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中国宁夏中中新世的原始板齿犀化石

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关键词：原始板齿犀·中中新世·中国西北地区

本文记述了采自宁夏的一些原始板齿犀化石包括邱氏华清犀（*Huaqingtherium qiui*）和同垩齿犀（*Caementodon tongxinensis*），并讨论了它们的分类地位和时代。

Primitive Elasmotherines from the Middle Miocene, Ningxia (Northwestern China)

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(*Beijing Natural History Museum*)

Key Words: Primitive Elasmotherine, Middle Miocene, Tongxin, China

INTRODUCTION

Two Primitive elasmotherini, *Huaqingtherium qiui* Guan et. Zhang 1993 and *Caementodon tongxinensis* Guan are described in this paper. The specimens were collected in Tongxin (105°50′E, 36°50′N), Ningxia Hui Autonomous Region, Northwestern China by the author from Beijing Natural History Museum (Fig. 1). The fossiliferous site of the type specimens was situated about 20 km east of Tongxin county town. The fossil-yielding bed consists of yellow-grey sands intercaleted with layers of gypsum and clay. Two fossiliferous layers containing the elasmotherine remains have been recorded on three localities (Gujiazhuang, Huangjiashui and Wudaoling). *Huaqingtherium* came from the upper fossiliferous zone and the *Caementodon* from lower one. To date, six species of elasmotherine rhinochrids have been discovered in Tongxin. The species discussed here are the earliest ones in age, (early middle Miocene, MN5 — MN6) and are very important elements of Miocene fauna. The primitive elasmotherines occur abundantly at this locality. Two species involved in this paper are, *Caementodan tongxinensis* Guan 1989 and *Huaqingtherium qiui* sp. nov.

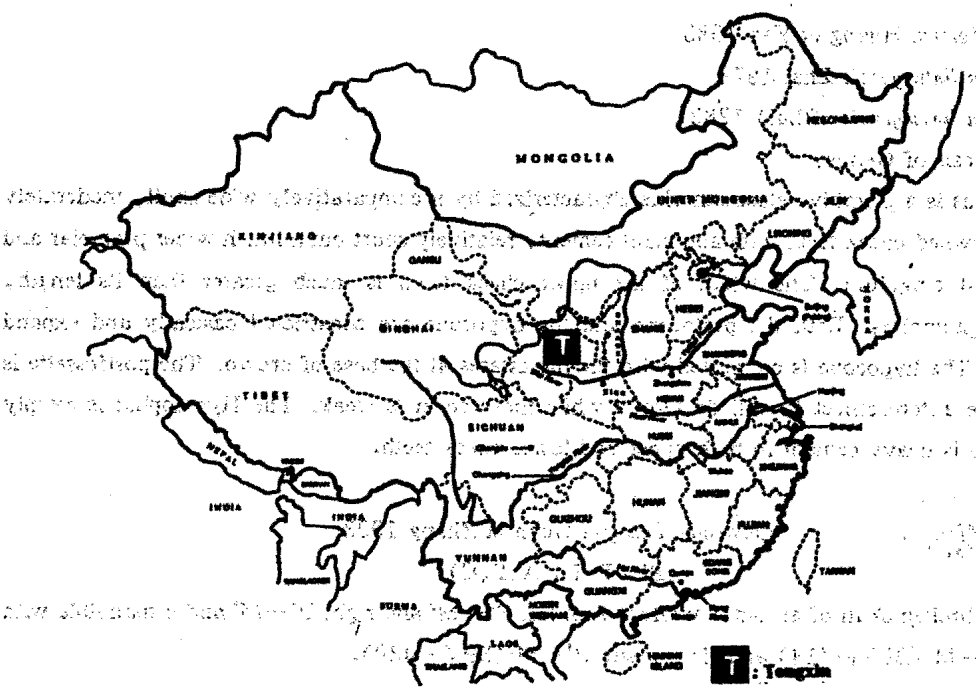

Fig. 1 The Map of Tongxin (Fossil Locality) in China.

