MORPHOLOGICAL STUDY OF UPPER DENTITION OF TERTIARY *HIPPARION*

Mahboob Iqbal, Abdul Qayyum Khan Sulehria, Farina Naz and Muhammad Fiaz Qamar
Department of Zoology, Government College of Science Wahdat Road Lahore
Department of Zoology, G. C. University, Lahore
Email: dr.fiazqamar@gcu.edu.pk

ABSTRACT: Hipparion species were collected, described and figured in the current research work. The specimens had been collected from the Tertiary hills of village Dhok Pathan of the Middle Siwalik subgroup and comprise three isolated upper premolars and molars. The genus is well known in the Tertiary of the Siwalik Hills of North India, Kashmir and West Pakistan. The specimen GCS07/34 had lost its morphological details however, others were completely preserved. The cheek teeth were longer and fairly hypsodont. They were quadrate in appearance. The protocone was very elongated somewhat flattened but round to oval in shape, and hypoconal groove was prominent in the studied specimens, which is the characteristics of Siwalik Hipparion. On the basis of sharp comparisons and similarities with previously described specimen of Hipparion the present material was ascribed to the genus Hipparion and the species anlilopinum.

KEY WORDS: Goiter, risk factors, prevalence, iodine deficiency.

INTRODUCTION

The genus *Hipparion* was erected by Christol (1832) *which* evolved from Merychippus Leidy (1847)[19] in the Miocene in the North America and afterward the genus spread over to Asia, Europe and Africa, while the genus *Equus* evolved from Dinohippus Linnaeus (1758) [20]. During 19th century Leidy described the remains of extinct Equus from near Natchez, Mississippi [19]. In 1857 the three-toed horse genus Merychippus was based on specimens collected by the Hayden Survey from the Bijou Hills in South Dakota. *Hipparion* horses were with isolated protocones in upper cheek teeth and tridactyle feet of Miocene and Pliocene, while the *Equus* is single toed, straight teeth of early Pliestocene times both in New and Old world [1,2,3].

The oldest occurrence of Siwalik *Hipparion* was from Nagri, Ca 9.5 Ma while oldest occurrence of *Equus* was from Hasnot, Ca 2.48 Ma that is the oldest occurrence of *Equus* in southern Asia [4, 5].

Siwalik Hipparionines have had a long history of study. Owen (1846) [6] was the first to describe siwalik *hipparions,* in the British Museum sent by cautley. Subsequently, several 19th century workers studied Siwalik *Hipparions* with little agreements of their evolutionary ralationships [1]. Lydekker wrote a number of short communications on Siwalik *Hipparions* and in 1882 finally complete his work recognizing two species of Siwalik *Hipparions* as *Hipparion antilopinum* and *Hipparion theobaldi*.

This two fold systematic scheme essentially maintained by most of investigation even though their systematic and evolutionary relationships remained obscure [2,3,7]. Hussain [4] made the first contemporary revision of Siwalik *Hipparions*. He suggested that *Hipparion* first appeared in the Siwaliks by a single migration record in lithologic boundary of Nagri formation and subsequently underwent autoethonous evolution. He recognized three species of Siwalik *Hipparion*; i) *H. nagriensis*, ii*) H. theobaldi*, iii) *H. antilopinum.*

Lockhart material was later implicity by Gaudry [8] to *Hipparion antilopinum* and by Lyedekker [11,12] to *Hipparion theobaldi*. The *Hipotherium antilopinum* was first introduced by Falconer and cautley, (1849) [9] and then after by Gaudry (1862) [10], and Lydekker (1882, 1883, 1884) [11,12,13] . Lydekker (1885) included this species from the genus *Hipotherium* to *Hipparion* [14]. This convention has been followed by most subsequent authors, as Lydekker, (1886) [15,2,3], Gromov, (1952), [4] , MacFadden and Woodburne, (1982) [16], Bernor and Hussain, (1985) [17]. Simson *et al,* (1971) described the early appearance of *Hipparion*, a tridactyl fossil equid in the Tertiary of the Siwaliks Hills [18].

MATERIALS AND METHODS

Fossils were collected at first from each locality without discrimination. The identifiable fossils were selected from the gross collection, numbered, registered and preserved for the taxonomic study. Some of the specimens were not in prepared conditions. These were thoroughly and carefully washed, cleaned and prepare for the study. Fine needles and brushes were used to remove sediments. Broken parts were assembled using various types of gums such as Araldite, Peligon and Alphy. Various measurements of the specimens were made with the help of metric Vernier Calippers. The photographs of the specimens were taken with the help of camera using additional lenses. The specimens under study have catalogue e.g. GCS 07/27, 07/12, the upper figure denotes the collection year and the lower one the serial of the respective year. All measurements are in millimeters.

