FOSSIL REMAINS EXCAVATED AT KU-HSIANG-TUNG NEAR HARBIN, MANCHOUKUO (Résumé)

By

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PLATES I—XXII

In July, 1934, we published a report of the remains unearthed as our first labour at Ku-hsiang-tung near Harbin in June and July, 1933. And in 1936 we presented a report as to the ancient human artifacts of those which we excavated in 1934 as the second digging. The present report treats the fossil remains as a sequel to the above, all of which were found from the fluviatile deposit of the middle Pleistocene epoch exposed along the river Wenchuan and its tributary.

Items of the second digging

The following are the species whose scientific names we have determined (except for the terms with asterisks, all the othors the authors have judged):—

PLANTS

DICOTYLEDONEAE

Juglandaceae

**Juglans manshurica* MAXIM. **Juglans manshurica tokunagai* ENDO. **Juglans manshurica naorai* ENDO.

ANIMALS

MAMMALIA

CARNIVORA

Canidae

**Canis lupus* L. **Canis* sp. *Nyctereutes* sp. *Vulpes* cf. *vulpes* (L.)

Ursidae

Ursus cf. *spelaeus* BLUMENB.

Mustelidae

Meles sp. *Mustela* cf. *sibirica* PALLAS.

Hyaenidae

Hyaena ultima MATSUMOTO subsp.

Felidae

Panthera tigris L. *Felis catus* L.

Measurements written in this report are all calculated in millimetres.

RODENTIA

Muridae

**Clethrionomys rufocanus* (SUND.) **Microtus* cf. *ratticeps* (YOUNG) **Microtus* cf. *pelliceus* THOMAS **Microtus* (*Lasiopodomys*) *brandti* (RADDE) **Microtus obscurus* (EVERS) **Microtus* cf. *mongolicus* RADDE **Microtus* (*Stenocranius*) *gregalis* (PALL) **Cricetulus griseus* MILN-EDW.

Spalacidae

**Siphneus* sp.

Ochotonidae

Ochotona cf. *mantchurica* THOMAS

Sciuridae

Citellus mongolicus (A.M.-EDWARDS) *Marmota mantchurica* sp. nov. *Marmota robusta* (A.M.-EDWARDS) *Marmota bobac sibiricus* (RADDE).

Castoridae

Caster orientalis sp. nov.

ARTIODACTYLA

Suidae

Sus continentalis NEHRING

Cervidae

Cervus xanthopygus A.M.-EDWARDS *Cervus elaphus* L. *Cervus harbinensis* sp. nov. *Cervus* cf. *hortulorum* SWINHOE *Cervus grayi* (ZD.) subsp. *Cervus mantchuricus* SWINHOE *Cervus* sp.? *Capreolus mantchuricus* (NOACK) *Capreolus* sp. *Alces alces fossilis* H.V. MEYER *Alces* cf. *alces bedfordiae* LYD. *Megaceros* cf. *ordosianus* (YOUNG) *Megaceros* sp. *Elaphurus* cf. *menziesianus* (SOWERBY)

Bovidae

Bos cf. *taurus* L. *Bos primigenius* BOJANUS *Bos primigenius* BOJ. subsp. *Bison priscus* BOJANUS *Bubalus* cf. *wansjocki* BOULE et TEILHARD *Bibos kuhsiangtungensis* sp. nov. *Ovis* sp. *Gazella przewalskii* BUCHNER

PERISSODACTYLA

Equidae

Equus przewalskii POLIAKOFF *Equus* cf. *caballus* L. *Equus hemionus* PALLAS subsp. *Asinus* sp.

Rhinocerotidae

Rhinoceros antiquitatis BLUM. *Rhinoceros* sp.

PROBOSCIDEA

Elephantidae

Elephas primigenius BLUM.

AVES

Phasianidae

Phasianus sp.

REPTILIA

Trionychidae

Amyda maackii (BRANDT)

PISCES

Eventognathi

Cyprinidae

Ctenopharyngodon cf. *idella* (VALEN.) *Ctenopharyngodon* sp. *Carassius* sp.

Nematognathi

Bagridae

Pelteobagrus sp. *Leiocassis* sp.

MOLLUSCA

**Unio douglasiae amurensis* MOUSSON **Cristaria plicata* (LEA) **Sphaerium lacustre compressum* MOUSSON **Valvata piscinalis manchurica* SUZUKI **Stenothyra tokunagai* SUZUKI **Bulimus* (*Bulimus*) *kiusiuensis naorai* SUZUKI **Bulimus* (*Parafossarulus*) *striatulus* (BENSON) **Semisulcospira concelata amurensis* (GERSTFELDT) **Carychium pessimum gerstfeldti* SCHLESCH **Aplexa hypnorum* (LINNÉ) subsp. **Lymnaea* (*Stagnicola*) *palustris terebra* WESTERLUND **Lymnaea* (*Galba*) *pervia* MARTENS **Lymnaea* (*Galba*) *truncatula* (MÜLLER) **Lymnaea* (*Radix*) *auricularia* (LINNÉ) **Lymnaea* (*Radix*) *plicatula* BENSON **Aplexa hypnorum* (LINNÉ) subsp. **Anisus* (*Gyraulus*) *gredleri* (BIELZ) **Hippeutis manchuricus* SUZUKI **Succinea pfeifferi pingi* SUZUKI **Succinea alpestris* MÖLL. **Cochlicopa lubrica* (MÜLLER) **Vertigo alpestris* ALDER **Vertigo alpestris harbinensis* SUZUKI **Gastrocopta coreana* PILSBRY **Vallonia chinensis* SUZUKI **Gonyodiscus* (*Discus*) *ruderata pauper* (GOULD) **Euconulus* sp. **Bradybaena saitoi* SUZUKI **Bradybaena virgo* (PILSBRY).

Description of species

MAMMALIA

Nyctereutes sp.

Pl. I, fig. 4; text-fig. 1.

A fragment of the left lower jaw.

The fragment has M_1 only, and yet I, C and P have retained their respective alveolus. What is characteristic is the ramus of the lower jaw quite low in height, while very long in length. Unfortunately the present specimen is too fragmentary to make a satisfactory investigation. But as compared with that of the fossil badger already announced or with that of an existing one, the present piece shows no identical nature, therefore, the specimen may perhaps be a new species. Leaving the species to further investigation, here we provisionally regard it as *Nyctereutes* sp.

Vulpes cf. *vulpes* (L.)

Pl. I, fig. 3; text-fig. 2.

A fragment of the left lower jaw.

The present specimen belongs to the young animal in the reteething stage, and in the deciduous molar teeth there are preserved dm_2 — dm_4, but absent are di, dc, and dm_1. In the alveolus of the lower jaw-bone there appears the sign of the growth of permanent teeth whose nature we examined by dissecting the bone, and in consequence we have come to see that in general the present specimen has the character of *Vulpes vulpes*.

Ursus cf. *spelaeus* BLUMENB.

Pl. I, fig. 5; text-fig. 3.

The right M_3.

The present tooth being much worn out, the grinding surface presents an egg shape. The tooth crown is low, and shows almost nothing different from that of an existing species, *Ursus spelaeus*. The present piece is smaller in size than that excavated in the locality No. 1 of Choukoutien.

Meles sp.

Pl. I, fig. 2; text-fig. 4.

A fragment of the left lower jaw.

The present fossil specimen now preserves only P_4 and M_1 which are much worn out. The characteristic of the specimen is the quite large size and great thickness of the ramus of the lower jaw. These features show nothing similar to the fossil specimens already announced, except some similar forms found in the fossil *Meles* of Japan.

Mustela cf. *sibirica* PALLAS

Pl. I, fig. 1; text-fig. 5.

The right lower jaw.

The lower jaw-bone has sustained almost no impair, but in the tooth-row I, C, P_2 and M_2 are absent. The present specimen is a little smaller in size as compared with that found in the Choukoutien locality No. 1 and an existing one in Manchoukuo.

Hyaena ultima MATSUMOTO subsp.

Pl. I, fig. 6; Pl. II, figs. 1–5; text-figs. 6 and 7.

A fragment of occipitale; the fragment of the left upper jaw; the right P^4; the right lower jaw; the left lower C.

Excavated at our digging locality No. 20, so we named, the present specimens show no particular difference in general with *Hyaena ultima* formerly found at several localities

in China, excepting that the ramus of the lower jaw-bone much curves inside. Judging from such, we regard these pieces as belonging to the subspecies of *H. ultima*.

Panthera tigris (L.)

Pl. II, fig. 6; text-fig. 8.

The right P_4.

The specimen retains itself comparatively in perfect condition. Compared with other species, the crown is slightly narrower in breadth in contrast with its length longer. As compared with fossil and living specimens of *P. tigris* formerly described, the present specimen is a little bigger in size.

Felis catus L.

A fragment of the skull.

The present specimen we announced in 1934 as Felidae gen. et sp. indet. in the Report of Digging at Ho-chia-kou, Ku-hsiang-tung, Manchoukuo, 1934, Section II, Part 1, p. 50, Pl. XI, figs. 1 and 1a. (Report of the 1st Scientific Expedition to Manchoukuo). The further investigation, however, has induced us to describe afresh the above items, as the young form of *Felis catus*.

Ochotona cf. ***mantchurica*** THOMAS

Pl. I, fig. 9; text-fig. 9.

The right lower jaws.

The specimens are similar in general to that of an existing one found in Manchoukuo, but what are different from the latter are: the ramus of the lower jaw is slightly high in height, and much rounded in the lower border; the diastema between the incisor and the fourth premolar is shorter.

Citellus mongolicus (A. MILNE-EDWARDS)

Pl. I, fig. 11.

A fragment of the left upper jaw.

The specimen is a small piece with P^3-M^2 thereon, and there is found no difference from the living specimen in Manchuria and Mongolia.

Marmota robusta (A. MILNE-EDWARDS)

A fragment of the right lower jaw; the fragments of the left lower jaws.

As to the present spieces the description was given in details in the previous report, then the redescription is omitted here.

Marmota mantchurica sp. nov.

Pl. I, figs. 10 and 12.

The skull; right lower jaws (3 pieces); left lower jaws (3 pieces); right M_2.

The right lower jaw. Though the rear portion of the ramus is broken, the rest retain comparatively intact. The ramus is high in general, and the molar series present a slight curve, and preserve I, P_4, M_1, M_2 and M_3. The incisor highly projects and is thick.

The fourth premolar leans slightly backwards, when seen from the outer side. Metaconid, protoconid, and hypoconid stand rather high respectively. Entoconid shows only its edge rising. Paraconid lies between protoconid and metaconid, and forms a small knot; between hypoconid and protoconid, and between metaconid and entoconid, and between paraconid nad protoconid there lies a small knot respectively.

The first molar is the smallest in the molar row; there is not such a small knot as that existing between metaconid and entoconid of P_4, but between protoconid and hypoconid there are two knots.

M_2 is similar in constructure to M_1 and the knots between protoconid and hypoconid are rather larger.

M_3 is the largest in the molar row, and there are three large knots between protoconid and hypoconid.

Length of the ramus	55.5	
Position measured	Height of ramus.	Thickness of ramus.
At median point of the diastema between I and P_4	12.0	6.0
at P_4	15.0	7.0
at M_1	14.5	8.5
at M_2	15.5	8.0
at M_4	16.5	9.0
Length of the diastema		17.0
Length of the molar row (P_4-M_3)		21.0
The same (M_1-M_3)		16.0

Tooth crown	Length	Breadth	Height (outer side)	Height (inner side)
I	4.5	4.0	—	12.5
P_4	5.5	5.2	5.5	5.4
M_1	4.5	5.0	5.0	5.5
M_2	4.5	6.0	3.9	5.0
M_3	6.0	6.0	3.5	4.4

The skull. The specimen is of large size, but it losts the main part of the facial bone.

