HOTTENTOT FOOD REMAINS AND THEIR BEARING ON THE INTERPRETATION OF FOSSIL BONE ASSEMBLAGES.

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(With 2 figures and 3 plates.)

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Abstract

A study is at present being made of the bone assemblages from the cave sites of Sterkfontein, Swartkrans and Kromdraai. One of the problems is to explain the unnatural proportions in which bones from different parts of the skeleton occur. Skull fragments are especially numerous, while ends of certain limb bones are found much more commonly than the opposite ends of the same bones.

A description is given of almost 2400 goat bone fragments picked up around Hottentot villages on the Kuiseb River in South West Africa. These food remains have been discarded by the Hottentots and then chewed by dogs. No other carnivore action is involved. Analysis shows that certain parts of the skeleton are found to the complete or partial exclusion of others. This is due to differences in the durability of the bones themselves. Some of the reasons for these differences are discussed.

Introduction

Work is at present being done in the Palaeontology Department of the Transvaal Museum on an evaluation of the complete bone assemblages from the australopithecine cave sites of Sterkfontein, Swartkrans and Kromdraai. These new studies are not basically taxonomic, but are concerned with the composition of the fossil fauna as a whole and with the relative proportions of the skeletal parts by which it is represented. It is hoped that new light will be shed on the ecology of the australopithecine period in the Transvaal and on the way of life of the early hominids themselves. The project is jointly supported by the Wenner-Gren Foundation and the C.S.I.R.

One of the most immediate problems to arise in the study of these fossil bone assemblages concerns the unnatural proportions in which certain parts of the skeleton occur. At Swartkrans, for instance, remains have been recovered from numerous individuals of the large ape-man, *Paranthropus;* these fossils are almost exclusively cranial, with bones from the rest of the skeleton being extremely uncommon. In fact less than 10 post-cranial bones are known, associated with skull remains of over 30 ape-men. In his pioneering study of the fossil bone assemblage from the Makapansgat Limeworks, Professor R. A. Dart[1] encountered the same problem. Not only did he find a disproportionately large number of cranial fragments, but also that certain ends of limb bones occurred in much larger numbers than the opposite ends of the same bones. Among ungulate humeri, for instance, the distal ends proved to be about ten times as common as the proximal ones.

Interpretation of bones from African fossil deposits is severely hampered by lack of background information. From the nature of the damage which bones have suffered, it is still difficult to reconstruct their history and to be certain of which carnivores were involved. Detailed studies are now under way on feeding behaviour and bony food remains of the large carnivores and of primitive people. The present paper deals with one aspect of this project — an analysis of the food remains of the Topnaar Hottentots living in the central Namib Desert.

TOPNAAR HOTTENTOTS OF THE KUISEB RIVER

The Kuiseb River rises on the South West African plateau west of Windhoek and descends over the escarpment edge in a spectacular canyon. It then continues for almost 100 miles across the flat Namib Plain to the sea at Walvis Bay. Below the canyon the river bed is normally dry, flowing only occasionally when heavy rains falls on the escarpment. Nevertheless, subsurface flow is considerable, making possible the dense vegetation found in the river-bed itself and providing water in the shallow wells dug by the Hottentots (pl. I, fig. a). Aridity of the Namib Plain in this area is so great that permanent human settlement is restricted to the banks of the Kuiseb River, where at least 18 Hottentot villages are known to have existed. At present only 8 are occupied, with a combined total of under 150 people. The inhabitants of these villages have recently been studied in some detail by Dr. T. Jenkins and the writer and will be described elsewhere.

The life of Kuiseb River Hottentots resolves very largely about their goat herds. Agriculture is normally confined to the growing of a small quantity of tobacco and the people subsist on goat milk, goat meat, naras melons and the few purchases made possible through the sale of goat skins. The goats themselves live entirely on the vegetation of the river-bed, from which they cannot stray on either bank. In particular they derive nourishment from the dry seeds of Ana trees *(Acacia albida)* which fall to the ground in large quantities. In this way the spacing of Hottentot villages along the river-bed is determined by the number of goats kept at each. At least 4 miles of river bed is required to provide the 460 goats of one village with adequate grazing. In all, about 2,000 goats are maintained by the Hottentots in the Namib Plain sector of the Kuiseb River.

