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HEMIBOS (BOVINI, BOVIDAE, MAMMALIA) FROM THE PINJOR FORMATION OF PAKISTAN

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ABSTRACT

The dental material of *Hemibos* from the Plio-Pleistocene of the Pinjor Formation (2.6 – 0.6 Ma) in the Upper Siwaliks (Pakistan) is reported here. The new specimens consist of two fragmentary maxillae. The comparative morphological and matric study of *Hemibos* dental fossils provide interesting information about individual variation.

Key words: *Hemibos*, Bovine, Pinjor Formation, Upper Siwaliks, Plio-Pleistocene.

INTRODUCTION

Bovines (clade Bovini) are widespread group including extant wild and domesticated species such as the African Cape buffalo, the American bison, the Asian water buffalo, kouprey, banteng, gaur, anoa, and yak, as well as the progenitor of domesticated cattle, the auroch (Bibi, 2007) as well as extinct species such as *Bos namadicus*, *B. acutifrons*, *Leptobos falconeri*, *Proleptobos birmanicus*, *Hemibos* spp., *Bison* spp., *Bubalus* spp., *Bucapra daviesii* and *Proamphibos* spp. (Pilgrim, 1937, 1939; Hooijer, 1958; Nanda, 2008, Khan *et al*., 2009). Bovines display a suite of craniodental characters that has facilitated their identification in the archaeological and fossil records (Bibi, 2007).

Hemibos is a bovine of large size and direct descendent of *Proamphibos* (Pilgrim, 1939). The genus *Hemibos* is represented by four species, three of which (*H. acuticornis*, *H. triquetricornis*, and *H. antelopinus*) are found in the Late Pliocene and Early Pleistocene deposits of the Pinjor Formation (Upper Siwaliks) (Pilgrim, 1939; Nanda, 1979). The fourth species (*H. palaestinus*) is found in the Upper Pliocene of Gadera (Israel) (Pilgrim, 1941). *Hemibos* is characterized by elongated, and not prominent, frontals. The horn-cores have no neck at the base, and the angle between the horn-cores is variable, but normally it is between 85º and 110º. The orientation of the horn-cores is also interspecifically variable (Martinez-Navarro and Palombo, 2004). The teeth are hypsodont, with increasing development of cement; upper molars are quadrate having lobes antero-posteriorly compressed with inner folds of outer lobes very prominent; outer folds, ribs and median basal pillars are strong (Pilgrim, 1939).

The studied specimens show similarities to *Hemibos* and include maxillae collected in the Plio-Pleistocene sediments of the Kurla Sharif (33°04´30 N, 73°34´55 E), district Jhelum and Pir Jaffar (32°46´44 N, 74°05´01 E), district Gujrat from the Pinjor Formation of Pakistan (Fig. 1). The anatomy of the specimens confirms that it is a member of the genus *Hemibos*, the ancestor of the water buffalo *Bubalus.*

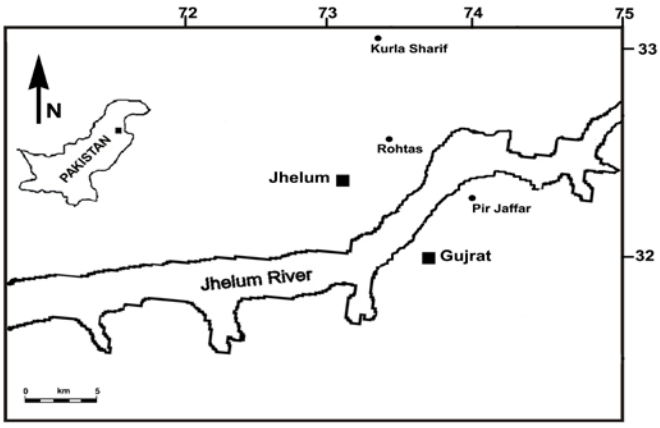

Figure 1. – Map showing the position of the localities in the district Jhelum and Gujrat, northern Pakistan.

Terminology, dental morphology, and taxonomy follow Pilgrim (1939) and Hooijer (1958). Measurements are given in mm and the upper case letter denotes upper dentition. The catalogue number of the specimens consists of series i.e., yearly catalogued number and serial catalogued number, so figures of the specimens represent the collection year (numerator) and serial number (denominator) of that year (e.g. 84/27). The material is housed in the Abu Bakr Fossil Display and Research Center, Zoology Department, University of the Punjab, Lahore, Pakistan.

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Abbreviation: PUPC – Punjab University Paleontological Collection, BMNH – British Museum of Natural History, M – Upper molar, P – Upper Premolar, Ma – Million Years Ago, mm – Millimeters.

SYSTEMATIC PALEONTOLOGY

BOVIDAE Gray (1821)
BOVINAE Gray (1821)
BOVINI Gray (1821)
HEMIBOS Rutimeyer (1865)

***Hemibos* sp.**
Plate 1, figs. 1-2; Table 1

Diagnosis. – *Hemibos* is characterized by elongated, and not prominent, frontals. Temporal lines are not strong crests and go almost parallel. The auditory bullae are well preserved, large and well inflated. The occipital condyles project clearly to the rear of the occiput. The horn-cores have no neck at the base, and the angle between the horn-cores is variable. Teeth are strongly hypsodont and selenodont. The cusps are strongly folded lingually, no cingulum and the basal pillars are present in the transverse valley (Pilgrim, 1939).

Referred Material. - PUPC 84/27, right maxillary ramus with P3-M3 collected from Kurla Sharif, district Jhelum; PUPC 92/146, left maxilla with P4-M3 collected from Pir Jaffar, district Gujrat, Punjab, Pakistan.
Age. **–** Late Pliocene to Early Pleistocene, ca 2.5-0.6 Ma (Dennell *et al*., 2006).