P^4: paraconus is small, while metaconus large. In the hollow portion on the front of metaconus there is not a knot, but one knot between entoconus and metaconus.

M^1: the tooth is worn out very much, and it resembles P^4, but the crown is slightly wider than its length; a knot exists between paraconus and metaconus.

M^2: the entire piece shows rather rounded shape in general, and remarkable is a

knot between paraconus and metaconus.

M^3: this is the largest in the molar row. Rather small is the knot between paraconus and metaconus.

Length of the skull (from supraoccipital to the anterior suture line in frontal)	60.5
Breadth of parietal.	24.5
Height of the same	27.5
Breadth of frontal (inclusive of postorbital)	38.0
Height × length of lachrymal.	20.0 × 20.0
Transverse diameter × vertical diameter of foramen magnum	9.5 × 12.0
Length × breadth × height of tympanic	14.5 × 14.0 × 7.5
Breadth at the base of the upper jaw.	19.0 (between right and left M^3) 27.0 (between right and left P^4)

Tooth crown	Length	Breadth	Height (outer side)	Height (inner side)
P^4	4.5	5.0	4.0	5.0
M^1	4.5	5.0	3.5	4.5
M^2	5.0	5.5	3.5	5.0
M^3	5.5	5.5	3.5	5.5

Besides there is isolated right M_2, which shows no remarkable difference from the aforementioned specimen.

The distinguished characteristic is that the present specimens are larger in size as compared with the specimens of *Marmota* ever found, and that there exists a knot between protoconid and hypoconid in each present lower molar. Especially, in P_4 it is noteworthy that a minor knot exists between protoconid and paraconid. In *M. complicidens* the knots between protoconid and hypoconid are extremely developed in one large knot to the same size to protoconid and hypoconid, and in the case of *M. robusta* there is not such a knot.

That the present specimen has not so big a knot is suggestive of intermediate from between a species which has not a knot at all and that which has a large knot. The variation of the plication of enamel in the teeth has an important meaning in determining the species of Rodentia. Thus the present specimens we have discovered are coincident with no other specimens hitherto known in construction of the teeth. So we mention here new specific names to the present specimens.

Marmota bobac sibiricus (RADDE)

Pl. I, fig. 8.

The right lower jaw.

No marked variation is observed, compared with existing species, except that the lower jaw-bone is a little longer.

Castor orientalis sp. nov.

Pl. I, fig. 7, text-fig. 10.

The right and left lower jaws.

The right lower jaw with $P_4 - M_2$, deprived of M_3.

The specimen has been well preserved; the ramus is rather thick, and the diastema between P_4 and the incisor is long, whose length is about the same with the tooth-row.

The incisor is quite large, but is not so markedly projected from the margin of the alveolus.

P_4 leans inside to a great degree, and curves strongly inside in upper view. The premolars and molars, when viewed from outer side, have the shape like two plain plates piled together respectively. The enamel plaits of the grinding surface show "3" figure, with a semi-circular ring on its head and a circular ring inside. Especially marked is the constricted part on the outer side, and in this part cement is sufficiently tamped.

M_1 is longer than P_4 in length, but broader than P_4 in breadth; in general this resembles P_4 in tooth construction, and yet this piece curves far inside, and at the same time leans forward also.

M_2 has the same tooth feature as M_1, yet in entire observation this is slightly smaller, and more keenly leans forward than M_1.

The length of the now preserved ramus 91.0

Position measured	Height of ramus	Thickness of ramus
at P_4	30.0	15.5
at M_1	26.5	29.0
at M_2	26.0	18.0
at M_3 (alveolus)	24.5	16.5
Length of tooth-row. $P_4 - M_3$ (alveolus)		35.0
,, $M_1 - M_3$ (alveolus)		27.0

	Length	Breadth	Height (outer side)	Height (inner side)
I_1	8.0	7.5	15.5	—
P_4	7.0	6.5	9.0	8.5
M_1	8.0	7.5	5.0	6.0
M_2	7.5	7.0	4.0	4.5
M_3 (alveolus)	9.5	8.5	—	—

The left lower jaw with $P_4 - M_3$ (text-fig. 10). This is almost the same in general view as the right lower jaw-bone mentioned above, but each molar is of slightly larger size than the aforementioned specimen, and enamel is slightly thicker.

The length of the ramus (from the rear edge of M_3 to the alveolus of the incisor). 73.0

Position measured	Height of ramus	Thickness of ramus
at P_4	31.5	16.0
at M_1	27.0	18.0

at M_2			25.0	19.0
at M_3			22.5	17.0
Teeth	Length	Breadth	Height (outer side)	Height (inner side)
I_1	9.0	11.5	—	—
P_4	9.0	8.0	10.5	7.0
M_1	8.0	9.0	8.2	4.0
M_2	8.0	8.5	7.5	4.0
M_3	7.5	7.0	6.5	5.0

The characteristic of the present species is that the lower jaw-bone is of larger size and the inner side of the molar is not rounded nor projected, but is rather plain.

Castor, the beaver, is popularly known animal living on the sea-shore or the river-bank, and the distribution of the living species is in some locality of Eurasia and in the nothern part of North America, namely, those to be found in Europe are called *C. fiber*, and those in North America *C. canadensis*. Now, as compared with our fossil specimens unearthed in Ku-hsiang-tung *C. canadensis* is extremely different in shape and structure of the teeth, as well as the shape of the lower jaw-bone. Our fossil species shows, however, much likeness in several points to *C. fiber*, but the latter species has not so high and projective lower jaw-bone, and dull is the degree of the constriction at the rear edge of the ramus. And, furthermore, as to the molar, *Castor* to be found in Europe shows its inner side projecting inside keenly and forming a bow shape; while almost straight in shape is that of the fossil species. This is indicative of how each differs in tooth constriction from one another.

The fossil species belonging to Castoridae were discovered as early as in Pliocene, and *Castor* was found in Europe for the first time in Pliocene, then in Pleistocene, and some species are still living at present. In North America, however, *Castor* appeared from Pleistocene. In Manchuria and Siberia, the authors have not yet heard of any being discovered except in Ku-hsiang-tung. In China the species belonging to Castoridae made its first appearance in lower Pliocene, and *Castor* appeared in lower Pleistocene at the locality No. 1 of Choukoutien, and it seems to have been extinct since then. Two right premolars found at the said locality of Choukoutien resemble those of Ku-hsiang-tung both in size and shape. Now, as for the other species, which differ from our species both in generic name and in geological age, the present specimen shows some resemblance to *Sinocastor anderssoni* found in the Tertiary in Mongolia in shape of the lower jaw-bone and in tooth shape of M_1 and M_2, but greatly differing in structure of P_4. With other species camparison is of no use. Judging from the points above mentioned, the fossil beaver discovered in Ku-hsiang-tung is a new species rather similar to *C. fiber*.

Here is given as reference table of the size comparison of the molars between the fossil and the existing *Castor*:—

		Fossils				Living	
		Castor sp. (Choukuotien Loc. 1)		*Castor orientalis* (Ku-hsiang-tung)		*Castor fiber* (Europe)	*Castor canadensis* (North America)
		sp. a	sp. b	sp. a	sp. b		
P_4	length	8.0	8.5	7.0	9.0	8.0±	6.5
	breadth	6.6	6.5	6.5	8.0	7.5±	4.0
M_1	length	—	—	8.0	8.0	9.0±	6.5
	breadth	—	—	7.5	9.0	7.0±	5.0
M_2	length	—	—	7.5	8.0	7.0±	8.5
	breadth	—	—	7.0	8.5	7.0±	8.5
M_3	length	—	—	—	7.5	7.0±	10.0
	breadth	—	—	—	7.0	6.5±	7.0

Sus continentalis NEHRING

Pl. I, fig. 17.

The canine of the upper jaw.

The present specimen is a single piece of a canine tooth, and no difference is found from that of a living species in Manchuria.

Cervus xanthopygus A. MILN.-EDWARDS

The left M^2.

Though the tooth crown is partially broken, from the rest the features of the living species *C. xanthopygus* is the same with our fossil specimen.

Cervus elaphus LINNÉ

Pl. I, fig. 16; Pl. III, fig. 9; text-fig. 12, *5*.

The right and left horn; right P^3; right M^3.

In no point the present specimens are different from a living species *C. elaphus*.

Cervus harbinensis sp. nov.

Pl. III, fig. 8; Pl. V, figs. 2, 3 and 6; text-fig. 12, *3*.

The skull (with molars) and antler.

The skull once perfectly preserved in every part was badly broken when it was being excavated. It is comparatively of a smaller size, and though tailer the parietal shows little rotundity. The supraoccipital presents somehow a pentagonal shape and is wider in breadth, and the rear side acutely projected backwards. The frontal is narrower in breadth; the occipital is by far taller as compared with the length of the base. Keener is the degree of the projectiveness of the occipital condyle and large is the transverse diameter of it; the foramen magnum is of an oval shape; the frontal portion of the paroccipital process is too far broken to trace up the original phase, but originally it must have been taller in height. The basioccipital is wide in breadth and its each end of the base is markedly projective. The tympanic is large and tall, and the stylo-

mastoid foramen is large and oval antero-posteriorly.

The left antler retains almost intact, while the right one is devoid of its tip; the antler burr is of an oval shape and the edge taller; the beam leans outside abruptly from the burr, and its section shows an oval shape; rather short is the distance between the burr and the first or brow tine, which shows almost 90° angle to the beam, viz. the common property seen on *Rusa*. The second or bez tine projects to the same direction as that of the brow tine, and shows about 70° angle to the beam, and keeps a distance of 178.0± from the brow tine; the length of the bez tine is about a half of that of the brow tine, and the tip of the tine curves slightly inwards. Generally the present antlers are rather shorter in length; dull is the outer curve of the middle part, and slight is the inner curve degree of the tip of the beam; on the horn surface there run the ridges rich in warts.

Teeth: all the molars P^2-M^3, when found, were fastened to the skull, but they were broken when they were being taken up from the stratum.

P^2: rather round is the anterior side when seen from the grinding face, while the posterior side is less round; on the grinding surface the angle of the edge facing outer side strongly projective; the roots three and all of them are short.

P^3: in construction the present piece is much similar to P^2, and yet wider is the breadth of the teeth, and stronger is the projection degree of the edge of the outerside in grinding face.

P^4: this is slightly of a large size than P^3, and the other characters are almost similar to the latter, except that the rear portion of the tooth curves so keenly outside in the present piece, that the grinding face forms a horse shoe.

M^1: the tooth is pretty much worn, and the grinding face is of a square form; the front part is much diminished owing to its being strongly compressed by adjoining P^4.

M^2: the present tooth is much similar to M^1, and keenly pointed is the inner edge of the tooth, when seen from the grinding surface.

M^3: the front part of the tooth is strongly compressed by the adjoining M^2; the outer side of the grinding surface is highly projected, and marked is the saw-shaped knot in the inner side of the crown.

Length of the skull (from the frontal to the supraoccipital)	144.00
Breadth of the parietal	81.5
Length of the parietal	54.0
Breadth of the frontal	92.0
Breadth of the supraoccipital	91.0
Height of the supraoccipital measured from the base of skull	65.0
Transverse diameter × vertical diameter of the foramen magnum	26.0 × 23.0
Length of the typanic	23.0
Breadth of the typanic	23.5
Height of the typanic	13.0
Length of the left antler (total)	326.0

Length of the burr	55.0
Breadth of the burr	50.0
Length from the burr to the upper edge of the first fork	68.0
Length of the brow tine	162.0

The right antler (Pl. III. fig. 8; text-fig. 12, *3*).