Plate 1 *Huangingtherium giui*

A; Palateal view of upper jaw with both P2—M3(×0.34)

B; Dorsal view of left lower jaw with P4—M2(×0.8)

C; Dorsal view of right lower jaw with P4—M3(×0.8)

Plate 2 *Camentodon tongxinensis* Guan

A; Left upper M2(×0.7)

B; Left upper M3(×0.7)

C; Right upper M3(×0.7)

D; Lateral view of B(left upper M3)(×0.7)

E;left lower M3(×0.6)

F;left lower M3(×0.6)

G;Dorsal view of left broken mandible with P3—M2(×0.7)

DISCRIPTION

Huaqingtherium Huang et Yan 1983

Hispanotherium lintungensis Zhai 1978

Huaqingtherium lintungensis (Zhai) 1983

Revised diagnosis of Genus;

This genus is a primitive elasmotherine characterized by a comparatively wide skull, moderately hypsodont crowned cheek teeth with abundant cement, relatively short but a much wider premolar and well developed cingulum. The width of the upper cheek teeth is much greater than its length, especially in premolars. Both the protocone and the hypocone are constricted basically and expand occasionally. The hypocone is connected with the metastases at the base of crown. The postfossette is closed and the antercrothect is well developed while the crochet is weak. The Hypolophid is steeply angled. There is heavy cement in both upper and lower check teeth.

Huaqingtherium qiui Guan et Zhang 1993

(PLAT I , A、B、C)

Materials; A broken skull of an old individual with left P^4—M^3 and right P^2—M^3 and a mandible with left lower P_3—M_3(BPV—414) and right lower P_4—M_2(BPV—430).

Diagnosis of species;

The sub-height crown check teeth contain much cement. Antecrochets develops and Crochets are weak. Protocone and hypocone both contracted. Accessory crests are similarly developed in M3. External wall is flat with indistinct parastyle and metastyle ribs. The skull is relatively wide. The width of the premolars is greater than the length. M^2 is the largest cheek tooth. Lower teeth are more wide, with less cement and thick enamel, than the upper teeth.

Discription;

Though crown of the maxillary teeth are mostly worn off, it still show that teeth are wider than its length. Cingulum is well developed. Cement is much more developed in molar than in Premolar. Medifossette is closed in P^2. The Inner cingulum developes with a post-cingulum spreading from metacone to front of parastyle. The metecone expands posteriorly toward the crown base and connects with metastyle. P^3 has a closed postfossets and a distinct medifossette crests.

P^4 has a flat ventral labial wall. The Parastylfurche is distinct. Inner cingulum developes well spreaing curve around procone. Antecrochet is large and connects with procone. The medifossette is closed. Crochet is weak, Crests develop. protoloph and mataloph incline posteriorly (backward).

M^1 has a strong cingulum. The protocone contacts M^2 with flat facial wall and distinct cingulum. protoloph obliquely connects with ectoloph and metaloph vertically connect with ectoloph Antecrochet is well developed.

H. qiui differs from the species of *Hispanotherium* by its larger size; greater teeth width Compare with it length; Antecrochet is well developed, Hypoloph contacted distinctly. *Hispanotherium* has a smaller size and square teeth. Crochet is better developed than Antechrochet. The *Tesselodon* from Fang Xien (Yen 1981) differs from the *Huaqingtherium* by its smaller size, high crown, weak antecrochet and flat labial wall.

H. qiui also differs from the *Kenyatherium*, *Beliajiva* and *Gobitherium*. They share an developed crochet and high crowns as well as the small size .

Some similar Characters can be observed between *H. qiui* and *Ningxiatherium*. i. e. , antecrochet developed and no crochet reduced reduced developed and enamel fold complexes (*Ningxiatherium*). The identical shape suggests that the *Huaqingtherium* is considered as being an ancestral form of *Ningxiatherium*.

Comparison Between *Huaqingtherium* and *Hispanotherium* are shown in table 1;

Table 1 The Comparison between *Huaqingtherium* and *Hispanotherium*.

