

NEW FINDS OF FOSSIL BUBALUS IN CHINA*

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In the past few years several new data concerning the history of *Bubalus* in China have been collected by members of the Cenozoic Research Laboratory of the Geological Survey of China. Remains of more or less well-preserved specimens were unearthed from the following places:—

- A posterior part of a skull with two complete horn cores from Mienchihsien, W. Honan.
- A nearly complete skull from Changlo, Shantung.
- A skull fragment with base of the horn cores from Kôho, Yungti, S.W. Shansi.
- A left complete horn core from Yenchingkou, Wanhsien, Szechuan.

Although the Shantung and Shansi specimens are not in our collection, yet we were able to make some valuable observations on all these finds. In the present paper we shall describe the Honan skull first, and then add a few observations of the other specimens. A complete review of the so far known *Bubalus* in China is also made based upon our present knowledge of this interesting group.

1. DESCRIPTION OF THE BUBALUS FROM HONAN

Genus *Bubalus* Rütimeyer

Bubalus brevicornis Young (sp. nov.)

Material The posterior portion of a skull broken at the level of the orbits. The preserved part is in good condition, especially the two horn cores. The bone is strongly fossilized and of a white yellowish coloration. The matrix was a rather dark red clay. The specimen was collected by technician Tang Liang from the vicinity of a village named "Miaoshang" some 15 li N.E. of Mienchihsien, W. Honan.

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DESCRIPTION

Horn cores. The most characteristic part of the specimen is found in the horn cores. In comparison with the heavy big skull they look surprisingly short and yet massively built. They are sharply trihedral.

