

ADDITIONAL FOSSILS OF *SIVALHIPPIUS THEOBALDI* (MAMMALIA, EQUIDAE) FROM THE MIDDLE SIWALIKS OF PAKISTAN

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ABSTRACT: New dental material is recovered from the Dhok Pathan type locality from the Siwaliks of northern Pakistan. The collection consists of isolated premolars and molars dental remains. The samples reflect the morphological features of *Sivalhippus theobaldi*, a hipparionine species of the Siwaliks. The study contributes new material for the Siwalik hipparionine, *Sivalhippus theobaldi*.

Keywords: Perrisodactyla, Hipparionine, Miocene, Pliocene, Siwaliks.

1.0 INTRODUCTION

The dental remains are recovered from the area located near the village Dhok Pathan (Lat. 33° 07' N: Long. 72° 14' E) and this area is in the type locality of Dhok Pathan Formation from Middle Siwaliks of Pakistan [1, 2, 3, 4, 5, 6]. The type locality of Dhok Pathan is situated at 65 km NE of the Chakwal city, Punjab, Pakistan (Fig. 1). The locality is characterized by the light colored sands with great amount of un-weathered igneous material. The lithology of the site studied is fine to medium grained sandstone in size and its color is light grey, gleaming white and reddish brown. But claystone colour is orange red to chocolate brown and lithologically it is hard and compact [3]. The unit is overlain conformably by the Soan Formation [7]. Dhok Pathan Formation range in age from late Miocene - early Pliocene [3, 8].

The fossils material was collected during the field tour which is arranged by Zoology Department, University of the Punjab, Lahore. The specimen were cleaned, prepared and cataloged for further systematic palaeontology. The metric variations of dental material are checked by vernier caliper in millimeters. The *Hipparion* and the mammalian fauna of the Siwaliks from the late Miocene have wide habitat range of woodland to extreme steppes [9, 10, 1, 2, 4]. The early equines has limited habitat but *Hipparion* depicts wide habitat range showing habits of mix feeding, browsing and grazing and they were hypsodont genus. [11, 12]. The aim of the paper is to describe the additional material of the Siwalik hipparionine.

2.0 SYSTEMIC PALAEOLOGY

Superfamily EQUOIDEA Hay, 1902

Family EQUIDAE Gray, 1821

Subfamily EQUINAE Steinmann and Doderlein, 1890

Genus SIVALHIPPIUS (Lydekker 1877)

***Sivalhippus theobaldi* (Lydekker 1877)**

New material: PUPC 09/98, rP2; PUPC 11/136, right maxillary fragment with P2-3; PUPC 11/139, rP3; PUPC 13/379, rP3; PUPC 13/378, rM2; PUPC 13/380, IM2.

Description: The crown is plicated. The premolars are large sized (Fig. 2). The traces of cementation are present in the teeth. The P2 is longer than P3. The anterostyle is prominent in P2 and placed anteriorly (Fig. 2). The protoconule is well developed and clearly visible in the teeth. The protocone is

elongated, isolated, sub ovate and is pillar like in shape. Posteriorly located hypoconal groove is strongly developed. The metacone and paracone are clearly visible and almost equal in size. The styles are well preserved. The prefossette and postfossette are furnished with plications. The pre-fossette is more complicated and highly plicated than post-fossette. The pre-fossette is smaller than post-fossette. The post-fossette represents average 6 plications. The pli-caballin is bifid.

3.0 COMPARISON

Comparative studied of the specimens with enamel plication and loph match to the family Equidae. The specimens were favored to be placed in tribe Hipparionini and excluded from the genus *Equus* on the basis of isolated protocone. These hipparionine horses which have isolated protocone on maxillary premolars and molars and tridactyl feet include these genera: *Cormohipparion*, *Neohipparion*, *Hippotherium*, *Cremohipparion*, *Eurygnathohippus*, *Proboscidipparion*, *Plesiohipparion*, *Hipparion* and *Sivalhippus* [13].