Description. - The upper molars are strongly hypsodont and selenodont (Plate 1, figs. 1-2). The enamel is thick and crenulated. Cingulum is absent. The central cavities are wide and moderately deep. A large spur (hypoconal spur) projects on the posterior side of the posterior central cavity. A small spur also projects on the anterior side of the anterior central cavity. The cusps are strongly folded on the lateral lobes and the entostyles are present between each lobe. The cement is well developed on the lingual as well as on the buccal side. The styles and ribs are strongly developed and prominent; the metastyle and the paracone rib prevail over them. The hypsodonty index can not be precisely assessed because all the preserved molars are in medium wear stage.

DISCUSSION AND CONCLUSION

All the teeth show the typical bovid features. They are large and hypsodont and follow the general pattern of *bovines.* The crown of the molars has wide central enamel islands, the second being infolded on the posterior side; the median accessory column on the inner side is large, with a contracted neck, cusps are blunt". The large size of the teeth (Table 1), the moderately thick and crenulated enamel, the well developed and transversely extended median basal pillar, the wide and moderately deep central cavities, and the presence of thick coat of cement clearly differentiate the studied specimens from other bovids and suggest the inclusion to Bovini. The upper molars are more quadrate and have fewer spurs into the central cavities make their exclusion to *Bubalus* (Pilgrim, 1939). Furthermore the studied molars are lower in the crown than in *Bubalus.* In *Proamphibos* the enamel is thinner, the folds on the outer side of the upper molars are more delicate, and the ribs in the centre of each lobe are weaker but wider than in *Hemibos* (Pilgrim, 1939).

The teeth are characterized by slightly rugose enamel, longer than broad (Table 1), with outer crescents moderately compressed antero-posteriorly, inner folds of outer lobes, in particular the median rib of the posterior lobe comparatively weak, basal pillars well developed, but not projecting beyond the inner base of the crown that make their inclusion to *Hemibos*. Morphometrically, the upper dentition from the Pinjor Formation of the Upper Siwaliks in Pakistan is assigned to as *Hemibos* sp. and is very similar to *H. triquetricornis* specimens (Table 1) recovered by Pilgrim (1939). The dimension (Table 1) and morphology (Plate 1, figs. 1-2) of the studied dentition indicate that it should be placed in *H. triquetricornis.* However, more material is required for the precise identification and subsequently the material is assigned to *Hemibos* sp.

The dimensions of the remains found at Kurla Sharif and Pir Jaffar as *Hemibos* sp. are large (Table 1). The proportion of the dental remains fit with the large individuals of *Hemibos* ever described in the Siwaliks. There seems to be interaspecific variation in size but the material is too scarce to make consistent comparison and provisionally identify it as large member of cf. *H. triquetricornis.*

Table 1. *Hemibos* sp. Comparative measurements (mm) of the cheek teeth. Referred material is taken from Pilgrim (1939).

Specimens	Position	Length	Width	Height
	M1	31	24	24
PUPC 92/146	M2	36	25	24.5
	M3	33	20	20
	P3	21.3	28	26
	P4	19	28.6	26
PUPC 84/27	M1	26	24.4	25
	M2	31	24	24
	M3	31.2	23	19
BMNH 39565 (*H.triquetricornis*)	M3	32	28	-
BMNH 40880 (*H.triquetricornis*)	M3	33	29	-

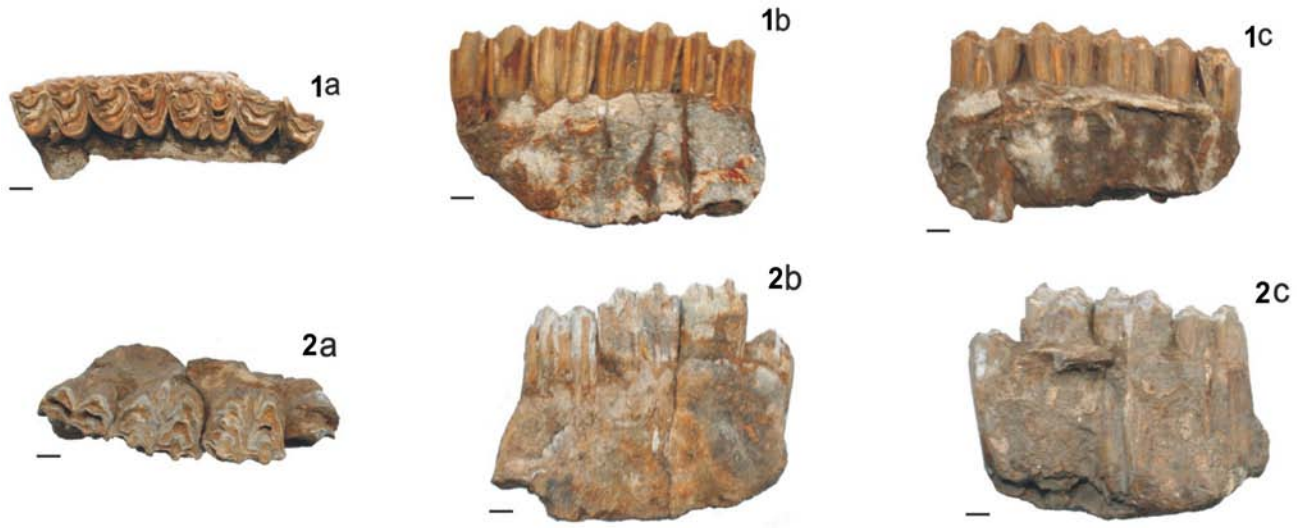

Plate 1. – *Hemibos* sp.: 1. PUPC 84/27. 2. PUPC 92/146. a = Crown view, b = buccal view, c = lingual view. Scale bar 10 mm.

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