

## SOME NEW REMAINS OF *HIPPARION* FROM THE DHOK PATHAN TYPE LOCALITY, PAKISTAN

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### ABSTRACT

Dental material attributed to *H. antilopinum* from the Upper Miocene of the Dhok Pathan village near Dhok Kundrali is described and discussed. Preserved features of the dentition permit to assign *H. antilopinum* for the specimens. *H. antilopinum* is found abundantly in the Middle Siwaliks and considered as one of the faunal members of the Siwalik Late Miocene sediments.

**Keywords:** *Hipparion*, Dhok Pathan, Middle Siwaliks, Late Miocene, *H. antilopinum*.

### INTRODUCTION

The fossil equids (Equidae and Perissodactyla) are very well known and abundant in the Siwaliks. They are represented only by two genera (1) *Hipparion*, and (2) *Equus*. The genus *Equus* is restricted to the Middle and Upper parts of the Upper Siwaliks (Falconer and Cautley, 1849; Nanda, 1978; Barry *et al.*, 1982; Hussain *et al.*, 1992; Ghaffar, 2005) and *Hyperion* (three toed horses) is abundant in the Middle Siwaliks (Hussain, 1971; Skinner and McFadden, 1977; McFadden and Bakr, 1979; Bernor and Hussain, 1985). The Siwalik hipparions have had a long history of study and a topic of numerous publications (Falconer and Cautley, 1849; Lydkker, 1877, 1882, 1886; Pilgrim, 1910, 1913; Matthew, 1929; Colbert, 1935; Sen *et al.*, 1997).

The village Dhok Pathan (lat. 33° 07, N: long. 72° 14, E) is situated in the district Chakwal of Punjab province and is of late Miocene in age (Barry *et al.*, 2002; Khan *et al.*, 2008). It is the type locality of the Dhok Pathan Formation. The Dhok Pathan Formation is composed of sandstone with alternate clay and minor layers of conglomerate is lower part and more conglomerates with sandstone and clay in the upper part. The clays are orange brown in colour. The Dhok Pathan Formation exhibits excellent development of cyclic deposition of shale and sandstone. At few places, crevasse-splay sheets, around 30 cm thick, clast-supported conglomerates occur. The conglomerate beds often contain unidentifiable bone and tooth fragments. Sandstone beds gradually get thicker as well as multistoried (Barry *et al.*, 2002). The thickness of this area is from 950-1200 m. The substantially thicker, vertically stacked and laterally extensive individual gray sandstone units form a fining-upward sequence with thinner dull red to brown siltstone on the top. Varicolored, mottled, highly bioturbated paleosol horizon

from distinct and lateral extensive units within the siltstone or at the transition of the sandstone to siltstone facies (Badgley and Behrensmeier, 1980).

The new material is housed in the Laboratory of Paleontology of the Zoology Department, Government College of Science, Wahdat Road, Lahore. The catalogue number of the GCS specimens consists of series i.e., yearly catalogued number and serial catalogued number, so figures of the specimen represent the collection year (numerator) and serial number (denominator) of that year (e.g. 07/21). GCS is an institutional abbreviation of Government College of Science. The material is compared with the Palaeontological Collection of Punjab University (institutional abbreviation PUPC). Measurements are taken in millimeters (mm). Superscript is for upper dentition and subscript is for lower dentition.

### SYSTEMATICS

Family EQUIDAE, (Gray, 1821)

Subfamily EQUINAE Steinmann and (Doderlein, 1890)

Genus *Hipparion* (Christol, 1832)

*H. antilopinum* (Falconer and Cautley, 1849)

Plate 1, Figs. 1-4; Table 1

**Diagnosis:** An average sized *Hipparion* characterized by small hypsodont teeth, oval-sub oval shaped protocone, complicated enamel plications of upper molar, distance between plicabalin and protocone is more than the *H. theobaldi*, fossa probably small with small dorsoventral height, plicabillin usually hypoglyph moderately deep incised, short snout and slender metapodials.

**Referred Material:** GCS 07/33 – right upper second premolar (P<sup>2</sup>); GCS 07/19 – right upper first molar (M<sup>1</sup>); GCS 07/23 – right upper first molar (M<sup>1</sup>); GCS 07/21 – right upper second molar (M<sup>2</sup>); GCS 07/57 – mandibular fragment of left side having P<sub>4</sub>-M<sub>1-3</sub>.

**Locality:** Dhok Pathan, Chakwal district, Punjab, Pakistan.

### DESCRIPTION

GCS 07/33 (Plate 1, fig. 1 a-c) is an excellent state of preservation and unworn. A thick layer of cement is present on the lingual as well as on the buccal sides. The enamel is moderately thick. P2 is almost triangular with a characteristically well-developed anterostyle. The parastyle is moderately developed. The metastyle is very straight and weak. The hypostyle is very weak and not prominent like other styles. The ectostyle are broad anteriorly. The mesostyle is also pillar like structure and similar to parastyle in their general appearance. All the major cusps are well developed and preserved. The protocone is an isolated compressed pillar and elongated in shape. It is covered with a thick layer of cement except at the anterior end. Its inner limb is straight, while the outer limb is convex. The paracone is greater in anteroposterior diameter than the other cones. The metacone is very similar to paracone in its outline. The hypocone is narrow and elongated with a thick layer of cement on its posterior side.

