

Some Mammals of the Extinct Ratnapura Fauna of Ceylon

(Part II)

By

P. E. P. DERANIYAGALA, M.A. (Cantab.); A.M. (Harvard);
F.C.P.S.; F.L.S.; F.Z.S.,

Director of Museums, Ceylon

(With Three Plates and Three Text Figures)

Introduction

This, the second article of the series, deals with fossils mostly collected since the publication of the first part which details the terminology and references to literature¹. With the exception of a donation of two rhinoceros teeth, much of the present material was secured by sending out H. Jayasundera and V. W. Dingiri Mahatmaya of Ratnapura Museum. They had been instructed to record carefully the bedding of the pit from which each respective fossil was obtained, and these returns are tabulated below. The bulk of the collection belongs to Ratnapura Museum, and is denoted by 'R', one tooth is in the Colombo Museum.

Bedding

TABLE I

List of Pits yielding fossils

Rhinoceros sinhaleyus (Pl. XXI., figs. a, b.)

(1) Rhinoceros tooth, Colombo Museum No. f 186. (text fig. 1 a)

Mōragalleyāgō kumbura at Āhaliyagoda—

Humus ..	.. 1½ ft.	Lateritized gravel ..	.. 3 ft.
Clay ..	.. 3 ft.	Boulders, pebbles & illama	1½ ft. to 2 ft.
Fine white sand ..	.. 1½ ft.	Ferricrete & fossils ..	.. 6 in. to 8 in.
Coarse sand ..	.. 3 ft.	Micaceous kaolin ..	.. 2 ft.
Leaf bed ..	.. 1½ ft. to 2 ft.	Crystalline limestone —

1. Deraniyagala, P. E. P., 1-44—*Spolia Zeylanica*, Vol. 24, pp. 19-56.

- (2) Rhinoceros tooth, Ratnapura Museum No. f 20 a (text fig. 1c)

Mäddé kumbura, Kosgoda, Kuruvita—

Humus . . .	.. 3 ft.	|	Grey illama . . .	.. 1 ft.
Yellow clay . . .	.. 2½ ft.		Kaolin marlava . . .	.. 1 ft.
White sand and leaves . . .	.. 14 ft.		Bed rock —

Rhinoceros sondaicus simplisinus ssp. nov. (Pl. XXI., figs. c, d.)

- (3) Rhinoceros teeth, Ratnapura Museum No. f 9 a and c (text fig. 2)

Parmunailágé gam mädde vala liyädä, Pothu kola Deniya, Nivitigala, near a tributary of the Hangamu ganga—

Lateritized surface soil . . .	.. 2 ft.	|	River sand and illama with	
Coarse white sand . . .	.. 4 ft.		pebbles about 4" in	
Leaf bed . . .	.. 4 ft.		diameter . . .	.. 2 ft.
Fine white sand . . .	.. 1 ft.		Kaolin Marlava —

Hexaprotodon sinhaleyus

- (4) A canine and two last lower molar teeth of hippopotamus (Pl. XXII., figs. d, a, b.)

Bandara Bögävala, Dodampé a quarter mile from a stream—

Swamp humus . . .	.. 3 ft.	|	Gravel of size of large shot 3 ft.	
Red clay . . .	.. 5 ft.		Leaf bed . . .	.. 2 ft.
Fine sand . . .	.. 2½ ft.		Illama . . .	.. 2 ft.
Micaceous white sand . . .	.. 3 ft.			20½ ft.

- (5) Hippopotamus incisor, Ratnapura Museum No. f. 16 a.

Mätivala Deniya, Pohorabäva, Ellävala—

Swamp humus . . .	.. 4 ft.	|	Red gravel . . .	.. 3 ft.
Adhesive clay . . .	.. 5 ft.		Fine sand . . .	.. 4 ft.
Clay . . .	.. 3 ft.		Illama . . .	.. 1½ ft.
				20½ ft.

Fauna

Family Rhinocerotidae

Genus **Rhinoceros** Linné*Rhinoceros unicornis* Linné 1758 Systema Naturae, Ed. X.

