right	Cathedral Cave.	
3	A rudimentary metatarsal (Met. IV)[2]	do	do
4	A metatarsal (?) distal end	do	do
5	Three incisors, germs (upper ?)	do	do

Of these, numbers 1, 2, 3, and 5 belong to a small individual, of about the size of an ordinary ass No 4 belongs to a much larger, coarser built, animal

[1] Lydekker, R Synopsis of the fossil Vertebrata of India, Records, Geological Survey of India, Vol XVI, p. 80, 1884.

[2] This rudimentary (left) metatarsal belongs doubtless to No. 2, as though found several feet apart in the cave earth (in squares Nos 41Ca and 45Ca respectively) the two bones fit perfectly and show identical colour and degree of fossilization

The section of the cave earth in the Charnel House Cave which was obtained by Mr Henry Foote while excavating the northern half was much clearer and more instructive than that seen by me in the southern half, the former is therefore given below —

Section of the Cave Earth, Charnel House Cave

4′		A[1]	Surface (bats' dung) bed	3′
2′ 9″		A	Rubble bed with large fallen blocks of limestone	2′ 9″
3′ 6″		B, C	Stiff red clay, with sandy partings [1]	4′
2′ 6″		D, E	Rubble bed	1′ 6″
	3″	H	Red cave earth, stony above	6″
	9″	H	Red cave earth, stony above	6″
1′ 3″		I	Red and mottled cave earth	1′
		J	Red brown cave earth with patches of calcareous sand	1′
		K, L	Red sandy cave earth with blocks of limestone	1′ 6″
		K, L	Red sandy cave earth with blocks of limestone	1
		M, N, O, P	Stiff marly clay taken out in four layers of 1 yard each in thickness	12′
				28′ 9″

The section is across the cave, rather to the westward of the centre, and runs in a nearly north south line
The depth and nature of the deposits below P are still unknown

"The stratification of the cave earth, though very distinct in places, was more often obscure, and the large amount of infiltrated colouring matters (though often giving rise to very beautiful tints) were a source of great difficulty in the separation of one bed from that underneath it"

Contents of surface bed

The artificial contents of the surface bed were, as already stated [2] a few bits of broken pottery and charcoal, and a couple of small chank shells, doubtless once the property of some gossain or fakir In addition to these were patches of small bones, &c, which are the half-weathered castings of large birds of prey before referred to (page 203) A full collection of these was made for comparison with the numereus bones of small animals which Newbold described as occurring in the cave earth below

Human bones and teeth below the surface bed

The loose red loam underlying the surface bed contained at one place (21 feet west of the entrance to the narrow passage at the east extremity of the cave), a number of human teeth and bones, belonging apparently to one and the same individual The bones consisted of numerous fragments of a very thick calvarium (too broken to piece together successfully), fragments of the mandible and one or two vertebræ, ribs and parts of various limb bones [3] They had been much broken up by a large mass of limestone which had fallen on the spot where they were buried, and being very brittle suffered a good deal more while being dug out

[1] The Rubble bed "A" occupied only the front or western half of the cave, in the back or eastern half, "B" lays immediately under the surface bed "A[1]"

[2] Rough notes on Billa Surgam and other caves in Kurnool District, &c Rec G S of I, Vol XVII, pt 1, page 27, 1884.

[3] These have not been compared as yet.

The most interesting facts connected with the underlying strata in the Charnel House may be briefly enumerated at this place Bed "A" yielded *inter alia* the right ramus of the mandible of a very young small ruminant (? *Antilope*), also the right maxilla with teeth of large monkey, differing slightly from *Presbytis* (*Semnopithecus*) *priamus* From the relatively small size of the canine the owner was probably a female, but her jaws exceeded considerably in size that of a very fine male langur whose skull is in my collection

Finds in bed A

In Bed $\frac{B}{C}$, Mr Henry Foote found some charcoal and fragments of coarse unglazed pottery, as well as fragments of thin glazed red pottery of a very antique type

In bed $\frac{B}{C}$

Bed $\frac{D}{E}$ showed nothing of interest, and beds F and G, which lie further back in the cave and do not come within the section above given, were also devoid of anything of special interest

In bed H, there was at one spot an immense quantity of small bones of rats, bats, lizards, &c, &c, accumulated either by an eddy in the small stream, which flowed through the eastern passage, or else representing one of the great collections of birds' castings above referred to

In bed H

In bed K, Mr Henry Foote found the bone gouge above referred to "the best specimen of man's work that was found in the caves" "The hollow of the gouge is highly polished probably by use" "The cutting edge is gone, but the other edges show distinct marks of having been cut with a sharp instrument It was found on the north side of the cave, about 4 yards from the mouth of the small passage, at a total depth of 15 feet below the surface"

Bone gouge in bed K

Of bed L, Mr Henry Foote says "it contained a little charcoal at the mouth of the small passage, this being the lowest horizon at which I found traces of man, the depth being 16 feet 6 inches Associated with the charcoal, I found two pieces of stag-horns, which present distinctly cut surfaces" The one, as already pointed out, is cut into something little a rude knife about 5 inches long, or it might possibly have been used as a small spear head if the but-end had been fixed vertically at the end of a pole The other piece, which is $6\frac{3}{4}$ inches long and much thicker and heavier, has the further end distinctly cut on two sides, so that it forms a short but thick wedge The whole piece looking like a rather rude pick-hammer The cuttings are very clear, and distinct on both implements Bed L was the most prolific in large bones of any in the Charnel House Among those found, it may be well to specialize a few of the most important

Cut stag horns in bed L

1 The left ramus of the mandible of *Portax pictus*, fragment with 4 teeth (No 7, 70 L)
2. Molar 3 (lower) of *P pictus* (No 9)
3 Five incisors (lower) of *P pictus* (No 12)
4 Carnassial (lower) left of *Viverra zibetha*? (No. 16)
5 Lower left incisor $\overline{3}$ of *Antilope bezoartica*
6 Cervical vertebra of *Portax pictus*? (No. 56).