The prefossette and postfossette are richly plicated with the maximum enamel folding at the posterior border of prefossette and at the anterior border of postfossette. The protoloph and metaloph are crescentic in shape. The anterior wall of prefossette also shows deep narrow pliprotoloph. The plicaballin consists of two enamel folds nearly touching the inner border of protocone. The hypocone is not separated anteriorly from the metaloph, while posteriorly it is separated from metaloph by a moderately developed hypoconal groove. The inner part of prefossette and pliprefossette are also well developed, while in anterior border of postfossette, the plipostfossette and in posterior border of postfossette the plihypostyle are well developed. The premolar is broad than that of the molars.

GCS 07/19 (Plate 1, fig. 2 a-c) and GCS 07/23 are in an early wear. The molars are hypsodont and broad crowned with well-developed cusps. The molars are roughly quadrate in their general appearance. The protocone is elongated and oval in shape. It is completely isolated from the rest of crown like an isolated pillar in all teeth and is suboval in shape, covered with thick layer of cement on its lingual side. The paracone is moderately deep and ambulatory at the mesostyle and the parastyle. The metacone is broad and lightly compressed. The hypocone is broad and elongated with well-developed hypoconal groove. The parastyle is well-preserved and prominent indicating pillar like appearance. The mesostyle is also well developed, V-shaped and pillar like. It is broad at the base, while narrow at the apex. The mesostyle is very weak and straight in its outline. The hypostyle is well developed and U-shaped.

The prefossette and postfossette are richly plicated with maximum enamel folding on posterior wall of prefossette and on anterior wall of postfossette. The protoloph and the metaloph are crescent shaped. The plicaballin consists of two enamel folds that are nearly touching the inner border of protocone. The enamel pattern is most complex on the posterior wall of the prefossette and on the anterior wall of the postfossette. GCS 07/21 (Plate 1, fig. 3 a-c) is in a good state of preservation, unworn and shows the above mentioned characteristic features of the molars.

GCS 07/57 (Plate 1, fig. 4 a-c) belongs to lower dentition, in middle wear comprising a fourth premolar and three molars. All the major conids are well developed and prominent. The outer conids are broad than that of the inner ones. The buccal conids are broad in the middle and narrow anteroposteriorly. The anteroposterior diameter of the hypoconid is greater than that of the protoconid. The metaconid is roughly triangular with an opening towards the centre of the tooth. The entoconid is also similar to the metaconid in its outline. The hypoconid is the largest conid among all. The lingual conids are slightly vertically higher than that of buccal conids.

The stylids are also well preserved and prominent. The parastyloid is the anterior extension of the protoconid. The protostyloid is compressed pillar like structure and is broken. The ectostyloid is absent. The ptychostyloid is fold like structure present at the mesial border of hypoconid. The mesostyloid is more prominent among the stylids. It is joined with the metaconid by a narrow isthmus. The entostyloid is also not clear because of thick layer of cement. The hypoconulid is the posteroexternal plication of hypoconid and the entoconid. On the lingual side there are two prominent internal depressions, the metaflexid anteriorly and entoflexid posteriorly. The metaflexid or anterior internal depression is broad in the middle and narrow anteroposteriorly in it. The entoflexid is elongated. It is narrow in the middle and broad anteroposteriorly. It is curved anteriorly and lingually. The talonid is a special character only present in the M<sub>3</sub>. It is also very similar to other conids. It is narrow at the apex and broad at the base. The comparative measurements of the cheek teeth are provided in table 1.