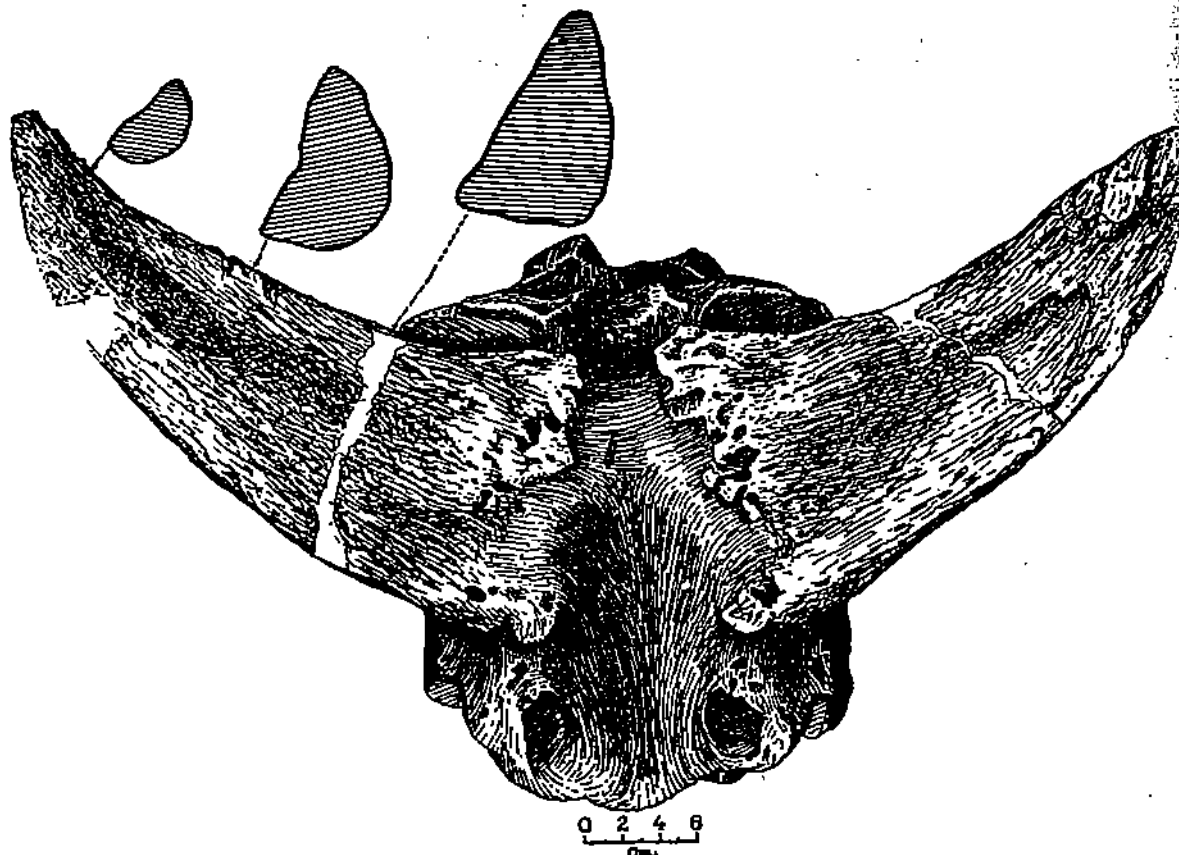


Fig. 1. *Bubalus brevicornis* Young (sp. nov.). Skull in frontal aspect. $\frac{1}{4}$ nat. size.

The superior face (the broadest of the three) is flat with a small depressed area near the tip.¹ The anterior face is the narrowest and at the same time flat. The slightly convex inferior face approaches almost the

¹ This depression can be faintly noticed in the type skull of *B. mephistopheles*: (cf. Teilhard and Young, 1936. Pl. VIII, fig. 2).

breadth of the superior one, so that the cross-section of the horn-core is almost an isosceles. The convexity of the inferior face increases gradually near the tip and consequently the trihedral shape of the horn-core is lost there. The horn cores are directed moderately backwards and gently curved inward. In top view both horn cores form a regular nice crescent. In side view their tip is directed slightly upwards.

Dimensions	Honan	Szechuan	<i>B. mephis-</i>	<i>B. teil-</i>	<i>B. wansjocki</i> *	
	spec.	spec.	<i>topheles</i>	<i>hardi</i>	(Type)	sp. b.
Breadth of the anterior face of the horn core at the base.....	79 mm	71 mm	74 mm	85 mm	95 mm	
Breadth of the superior face...	162 mm	125 mm	108 mm	105 mm	205 mm	185 mm
Breadth of the inferior face...	142 mm	112 mm	103 mm	130 mm	220 mm	
Perimeter at the base	405 mm	326 mm	300 mm	340 mm	535 mm	
Length of the core along the convex border...	412 mm (right)	330 mm	282 mm	550 mm	595 mm	548 mm
Length along the concave border...	350 mm	250 mm	225 mm	470 mm	480 mm	
Index of the horn cores: supra breadth of the upper face at the base $\times 100$, divided by length along the convex border...	.395	.378	.383	.190	.345	
Distance from tip to tip.....	665 mm	—	430 mm	784 mm	—	

* Dimensions kindly revised by P. Trassaert.

Skull. In contrast to the rather short horn cores, the skull is very large and massive. Projection of the occipital part behind the horn cores well marked. Frontal area between the horn cores slightly convex but weakly depressed in the part of the supraorbital foramina which are large and bear strong over-hanging bony tubercles. Postorbital constriction moderate. Supraoccipital area broad, gently sloping above the supraoccipital crista which is very strong. Temporal fossæ narrow and strongly constricted.

Dimensions:	B. b.	B. m.	B. t.
Maximum breadth between the orbits.	230 mm	225 mm	210 mm
Breadth at the postorbital constriction.	160 mm	155 mm	180 mm
Minimum distance between the posterior end of the temporal fossæ.....	88 mm	79 mm	85 mm
Maximum breadth of the occipital wall	250 mm	248 mm	200 mm
Distance (along the skull) between the posterior line of the horn cores and the occipital crista.....	70 mm	78 mm	93 mm
Distance (normal) between the same...	47 mm	70 mm	60 mm
Distance between the roots of the horn cores at the anterior edge.....	93 mm	145 mm	100 mm
Distance at the posterior edge.....	42 mm	93 mm	—
Minimum distance between the orbits and the base of the horn cores.....	55 mm	58 mm	49 mm
Distance between the supraorbital foramina	77 mm	85 mm	95 mm

Horizon. Basal (?) Red concretionary clays of N. Honan. Lower Pleistocene.