The Siwalik hipparionine *Sivalhippus* and *Cremohipparion* show size variation [14, 15, 4, 12, 13]. High frequency of plications in fossettes and bifid (in some teeth trifold) pli caballin are the major characteristics of the *Sivalhippus*. *Cremohipparion* represents simple plication frequency, single pli caballin, small size and somewhat rounded, oval shaped protocone [13]. *Sivalhippus* represents compressed protocone, which is strongly flattened lingually. The fossettes walls are thin in *Cremohipparion* and thick in *Sivalhippus* [14, 13]. Morphometrically (Fig. 2; Table 1), the specimens are much close to *Sivalhippus* and the species *Sivalhippus theobaldi*.

4.0 DISCUSSION AND CONCLUSIONS

The first migration of Hipparionini from North America recorded in the Siwalik Nagri Formation at about 10 Ma [16, 3]. The Siwalik hipparionine group was represented by *Sivalhippus nagriensis*, *S. theobaldi*, *S. perimensis*, *Cremohipparion antilopinum* and *Hipparion* sp. [17, 18, 13, 6]. *Sivalhippus nagriensis* (*Hipparion nagriensis* of Hussain (1971) was noted an advanced species, migrated during the start of the Nagri Formation (ca 10.7 Ma) and radiated into local *Sivalhippus* and *Cremohipparion* taxa [17, 18, 19, 13].

Sivalhippus theobaldi have been identified from the type locality of Dhok Pathan Formation from northern Pakistan. In accord with the associated fauna of the type

Table 1: The comparative measurements (mm) of *Sivalhippus theobaldi*. Referred material is taken from [14, 9, 20, 21] * the studied specimens.

Inventory number	Specimens	Width (mm)	Length (mm)	W/L
PUPC 09/98*	P2	36.65	35.69	1.03
PUPC 11/136*	P2	33.96	22.75	1.49
PUPC 11/136*	P3	25.21	25.33	1.00
PUPC 11/139*	P3	34.84	24.35	1.43
PUPC 13/378*	M2	26.7	24.9	1.07
PUPC 13/379*	P3	34.85	22.5	1.55
PUPC 13/380*	M2	28.9	23.75	1.22
PC-GCUF 09/37	M1	22	26	0.85
PUPC 2000/99	M1	26	23	1.13
PUPC 2000/99	M1	14.5	22	0.66
GCS 07/19	M1	21.8	21.4	1.02
GCS 07/23	M1	19.8	22.8	0.87
GCS 07/57	M1	11.9	19.7	0.60
AMNH 19723	M1	23	23	1.00
AMNH 19752	M1	23	23.5	0.98
AMNH 19676	M1	24	23	1.04
AMNH 19492	M1	22	20	1.10
AMNH 19855	M1	15	24.5	0.61
BMNH M 2647	M1	21.5	19.7	1.09
PC- GCUF 09/38	M2	22.3	25.4	0.88
PC- GCUF 09/40	M2	24	24	1.00
PC- GCUF 09/41	M2	23	22	1.05
PUPC 2000/99	M2	26	24	1.08
PUPC 2000/99	M2	15	22	0.68
GCS 07/21	M2	19.95	20.8	0.96
GCS 07/57	M2	11.6	18.75	0.62
AMNH 19723	M2	22.5	22.5	1.00
AMNH 19752	M2	22	23	0.96
AMNH 19676	M2	22	21	1.05
AMNH 19492	M2	21.5	20	1.08
AMNH 19855	M2	14	25	0.56
BMNH M 2647	M2	19.8	21.3	0.93
PC-GCUF 9/39	P2	32.2	25	1.29
PUPC 83/284	P2	39.5	21.5	1.84
PUPC 83/498	P2	40	40	1.00
GSI C 153	P2	38.5	38.5	1.00
AMNH 19857	P2	32	32	1.00
AMNH 19466	P2	38.5	26	1.48
PC-GCUF 09/36	P3	25	25	1.00
AMNH 19858	P3	21	25	0.84
AMNH 198567	P3	26.5	26	1.02

