56.9(1183:51.3)

Article XVII.—NEW FOSSIL MAMMALS FROM THE PLIOCENE OF SZE-CHUAN, CHINA[1]

By W. D. Matthew and Walter Granger

The following is a preliminary notice of a collection secured during the winter of 1920–1921 by Mr. Walter Granger, palæontologist of the Third Asiatic Expedition sent out by the American Museum, the American Asiatic Association, and Asia Magazine, under leadership of Mr. Roy C. Andrews. The locality is a series of pits or fissures at the village of Yen-ching-kao in the vicinity of Wan-hsien, province of Sze-chuan. These pits have been worked by the natives for many years for the Chinese drug trade. Mr. Granger's account of their occurrence and stratigraphic observations and more extended descriptions of the fauna will be published later, this notice serving to place certain interesting novelties upon record.

The age of the fauna is provisionally placed as Upper Pliocene on account of the abundance of *Stegodon* remains and absence of any higher type of Proboscidean, but its final correlation is left open for the present.

The Chinese fossil mammals described by Owen in 1870[2] came from "a cave near the city of Chung-king-foo in the province of Sze-chuan." Chung-king is on the Yang-tse-kiang above Wan-hsien, about one hundred and forty miles distant in an air line. If correctly reported by the finders, Owen's specimens could hardly have come from the Yen-ching-kao pits; but it is apparently the same fauna, or at all events of similar facies and doubtless the same conditions of preservation. Possibly the Chinese informants of Consul Swinhoe, who sent the fossils to Owen, misled him, unintentionally or deliberately, as to the locality. This point will be further discussed at a later date. Owen regarded the fauna as Pliocene and described the following species:

Stegodon orientalis.	Parts of molars.
Rhinoceros sinensis.	Parts of 4 upper and 4 lower molars.
Tapirus sinensis.	Parts of 3 upper and 4 lower teeth.
Chalicotherium sinense.	Part of an upper molar.
Hyæna sinensis.	Canine, 2 premolars.

[1]Publications of the Asiatic Expeditions of The American Museum of Natural History, Publication No. 15.

[2]Quar. Journ. Geol. Soc., London, XXVI, pp. 417–436, Pls. xxvii-xxix.

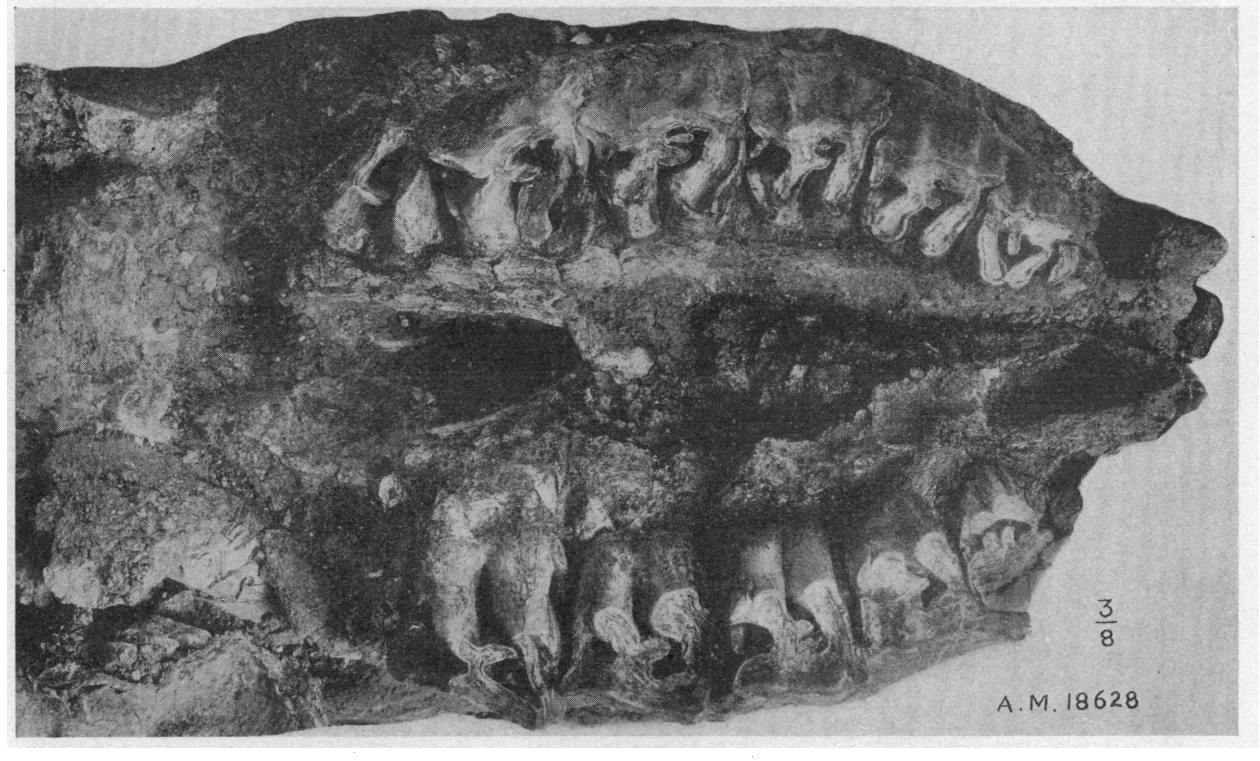

Fig. 1. *Rhinoceros sinensis* Owen. Amer. Mus. No. 18628. Palate of neotype skull. Natural size.

The first three genera are among the most abundant types of large animals in the Yen-ching-kao pits. *Chalicotherium* and *Hyæna* are rare. Owen's descriptions and figures accord very well with some of the species in our collection, so that we have referred them to his species, whether or not later investigation proves them to be exact topotypes.

Koken in 1885[1] described a collection secured by von Richthofen, apparently from the trading junks of the Yang-tse-kiang and understood by him to have come from far up the river in "caves in Yun-nan." Whether this was the real locality remains to be verified; one has the impression from the reading of von Richthofen's letter, quoted by Koken, that the traveller himself suspected that the locality might not have been correctly stated. It is certain at all events that the major part of Koken's collections, like Owen's, represent substantially the same faunal facies, and they seem to agree as to species, in part at least, with our collections. Koken also distinguishes an older fauna of supposed Lower Pliocene age, including *Hipparion*, *Camelopardalis*, *Palæomeryx*, etc., which is more extensively represented in Schlosser's later collections, and is probably substantially the same fauna as the fine collections secured recently by J. G. Andersson[2] and now being studied by Professor Wiman.

Schlosser in 1903[3] described a large collection secured by Dr. Haberer for the Munich museum, and revised the work of Owen, Koken and other previous writers. He concluded that Owen's fauna, except *Stegodon*, and most of Koken's material, was of Pleistocene age. There is no doubt, however, that the *Stegodon* is coeval with the rest of the fauna in Granger's collection, and one may assume that it was probably so in the Owen and Koken collections. Schlosser's material belonged mostly to the older Pliocene fauna distinguished by Koken and came from localities farther to the north.

The collections from Sze-chuan described by Professor Matsumoto in 1915[4] may have come in large part or all from the Yen-ching-kao pits; he does not state any exact localities, but the correspondence of the fauna is evident. Matsumoto divides the material studied by him into two faunas, one found in brown clay and more strongly petrified, the other in cave-loam, feebly fossilized and the teeth strongly colored. The former includes *Stegodon*, *Aceratherium hipparionum*, *Proboselaphus watasei* and *liodon*, *Bibos geron* and two unnamed species of *Buffelus*. The latter includes *Hyæna ultima*, *Rhinoceros sinensis* and *R. plicidens*.

[1]Koken, E. 1885. 'Fossile Saügethiere aus Chinas.' Pal. Abh., III, Heft 2.
[2]Andersson, J. G. 1922. Bull Amer. Mus. Nat. Hist., XLVI, pp. 727–737.
[3]Schlosser, Max. 1903. 'Fossile Saügethiere Chinas.' Abh. k. bayer. Akad. Wiss., XXII, Abt. 1
[4]Matsumoto, H. 1915. Science Reports, Tohoku Imp. Univ., Second Ser. (Geol.) III, No. 1, pp 1–28, Pls. I–X.

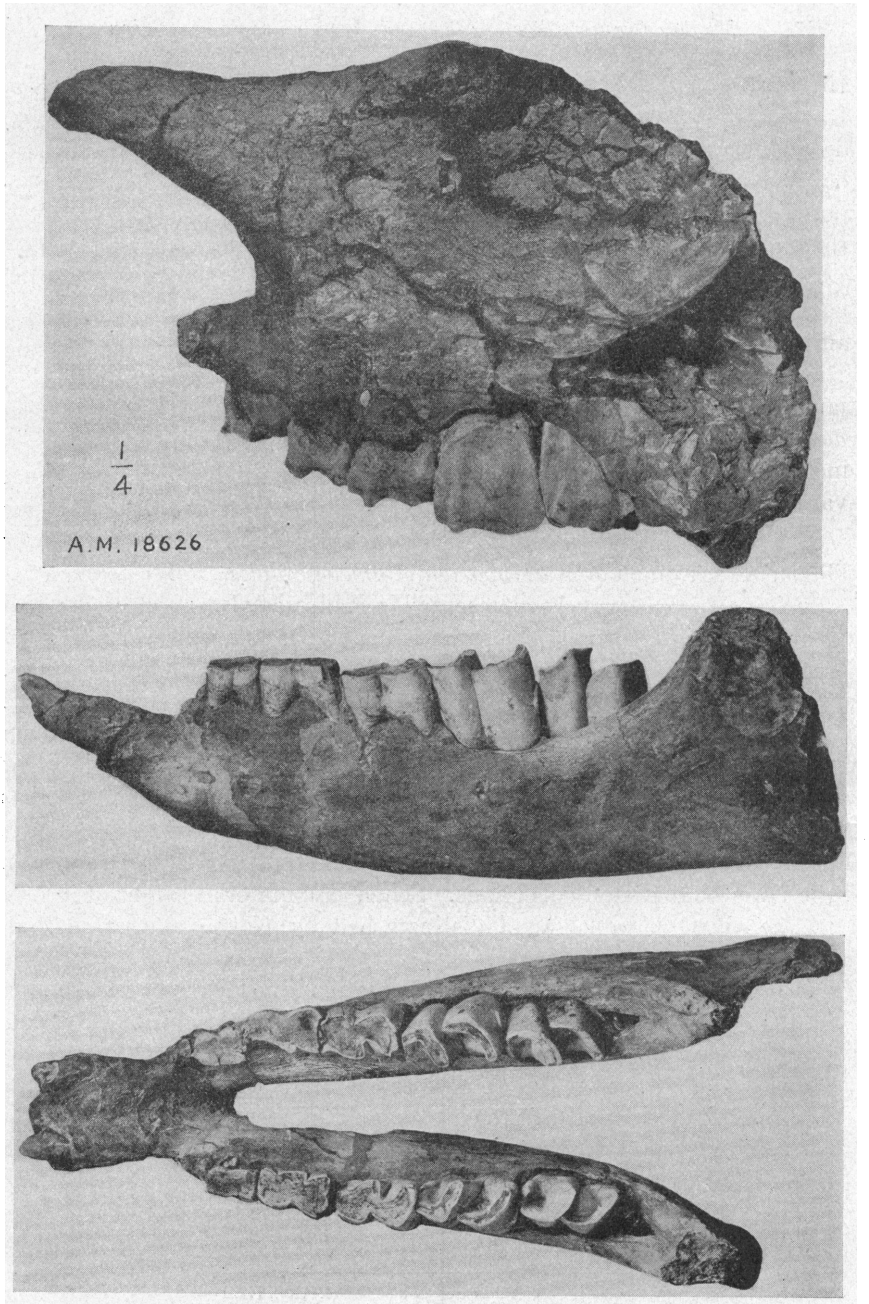

Fig. 2. *Rhinoceros sinensis.* Front of skull and jaws, No. 18626, young individual with milk dentition, the last molar not yet emerged and the second unworn. Natural size.

He regards the first as Upper Pliocene, the second as Lower Pleistocene. In our collections the *Stegodon* material was limited to certain pits occurring low down on the slopes of the mountain valley, and did not occur in pits higher up on the mountain; but we are provisionally disposed to regard this as a matter of limitation of range, and to consider the material from all the pits as of substantially the same geologic age.

Professor Matsumoto's researches[1] upon this and related faunas have been of peculiar value to us as a guide in searching for the probable affinities and identifications of our material.