GOAT BONES FROM THE HOTTENTOT VILLAGES

During December 1965, the writer visited the Namib Desert Research Station, on the bank of the Kuiseb River about 70 miles from Walvis Bay, to study the effects of an arid climate on bones. This study has special relevance in the interpretations of bone assemblages from sites such as Sterkfontein, known to have accumulated during arid times. In the course of this visit, a small collection of goat bones was made. These were picked up on the sandy desert surface among the Hottentot huts and, as an exercise in osteology, were laid out at the Desert Research Station and classified according to skeletal parts. It was immediately clear that certain bones occurred abundantly, while others were virtually unrepresented. For instance the distal end of the humerus was common, though no proximal end could be discovered. Atlas and axis vertebrae cropped up far in excess of their natural proportions. The possible implications of this disproportionate representation of skeletal parts seemed so significant that the remaining time in the Namib was devoted to collecting all available goat bones from the 3 villages closest to the Research Station and to on-the-spot studies of what the Hottentots do to them. In one village, Zoutrivier, a goat was bought and then given to the inhabitants to eat, making possible detailed observations on eating customs.

The poverty of the Hottentots ensures that no edible part of a goat is overlooked. Since wealth and status is determined by the size of a man's goat herd, the animals are not frequently killed. However when a goat is slaughtered, the standard procedure in dealing with bones which contain marrow is to break them with a stone, using another as an anvil (pl. II, fig. a). No particular stone implement is used, any convenient piece of rock being picked up for the purpose. The goat's head is normally boiled whole, after the horns have been detached at their bases by a sharp blow from an axe. When the Hottentots have eaten all they can from the bones, these are thrown to the dogs, of which each village has several. The dogs tend to be fairly small, of about jackal size, mostly having the appearance of "kaffir dogs" (pl. III, fig. b).

When both Hottentots and dogs have finished their meals, the bone remnants, representing the more durable parts of the goat skeleton, lie on the sand surrounding the villages and become bleached in the sun (pl. I, fig. b). No scavengers other than very occasional jackals and pied crows need to be considered in this part of the desert.

In order to obtain a larger sample of goat bones for analysis, a second visit was made to the area during February 1966. All available bone fragments were collected from the 8 occupied villages along the length of the Kuiseb River, from Rooibank in the west to Ossewater in the east. The great aridity of the area was found to be an advantage in that bones lying on the sand were not obscured by vegetation. Nearly 2,400 pieces were collected, an analysis of which is now presented.

ANALYSIS OF THE GOAT BONES

The available sample was divided up according to parts of the skeleton represented. Results are given in Table I (opposite).

TABLE I

SKELETAL PART			TOTALS
SKULL	Horns and cores	385	
	Cranial fragments	70	
	Maxillary fragments	57	512
MANDIBLE	Complete half mandibles	38	
	Mandibular fragments	150	188
LOOSE TEETH		15	15
VERTEBRAE	1st cervical (atlas)	12	
	2nd cervical (axis)	14	
	Other cervical	12	
	Thoracic	21	
	Lumbar	31	
	Sacral	1	
	Caudal	0	
	Fragments	24	115
RIBS		174	174
SCAPULA	Head portion	28	
	Other fragments	31	59
PELVIS	Acetabular portion	34	
	Other fragments	21	55
HUMERUS	Proximal ends	0	
	Distal ends	82	
	Shaft fragments	114	196
RADIUS + ULNA	Complete bones	3	
	Proximal ends	62	
	Distal ends	19	
	Shaft fragments	123	207
FEMUR	Proximal ends	18	
	Distal ends	9	
	Shaft fragments	88	115
TIBIA	Proximal ends	13	
	Distal ends	72	
	Shaft fragments	152	237
METACARPAL	Complete bones	8	
	Proximal ends	24	
	Distal ends	15	
	Shaft fragments	53	100
METATARSAL	Complete bones	9	
	Proximal ends	30	
	Distal ends	11	
	Shaft pieces	51	101
ASTRAGULUS	Complete	16	16
CALCANEUM	Complete	14	14
PHALANGES	Complete	21	21
BONE FLAKES		248	248
			2373

COMPARATIVE DURABILITY OF SKELETAL PARTS

Numbers listed in Table I make it clear that certain parts of the skeleton are better able to survive destructive treatment than others. Reasons for the greater durability of some parts will be discussed elsewhere. However a few remarks are pertinent here.

