

# 论额尔登敖包下第三系——兼论 湖牧兽在该地之发现

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**关键词** 内蒙古 额尔登敖包 下第三系 湖牧兽

## 内 容 提 要

内蒙古沙拉木伦地区额尔登敖包下第三系剖面为亚洲下第三系最佳剖面之一。但过去的地层研究过于简单,有关地层层位的时代不准确,因此,对其进行全面的认识实有必要。

湖牧兽 (*Pastoralodon lacustris*) 仅发现于脑木根组,而从未在其它下第三系层位中发现过。因而,在额尔登敖包地区发现的湖牧兽表明这一地区并不存在中始新世阿山头组,而早始新世巴彦乌兰层的存在则是确凿无疑的。

## 一、地层概述

内蒙古沙拉木伦地区(图1)额尔登敖包下第三系剖面为该地下第三系主要剖面之一。在这一地区发现过许多重要的早第三纪哺乳动物。这些动物计有中始新世晚期的伊尔丁曼哈动物群,早渐新世乌兰戈楚动物群、巴伦索动物群以及中渐新最早期的呼尔井动物群的成员。由于过去在此剖面最底部的红色粘土层中未发现任何哺乳动物化石,所以对它的时代虽有一些推测,但都不够准确。由于湖牧兽的发现,解决了该红色粘土层的时代问题。这样,额尔登敖包下第三系的各个层位几乎都有了可靠的哺乳动物化石的依据。

额尔登敖包下第三系剖面最早为美国自然历史博物馆的奥斯朋(H. F. Osborn, 1929)所报道(图2)。多年来,奥氏剖面成了额尔登敖包下第三系划分地层的主要依据,然而其细节的研究显然是欠缺的。

首先,我们看到该剖面中的“底部红层”(“Basal Red”)被推测为阿山头组(?)。它的“沙拉木伦组”包括了“底部白层”(“Basal White”)和部分的“下部白层”(“Lower White”)。“乌兰戈楚组”则包括了大部分的“下部白层”(“Lower White”),“中部红层”(“Middle Red”),“中部白层”(“Middle White”),以及“上部红层”(“Upper Red”)。而其“顶部白层”(“Upper White”)则被认作“巴伦索组”。现在看来除乌兰戈楚组推测得部分正确外,其它地层的推断都有一些问题。这些问题包括:1)事实上,在此剖面中中始新世阿山头组是缺失的,有的是伊尔丁曼哈组;2)早渐新世地层除乌兰戈楚组外,尚有巴伦索组,但巴伦索组不是奥氏剖面中的“顶部白层”,而是“顶部白层”之下伏的地层;3)“顶