The present paper deals with two rhinoceroses. One of these is a new race of the Javanese *Rhinoceros sondaicus* Demarest.

KEY TO THE RHINOCEROSSES OF CEYLON

1. Upper molars usually with a crista, cingulum usually present upon lingual, basal, aspect of protocone.

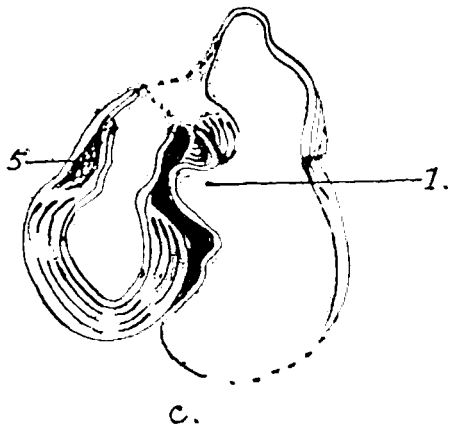
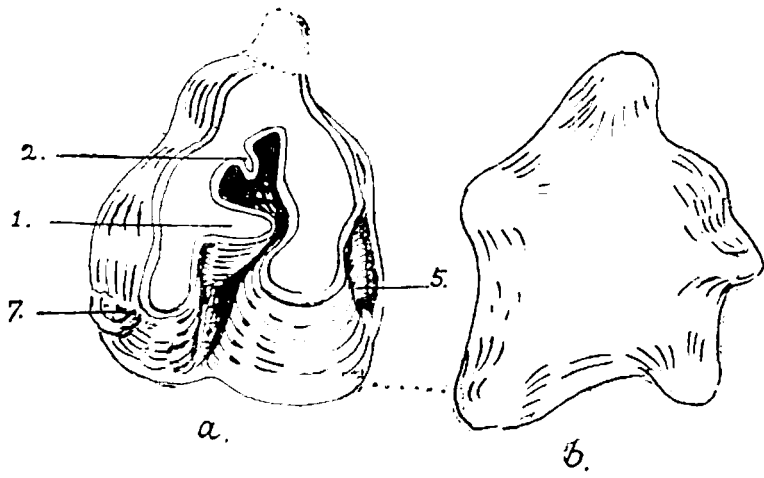
Rhinoceros sinhaleyus.

2. Upper molars without crista, cingulum absent from lingual, basal, aspect of protocone—

Rhinoceros sondaicus simplisinus ssp. nov.



Some upper molars of two extinct species of Ceylon rhinoceroses.



P. Deraniyagala del.

Fig. 1. Two upper third molar teeth of *Rhinoceros sinhaleyus* Deraniyagala

1 crochet, 2 crista, 5 anterior shelf produced by cingulum, 7 vestige of cingulum.
 a A right third molar showing crochet 1 and crista 2, anterior shelf 5. Colombo Museum No. f 180; b the five roots of a; c a left third molar, showing crochet 1, anterior shelf 5, Ratnapura Museum No. f 20a; also figured on Pl. XXI., figs. a, b.

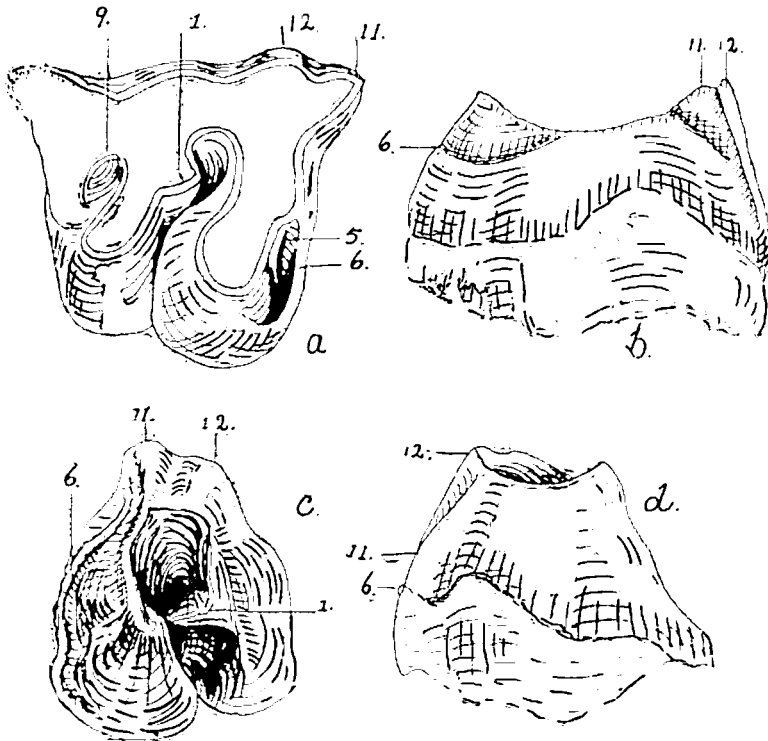
Rhinoceros sinhaleyus Deraniyagala (Pl. XXI)