Of the 2373 bone pieces being considered, 700 are derived from the skull, meaning that the head contributed almost 30% to the total sample (pl. III, fig. a). Associated with this is the unnaturally high proportion of atlas and axis vertebrae, 26 out of a total of 90. The reason for their survival lies in their robust construction and the fact that, due to their powerful ligamentous attachment to the skull, they normally remain connected to the occiput when the head is severed from the neck.

Long bones of the limbs are almost without exception broken by the Hottentots for marrow and then gnawed by the dogs. The result is survival of the durable portions and disappearance of the fragile ones. Figure 1 shows diagrammatically how different ends of the long bones are numerically represented in the sample. In the humerus for instance, 82 distal ends are found but not a single proximal one has survived (pl. III, fig. b). Again, the proximal end of the fused radius/ulna is represented by 62 pieces, compared with 19 distal ones. In the femur, the proximal end occurs twice as commonly as the distal one, while the position is reversed in the tibia, where the distal end is about 6 times as common as the proximal. With both metacarpal and metatarsal, proximal ends are more commonly found than distal ones.

Considering the forelimb, it is clear that the elbow joint is specially durable, though this is not true for the knee joint of the hindlimb. Comparative durability of bones is clearly influenced by their shape and structure, though another important factor is the stage in the goat's life which epiphyses of the long bones fuse to their shafts. Figures do not seem to be available for goats, but two separate studies have been made on sheep, one in 1897 by Lesbre[2] and a more recent one done radiographically by Smith[3] in 1956. Figures from both sources are given in Table II (opposite).