Determination and Comparison. By many of the above described characters and more particularly by the shortness of the massive, trihedral horn cores, the Honan *Bubalus* is so similar to *Bubalus mephistopheles* from the Anvang archaeological site (Hopwood, 1925; Teilhard and Young,

1936) that our first idea was to regard the two forms as identical. But a closer examination detects several important differences: 1) In the Mienchih specimen the horn cores are directed more sideways, so that the crescent form is more expanded than in the Anyang species: 2) The horn cores are much bigger, their dimensions being closer to *B. teilhardi* than to *B. mephistopheles*. 3) The occipital part of the Anyang skull is

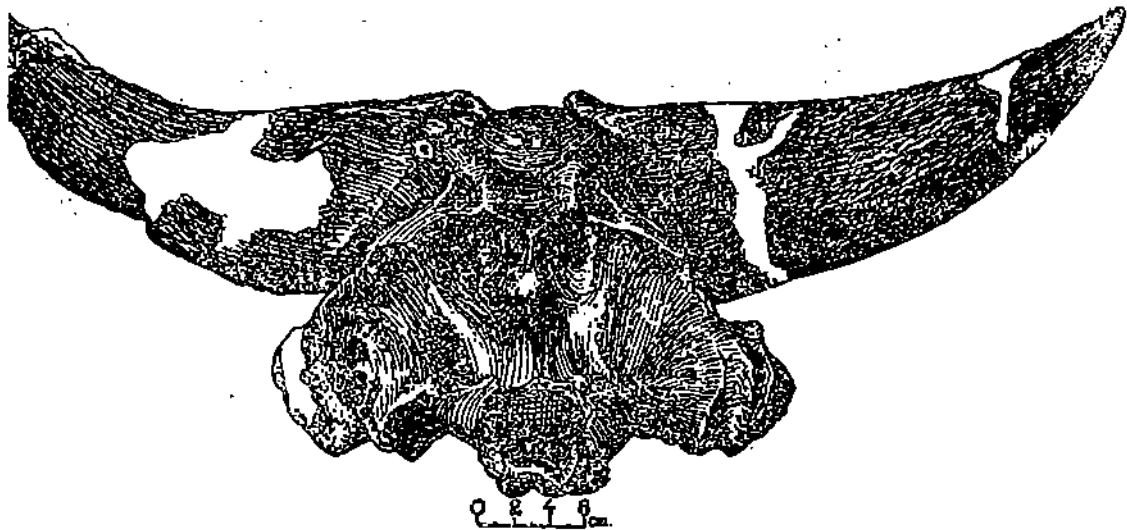


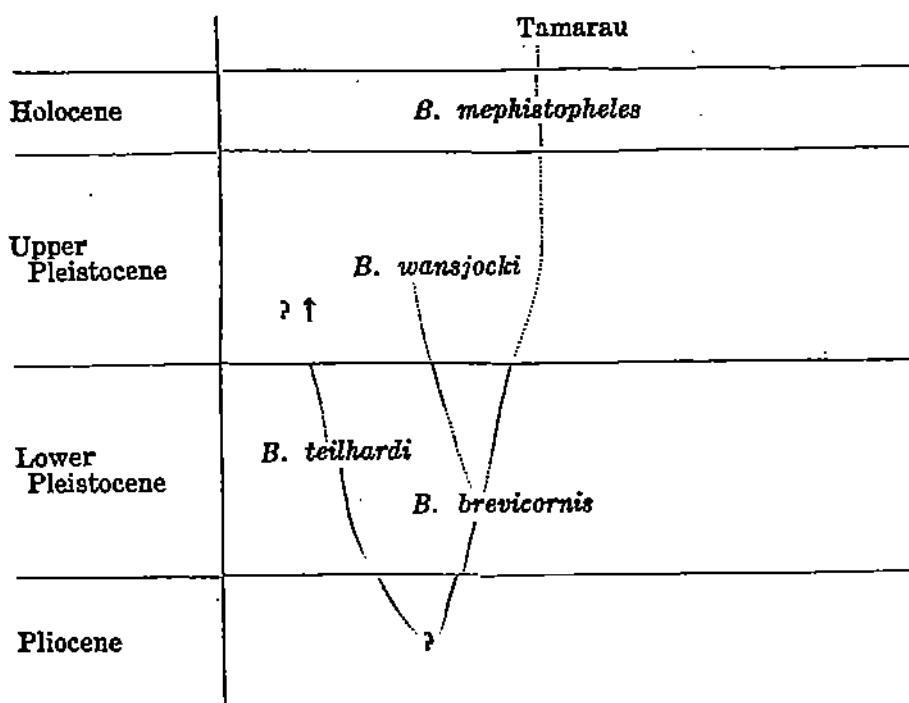
Fig. 2. *Bubalus brevicornis* Young (sp. nov.). Skull in occipital aspect. $\frac{1}{2}$ nat. size.

more projecting. In addition, the two forms are of widely different ages, the Anyang one being the latest, and the Mienchih one perhaps the oldest of the fossil water buffalos so far known in China. A new species has therefore to be erected. The name *Bubalus brevicornis* Young (sp. nov.) is proposed, the specific name alluding to the characteristic short and massive shape of the horn cores.