Rhinoceros ?] sinhaleyus Deraniyagala 1936 Journal of Royal Asiatic Society (Ceylon Branch) Vol. XXXIII No. 88.
Rhinoceros sinhaleyus Deraniyagala 1944 Spolia Zeylanica Vol. 21, pp. 27-36.

The two teeth now described are assigned to *Rhinoceros sinhaleyus*, the exact identity of the first of these being established by the presence of a crochet and crista

(Pl. XXI, figs. *a*, *b*). The identity of the second tooth is less certain as it differs from the other third molars described in this paper in that its protocone is smaller than its hypocone fig. 1.

(1) Colombo Museum Number f 186 (Pl. XXI., fig. *a*, and text fig. 1 *a*). Fig. *a* is an upper, right, third molar worn down to about two-thirds of its original height. The enamel is black, the dentine grey. There are five roots (fig. 1 *b*), the external outline of the ectoloph is wavy, the tip of the parastyle buttress has been broken off, but this has been reconstructed after examining a left third molar (Pl. XXI., fig. *a* and text fig. 1, fig. *c*) the paracone is well developed; the protocone is not much larger than the hypocone which inclines towards it. The oblique cingulum forms an anterior shelf (fig. 1 *a* 5) but this does not exist upon the lingual aspect of the protocone, although it recurs as a vestige (fig. 1 *a* 7) on the hypocone. The hypocone gives out a strong crochet and a crista also juts into the median valley (fig. 1 *a* 2), the protoloph bulges feebly into the median valley suggesting a tendency to develop an



P. Deraniyagala del.

Fig. 2. Two upper molars of a *Rhinoceros sondaicus simplissimus* ssp. nov.

1 crochet, 5 anterior shelf, 6 cingulum, 9 posterior valley, 11 parastyle buttress, 12 paracone. (a) The crown of front molar. (c) crown of third molar. (b) and (d) anterior views of (a) and (c) respectively, also figured on Pl. XXI., figs. c, d.

antecrochet. The dimensions of the tooth are given in Table II, its locality is Āhāliyagoda near the type locality; the pit is (1) in the list of pits. In association with this tooth was another mammalian tooth which will be described elsewhere.

(2) Ratnapura Museum No. f 20 (a) (Pl. XXI., fig. b, and text fig. 1, fig. c) is an upper, left, third molar worn down to about one third of its original height. The enamel is black, the dentine grey, the roots are missing. The tooth was fractured into two, and part of the paracone is missing, but the pieces interlocked and were cemented together. The external outline of the ectoloph is very wavy and the parastyle buttress is strong. The protocone is somewhat smaller than the hypocone. There is as prominent a crochet (text fig. 1, c 1) as in the previous specimen, but as the enamel is missing from the labial aspect of the median valley it is impossible to state whether a crista existed in the perfect tooth. The anterior shelf (fig. 1, c 5) is vestigial.

The dimensions of this tooth are given in Table II, its locality is Kosgoda; pit (2) in the list of pits.

The tooth was encrusted with river sand, its median valley also containing this fine grey sand with ilmenite and a fragment of ruby. In the same pit was found a broken molar, consisting of six and a half folds, of an *Elephas maximus sinhalleyus* Deraniyagala.