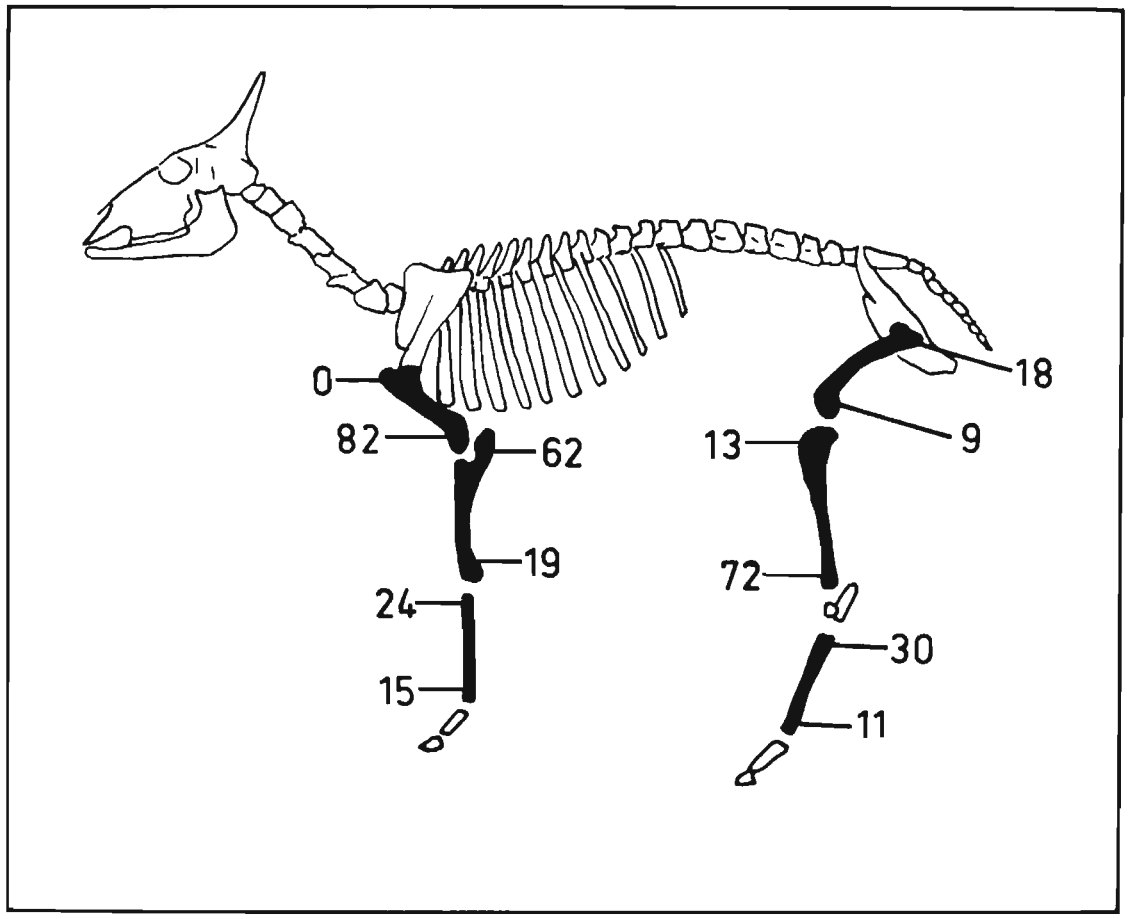

Figure 1: Diagram of a goat skeleton. The numbers refer to ends of long bones present in the sample from the Namib Desert.

TABLE II

FUSION OF EPIPHYSIS TO SHAFT

		Lesbre (1897)	*Smith* (1956)
HUMERUS	proximal	3½ years	17 months
	distal	3—4 months	4 months
RADIUS	proximal	3—4 months	4 months
	distal	3½ years	21 months
ULNA	proximal	——	21 months
	distal	——	26 months
FEMUR	proximal	3—3½ years	17—18 months
	distal	3½ years	18—22 months
TIBIA	proximal	3½ years	25 months
	distal	15—20 months	15 months
META-CARPAL	proximal	before birth	——
	distal	20—24 months	16 months
META-TARSAL	proximal	before birth	——
	distal	20—24 months	15 months

It will be seen that a remarkable correlation exists between the age at which fusion of epiphysis to shaft occurs and abundance of long bone ends in the sample discussed earlier. Ends of those bones whose epiphyses ossify early in life are well represented in the bone collection whereas those which undergo late fusion less often survive. Considering the humerus, Smith has shown that cartilage persists between epiphysis and shaft for 17 months proximally but only 4 distally. Thus, in a goat which is not altogether mature, the proximal end will remain cartilaginous, while the distal is fully ossified. The same factor will operate for other limb bones in accordance with relative fusion times of epiphysis to shaft.

An attempt has been made to establish the ages of the goats eaten by the Kuiseb River Hottentots. 370 of the individual goat horns were found to be reasonably complete and these were measured and plotted in Figure 2 (turn page) according to their lengths, measured straight between base and tip. It is very difficult to be certain of exact age, but an approximate age/length correlation provided by a reliable Hottentot is shown at the base of Figure 2. It will be seen that the great majority of the goats eaten fall in the 1 to 3 year old category.

CONCLUSION

This study of goat bones which were discarded by Hottentots and then gnawed by their dogs, shows that in a bone assemblage of this kind, a disproportionate representation of skeletal parts can be expected. Certain parts of the skeleton are likely to be found to the complete or partial exclusion of others. The reason is to be found in differential durability due to shape and structure, but also in the fact that fusion of epiphyses to shafts occurs at different stages for different ends of long bones.

In the present instance, the prey animal is a small ungulate, whose bones have been subjected to human and small carnivore feeding action. However the conclusions reached on comparative durability of bones will apply equally well to those of larger mammals subjected to more drastic treatment, like chewing by hyaenas. Certain bones last better than others, whatever destructive influences are brought to bear upon them.