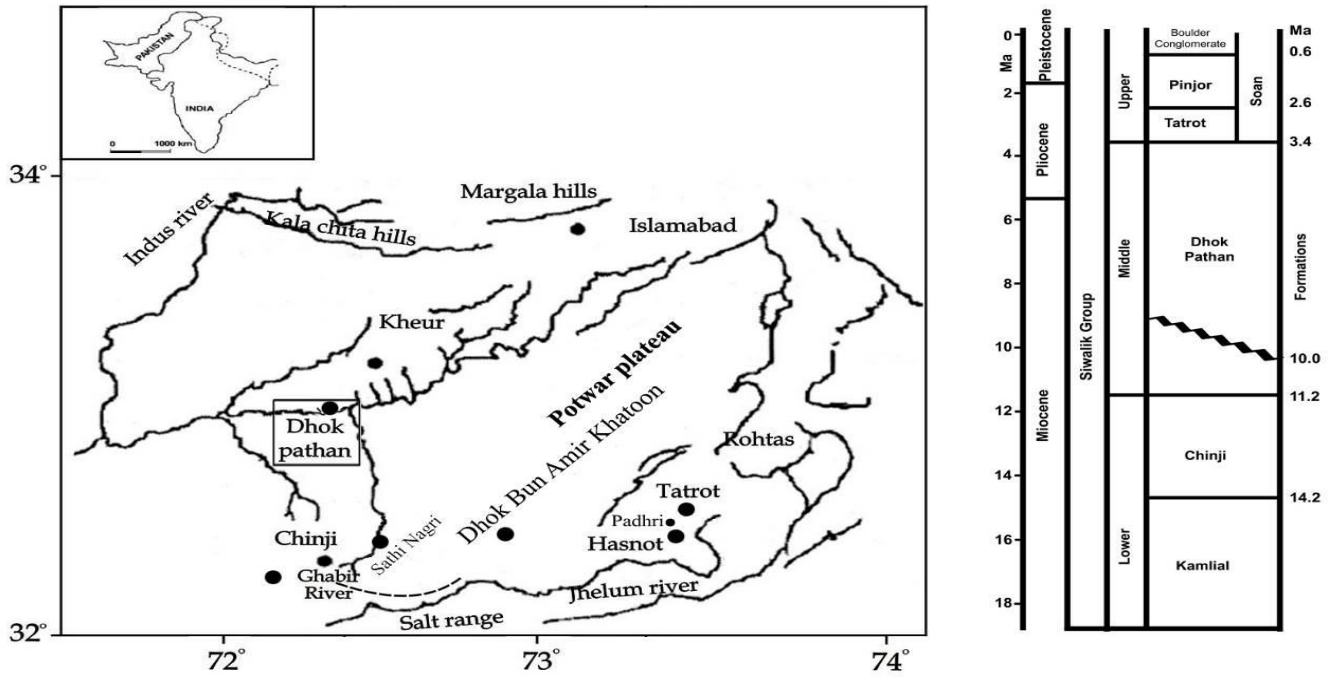


Fig.1. Map of Potwar Plateau showing the Dhok Pathan type locality (enboxed).