Rhinoceros sondaicus simplisinus ssp. nov. (Pl. XXI.)

Every upper molar hitherto known has been secured from a different gem pit, and the teeth belong to as many individuals. The first recovery of two upper molars found together in one pit and presumably belonging to the same individual rhinoceros is now recorded. These teeth are a right molar, which is probably a first molar and a left third molar. They were presented to Ratnapura Museum by Mr. M. Appuhami, the Gan Arachchi of Nivitigala, together with fragments of a molar of *Elephas ? maximus sinhalleyus* Deraniyagala, which came from the same gem pit. Neither of these rhinoceros teeth possesses a trace of the antecrochet or crista as in *R. sinhalleyus*. They are closely allied to *Rhinoceros sondaicus* Demarest¹ and are now described below as follows:—

(1) Ratnapura Museum No. f 9 (a) (Pl. XXI., fig. c and text fig. 2 a) is an upper, right, first molar worn down to about one third of its original height; the enamel is black the dentine grey; the roots are missing. The external outline of the ectoloph is wavy, but its posterior end is missing, the parastyle buttress and paracone are developed, the length of the protoloph exceeds that of the ectoloph. The protocone is strong and larger than the hypocone which inclines towards the former to constrict the entrance to the median valley.

The cingulum ascends obliquely from the ectoloph and then descends towards the base of the protocone forming an anterior shelf and then disappears from the lingual aspect of the tooth.

The hypocone gives out a heavy, blunt crochet, but there are no signs of a crista or antecrochet. The posterior valley is well developed; for dimensions see Table II. Its locality is Nivitigala, Pit No. 3 in the list of pits.

¹ *R. novae karnulensis* has been assigned to *R. unicornis* by Matthew 1929 (Bul. A.M.N.H. LVI, p. 461), and to *R. sondaicus* by Hooijer (1946).

(2) Ratnapura Museum No. f 9 (*b*) is an unworn, upper, left, third molar. Pl. XXI, fig. *d*. The enamel is black, the dentine grey, the roots are missing. The external outline of the ectoloph is wavy, the parastyle buttress and paracone are well developed. The protocone is strong and larger than the hypocone and the two are widely separate at the entrance to the median valley. The cingulum exists along the anterior aspect of the tooth. The hypocone gives out a strong crochet which touches the protocone and curves labially, there is no crista or trace of an anterochet. For dimensions see Table II. Its locality is Nivitigala, Pit No. 3 in the list of pits.

The relationships of the above two molars are now considered. The following characters of the front molar (R. f 9 *a*) show affinity to *Rhinoceros sondaicus* Demarest—(1) the anterior width exceeds the length of the ectoloph, (2) the absence of a posterior denticle, (3) the fact that the median valley is deeper than the posterior one, (4) the absence of a crista or anterochet, (5) the absence of a vertical, lingual, groove¹ upon either the protocone or hypocone, (6) the absence of the cingulum upon the lingual aspect, (7) the metaloph overhangs the protoloph, (8) the presence of a strong parastyle buttress.

The following characters of the last molar (R. f 9 *b*) show affinity to *Rhinoceros sondaicus* (1) the crochet extends from the bottom of the valley to the outer edge of the metaloph, (2) the crochet is recurved terminally towards the antero-external angle, (3) the cingulum exists upon the anterior aspect of the base of the protocone but is absent lingually, (4) there are no vertical folds upon the lingual aspect of the protocone.

The teeth differ from those of *Rhinoceros sondaicus* thus—(*a*) in size (*b*) in possessing no trace of a crista as in *R. sondaicus*, (*c*) neither is the cingulum continued along the basal, lingual, surface of the protocone. The third molar is less reduced in relation to the front teeth than in *R. unicornis* Linné.

Types.—Ratnapura Museum No. f 9 (*a*) and (*b*) pl. XXI, figs. *c*, *d*.

Distribution.—From alluvial gem sand at a depth of 13 feet beneath the surface. (Pit No. 3) in the vicinity of a tributary of the Hangamuva ganga off the Nivitigala to Kalavāna road, in Sabaragamuva Province.

