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ON THE FOSSIL VERTEBRATE REMAINS FROM LOCALITIES 2, 7 AND 8 AT CHOUKOUTIEN

BY

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WITH PLATE I AND TEXT-FIGURES 1-7.

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INTRODUCTION.

It was originally planned to publish descriptions of the fauna of each of the three localities here described in separate fascicles of Palæontologia Sinica. In view however of the state of preservation of the material and of the number of forms which it represents it has been found more convenient to combine their descriptions in one fascicle. Locality 2 was much the richest of the three in fossil material but from the other two localities some forms have been preserved which are of not little palæontological importance.

For the permission to study this material and for many suggestions and much help during my study I am indebted to Dr. W. H. Wong, Dr. Davidson Black and to P. Teilhard de Chardin respectively. The sketches were made by Mr. S. K. Wang of the Laboratory and the photographs were prepared by the Photographic Office of the Survey. The Catalogne numbers are those of the Cenozoic Laboratory of the Geological Survey of China.

PART I: LOCALITY 2.

HISTORICAL AND GEOLOGICAL NOTES.

This locality represents one of the earliest discovered fossil sites in Choukoutien of which the rodent fauna has already been studied in 1927 (Young). In that paper I was able to distinguish seven forms of rodents, namely: *Tamias wimani*, *Cricetulus* cf. *songarus*, *Cric.* sp., *Mus plumbeus*, *Mus* sp., *Arvicola brandti* and *Lepus wongi*. The locality was there indicated as "No. 2, 1/2 li von Loc. 53".

While the excavations were being made at the *Sinanthropus* site (Zdansky's loc. 53 is equivalent to our Loc. 1), we had opportunity to make some additional collections from the place to the west of the latter site which we have designated as Loc. 2. The general appearance of this locality was reported on by Teilhard and by me in 1929 (Teilhard and Young) and I shall now give a general account of its palæontological contents. It involves not only some revisions of my early determinations but also the addition of some fossils not previously known from that region.

The bones were found in a kind of breccia, consisting of fragments of limestone cemented by red clays and sands. The matrix is especially hardened by lime-bearing water and stalagmites. The preservation of the fossils is consequently very fragmentary. Most of the materials are the limb-bones of Ungulata very badly broken and too poorly preserved for detailed study. The degree of fossilization is, on the contrary, very marked and the bones are yellowish-white in color. An isolated bone from this locality with its red matrix is sometimes hardly distinguishable in color and mineralization from fossils found in the true Hipparion beds of Northern China.

DESCRIPTION OF THE FOSSILS

Class **Mammalia** L.

Order **INSECTIVORA** Cuvier

Family **ERINACEIDÆ**

Genus **ERINACEUS** L.

Erinaceus sp. indet.

The presence of this form is indicated only by some isolated teeth. A specific determination is not possible.

Order **CHIROPTERA** indet.

A small chiropteran form is represented by a hinder part of a left lower jaw with the last three teeth *in situ*. Closer determination of this specimen is likewise not possible. Cat. C. L. G. S. C. No. $\frac{C}{C.310}$

Order **CARNIVORA.** Gray

Family **MUSTELIDÆ** Swainson

Genus **MELES** Storr

Meles sp. indet.

Only one isolated tooth indicates the presence of this form which is specifically not determinable.

Family **HYÆNIDÆ**

Genus **HYÆNA** L.

Hyæna cf. **sinensis** Owen

This form is only represented by some fragments of limb-bones and no specimens whatever of teeth have been recovered here though the latter are so abundant in the deposits of Locality 1. From the size of the limb-bones and the closeness of this locality to Locality 1, it is very probable that the species here encountered is the same as that occurring in the latter site. (To be fully described later.) Cat. C. L. G. S. C. No. $\frac{C}{C.332}$

Order **RODENTIA**

Family **SCIUROIDEA**

Genus **TAMIAS** *Illiger*

Tamias wimani Young

Pl. I, Figs. 1-1C.

1927. *Tamias wimani* Young, C. C., Fossile Nagetiere aus Nord-China. Palæontologia Sinica, Ser. C, Vol. V, Fasc. 3, p. 8, Plate 1, Figs. 1-3.

This species *Tamias wimani*, so far known only in the locality mentioned and described by me, is now supplemented by three left lower jaws. One of the latter is well preserved though both ends of it are unfortunately broken. The others are fairly complete, but their teeth are damaged. As mentioned before, the lower jaw is characterized by its massive structure and the big foramen in front of P_4. It may be added furthermore that the masseter crista is rather strong, processus coronoideus very narrow and pointed while the processus angularis is very broad.

The lower teeth in one specimen are beautifully preserved. The general shape is a big basin, surrounded by two well differentiated outer cusps and one front inner cusp, while the inner hinder part is only marked by a faint ridge. Between the outer cusps, there usually is developed a small cusp, and the connection between the front outer and front inner cusp is marked by a very prominent ridge. P_4 differs from the molars in the absence of the front inner cusp and in its small ridge. As in M^3, the M_3 is prolonged backwards in a remarkable manner.

DIMENSIONS:

Maximum length of the jaw from fore-part of I to condyle	29 mm
Height of the jaw before P_4	5 mm
Height of the jaw behind the M_3	5.5 mm
Length of P_4-M_3	6.4 mm
Length of M_1-M_3	5 mm

Limb-bones are represented by several pieces, but they are all too fragmentary to be worth detailed description.

HORIZON AND LOCALITY: Polycene (Upper Sanmenian) of Choukoutien, Hopei.