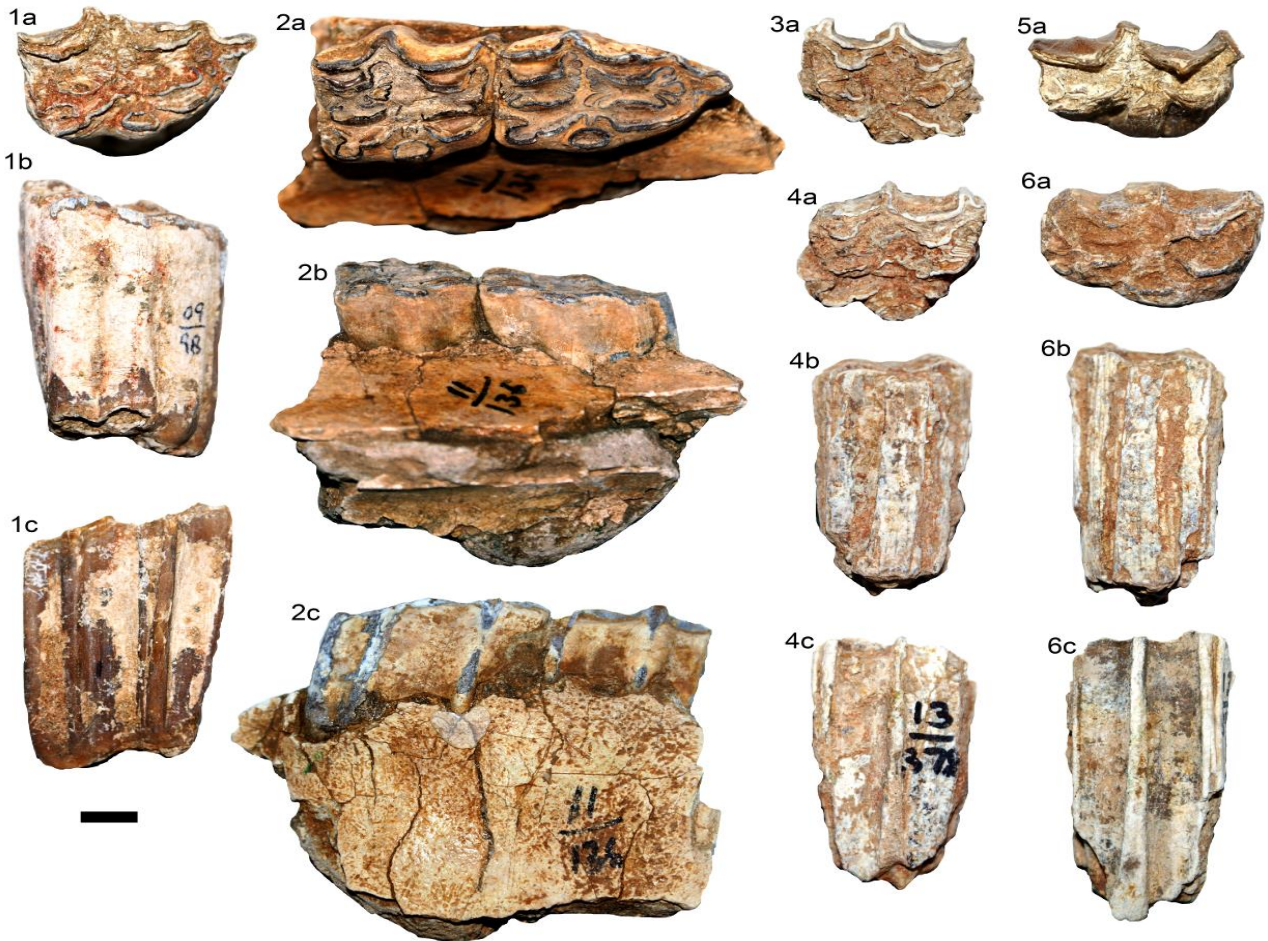


Fig.2. Studied specimen of *Sivalhippus theobaldi*. 1. PUPC 09/98, right P2; 2. PUPC 11/136, right maxillary fragment with P2-3; 3. PUPC 11/139, right P3; 4. PUPC 13/379, right P3; 5. PUPC 13/378, right P3; 6. PUPC 13/380, left M2. Views: a, Occlusal; b, Lingual; c, Labial. Scale bar 10 mm.

Locality, particularly with the bowed taxa *Pachyportax*, *Selenoportax* and *Gazella* [9, 10, 1, 2, 4] the drier and vast open habitat are depicted by the occurrence of hipparionine horses these hipparionine taxa lives in comparatively more and more open environments.

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