Comparing now *B. brevicornis* with the Late Pleistocene *B. wans-jocki* Boule and Teilhard (B. and T., 1928) we observe that in this latter form the size of the horn cores is absolutely much larger, and their length relatively bigger (see the mensurations above). Yet the breadth-length

index is rather close in the two forms so that we may regard them as closely related. On the contrary, *B. teilhardi* Young (Young, 1932) from Choukoutien differs remarkably from *B. brevicornis* by its very low index (slender horn cores) and also by the sideways orientation of the horns. Among the fossil *Bubalus* of China, all characterized by sharply trihedral horn cores, *B. teilhardi* stands as the most isolated form.

Hence it seems that during the Lower Pleistocene two forms of water-buffalo were living in N. China: *B. brevicornis* and *B. teilhardi*. The latter seems to have disappeared before the Late Pleistocene, whilst the former evolved into *B. mephistopheles* now represented by the Malayan Tamarau. *B. wansjoki* may be regarded as an extinct form branching also from *B. brevicornis*. These possibilities are expressed schematically in the table below.



2. BUBALUS REMAINS FROM SZECHUAN

Bubalus cf. *brevicornis* Young

In the spring of 1936 when collecting in the classical Yenchingkou fossiliferous area (near Wanhsien, Szechuan, cf. Matthew and Granger, 1923: Lower Pleistocene *Stegodon*-bearing fissure deposits), Mr. L. P. Chia, of the Cenozoic Laboratory found near Yueliangtse (about 30 li S. of Yenchingkou) a number of upper and lower jaws, isolated teeth and limb bones belonging to a large Bovid. Associated with these remains was a left horn core of *Bubalus* which seems to me of great interest because it suggests the presence in the *Stegodon* deposits of Szechuan of a form closely related to *Bubalus brevicornis* above described from Honan. Fortunately the base of this specimen is partly intact, and the tip is only slightly broken, so that there is no doubt concerning the true size and proportions of the piece (see textfigure 3.)

At first glance, this horn core reminds immediately of *B. brevicornis*, and this impression is confirmed by closer examination. Of course, the absolute size is smaller. But the sharply triangular section of the core and its short and massive outline (breadth-length index: .375) are very much the same as in the Mienchiu Buffalo. The specimen may be well referred to a not quite fully grown individual of *B. brevicornis*.

Remains of water-buffalo (not yet described) had been already collected at Yenchingkou by Dr. Granger (personal communication), but not preserved horn core. Using the new find made by Mr. Chia we are now for the first time in the possession of a characteristic form bridging the fauna of the Lower Pleistocene red clays of N. China with the *Stegodon* beds of Central China. From this important fact we may conclude that, in spite of a differentiation of the fauna N. and S. of the Tsinling at the beginning of the Pleistocene, some southern elements (including *Bubalus*, and even perhaps *Stegodon* itself, see below) were able to extend (or to keep their position) in the Huangho basin. This might have an important bearing on the history of *Sinanthropus*.

3. OTHER NEW BUBALUS REMAINS IN N. CHINA

1) *Skull of Changlo*. A rather complete skull of *Bubalus* was unearthed by natives in the Lower Pleistocene red clays near the Lichiachen village (Young, 1936). The writer had the opportunity of seeing this piece in the Public Educational Bureau of Changlo (Central Shantung). With the exception of the muzzle which is missing and of the teeth which are partly damaged the specimen is well preserved. The bone is still incrustated by the