The Granger collection includes skulls, jaws and numerous parts of jaws of *Stegodon* and *Tapir*, incomplete skulls and many jaws of *Rhinoceros*, a tooth of *Chalicotherium* and a large series of other animals, including a large bovid, smaller antelopes and two or three deer, a pig, various carnivora and a very abundant rodent.

The following notes upon certain described species are a necessary preliminary to the discussion of our new collections.

Stegodon orientalis Owen

Schlosser regards this species as identical with *S. insignis* of India, basing the reference upon the fragmentary teeth described by Owen. Matsumoto regards it as distinct, upon the evidence of the referred material which he describes and figures. The Yen-ching-kao material includes a fairly complete adult skull, two young skulls, a series of palates and lower jaws and many teeth. It should enable us to estimate the affinities of the species more exactly when it has been cleaned up and studied.

Rhinoceros sinensis Owen

Schlosser in his masterly review recognizes this species as valid and considers it most nearly related to *platyrhinus* of the Siwaliks and to the Atelodine group of Pleistocene and modern times. It was, however, practically absent from his Chinese collections at Munich, which seem to have come mostly from the "red clays" of Shan-si, Shen-si and Sze-chuan, but as they were not observed in place the real character and age of the formations remain doubtful. Probably they are chiefly Lower Pliocene. Most of the rhinoceros teeth he refers to *R. habereri*, related in his opinion to *R. palæindicus* and thus to the typical modern *Rhinoceros* of India.

Matsumoto appears disposed to assign *R. sinensis* to the *Teleoceras* group; but if our material be correctly referred, the affinities of Owen's

[1]Matsumoto, H. 1915, *loc. cit.*; 1921, *idem*, V, No. 3, pp. 75–91, Pls. XIII–XIV.

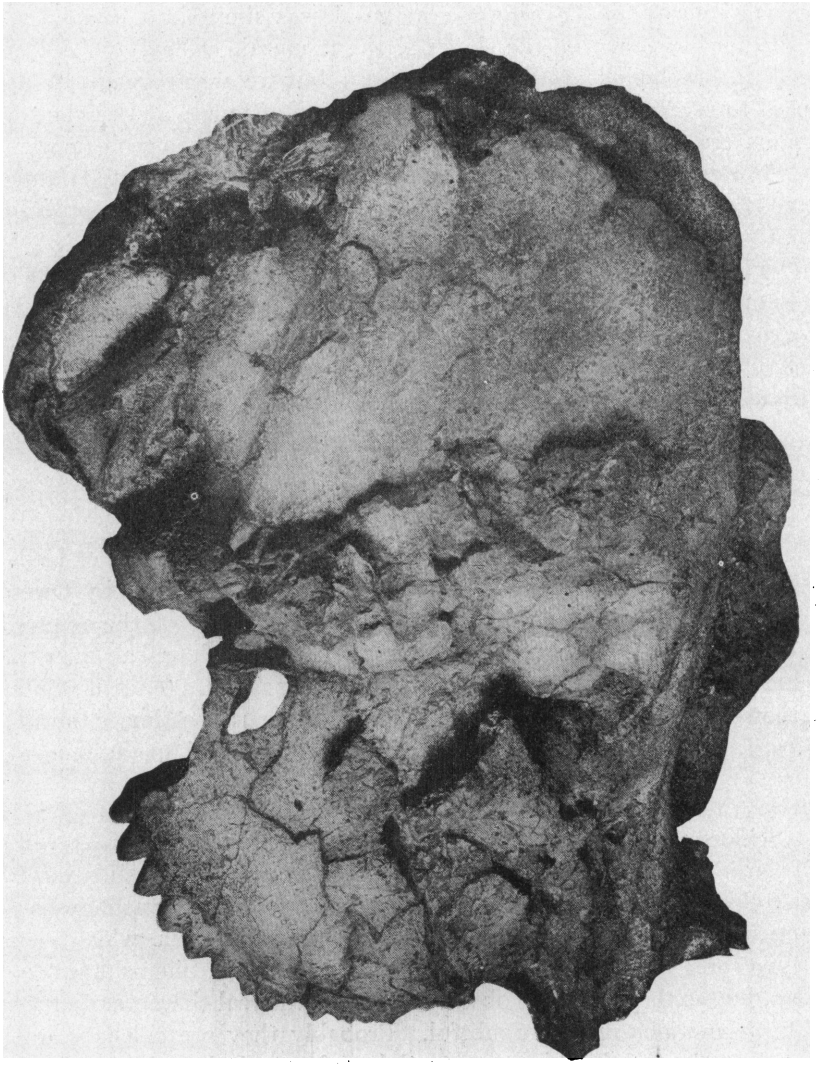

Fig. 3. *Stegodon orientalis* Owen. No. 18630, adult skull, laterally crushed. One-fifth natural size.

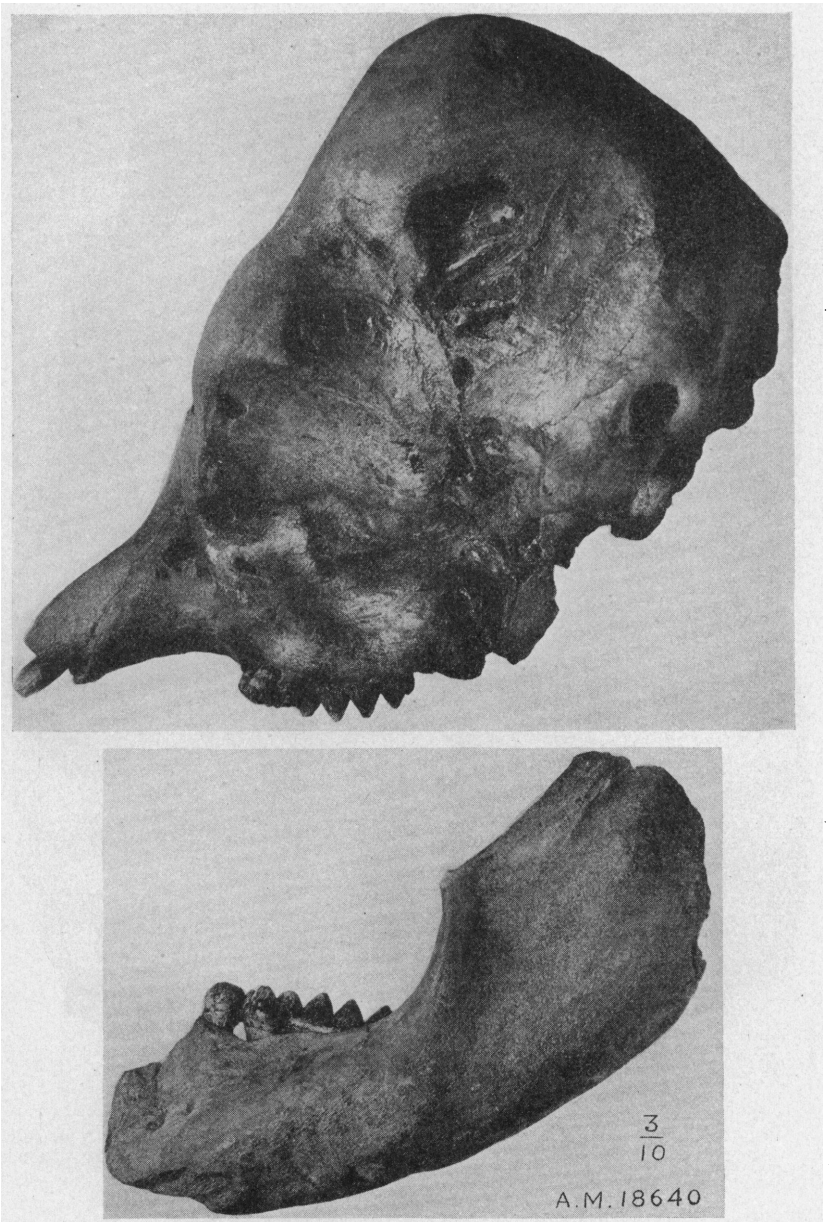

Fig. 4. *Stegodon orientalis*. No. 18640. Young skull and lower jaw, uncrushed. Three-tenths natural size.

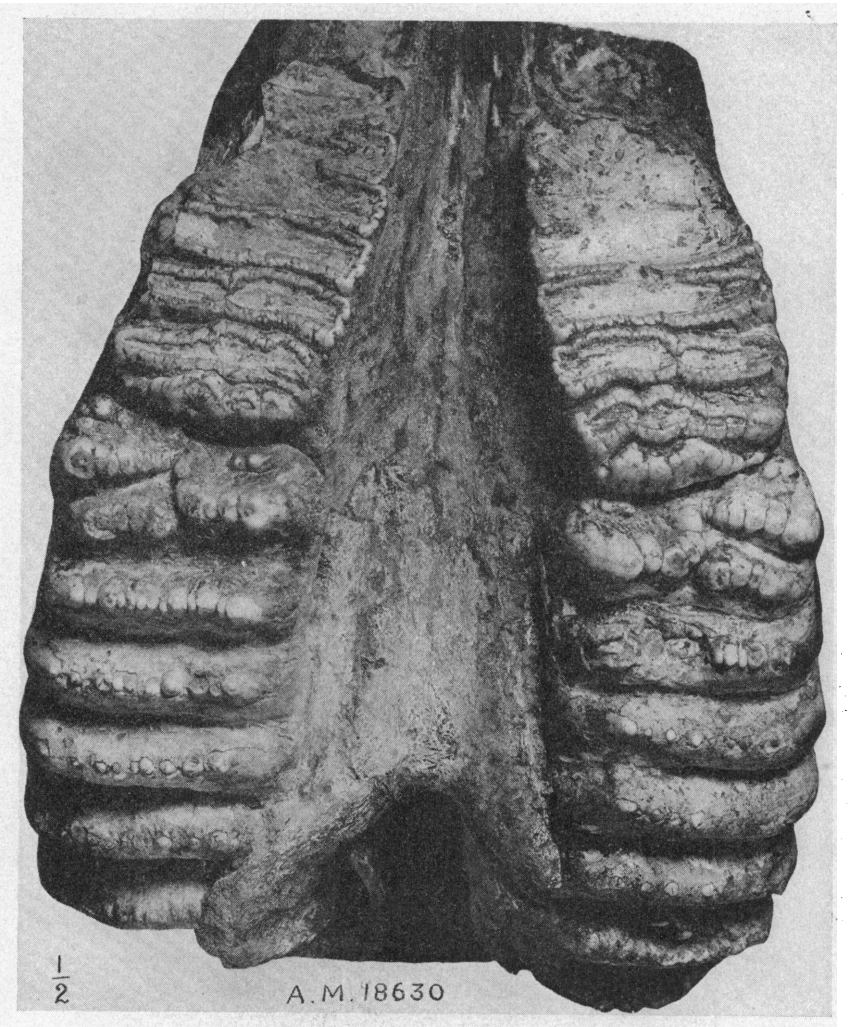

Fig. 5. *Stegodon orientalis.* No. 18630. Palate of adult skull. One-half natural size.