The present specimen is deprived of its tip; the burr is of a round shape, and of a moderate thickness, and the warts are well developed. The length between the right and left burrs is short. The brow tine projects at the angle of 90° to the beam, and is quite long. The bez tine is similar in length to the brow tine, and is project at an angle of about 85° to the beam.

Length of the antler	23.0
Length of the burr	42.0
Breadth of the same	41.0
Height of the same	8.0
Length (from the burr to the upper edge of the first fork)	51.0
Length of the brow tine	100.0

The present antler strikingly resembles *Rusa*, partly because there are two tines, and great is the angle between the brow tine and the beam, and partly because the brow tine is not high. The antler is, however, of a smaller shape; comparatively short is the brow tine, and quite distinct is appearance of forking at the first tine from the beam; furthermore, that part of the beam right above the burr is somewhat slightly slender. Thus observing, the specimen has properties shown in *Sika*. From the above mentioned consideration, of much interest is that the present specimen is in construction in the same category as *Rusa*, and that the specimen resembles that of *Sika* in the manner of the forking of brow tine. Comparing the present specimen with specimens belonging to *Sika* in similar growing stage, difference is observable in construction of the antler; especially in the distance between the brow and the bez tine. The fossil specimen is shorter; the molars are smaller, yet the tooth phase is suggestive of *Sika*. In short, the present specimen has molars somewhat similar to *Sika*, while in construction the antler itself belongs to *Rusa*. Somewhat similar form is *Rusa elegans* that existed in Pliocene in China, but the antler of *R. elegans* is 390.0± in length, and in general our fossil is smaller in shape. According to what is mentioned above, we find that the present specimen has intermediate feature between *Sika* and *Rusa*.

Cervus cf. ***hortulorum*** SWINHOE

Left M^3.

No different feature can be found in our fossil specimen from M^3 of a living species in Manchuria.

Cervus grayi (ZD.) subsp.

A fragment of the right lower jaw and a right P_4.

As is mentioned in the preceding report, the present specimens show almost nothing different from *C. grayi.* var. ZDANSKY found at locality No. 1 of Choukoutien. However, in general the molar discovered at Ku-hsiang-tung is not so rounded.

Cervus mantchuricus SWINHOE

Pl. I, figs. 14 and 15; Pl. III, figs. 1, 5, 7 and 11; text-figs. 12, *4* and *12*.

The right and left antlers (4 pieces); left upper M^3 (2 pieces); right lower M_2 (2 pieces); right lower P_3 and P_4 (each 1 piece); left lower M_3 (1 piece); left lower jaw-bone.

All the antler pieces discovered in the present locality are those which are under developed, while the molars are comparatively of a large size.

Cervus sp.

Pl. IV, fig. 6.

The left lower jaw.

With P_2-M_3 on the jaw, the present specimen is deprived of its geater part, and then no entire phase can be investigated. As for the tooth-row, the crown is shorter in length in proportion to its breadth being wider, and in general view the crown is much rounded. Judging from the condition of the premolars, the specimen belongs to *Cervus* type, and yet the tooth-row is too short in length as compared with Japanese *Sika*. Therefore, we have to entertain some doubt that it belong to *Cervus*.

Capreolus mantchuricus (NOACK)

Pl. III, figs. 3, 4, 6 and 10; text-figs. 11, 12 *1*, *2*, *7*, *8*, *10* and *11*.

A bone piece of the left lower jaw; two left horns (2 pieces); five right horns (5 pieces).

The specimens show no difference from the living species.

Capreolus sp.

Pl. I, fig. 13; text-fig. 13.

The broken piece of the upper jaw with the left first and second molars.

The present piece much resembles that of *C. mantchuricus*, except the there is a small cone on the outside border of the tooth crown.

Alces alces fossilis (HERMANN v. MEYER)

Pl. IV, figs. 1, 4 and 7; Pl. V, fig. 5; text-fig. 14, b.

A broken piece of the skull; a fragment of the upper jaw-bone; a fragment of the right lower jaw-bone; a fragment of the left lower jaw-bone.

The present specimens have quite large teeth, but they are so pointed. Enamel

layer is thin and the plication delicate. The present species is now-a-days distributed in the northern part of Eurasia.

Alces cf. ***alces bedfordiae*** LYDEKKER

Pl. III, fig. 2; text-fig. 12, *6*.

A fragment of the left antler.

The present specimen is known as east Siberian elk, and much resembles that of Yakutsk district. However, as compared with the living species, the brow tine is longer, and the curve of the beam itself is obtuse.

Megaceros cf. ***ordosianus*** (YOUNG)

Pl. IV, fig. 5; Pl. V, fig. 1; Pl. XXII; text-figs. 12, *9* and *9'*

A fragment of the right lower jaw-bone; the right antlers (3 pieces); left antler (1 piece).

The present specimens well resemble *M. ordosianus* ever described, but the antler is smaller in our specimens.

Megaceros sp.

Pl. IV, fig. 8.

The right lower jaw.

The specimen is still in its infancy in development, and if grown, it would have been quite big.

Elaphurus cf. ***menziesianus*** (SOWERBY)

Pl. V, fig. 4; text-fig. 14, a.

A fragment of the left horn.

Strikingly great is the distance between the burr and the first fork (upper margin) branch, and the angle between the beam and the first fork shows $70°\pm$, as compared with the $90°\pm$ of *E. davidianus*.

Bos cf. ***taurus*** L.

Pl. VI, figs. 1–14; Pl. VIII, figs. 17–24.

The premolars and molars.

The present specimens strikingly resemble *Bos taurus*, from which almost no difference is discovered especially in Pl. VI, figs. 3 and 4 (M^2 of the left side). The fossil species found in the locality show no acuteness in the general outline of the teeth.

Bos primigenius BOJ.

Pl. VI, figs. 15–29; Pl. VII, figs. 1–24a; Pl. VIII, figs. 1–16, fig. 25; Pl. IX, figs. 1–11; Pl. X, figs. 1–9; Pl. XI, figs. 7, 8 and 12; text-fig. 15.

The right horns (3 pieces), left horn (1 piece), a fragment of the left lower jaw-bone, a fragment of the lower jaw-bone, and a number of molars.

The present fossils together with *Bison priscus* consist mainly of the fossils of Bovidae. The features of the horns and teeth are not different from those of the same species ever described.

Bos primigenius Boj. subsp.

Pl. IX, figs. 12–21; Pl. XI, figs. 1, 2 and 3.

The molars only.

In general, the present specimens resemble those of *Bos primigenius*, but as compared with the length, tooth crown is narrower in breadth; the anterior and posterior parts of the crown are curved inside. As to the molars on the grinding surface, there is a semi-circular plication, which still exists in the last stage of mastication until reaching it reaches the base of crown.

Bison priscus (Boj.)

Pl. X, fig. 7; Pl. XI, figs. 4–6; figs. 9–11; figs. 13–21; Pl. XII, figs. 1–19; Pl. XIII, figs. 1–6; Pl. XV, fig. 4; text-fig. 16.

Horn fragments of the right (4 pieces) and left sides (2 pieces); a lower jaw-bone; a fragment of right lower jaw-bone; several teeth; a third phalanx.

The present specimens are much the same as those excavated before.

Bubalus cf. ***wansjocki*** Boule et Teilhard

Pl. XIII, figs. 7–19; Pl. XIV, figs. 1–8, fig. 12; Pl. XV, figs. 1 and 2.

The right lower jaw-bone with $P_4 - M_3$ (2 pieces); numerous teeth; a third phalanx.

The lower jaw-bone discovered at Ku-hsiang-tung resembles that which was excavated at Choukoutien No. 1 locality, but in height of the ramus the present specimens are lower.

Bibos kuhsiantungensis sp. nov.

Pl. XIV, figs. 9, 10 and 11; Pl. XV, figs. 3 and 5.

A fragment of the upper jaw-bone (with molars); a fragment of the right lower jaw-bone (with molars); the left M^3 and the left M_3.

The upper jaw (Pl. XIV, fig. 9, Pl. XV, fig. 3). The jaw bears the right $P^2 - M^2$ and the left $P^3 - M^1$.

The grinding face of P^2 is rather sharply projected and curved inside. The de-

pressed portion of the grinding face is deeply cemented.

P^3 has the rather sharpened grinding face; especially the portion near the outer side is remarkably sharpened, and that near the inner side slightly projects inwards in a round shape.

P^4 is a tooth fresh from germination, and it is the same in size and shape with P^3, but on the whole more rounded.

M^1 is long and high. The degree of projecting inside is especially high in the posterior part. The development of the cement is remarkable.

M^2 is very large and its features are the same with M^1.

The width of the upper jaw (measured between left and right P^2) 90.0

Length of the tooth-row (P^2–M^2) 146.0

Teeth	Length	Breadth	Height (outer side)	Height (inner side)
P^2	23.0	18.0	21.0	—
P^3	24.0	20.0	22.5	25.0
P^4	23.5	18.5+	21.0	17.0
M^1	34.0	26.0	23.5	30.0
M^2	42.5	30.0	24.5	26.0

The right lower jaw (Pl. XV, fig. 5)

P_3 is not found but other molars remain comparatively intact. The lower jaw-bone lacking the posterior part is comparatively large and especially high in height. The crevice between the incisor and premolar is long.

P_2 wears out a little and is not so long in height. The development of cement is not remarkable.

P_3 is likely longer and newly germinated. Its breadth is comparatively narrow.

M_1 is longer, but narrow in breadth. The grinding surface is rather sharply projected.

M_2 is quite large and high.

M_3 is masticated only in the anterior part and its enamel is thick. There exist large columns between each lobe when seen in the outer side. The development of cement is remarkable.

Length of the lower jaw-bone. 455.0

Position measured at	Height of the ramus	Width of the ramus
P_2	52.0	26.0
P_3	61.0	28.0
P_4	68.5	30.0
M_1	70.0	33.5
M_2	80.0	33.0
M_3	86.0	34.0

Length of the tooth-row ($P_2 - M_3$) 187.0

,, ,, ,, ,, ($M_1 - M_3$) 122.5

Teeth	Length	Breadth	Height (outer side)	Height (inner side)
P_2	16.5	12.5	20.0	21.0
P_3 (alveolus)	25.0	18.0	—	—

P_4	28.0	13.5	12.5	17.0
M_1	34.0	17.5	24.5	28.0
M_2	38.0	17.5	25.5	32.0
M_3	51.0	17.5	19.0	24.5

The left upper M^3 (Pl. XIV, fig. 11).

The tooth is large and its root missed. In the middle of the outer side part of the tooth, there is a small cone, while a considerably large one is in the inner side.

Length	Breadth	Height
40.5	31.0	71.0

The left lower M_3 (Pl. XIV, fig. 10)

The present tooth is large. The column between each lobe in the outer side is considerably large. The root is short and tiny, and it shows the character of a young aged animal.

Length	Breadth	Height
51.0	21.0	75.0

As mentioned above, the present fossils have the special features in the characters of the teeth and the lower jaw. It should be noteworthy that all the teeth are pretty large. In the construction of the teeth the pillar-shaped body on the median of each lobe on the inner side is constricted not so keen as *Bubalus*, but keener than *Bison* or *Bos*. There are cones much developed.