Cat. C. L. G. S. C. Nos. $\frac{C}{C.298}$—$\frac{C}{C.299}$

REMARKS: Concerning the relationship and the distribution of *Tamias wimani*, the additional finds give us no important information. It may be noted here, that by the

associated fauna of this locality and by the faunistical comparison with the other localities of Choukoutien, *Tamias wimani* can not be regarded as of Pliocene age as I formerly believed, but of upper Polycene age. The strong fossilization and the red matrix are simply a special case of occurrence. The same is also true for *Lepus wongi* which has been redescribed. (See below.)

Family **MYOIDEA** Schlosser

Several fragments representative of this family are here noted. In Locality 1 similar materials collected were in much better condition and in greater quantity. It is therefore not necessary to make a thorough study here and the following notes are given for the sake of the completeness of the fauna.

Genus **CRICETINUS** Zdansky

Cricetinus varians Zdansky

1928. *Cricetinus varians* Zdansky, Die Säugetiere der Quartärfauna von Choukoutien. Palæontologia Sinica, Ser. C., Vol. V, Fasc. 4 p. 54, Taf. V, Figs. 4-11.

A badly preserved right lower jaw with M_1-M_2 closely resembling *Cricetinus varians* in the shape of the teeth has been recovered from Locality 2. According to Schaub (1930), the fossil described by me as *Cricetulus* cf. *songarus* (1927) belongs also to this species. Unfortunately I have not sufficient material from Locality 2 or the original of 1927 for making a detailed comparison. Cat. C.L.G.S.C. Nos. $\frac{C}{C.303}$

Genus **CRICETULUS** Milne Edwards

Cricetulus sp.

(**Cricetulus** sp. Young, 1927)

Two left and four right lower jaws represent a second small species of *Cricetulus*. On account also of the poor material, these specimens do not serve to increase our knowledge of this form.

According to Schaub (1930) the nearest form to this species may be *C. obscurus* M. Edwards. Cat. C.L.G.S.C. No. $\frac{C}{C.302}$

Apodemys sylvaticus L.

(*Mus* cf. *plumbeus* M. Edwards, Young 1927)

One broken skull, one isolated M^1 and three right lower jaws indicate the presence of this species, which according to Zdansky (1928), is the same as *M.* cf. *plumbeus* described by me (1927).

The skull has only its front part preserved. With the exception of the right M^1 and M^2, all teeth are missing. In comparison with the collections of living individuals of this species collected by Miss Vera von Lude from Manchuria, I fail to find any special character worth mentioning. Dimensions: Length of the skull from front margin of I to the back part of M^3=13 mm; width at front part of zygomatic arch=12.5 mm.

The teeth represented resemble exactly those of *A. sylvaticus* as noticed by Zdansky. The same is true for the lower jaw and the lower teeth. It may be interesting to mention that the lower teeth of our specimens are somewhat shorter on the average (4 mm) than those described by Zdansky (4.2 mm). Cat. C.L.G.S.C. No. $\frac{C}{C.301}$

Genus **Mus** L.

Mus sp.

(**Mus** sp. Young, 1927)

Pl. I, Figs. 3-4.

Three badly preserved lower jaws, show that we have still a much smaller form of Mus which is exactly the same as that which I have described in 1927. One of the right lower jaws is preserved in much better state than the specimen I described before. Only the hindermost part was missing. The incisor is very massive and the masseteric crista is well marked. M_1 shows the same characters as those I described before, being chiefly characterized by the reduction of the first outer cusp. M_2, not known before, consists of four chief cusps, the outer are considerably stronger than the inner, and one small posterior cusp at the posterior margin. The alveolar socket for M_3 shows that this tooth was very small and reduced.

Dimensions:

Length of the jaw from the frontal margin of I to the condyle	?9 mm
Height of the jaw near M_2	2.4 mm
Length of M_1-M_3	3 mm
Length of M_1... 1.4 mm; M_2... 1 mm; breadth of the teeth row	1 mm

On the whole, this interesting form of *Mus* is characterized by its exceeding smallness, the reduction of the first outer cusp of M_1 and the special features of M_2. *Micromys* sp. (Zdansky, 1928) is also small but differs from our form in the more complicated structure of M_1.

In comparison with *Mus minutus ussuricus*[1] our specimen is on the whole a little bigger and the dentition is more massive, but very close in every respect to a modern specimen of *Mus* sp [2] which is specifically not yet determined. The masseteric crista of our specimen is however much more strongly and sharply developed than that of *Mus* sp. Cat. C.L.G.S.C. No. $\frac{C}{C.307}$

Genus **GERBILLUS** Desmarest

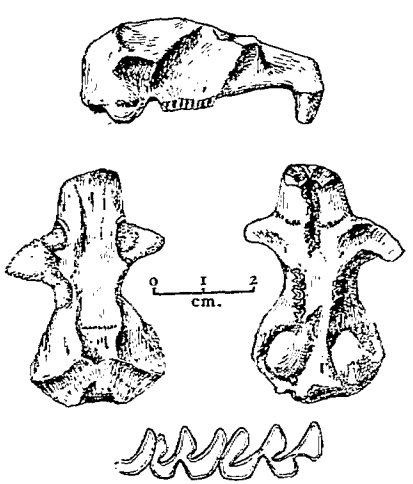
Gerbillus sp.

Only represented by M^1. Length 2.4 mm. Cat. C. L. G. S. C. $\frac{C}{C.306}$

Genus **MICROTUS** Schrank

Microtus brandti (Radde)

This form is represented by one skull fragment, two left and two right lower jaws, possibly some limb-bones. The skull is not sufficiently preserved to give any reliable details. The massive molar folding suggests the possibility of its belonging to this species. The numbers of the molar folds are also typical of *M. brandti*. Cat. C. L. G. S. C. $\frac{C}{C.305}$



Text-fig. 1. *Siphneus* cf. *fontanieri* Milne Edwards. 3 views of the skull (1/1 nat. size.) and upper right teeth row (below) 4/1 nat. size.