Character	*Huaqingtherium*	*Hispanotherium*
posterial fossa	Closed;not reaching lingulum side	Reaching laberial lingulum
Mid-paracone	Weak	Strong
Enamel band	Only in posterial side	Strong in both side
Anterial crista	Weak	Develop
Compression of the precone	Distinct	Weak
Compression of the Hypocone	Distinct	Weak

Caementodon tongxinensis Guan, 1989

(PLAT I , A—G)

Materials; right M^1;M3 and a left P3 (BPY—900) from Dingjiaergou. A left premolar 4, M_2, M_3(BPV—901) from Shataigou. Lower check teeth from Yujialiang and a third molar from Wudaoling.

Diagnosis;

A primitive elasmotherine with subhypodont teeth filled with cement. Premolar submolarized, square shape (width of the cheek teeth slightly longer than its length). The parastyle and metastyle developed. The Crochet is stronger than antecrochet. Crests develop more in premolar than molar. Protocone and Hypocone contact distinctly.

Description;

The cementless premolar is in association with a well cemented molar. Paracone rib and metacone rib both develop in premolar. The stronger parastyle and mesostyle both spread laterally. Thick enamel layer of the teeth are with indistinct fold. Rich cement exists in the concave spot the walls of the teeth. The Crochet in metaloph of upper premolar the is weak. Paracone reduced and parastyle developed. Metaloph is narrow; hypocone not only expanded and bent upward but also connected with metastyle. Postfassette closed and to be triangular; front of metaloph has many small enamel folds inetaloph with many small enamel fold; medifossette unclosed.

M^3 triangular cingulum in labial wall developed with the flat wall. Paracone rib distinct; inner cingulum well developed in front of protocone; protoloph connected viaincline with ectoloph. Protocone contracted. Antecrochet developed and crochet absent; crests were divided into two bigger fale. Aubenturche distinct; Cement developed;

medium high crown; cingulum remained in anterior part of the teeth; hypolophid with deep angle.

P^2 Triangular. anterior is narrow and posterior is wide. Promolars molarized. Trigonidgrube and Talonidgrube open.

Remarks:

The generic name *Huaqingtherium* was proposed by Huang and Yan (1983) in a revision of *Hispanotherium lintungensis*, the species discribed by Zhai from Shannxi in 1957. It is charactered by subhypodont molar crown, weak crochet and developed antecrochet. The new species from Tongxin is similar to the *Huaqingtheurum lintungensis*. They share: 1) Similar size and shape of the checkteeth; 2) Anthcrochet develop; 3) Cement present in both upper and lower teeth. They differ in that the hypocone contacted indistinct and the metaloph connected with ectoloph vertically in Tongxin species.

The front and rear cingulum exist distinctly in the upper cheek teeth. The posterior ciugulum has many folds and the anterior cingulum is seemly platelike. The crochet is very strong in M^1 and is less developed in M^3. Antecrochet is weak in all cheek teeth except M^3. The rest evidence is only in metaloph. Lower premolar submolarized. The paralophid in lower cheek teeth is comparatively developed and the angle of the hypolopid is quite large. Cement is abundant in talonidgrube and trigonidgrube. The volume of the two grubes is similar. The vordere aubenfurche develops and aubenfurche distinct.

P2 is slightly square in occlusial section. The width is comparatively longer than the length. Both paracone rib and metacone ribs are developed. The metacone expands (or the crochet spreads forward) and contacts with the hypocone and medifossetle is closed. Crests are well developed with a small fold in the metaloph. The hypecone expands to connect with the precone in front and spreads to the lingulum in the rear. The antercrechet absent and postfossette is subclosed. And protoconfurche is developed.

P^3 is sub-squared in shape and is well cemented. Also it is with a distinct crooked labial wall. The meteloph, parastyle and metastyle are stronger comparing to the protocone. The small hypecone connects with precone and forms a closed medifossette. Protocone-furche is distinct. Metaloph is less connected with ectoloph and the postfossette is closed and M^1 sub-aguae in shape. Paratyle and metastyle are strongly folded outward. The labial wall is crooked. The protoloph and metaloph connects diagonally with ectoloph. The crochet is developed. Antecrochet is weak. The protocone is contracted, however the hypocone is not. Crests are absent. The anterior and posterior lingulum are developed. Postfossette is closed triangularly. The paracone rib and a metacone rib are parallel.