7 Olecranon (broken) of *Axis maculatus*? (No 57)
8 Left scapula of *A maculatus*? (No 64)
9 Right scapula of *Rusa aristotelis* (No 68)
10 Left tibia of *Axis maculatus*? (No 32)
11 Right tibia (distal end) of *A maculatus*? (No 37)
12 Left calcaneum of ditto (No 31)
13 Right femur of ditto (No 33)
14. Metacarpal of ditto (No 43)
15 Right tibia (distal end) of *Rusa aristotelis*? (No. 36)
16 Left astragalus of ditto ? (No 30)
17 Phalanx of *Capra*? (No 1)

Bed M was also productive of bones and, in a recess in the side of the small passage at its bend, some remains of a large monkey were found consisting of a right maxilla with 3 molars and 2 premolars, the right ramus of the mandible with 3 molars and 1 premolar, also a fragment of a left ramus with the canine and 1 premolar, and lastly a lower left molar ($\overline{M\ 2}$) All apparently belonged to the same individual

In bed M bones of monkey

The other important bones found in bed M were—

1 Os innominatum (right) of *Rusa*
2 Ditto (do) of *Axis*
3. Femur (right) of *Antilope*
4. Metatarsal (right) of *Axis*?
5 Vertebra of a snake

The excavation of the beds in the inner-most part of the small passage was carried out by Mr Henry Foote separately, as he found it impossible to make out their exact relation to the several beds of the cave earth in the outer cave The cave earth beneath the surface (bats' dung) layer was red and so nearly homogeneous in character, owing to the absence of infiltrations of colour, that the division into layers for excavations must be considered a purely arbitrary one The four divisions in which it was taken out were termed X, Y, Z, and X^1, of which Y yielded a small crocodile's tooth much blackened in colour, and X^1 the rather broken crown of a very large left lower premolar of some ruminant which was most likely that of a bison (Gavæus)

Beds in the passage

The most interesting bones Mr Henry Foote obtained from the Purgatory Cave were as follows —

Finds in Purgatory Cave

1 The right upper carnassial tooth of a feline animal smaller than a tiger
2 The right metatarsal bone of a large tiger (*Felis tigris*) of which the proximal end and the under side are wanting but the bone otherwise in good condition
3 The right tibia of a large tiger, the proximal end wanting
4 & 5 Two phalanges (right) of pes of *Felis tigris* Besides these were seven or eight molars of different ruminants, large and small, which could not be satisfactorily determined

In the case of the Cathedral Cave the most important finds made by Mr Henry Foote beside the Rhinoceros teeth and the teeth and bones of Equus above referred to (page 204) were—

Finds in the Cathedral Cave

1 A series of bones of *Hystrix (leucurus)*, consisting of two mandibles and sundry molars and incisors belonging to several individuals [1]

2 Two upper molars, four lower incisors, and two lower canines of *sus indicus*

3 A series of bones of *Varanus*, including 3 maxillæ and 3 left rami of mandible and many vertebræ

4 A series of bones of birds of several genera

The determination of the animal remains found in the Billa Surgam Caves, so far as has been practicable, shows that the very great majority, if not all the larger animals, belonged to living species, they must therefore be regarded as of pre-historic or post-pleistocene age This result is in accordance with the evidence furnished by the bone implements found in the caves, which implements bear a very close resemblance to finds made in various pre-historic bone-caves in Europe The stone implements, accompanying the European bone implements, belong to the neolithic, or polished, type, we may therefore very reasonably expect that, should stone implements be discovered during the further explorations, they will prove to be of the neolithic type But we may also very reasonably anticipate that in some of the caves only partially explored at present, or in some of those still untouched, future explorations may bring to light remains of palæolithic man and pleistocene animals, for it must be borne in mind that palæolithic man lived in that region and left numerous implements behind him in the adjacent alluvium of the Khunder valley

Conclusions as to the age of the caves

The results now communicated may, I believe, be accepted unhesitatingly, as very great care was taken both by my son and myself to register exactly the positions in which the bones were found

I re-visited the caves in the beginning of May to see how the exploration was progressing, and was much gratified to find that Mr Henry Foote had organized his band of excavators very thoroughly, so that the work proceeded steadily and safely

The efficient way in which he carried out the very arduous piece of work confided to him fully justified the confidence with which I had recommended him to His Excellency Mr Grant Duff, and will I trust be recognized by the authorities

In conclusion, I must mention that our work at the caves was rendered much less irksome by the great interest taken in it by His Excellency Mr Grant Duff Our thanks are also due to Mr W H Glenny, the Collector of Kurnool, for the kindly interest he took in the work throughout which greatly helped to make things easy in the matter of securing supplies and labour in a very outlandish place Nor do we forget various acts of courtesy and kindness from the Nawab Sahib of Banaganpalli

[1] Up to the time of the excavation porcupines were constantly trying to colonise the caves, and were only repressed by the use of traps built by the villagers of pieces of limestone As it was, a couple of them was caught and killed by the diggers in one of the pits in Purgatory Cave