# SOME NEW FOSSIL REMAINS OF *CHILOTHERIUM* SP. FROM THE DHOK PATHAN FORMATION OF THE SIWALIKS

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## ABSTRACT

Three rhinoceros specimens from the Dhok Pathan Formation of the Middle Siwaliks of Pakistan are recovered and described in this paper. The specimens are well preserved, allowing for identification on morphological and metrical grounds as *Chilotherium* sp. The following investigation documents *Chilotherium* remains from the Dhok Pathan Formation and contributes to recent work on the Siwalik rhinoceroses.

**Key words:** Rhinoceros, Dhok Pathan, *Chilotherium*, Middle Siwaliks.

## INTRODUCTION

The Dhok Pathan Fauna mainly consists of Primates (Cercopithecidae, Pongidae), Rodentia (Spalacidae, Muridae, Hystricidae), Carnivora (Fissipedia, Viverridae, Ursidae, Canidae, Mustelidae, Hyaenidae, Felidae), Proboscidea, Artiodactyla (Suidae, Anthracotheriidae, Tragulidae, Cervidae, Giraffidae, Bovidae) and Perissodactyla (Rhinocerotidae: *Aceratherium perimense*, *A. lydekkeri*, *A. blanfordi*, *Rhinoceros planidens*, *R. iraraicus*, *Chilotherium intermedium*; Equidae) (Colbert, 1935; Raza *et al*., 1984; Barry *et al*., 2002; Khan, 2007).

Ringström (1924) established the genus *Chilotherium*, twelve species have been described, and 19 other species have been referred to this genus. He referred two species from Siwalik into the genus *Chilotherium*, i.e. *C. blanfordi* (Lydekker, 1884) and *C. fatehjangense*. Foster-Cooper (1934) changed *Aprotodon* smith-woodwardi, a new genus and species established by him in 1915, to *Chilotherium smith-woodwardi*. Heissig (1975) attributed *C. blanfordi* and *C. fatehjangense* to the genus *Aprotodon*. Recently, Qiu and Xie (1997) reassigned *C. smith-woodwardi* to its original name *A. smith-woodwardi*. Matthew (1929) revised *Rhinoceros sivalensis* var. *intermedius* described by Lydekker (1884) from Siwalik into *C. intermedium*, and Heissig (1975) placed the Siwalik *C. intermedium* in the new subgenus *Subchilotherium*. Heissig (1989) raised the subgenus *Subchilotherium* to the genus rank, so the species became *S. intermedium*. According to Heissig (1989), the mandibular symphysis of *Subchilotherium* is narrow, and different from the widely expanded one of *Chilotherium*. According to Deng (2006), there is no any real species of *Chilotherium* in the Siwalik faunas and consequently a comprehensive work in future is required to study the phylogeny of the Siwalik *Chilotherium*.

## MATERIALS AND METHODS

The described specimens were collected during field visits by students of the Zoology Department of the Punjab University, Lahore, Pakistan. The specimens were abbreviated PUPC (Punjab University Palaeontological Collection) and housed in the Palaeontology laboratory of the Zoology Department. The specimens are thoroughly and carefully washed, cleaned and prepared for study. Fine needles and brushes were used to remove sediments and broken parts were assembled by using various types of gums (resins) such as Araldite, Peligom, Magic stone, Elfy and Fixin.

The specimens are catalogued by year and serial catalogue number for that year, e.g., 2007/11. Measurements were taken in millimeters using Vernier calipers. Tooth cusp nomenclature follows that of Heissig (1969). Tooth length and breadth were measured at occlusal level. Paired measurements given for teeth are occlusal length and occlusal width.

## RESULTS AND DISCUSSION

**SYSTEMATIC PALAEONTOLOGY**
Family RHINOCEROTIDAE Owen, (1845)
Subfamily RHINOCEROTINAE Owen, (1845)
Tribe CHILOTHERIINI Qiu *et al*., (1987)
Genus *CHILOTHERIUM* Ringstrom (1924)
*CHILOTHERIUM* sp.
(Figs. 1-3; Table 1)

**Type species**: *Chilotherium anderssoni* Ringstrom.
**Type Specimen**: GSI C34, a second right upper molar.

**Diagnosis**: A chilotherium of medium size. Upper incisor absent; cheek teeth hypsodont; parastyle fold indistinct or lacking; protocone constricted, ectoloph greatly elongated, mandibular symphysis transversely expanded. Lower incisor directed up and downwardly, slight constriction of protocone. The trigonid is angularly V-shaped. On the lower molars the lingual and labial ungula are absent, the hypolophid reclines backward and the entoconid have a flat lingual margin.

**Distribution**: Lower to Middle Siwaliks.

**Material Referred from the Dhok Pathan Formation**: PUPC 29/99, lm2 (a left mandibular ramus with a broken molar); PUPC 84/106, lm3 (a left mandibular ramus with last molar); PUPC 02/109, lm3 (a mandibular ramus with partially erupted last molar).

**DESCRIPTION:** The collected specimens from the Dhok Pathan Formation include lower molars and mandibular sections. PUPC 29/99 is a broken 2nd lower molar with mandibular ramus. The specimen is too damage to include it for the metrical values. The roots of the first molar are preserved in the mandibular ramus. The paralophid of PUPC 29/99 is short and its anterior end extends lingually along the anterior crescentic valley. The metalophid is obliquely transverse with the constricted metaconid, and the hypolophid and entoconid are missing.