Table 2 The comparison between *Huaqingtherium* and *Caementodon* from Tongxin locality

Character	*Huaqingtherium*	*Caementodon*
Individual	Larger	Small
Check Teeth	Wide. larger than length.	Square
Antercrochet	Develop	Indevelop
Crochet	Indevelop	Develop
Protocone	Strongly compressed	Weakly compressed
Cingulum	Indeveloped	Developed
Hypocone	Expanding, Connecting with Para-post cone	Inexpanding, not connecting
Inner cingulum	develop	None

M^2, triangular in shape, is the largest among the cheek teeth. The protoloph and metaloph are connected at an angle with the entoloph. The protocone is relatively small but the hypocone. The crochet and crests are both developed. The cigulum spreads from the protocone to the labially side cone, The postfossette is sub-closed and triangle in shape.

M^3 is sub-hight crown tooth with well cement. The labial walls are smooth. The paracone rib and metacone ribs are parallel. The protocone is less distinct and protoconfurche developed in both sides. The crochet is strong but antecrochet is absent; no crests; lingulum development is of strong.

CONCLUSION

Since the first discovery in the 19th century, many primitive elasmotheris have been discribed till now. 11 genera of these animals are known in the world, of which 8 ones occurred in China.

1. According to Kretzoi (1942), two sub-families could be distinguished each other based on the position of the horn. (Elasmothirinae with a forehead horn and Iranotheriinae with nasal horn). Due to the uncertain horn position in different species (*Hispanotherium* with post-ward. *Beliajevina* with a seat between), it was considered as a feasible character of classification.

2. After comparison of existing materials of the primitive elasmotheres from the Old World, we considered that the character of the cheek teeth, as noted by Heissig, and the postcranial specimens are also very important for subdividing materials (because of providing a date methology to divide two different species of the elasmotheres) and have been established in this paper by their dental anatomy.

3. As mentioned above, 5 primitive species in addition to *Elasmotherium* (*Sinotherium*) have been described;

Teseslodon fangxianensis Yen 1979

Ningxiatherium congirhinus Chen 1977

Huaqingtherium lintungensis Zhai 1976

Ceamentodon tongxinensis Guan 1989

Huaqingtherium qiui Guan 1993

The teeth and skull of these five primitive elasmotheres are relatively small and differ decidedly from *Elasmotherium/Sinotherium* in morphological aspects; therefore, *Elasmotherium* need. not be discussed in this paper. The two small species (*Huaqingtherium* and *Caementodon*) from Tongxin are considered as the oldest species in this family because they were recovered in early Miocene. The distict difference between Tongxin specimens and the *Nigxiatherium* (Chen 1977) from early Pliocene in Zhongning is that the latter one is characterized by their large size and the seat of nasal horn. A complete old skull was described as a new genus and species by the character of a narrow nasal horn associated with a long head. *Tesselodon* (Yen 1979) is characterized by high crowned teeth with a flat and straight labial wall which differs evidently from other species. The *Shennongtherium hyposodentus*, which was established by Huang and Yan in 1983, without cement on its teeth and a rather high crown. It absolutely differs from all materials collected in China. Distinguish dental character easily separate *Caemetodon* and *Huaqingtherium*. In addition, the large species, *Huaqingtherium* has a very wide skull as an elasmotheris.

4. The distinguishes between the characters of the two genera from Tongxin can be observed in Table 2.

Moreover other important characters are noted by the authors in this paper; (*Huaqingtherium* with flat occlusial surfaces and wide lower cheek teeth.) The ectoloph, grinding tendancy and groove on upper and cheek teeth, to be abrasive horizontally, are expressly flat and delicate. In *Caementodon*, the ectoloph is much higher and the surface of grinding is tangency to the root of the mouth. Two species represent distinctly the different feeding habits. *Caementodon* with grass vegetation in the diet and *Huaqingtherium* with grinding feeding habits.

