ON PREHISTORIC MAMMALS FROM THE SAMPOENG CAVE, CENTRAL JAVA.

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Up till now our knowledge of prehistoric mammals, and animals generally, in Java was very scanty whereas in the field of study of fossil animals and fossil man already much has been achieved. Only recently the remains of prehistoric men together with the implements used by them and the animals living at the same period were discovered. One of the finding-places of such prehistoric material, the Sampoeng cave near Ponorogo, has been studied in more detail and a number of specialists have each worked out a part of the problem. Thus it has been possible to get an insight into the way of living of these cave-dwellers of Java.

The locality, where these prehistoric remains were found, is situated near the small village of Sampoeng in the neighbourhood of Ponorogo, Central Java. It is not a real cave but a shelter under inclining rocks, a true "abri-sous-roche". These rocks are tertiary limestone and the cavity used by primitive man has originally been washed out by a small river, the deposits of which were disclosed at the bottom of the cave. Now the upper part of the soil consists of a layer about 4.5 m thick of a fine lösslike material containing the prehistoric remains.

In this top layer a number of horizontal sections can be discerned which for convenience sake were denoted by the letters A, B, C and D, each section having a thickness of about one metre. The different horizontal layers do not show any differences as to stratigraphical features but are characterized by different kinds of implements and tools.

For further details about the topography and geology of the Sampoeng cave the reader is referred to the paper by VAN ES [1]), the geologist who made the first excavations and brought to light many remarkable finds. Later on in 1927 more systematic investigations were instituted in collaboration with VAN STEIN CALLENFELS of the Archaeological Survey [2]).

The exact place where each prehistoric implement or utensil was found, also of the human remains, has been ascertained with regard to depth as well

[1]) VAN ES, The prehistoric remains in Sampoeng cave; Proc. 4th Pac. Science Congress, Vol. III 1930.

[2]) V. STEIN CALLENFELS a.o., Hommage Service Archéol. Ind. Néerl. 1er Congrès Préhistoriens á Hanoi, 1932.

as to the horizontal position. Unfortunately the animal remains were all thrown together, only those belonging to different sections A - D having been kept separate. Therefore if an animal species is recorded from two sections only this has no definite significance as to the extension of the dispersal in the different layers, as some of the specimens may have been derived from the lowest part of a section and others from the top of the next one.

According to the type of implements the sections A - C revealed some very peculiar discrepancies (see VAN STEIN CALLENFELS). The top layer of the cave beds contained besides stone mortars and other utensils, stone axes carefully polished, a type of implement supposed to belong to the late neolithic. But in the next layer B practically no stone implements or pot-sherds are represented, nearly all the tools being spatules or scrapers made from bone or horn. The latter most likely served for cleaning skins which provided the articles of dress. At first sight it seemed that here a period of the stone-age succeeded a period of culture during which mainly bone implements were used, but the underlying layer C is again characterized by stone manufacts especially winged arrow-heads with a concave base and serrated edges. From the same layer also mortars and pot-sherds appeared again. It is not to be doubted that this layer C is much older as the bones derived from it show a much more intimate cohesion with the surrounding soil.

Now it is certainly a most noteworthy fact that the majority of the animal species and the great bulk of the remains of those mammals which apparently were hunted for food are found just in layer B, the layer in which nearly all hunting weapons are absent.

That hunting was the chief means of livelihood may be deduced from the great quantities of game animals detected in layer B. But the food did not consist exclusively of venison: fish and fruits were also eaten. Fish-bones and many hard fruit skins have been dug out which, however, do not allow a further identification. Besides these foods many snails were taken, these being found in large numbers among the other remains of food [1]).

Cooking must have been a well-known practice for a number of fire-places have been uncovered, mostly being undisturbed with woodash and scorched bones still intact.

The age of the cave deposits is estimated to be from about 1000 year before Christ. But at the time these primitive cave-men, who according to MIJSBERG show Australoid characters, were living more inland other people of a more advanced civilization may have been inhabiting the coastal regions. There must have been some intercourse between these aboriginal tribes as the inland inhabitants used preferably marine shells for ornament.