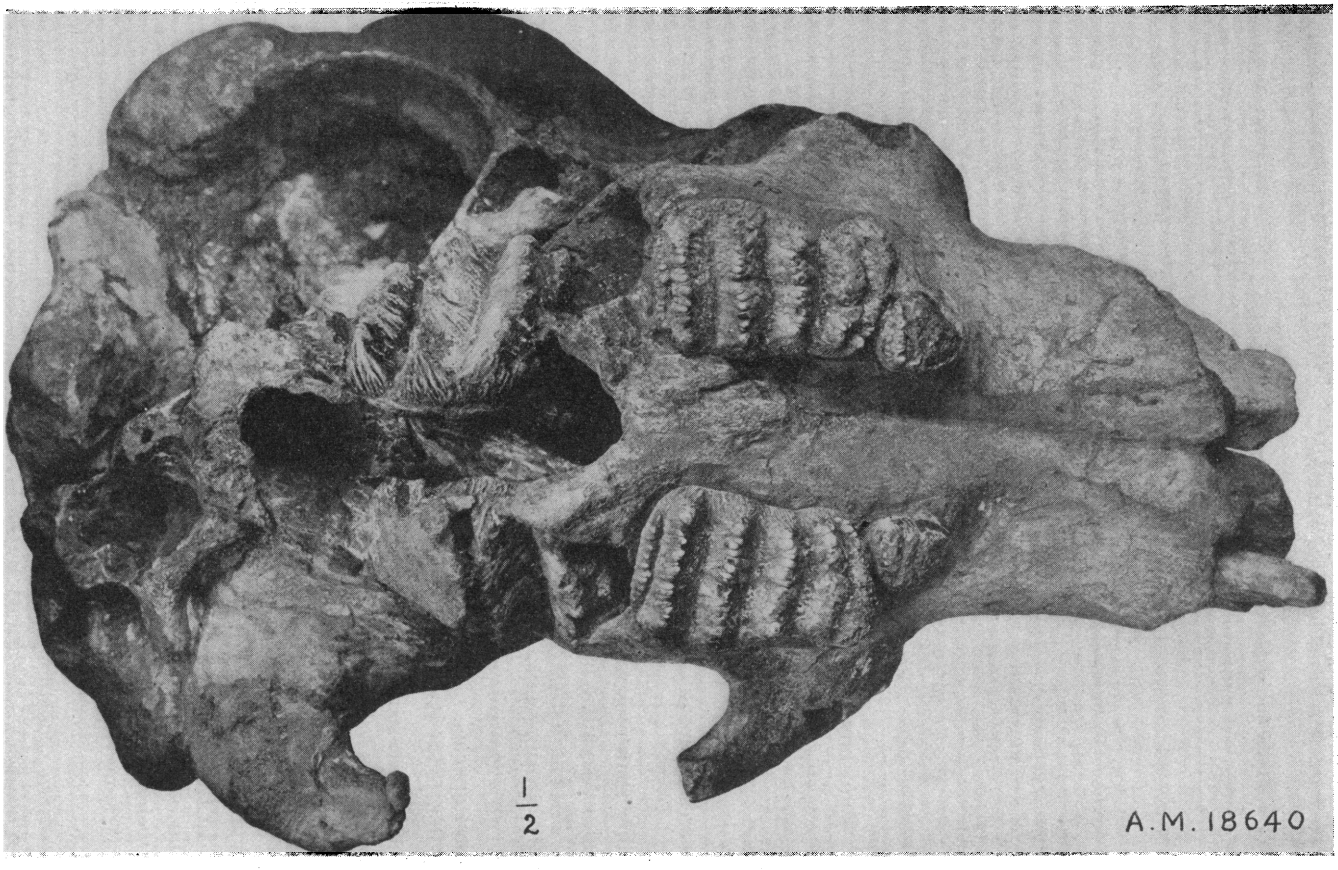

Fig. 6. *Stegodon orientalis.* No. 18640. Palatal view of young skull. One-half natural size.

species must be with *R. unicornis*. At all events, the Yen-ching-kao rhinoceros is a near relative of the typical modern Indian rhinoceros.

The type of *R. sinensis* consists of parts of upper and lower teeth, probably of different individuals. We designate the following as a neotype.

NEOTYPE.—A crushed skull, Amer. Mus. No. 18623.

CHARACTERS.—A large nasal horn. No clear indications of a second horn. Occiput apparently rather posterior in position. Teeth moderately hypsodont, slightly less so than in *R. indicus*. Premolars 130; length of molars, 160; p^1 small, deciduous. Both external ribs prominent on p^{2-4}, posterior rib weak on m^1, wholly absent on m^{2-3}, the anterior rib prominent on all three molars. Crochet prominent on p^3-m^3, doubled on p^4-m^1; crista rudimentary except on p^2, where it is prominent. No antecrochet save as an obscure swelling. Postfossette on p^3-m^1 only when considerably worn. The two inner cones of p^2 strongly twinned, slight twinning on p^{3-4}.

The above characters are shown on the neotype and in Owen's type, so far as it goes. A number of incomplete skulls, palates and upper jaws and teeth show more or less variation in the external ribs, details of the crochet, crista and posterior fossette, but in all it may be said that the crochet is strong and more or less reduplicate, the crista and antecrochet weak or absent, the postfossette moderately developed, the external ribs variable, the teeth subhypsodont, premolars considerably smaller than molars, but p^2 unreduced and only p^1 vestigial, molars subequal, m^3 smallest of the three.

The characters of the teeth in the neotype are strongly suggestive of affinity to the Indian and Javan rhinoceroses, combining peculiarities of the two; the referred specimens bring it on the whole nearer to the Indian species. None of our specimens has the premaxilla preserved sufficiently to demonstrate the presence or absence of upper incisors; but the cheek teeth are nearer to the true rhinoceroses than to *Atelodus* and the proportions of the anterior end of the lower jaw agree best with *R. indicus*. The neotype skull is too badly crushed to be decisive as to the characters of the occiput, and no other specimens show this region. The position of the horn, on the nasals but not quite terminal, is like *R. indicus* and unlike *Atelodus*.

In the skeleton, including especially the length and proportions of the limb bones and feet, all the Yen-ching-kao rhinoceros material agrees fairly closely with *R. indicus*.

Among the numerous fossil species described we find certain Indian and western Eurasian forms that may be nearly related, especially *R. platyrhinus*, *palæindicus*, *sivalensis*.

The species described by Koken and Schlosser are founded upon tooth distinctions, of which the constancy is doubtful, to judge from our

collections. Both Schlosser and Matsumoto, in sorting out the material described and assigning it to various species and horizons, have attached great importance to the degree of fossilization and the quality of the matrix. Wide variation is shown in our collections in this respect, from almost unaltered and recent-appearing to thoroughly fossilized teeth and bones in hard clay matrix. But we cannot associate these differences at present with any faunal distinctions and it is probable that they are due chiefly or wholly to the accidents of location of the specimen, whether in the path of mineralizing waters or protected from their action. The present species can be satisfactorily placed as to its relationships, but not as to its nomenclature and synonymy.

AFFINITIES.—*R. sinensis* is clearly excluded from *Aceratherium*, *Teleoceras* or *Cœlodonta* and apparently from *Opsiceros*. Affinity with *Ceratotherium* is not especially indicated. All the positive evidence goes to show that it is a near relative of the true *Rhinoceros*, but specifically distinct from either the Indian or the Javan species, nearer perhaps to the former.

Tapirus sinensis Owen

Besides the teeth described by Owen, Koken figured a number of teeth and Schlosser records two from the Haberer collections. The latter were obtained at I-chang, a hundred miles down-river from Yen-ching-kao; Koken's material is said to be mostly from caves in Yun-nan or other southern provinces. They are all referred to the Pleistocene by Schlosser. It would appear that Owen's species is closely related to *T. indicus*, perhaps doubtfully distinct. Our tapir material consists of skulls, jaws, etc., of a very much larger species described below. It is not close to the modern Malayan tapir; whether the genus is distinct remains to be determined. *T. sinensis* is not represented in the Granger collection.

Chalicotherium sinense Owen

Owen's collection contained one upper molar. Koken described a supposed p_4 (m_1 according to Schlosser). Our collection contains a single lower molar, No. 18453, probably m_3. It affords no especial light upon the relations to the Indian *C. sivalense*.

Hyæna sinensis Owen

No. 18392, upper and lower jaws, is referred to this species; also Nos. 18395–7, isolated parts of jaws.

Owen distinguishes the species as larger and more robust than the modern *H. crocuta*, much larger than the Asiatic striped hyæna, and as allied to the African and not to the Asiatic species, "unlike the European cave hyæna."

NEW GENERA AND SPECIES IN THE YEN-CHING-KAO COLLECTION

Spalacidæ

Rhizomys troglodytes, new species

TYPE.—No. 18408, skull and jaws.

PARATYPES.—Nos. 18401–18417, a series of skulls and jaws, some with parts of skeleton associated.

DISTINCTIVE CHARACTERS.—(*a*) Size large, length of skull incisors to condyles = 77–85 mm.; (*b*) skull rather long and narrow, postorbital crests contracting sharply behind the orbits to a long and well-marked sagittal crest; (*c*) infra-orbital foramen sub-triangular, the maxillary crest in front of it and plate beneath extended upward on the side of the muzzle almost to its upper surface; (*d*) nasals long, narrow, wedge-shaped, tapering backwards almost to a point; (*e*) squamosals fail to reach the sagittal crest superiorly or the postorbital constriction anteriorly; (*f*) occiput strongly sloped forward; (*g*) posterior nares narrow and contracted transversely; (*h*) bulla somewhat flattened inferiorly, strongly convex anteriorly, culminating in a ridge directly behind the posterior lacerate foramen, slightly reflexed on the anterior inner border against the basisphenoid; (*i*) carotid foramen lying close behind the basisphenoid-basi-occipital suture and the bulla extending a considerable distance in front of it; (*j*) bulla strongly reflexed posteriorly upon the surface of the paroccipital process; (*k*) inferior surface of auditory meatus strongly concave both ways, without any longitudinal ridge, and the opening large and flaring; (*l*) incisors strongly convex, the points of the upper pair directed somewhat backward, the anterior faces of the lower pair strongly flattened, of the upper pair, moderately so; (*m*) first upper molar somewhat, and first lower molar considerably reduced and m^1 wearing to a lower grinding plane than the others; (*n*) third upper molar unreduced, approximately equal to m^2 in size, the posterior portion of the third lower molar correspondingly enlarged and broadened.

Of the above characters, Nos. *c*, *d*, *e*, *f*, *g*, *h*, *i*, *k*, *l*, *m*, and *n* appear to be characteristic of *Rhizomys* proper as against *Nyctocleptes*. Nos. *a* and *j* resemble the latter, while *b* is peculiar. The affinities of the species are thus clearly shown to be with the much smaller *Rhizomys* of China, although in size and one or two characters associated with size it is suggestive of the large Malayan bamboo-rat, *Nyctocleptes sumatrensis*, etc., which it fully equals in size.

The above comparisons were made with modern skulls from South China collected by Mr. Andrews and a series of Malayan skulls in the National Museum loaned through the courtesy of Dr. Gerrit S. Miller and Mr. J. W. Gidley.

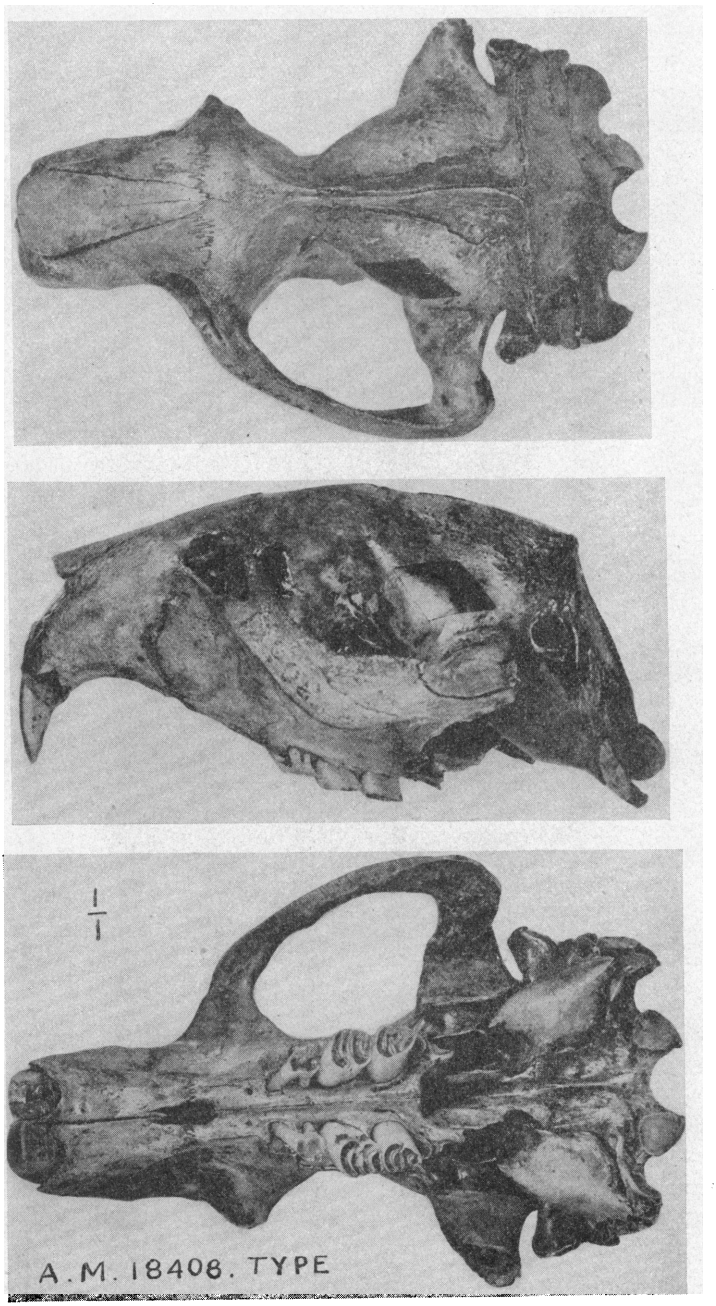

Fig. 7. *Rhizomys troglodytes.* Type skull, No. 18408. Natural size.