Genus **SIPHNEUS** Brants

Siphneus cf. **frontanieri** M. Edwards

Pl. I, Figs. 2.

In this locality the occurrence of a mole rat is of great interest, because it supplies one fact more in correlation with the Choukoutien fauna with that of the other places in northern China. The determination is based on one skull and three lower jaws.

The skull is rather well preserved, but both zygomatic arches are wanting. Some parts of the surface are smashed and the teeth are badly preserved.

(1) Collection of Miss Vera von Lude, Cat. No. 381.

(2) Collection of Miss Vera von Lude, Cat. No. 382.

From the size and the big occipital hump and from the massive and quadratic shape of the skull, this specimen can be easily recognized as *Siphneus fontanieri*. Our specimen differs from the latter in that its bullæ are much stronger, the distance between its orbits is somewhat less and the sagittal crista especially are characterized by their peculiar shape. Both crista are rather narrow at the posterior end and expand suddenly in their middle part and then narrow strongly between the orbits which form a broad lyra at the frontalia. The crista in *S. fontanieri* are much narrower and sharply parallel to each other.

All the lower jaws are too fragmentary to permit determining any character worth mentioning.

The teeth are typical for *S. fontanieri* in both upper and lower jaws. There is no vertical groove present at the front margin of M^1 as we noticed in some specimens from Shansi. (Teilhard and Young, 1931). M^2 is not sufficiently preserved for exact determination, but the broken part shows that it is not reduced and probably the last outer folding is forked just as in typical *S. fontanieri*.

DIMENSIONS:

Basal length of the skull.	36 mm
Minimum breadth of the orbits	9 mm
The minimum width of the sagittal cresta	6 mm
The maximum width of the sagittal cresta	9 mm
Length of upper teeth row	11 mm

HORIZON AND LOCALITY: Upper polycene of Choukoutien. Cat. C. L. G. S. C. No. $\frac{C}{C.294}$

REMARKS: The above mentioned differences, when compared with the typical *S. fontanieri*, seem not sufficient for separating the fossil remains from that species and creating a new species. Palæontologically, the finding of this form in Locality 2 gives us very little new information. But stratigraphically, it is very interesting, because it proves definitely that the Choukoutien fauna corresponds to Zone C of the Reddish Clays formation, elsewhere so widely distributed in Northern China.

Family **LEPORIDÆ** L.

Genus **LEPUS** L.

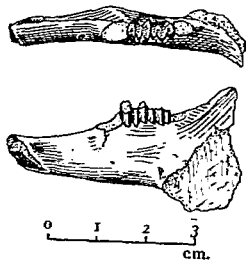
Lepus wongi Young

Pl. I, Figs. 5.

1927. *Lepus wongi*, Young, C. C., Fossile Nagetiere aus Nord-China. Palæontologia Sinica, Ser. C., Vol. V, Fasc. 3, p. 59, Taf. III, Figs. 9-10.

This species created by me on the basis of material from the same locality is represented by two skull fragments, one of which is better preserved, one right lower jaw and some limb and foot bones.

The better preserved skull has its posterior part broken. It differs from the first specimen of *L. wongi* by its small size and the slenderness of its muzzle. The most important characters I have mentioned for this species cannot be confirmed in the present specimen, on account of the poor preservation of the latter. Nevertheless, the short muzzle and the massive teeth seem to indicate that we have to do with the same form. The smallness and the slenderness of the specimen may be most probably explained by its rather young ontogenetic age or less probably as due to an individual variation.



Text-fig. 2. *Lepus wongi* Young. Left lower jaw from outer side and from above, 1/1 nat. size.

The lower jaw looks very massive and heavy, especially the part of the symphysis, as compared with *L. oiostulus* and other recent *Lepus* P_2 and M_3 are wanting. Their alveolar sockets show that they were rather big and consequently M_3 is not reduced. The other teeth look also very massive.

DIMENSIONS:	Specim. 1927	Present Specim.
Length of the skull from the tip to the hinder part of pterygoid	56 mm	48 mm
Breadth between the zygomatic arch (fore)	42 mm	34 mm
Breadth between the orbits	13 mm	16 mm
Length between I_2 and P_2	22 mm	19 mm
Length of the lower jaw from the tip of I to hinder part of M_3		38 mm
Thickness of the jaw in front of P_4		7 mm
Height of the jaw in front of P_4		13 mm
Length of upper teeth row. (of the specimen of 1927=14.8 mm)		12.5 mm
Length of the lower teeth row		17 mm

The skeletal bones are too much broken to yield any detail. Their dimensions show that they are of the same size as the ordinary hare.

HORIZON AND LOCALITY: Upper Polycene of Choukoutien. Cat. C. L. G. S. C. No. $\frac{C}{C.308}$

REMARKS: The question whether *L. wongi*, *L. oiostulus* Hodgson (Young, 1927 and 1930) from Locality 6 and *Lepus* sp. (Young 1927) from Hui-Yu near Sanchiatien in Hsishan really belong to a single species, or may be separated into several forms as I have provisionally done, is not easy to settle. It requires a large osteological series of different recent species which has not yet been possible for us to obtain.

Family **OCHOTONIDÆ** L.

Genus **OCHOTONA** *Linck*

Ochotona sp.

Only one fragment of a lower jaw and one single molar indicates the presence of an *Ochotona* which is of rather large size. Cat. C. L. G. S. C. No. $\frac{C}{C.297}$

Order **UNGULATA**

Sub-Order **PERISSODACTYLA** Owen

Family **RHINOCEROTIDÆ**

Genus **RHINOCEROS** Gray

Rhinoceros sp.