Abbreviation:

AMNH-American Museum of Natural History, BMNH: British Museum of Natural History, Ma- Million years ago, mm- Millimeter, GCS- Government College of science, PUPC-Punjab University Paleontology Collection, W-Maximum preserved crown width.

Systematic Paleontology:

Class	MAMMALIA Linnaeus, 1758
Subclass	THERIA Parker and Haswell, 1897
Infraclass	EUTHERIA Gill, 1872
Order	PERISODACTYLA Owen, 1848
Suborder	HIPPOMORPHA Wood, 1937
Superfamily	EQUOIDEA Hay, 1821

Family EQUIDAE Gray, 1821
Subfamily EQUINAE Steinmann and Doderlein, 1890
Genus *Hipparion* Chirstol, 1832 *Hipparion* sp
(Figs. 1-4, Table 1)

Type species: *Hipparion antilopinum*

Type Specimens: GCS 07/27, Right upper second premolar, GCS 07/12, Right upper first molar, GCS 07/26, Right upper first molar, GCS 07/34, Right upper third molar of *Hipparion antilopinum*.

DIAGNOSIS:

An average sized *hipparion* characterized by small hypsodont teeth, oval protocone complicated, complicated enamel plications of upper molar, fossa probably small with dorsoventral height, plicabillin usually hypoglyph moderately deep incised, short snout and slender metapodials.

DESCRIPTION AND DISCUSSION

Description:

The GCS 07/27 second right upper premolar is excellently preserved and unworn. A piece of palate is also preserved with the premolar. A thick layer of cement is present on the lingual as well as on the buccal sides. The enamel is moderately thick. P^2 is almost triangular with a well-developed anterostyle. The anterostyle is well marked and much prominent in P2. The parastyle is moderately developed. The metastyle is very straight and weak. The mesostyle is a pillar like structure. The hypostyle is very weak and not prominent. The ectostyles are broad.

All major cusps are well developed and preserved. The protocone is an isolated compressed pillar and elongated in shape. It is covered with thick layer of cement except at the anterior end. 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. The prefossete and postfossete are also present

DESCRIPTION AND DISCUSSION

Description:

The GCS 07/27 second right upper premolar is excellently preserved and unworn. A piece of palate is also preserved with the premolar. A thick layer of cement is present on the lingual as well as on the buccal sides. The enamel is moderately thick. P^2 is almost triangular with a well-developed anterostyle. The anterostyle is well marked and much prominent in P2. The parastyle is moderately developed. The metastyle is very straight and weak. The mesostyle is a pillar like structure. The hypostyle is very weak and not prominent. The ectostyles are broad.

All major cusps are well developed and preserved. The protocone is an isolated compressed pillar and elongated in shape. It is covered with thick layer of cement except at the anterior end. 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. The prefossete and postfossete are also present

The GCS 07/12 right upper first molar. The molar is in a good state of preservation. The enamel is moderately thick. A thick layer of cement is present between the styles and also covers the lingual sides. Thin layer of cement is present in hypoconal groove. The molars are hypsodont and broad crowned with well-developed cusps. It is roughly quadrate in their general appearance. The protocone is elongated and oval in shaped. The paracone is moderately deep. The metacone is broad and lightly compressed. The hypocone is broad and elongated with well-developed hypoconal groove but not prominent.

The parastyle is well preserved and prominent having a pillar like appearance. The mesostyle is present but broken. The hypostyle is well-developed and U-shaped. The prefossette and postfossette are richly plicated with enamel folding on posterior wall of prefossette and on anterior wall of postfossette. The prefossette is damaged.The protoloph and metaloph are crescent shaped. The pli-caballin is damaged. The protoconule is present covered with enamel but not prominent.