On the grinding surface, as mastication advances, the inside enamel plication well shows the characteristic features of *Bibos*. But as compared with the species of *Bibos* already found, there is none coincident with the present fossils. The fossil species has the teeth longer but thinner in the breadth than *B. geron* which was excavated in the cave at Sze-chuan, China, and as compared with *B.* sp. from Indo-China, it is much different in breadth of the tooth crown, and different in many points from *B. sondacius fossilis*, etc., in Java. As compared with the living species *B. banteng*, the present fossil specimens are of large size. Judging from the above-mentioned, the present specimens should be regarded as a new species.

Bibos, as shown in the distribution of the living species, belongs to Bovidae peculiar to the Orient, and is of tropical nature. Therefore, of much interest is that the present animal was found as fossils in the same stratum at Ku-hsiang-tung, where mainly the animals of frigid nature have been dug out. Perhaps, the *Bibos* came from southward to the northern district with *Bubalus* in the ancient time.

Ovis sp.

Pl. I, fig. 18.

A left horn core.

Both in size and structure of the horn core the present specimen much resembles *Ovis aries*, except that the core is narrower in breadth and the outside surface shows

strong rotundity; also in *O. aries* core groves on the surface run slightly in a wave row, while in the fossil specimen the rows run almost straight.

Gazella przewalskii Buchner

Pl. IV, figs. 2 and 3; text-fig. 17.

The right horns (3 pieces); left horns (2 pieces); a right lower jaw-bone; a left lower jaw-bone.

No difference is observed from those of the living species.

Equus przewalskii Poliakoff

Pl. XV, figs. 6 and 7; Pl. XVI, figs. 1 – 29, figs. 31 – 33; Pl. XVII, figs. 18; Pl. XVIII, figs. 4 and 5.

A fragment of the cranium; a lot of teeth; the right lower jaw-bone (2 pieces); and the third phalanx (4 pieces).

As compared with the living species parietal is highly rounded, the posterior edge of orbital slender, and the projection of the posteriorly projected part of the cranium is dull. As to the lower jaw-bone of the fossil specimen, the lower border of the ramus presents weeker swelling; in the tooth phase the fossil specimens are almost similar to the living species.

Equus cf. ***caballus*** L.

Pl. XVII, figs. 5 and 7.

The left P^3 (2 pieces); left M^3 (1 piece).

The features of M^3 are almost the same as *E. caballus*; however, what is different is that tooth crown is narrower; the inside plication near the inner side in M^3 shows richer waves than the living specimen; P_3 is of large size, but the plication is fine.

Equus hemionus Pallas subsp.

Pl. XVI, figs. 30 – 41; Pl. XVII, figs. 1 – 4, fig. 6, figs. 9 – 14, figs. 16 and 17, fig. 22.

A lot of teeth and one piece of the third phalanx.

As compared with *E. hemionus*, the inner plication on the grinding surface is very fine, and different is the degree of the curve of the embayment in each lobe on the outer side.

Asinus sp.

Pl. XVII, figs. 8, 15, 19, 20, 21 and 23; Pl. XVIII, fig. 6.

The left P^3; the left P^4; the right M^1; the right M_1; the right M_2; the right M_3; the right lower jaw-bone; the third phalanx.

There appears little rotundity in the shape of teeth, but as a whole the present teeth are of rather angular shape, and as big as the living mule in North Manchuria.

Rhinoceros antiquitatis BLUM.

Pl. XVII, fig. 24; Pl. XVIII, fig. 1; Pl. XIX, figs. 1 and 2; text-fig. 18.

A fragment of the upper jaw-bone; lower jaw-bone of an adult animal; the lower jaw-bone of a young one; a number of teeth.

The present specimens are the same as those previously announced, but the present specimens are by far more in number.

Rhinoceros sp.

Pl. XVIII, figs. 2 and 3.

The skull.

The parietal is markedly narrow and long, and in turn forehead bone is broader; the curve of the surface of nasal is dull, and the breadth of nasal is narrow; like *R. sondaicus* there is no wall bone of the nostril in the lower part. These features are markedly different from the afore-mentioned *R. antiquitatis*. The present specimens are similar to those found in Transbaikal district, which were announced by Dr. MATSUMOTO in 1915.

Elephas primigenius BLUM.

Pl. IV, fig. 9; Pl. XIX, figs. 3-6; Pl. XX, figs. 1-4; Pl. XXI, figs. 1-3.

The right (?) M^2; the right M^3 (2 pieces); the right M_1 (1 piece); the left M^2 (?) (1 piece); a lower jaw-bone.

The specimens we excavated at Ku-hsiang-tung cover, we suppose, in number at least twenty individuals, but no piece is a complete body; of much interest is that we discovered a large number of bones of young ones. In the preceding report we have mentioned that weak is the plication of the enamel on the grinding surface, and generally thin the enamel plate, and other structures of teeth are not exactly identical with hitherto mentioned Mammoth, thus we have regarded the present specimens from Ku-hsiang-tung as a subspecies. But the further investigation has suggested us that this is a mere phenomenon of individual variation, then as such we want to revise. Comparatively typical specimens are shown in Pl. XIX, figs. 3, 4 and 6, Pl. XX and Pl. XXI; of which some are fine in enamel plication, and the others coarse; and some enamel plates on the grinding surface are of parallel straight shape, while the other, with the advancement of wearing, assumes slight loxodont shape in the median part; the European specimens also show a trend of the similar shape. Here, what is worthy of attention is the molar mentioned in Pl. XIX, fig. 5; the molar has comparatively a long and narrow crown. On the crown-view the ridges on the non-masticating plates show a propellar shape, but assume a lozenze shape at the anterior grinding plates, like the feature seen in *Palaeoloxodon antiquus*.

The ridge plates which first assume propellar shape are seen beside *E. primigenius*, in *E. trogontherii* and *E. meridionalis*. And that they assume slight lozenze shape by

the advancement of wearing is the general character of Elephantidae. Yet stronger degree as is indicated in the present specimens, is not always observable and is rarely in Mammoth. The ridge-interval of the present specimens is great, and that the ridge-formula involved in 100 mm. is 5+ is quite a low ratio in the case of Mammoth. These features, when studied only in the present specimens, are thought to be a different characters from Mammoth, but if observed in molars of a Siberian Mammoth as suggested by PFIZENMAYER or in a molar of Borna afforded by FLEX, such a phenomenon regarding on the ridge gives no powerful evidence as the distinction of the species. After all, we should like to regard the Mammoth in Ku-hsiang-tung as one species in the broad sense, and to suppose that individual variation occurs rather frequently in species.

AVES

Phasianus sp.

Text-fig. 20.

The right humerus; left and right tarso-metatarsus.

The present specimens show no marked difference from *Phasianus* now living in North Manchuria.

REPTILIA

Amyda maackii (BRANDT)

A fragment of terrapin-shell.

The present fossil is not different from those now often found in various rivers, meres and tarns in Korea, Manchuria, the Usuri, the Sungari and the Amur.

PISCES

Ctenopharyngodon sp.

The left operculum bone; left and right ventral fins; a front spinous bone.

The operculum bone is not different from those of the existing species. The fossil spinous bone in front of the ventral fin, as compared with the living species almost of the same size, is wider than the living specimen, and its inside perpendicular grooves are a little deeper.

Ctenopharyngodon cf. ***idella*** (VALENCIENNES)

Text-fig. 21.

The teeth of the left lower jaw (?).

The present fossil almost resembles the tooth of the fish, which was made public

as C. *idella* by CHANG. He obtained it from M. N. BIEN who excavated it in 1936 at locality No. 3 in Choukoutien. That the present tooth is of a fish cannot be denied, but the conclusion that it is a tooth of *C. idella* is still not ascertainable.

Carassius sp.

Text-fig. 22.

Two side scales; one breast scale. No difference from living *C. auratus* (L.) merely on the shape of scales.

Pelteobagrus sp.

A spinous bone of the right breast scale.

Of the present fossil as we mentioned in details at p. 45 of the preceding report, the re-narration is omitted.

Leiocassis sp.

The spinous bone of the left breast scale.

The points much different from *Pelteobagrus pulvidraco* are that the present specimen has neither knot in the entire bone surface, nor the spines at the front edge.

Land mammalian fossils of the Pleistocene epoch excavated in every district through Manchoukuo.

In Manchoukuo many mammalian fossils were excavated in various districts besides Ku-hsiang-tung, and they run briefly as follows:—

1. The source of water supply at Long-wang-tarng, Dairen.
   Cervus sp., *Rhinoceros antiquitatis*, *Elephas primigenius*. As to Mammoth we described in details at p. 109 of the previous report.
2. Sheau-pyng-dao near Dairen.
   Elephas primigenius.
3. South-western part of Chao-yang, Jehol.
   Rhinoceros antiquitatis.
4. Chao-yang-gou, north-east of Chih-feng, Jehol.
   Rhinoceros antiquitatis, *Ovis ammon*, *Elephas primigenius*.
5. Borden lake side near Tungwengniute, northern side of Jehol.
   Cervus sp.
6. Sinmin Shyuan, Mukden.
   Bos primigenius.
7. Luh-poh-dong in Shang-yi-shin, Yenchi-shyuan, Chientao-sheng.
   Elephas primigenius.

8. Tamalukou, Yeuchi-shyuan, Chien-tao-sheng.
   Cervus elaphus, *Cervus* sp., *Equus* sp., *Rhinoceros* sp., *Elephas primigenius*.
9. San-chi-tyng in Shang-yi-shing, Chien-tao-sheng.
   Elephas primigenius.
10. Syh-dong in Yenchi-shyuan, Chien-tao-sheng.
    Elephas primigenius, described at p. 108 of the previous report.
11. Liuho, Feng-tien-sheng.
    Elephas primigenius, described at p. 107 of the previous report.
12. Suiteng in the eastern part of Jehol.
    Elephas sp.
13. Ssuping-chien, Fen-tien-sheng.
    Bos primigenius, *Elephas primigenius*.
14. Kungchu-ling, Fen-tien-sheng.
    Rhinoceros antiquitatis, *Elephas primigenius*.
15. Near Hsinching.
    Cervus canadensis, *Megaceros ordosianus*, *Bos primigenius*, *Bison occidentalis*, *Rhinoceros antiquitatis*.
16. Bodōnē on the upper course of the Sungari river.
    Bubalus wansjocki.
17. Taur-lay-jau, Chiling-sheng.
    Elephas primigenius.
18. E-shyr-ho, Pin-kiang-sheng.
    Elephas primigenius.
19. Near Tanorin tunnel in Chi-dau-gou, Pin-kiang-sheng.
    Elephas primigenius.

The left M^2 (Pl. XXI, fig. 2), the left M_2 (Pl. XXI, fig. 1).

Some parts of the molars are regarded rather as morbid, but in general it is characteristic that the ridge forms, on the grinding surface, weak loxodont sinus in the median.

20. Muleng, Chilin-sheng.
    Cervus sp.
21. Near Peiho, Peiho-sheng.
    Bison priscus.
22. Ku-hsiang-tung.

Besides what we excavated, the following are those which were dug out by Loukashkin and his party;—

Canis lupus, *Hyaena ultima* subsp., *Ursus* sp., *Panthera tigris*, *Felis* sp., *Vulpes* sp., *Ochotona* sp., *Myospalax* sp., *Microtus* sp., *Cervus elaphus*, *Cervus mantchuricus*, *Alces alces fossilis*, *Gazella przewalskii*, *Camelus* cf. *knoblochi*, *Rhinoceros antiquitatis*, *Equus hemionus* subsp., *Equus przewalskii*, *Elephas primigenius*.

23. Nioula-chengtze, Pin-kiang-shen.
Elephas primigenius.

The right dm_4 (Pl. XX, fig. 4)
The present specimen is the same in shape as that we described in the preceding report.