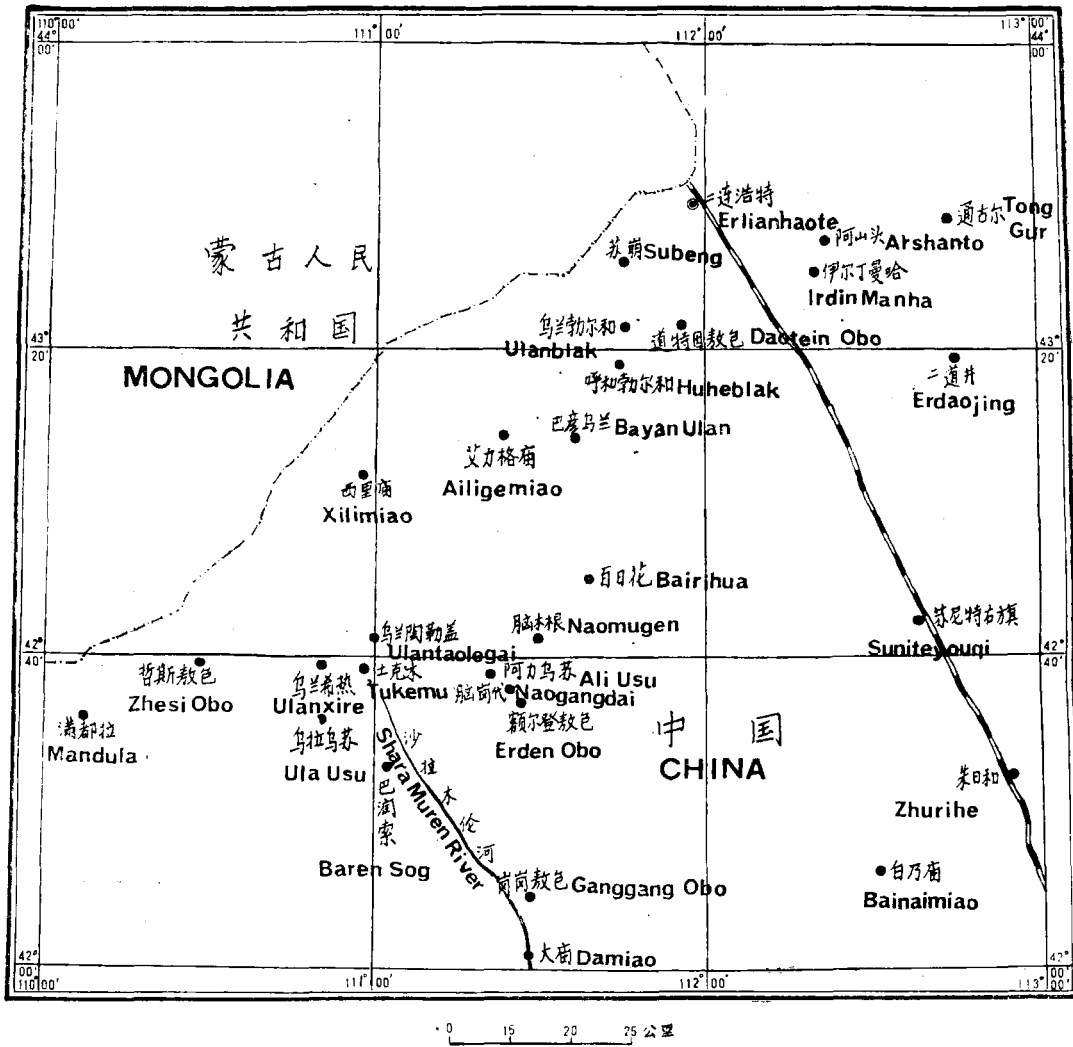


图1 内蒙古沙拉木伦地区地理位置图

Fig. 1 Map of Shara Murun area, Nei Mongol

部白层”实为呼尔井组。4) “底部红层”实为脑木根组中的早始新世巴彦乌兰层。

1983 年,江浩贤详细报道了额尔登敖包下第三系剖面(图 3),现简介如下,然后说明有关联的几个问题。(其中组名依内蒙古地层志)。

(自上而下)

上覆: 第四系砂土层

中渐新统呼尔井组

21-23 灰白色、黄色粗砂岩,猪肝色泥岩以及松散的黄色砂砾岩。含哺乳动物 *Indricotherium sp.*, *Schizotherium sp.* 等。 11.13 米