PUPC 84/106 is a mandibular fragment having a complete last molar and a posterior part of the second molar. An anterior part of the ascending ramus is also preserved. Being much worn, many details have vanished. The tooth is two-rooted; the roots are long, thick and turned posteriorly. The enamel is thick and wrinkled vertically. The occlusal outline is rectangular, longer than broad. No trace of cement is preserved. There is neither lingual nor labial cingulum, but posteriorly the ectolophid groove is marked on the top to the base of the crown. The worn paralophid is present but is crushed anteriorly. The hypolophid is oblique but transverse in occlusal view.

PUPC 02/109 is a partially erupted molar with a broken dentary. The dentary break is at the anterior boundary of the ascending ramus such that the molar is a last one of the left lower series. The enamel is thick and the molar is unworn. The paralophid is short, curved and complete whereas the metalophid is broken at the top because of long surface exposure. The anterior and posterior conids are not united at this stage. The metaconid is constricted whereas the entoconid is not erupted from the mandible. The molar has an incomplete trigonid and the metalophid is oblique in appearance.

**DISCUSSION:** Heissig (1989) considered the origin of *Chilotherium* in early middle Miocene of South Asia with the appearance *Subchilotherium* from the Lower Siwalik series. In Europe, the first appearance of *Chilotherium* is in Pentalophos (Greece) during the age of MN 11-12 (Heissig, 1999).

The dental characters of the rhinocerotid material from the Dhok Pathan Formation here are easily recognizable as typical of Aceratheriini (Heissig, 1989, 1999). The lower dentition follows the general rhinocerotid pattern with two contiguous crescents open lingually.

The material includes the lower dentition from the Dhok Pathan Formation of the Middle Siwaliks, characterized by V-shaped trigonid, absence of lingual and labial cingulum, the hypolophid reclines backward and the entoconid have a flat lingual margin. Measurements of all the specimens collected (Table 1) overlap those of previously studied specimens. All the morphological and metrical characters observed in the studied lower dentitions clearly identify the specimens as belonging to the genus *Chilotherium* and waiting for more material to identify it up to species.

**Table 1: Comparative measurements of the collected lower molars in millimeters. *Studied specimens.**

| Specimens | Position | | *C. intermedium* |
|---|---|---|---|
| *PUPC 84/106 | Lm3 | L | 44.7 |
| | | W | 28.0 |
| | | H | 12.3 |
| *PUPC 02/109 | Lm3 | L | 43.6 |
| | | W | --- |
| | | H | ---- |
| PUPC 87/113 | Lm3 | L | 45 |
| | | W | 26 |
| | | H | 34 |
| PUPC 07/144 | Lm3 | L | --- |
| | | W | 20 |
| | | H | 8.6 |
| PUPC 07/145 | Rm3 | L | 67 |
| | | W | 37.4 |
| | | H | 11 |
| PUPC 86/305 | Lm3 | L | 39.1 |
| | | W | 19.2 |
| | | H | --- |


**Fig. 1:** *Chilotherium intermedium*, PUPC 84/106, a left mandibular ramus with the last molar, (a) Occlusal view, (b) Lingual view and (c) Buccal view. Scale bar 10 mm.

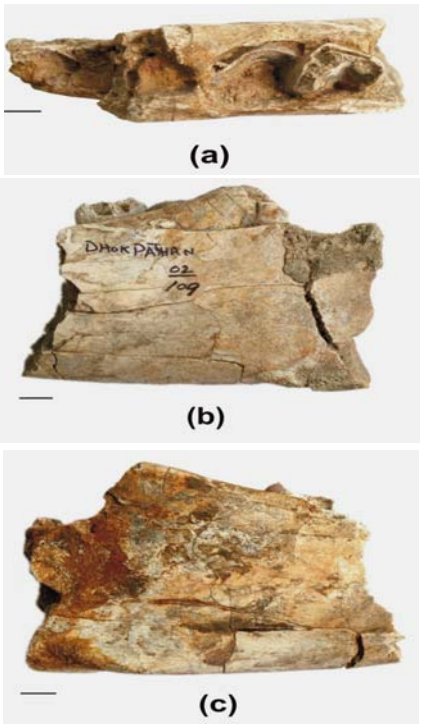


**Fig. 2:** *Chilotherium intermedium*, PUPC 02/109, a broken mandibular ramus having a partially erupted m3, (a) Occlusal view, (b) Lingual view, and (c) Buccal view. Scale bar 10 mm.

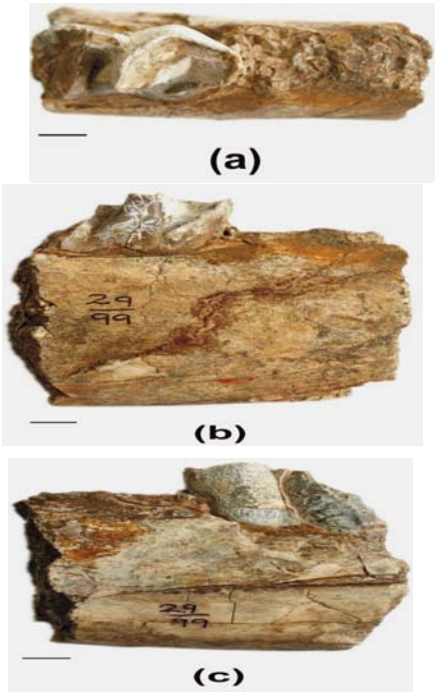


**Fig. 3:** *Chilotherium intermedium*, PUPC 29/99, a mandibular ramus having a broken molar, (a) Occlusal view, (b) Lingual view, and (c) Buccal view. Scale bar 10mm.

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