24. From the bottom of the Sungari river near Harbin.
Elephas primigenius.

The lower jaw-bone (Pl. XX, figs. 2 and 3)
The present species is the lower jaw in an adult stage in which M_3 are planted.

25. Furarki on the Nenho, Lung-chiang-shen.
Rhinoceros antiquitatis.
26. Chichiharh, Lung-chiang-shen.
Elephas primigenius.
27. Chalainorh, Hulunpair-shen.
Cervus sp., *Megaceros* sp., *Gezella przewalskii*, *Bos primigenius*, *Bison priscus*, *Bison* sp., *Rhinoceros antiquitatis*, *Elephas primigenius*, *Elephas trogontherii.*

Of the above mentioned we have some doubt that *E. trogontherii* was imbedded surely in the same stratum as other fossil specimens; anyhow here we provisionally mention as above.

28. Tuhgan-nor, Hulunpair-shen.
Bos sp.
29. The foot (?) of Tah-hsingan-ling, Hulunpair-shen.
Poephagus grunniens.

Summary as to species of the fossils excavated at Ku-hsiang-tung

The above is the results obtained through investigations as to the fossil species of Vertebrate from what were excavated as the second expedition with the laborous help by Messrs. Ota and Makita in 1934. Here we mention all the summary of the fossils we dug out and investigated in 1933 and 1934. † in the table shows a species already extinct, inclusive of those which are announced as new fossil species; what have no mark are existing species; (+) shows a big volume of unearthing ratio; (−) little volume of unearthing ratio.

Plants

Trapa natans L. subsp. (Nut) (−)
Salix sp. (Leaf) (+)
Juglans manshurica MAXIM (Nut) (+)
† *Juglans manshurica tokunagai* ENDO (Nut) (+)
† *Juglans manshurica naorai* ENDO (Nut) (+)

Betula alba L. (Leaf) (+)
Hordeum sp. (Seed) (−)

Besides these species, a large volume of small tree-trunks and many specimens of indeterminable leaves of Graminaceae were found.

Animals

Mammalia

1. *Canis lupus* L. (+)
2. † *Canis* sp. (−)
3. † *Nyctereutes* sp. (−)
4. *Vulpes* cf. *vulpes* (L.) (−)
5. *Ursus* cf. *spelaeus* BLUM. (−)
6. † *Meles* sp. (−)
7. *Mustela* cf. *sibirica* PALLAS (−)
8. † *Hyaena ultima* MAT. subsp. (+)
9. *Panthera tigris* L. (−)
10. *Felis catus* L. (−)
11. *Clethrionomys rufocanus* (SUND.) (−)
12. *Microtus* cf. *ratticeps* (YOUNG) (−)
13. *Microtus* cf. *pelliceus* THOMAS (−)
14. *Microtus* (*Lasiopodomys*) *brandti* (RADDE) (+)
15. *Microtus obscurus* (EVERS.) (+)
16. *Microtus* cf. *mongolicus* RADDE (+)
17. *Microtus* (*Stenocranius*) *gregalis* (PALL.) (−)
18. *Cricetulus griseus* MILN-EDW. (−)
19. † *Siphneus* sp. (+)
20. *Ochotona* cf. *mantchurica* THOMAS (+)
21. *Citellus mongolicus* (A.M.-EDW.) (+)
22. † *Marmota mantchurica* TOK. et NAORA (+)
23. *Marmota robusta* (A.M.-EDW.) (+)
24. *Marmota bobac sibirica* (RADDE) (−)
25. † *Tamias* sp.? (−)
26. † *Castor orientalis* TOK. et NAORA (−)
27. *Sus continentalis* NEHR. (−)
28. † *Sus* cf. *lydekkeri* ZD. (−)
29. *Cervus xanthopygus* A.M.-EDW. (−)
30. *Cervus elaphus* L. (+)
31. *Cervus harbinensis* TOK. et NAORA (+)
32. *Cervus* cf. *hortulorum* SWIN. (−)
33. *Cervus grayi* (ZD.) subsp. (+)
34. *Cervus mantchuricus* SWIM. (−)
35. † *Cervus* sp.? (−)
36. *Capreolus mantchuricus* (NOACK.) (+)
37. † *Capreolus* sp. (−)
38. † *Alces alces fossilis* (MEY.) (−)
39. *Alces* cf. *alces bedfordiae* LYD. (−)
40. † *Megaceros pachyosteus* YOUNG (−)
41. † *Megaceros* cf. *ordosianus* (YOUNG) (+)
42. † *Megaceros* sp. (−)
43. *Elaphurus* cf. *menziesianus* (SOW.) (−)
44. Giraffidae gen. et sp. ind. (−)
45. *Bos* cf. *taurus* L. (+)
46. † *Bos primigenius* BOJ. (+)
47. † *Bos primigenius* BOJ. subsp. (+)
48. † *Bison priscus* BOJ. (+)
49. † *Bubalus* cf. *wansjocki* BOULE et TEIL. (+)
50. † *Bibos kuhsiangtungensis* TOK. et NAORA (+)
51. † *Ovis* sp. (−)
52. *Gazella przewalskii* BUCH. (+)
53. *Equus przewalskii* POL. (+)
54. *Equus* cf. *caballus* L. (−)
55. † *Equus hemionus* PALLAS subsp. (+)
56. † *Asinus* sp. (+)
57. † *Rhinoceros antiquitatis* BLUM. (+)
58. † *Rhinoceros* sp.
59. † *Elephas primigenius* (BLUM.) (+)

Aves

Phasianus sp. (−)
† *Struthio* sp.? (−)

Reptilia

Amyda maackii (BRANDT) (–)

Pisces

1. *Ctenopharyngodon* cf. *idella* (VAL.) (–)
2. *Ctenopharyngodon* sp. (–)
3. *Carassius* sp. (–)
4. *Pelteobagrus* sp. (+)
5. *Leiocassis* sp. (+)

Insecta

Coleoptera indet. (–)

Mollusca

1. *Unio douglosiae amurensis* MOUS.
2. *Cristaria plicata* (LEA.)
3. *Sphaerium lacustre compresum* MOUS.
4. † *Valvata piscinalis manchurica* SUZUKI.
5. † *Stenothyra tokunagai* SUZUKI.
6. *Bulimus kiusiuensis naorai* SUZUKI.
7. *Bulimus striatulus* (BENSON).
8. *Smisulcospira cancelata amurensis* (GERS.)
9. *Carychium pessimum gerstfeldti* SCHL.
10. *Lymnaea palustris terebra* WEST.
11. *Lymnaea pervia* MART.
12. *Lymnaea truncatula* (MÜL.)
13. *Lymnaea auricularia* (L.)
14. *Lymnaea plicatula* BEN.
15. *Aplexa hypnorum* (LINNÉ) subsp.
16. *Anisus gredderi* (BIEL.)
17. † *Hippeutis manchuricus harbinensis* SUZ.
18. *Succinea pfeifferi pingi* SUZUKI.
19. *Succinea alpestris* MOL.
20. *Cochlicopa lubrica* (MÜLL.)
21. *Vertigo alpestris* ALDER.
22. *Vertigo alpestris harbinensis* SUZUKI.
23. *Gastrocopta coreana* PILS.
24. † *Vallonia chinensis* SUZUKI.
25. *Gonyodiscus ruderata paupez* (GOULD.)
26. *Euconulus* sp.
27. *Bradybaena satoi* SUZUKI.
28. *Bradybaena virgo* (PILS.)

Phase viewed from plant fossils

The plant fossils at Ku-hsiang-tung are found many in number, for example, *Betula juglans* as species. Almost all specimens belong to small trunks, and in some localities they are considerably accumulated. By the ill-preservation their scientific names, except a few, cannot be detected. It is assumed that almost all plants belong to the flora of lower temperature, and we can learn that the botanical phase resembles that of the Great Hingan in the present time. At present *Trapa* is not found near Harbin. In general the group of Ku-hsiang-tung fossils have the phase of steppe devoid of big trunks, and have no feature to be seen in the groups of animal fossils, where the frigid and temperate fauna are mingled.

Now for reference, we should show the groups of fossil plants of Palaeolithic age in the Far East.

Locality No. 1 Choukoutien	Ku-hsiang-tung	Afontova (Lower stratum)	Kokorevo (II)
Celtis barbouri	*Salix* sp., *Betula alba*, *Juglans manshurica*, *Juglans manshurica tokunagai*, *Juglans manshurica naorai*, *Trapa natans* subsp., *Hordeum* sp.	*Larix* sp., *Salix* sp.	*Larix* sp., *Salix* sp., *Betula* sp.

Voennyo Gorodok	Afontova (Upper stratum)	Branch of Lena river	Choukoutien (Upper cave)
Larix sp., *Salix* sp., *Betula* sp.	*Larix* sp., *Salix* sp.	*Juglans cinera*	*Celtis karalhensis*

Phase viewed from animal fossils

(1) Mammalia.

(A) The ratio of extinct species versus living species.

The number of all mammalian species are as follows:—

Carnivora	11 species	(5 families	9 genera)
Rodentia	16 species	(5 families	8 genera)
Artiodactyla	27 species	(3 families	13 genera)
Perissodactyla	6 species	(2 families	3 genera)
Proboscidea	1 species	(1 family	1 genus)
	61 species in total number		

As to the Mammalia excavated at Ku-hsiang-tung, already mentioned above, seeking the ratio of extinct species versus living species, we can show as follows:—

Species	Number of extinct species	Percentage to all species 61	Number of living species	Percentage to all species 61
Carnivora	5	8%+	6	9%+
Rodentia	4	6%+	12	19%+
Artiodactyla	18	29%+	9	14%+
Perissodactyla	4	6%+	2	3%+
Proboscidea	1	1%+	0	
	32 in total number		29 in total number	

The percentage of 32 extinct species and 29 living species to all of the 61 mammalian species:

Percentage of extinct species	52%+
Percentage of living species	47%+

(B) The ratio in the living condition.

Analysing the preceding species from the living condition, the species can be classified into three; that is, chiefly living in forest, grass-field and wetland.

Chiefly living in forest 26 species
- Carnivora 11 species
- Rodentia 1 ,,
- Artiodactyla 12 ,,
- Perissodactyla 2 ,,

ratio 42%+

in grass-field 30 species
- Rodentia 14 species
- Artiodactyla 11 ,,
- Perissodactyla 4 ,,
- Prosboscidea 1 ,,

ratio 49%+

in wetland 5 species
- Rodentia 1 species
- Artiodactyla 4 ,,

ratio 8%+

(C) The ratio in distribution.

Biogeographically the species can be classified as follows:—

Living species

Number of the species existing in Manchoukuo 20 species
- Carnivora 5 species
- Rodentia 9 ,,
- Artiodactyla 6 ,,

ratio 32%+

Number of the species existing not in Manchoukuo 8 species
- Carnivora 1 species
- Redentia 2 ,,
- Artiodactyla 3 ,,
- Perissodactyla 2 ,,

ratio 13%+

Extinct species

Number of the species already known in Far East 5 species
- Artiodactyla 4 species
- Perissodactyla 1 ,,

ratio 8%+

Number of the species already known in the localities except Manchoukuo 7 species
- Artiodactyla 5 species
- Perissodactyla 1 ,,
- Proboscidea 1 ,,

ratio 11%+

Number of the species found only in Manchoukuo 21 species
- Carnivora 5 species
- Rodentia 5 ,,
- Artiodactyla 9 ,,
- Perissodactyla 2 ,,

ratio 34%+

(D) The ratio in the geological chronology.