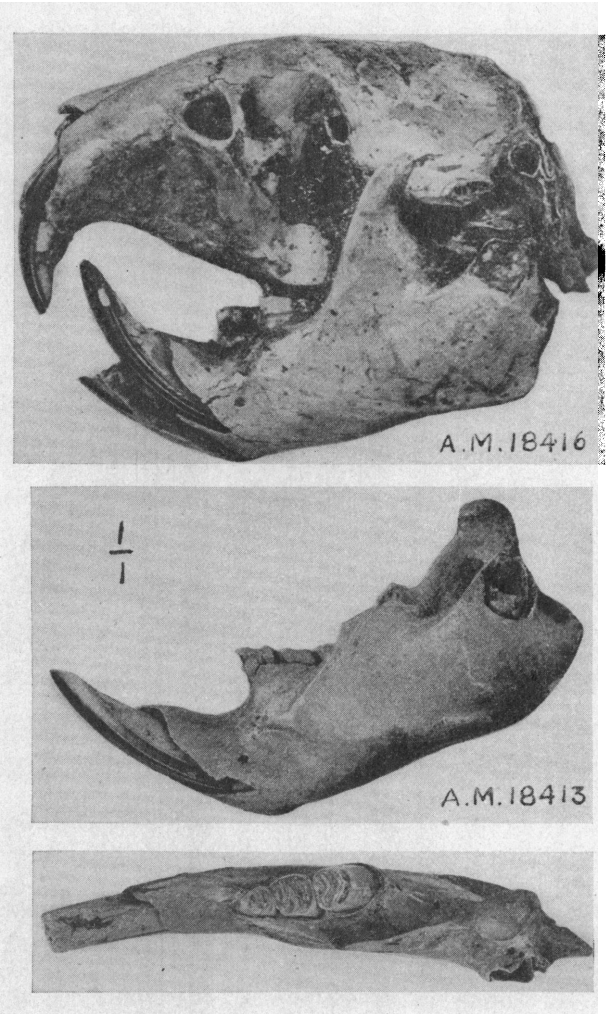

Fig. 8. *Rhizomys troglodytes.* Side view of skull and jaws, No. 18416. Outer and top views of lower jaw, No. 18413. Both natural size.

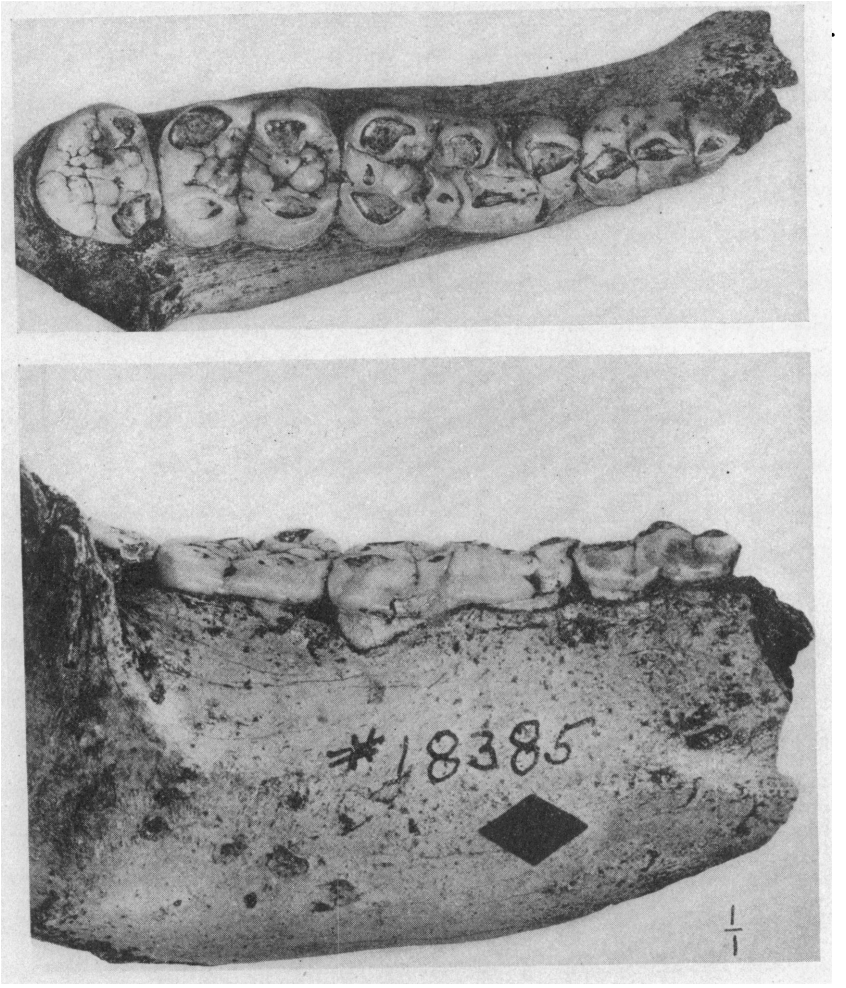

Fig. 9. *Æluropus fovealis*. No. 18385, type. Lower jaw, outer and crown view of teeth. Natural size.

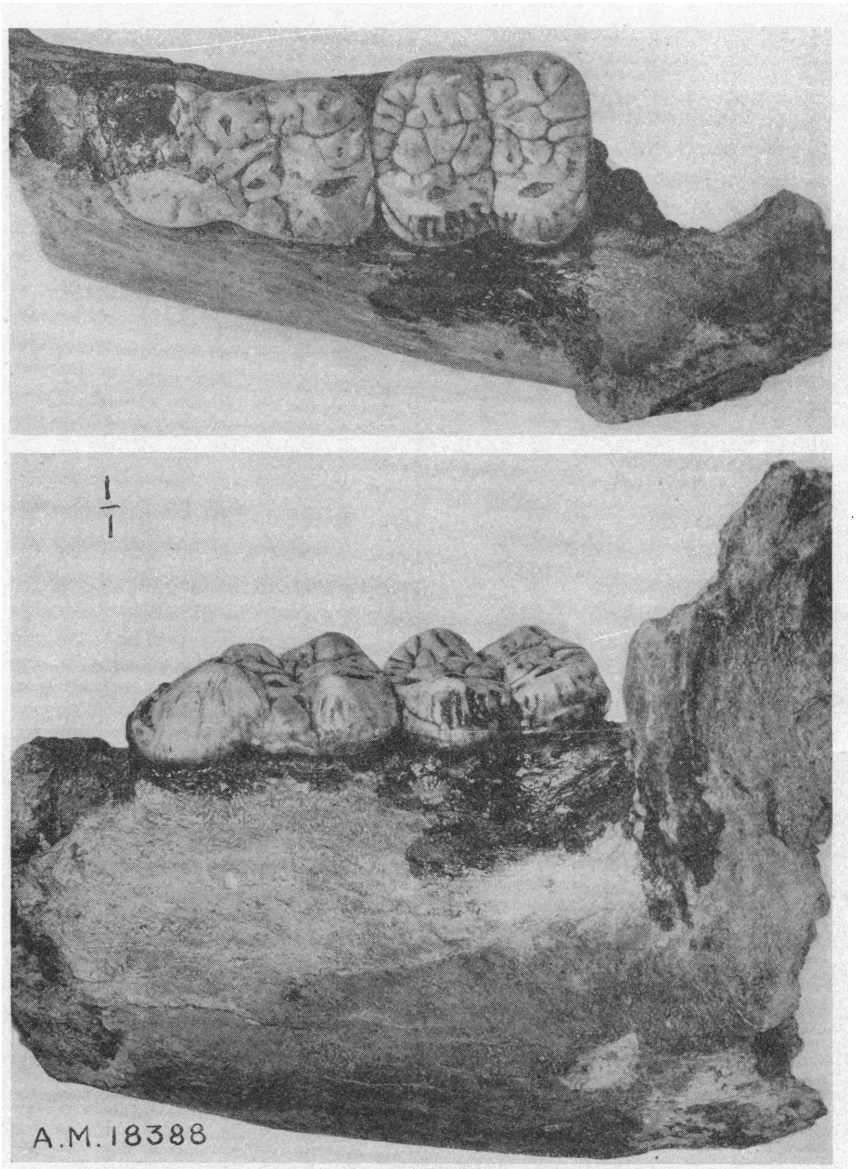

Fig. 10. *Æluropus fovealis*. No. 18388. Lower jaw, outer and top views. Natural size.

Ursidæ

Æluropus[1] fovealis, new species

TYPE.—No. 18385, right lower jaw with p_4 to m_3, also left m_3 of the same individual.

DISTINCTIVE CHARACTERS.—The teeth resemble those of *Æ. melanoleucus* as figured by Lankester, 1901, except in the following particulars: the protocone of p_4 is distinctly higher than the anterior and posterior cusps; m_1 retains more of the normal canassial construction, the anterior end being less quadrate, protoconid larger, paraconid more advanced and the whole tooth is relatively larger; m_2 and m_3 are broader, though not longer. Bardenfleth's figure in 1913 of the teeth of a specimen also in the British Museum agrees much more closely in proportions with our specimen and, if both are accurate, would suggest that the differences noted above are individual rather than specific. However, as it seems unlikely that a species of the Carnivora would persist unchanged from the Pliocene to the present day, it appears better to regard the species provisionally as distinct. Three other specimens, Nos. 18386–8, are referred to the species. Two of them show the unworn m_1 in broken lower jaws. The third is a lower jaw with m_{1-2} complete, so much larger and more robust than the type that we hesitate to include it under the same species.

The affinities of *Æluropus* appear to be with *Hyænarctos*, as has been observed by Lydekker,[2] Winge[3] and other writers. Its systematic position appears to be clearly in the family Ursidæ,[4] although of a distinct subfamily from the true bears. Bardenfleth[5] has presented the evidence for this view very clearly. The occurrence of *Æluropus* almost completely modernized in the Pliocene, if these deposits are in fact Pliocene, contemporary, or nearly so, with *Hyænarctos*, shows that it cannot be a direct descendant, although *Hyænarctos* seems to be in general structurally ancestral.

Lydekker[6] has reported a species of *Hyænarctos* from the collection of Chinese fossils described by Owen. Schlosser[7] gives reasons (not very convincing) for regarding it as Pleistocene and notes an incisor and m_3 in the Haberer collection at Munich, but doubts their pertinence to this genus. They approach the amphicyons, differing from *Hyænarctos* in quite an opposite sense from the present species.

---

[1] *Æluropus* = *Æluropoda*, for the purists.

[2] Lydekker, R. 1896. 'Geographical History of Mammals,' p. 321.

[3] Winge, H. 1896. 'Jordf. og. nulev. Rovdyr (Carnivora) fra Lagoa Santa,' p. 62. These are probably by no means the earliest authorities, for the comparison is too obvious to have escaped notice. It is at least implied in Flower's arrangement of the genera in the 'Catalogue of Mammals, Mus. Roy. Coll. Surgeons.'

[4] As placed by most authors. Osborn in the 'Age of Mammals,' following Lankester's authority, places it in the Procyonidæ.

[5] Bardenfleth, K. S. 1913. 'On the Systematic Position of *Æluropus melanoleucus*.' Mindesk. f. Japetas Steenstrup, Kobenhavn.

[6] Lydekker, R. 1885. 'Cat. Foss. Mam. Brit. Mus.,' Part I, p. 157, fig. 23.

[7] Schlosser, M. 1903. 'Fossile Saügethiere Chinas,' p. 23.