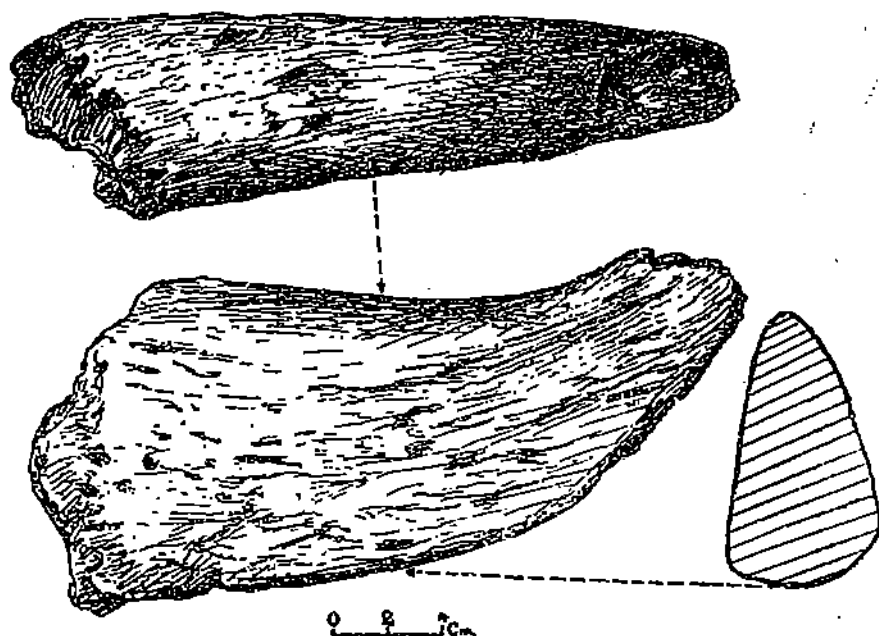


Fig. 3. *Bubalus* cf. *brevicornis* Young. Left horn-core in top and front views. $\frac{1}{4}$ nat. size.

red concretionary clay. The horn cores are sharply trihedral, stout and short, crescentic. I could not persuade the keeper of the specimen to let me have it for study. Yet, by looking at it carefully in two different visits, I became convinced that the animal bears a great similarity to *B. brevicornis*. Although the horn cores may be somewhat longer than in

B. brevicornis, they are surely shorter than in *B. teilhardi* and have a decidedly massive outline. Breadth of the superior face of the horn core at the base, 140 mm. Breadth of the anterior face, 88 mm. Breadth at the post-orbital constriction, 178 mm. Such dimensions fit well with those of *B. brevicornis*.

2) *Skull of Yungtsin*. During a short stay in Sian (Shensi) I had the opportunity (in 1936) to see a collection of fossils purchased by my friend Lui An Kuo from Huayinmiao (In Huayinhsien). According to him these fossils were recently unearthed near Kôho, Yungtinghsien (Shansi), just above the sharp bent and on the left side of the Huangho (N. of Tungkuan). The matrix is a coarse and moderately consolidated violet sand, very similar to the Yüshe formation of S. E. Shansi. In this collection I noticed immediately a remarkable head of *Bubalus*. The posterior part only of the skull is preserved, the horn cores being rather incomplete, so that I could not be sure of the length nor of the exact shape of them. Yet it seems that their basal portion is directed more sideways than in *B. brevicornis*, that is, rather as much as in *B. teilhardi*. Due to lack of time, I could not measure the specimen, but I was much impressed by its massiveness and enormous size. I hope to be able some day to describe it as also the associated forms.

These other forms (according to Liu were found in certain association) render the *Bubalus* skull from Yungtsin still more interesting. Amongst them I could recognise: a *Stegodon* (remains of skulls and teeth), *Euryceros pachyosteus* Young (lower jaws of the typical shape so characteristic of Choukoutien Locality 1), and a *Pseudaxis* sp. (antlers and jaws). My impression is that for the first time we have found in Yungtsin a lacustrine facies of the Choukoutien formation (*Sinanthropus* beds). This idea would be strengthened if we could prove that the buffalo really is a *Bubalus teilhardi*, a leading fossil of Choukoutien.

The presence of *Stegodon* of course is rather puzzling, since no *Stegodon* has so far been reported as certain in N. China in any deposit younger than the Pliocene (no *Stegodon* seems to occur in the Villafranchian beds of Nihowan, nor a fortiori in Choukoutien). If really

the *Stegodon* remains of Yungtsin come from the *Euryceros-Bubalus* beds (and not as in Yüshê from a lower horizon in the same section) we should have to admit that during the Lower Pleistocene the *Stegodon* were not confined to the south of the Tsinling (Szechuan fissures) but were also still living along the northern foot of the range—although not extending much further northward. And then also the Yungtsin's *Stegodon* would turn to be a *Stegodon orientalis* Ow.