5; A single ancestor for all species is believed to have produced four lineages in the world wide. Huang and Yan (1983) hypothesized four lineages;

1) *Caementodon oettingenae.*

2) *Kenyatherium*; A species which may derived from *Caementodon* or *Hispanotherium*

3) *Iranotherium*

4) *Elasmothium*

They assume that the *Caementodon* is the ancestor of *Elasmotherium*, the lineage can be from *Caementodon* through *Beliajevina* to *Elasmotherium.*

Until now, the earliest species of elasmotheres, (cf. Caementodon sp. Heissig 1979, was found in Mongolia and exhibits no cement and low crown. However, the most advanced species from Tongxin share common age (middle Miocene, MN6) with Mongolia cf. Caementodon sp.. There must have been other primitive species ancestred to two species from Tongxin. These forms have preserved two lineages, one from Huaqingtherium through Ningxiatherium to Elasmotherium because they share wide check teeth and large size. *Caementodon tongxinensis* and *Hispantherium* share another lineage as they have the same pattern of the dental structure and the animals were of similar size.

6. It has been proposed that *Caementodon* and *Hispanotherium* are probably synonymous (Chen 1977, Huang & Yan 1983). No evidence has been found to supprt that point. And no postcranial and skull element of *Caementodon* were known until now. Certain difference have been pointed by Hessig (1972) and some unidentical characters in cheek teeth are noted in this paper.

7. Wide distribution of Elasmotheres in Miocene after their radiation, have been emphasized in recent years. These animals were widely *dispersed* over Asia, Europe and lately in Africa. There is the possibility of a large scale exchange and migration throughout Mongolia, southern Europe, Turkey and Spain. After middle Miocene, when the Himalaya moved, many species were isolated in different areas of the old world. It is that there were three forest origin centers, there being in a large area including northwestern China, Mongolia, Turkey and some land in Slberian. Hernor R. L. et al (1979); Antunes M. T,. (1979), believed one branch of elasomotheres entered Spain through a land bridge. The destruction of this land bridge isolated the species and allowed the animals to became abundant.

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REFFERENCES

Beliaeva, E. I. (1971) On some rhinoceros of family rhinoceroitidae from the Neogene of west Mongolia. Some. Soviet-Mongol. Nauch-Issled. Gel. Eksped. ,tr. ,3.

Chen G. (1977), A Ningxiatherium from Zhongning, Ningxia, *Vertebrate PalAsiatic*,15,2.

Chow M. (1958) New Elasmotherine Rhinoceroses from Shansi. Vertebrate PalAsiatic, 2, 2—3.

Hessig, K. (1974), Neue Elasmotherini (Rhinocerotidae, Mammalia) aus dem obermiozan Anatoliens—Mitt. bayer. *Staatssamml. Palaont. hist. Geeol.*, 14 21—35, Taf. 2. Munchen.

——(1976),Rhinocerotidae (Mammalia) aus der Anchitherium -Fauna Anatoliens. -*Geol. Jb.* 19, 3-121, 4 Abb. 24 Tab. 5 TAf. ; Hannover.