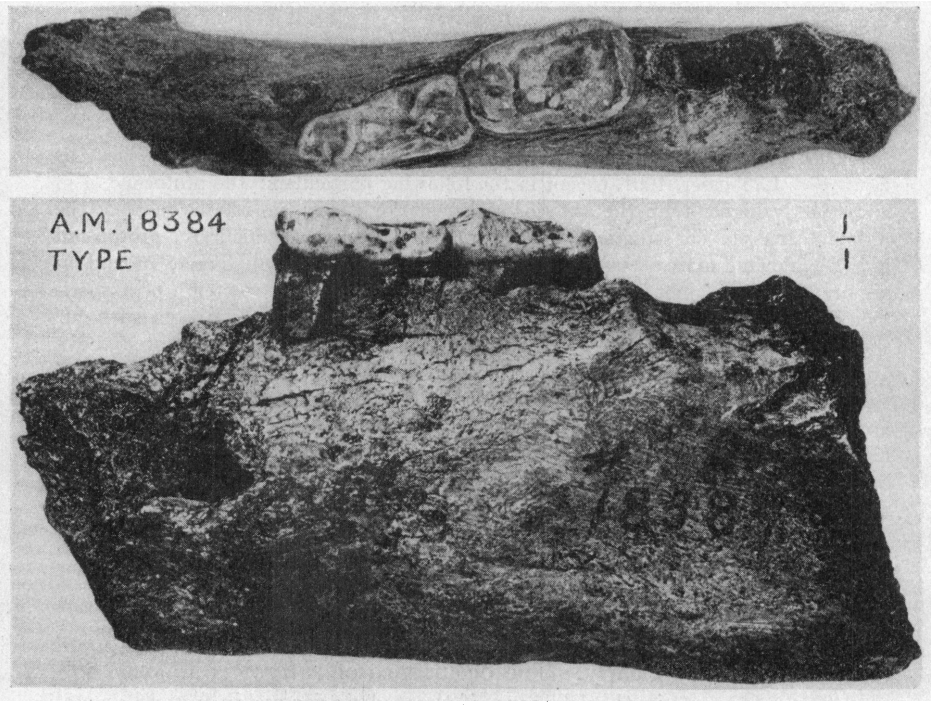

Fig. 11. *Ursus kokeni.* No. 18384, type. Lower jaw, outer and top views. Natural size.

Ursus kokeni, new species

TYPE.—No. 18384, a lower jaw with m_{1-2} and adjacent alveoli.

DISTINCTIVE CHARACTERS.—Jaw very short and deep as in the sun-bear *U. malayanus*, but size large, comparable with *U. arctos;* m_1 narrow and long, lacking the metastylid cusp of *U. malayanus;* m_2 rather short and wide, wider posteriorly than anteriorly.

It is very likely that the molar figured by Koken as *U.* aff. *japonicus* is of this species.

Arctonyx rostratus, new species

TYPE.—No. 18393, skull lacking the zygomatic arches and with damaged teeth.

PARATYPES.—Nos. 18394, skull, and 18382, 18383, lower jaws.

DISTINCTIVE CHARACTERS.—Length of skull, premaxillæ to condyles, 148 mm.; sagittal crest narrow, distinct; $p\frac{1}{1}$ absent, $p\frac{2}{2}$ larger than in *A. collaris* and more clearly two-rooted, the diastema behind p^2 greater than length of p^3; p^4 larger with inner cusp better developed and more antero-internal; m^1 larger, broader and more quadrate in form; auditory meatus and posttympanic process broad, massive and

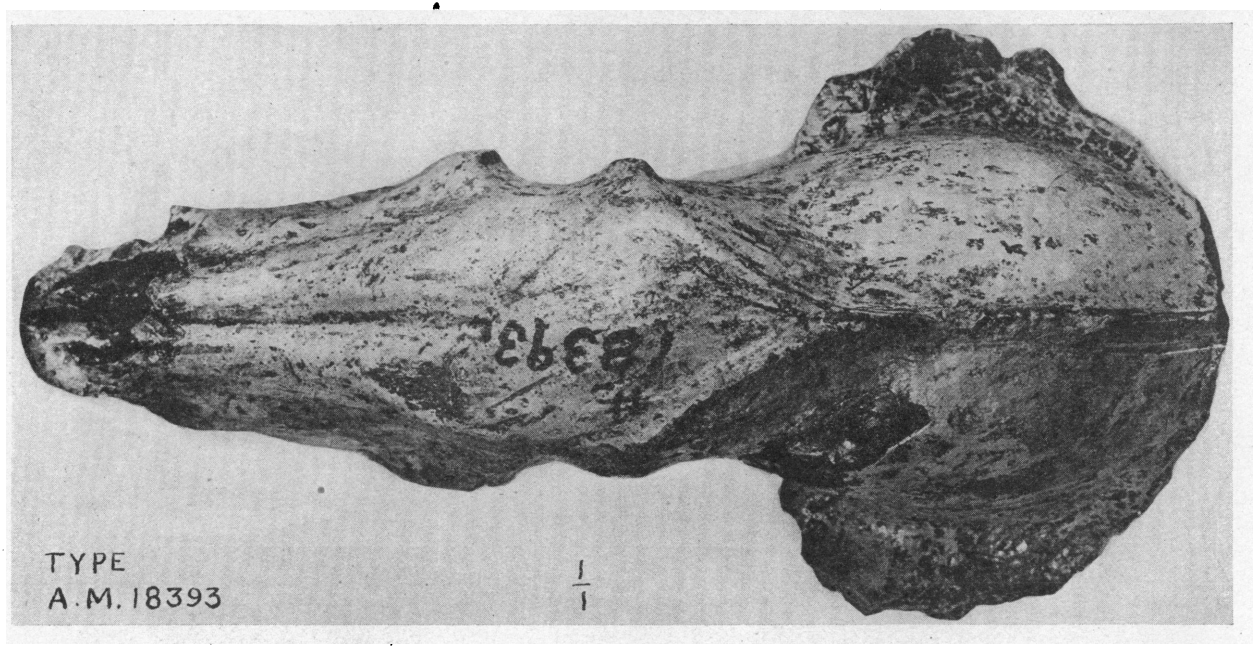

Fig. 12. *Arctonyx rostratus*. No. 18393. Type skull, top view. Natural size.

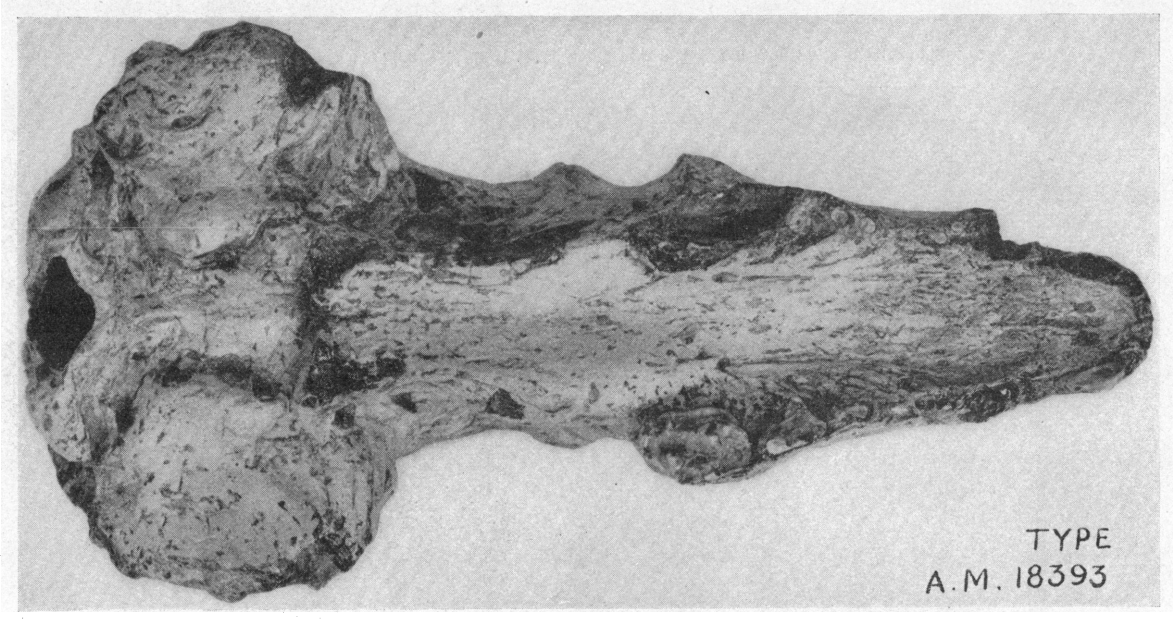

Fig. 13. *Arctonyx rostratus*. Type skull, No. 18393, palatal view. Natural size.

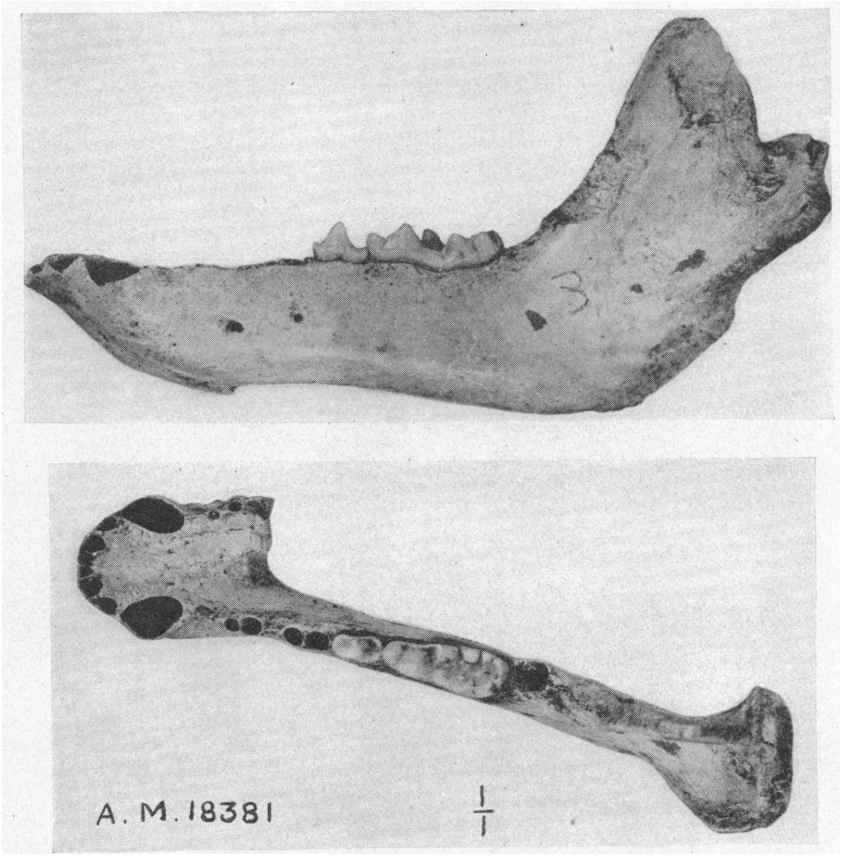

Fig. 14. *Arctonyx rostratus.* No. 18381. Lower jaw, outer and top views. Natural size.

flattened, occiput broader at the base. P_3 and p_4 are more robust than in *A. collaris* and there is no diastema between them; m_1 and m_2 are considerably larger and more robust, with the cusps more conical in form.

This species differs but little from Milne Edwards' drawing of *A. collaris*. The differences from a specimen obtained in the mountains of Shensi (with which the above comparisons are made) are more considerable but may also be reduced in essence to the greater size and robustness of the fossil species and the somewhat higher degree of specialization of its modern relative.

The construction of the teeth in *Arctonyx* is essentially the same as in *Meles*, to which it is rather nearly related, in spite of the wide difference in proportions.

Cyon antiquus, new species

TYPE.—No. 18389, a pair of lower jaws. No. 18583, parts of crania, limb bones and vertebræ of a canid of appropriate size and characters are provisionally referred to the species.

DISTINCTIVE CHARACTERS.—Metaconid distinct upon m_1 and m_2. Teeth slightly more robust than in our specimens of *C. alpinus*, more decidedly larger and heavier than in *C. javanicus*.

There is some question as to the validity of this species, as Mivart in his 'Monograph of the Canidæ' figures the metaconid as present on m_1 of both species of *Cyon*, although it is absent in our specimens referred to them. It may therefore be a variable character.

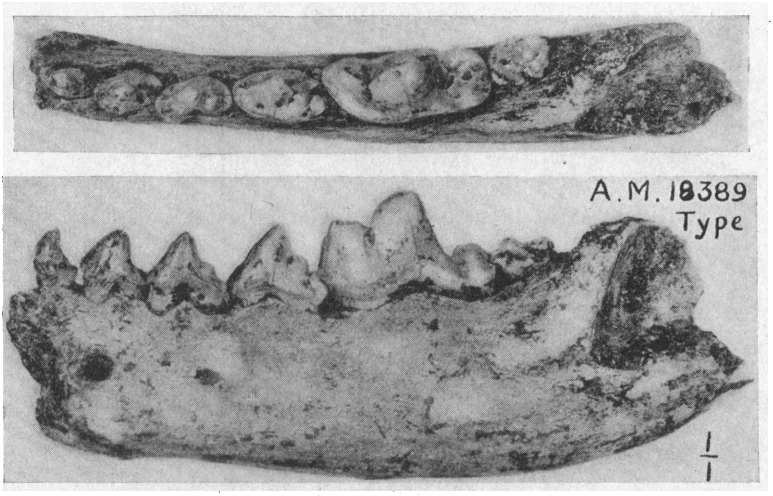

Fig. 15. *Cyon antiquus*. Lower jaw, No. 18389, type specimen, top and outer views. Natural size.