The species found in older Pleistocene 8 species
- Carnivora 4 species
- Rodentia 1 ,,
- Artiodactyly 2 ,,
- Perissodactyla 1 ,,

ratio 13%+

The species found in the middle and younger Pleistocene 53 species
- Carnivora 8 species
- Rodentia 15 ,,
- Artiodactyla 24 ,,
- Perissodactyla 5 ,,
- Proboscidea 1 ,,

ratio 86%+

(2) Aves.

What we excavated as Aves fossils in the second excavation is only *Phasianus* sp., but besides these species the bones whose genus and species have not yet been determined were dug out also in the first excavation. According to A.S. Loukashkin, an ornithologist, something like a thigh bone of a large raven is said to have been excavated. Further, in his excavation in 1931, he discovered a fossil egg-shell of *Struthio*. To-day, *Struthio* is found only in the barren field or in the desert of north Africa, Arabia and south Palestine. Therefore, of much interest is that these species are found in north Manchuria in the point of biogeography. The distribution of *Struthio* in the Pleistocene period appears to cover a larger scope, though the last limit of the geological age seems to have been in younger Pleistocene. Here, as reference, we mention the fossil Aves found in the remains of Palaeolithic age:—

Upper cave of Choukoutien	Ordos (Sjara-osso-gol) (The culture in loess period)	Ku-hsiang-tung (The culture in loess period)	Nomokhonovo (Magdalenian)
Struthio sp.	*Struthio* sp., *Buteo* cf. *ferox*, *Vultur monuchus*, *Passereaux* sp., *Perdix* cf. *perdix*, *Coturnix* sp., *Syrrhaptes paradoxus*, *Echassier* sp., *Podiceps auritus*, *Anas boschas*, *Tadorna tadorna*.	*Struthio* sp.	*Lagopus lagopus*

Peresselen Punkt (Magdalenian)	Malta (lower stratum) (Aurignacian-Solutrean)	Afontova (II) (Solutrean-Magdalenian)	Afontova (III) (Solutrean-Magdalenian)
Lagopus lagopus	*Metlanonyx fabalis*, *Larus* sp.	*Melanonyx fabalis*, *Falco rusticolus*, *Corvus corax*, *Colocus mendula*.	*Lagopus lagopus*, *Lagopus mutus*.

(3) Reptilia.

As Reptilia only *Amyda* was discovered; the specimen is quite a fragmentary piece, so no satisfactory determination could be obtained, but it may likely be identical with *Amyda maackii* living in the Sungari. Ku-hsiang-tung and the third locality of Choukoutien are the only regions where Chelonia fossils have hitherto been unearthed.

(4) Pisces.

In Eventognathi as Cyprinidae, and in Nematognathi as Bagridae fossils are found in Ku-hsing-tung, each of which is supposed to bear relation with those living at the Sungari, but is quite small in size as compared with the living species. The fish teeth we treat as *Ctenopharyngoden* cf. *idella* requires, we suppose, further investigation. Very few in number besides the present locality are the Pisces unearthed in the Pleistocene strata of the East Asia, at the third locality of Choukoutien, where only the teeth of *Ctenopharyngodon idella* were discovered.

(5) Insecta.

The species unearthed at Ku-hsiang-tung are quite imperfect and very few.

(6) Mollusca.

According to Mr. K. Suzuki treating molluscan fossils of Ku-hsiang-tung, from among the twenty-seven species, those which have not yet been known as living are:— *Valvata piscinalis manchurica*, *Stenothyra tokunagai*, *Hippeutis manchuricus*, *Gastrocopta coreana harbinensis* and *Vallonia chinensis*. Among whole species only a few belong to land shells, and all others to fresh water shells that lived in a quite calm current.

Climatic phase

(1) The climatic phase indicated by flora.

Excepting one species of *Juglans* dug out at Ku-hsiang-tung, the rest in general are the living species, and many of them are of frigid type; of which *Betula* and *Salix* are supposed to have grown thick during the latter period of Palaeolithic age in Siberia. Judging from the fact that *Juglans cinerea* together with the fossils of *Elephas primigenius* are discovered in large number in the clay bed under loam-like stratum of Yakutsk district, the distribution of *Juglans* in the latter period of Pleistocene must have covered a considerably large field. Further judging from the above-mentioned fact, Ku-hsiang-tung and its vicinity must be humid state, and may be in such a climatic condition as that which prevails now the inner land of north Manchuria and a part of Siberia.

(2) The climatic phase indicated by fauna.

According to Dr. Tokuda almost all the Myoidea specimens unearthed at Ku-hsiang-tung are the living species numbering 7; a closer study suggests that these now live in the northern part of Asia (Great Hingan range, north Mongolia and northern Siberia), and then the climate then at Ku-hsiang-tung is assumed by him to have been somewhat colder than present. However, according to the investigation as to 52 species of animals we dug out except Myoidea, the following is given for reference:—

The living species	21 species	Those which lived in the similar climate to that of today	16 species	ratio	30%+
		in the frigid region	4 ,,	,,	7%+
		in the temperate region	1 ,,	,,	1%+
The extinct species	31 species	Those which are supposed to have lived in the similar climate to that of today	15 ,,	,,	28%+
		in the colder climate to that of today	10 ,,	,,	19%+
		in the warmer climate to that of today	6 ,,	,,	11%+

As indicated above, 21 species are among the living species. Absolutely the largest is the number that indicates the climatic phase of the present north Manchuria, which

covers 30% of all the species. 15 species of extinct animals are supposed to have been in the same condition as in the present climate, and in ratio they show 28% of all species. In a general observation, the species indicative of the present climate of Ku-hsiang-tung show as high as 58%. Those which suggest cold weather show 28%, and the species both of warmer climate 14%. Judging, therefore, from the above ratio figures, the climatic condition in that ancient age in Ku-hsiang-tung and its neighbourhood had something common with the present climate of north Manchuria; yet here we have to take into consideration the species moving from the northern district towards the southern by the climatic change, and at the same time we have to accept the warmer living animals shifting to the northern part. Then, inductively mentioning from the above fact, even the present district admitting of no existence of a glacier, we cannot accept that the climate in general is almost unchangeable; on the contrary in some period it may be much colder and in another warmer than the present condition. Such a climatic phase is not only limited to the present area, but the distribution and species of fossil Mammalia in all Manchuria are important data to investigate these points.

As to Aves, rarely found, no accurate information can be obtained like Mammalia; no species unearthed in the Palaeolithic bed of Siberia, nor in the Ordos district of south-western Mongolia has been discovered. As to Pisces and Reptila we cannot find any species living in the climatic region different from the present north Manchuria. As to Insecta no obvious investigation has been made.

As to ages

With regard to the Ku-hsiang-tung beds with fossils imbedded we have already announced in Japanese in this Volume, Section II Part VI and Section VI Part II. During the first and second excavation works the following two items made us ceaselessly careful:—

(1) An investigation into whether there is any sign of disturbance or stirring-up caused either by human or the present stream agency at a period after the fossil-embedded beds were formed.

(2) As to the formation of the excavated fossil-bed is there any doubt that it was formed by drift, owing to the crumbling and flowing down of the pre-existing one or more strata?

So long as the above conditions are not assured, we cannot work out the questions as to the mixture of the fossils of different ages, or with regard to the mixture of the human artifacts in later ages; namely prior to presenting conclusion on the ages due to fossils and human artifacts, all important is it to consider precisely the geologic condition. The fossil-embedded strata we dug out and closely investigated during the first and second expedition leave no sign of being disturbed later.

Synthesizing what we excavated, we could not prove that the fossil-embedded bed was a pile-up attributed to the result of the crumbling and flow-down of another fossil stratum. An excavation we made at only a single fossil bed, though executed at wide area, has rewarded us more than ten hundred specimens of fossil Mammalia. Then if we

provisionally consider the drift as to (2), we must suppose that in the vicinity there we could find some strata including a large number of specimens. Though the neighbourhood is a low land, we rummaged the locality as best as we could, but no confirmation like the above idea could be obtained.

However, as was mentioned in the report (Section VI Part II p. 6, written in Japanese) we explained a fact that a fossil-embedded bed was exposed at a cliff up the river Huponyao, the tributary of Wenchuanho. Though we could not clearly determine that this stratum is the same continuation of that of the river Wenchuan, which yields the mammalian fossils we described, we regard them as coeval each other geologically. The species of the fossil Mammalia from this stratum of the cliff show no particular difference from those of the spots we excavated, and what is of much interest is that we found stone artifacts together with bone artifacts as the case of Wenchuanho. That land Mammalia came to be embedded in a stratum, excepting a rare case, is indisputably due to their piled-up in general by the agency of a river flow. In all the vicinity near Ku-hsiang-tung these is found no loess, but clay or fine sand; and the large number of the shells found together with fossil Mammalia is that of fresh water that lived in a calm stream. Thus, it is obvious even as a matter of common sense that by the agency of a slow running water dead beasts that were near by came to be embedded in a stratum.

The tenor we suggested in the report is that together with human artifacts many specimens of Mammalia were dug out at the very same stratum, and we should mean that the artifacts were probably brought from not so distant spot at the same time. Summarizing our study, we can affirm that the living age of Mammalia and the mankind who left artifact is identical, and the stratum excavated is coeval geologically with Mammalia imbedded.

As we mentioned in the first report, the fossil group from Ku-hsiang-tung suggests middle Pleistocene. Here, we further mention a little with regard to this problem. There can be no gainsaying that the data necessary for determining the age of fossils dug out at Ku-hsiang-tung must principally be dependent upon the fossil Mammalia. Accordingly adding the two species preserved at the Harbin Museum to the fossils we dug out, and figuring up the living and extinct species, the living species show 47%+ and the extinct ones 52%+; thus the ratio being almost equal. Now, observing this phenomenon in the case of the 90 species from the Choukoutien No. 1 locality which will be a base of the studies of the fossil fauna of the East Asian Pleistocene, the ratio is that 22 living species show 24%+ and 68 extinct species 75%+; that is to say, the ratio of the species extinct is three times as many as that of the living species. Further, the comparison of living and extinct mammals of Ordos regarded by us as almost coeval with those of Ku-hsiang-tung shows that the living species are 18, namely 56%+, the extinct species 14 or 43%+; thus the living species are a little higher in ratio. Furthermore, as compared with the Mammalia from the lower stratum of Afontova, (the total number is 21, ratio: the living species 15 or 71%+, the extinct species 6 or 28%+) regarded as Solutrean or Magdalenian, the fossil fauna from Ku-hsiang-tung show

a little higher ratio in the extinct species. Difference is 23%, comparing the ratio of our fossils with the ratio 75%+ of the extinct species of Choukoutien No. 1 locality considered as older Pleistocene.

While, if the age of the lower stratum of Afontova be Solutrean or Magdalenian not only in the living and extinct ratio of Mammalia, but in the consideration of the human artifacts dug out simultaneously, it will naturally follow that the age of Ku-hsiang-tung bed is older by the higher ratio of the extinct species, and will be almost coeval with that of Ordos, which is considered as middle Pleistocene.

Conclusion

(1) Ku-hsiang-tung is a village situated near the north-western edge of Harbin, and along the western part of the village runs a tributary (which is called the Wen-chuan-ho) of the Sungari; the depressed ground formed by the river erosion is called Ho-chia-kou, where we dug out the fossils.