Taking into account the primitive and rather small weapons which the cave-dwellers had it is surprising that the main hunting object was such big

[1]) VAN BENTHEM JUTTING, On prehistoric shells from Sampoeng cave; Treubia Vol. XIV 1932.

game as the banting. A rather amazing quantity of teeth and leg bones of this species was brought to light. Almost only these parts were discovered, other bones of the trunk, vertebrae or ribs being almost entirely absent. Therefore it may be inferred that the whole animal was not taken home, but only the head and the limbs. The same holds good with regard to the other game animals as of these species also mainly the parts referred to above were excavated.

Considering the large number of teeth found the almost total absence of skull bones and horns of the banting is very curious. Evidently the skulls were entirely smashed for procuring the brains. In the same way all the larger bones of the limbs were split or broken to get the marrow. However, the great quantity of fragments of bones taken from layer B may also be an indication of these bigger bones also having been broken into suitable pieces from which the bone implements were to be made. But the absence of horns or horn fragments of the banting is not easy to understand, the enormous number of beasts killed being out of proportion to the number of utensils made from horn.

In all layers the banting is the most prominent game animal, next to it comes the wild swine followed by deer and muntjac. With the exception of layer C (that of the arrow-heads) in which deer become more abundant, this proportion is the same in the various layers. Whether this is due to the fact that the cave-men altered their mode of hunting, or that this species of game became more abundant at that period must be left undecided.

We should like to call attention to the fact of the wild swine belonging to the species *Sus vittatus,* the widely spread common Java swine nearly related to the domesticated form, whereas remarkably enough the warted swine, *Sus verrucosus,* is not represented although this species is considered generally as a much older form.

Besides the animals noticed before which constituted the main food a great many other species have been discovered. A number of species have been already recorded by VAN ES among which he mentions the horse. We did not come across the remains of this animal and most likely the heavy teeth of the buffalo were mistaken for those of a horse. The finding of the latter in prehistoric time in Java would certainly be a most remarkable discovery. Many of the species of which only a few bones or a single tooth has been dug out may accidentally have got into the shelter, others like rats were obviously inhabiting it on account of the rich garbage. But still others were apparently killed for the purpose of obtaining the large canines which were used as ornaments. Foremost among these ranks the palm civet (*Paradoxurus hermaphroditus*) of which a great number of jaw bones have been found and two teeth with holes drilled into them. Yet teeth do not seem to have been used largely for adornment, shells or pieces of mother of pearl being preferred to a far larger extent.

Now among the remaining species there are few worthy of some closer consideration. For example, the Javanese one-horned rhinoceros the present distribution of which does not extend so far to the east. Then there are three other noteworthy species two of which have become extinct in Java, the third

one being the common buffalo. The last-named species is represented by very few remains which, however, exceed in size those of the recent form. In this respect the prehistoric form agrees very well with the fossil buffalo known from the pleistocene deposits of Java. As palaeontologists consider this fossil form specifically identical with the recent one the question arises as to whether the domesticated form in Java is a descendant from this prehistoric and fossil stock, or whether the latter has died out and the tame form has been introduced later on. We will revert to this subject more fully in a separate paper.

Another animal now certainly extinct in Java is a species of deer. Of this species nothing but a single fragment of the antler has been disclosed but this piece is so characteristic that it cannot be classified as belonging to either the common Java deer, or the muntjac (see Pl. 11 fig. 2). Owing to the very peculiar form of the antler it has to be considered as belonging to the species *Cervus eldi*, which does not occur at the present time in the Indian Archipelago but has been found in a fossil state in Java. The suggestion that this fragment is derived from older strata and only in the cave beds by accident is not very probable as this piece of antler is scorched by fire and the layers in the cave remained practically undisturbed.