4. CONCLUSION. DISTRIBUTION OF FOSSIL BUBALUS IN CHINA

In Fig. 4 I have plotted on a map of China the various localities where fossil water-buffalo has been reported so far. When the species

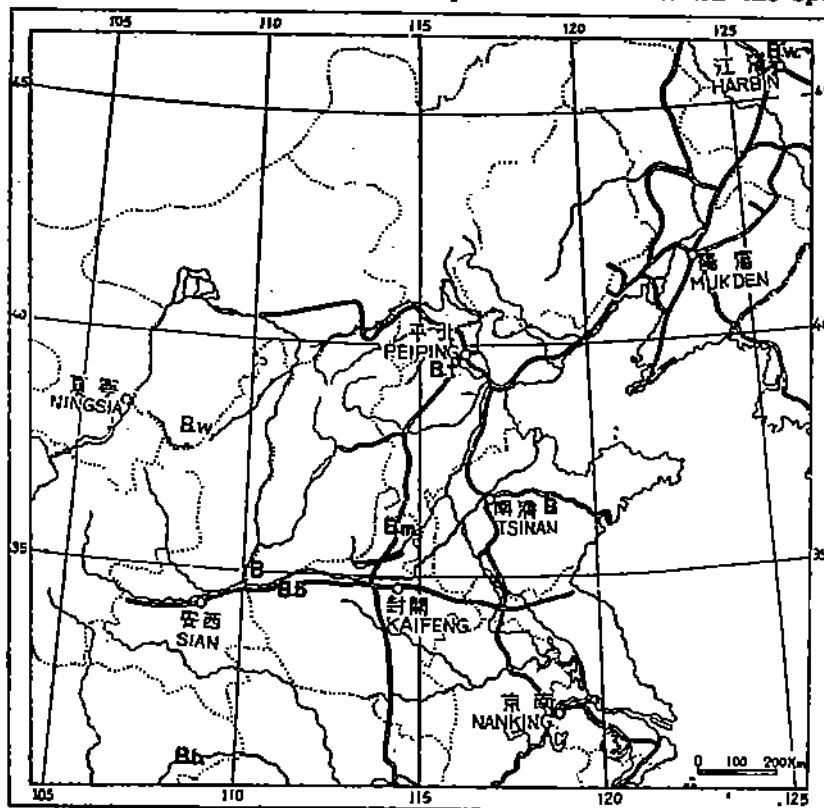


Fig. 4. Sketch map showing the geographical distribution of fossil *Bubalus* in China. (Explanation in text)

is not sure, the locality is marked with a *B*. Whenever the species is known, the *B* is followed by the first letter of the specific name. The inspection of this map will show that the genus (only represented by forms with sharply trihedral horn cores) was once extensively distributed over N. China, the absence of records in the South-East evidently being due to lack of information or of fossiliferous deposits. Judging by their way of living, and also by their past and present distribution, the *Bubalus* must have entered China from the South and reached the maximum of their expansion at the end of the Lower Pleistocene¹. At the end of the Pleistocene, they are still found as far north as Harbin (a fact not easy to put in accord with the assumed cold climate of the Malan Loess...). During the Shang dynasty, *B. mephistopheles* represented the last survivor of the group in the Huangho basin and possibly on the continent.

Remains of fossil *Bubalus* occur mostly in fluviolacustrine sands and in red loams. This latter fact favours the idea that these loams should be considered as muddy slope deposits rather than as a loessic (æolian) sediment, contrary to the idea recently supported by Dr. J. Thorp and Dye (Bull. Geol. Soc. China, Vol XV, 1936, p. 225).

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1 A water-buffalo of a type strikingly similar to the fossil *Bubalus* of China occurs as far West as Steinheim in Germany!

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**Explanation of
Plate I**

PLATE I.

- Fig. 1. *Bubalus brevicornis* Young (sp. nov.). Skull in right aspect.
Ca $\frac{1}{4}$ nat. size.
- Fig. 2. *Bubalus brevicornis* Young (sp. nov.). Skull in frontal aspect
Ca $\frac{1}{4}$ nat. size.