The "forma typica" is known as a Pleistocene fossil from Bornco, Sumatra and Java and survives as a living species in the last two islands.

Rhinoceros sondaicus is probably the survivor of two closely related Pleistocene forms of which *Rhinoceros sivalensis* is extinct. As *Rhinoceros sinhaleus* is closely related to both and since it shows greater specialization, it is probably the direct result of isolation upon one of them. The presence in Ceylon of the Javanese rhinoceros suggests the spread of this animal to Ceylon by the temporary route which produced the discontinuous distribution of several living animals.² These two rhinoceroses and the living and extinct races of *Elephas maximus* in Ceylon also suggest that several phases of the Pleistocene exerted their influence upon evolution in Ceylon. The repetition of the different types of bedding including the layer of gem sand, in some gem pits, further supports such a view.

¹ This is present in both *R. sivalensis* and *R. serratensis* according to D. A. Hooijer (1946).—*Prehistoric and Fossil Rhinoceroses from the Malay Archipelago and India* (Leiden).

² Deraniyagala, P. E. P.—1940 (*a*); 1942; (see *Mammals of the Extinct Ratnapura Fauna*, part I).

TABLE II

Upper molars of Ceylon rhinoceroses (Pl. XXI).

figs. (a) (b) *Rhinoceros sinhaleys* Deraniyagala are C. M. f. 186 and R. f 20 (a)figs. (c) (d) *Rhinoceros sondaicus simplisinus* ssp nov. are R f. 9 (a) & (b)

Number	Tooth	Length	Width	Crown height	L. of median valley	Plate XXI
C.M.f 186	$\frac{3 \text{ R M}}{0}$	50 mm.	57 mm.	45	32	fig. a
Ratnapura f 20 (a)	$\frac{3 \text{ L M}}{0}$	40 mm.	60 mm.	30 mm.	40 mm.	fig. b
Ratnapura f 9 (b)	$\frac{3 \text{ L M}}{0}$	48 mm.	50 mm.	40 mm.	36 mm.	fig. d
Ratnapura f 9 (a)	$\frac{1 \text{ R M}}{0}$	40 + (10) [?]	65	38	30	fig. c
Ratnapura f 9 (a)	$\frac{1 \text{ R M}}{0}$	l. of ectoloph 45 + (10) :	l. of protoloph 42			

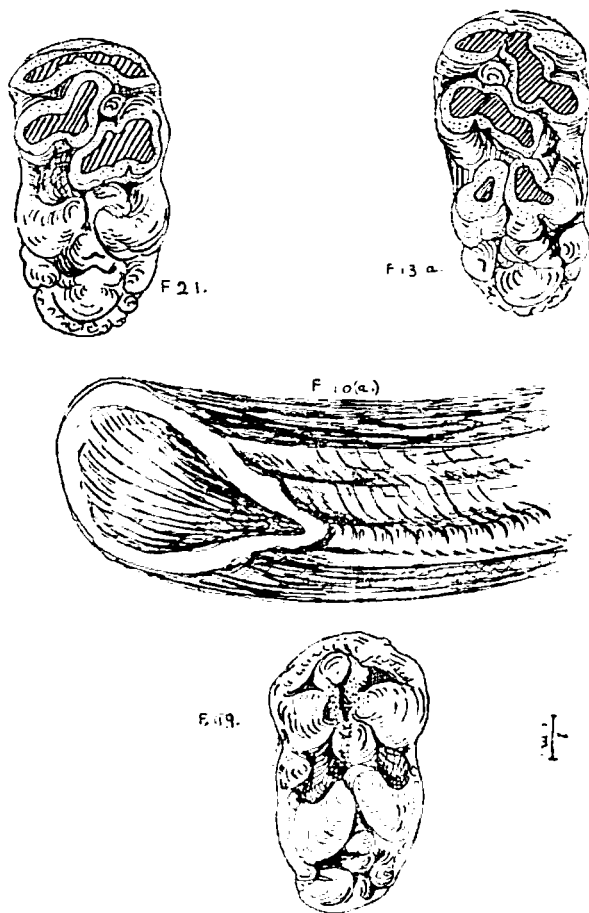
TABLE III

Upper molars of *Rhinoceros unicornis* Linné

	tooth	l. of ectoloph	l. of protoloph
Skull in Intermediate College, Mysore, India	$\frac{3 \text{ R M}}{0}$	48 mm.	35 mm.
	$\frac{2 \text{ R M}}{0}$	58	60
	$\frac{1 \text{ R M}}{0}$	53	60