Finally we have to notice the finding of remains of an elephant, another species extinct now in Java. The parts found are very scanty but the molar ridges which came to light match exactly those of the Indian and Sumatra species. As the Indian elephant (*Elephas maximus*) has been found in pleistocene deposits in Java [1]) there is every possibility of the prehistoric form being this species. In any case we are dealing here with the same genus.

Here again, as in the case of the buffalo the question has to be considered whether elephants were still living in Java in historic time. Now in many instances elephants are recorded from Java. Old Chinese chroniclers tell that the kings of Java rode on elephants [2]) but they are speaking of a period after the Hindus had arrived in Java, so these elephants may have been introduced. That importation of such large animals actually took place notwithstanding the small and primitive vessels used in those early days is recorded in the same chronicles. Living elephants and even rhinoceroses were sometimes presented to the emperors of China as tributary gifts.

Another fact worth mentioning recorded by these Chinese chroniclers is the exportation of ivory from Java in ancient times. They also tell that the king of Java sent an embassy to the Chinese emperor and among the presents was also ivory which was called "kara" in the language of Java. Kara, however, is a sanskrit word meaning elephant's trunk. We certainly have to accept these statements with every caution as formerly localities were not always carefully discriminated and, moreover, products arriving from a certain country were

[1]) V. D. MAAREL, Contribution to the knowledge of the fosil mammalian fauna of Java; Wet. Med. Dienst Mijnb. Ned. Ind., No 15, 1932.

[2]) Cfr. GROENEVELDT, Notes on the Mal. Arch. and Malacca compiled from Chinese sources; Verh. Bat. Gen. Vol. 39, 1880.

often denoted as originating from that region. But anyhow in connection with our prehistoric find we should not reject altogether these old stories.

I should also like to draw attention to the old Javanese language having its own word for elephant, i.e. "liman", related to "lima" = five or hand. "Liman" thus means "the beast provided with a hand": the Sanskrit word for elephant "hastin" has the same meaning. The comparison of the trunk of an elephant with a hand is certainly very old. ARISTOTELES speaking about this pachyderm said: it possesses a nose which is used like a hand.

We hope that future researches will throw further light upon this interesting question.

List of the species found in the different layers

layer depth	A 0—1 m	B 1—2 m	C 2—3 m	D 3—4 m
Primates				
Macaca irus		×		
Pithecus pyrrhus		×		
Nycticebus coucang		×		
Ungulata.				
Elephas maximus (?)		×		
Rhinoceros sondaicus		×	×	
Bos banteng	×	×	×	×
Bos bubalis		×	×	
Cervus hippelaphus	×	×	×	×
Cervus eldi			×	
Muntiacus muntjak	×	×	×	×
Tragulus kanchil		×		
Sus vittatus	×	×	×	×
Carnivora				
Felis tigris			×	
Felis bengalensis		×		
Paradoxurus hermaphroditus		×	×	
Cuon javanicus		×		
Lutra cinerea		×		
Rodentia				
Hystrix javanica		×	×	×
Petaurista petaurista		×	×	
Ratufa bicolor		×		
Sciurus notatus		×		
Rattus sabanus (?)		×		
Rattus rattus		×		
Rattus spec.		×	×	

TAXONOMIC PART

PRIMATES

Macaca irus CUV. (*Cynomolgus fascicularis*) [1])

Only one fragmentary left mandible and some teeth (from layer B). The mandible with 3 molars (m_1, pm_{1-2}); 1 left lower molar (m_3) and 1 right lower canine.

Pithecus pyrrhus HORSF. (*Semnopithecus maurus*)

One piece of right maxilla with a complete molar series (length 30 mm) and the canine; idem with 4 molars (m^{1-2}, pm. $^{1-2}$); idem with 4 molars (m^{1-3}, m^1 and pm^2 broken); one piece of left maxilla with 4 molars (m^{1-3}, pm^2); idem with 5 molars. One piece of left mandible with 4 molars (m_{1-3}, pm_2); idem with 3 molars (m_{1-2}, pm_2) and the canine. All from layer B.