-----假整合-----

下渐新统巴伦索组

18-20 杂色泥岩,砖红色含钙质结核砂质泥岩及深棕红色或鲜红色泥岩。 23.11 米

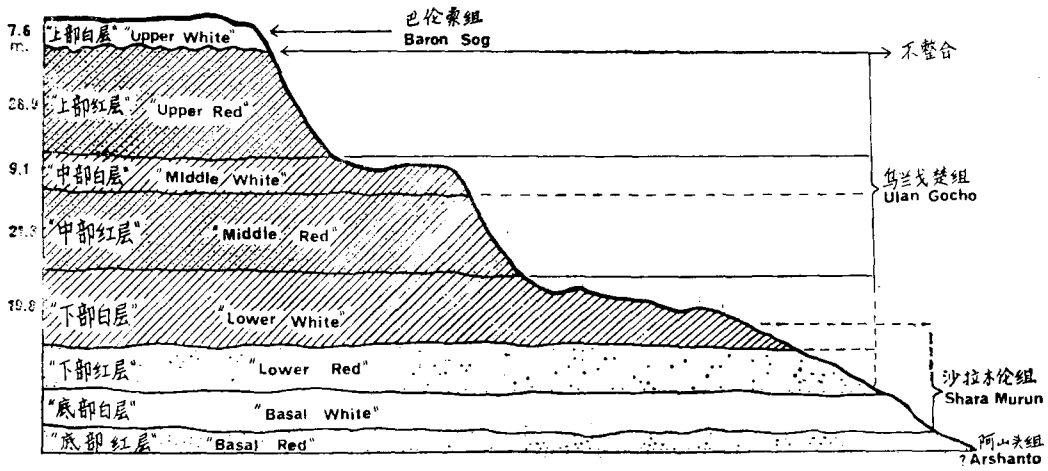


图 2 额尔登敖包剖面(依奥斯朋)

Fig. 2 Paleogene section at Erden Obo (Urtyn Obo) (By Osborn, 1929, p. 5)

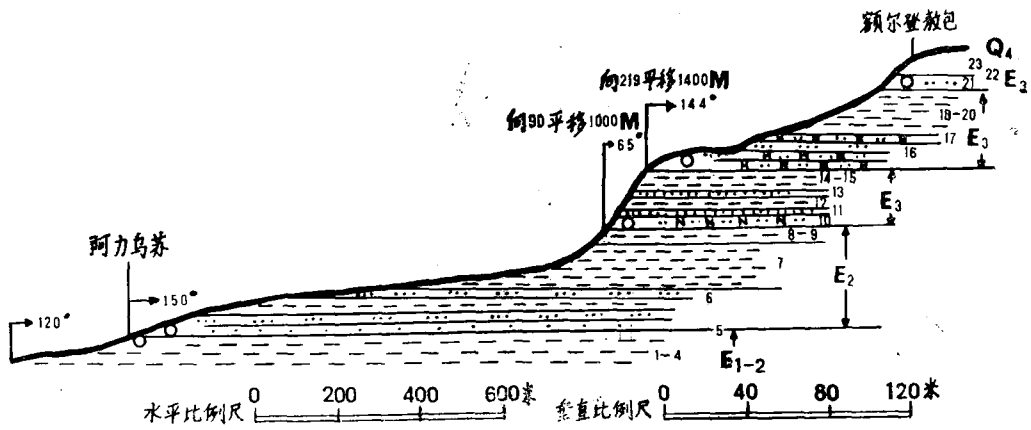


图 3 额尔登敖包下第三系剖面

Fig. 3 Paleogen section at Erden Obo

16-17 灰白色含砾长石英粗砂岩,含砾中粗粒长石英砂岩及粉细砂岩。含安氏大角雷兽 (*Embolotherium andrewsi*) 11.03 米

-----假整合-----

下渐新统乌兰戈楚组

14-15 浅砖红色粉砂质泥岩,深棕色泥岩。 12.49 米

10-13 灰白色含砾中粗粒长石英砂岩,粉-细砂岩,灰白-微红色松散砂岩,含葛氏大角雷兽 (*Embolotherium grangeri*)。 12.94 米

-----假整合-----

上始新统沙拉木伦组

8-9 灰绿色泥岩夹二层透镜状长石英粗砂岩及杂色泥岩。 8.27 米

-----假整合-----

## 上始新统土克木组

7 浅砖红色砂质泥岩,含龟鳖类化石。 20.51 米

-----假整合-----

## 中始新统伊尔丁曼哈组

5-6 灰白—微绿色粗砂岩夹细砂岩,灰白色粉砂岩及灰绿色泥岩。含 *Eudinoceras mongoliensis*, *Gobiohyus orientalis* 等。 13.59 米

-----假整合-----

## 下始新统(脑木根组上部)巴彦乌兰层

1-4 浅棕红色砂质泥岩,灰白微黄及红色粉—细砂岩及杂色泥岩。含湖牧兽 (*Passoralodon lacustris*)。 9.02 米

(未见底)

现将本文和江浩贤所使用组名比较如下:

本 文		江 浩 贤 (1983)	
中渐新统	呼尔井组	上脑岗代组	上渐新统
下渐新统	巴伦素组	下脑岗代组	中渐新统
	乌兰戈楚组	额尔登敖包组	下渐新统
上始新统	沙拉木伦组	沙拉木伦组	上始新统
	土克木组		
中始新统	伊尔丁曼哈组	阿力乌苏组	上始新统
	阿山头组	阿山头组	中始新统
下始新统一	脑木根组	巴彦乌兰组	下始新统
上古新统		脑木根层	上古新统

对上述剖面的划分和组的名称的使用应有以下几点说明:

- 1) 底部巴彦乌兰层时代的确定,是基于将在本文中报道的湖牧兽的发现。
- 2) 伊尔丁曼哈组时代的确定是根据在剖面中发现的伊尔丁曼哈动物群的一个埋藏群落(待刊)。

3) 在巴彦乌兰层和伊尔丁曼哈组之间存在着一个明显的冲刷面,说明在两组沉积之间的间隔内由于风化剥蚀的结果,阿山头组未能在额尔登敖包地区留下任何沉积物。

4) 剖面上土克木组和沙拉木伦组的出现是由于地质队在进行 1/20 万地质填图时沿地层出露进行追索并对比的结果。虽然在额尔登敖包未发现相应的化石哺乳类,但由于与沙拉木伦组和土克木组的建组地点——乌拉乌苏的距离很近,因此,这一推断当无问题。这样,土克木组第一次有了确切的厚度。同时,我认为它应是晚始新世的最早期。它的代表动物就是德氏犀 (*Teilhardia pretiosa*)。

5) 乌兰戈楚组应限于含谷氏大角雷兽 (*Embolotherium grangeri*) 的地层及其上部红层。而巴伦素组则应为含安氏大角雷兽 (*Embolotherium andrewsi*) 的地层及其上部红层。特别要指出的是巴伦素组并不是奥氏剖面中的“顶部白层”,而是其下的一套地层。

这是沿层追索的结果。

6) 奥氏的“顶部白层”实为呼尔井组。这与其中发现巨犀的情况是相符的。

## 二、化石记述

钝脚目 *Pantodonta* Cope, 1873

牧兽科 *Pastoralodontidae* Chow and Qi, 1978

牧兽属 *Pastoralodon* Chow and Qi, 1978

湖牧兽 *Pastoralodon lacustris* Chow and Qi, 1978

材料 V8806-1, 部分头骨, 具  $P^2$ ,  $P^3$  及  $M^1$ 。

V8806-2, 一段下颌骨, 具  $M_3$  (破损)(图4)。

时代 早始新世。

**记述与讨论** 头骨: 外侧视均为残破的上颌骨及上颌骨的颧突 (zygomatic process of maxilla), 内侧视可见上颌骨的腭突 (palatine process of maxilla), 部分鼻甲 (nasal conchae) 以及部分大脑窝 (cerebral fossa)。眶下孔大; 在眶下孔外侧有一明显的翼腭孔 (Sphenopalatine foramen), 其旁有一小管道孔是为后腭管 (posterior palatine canal)。在眶下孔上侧的内壁上有一清晰的鼻泪管 (nasolacrimal canal)。

牙齿: ( $C^1$ ,  $P^1$  和  $P^2$  均为单齿根)。

$P^3$ : 前尖和后尖合为一个齿尖并与前附尖及后附尖相连形成“V”字形的两翼; 次尖架非常之宽大, 形成一舌状体, 其前缘在前尖—后尖之基部, 其后缘几达后附尖之基部。

$P^4$ : 个体稍大, “V”形翼极明显, 次尖架相对较弱。

$M^1$ : 个体明显变大。原尖突出; 原尖前棱和原尖后棱分别向前缘和后缘延伸, 形成前、后齿带, 但均未与前尖、后尖相连。前尖和后尖相距不大, 它们与前附尖、中附尖以及后附尖相连成“W”形齿嵴。中附尖外侧也分为前、后两条小棱。次尖架冠视呈半圆形, 十分强大。中凹 (ectoflexus) 较浅。