Being 2 – 3 m in breadth, the Wen-chuan-ho is small river, at the upper parts of the stream chiefly we were engaged in excavation, and the locality where we laboured in digging-out is denoted in the black and shaded figures at page 4, Sec. VI, Part II, in the previous report. We suppose there lay once clay of recent formation in the upper part of the sunken ground we dug. To-day, however, owing both to river erosion that took place afterwards and to the shoveling-away of the clay for brick material, the Pleistocene strata lie right beneath (only 0.5 – 1 m) the recent black clay. These strata consist of a clay-bed with fresh-water shells, concordant right beneath with a sandy clay-bed and are 1 – 3 m deep. In digging fossils at these two strata we carefully examined the positions which had suffered neither natural nor artificial agitation. It is from these two strata that the fossils and the human artifacts we treat in the present and previous reports were picked up, and the excavation of quite the same species from both strata proves that, the diggings from the one stratum is quite coeval with those from the other.

(2) The fossils dug out at Ku-hsiang-tung in 1933 – 1934 run as follows: the plants and animals; in plants there are 7 species as well as a lot of grasses and trees; in animals there are Vertebrata (Mammalia, Aves, Reptilia, Pisces) and Invertebrata (Mollusca and Insecta). The species inclusive of subspecies are: Mammalia 50, Aves more than 2, Reptilia 1, Pisces 4, Mollusca 29, and Insecta a few.

(3) The above-mentioned animals were all embedded either in the grey-coloured clay bed or sand layer, both beneath the recent clay bed. There is no any sign of disturbance nor stirring-up caused either by human or the present stream agency at a period after the fossil-embedded bed was formed. The age of the fossil bed should be regarded geologically as coeval with the age in which Mammalia lived.

(4) In the number of species of all dug out, Mammalia are the most, followed by Mollusca; all the Mammalia are land living, Ungulata are quite many, next Rodentia, Carnivora few. All excavated 61 species are Mammalia, of which 11 species are Carnivora or 18%, 33 are Ungulata, namely 54%+, 16 are Rodentia, namely 26%,

1 species is Proboscidea, that is to say, 1%.

(5) In individual number quite many are Cervidae, Bovidae and Equidae, while Carnivora quite few; especially that Bovidae and Equidae are equally so many in number is characteristic to the fossil fauna of Ku-hsiang-tung. And in Siberia during the whole Quaternary period the remains of *Rangifer* were unearthed in a large volume. While in north Manchuria *Rangifer* now still live, in Ku-hsiang-tung as well as in the Manchurian fossil fauna nothing of the species is discoverable. Judging from this fact we should think that quite recent is that the species of *Rangifer* have been distributed in Manchuria.

(6) In Mammalia the extinct species are 52%+ and the living species 47%+; that is to say, the former are; Carnivora 8%+, Rodentia 6%+, Artiodactyla 29%+, Perissodactyla 6%+, Proboscidea 1%+: the latter: Carnivora 9%+, Rodentia 19%+, Artiodactyla 14%+, and Perissodactyla 3%+.

(7) Observing the living condition, in Mammalia the forest living ones show 42%+, steppe ones 49%+, water-side ones 8%+. That the steppe-living animals are so many is suggestive of rich grass vegetation. Judging from these ideas, it can be assumed that the whole neighbourhood of Ku-hsiang-tung presented grassy prospect; that several animals, which preferred to living only in a wetland or water-side are included, clearly suggests the development of rivers, tarns, or meres; even judging from Amyda, Pisces, freshwater shells, this problems can favourably be solved. As water-side living Mammalia beavers and buffalos are noteworthy, namely, the former is of the colder type and the latter the warmer type. Judging from the present beavers resembling the fossil species that live only in the rivers, meres or pools of central Europe, we can see the unusual difference of distribution, and it is noteworthy that the buffalo species are distributed now far in South Australia and Africa.

(8) Of the 45%+ living species, those which now live in Manchuria shows 32%+, those which live outside of Manchuria 13%+; as to the extinct species, those which are found only in Manchuria show as high as 34%+.

(9) Among the whole fossil fauna, 13%+ is already known from lower Pleistocene in the East Asia, among which the majority was extinguished since the formation of middle Pleistocene, but few are still existing. The remaining species showing 86%+ appeared from middle Pleistocene, most of which are now existing but a few were extinguished in the latest Pleistocene.

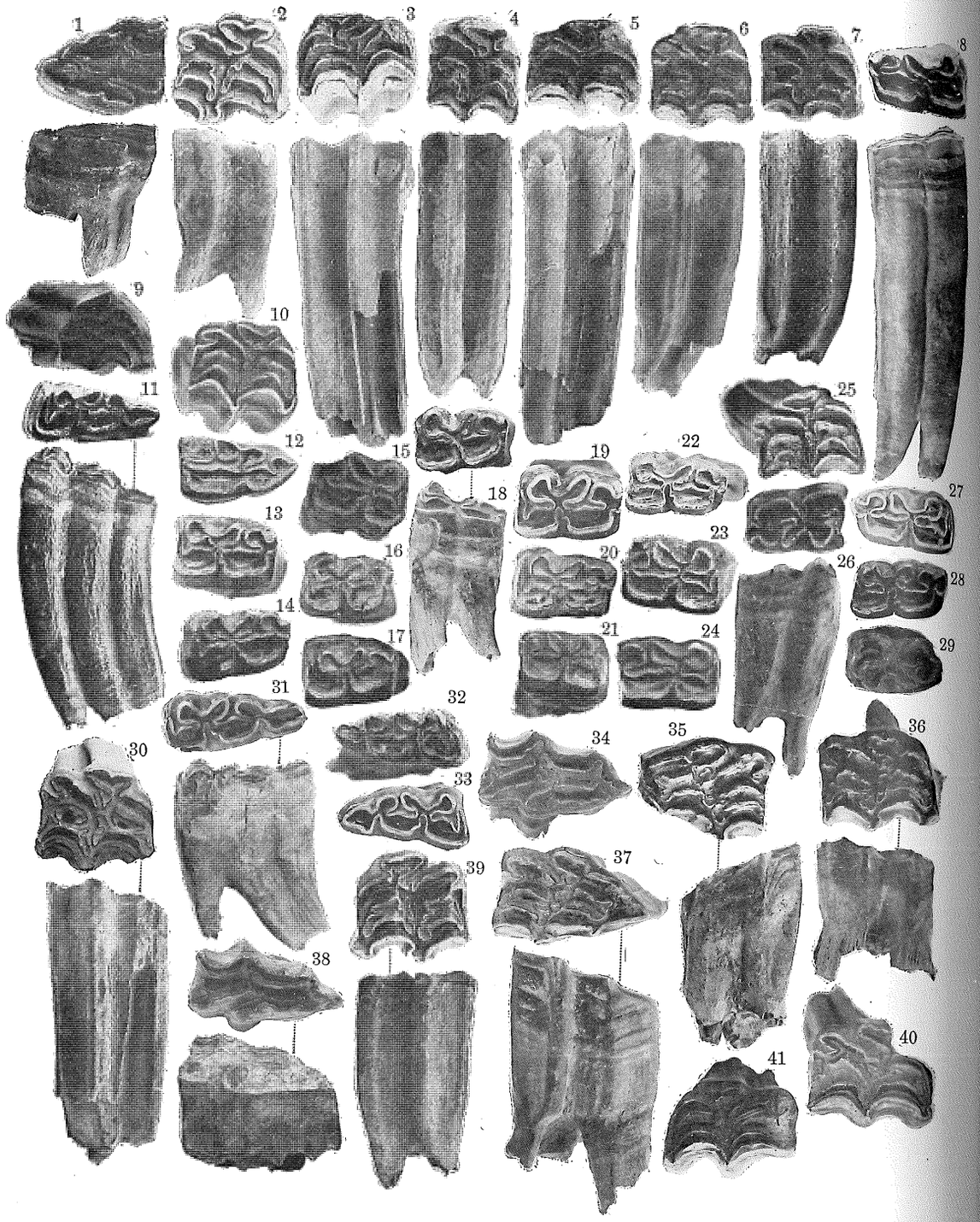
(10) Though the climatic condition in that period can not be made clear, it is important that the condition can be supposed by the fossils excavated. Only for the flora, it seems that some plants of colder climate grew luxuriantly at the present locality; thus we remind the climate of the ancient time, similar to the present climate of more northern part of Manchuria. As to Mammalia absolutely predominant the fossils indicating the present north Manchurian climate, yet at the same time, the species extinct and now living, distributed in more frigid districts, occupy about 26% of the whole, and those in temperate districts exist but a few, 12%. Judging from these phenomena, the animals mentioned above appear to have lived in the climate like that

of today, or in slightly colder climate, but judging from the existence of Ostrich (*Struthio*) and the Mammalia of the temperate region, it may be inferred that some warmer climatic changes occurred temporarily in northern Manchuria.

(11) Observing the point of several views mentioned above the geological age of the Ku-hsiang-tung fossils will be recognized as middle Pleistocene (Mousterian or Aurignacian). The extinct species of the fossils show slightly higher in ratio of the extinct species to the existing species. Comparing the said result of the ratio of the No. 1 locality at Choukoutien on one hand, with that of the lower stratum of Afontova on the other, it proves to be a mediate ratio, and the ratio resembles that of the Ordos mammalian groups hitherto regarded as middle Pleistocene.

April 1937.