Nycticebus coucang BODD. (*N. tardigradus*)

Only one piece of a right mandible with 4 molars (m_{1-2}, pm_{1-2}) and the canine, from layer B.

UNGULATA

Elephas maximus L. (?)

Of this species only two molar ridges of a semi-adult animal partly broken were found in layer B (see Pl. 11, fig. 1), which exactly match ridges of the recent Sumatran elephant.

Rhinoceros sondaicus DESM.

A number of molars, partly fragmentary from layer B and C, and four poorly preserved mandibular incisors. At least three specimens are represented for there are besides the incisors two left upper m^3 and one deciduous upper and three deciduous lower teeth from a young individual. The molars are of normal size but the incisors are rather heavy. Of other bones the nail phalanx of a fore middle toe was excavated.

Bos banteng RAFFL. (*Bibos sondaicus*)

This species is the most common of all the animals found in the cave deposits. It is represented by an enormous quantity of teeth. There are remains of at least 83 specimens from layer B as this number of right lower third molars was counted against 79 of the left mandible. As many teeth are broken and difficult to classify the number of individuals is positively far beyond the above estimation. In other layers this number is far less, in layer A 4, in layer C 15, and in layer D only 1 specimen being represented.

Some molars are blackish, a few apparently scorched by fire but others are pigmentated by some soil component. The length of the third lower molar is varying from 37.7 to 43 mm.

[1]) The synonyms given are the names used in TROUESSART's Catalogue Suppl. 1904.

Measurements of m_3 of banting

37.7—37.9	38—38.9	39—39.9	40—40.9	41—41.9	42—42.9	43 mm.
1	1	5	1	2	1	1

Other bones are rarely met with excepting those of the fore and hind limbs, which are rather numerous. The larger leg bones are all broken and split lenghtwise apparently to get at the marrow, the capita only having been left intact. Further, only a few cervical vertebrae and ribs, a portion of a scapula and some pieces of horn cores were dug out. Complete horns were altogether absent only small fragments being found for the greater part polished and shaped into slabs.

Not a single skull was brought to light and even skull-bones were rare, only fragments of the maxillar bones or mandible being present.

Bos bubalis L. (*Buffelus bubalus*)

The remains of a species of buffalo are very scanty but some very large molars and leg bones are almost certainly to be attributed to *Bos bubalis*. A third lower molar from layer C measures 48.1 mm in length and 21 mm in breadth, an upper m^3 is 74.8 mm heigh and 38 mm long. Another lower molar (m_1 or m_2) from layer B is 67.4 mm in heighth (without root) and the length 35.1 mm. For the rest only fragments of these large molars are extant.

Other bones could not be ascribed to this species with any certainty with the exception of a few smaller bones of the foot, especially four astragali which by their big size could not belong to the banting: of these one is from a left foot, the other three from right feet.

The measurements of these bones are:

greatest length: 100.5, 93.5, 93.8, 97.5 mm
„ breadth: 77.6, 67.3, 70.8, 74.4 mm

Further a second phalanx was detected with a length of 70.6 mm and breadth of 59.5 mm, and a calcaneum long 167.5, broad 69.6 mm.

These molars and foot bones are not only far bigger than those of the banting but also exceed those of the recent buffalo. Now the fossil buffalo known from diluvial deposits of Java is also a far larger animal than the domesticated form and in this respect our prehistoric buffalo agrees fairly well with the fossil one. Whether the fossil and prehistoric forms are specifically identical with the recent one is a question to which I will revert again in another paper.

Cervus hippelaphus CUV.

This species is represented in all four layers but is most numerous in layer C, a condition somewhat the reverse of that of other species which are all more common in layer B. In layer A only one single molar was found, from layer B remains of at least 3, and from layer D of 2 specimens came to light, whereas layer C yielded teeth and bone fragments from 18 individuals, among which

are an almost complete skull from a semi-adult roe, and several parts of antlers. The antlers are never complete: all seem to have been broken into pieces which for the greater part show traces of manufacturing or are blackened by fire. Some of these are ground or sharpened so as to be shaped into an implement for piercing or digging, others are split and hollowed.