The *Rhinoceros* is only indicated by a fragment of the humerus. Cat. C. L. G. S. C. No. $\frac{C}{C.304}$

Sub-Order **ARTIODACTYLA** Owen

Family **SUIDÆ** L.

Genus **SUS** L.

Sus cf. **lydekkeri** Zdansky

1928. *Sus lydekkeri* Zdansky, Die Säugetiere der Quartärfauna von Chou K'ou Tien. Palæontologia Sinica, Ser. C, Vol. V, Fasc. 4, p. 91, Pl. X, Figs. 1-21; Pl. XI, Figs. 1-27.

This species is represented only by one upper and one lower jaw, both with milk dentition. It is very probable that they belong to *S. lydekkeri* which is so commonly

found in Locality 1, and close to the site where these remains have been found. Cat. C. L. G. S. C. No. $\frac{C}{C.295}$

Family **CERVICORNIA** Schlosser

Genus **MOSCHUS** L.

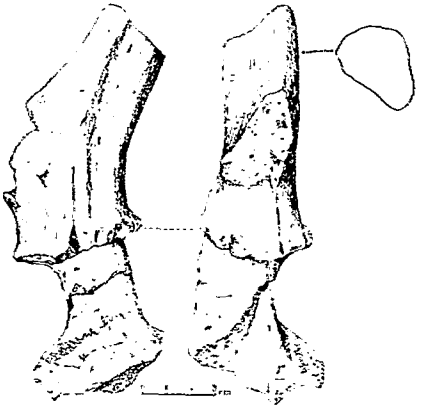
Moschus sp.

Indicated only by some metacarpalia which do not permit of any detailed description. Cat. C. L. G. S. C. No. $\frac{C}{C.300}$

Genus **CERVUS** L.

Cervus (Pseudaxis) sp.

Pl. I, Fig. 6.



Text-fig. 3. *Cervus (Pseudaxis* sp.) Right antler from front and from inner side. 1/2 nat. size.

This species is based on three fragments of antlers, one of which is well preserved, a great number of upper and lower jaws, limb and foot bones, for the most part very fragmentary.

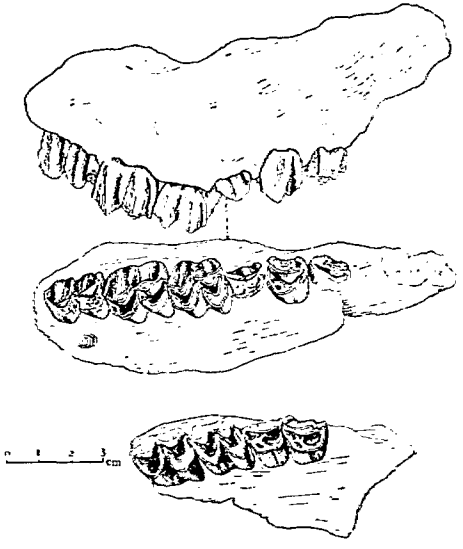
The best preserved antler represents a basal part of the right side, with the broken part of the brow tine. The burr is situated about 20 mm above the frontalia. The first tine is broken and branches 17 mm above the burr; it seems perpendicular to the main tine, which is chiefly characterized by the sharp ridge along its front. The cross section is clearly rounded and triangular in shape.

DIMENSIONS:

Sagittal thickness of the antler below the burr	31 mm
Maximum thickness of the burr	59 mm
Maximum thickness 10 mm above the first tine	48 mm
Lateral thickness of the antler 10 mm above the burr	37 mm

On account of their fragmentary preservation, the skull and the lower jaw cannot be described.

Dentition: Both upper and lower teeth are generally characterized by their very strong hypsodont appearance, by the poor development of the pillar, and chiefly by the strong ribs (especially the front one) which run up the very base of the crown and almost parallel to each other, thus differing from most (if not all) other fossil and recent deer. The inner size of P^2 has a split, while the same of P^3 and P^4 are only marked by a weak depression. The upper molars seem furthermore characterized by the poor development of the spur and some other primitive characters.



Text-fig. 4. *Cervus (Pseudaxis* sp.) Right maxilary with P^2-M^3 (above) from outer side and from below and other fragment of upper jaw with P^2-M^3 from below (below). 1, 2 nat. size.

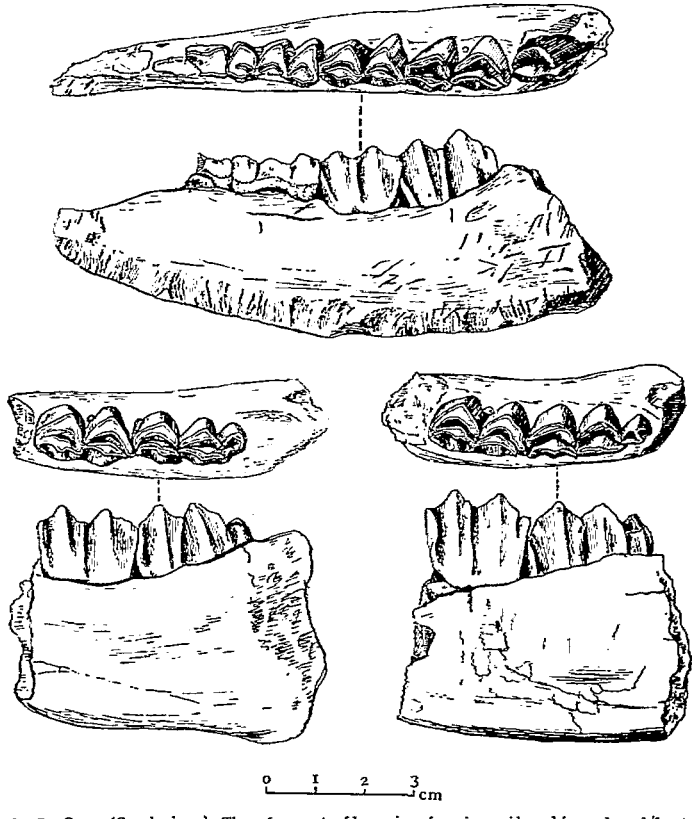
The lower milk teeth are represented by four examples, in jaws which show traces of having been gnawed by rodents at their lower edges.