Genus **Hexaprotodon** Falconer et Cautley*Hippopotamus (Hexaprotodon) sivalensis* Falconer et Cautley 1836 Asiatic Researches XIX.**Hexaprotodon sinhaleyus** Deraniyagala (Pls. XXII, XXIII)*Hippopotamus (Hexaprotodon)? sivalensis?* ssp. Deraniyagala 1936 Geological Magazine Vol. LXXIII, No. 865 fig. 1.*Hexaprotodon sinhaleyus* Deraniyagala 1944. Spolia Zeylanica Vol. 24, pt. 1, p. 37 pl. VI.

Incisor.—Ratnapura Museum No. f 16 a is part of an outer incisor, both the pulp cavity and distal end are missing. The solid, rod-like tooth is subquadrangular in section. Its length is 125 mm. the diameter at one end is 30×22 mm. and 25×19 mm. at the other. The fossil was obtained from Pohorabāva, Ellāvala, Pit No. 5 in the list of pits.



P. Deraniyagala del.

Fig. 3. Canine and molars of *Hexaprotodon sinhaleyus* from Dodampé; in Ratnapura Museum, F 21 last left lower molar, F 13 a last, right, lower molar, F 10 (a) base of left lower canine, all from the same animal = (Pl. XXII, figs. a, b, d). F 19, last, left, lower molar of another individual = (Pl. XXII, fig. c) $\times \frac{1}{2}$ natural size.

TABLE V.

Dimensions of third lower molars of *Hexaprotodon sinhaleys* (Pls. XXII, XXIII)

Number	basal length	greatest width	crown height	Pl. XXII.
R. f 21	66 mm.	39 mm.	47 mm.	fig. a
R. f 13 a	65 mm.	38 mm.	46 mm.	fig. b
R. f 19	55 mm.	38 mm.	47 mm.	fig. c

TABLE VI.

Fossils in Ratnapura Museum.

Reg. No.	Fossils	Localities	Depth of
F 1.	Seven bovine fossil bones	Badagātaya Ōvita, Haldola	23 feet
F 2.	One bovine leg bone	Digdeniya field, Pathagama, Halpé	11 feet
F 3.	One hippopotamus canine fragment	Balléliyādda, Gōnapitiya, Kuruvita	30 feet
F 4.	Five bovine fossil teeth	Mātilvaladeniya, Poharabāva	12 feet
F 5.	One fossil bone	Digané field, Ellāvala	
F 6.	One molar of an elephant	Vila Kumbura, Pahalagama, Kūndangamuva	
F 7.	Three bovine teeth	Mādde Kumbura, Kosgoda, near Adandēvala	
F 8.	Rhinoceros tooth fragment		20 feet
F 9.	(a) Rhinoceros tooth (Pl. XXI c) (b) Rhinoceros tooth (Pl. XXI d) (c) Four fragments of an elephant molar	Parmunailage Gammaddé Vala Liyadde, Pothukula deniya, Nivitigala	16 feet
F 10.	(a) Fragment of a hippopotamus tusk		
F 11.	(b) Three bits of elephant molar	Bandara Bōgāvala, Dodampé.	16 feet
F 12.	Fragment of an elephant molar	Halpé	30 feet
F 12.	(a) Three fragments of an elephant molar (b) Fragment of an elephant molar (c) Hippopotamus fossil	Halpé	16 feet
F 13.	(a) One hippopotamus molar (Pl. XXII. b). (b) Two bits of hippopotamus tusk	Bandara Bōgāvala, Dodampé	18 feet
F 14.	(a) One hippopotamus tooth (b) One bovine tooth	Mahadeniya, Kosgala	12 feet
F 15.	Two fragments of a hippopotamus tusk fixed with plaster	Bandara Bōgāvala, Dodampé	20 feet
F 16.	(a) Part of a hippopotamus incisor (b) Two rib fragments (c) Fragment of a rhinoceros molar	Mativala Deniya, Poharabāva	20 feet
F 17.	(a) Leg bone (b) One bovine tooth* (c) Fragment of a leg bone.*		
F 17.	Part of an elephant molar	Pahala Teppanāva, Kuruvita	15 feet
F 18.	One hippopotamus molar (Pl. XXII. c)	Mudunkotuva,* Ellavala	10 feet
F 19.	(a) Rhinoceros molar in two pieces fixed together (b) Four fragments of fossil bones (c) Elephant molar	Bandara Bōgāvala	15 feet
F 20.	Hippopotamus molar (Pl. XXII. a)	Halpé, Dodampé	16 feet
F 21.	(a) Elephant molar (b) A piece of leg bone (c) A piece of fossil bone	Kosgoda, Kuruvita	20 feet
F 22.	Elephant molar		
F 21.	Hippopotamus molar (Pl. XXII. a)	Bandara Bōgāvala, Dodampé	12 feet
F 22.	(a) Elephant molar (b) A piece of leg bone (c) A piece of fossil bone	Tabana, Pahala Teppanāva, Kuruvita	15 feet
F 23.	Fragment of bovine teeth	Vadu Kumbura, Haldola	16 feet
F 24.	Elephant molar	Allagé Kumbura	30 feet