Felis aff. tigris Linnæus

No. 18624, a complete skull and jaws; also a part of skull with lower jaws associated, and a number of jaws and limb bones more or less associated, are referred here. In comparison with a series of skulls of the modern tiger we have been unable to recognize any constant distinctions for the fossil form, and therefore refer it to *F. tigris*, although a more minute and exhaustive comparison might very well show valid specific distinctions.

There is no doubt, at any rate, that it belongs nearer to the tiger than to the lion and that it is quite distinct from *F. cristata* of the Siwalik Pliocene.

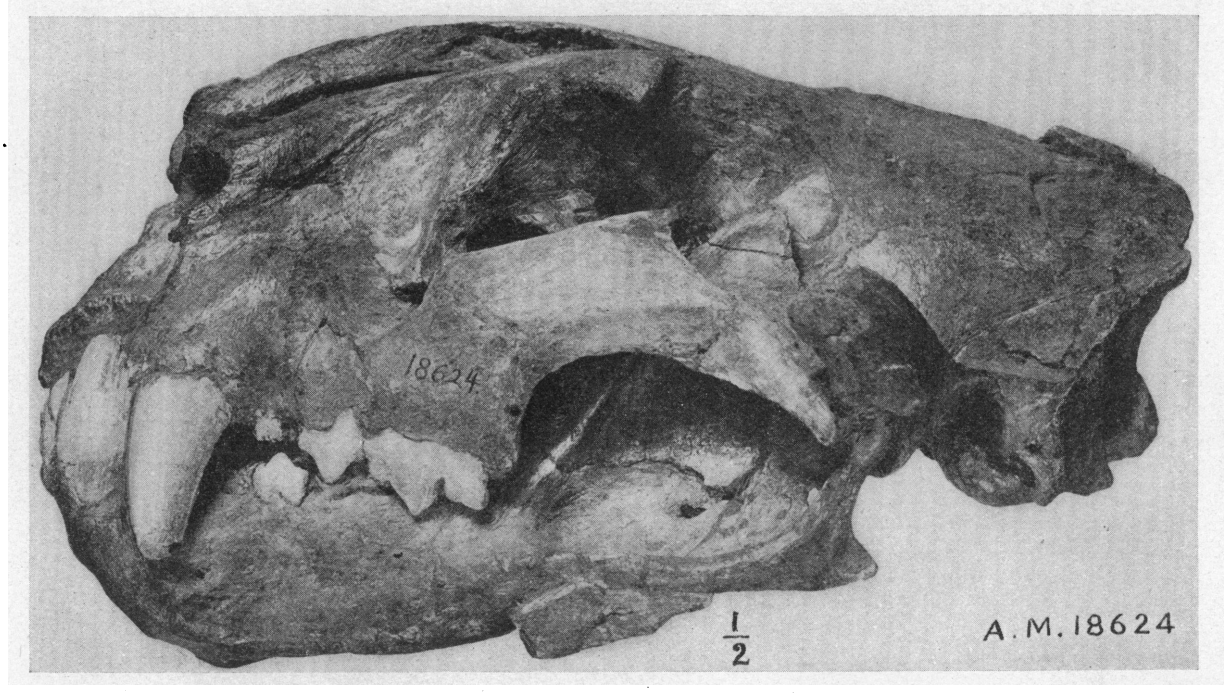

Fig. 16. *Felis* aff. *tigris*. No. 18624, skull and jaws. One-half natural size.

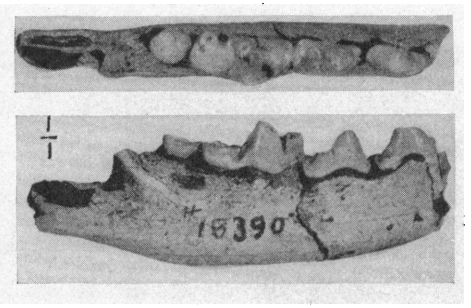

Fig. 17. *Viverra* sp. Lower jaw, No. 18390, top and outer views. Natural size.

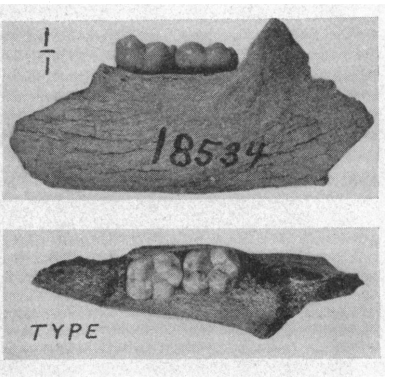

Fig. 18. *Bunopithecus sericus,* No. 18534, type, lower jaw fragment, top and outer views. Natural size.

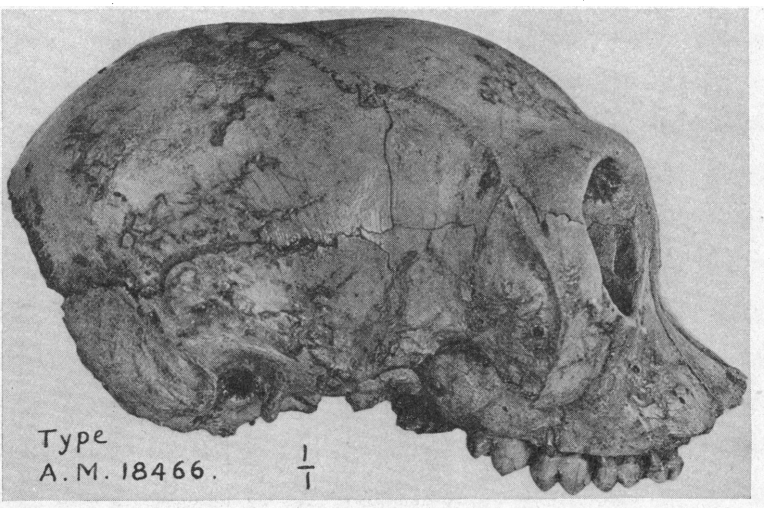

Fig. 19. *Rhinopithecus tingianus.* No. 18466. Type skull, side view. Natural size.

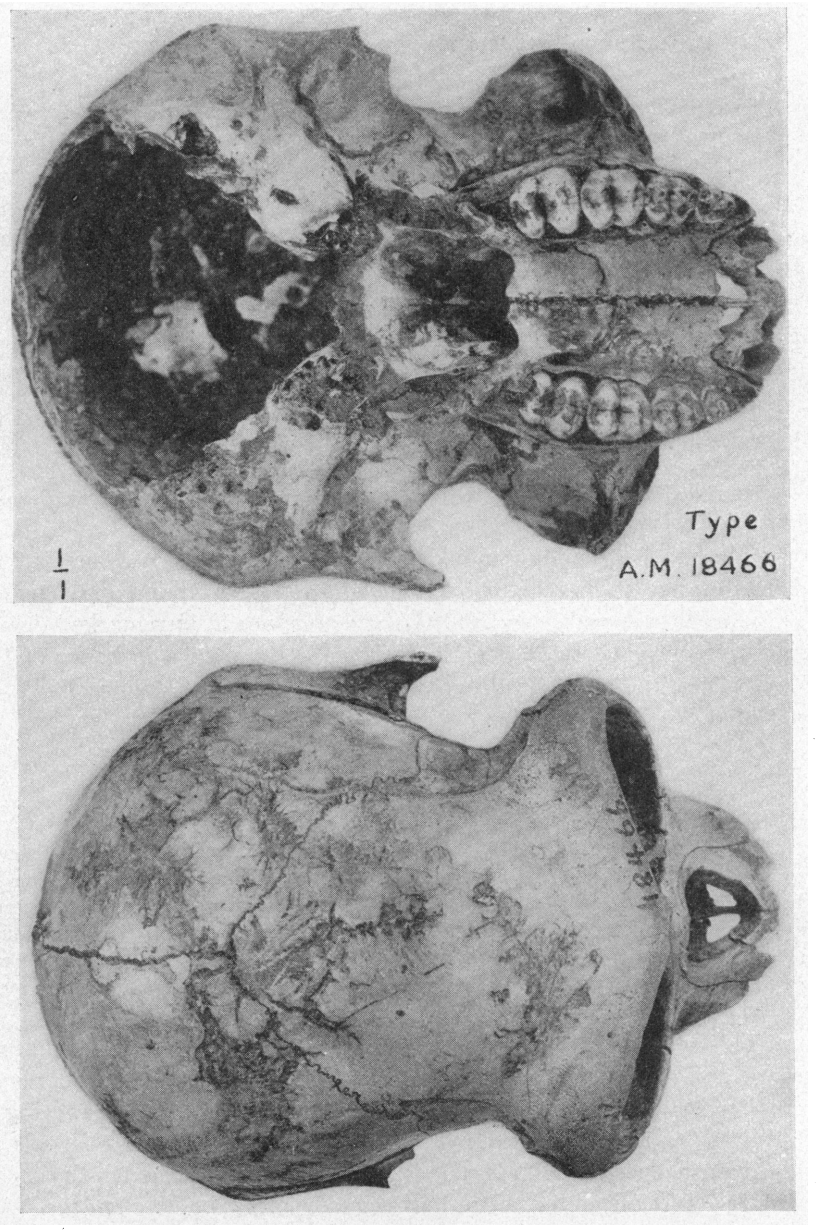

Fig. 20. *Rhinopithecus tingianus*. No. 18466. Type skull, top and palatal views. Natural size.

Bunopithecus sericus, new genus and species

TYPE.—No. 18534, a lower jaw with m_{2-3} on the left side.

GENERIC DISTINCTIONS.—Jaw and teeth much as in *Hylobates* except for greater width of molar and large size of hypoconulid on m_2 and m_3.

The heels are slightly broader than the anterior half of the teeth and the hypoconulid is as large as the entoconid on both teeth. In the gibbon it is small on m_2 and absent on m_3; m_3 is narrower and smaller than m_2 in the gibbon but broader in *Bunopithecus*.

The species is about the size of the hoolock.

Rhinopithecus tingianus, new species

TYPE.—No. 18466, a skull, immature, retaining the milk premolars, and the last molar not yet emerged.

PARATYPES.—Nos. 18467–9, upper and lower jaws.

DISTINCTIVE CHARACTERS.—Larger and more robust throughout than *R. roxellanæ*. Size about as in *R. bieti* but with much smaller teeth.

The modern langhur monkeys of this genus have a somewhat ill-defined range in northwestern and southwestern China and eastern Thibet. This species is typical of the genus, not in any marked degree primitive or synthetic in generic position. It is named in honor of Dr. V. K. Ting, the able and progressive director of the Geological Survey of China.

Tapirus (Megatapirus) augustus, new species

TYPE.—No. 18433, skull and jaws.

PARATYPES.—Nos. 18428, 18431, and 18432, skulls, the latter two with lower jaws.

DISTINCTIVE CHARACTERS.—Teeth and skull about one-fourth larger lineally than *T. indicus* or *terrestris* and almost as much exceeding *T. sinensis* in size. Anterior premolars more molariform than in *T. indicus*, the inner cusp and cingulum much more developed, especially in p^1 which in *T. augustus* is wider than long (?). Skull very short and deep, the vomer higher and thicker than in *T. indicus*, much more so than in *T. terrestris*.

This species far exceeds in size any living tapir of which we can find record and differs so considerably in proportions of skull and details of tooth construction that we consider it provisionally as representing a distinct subgenus. All of our tapir specimens appear to be referable to this gigantic species. *T. sinensis* is not present here, although the specimens provisionally referred to it by Schlosser may be *T. augustus*. Although resembling *T. terrestris* in the relative complexity of the anterior premolars, it appears in the skull to be an exaggerated type of *T. indicus*, deeper and shorter with more massive vomer, high-set nasals, etc.