DIMENSIONS:

Length P^2-P^4	40 mm:	M^1-M^3	57 mm
Length P^2-M^3	94 mm		
Length M_1-M_3	42 mm		
Length M_2	19 mm:	M_3	23 mm
Height of the jaw between M_2 and M_3			23-35 mm
Length of Dp_2			17 mm

Limb and foot bones are very poorly represented and need no special notice.

HORIZON AND LOCALITY: Upper Polyene of Choukoutien. Cat. C. L. G. S. C. Nos. $\frac{C}{C.313}$—$\frac{C}{C.331}$



Text-fig. 5. *Cervus (Pseudaxis* sp.) Three fragments of lower jaws from inner side and from above 1/1 nat. size.

REMARKS: In comparison with all known fossil Cervidæ in China, *Pseudaxis grayi* may be considered closest to this species. The other forms, chiefly described by Zdansky (1925, 1927, 1928) differ from our form, either in size or by the structure of the antlers and teeth. But, as mentioned above, the present fossil is characterized by the peculiar shape of its antler and its more hypsodont and simple teeth, in which respects it differs from *P. grayi*.

Because of insufficient material, a careful comparison of this fossil deer with the recent Cervidæ is not possible.

In Locality 1, antlers of *Pseudaxis* were collected in great numbers and demonstrate the extreme degree of their variability, both in size and in shape Young 1932. But a form having a triangular cross-section of the main tine above the first tine has, however, not been found there. On the contrary, some of the teeth from that locality show the same characters as those which we have observed in the remains from Locality 2. Therefore, the question whether this species has to be identified with *P. grayi* or to be considered as a new species or new variation of deer, cannot be decided upon at present.

Cervus (Euryceros) pachyosteus Young

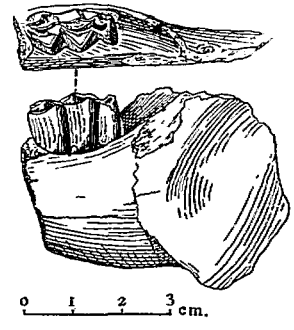
1932. *Cervus (Euryceros) pachyosteus* Young, C. C. Young, On the Artiodactyla from the Sinanthropus site of Choukoutien. Palæontologia Sinica, Ser. C, Vol. VIII, Fasc. 2 (in press).

Some fragments of lower jaws indicate that this species, characteristic of Locality 1, is also represented in the fauna of Locality 2. Because of the poor preservation of the collection, further description is superfluous. Cat. C. L. G. S. C. No. $\frac{C}{C.312}$

Genus **CAPREOLUS** Ham. Smith

? Capreolus sp.

A third much smaller form of deer is represented merely by a right lower jaw, with only M_3 and some limb-bones. The size of the jaw and the shape of the tooth, chiefly the expansion of the last lobe of the latter, suggest close affinity to the *Capeolus manchuricus*, recently collected by Miss von Lude and preserved in the Canozoic Laboratory collection. Dimensions: height of the jaw behind M_3=31 mm; length of M_3=18 mm (measured from inside); breadth of distal end of metacarpalia (?)=22 mm; breadth of astragalus=21 mm. Cat. C. L. G. S. C. No. $\frac{C}{C.296}$



Text-fig. 6. *?Capreolus* sp. Right lower jaw with M_3 from outer side and from above. 1/1 nat. size.

The presence of *Capreolus* sp. in the fauna of Locality 2 is rather interesting. Unfortunately no trace of antler of this species has been found.

Family **CAVICORNIA** Schl.

Boviæ indet.

One atlas and some phalanges and hoof bones show clearly that a small member of the Bovidæ is represented in this fauna. The size of these specimens shows that it is not the big *Bubalus* of Locality 1. Cat. C. L. G. S. C. No. $\frac{C}{C.334}$

Order **PRIMATE** L.

Family **CYNOPITHECIDÆ**

Genus **MACACUS** Lacépède

Macacus cf. **anderssoni** Schlosser

1924. *Macacus anderssoni*, Schlosser, M. Fossil primates from China. Palæontologia Sinica, Ser. C, Vol. I, Fasc. 2. 1924.

A fragment of upper jaw with P to M^3 and some isolated teeth are represented. According to the personal communication kindly given by Dr. Black, the remains are referable to *M. anderssoni* described by Schlosser (1924).

Class **Aves** L.

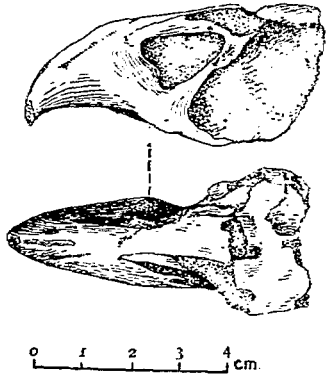
Family **ACCIPITRODÆ**

Genus **AQUILA** Brisson

Aquila heliaca heliaca

Pl. I., Fig. 7.

Brisson. "Die Vögel der paläarktischen Fauna von E. Hartert", Bd. II, 1092-1094.



Text-fig. 7. *Aquila heliaca heliaca*. Muzzle from left side and from above. 1/1 nat. size.