下颌骨: 仅存  $M_2$  后部及  $M_3$  之下的一段下颌枝。上升枝前缘在下颌枝的外侧凸起, 呈一明显的粗嵴。

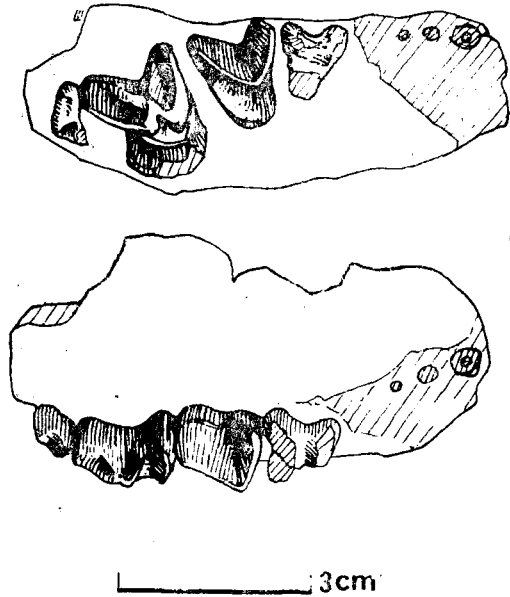


图4 *pastoralodon lacustris* (V8806-1) 上颊齿冠视(上)及外侧视(下)

Fig. 4 *pastoralodon lacustris* (V8806-1), upper cheek teeth: crown view and lateral view

目前, 牧兽科含有两个属: 一为牧兽属 (*Pastoralodon*), 一为谷齿兽属 (*Convallisodon*)。两者上颊齿的主要区别是: 1) 前臼齿: 牧兽的前臼齿比较小; 它的  $P^4$  的次尖架未达牙齿前缘, 而谷齿兽的  $P^4$  的次尖架的前缘可达牙齿前缘。2)  $M^1$ : 牧兽的  $M^1$  较小; 原尖后棱上无原后小尖, 而谷齿兽的  $M^1$  却有一明显的原后小尖。3) 牧兽的前中棱 (*precentrocrista*) 和后中棱 (*postcentrocrista*) 均较短, 尤其是中附尖的前后棱明显地较谷齿兽的短。另外, 牧兽的下颌枝在  $M_3$  之下有一段上升枝前缘向下形成的粗嵴, 而这一粗嵴在谷齿兽的下颌枝上是不存在的。根据以上两个属的区别, V8806 号标本无疑应为湖牧兽。

最后, 要说明的是, 在脑木根组中, 晚古新世脑木根层和早始新世巴彦乌兰层都曾发现湖牧兽。但脑木根层的主要标志是化石和大量的天青石结核共生。而在巴彦乌兰层中发现的化石则在分散的, 不集中的, 没有大量的天青石结核共生。根据这种情况, V9491 号标本所在层位应属巴彦乌兰层。

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## A PALEOGENE SECTION AT ERDEN OBO, NEI MONGOL AND ON THE DISCOVERY OF *PASTORALODON LACUSTRIS* (PANTODONTA, MAMMALIA) IN THAT AREA

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**Key words** Erden Obo, Nei Mongol; Paleocene; *Pastoralodon*

### Summary

Paleogene section of Erden Obo (Urtyn Obo) is one of the best known Paleogene sections in Asia. But the understanding of it was insufficient and simplified in the division of strata and in the demarcation of the boundaries. This paper attempts at a revision of the former.

*Pastoralodon lacustris*, originally known from Nomogen Formation, has never been found in any where else. Its discovery in Erden Obo area indicates that the age of the stratum containing it is of Early Eocene (Bayan Ulan beds).