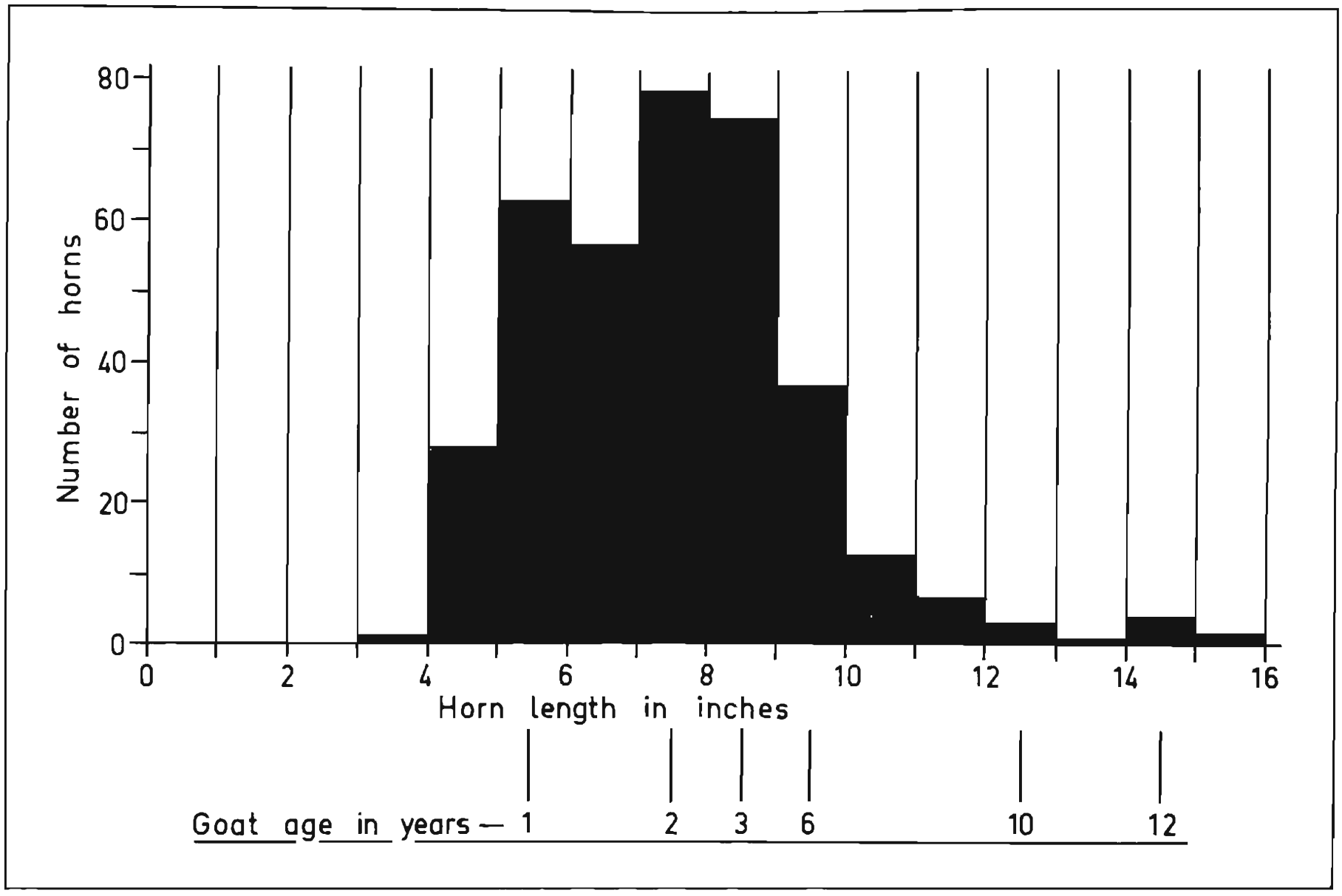

Figure 2: Histogram in which lenghts of goat horns in the Namib Desert sample are plotted. A Hottentot estimate of the age of the goats is appended at the base of the diagram.

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EXPLANATION OF THE PLATES.

PLATE I

Figure a: A general view of the Kuiseb river-bed at the Ossewater Hottentot village. Due to recent floods, an open pool covers the well where the goats normally come to drink. The large *Acacia albida* trees are restricted to the river course itself.

Figure b: Goat bones and other typical debris lying on the sand among Hottentot huts. Klipneus village, Kuiseb River.

PLATE II

Figure a: A Kuiseb River Hottentot uses a stone to crack a goat bone for marrow in the traditional manner.

Figure b: A characteristic Hottentot dog. These animals chew the goat bones once they have been discarded by the Hottentots themselves.

PLATE III

Figure a: Goat bones from the Hottentot villages. — Characteristic cranial and mandibular fragments. Parts of the skull make up almost 30% of the total sample.

Figure b: Goat humeral fragments from the Hottentot villages. — The bone in the left bottom corner is a complete humerus for comparison. Next to it are the three most complete humeri in the sample. Among 82 complete distal ends, not a single proximal end was found.