A fore-part of the beak region of a rather big bird has been found among the specimens from Locality 2. Thanks to the kindness of Mr. T. H. Shaw of the Fan Memorial Institute of Biology, I have been able to make some comparisons of this fragment with species from the rich ostelogical collection of bird material preserved in that Institute. The size and general character of the Locality 2 fragment suggests that it represents a form closely resembling *Aquila heliaca heliaca* which is still living in N. China. The presence of this big eagle in the fauna is rather interesting, because it represents one of the better preserved specimen of vertebrates other than mammalian. Cat. C. L. G S. C. No. $\frac{C}{C.333}$

Reptilia indet.

A lower mandible with teeth indicates the presence of a small snake. Cat. C. L. G. S. C. No. $\frac{C}{C.309}$

CONCLUSIONS

On the whole, the above described fauna is very close to that of Locality 1. Most of the forms here mentioned were found in the *Sinanthropus* site also, but very poorly represented on account of the unfavourable condition of preservation. With the exception of Locality 3, this place is the only locality having a rather rich macro-fauna comparable with that of Locality 1. There are of course some additional differences between the macro-fauna of the two sites which would seem to be due largely to different local conditions.

PART II: LOCALITY 7.

GEOLOGICAL NOTES.

This locality was found by Mr. Pei in 1929. It lies about one kilometer S. of Locality 1, and close to the right side of the road from the railway station to Locality 6, Chikushan. The deposit is also found in a depression or fissure in the limestone, but more open and its surrounding parts have been almost entirely removed by quarrying. The sediments consist chiefly of red clay and sandy loam and differ from those of other localities in their more intensive red color and where unconsolidated in being very sticky, just like the *Hipparion* red clay of Shansi. The color of the sediments becomes lighter from below upwards, evidently as a result of the surface weathering. Up to the present, there is no indication of the presence of any deposit of gravel in this site and fragments of rocks are also very rare. The site may represent the rather open facies of the Choukoutien deposits, and may correspond to the lower part of Locality 1 (lower cave).

DESCRIPTION OF THE FOSSIL.

Order **CARNIVORA** Gray

Family **HYÆNIDÆ** L.

Genus: **HYÆNA** L.

Hyæna cf. **sinensis** Owen

One broken left lower jaw confirms the presence of this species. The determination of its specific name is based solely upon geographical considerations because in Locality 1 the species mentioned is so extraordinarily abundant. Cat. C. L. G. S. C. No. $\frac{C}{C.335}$

Order **UNGULATA**

Sub-Order **PERISSODACTYLA** Owen

Family **RHINOCEROTIDÆ**

Rhinoceros sp.

Some molars and limb bones of *Rhinoceros* form a part of the fauna of Locality 7. Their fragmentary preservation does not, however, permit of making a specific determination, though probably they are referable to *R. sinensis*. Cat. C. L. G. S. C. No. $\frac{C}{C.336}$

Sub-Order **ARTIODACTYLA** Owen

Family **SUIDÆ** L.

Genus **SUS** L.

Sus cf. **lydekkeri** Zdansky

1928. *Sus lydekkeri*, Zdansky, ibid. P. 91.

Some broken jaws and isolated teeth indicate the presence of a pig. From geological and geographical considerations these remains can be referred to *S. lydekkeri* which is so abundantly found in Locality 1. Cat. C. L. G. S. C. No. $\frac{C}{C.337}$

Family **CERVICORNIA** Schl.

Genus **CERVUS** L.

Cervus (Pseudaxis) sp.

The presence of this species is also based upon a few fragmentary antlers and lower jaws only. The materials obtained from this locality are also not sufficient to permit of further study. The teeth show clearly the hypsodont character just like those described from Locality 2, their size is also practically the same. It seems, therefore, that we may refer the remains provisionally to the species of Locality 2. Cat. C. L. G. S. C. No. $\frac{C}{C.338}$

Cervus (Euryceros) pachyosteus Young

Pl. I. Fig. 8.

1932. *Cervus (Euryceros) pachyosteus* Young, C. C., Young, on the Artiodactyla from the Sinanthropus site of Choukoutien. Palæontologia Sinica, Ser. C, Vol. VIII, Fasc. 2 (in press).

The remains of this species are by far the most abundant in the fauna of Locality 7. This form is represented not only by a great number of upper and lower jaws (about 40) as well as some limb bones, but also by a rather strange antler which may provisionally be referred to this species.

Unfortunately this antler has its basal part wanting, so that we can not be sure of the situation of the brow-tine. Judging by the general shape, the broken end is very close to the burr. The lower part of this specimen shows the triangular cross-section as commonly noticed in *Cervus (Euryceros) pachyosteus*, but is less sharp at the groove, and the front part is not well developed. It flattens very gently upwards in contrast to the typical *C. pachyosteus*. The preserved part has a length of about 315 mm and shows still no real palmation of the main tine. In some respects it is comparable to *Cervus*

boulei Teilhard and Piveteau (1930) found from the Sanmenian beds of Sangkanho. Comparing this specimen with *Cervus (Euryceros) ordosianus* Young from the Sjara-ossogol formation (see Boule and Teilhard, 1928 and Young 1932) one may find close similarities. It is therefore possible that this specimen does not belong to *C. pachyosteus* but to a form in close connection with *C. (Euryceros) ordosianus* which has doubtlessly close phylogenetical relation with the former. Stratigraphically, it is however less probable. Since the material on hand is very poor, we cannot hope to decide this problem now.

Considering the upper and the lower jaws, they confirm without doubt the identification of the species. They resemble in every respect *C. pachyosteus* of Locality 1 which is fully described in another fascicle of this Journal. (Young, 1932). Cat. C. L. G. S. C. No. $\frac{C}{C.339}$

Family **CAVICORNIA** Schl.

Bovinæ indet.