Bones of the legs, which do not occur commonly, are not split but broken.

Cervus eldi GÜTHRIE

A peculiar piece of antler also from layer C was found among the remains of the common deer. Although this fragment was very incomplete it obviously could not belong to either the Java deer or the muntjac. Owing to the brow tine forming a continuous curve with the beam, and both standing almost horizontally upon the pedicel this antler most probably has to be identified as that of *Cervus eldi,* as no other deer has similar antlers (see Pl. 11, fig. 2). This species, the brow-antlered deer inhabiting the mainland of South-east Asia, does not occur now in Java but has been found there in a fossil state, living in the pleistocene period. The absence of an axillar snag is probably due to the specimen being not full-grown. The fragment has also been compared with another fossil species known from Java, *Cervus axis,* but in this the brow tine joins the beam at a distinct angle (Pl. 11, fig. 2 c).

Muntiacus muntjac ZIMM. (*Cervulus muntjac*)

This is another species of deer which seems to have been hunted by the cave-men in fairly large quantities. The muntjac is represented in layer B by almost the same number as the common deer in layer C. In the other layers the species is scarcely met with.

To a still larger extent than the antlers of the deer those of the muntjac were used for making tools, perhaps owing to their more convenient size. The tines and beams are often broken or split, nearly all ground or polished, the rough surface being smoothened, and made into utensils used as drills or spatules.

With the exception of teeth and antler fragments, bones are scarce: only a few broken leg bones and e few vertebrae were discovered.

Tragulus kanchil RAFFL.

Only one portion of a left mandible with 4 molars (m_{1-3}, pm_3) from layer B but no other remains of this species were excavated.

Sus vittatus TEMM.

After the remains of the banting those of this species of wild swine are most abundant. From layer B the remains of at least 29 specimens were counted, against only 3 from layer A, 6 from C, and 1 from D.

Molars, incisors and tusks predominate among the parts that are preserved, but leg bones, especially their more solid extremities were also found, the shafts being broken into numerous fragments. Furthermore there are two pieces of a scapula and a cervical vertebra.

CARNIVORA

Felis tigris L.

Of this largest beast of prey nothing was found except a single upper sectorial tooth and a right upper incisor (i^3) from layer C. The molar, a part of which is broken off, is of normal size, the incisor being rather stout but not surpassing the same tooth in a full-grown recent tiger.

Felis bengalensis KERR.

This wild cat is only represented by a fragment of a right maxillar bone containing 2 molars (pm^{2-3}).

Paradoxurus hermaphroditus PALL.

This civet ranks first among the carnivorous animals. From layer B especially, a large number of mandibles came to light, whereas layer C yielded only one piece of the same bone. As moreover two canines were found with holes drilled in them it seems likely that the primitive cave-dwellers preferably used the teeth of this species for ornamental purposes.

Remarkably enough no remains of other bones have appeared. Whether this is due to the fact that only the jaw-bones were taken into the dwelling-place or to some other reason must be left undicided for the moment.

Cuon javanicus DESM.

A single molar of the right maxillar (m^1) undoubtedly belongs to this species.

Lutra cinerea ILLIG.

A fragment of a right mandible with two molars (pm_{2-3}) is all that came to hand of this species.

RODENTIA

Hystrix javanica CUV.

The porcupine is represented in all layers except layer A but like most of the other animals it is more numerous in layer B. Of this species also little but fragments of mandibles and of incisors were excavated.

One piece of a left mandible with two molars (pm_1, m_3) and the incisor, broken off; three parts of right mandibles with respectively 2 molars (pm_1, m_1) and 4 molars with the incisor, broken off, and one fragment with a broken incisor. From layer C another fragment of a left mandible with two molars (m_{1-2}) and three pieces of the lower part of the humerus.

Petaurista petaurista PALL. (*Pteromys nitidus*)

This large flying squirrel is found both in layer B and C. From layer B are one left and one right mandible both with 4 molars and the incisor, the latter broken off; another left mandible without molars but with the molar alveoli complete. In layer C only a piece of a left mandible with a complete molar series.