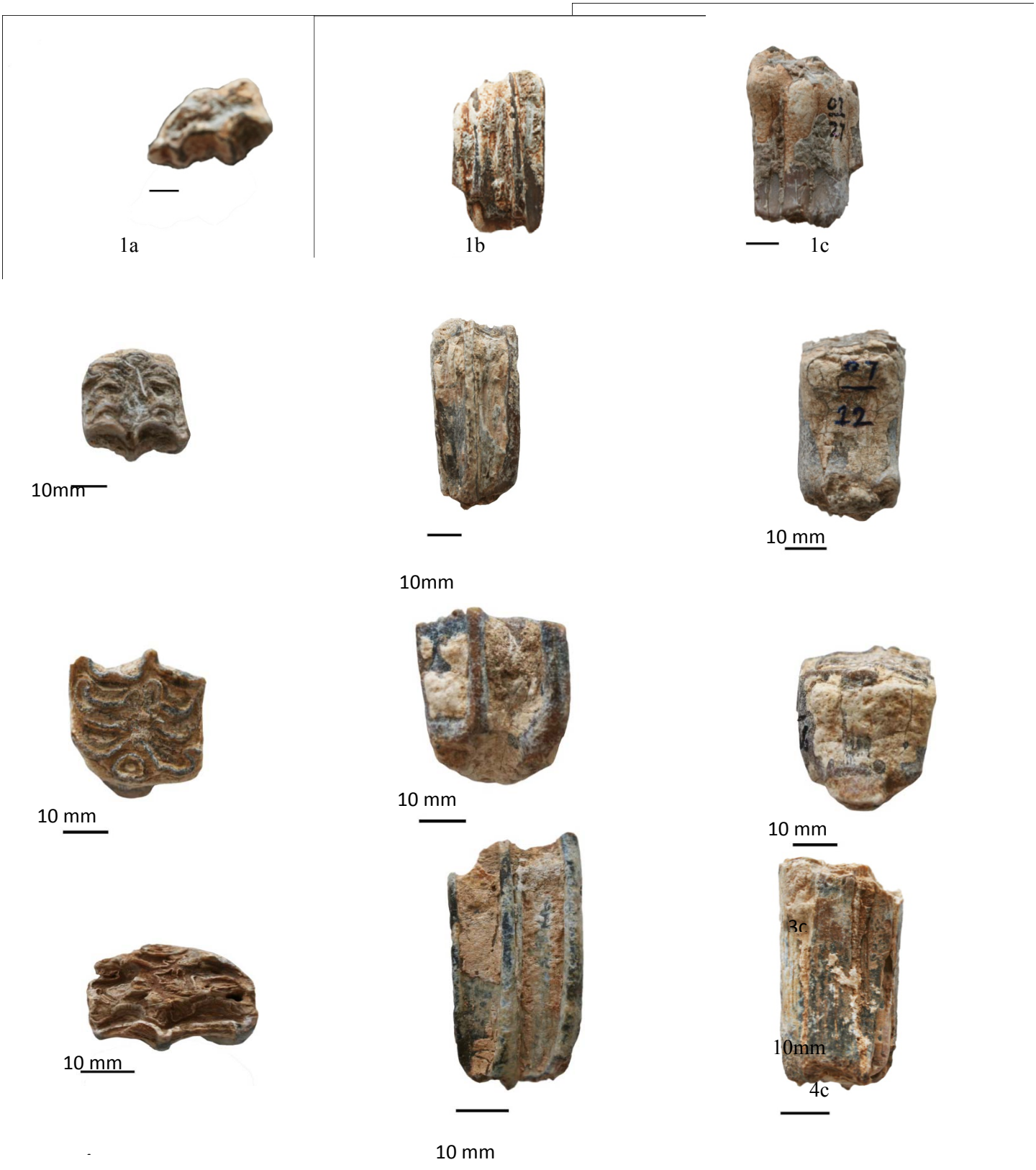
The GCS 07/26 is the right upper first molar. The molar is in a good state of preservation. The enamel is moderately thick. A thick layer of cement is present between the styles and also covers the lingual sides. Thin layer of cement is present in hypoconal groove. The molars are hypsodont and broad crowned with well-developed cusps. It is roughly quadrate in their general appearance. The protocone is elongated and oval in shaped. The paracone is moderately deep. The metacone is broad and lightly compressed. The hypocone is broad and elongated with well-developed hypoconal groove but not prominent.

The parastyle is well preserved and prominent having a pillar like appearance. The mesostyle is present but broken. The hypostyle is well-developed and U-shaped. The prefossette and postfossette are richly plicated with enamel folding on posterior wall of prefossette and on anterior wall of postfossette. The prefossette is damaged.The protoloph and metaloph are crescent shaped. The pli-caballin is damaged. The protoconule is present covered with enamel but not prominent.

The GCS 07/34 is the right upper third molar. The enamel is moderately thick. A thick layer of cement is present between the styles and also covers the lingual sides. The molars are hypsodont and broad crowned with well-developed cusps. It is roughly quadrate in general appearance.

The protocone is elongated and oval in shape. The metacone is broken and the paracone is not prominent. The hypocone is broken. The parastyle is well preserved and prominent indicating pillar like appearance. The mesostyle is present v-shaped but not clear. The metastyle is broken. The perfossett and postfossette are damaged. The protoloph and metaloph are not present. The pli-caballin is also damaged.

Figs.