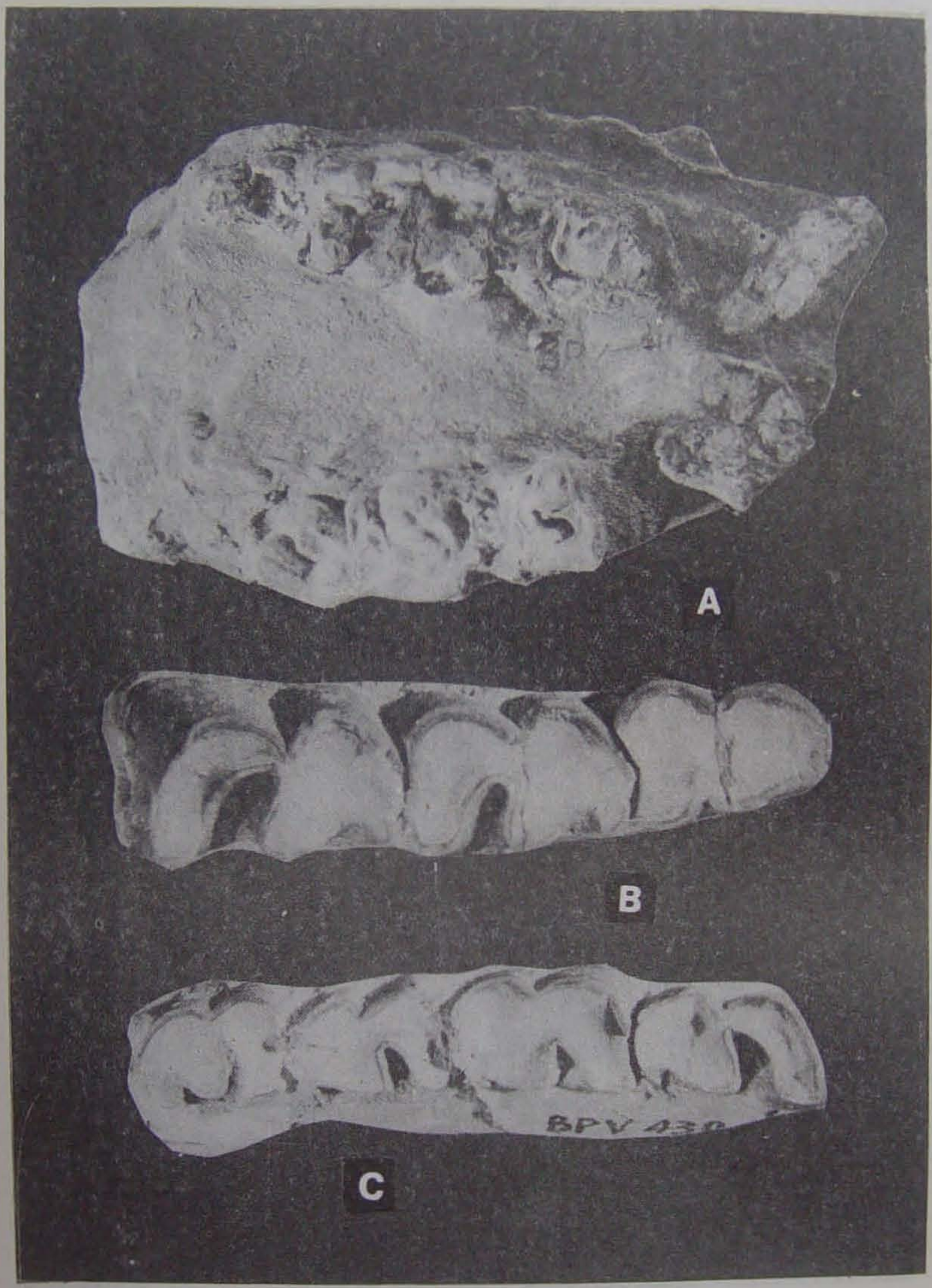
Huang,W. P. and Yan, D. F. (1983) New material of Elasmotherini from Shennongjia. Vertebrata *PalAsiatica*,21 (3).

Kretzoi, M. (1942) Bemerkungen zum System de nachmiozanen Nashorn Gattungen. *Foldtani Kozlony*, 72. Kotet 4—12, 309—318.