TABLE VII

Association of fossils in gem pits showing the number of pits in each instance

Fossil	Total number of pits	is the only fossil in	occurs with	with Elephas in	with bovines in
Hippopotamus	8 pits	4 pits	Rhinoceros in 1 pit	2 pits	1 pit
Rhinoceros	4 pits	0	Hippopotamus in 1 pit	2 pits	1 pit

The above analysis of the recent acquisitions from gem pits shows that although the hippopotamus is commoner than the rhinoceros, the former frequently occurs alone whereas the latter does not. This is to be expected owing to the former being subaquatic. Since both occur in association with a race of *Elephas maximus*¹ and bovines they probably persisted in Ceylon until a comparatively recent date, although the absence of equine fossils from Ceylon is an unusual feature in such an assemblage of Pleistocene mammals.

Explanation of Plates

Plate XXI. Upper molars of the two species of Ceylon Rhinoceroses.

a An upper right, third molar of *Rhinoceros sinhalcyus*. (Colombo Museum No. f 186) $\times 1$.

b An upper, left, third molar of *Rhinoceros sinhalcyus*. (Ratnapura Museum No. f 20 a) $\times \frac{3}{4}$.

c An upper, right, first molar of *Rhinoceros sondaicus simplisinus* ssp. nov. type (Ratnapura Museum No. f 9 a) $\times 1$.

d An upper, left, third molar of *Rhinoceros sondaicus simplisinus* ssp. nov. type (Ratnapura Museum No. f 9 b) $\times 1$ found with c.

Plate XXII. Lower canine and lower last molars of *Hexaprotodon sinhalcyus*.

a crown view of lower left, last molar found with b and c $\times \frac{7}{10}$.

b crown view of lower right, last molar found with a and c $\times \frac{7}{10}$.

c lower left canine found with a and b $\times \frac{7}{10}$.

d a lower left, last molar of another individual $\times \frac{7}{10}$.

Plate XXIII. Lingual aspect of last molars figured in Pl. XXII. a, b, lettering the same $\times \frac{7}{10}$.

d is a terminal view of the pulp cavity of the canine figured in Plate XXII $\times 1.1$.

Photographs by E. L. Moses

¹ *Elephas maximus* Linné, apparently evolved in Ceylon by the isolation of a hypsodont elephant. The occurrence of fossils of *Elephas maximus* in association with those of hippopotamus and rhinoceros in Ceylon alone, supports this view. This elephant is the most recent of proboscideans and the possibility of the hippopotamus surviving into late prehistoric times in Ceylon has been mentioned elsewhere (Deraniyagala 1939a, 1941a).