PLATE I

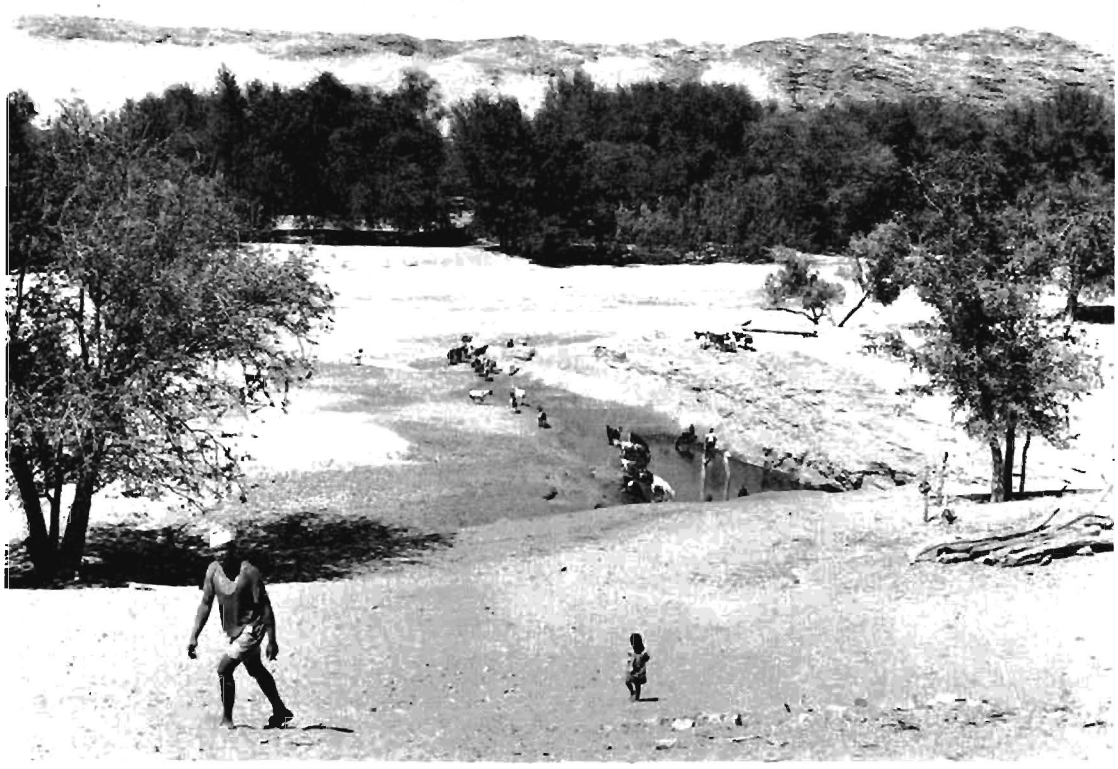

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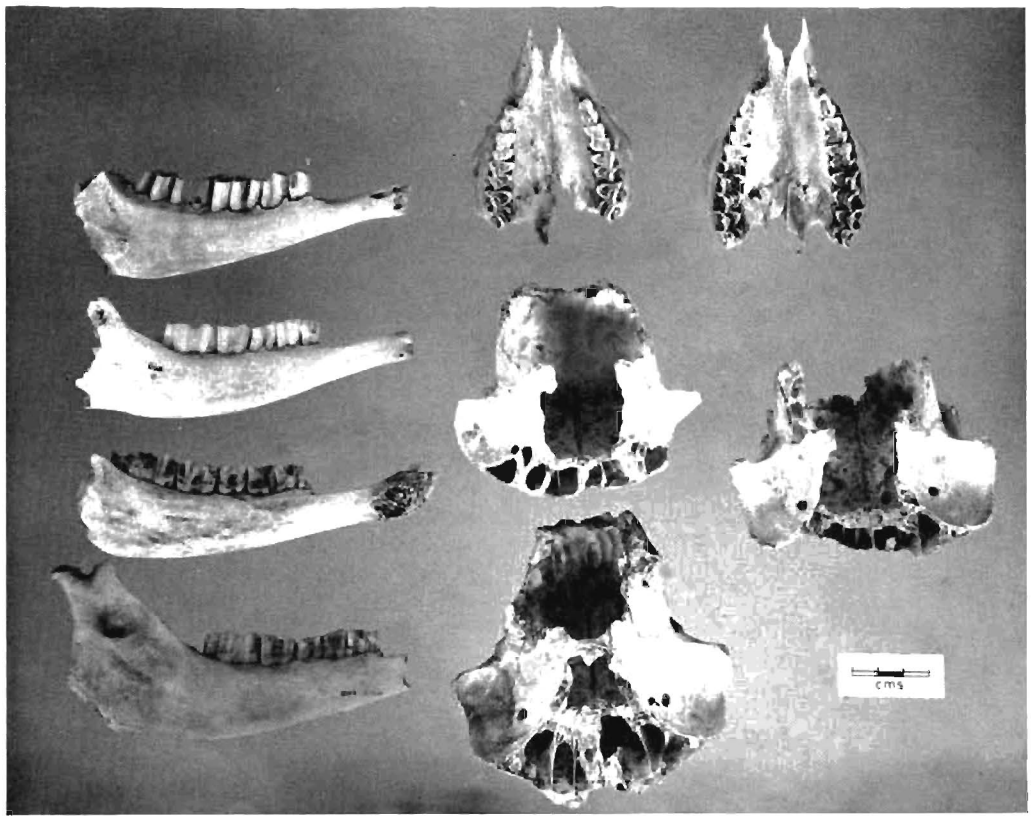
PLATE II

a

b