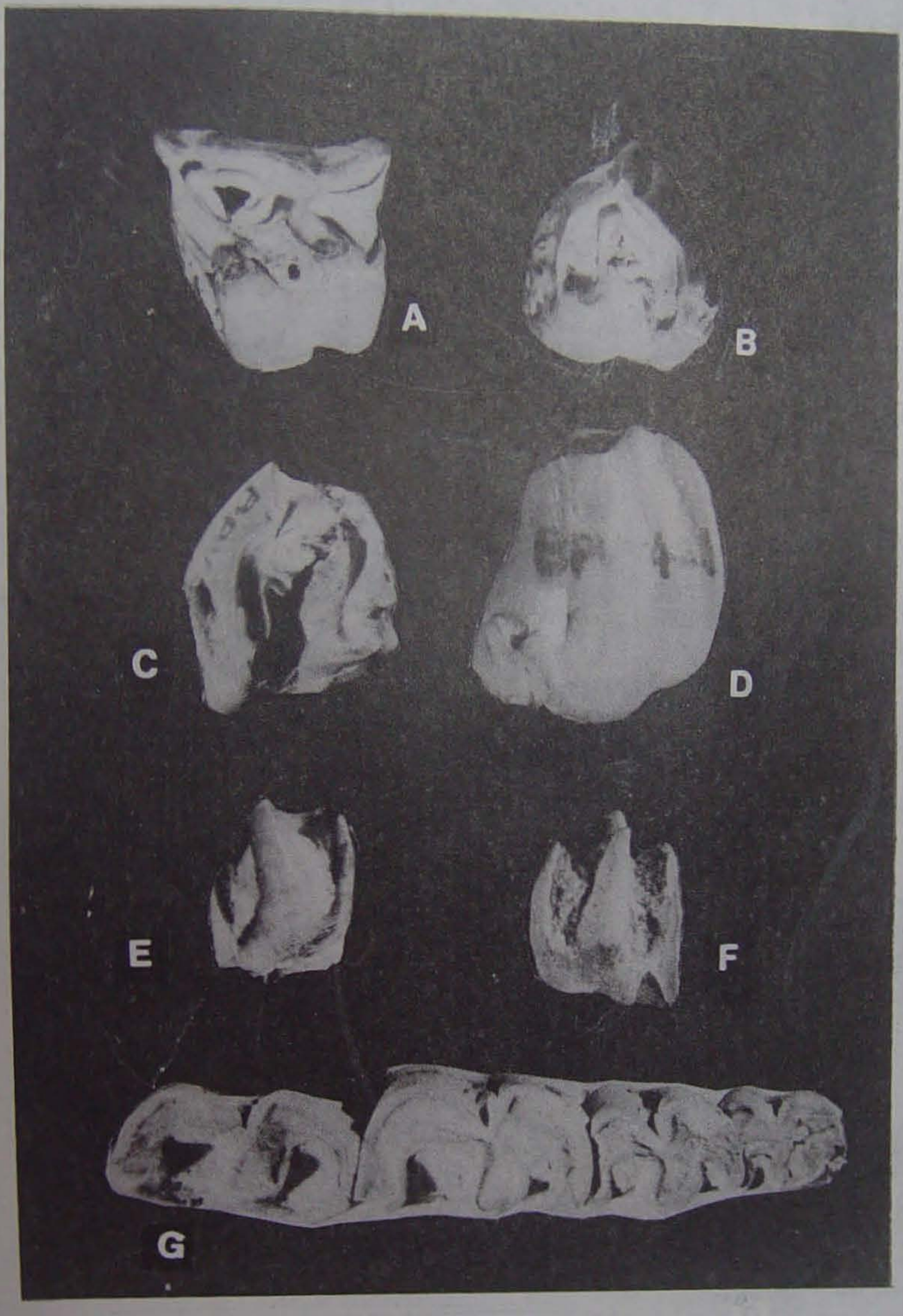
Yan D. (1979), Einige der dossilen moizanen saugetiere der Kreis von Fangxian in der provinz Hupei. *Vertebrata PalAsiatica*, 17, (3).

——, (1983), Uber die klassifikation und Morphologiedes Schadel vol Plesiaceratherium. *Vertebrata PalAsiatica*, 21, (2).

Zhai R. (1978), A Primitive Elasmothere from the Miocene of Lintung, Shensi. Professional papers of stratigraphy and Palaeontology. no. 7, 122—126.



A: Palateal view of upper jaw with both P2-M3 (X 0.34)
B: Ventral view of left lower jaw with P4-M2 (X 0.8)
C: Ventral view of left lower jaw with P4-M2 (X 0.8)



A: Ventral view of left upper M2 (X 0.7)
B: Ventral view of left upper M3 (X 0.7)
C: Ventral view of right upper M3 (X 0.7)
D: Lateral view of B (left upper M3, X 0.7)
E: Lateral view of left lower M3 (X 0.6)
F: Lateral view of left lower M3 (X 0.6)
G: Dosal view of left lower brocken mandible with P3-M3 (X 0.7)