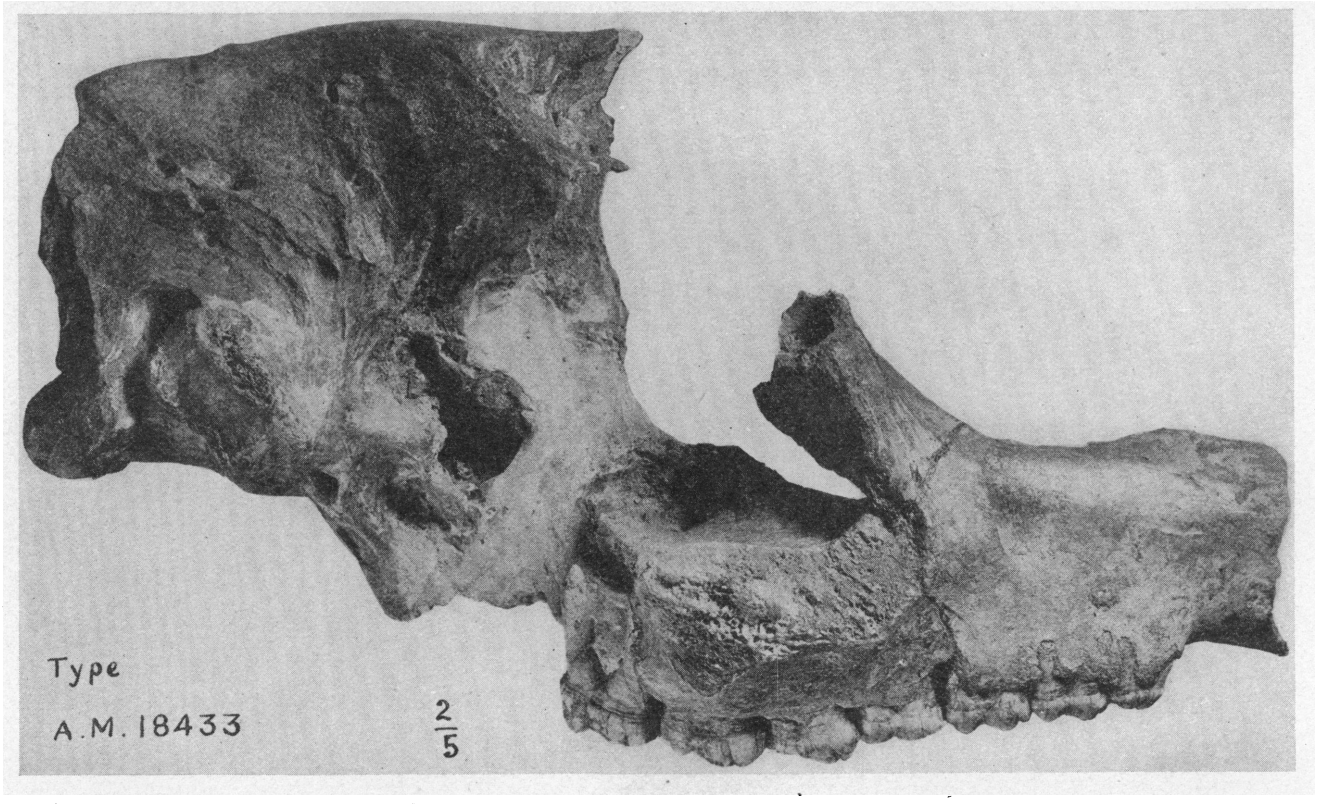

Fig. 21. *Tapirus* (*Megatapirus*) *augustus*. No. 18433, type skull, side view. Two-fifths natural size.

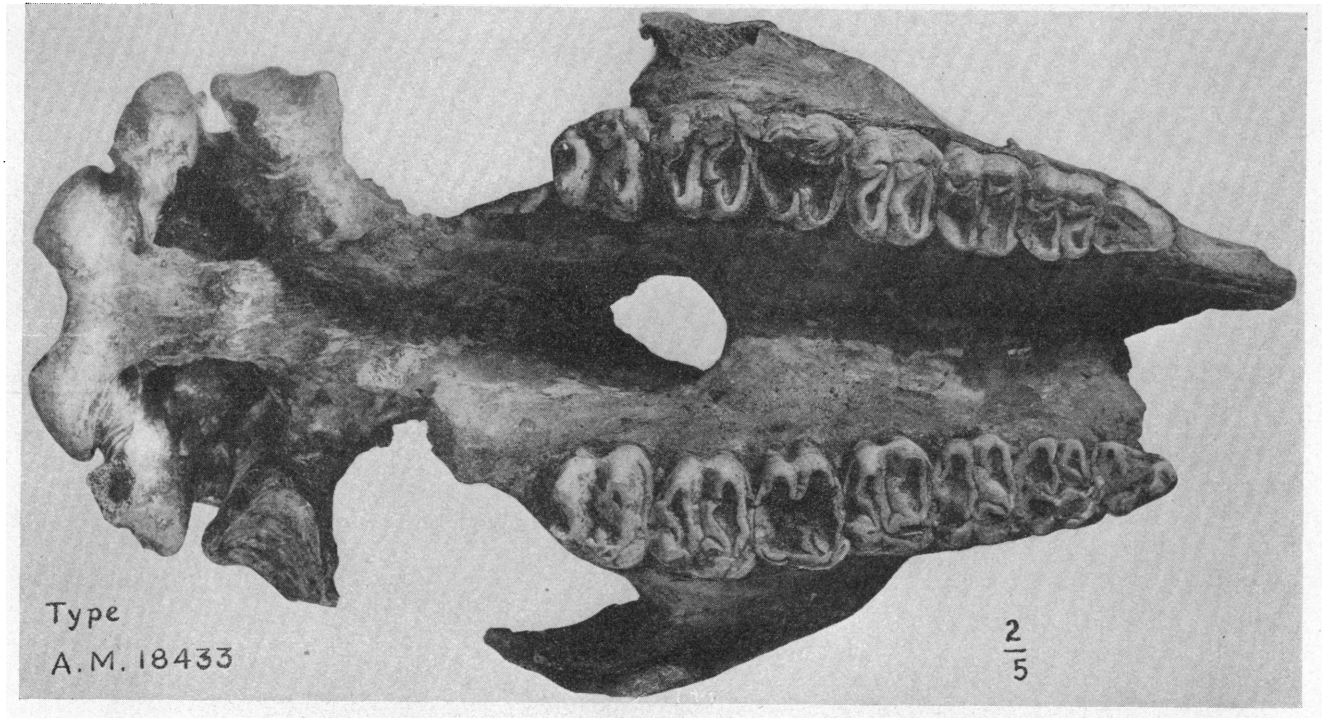

Fig. 22. *Tapirus augustus.* No. 18433. Palatal view of type skull. Two-fifths natural size.

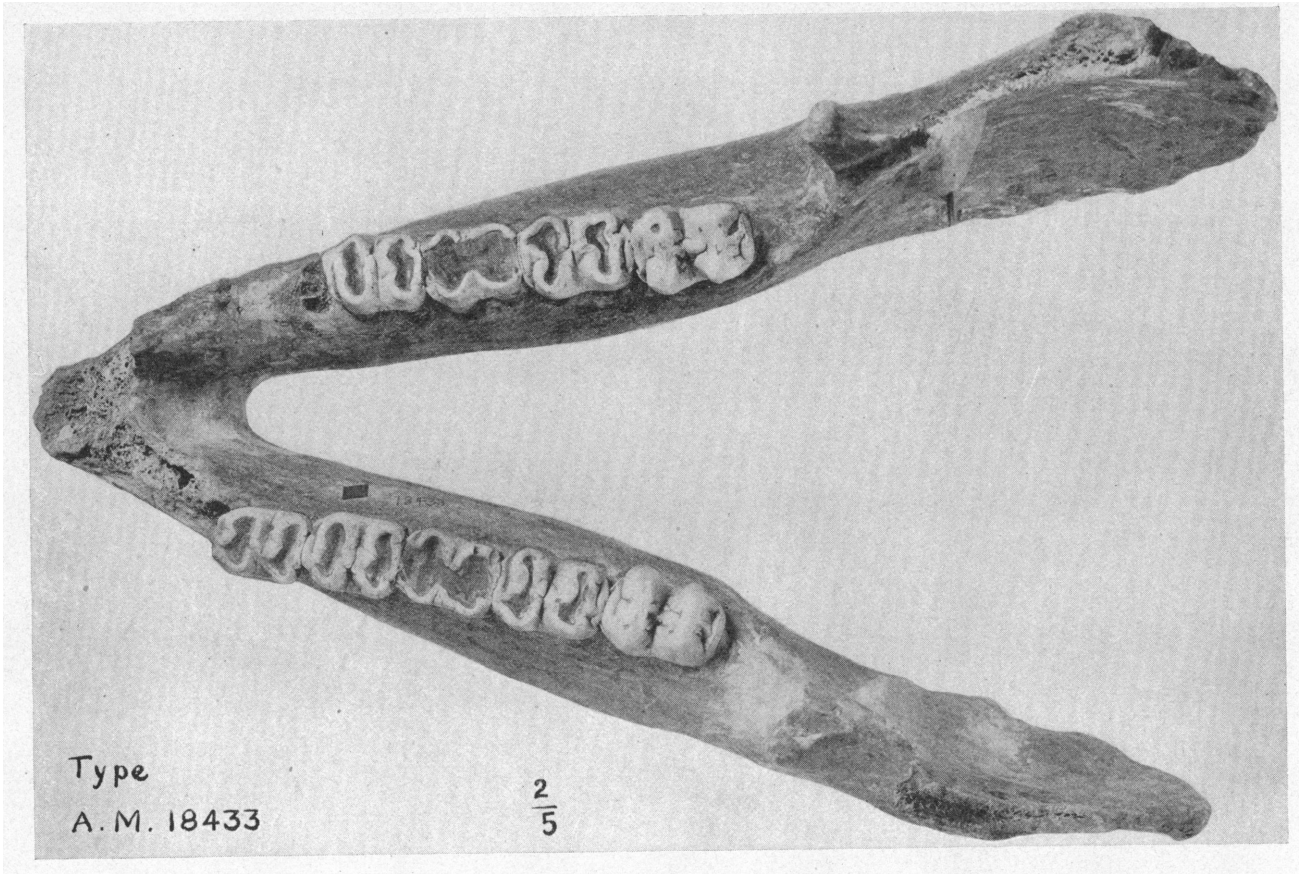

Fig. 23. *Tapirus augustus.* No. 18433. Lower jaw of type, top view. Two-fifths natural size.

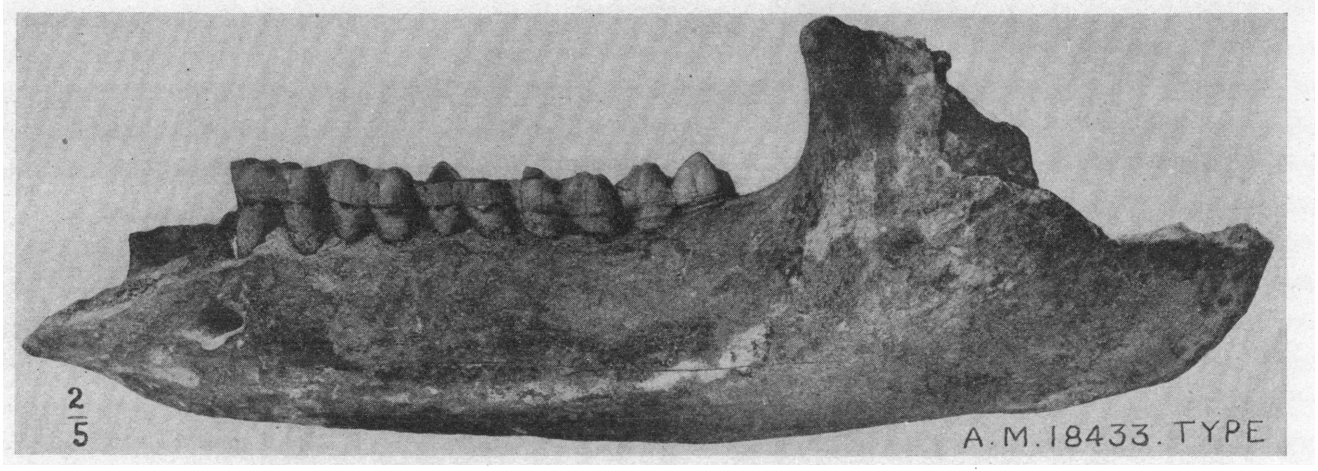

Fig. 24. *Tapirus augustus*. No. 18433. Lower jaw of type, outside view. Two-fifths natural size.