PLATE III



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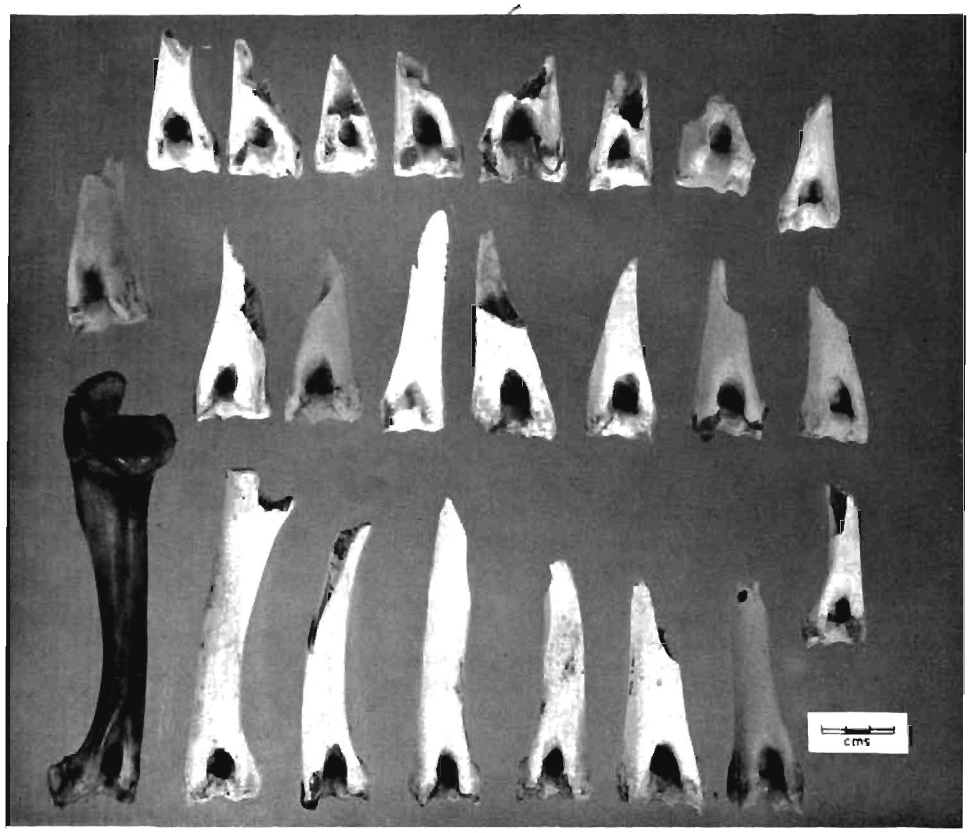

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