### DISCUSSION

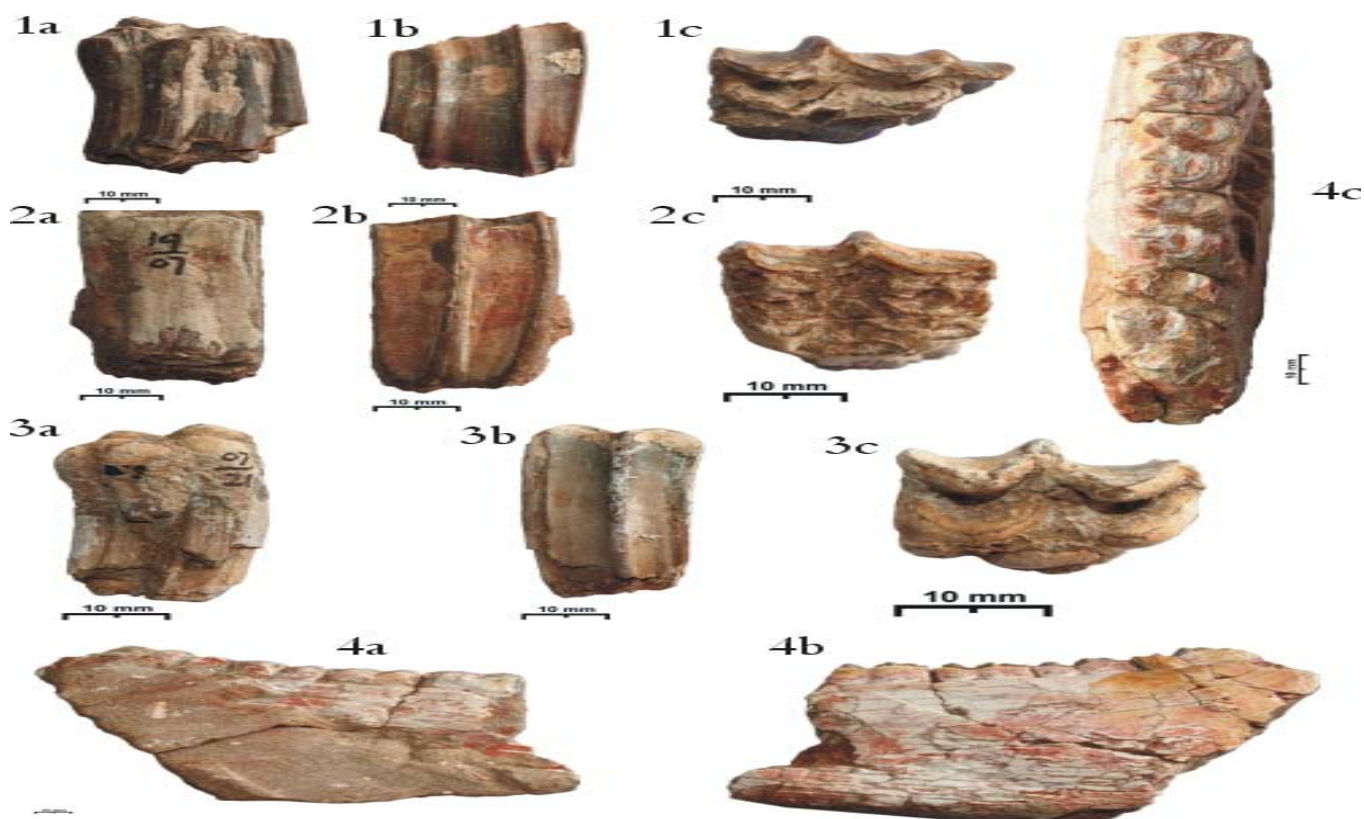
The occlusal pattern of the studied specimens differs in many respects from *H. nagriensis* and *H. theobaldi*. *H. theobaldi* is a large sized *Hipparion* and has a comparatively more compressed protocone but has less plications in plicabalin. In these species the fossettes are moderately plicated whereas these are well plicated in *H. antilopinum*. Lower dentition has typical *Hipparion* characters but it is not reliable feature to discriminate

them as species level. The dental pattern of the studied specimens is closely compared to the referred material of *H. antilopinum*. Morpho-metrically, the specimens show resemblance to the referred specimens of *H. antilopinum*

(Hussain, 1971; Ghaffar, 2005). The Dhok Pathan upper and lower cheek teeth morphologically are similar to *H. antilopinum* and refers the studied specimens taxonomically *H. antilopinum*.

**Table 1. Comparative measurements of the studied *Hipparion* cheek teeth. Referred material is taken from Ghaffar (2005).**

Specimens	Length	Height	Width
GCS 07/33 P <sup>2</sup>	27.8	49.6	19.4
GCS 07/19 M <sup>1</sup>	21.4	55.7	21.8
GCS 07/21 M <sup>2</sup>	20.8	52.6	19.95
GCS 07/23 M <sup>1</sup>	22.8	52.9	19.8
PUPC 2000/99 P <sup>2</sup>	36	-	23
PUPC 2000/99 M <sup>1</sup>	23	-	26
PUPC 2000/99 M <sup>2</sup>	24	-	26
GCS 07/57 P <sub>4</sub>	22.05	13.8	19
GCS 07/57 M <sub>1</sub>	19.7	12.9	11.9
GCS 07/57 M <sub>2</sub>	18.75	15	11.6
GCS 07/57 M <sub>3</sub>	29.9	16	12.9
PUPC 2000/99 P <sub>4</sub>	22.5	-	16
PUPC 2000/99 M <sub>1</sub>	22	-	14.5
PUPC 2000/99 M <sub>2</sub>	22	-	15
PUPC 2000/99 M <sub>3</sub>	28.5	-	14



**Plate 1. *Hipparion antilopinum*:** 1. GCS 07/33 - an isolated right upper second premolar; a = lingual view, b = buccal view, c = occlusal view. 2. GCS 07/19 - an isolated right upper first molar; a = lingual view, b = buccal view, c = occlusal view. 3. GCS 07/21 - an isolated right upper second molar; a = lingual view, b = buccal view, c = occlusal view. 4. GCS 07/57 - a mandibular fragment of left side having p4- m1-3; a = lingual view, b = buccal view, c = occlusal view. Scale bar 10 mm.

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