MEASUREMENTS

	No. 18433	No. 18428	No. 18432	*T. sinensis*	*T. haysii* Phila. Acad.	*T. malayanus* A. M. 14106	*T. americanus* A. M. 36198
Skull length pmx-condyles	E. 530	E. 530				417	390
" width	E. 280						
Upper teeth, p^1-m^3	214	212	205		174	E. 151	145
" molars m^{1-3}	101	103	101		79		70
Diameters of p^1 a-p×tr.	27×25	26×23			20×19	18×14	17×17
" " p^2	27×31	27×33	28×34		21×25	20×23	18×22
" " p^3	30×36	29×38	29×37	25×31	21×25	23×27	19×25
" " p^4	29×38	29×39	30×38		22×26		19×27
" " m^1	31×38	31×40	31×37		24×28	24×25	19×24
" " m^2	36×40	35×43	34×40	29×31	26×30	27×30	24×26
" " m^3	34×40	34×38	34×40	27×31[1]	26×30		25×26
Lower teeth p_2-m_3			199		161	152	136
" molars m_{1-3}	104		107		89		70
Diameters of p_2			34×19		25×17	24×13	20×15
" " p_3	20×22		31×24	26×19	22×19	24×19	20×19
" " p_4	31×25		31×26		23×19	25×17	21×19
" " m_1	32×24		32×25	27×21	27×19	24×18	21×17
" " m_2	34×27		35×26	29×21	28×21	28×21	25×19
	38×28		38×27		28×21		26×19

[1]From Owen's figures.

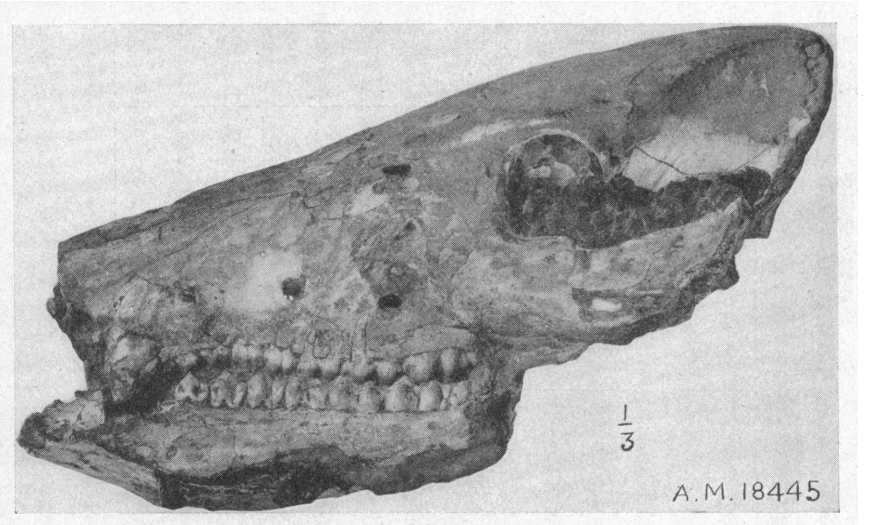

Fig. 25. *Sus* sp. cf. *hyotherioides* Schl. No. 18445, skull and jaws. One-third natural size.

Sus compare **S. hyotherioides** Schlosser

This is a species about the size of the modern *Potamochœrus* but p^4 is larger and more complex.

Proboselaphus watasei Matsumoto

Several incomplete skulls, numerous jaws and skeletal bones are provisionally referred to this species. If the reference be correct, it would appear to be rather nearly related to the nilghai (*Boselaphus*) of India.

Bibos geron Matsumoto

This species was based upon parts of upper and lower jaw. We refer to it a series of skulls, skeletons, upper and lower jaws, etc., of which No. 18465, a fairly complete skull, is selected as neotype. The affinity to the gaur and other species of this group is shown especially in the character of the horns, flattened, angulate, arising from the vertex of the skull and sweeping downward and upward, but not backward.

Koken and Matsumoto record *Buffelus* and *Bison* upon the evidence of teeth. While there is a very large series of Bovinæ skulls, jaws, etc., and a considerable variation in the characters of the teeth, we have not seen among the skulls and horns any evidence of any other true bovine type than *Bibos*. Whether the supposed distinctions among the teeth

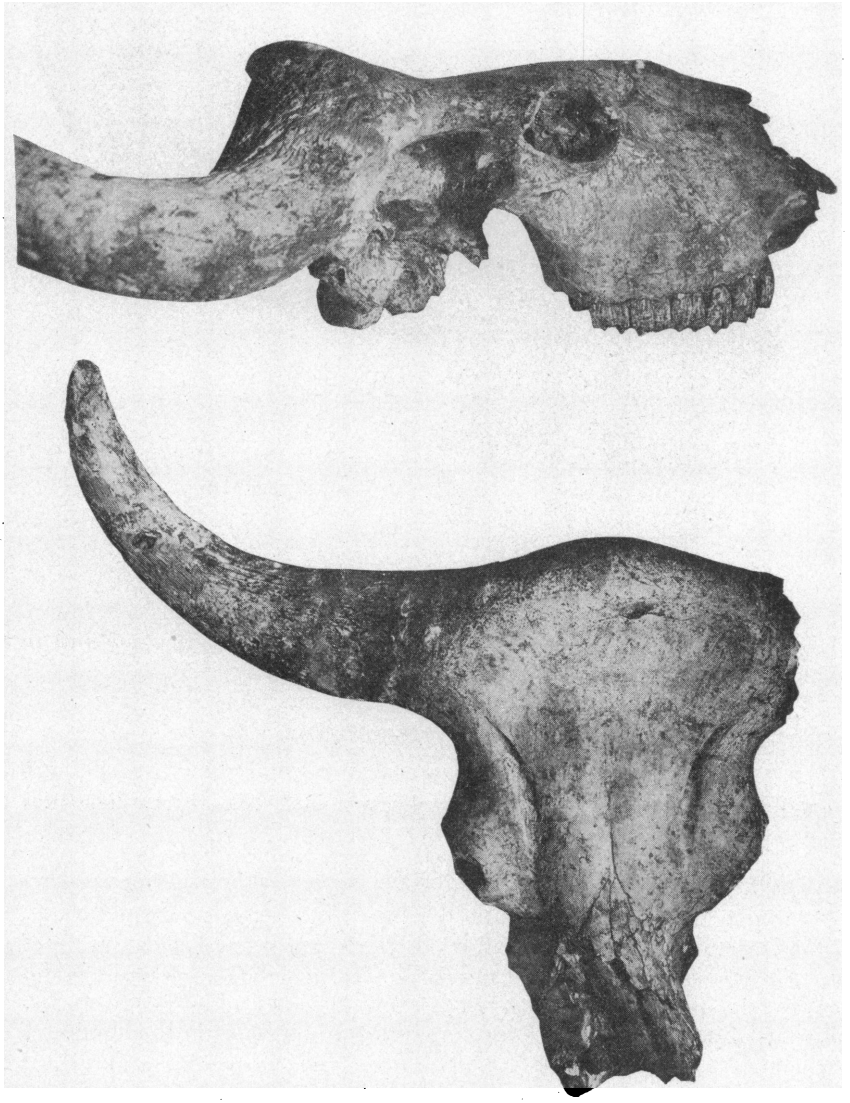

Fig. 26. *Bibos* ? *geron* Matsumoto. No 18465, skull, top and side views. One-sixth natural size.

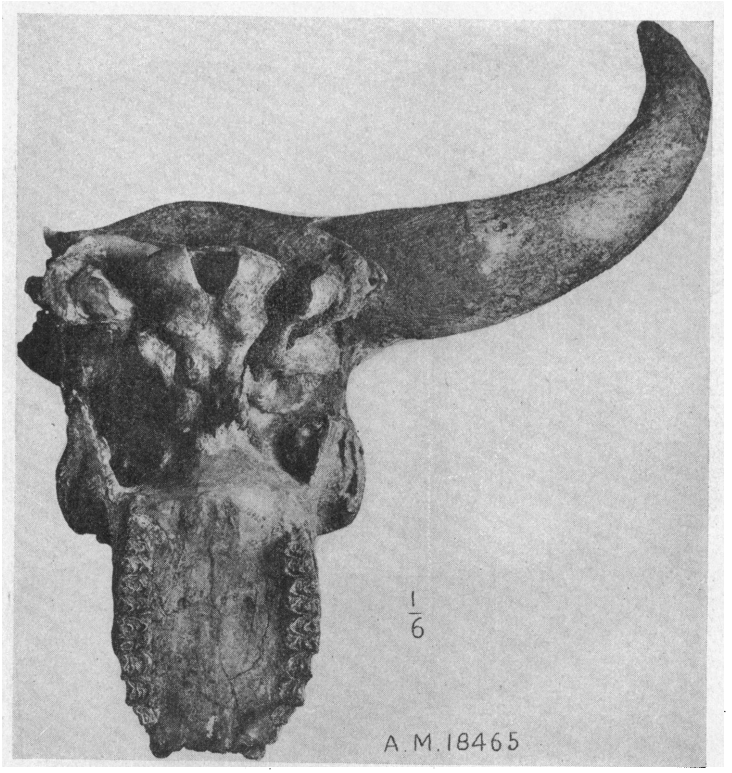

Fig. 27. *Bibos ? geron.* No. 18465, palatal view of skull. One-sixth natural size.

are really constant characteristics of the several genera of Bovinæ remains to be verified by more careful comparative study of the materials.

It is quite clear, however, that there are two distinct types of Bovinæ represented in the foot material; one with extremely short metapodials, the other of larger size and with metapodials somewhat longer than in the American bison.

AFFINITIES OF THE YEN-CHING-KAO FAUNA

The following faunal list is a preliminary one and may be considerably modified and better defined by further study. It will serve, however, to show the general character of the fauna.

PRIMATES		
Bunopithecus sericus	cf. *Hylobates*	Malaysia
Rhinopithecus tingianus	" *Rhinopithecus*	W. China
FERÆ		
Ursus kokeni	" *U. malayanus*	Malaysia
Æluropus fovealis	" *Æ. melanoleucus*	W. China, Thibet
Arctonyx rostratus	" *A. collaris*	" "
Cyon antiquus	" *C. alpinus*	" "
Viverra sp.	" *Viverra* sp. div.	" "
Hyæna sinensis	" *H. crocuta*	Africa
Felis aff. *tigris*	" *F. tigris*	India, E. Asia
GLIRES		
Rhizomys troglodytes	" *R. sinensis*	S.-W. China
Lepus sp.		
PROBOSCIDEA		
Stegodon orientalis	" *Elephas*	India
PERISSODACTYLA		
Tapirus augustus	" *Tapirus*	Malaysia, tropical America
Chalicotherium sinense		
Rhinoceros sinensis	" *R. indicus*	India
ARTIODACTYLA		
Bibos geron	" *B. gaurus*	India
?*Bos* (cf. *grunniens*)	" *B. grunniens*	W. China, Thibet
?*Antilope*		
?*Proboselaphus watasei*	" *B. nilghai*	India
Gazella	" *G. gutturosa*	Thibet
Cervus sp.	" *C. wapiti*, etc.	Central Asia
Sus sp. cf. *hyotherioides*	" *Sus* sp. div.	Malaysia

The above list is remarkable, as a cave or fissure fauna, for the scarcity of rodents (other than *Rhizomys*) and small carnivora. While the remains of large animals are abundant and varied, the bamboo-rat is the only rodent, except for a single hare jaw, and no small mustelids or viverrids appear.[1] It is no less remarkable that no trace of Equidæ is found in it, nor of camels, giraffes, typical Canidæ or machærodonts. This, coupled with the abundance of tapirs and deer, may point to a heavily forested condition. The abundance of *Stegodon* and entire absence of *Elephas* and the presence of *Chalicotherium* are the only observed indications of Pliocene age; for the most part the fauna appears to be quite closely related to modern species and might well be considered Pleistocene. The faunal affinities appear to be principally Chinese, partly Malayan, not much Indian; there is nothing especially suggestive of North American or of Siberian affinity. A more careful comparison

[1] In his second season (1922–3) Mr. Granger reports finding good material of small carnivora.—W. D. M.

and identification of the whole fauna, especially of the smaller ruminants, might show a clearer differentiation from the modern species than we have observed in this preliminary study, but could hardly alter materially the geographic and environmental affinities of the fauna. It is such a fauna as one might expect to find in the valleys of southwestern China at any time before the appearance of civilized man, and under climatic conditions similar to those now prevalent. The effect of the clearing and cultivation of the valleys and the lower slopes of the hills by man has been, broadly speaking, to drive the smaller animals to the mountains and to exterminate the larger ones. Some of the extinct types have left relatives, more or less distant, in the jungles of southeastern Asia, more resistant to human encroachment than the Chinese hills. But the tapir, rhinoceros, gaur and *Stegodon* of the Yen-ching-kao fauna, although their nearest existing relatives are of tropical habitat, do not necessarily indicate a warmer Pliocene climate in China. They may quite well have been species adapted to a temperate climate, such as is more definitely indicated by the geographic affinities of the remainder of the fauna.