The section at Orden Obo Paleogene (Fig. 1) is unique complete one among the investigated sections in Shara Murun area, Nei Mongol. A lot of important mammalian fossils have been collected there. These mammals include the numbers of Middle Eocene Irдин Manha

fauna, Early Oligocene Ulangochu fauna, Early Oligocene Baron Sog fauna and the earliest Middle Oligocene Houldjin fauna. Because *Pastoralodon lacustris* (Panodontia, Mammalia) was found in the basal beds of that section, in which no mammalian fossil has been found before, the age of the basal red beds is reasonably considered to be of Early Eocene.

Erden Obo Paleogene section was reported by Dr. Henry F. Osborn in 1929 for the first time. His description about the section has been cited by the later researchers for a long time. But there are some misinterpretations in his paper about the section (Fig. 2).

First, the "Basal Red" in his section was considered as the 'Arshanto Formation?' (Middle Eocene); the 'Basal White', 'Lower Red' and a part of the 'Lower White' on the Shara Murun Formation; the main part of the 'Lower White', 'Middle Red', 'Middle White' and 'Upper Red' on the Ulangochu Formation, while the 'Upper White' on the Baron Sog Formation. But, according to realistic geologic mapping, most of the speculations is not correct.

Jiang Haoxian (1983) reported the section in detail. The strata in his description are unquestionably correct. But the names of the formations adapted by him are revised by later specialists. In the respect of this condition, I would like to introduce this section here by adapting realistic lithology reported by Jiang and the names revised by the specialists recently.

#### Erden Obo Paleogene Section (Fig. 3)

(From upper to lower):

##### Middle Oligocene Houldjin Formation

21—23. grey-white to yellow coarse sandstones with thin yellow-grey clay; pig liver colored clay; loose yellow sandstone and conglomerate beds. containing *Indricotherium* sp., *Schizothrium* sp. 11.13 m

---disconformity---

##### Early Oligocene Baron Sog Formation

18—20. Variegated clay; light brick-red sandy clay with calcium concretions; dark brown-red sandy clay. 23.11 m

16—17. grey-white medium to coarse grained feldspathic quarts; coarse sandstone and conglomerates; fine silty sandstone containing *Embolotherium andrausi*, *Gigantamynodon* sp. 11.03 m

---disconformity---

##### Early Oligocene Ulangochu Formation

14—15. Dark brown red clay; light brick-red silty clay. 12.49 m

10—13. grey-white medium and coarse feldspar-quartz sandstone with conglomerates. containing *Embolotherium grangeri*, *Amynodon* sp. 12.94 m

---disconformity---

##### Late Eocene Shara Murun Formation

8—9. grey-green clay with two layers of lense-like coarse feldspar-quartz sandstone and variegated clay. 8.27 m

..disconformity..

##### Late Eocene Tukhum Formation

7. light brick-red sandy clay. containing fossil turtles. 20.51 m

---disconformity---

##### Middle Eocene Irden Manha Formation

5—6. grey silty sandstone, grey-green clay and grey-white and slightly green coarse sandstone with fine sandstone. containing *Eudinoceras mongoliensis*, *Gobiohyus orientalis*.

13.59 m

..unconformity..

Early Eocene Bayan Ulan beds (Nomogen Formation)

1—4 Light brown-red sandy clay, grey-white and light yellow and red silt-fine sandstone and variegated clay. containing *Pastoralodon lacustris*.

9.02 m.

(lowest layer not exposed)

The comparisons of nomenclatures between this paper's and Jiang's are as follows:

	This paper	Jiang's paper (1983)
M. Oligocene	Houldjin Fm.	Shangnaogangdai Fm.
L. Oligocene	Baron Sog Fm. Ulangochu Fm.	Xianaogangdai Fm. Erden Obo Fm.
U. Eocene	Shara Murun Fm. Tukhum Fm.	Alisu Fm.
M. Eocene	Irden Manha Fm.	
L. Eocene	Nomogen Fm. (Bayan Ulan beds)	Arshanto-Nomogen Fms.

Some explanations are necessary about this section:

1) The discovery of *Pastoralodon lacustris* here confirms the existence of Early Eocene Bayan Ulan beds in that area.

2) On the discovery of the members of Irden Manha fauna (under studying), we can affirm that 5—6 layers should be of Irden Manha Fm.