REPORT OF THE FIRST SCIENTIFIC EXPEDITION TO MANCHOUKUO
SECTION II, PART IV. MARCH, 1939.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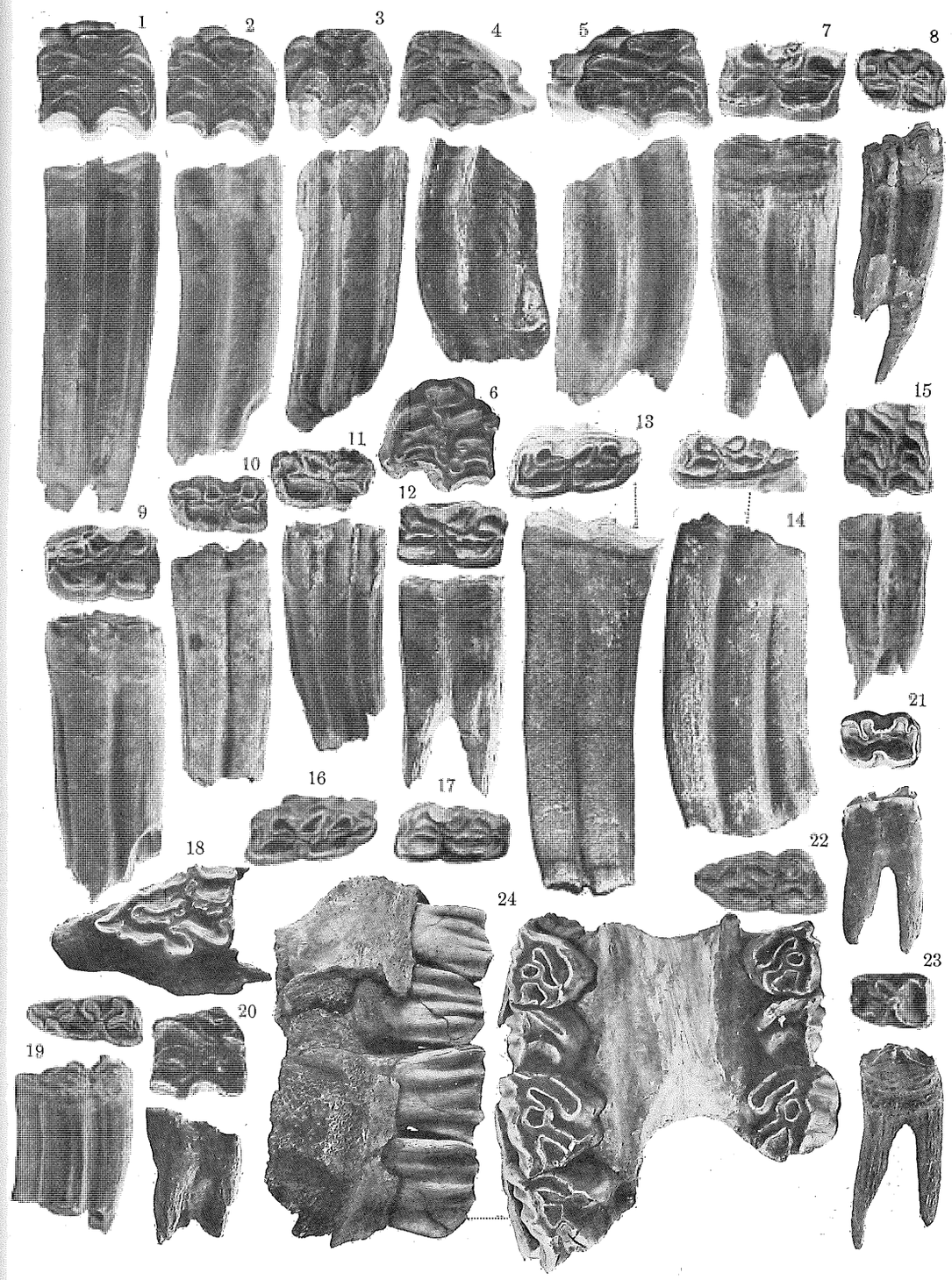
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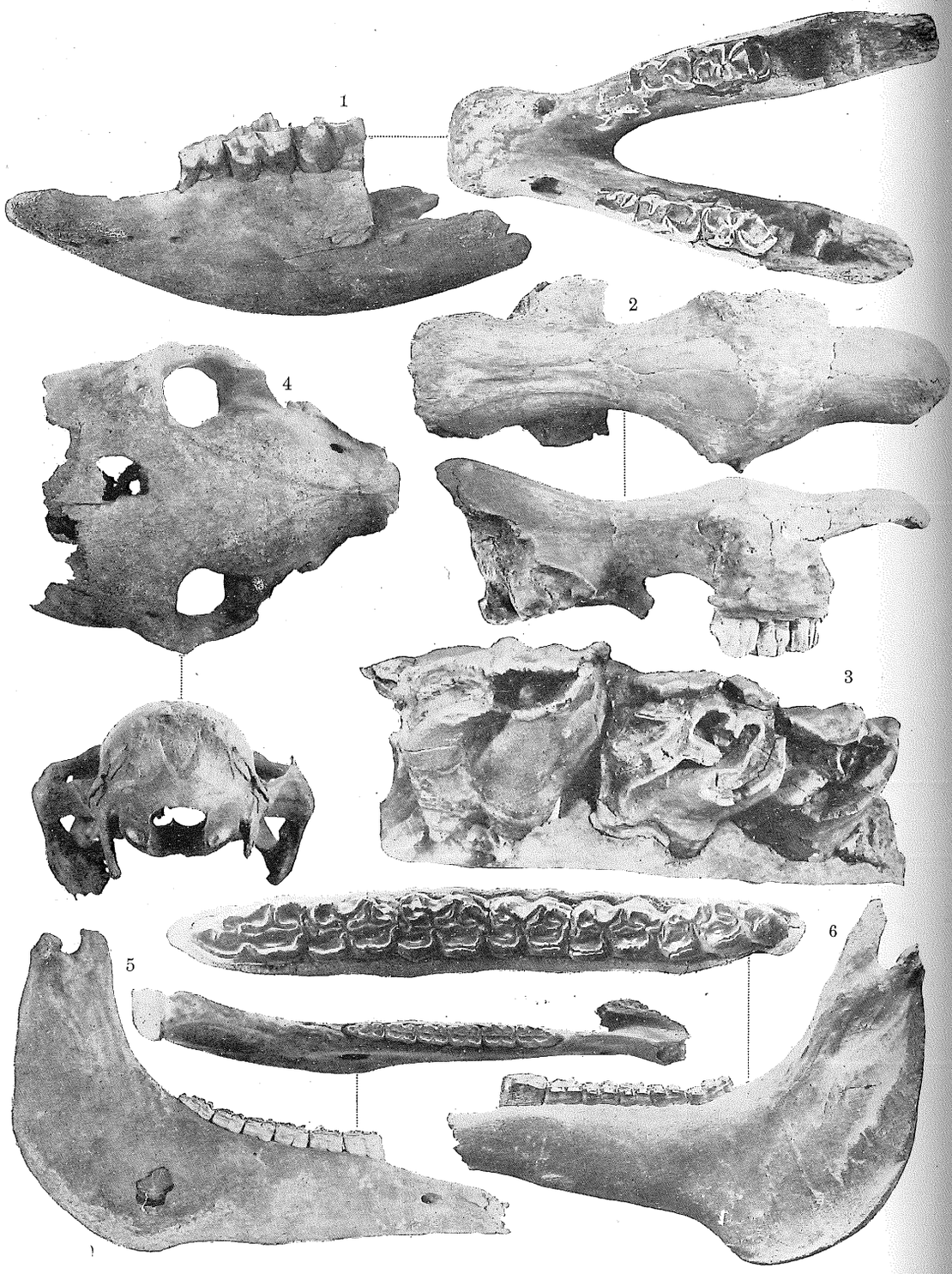
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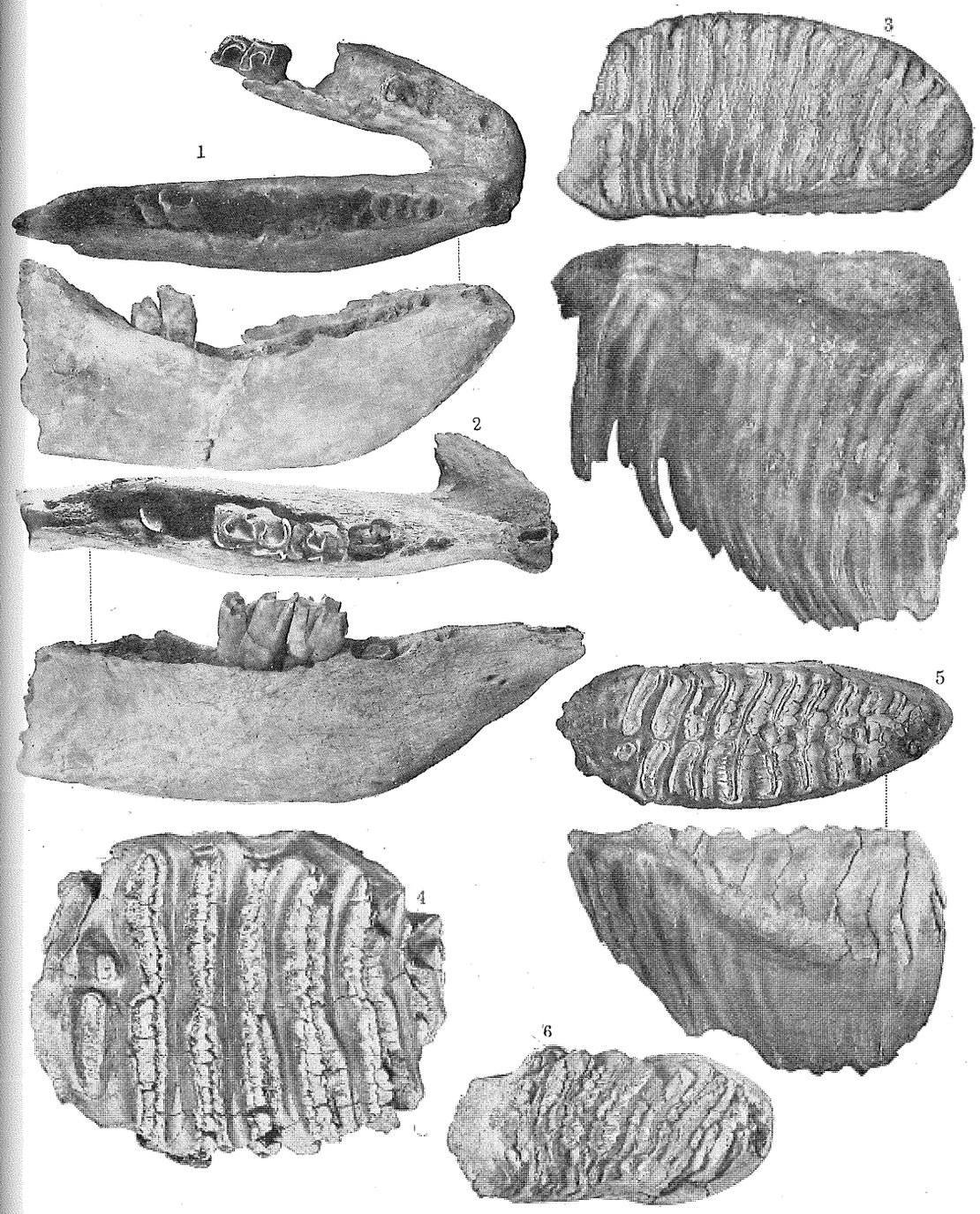
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東部亞細亞ニ於ケル最新世陸棲哺乳動物群

1. 滿　　洲

磚郷屯何家溝	新京附近	札賚諾爾	間島地方	赤峰朝陽溝
Clethrionomys rufocanus				
Microtus cf. *ratticeps*				
Microtus cf. *pelliceus*				
Microtus (*Lasiopodomys*) *brandti*				
Microtus obscurus				
Microtus cf. *mongolicus*				
Microtus (*Stenocranius*) *gregalis*				
Cricetulus griseus				
Shiphneus sp.				
Ochotona cf. *mantchurica*				
Citellus mongolicus				
Marmota mantchurica				
Marmota robusta				
Marmota bobac sibirica				
Tamias sp?				
Castor orientalis				
Canis lupus				
Canis sp.				
Nyctereutes sp.				
Vulpes cf. *vulpes*				
Ursus cf. *spelaeus*				
Meles sp.				
Mustela cf. *sibirica*				
Hyaena ultima subsp.				
Panthera tigris				
Felis sp.				
Felis catus				
Sus continentalis				
Sus cf. *lydekkeri*				
Cervus xanthopygus				
Cervus elaphus	*Cervus canadensis*	*Cervus* sp.	*Cervus elaphus*	
Cervus harbinensis			*Cervus* sp.	
Cervus cf. *hortulorum*				
Cervus grayi subsp.				
Cervus mantchuricus				
Cervus sp?				
Capreolus mantchuricus				
Capreolus sp.				
Alces alces fossilis				
Alces cf. *alces bedfordiae*				
Megaceros pachyosteus		*Megaceros* sp.		
Megaceros cf. *ordosianus*	*Megaceros ordosianus*			
Megaceros sp.				
Elaphurus cf. *menziesianus*				
Giraffidae gen. et sp. indet.				
Bos cf. *taurus*				
Bos primigenius	*Bos primigenius*	*Bos primigenius*		
Bos primigenius subsp.				
Bison priscus	*Bison occidentalis*	*Bison priscus*		
Bubalus cf. *wansjocki*		*Bison* sp.		
Bibos kuhsiangtungensis				
Ovis sp.				*Ovis ammon*
Gazella przewalskii		*Gazella przewalskii*		
Equus przewalskii				
Equus cf. *caballus*				
Equus hemionus subsp.			*Equus* sp.	
Asinus sp.				
Camelus cf. *knoblochi*				
Rhinoceros antiquitatis	*Rhinoceros antiquitatis*	*Rhinoceros antiquitatis*	*Rhinoceros* sp.	*Rhinoceros antiquitatis*
Rhinoceros sp.				
Elephas primigenius		*Elephas primigenius*	*Elephas primigenius*	*Elephas primigenius*