The presence of a Bovid is only indicated by some isolated upper and lower teeth which are almost the same size as the teeth of *Bubalus teilhardi* Young (sp. nov.) found in Locality 1 (Young 1932.) It is probable that they may belong to that species, but not to the same species as the Bovid of Locality 2. On account of the limited material, it is not possible to be sure of its generic and specific determination. Cat. C. L. G. S. C. No. $\frac{C}{C.340}$

PART III: LOCALITY 8

(TUNGTUNG)

This locality represents the only fossiliferous site which lies east of the Choukoutien branch of Liuliho. It lies at the western slope of the low hill near the village of Choukoutien, and was discovered by Mr. Pei in 1928. The sediments of this locality consist of limestone breccia mixed with sands and loam. The "cave" is about one and half meters in height and in breadth and 4 meters in length, and is certainly excavated artificially. Since conditions do not permit of further excavation and the outside of the deposit is entirely covered, the extent of this locality has not been determined. The color of the sediments varies from light red to gray and yellowish white.

Fossils from this site are very poor. We have so far only a number of fragments which are well fossilized, and with dendritic black spots. They belong to a single species of *Equus*. Cat. C. L. G. S C. No. $\frac{C}{C.311}$. The best preserved piece is one upper P^4 or M^1 and one astragalus. They would seem to represent a species similar to that of Locality 1, but this identification is uncertain on account of the insufficiency of the material.

There is no clear evidence to show that the material from Locality 8 does not belong to the general fauna of the Choukoutien fissure formation. Though this fossil site yields neither geological nor palæontological novelties yet it adds new knowledge to the distribution of the fossiliferous deposits of the Choukoutien region.

GENERAL CONCLUSIONS

The faunal contents of the three localities above described in comparison with that of other known fossiliferous localities of Choukoutien may be summarized in the following table:

Fossils	Loc. 2	Loc. 7	Loc. 8	Loc. 1	Loc. 5[1]	Loc. 6
Erinaceus indet.	+	−	−	+	−	−
Chiroptera indet.	+	−	−	+	−	−
Meles sp.	+	−	−	+	+	+
Hyaena sinensis	+	+	−	+	−	−
Tamias wimani	+	−	−	+	−	−
Cricetinus varians	+	−	−	+	+	−
Cricetulus sp.	+	−	−	+	+	−
Apodemys sylvaticus	+	−	−	+	?	−
Mus sp.	+	−	−	+	?	−
Gerbillus sp.	+	−	−	+	−	−
Microtus brandti	+	−	−	+	+	−
Siphneus fontanieri	+	−	−	+	−	−
Lepus wongi	+	−	−	+	−	−
L. oiostulus	−	−	−	?	−	+
Ochotona sp.	+	−	−	+	−	−
Equus sp.	−	−	+	+	−	−
Rhinoceros sp.	+	+	−	+	−	−
Sus lydekkeri	+	+	−	+	−	−
Cervus (Pseudaxis) sp.	+	−	−	?	−	−
Pseudaxis grayi	?	?	−	+	−	−
Euryceros pachyosteus	+	+	−	+	−	−
Capreolus sp.	+	−	−	+	−	−
Bovidae indet. a.	+	−	−	?	−	−
Bovidae indet. b.	−	+	−	+	−	−
Macacus anderssoni	+	−	−	+	−	−
Aves indet.	+	−	−	?	−	−
Reptilia indet.	+	−	−	+	−	−

In general, we may say that all the fossiliferous localities differs slightly one from the other, a condition which can be readly explained by differences in purely local environment. Such local variations by no means imply clear differences of a faunastical value.

(1) See Pei, W. C. 1931.

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EXPLANATION OF PLATE I.

All specimens are preserved in the Cenozoic Research Laboratory of the Geological Survey of China.

PLATE I.

Page

Fig. 1. *Tamias wimani* Young. Left lower jaw from outer side, 1/1 nat. size; 1a from above; 1b from outer side, 2/1 nat. size; 1c the teeth 4/1 nat. size..... 3

Fig. 2. *Siphneus* cf. *fontanieri* Milne Edwards. Skull from above, 2a from below, 1/1 nat. size..... 6

Fig. 3. *Mus* sp. Right lower jaw from inner side, 3a from outer side, 4/1 nat. size, 3b the teeth 10/1 nat. size..... 5