Ratufa bicolor SPARRM.

The material at hand of this species of giant squirrel is also very scanty. Only one right fragmentary mandible with 4 molars but the incisor broken off, and one entire upper incisor.

Sciurus notatus BODD.

A single right mandible with the molar series complete and of normal length (9 mm).

Rattus sabanus THOS. (?) (*Mus sabanus*)

A left mandible is with some hesitation identified as belonging to this species of rat, although the molar series is rather large (9.8 mm).

Rattus rattus L. (?) (*Mus rattus*)

Of two other species of rats there are a large number of mandibles collected by VAN ES in 1926. One set of 13 mandibles has a molar series with an average length of 6.7 mm (max. 7 mm), in this as well as in other respects agreeing very well with the common *rattus*.

But in another much larger series of 42 mandibles the molar row varies from 7.3 - 8.1 mm in length, average 7.7 mm. For the moment we are unable to allocate these to one of the recent species of rats found in Java.

Fig. 1. Molar ridges of *Elephas maximus* (?); $^{3}/_{5}$ nat. size.

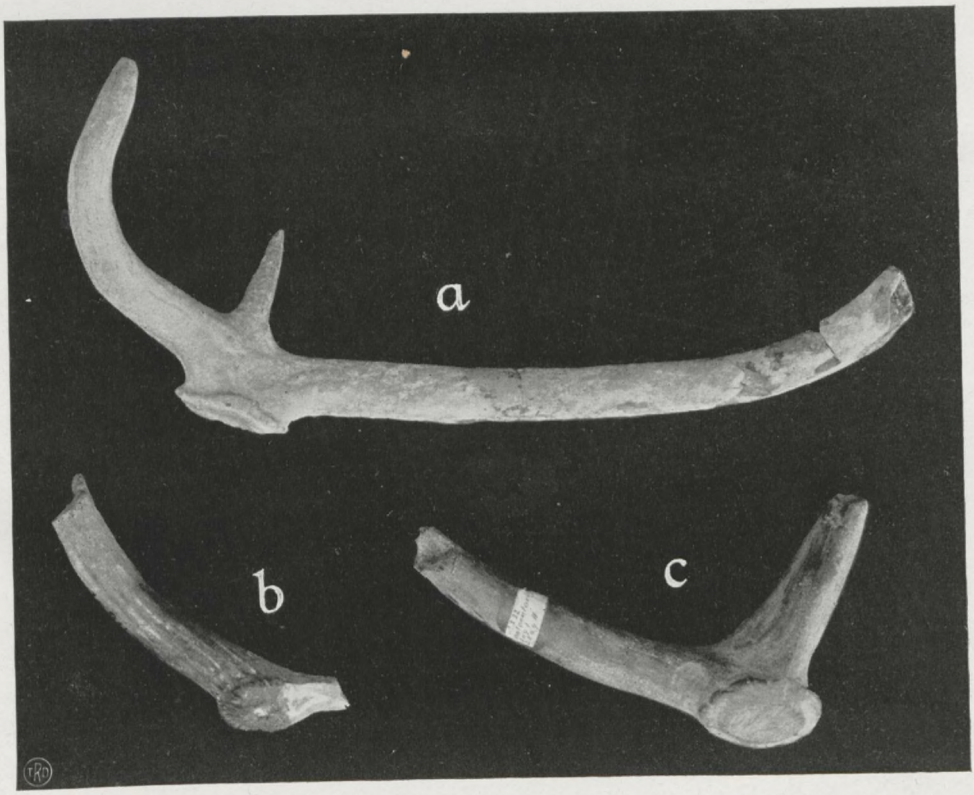

Fig. 2. a. & b. *Cervus eldi*; a. fossil horn, b. fragment of prehistoric horn; c. *Cervus axis*, fragment of fossil horn; $^{2}/_{5}$ nat. size.