Figs: 1-4 *Hipparion antilopinum* 1.GCS 07/27, 2.GCS 07/12, 3.GCS 07/26, 4.GCS 07/34 a= Occlusal view, b= Buccal view, c= Lingual view

Table 1: Comparative measurement of *Hipparion antilopinum* (in mm)

Specimen studied	*H. antilopinum* measurement (Present Collection)		*H. antilopinum* Measurement taken from PUPC 2000/99	*H. antilopinum* measurement taken from thesis GCS,LHR	* BMNH
GCS 07/27 P^2	L	30.2	-	27.8	30.1
	W	19.5	-	19.4	19.9
GCS 07/12 M^1	L	20.9	23.00	21.4	19.7
	W	23.4	26.00	21.8	21.5
GCS 07/26 M^1	L	21.1	23.00	21.4	19.7
	W	21.4	26.00	21.8	21.5
GCS 07/34 M^3	L	21.8	24.00	-	21.3
	W	20.6	26.00	-	19.8

*BMNH Taken from Bernor & Hussain, 1985.

CONCLUSION:

Hipparion antilopinum was one of the most widely distributed hipparions species during the Middle Miocene of the Siwaliks. The *Hipparion antilopinum* differentiated from other *hipparions* by its small size, oval protocone. This appears to be abundant in the Dhok Pathan formation of the Siwaliks Hills.

REFERENCES:

[1] Falconer, H. and Cautley, P.T.,.Fauna Antiqua sivalensis. **1847.**

[2] Mathew, W. D., Critical observations upon Siwalik Mammals. *Am. Mils. Nat. Hist Bull.,* 56: 437-560. **1929**

[3] Colbert, E.H.,. Siwaliks mammals in American Museum of Natural History. *Trans. Amer. Phil. Soc.* n.s., **26:**1-401. **1935.**

[4] Hussain, S.T., Revision of Hipparion (Equidae, Mammalia) from the Siwalik Hills of Pakistan and India. *Bayerische Akademic der Wissenschaffen, Abhandlungen,* **147:** 1-68 **1971.**

[5] Barry, J. B. Lindsay, E. H. & Jacobs, L. L. A biostratigraphic zonation of the Middle and Upper Siwaliks of the Potwar Plateau of Northern Pakistan. Palaeogeography, Palaeoclimatology, Palaeoecology 37, 95-130. **1982.**

[6] Owen, R., History of British Fossil Mammals. London, 560 pp. **1846.**

[7] Nanda, A.C., Fossils equids from the upper Siwaliks subgroup of *Ambala, Haryana*. *Himalayan Geol.,* 8: 149-177. **1978.**

[8] Gaudry, A., Animaux fossils du Mont Luberon, Pairs: Savy, 180pp. **1873.**

[9] Falconer, H. AND CAUTLEY, P.T., Equidae, Camelidae and Sivatherium. Fauna Antigua Sivalensis, Part-9. **1849.**

[10] Gaudry, A., Animaux fossils et Geologie de I´ Attique, Paris, Savy. **1862.**

[11] Lydekker, R., Siwalik and Narbada Equidae. Paleontological. *Indica* (X), Part 3, 2**:** 67-98, pls. XI-XV. **1882.**

[12] Lydekker, R., Indian Tertiary and post- Tertiary Vertebrata Siwalik Selenodont Suina, etc. Memoirs of the Geological Survey of India, *Palaeontological Indica*, Series 10, **5:** 143-177. **1883a**

[13] Lydekker, R.,. Synopsis of the Fossil Vertebraya of India. *Rec. Geol. Surv. India*, **XVI:** 61-93 **1883b**

[14] Lydekker, R., Additional Siwalik Perissodactyla and Proboscida, *Memoirs of the Geological survey of India-Palaeontology Indica* 10, **3:** 1-31. **1884.**

[15] Lydekker, R., Catalogue of Fossil Mammalia in the British Museum. Part 3, London, 186 pp. **1886.**

[16] Macfadden, B.J. and Woodburne, M.O., Systematic of Neogene Siwalik hipparions (Mammalia, Equidae) based on cranial and dental. *J. Vert. Paleontol*., 2(2):185-218. **1982.**

[17] Bernor, R.L. and Hussain, S.T., An assessment of systematics Phylogenetic and biogeographic relationships of Siwalik Hipparionine Horses. J. P., **5(1):** 32-87. **1985.**

[18] Simson *et al.,* Pilbeam, D and Boyer, S. J., Nature, 229,408. **1971**.

[19] Leidy, J., On the fossil horse of America. *Proc. Acad. Nat. Sci*., **3:** 262-266. **1847**

[20] Linnaeus, C., Systema Naturae per Regnatria Naturae, Secundum classes, ordincs, Genera, species, cum characteribus, differentus synonymis, Locis, 10 ed. Stockholm. 1758.