3) An apparently erosional surface between 4 and 5 layer indicates that there used to be an interruption of deposition. As a result of it, the Middle Eocene Arshanto Fm. disappeared in Erden Obo area.

4) The determination of Tukhum and Shara Murun Fms. are the results of following the trail along the strata from Erden Obo to Ula Usu where are the type site of the two Fms. Therefore, I consider the age of Tukhum Fm. containing *Teihardia pretiosa* is to be of earliest Late Eocene.

5) Ulangochu Fm. is only confined in the beds containing *Embolotherium grangeri*. And Baron Sog Fm. containing *Embolotherium andrewsi*.

6) Osborn's "Upper White" (21—23 layers in Jiang) should be Houldjin Fm. containing *Indricotherium mongoliensis*, *Schizotherium* sp.. Hence the Ulangochu Fm. and Baron Sog Fm. have their thickness for the first time.

7) Because there is no fossil mammals found in Osborn's 'Basal Red' (Jiang's 1—4 layers) in the past, it is impossible to infer the age of it. So now, in the respect of the discovery of *Pastoralodon lacustris*, we can infer the age of it, i.e. Early Eocene.

### Systematic Description

#### Pantodonta Cope, 1873

#### Pastoralodontidae Chow and Qi, 1978

#### *Pastoralodon* Chow and Qi, 1978



*Pastoralodon lacustris* Chow and Qi, 1978

(Fig. 4)

**Material** V8806-1, a broken skull with P2/, P3/ and M1/. V8806-2, a broken dentary bone with a broken M/3.

**Age** Early Eocene (Bayan Ulan beds).

**Description and discussion** Skull: zygomatic process of maxilla can be seen at lateral view; palatine process of maxilla; a part of nasal conchae and a part of cerebral fossa preserved at ventral view; infraorbital foramen relatively big; an apparent sphenopalatine foramen at the outside of infraorbit foramen; posterior palatine canal small and a clear nasolacrimal canal at the inside of upper end of infraorbital foramen.

Teeth: (C1/, P1/, P2/ single root respectively)

P3/: (protocone broken), paracone and metacone combine together as one cusp which connects with parastyle and metastyle forming two wings of 'V'; hypocone shelf very wide forming a tongue-like spoon, the anterior edge of which almost attaching the protocone and the posterior edge almost attaching the basement of metastyle.

P4/: bigger in width and length, two wings of 'V' very clear; hypocone shelf still very strong, but relatively weaker than that of P3/.

M1/: much bigger than P4/; protocone prominent; preprotocrista and postprotocrista extend toward the anterior edge and posterior edge respectively forming anterior cingulum and posterior cingulum, but neither of them attach with paracone and metacone; not much distance between paracone and metacone. They connect with parastyle and metastyle forming a "W"-formed crest; hypocone shelf very large which semicircular in crown view; ectoflexus relatively shallow.

Dentary bone: the outside of anterior edge of ramus prominent forming a robust crest.

At present, Pastoralodontidae includes two genera: *Pastoralodon* and *Convallisodon*. The main differences between them are: 1) premolars: smaller in *Pastoralodon*, its hypocone shelf of P4/ not reach at the anterior edge; while the hypocone shelf of P4/ of *Convallisodon* reach at the anterior edge; 2) no protoconule on postprotocrista, but a clear protoconule on postprotocrista of *Convallisodon*; 3) shorter precentrocrista and postcentrocrista in *Pastoralodon*, especially the anterior crest and posterior crest of metastyle much shorter than that of *Convallisodon*. Besides these, the robust crest on the outside of the ramus of *Pastoralodon* not appears on the ramus of *Covallisodon*. According to the charaters mentioned above, it is no doubt that V8806 should be *Pastoralodon lacustris*.

*Pastoralodon lacustris* was found both in Nomogen beds and Bayan Ulan beds of Nomogen Formation. But in Nomogen beds there are usually celite nodules containing mammalian fossils. While mammalian fossils are rare and sparse in Bayan Ulan beds. Therefore the stratum containing V8806 might be from Bayan Ulan beds.