Fig. 4. *Mus* sp. Right M_1-M_2 10/1 nat. size. 5

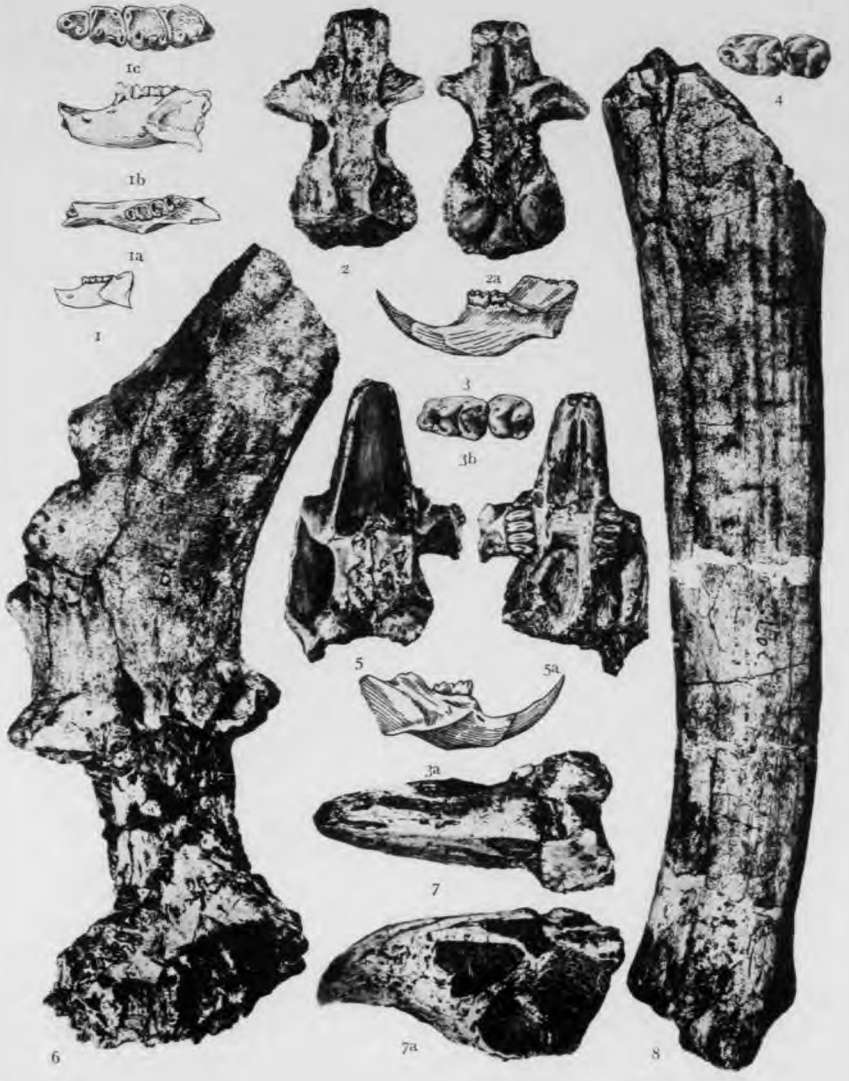
Fig. 5. *Lepus wongi* Young. Skull from above, 5a from below. 1/1 nat. size..... 8

Fig. 6. *Cervus (Pseudaxis* sp.) Right antler from inner side. 1/1 nat. size..... 10

Fig. 7. *Aquila heliaca heliaca* Brisson. Muzzle from above, 7a from left side 1/1 nat. size..... 14

Fig. 8. *Cervus (Euryceros)* cf. *pachyosteus* Young. Fragment of antler, 2/3 nat. size. 17

Young, C. C.: Vertebrate Remains from Loc. 2, 7 and 8 at Chou Kou Tien. Pl. I.



周口店第二第七第八地點之脊椎動物化石

地點之水牛同種。

第八地點

在鐵路以東山坡上，名東洞，岩質爲石灰岩角礫岩及泥土，一部已被採掘而呈洞狀。因種種關係，未在此作採掘。其化石僅發現有若干馬齒及其足骨等。由地質上及化石上之觀察推斷，實無確切之事實，可令此地點與周口店人骨化石堆積有若何顯著之差異。此地點之發現，僅可表示周口店化石堆積之分布，不僅限於鐵路以西而已。

結論

由上述三地點之化石與其他化石地點之動物羣比，除由於局部不同之情形外，可視爲同一建造，即所謂周口店骨化石堆積是也。

偶蹄類中屬於奇蹄類者，僅有一種犀牛。因僅有四肢骨，故不能據以作詳盡之研究，而確定其種。至偶蹄類則較多，計有猪一（*Sus lydekkeri* Zdy）麝鹿一（*Moschus sp.*），鹿一（*Cervus* (*Pseudaxis*) *sp.*），其與第一地點相當之鹿之關係，不十分明確。又有腫骨鹿一種（*Cervus* (*Eurycerus*) *pachyosteus*）則與第一地點完全相同。麋鹿一（*Capreoolus sp.*）及一不能詳爲鑑定之牛類。

靈長類中有猴一種，大約爲 *Macacus anderssoni*。

鳥類一爲鷹（*Aquila heliaca*）。

爬行類遺跡若干。

概括言之，第二地點之動物化石，與第一地點極相近，大多數種類，均發見於第一地點，而保存不良。因其大小動物，同發見於一地，除第三地點以外，第二地點之化石，爲唯一可與第一地點相比。兩地點當然因局部差異，而有若干不同，但此等差異，決不能影響於一般性質及其年代，則無疑問。

第七地點

爲裴文中君於一九二九年所發見，在第一地點南約一公里，亦爲石灰岩裂隙中之堆積，岩質爲深紅土，所產化石計有：

肉食類，土狼一，與第一地點相同。

有蹄類中奇蹄類亦僅有犀牛，偶蹄類有猪與鹿兩種，第一種鹿與第二地點者相同，而腫骨鹿則完全與第一地點相同。惟其角柄特長，而扁度亦與第一地點者，少不同耳。又有不能確切鑑定之牛類，大約亦與第一

周口店第二第七第八地點之脊椎動物化石

楊鍾健著

依原定計畫，係將第二第七第八各地點化石，逐一作詳盡之研究，而分別發表於古生物誌中。俾各該地點之化石，經盡力採掘後，或種類稀少，或破碎不完，故決歸納研究之。就中以第二地點材料最豐，但其他二地點，亦在古生物學上，不無意義，茲分別述之。

第二地點

此地點在周口店骨化石中，發見最早。其化石於一九二七年，已由作者研究。自地質調查所在周口店猿人地點（第一地點）採掘以來，亦得在此作若干採掘。故今茲之研究，可補充以前之不足。

此地點之化石，在極硬之石灰角礫岩中，故多破碎不完。大半爲有蹄類之四肢骨，難藉以作詳盡而可靠之研究。計可鑑別之種類爲：

食虫類（刺蝟）一種。

蝙蝠類（不能作較確設定）一種。

肉食類兩類，一爲獾，一爲土狼。

齧齒類甚多，計有九種，而最有意義者爲田穴鼠之發見。其種極近於 *Siphneus fontanieri*，因之於周口店堆積，與其他華北近生代地層之比較，殊有臂助。

中國古生物誌丙種第七號
第三册

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