

New Fossils of Bovids (Bovidae, Mammalia) from Dhok Pathan Formation of Siwaliks

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ARTICLE INFORMATION

Received: 04-05-2017
Received in revised form:
10-08-2017
Accepted: 22-08-2017

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ABSTRACT

New dental elements comprising upper and lower dentition of bovids have been recovered from Dhok Pathan Formation of Siwalik Group. The fossiliferous sites are situated in the Punjab province, ranging from Late Miocene to Middle Pliocene in age. On the basis of the comparative morphology and measurements, the material can be assigned to *Pachyportax latidens*, *Selenoportax vexillarius* and cf. *Gazella*. The new dental material is presented in this article.

Key Words: Taxonomy, Palaeontology, *Gazella*, *Pachyportax*, *Selenoportax*.

INTRODUCTION

The fluvial sequences of Siwaliks have been studied in detail (Colbert, 1935; Andrews and Cronin, 1982; Pilbeam, 1982; Acharyya, 1994). They consist of sandstones, mudstones and coarsely bedded conglomerates deposited during Middle Miocene to Upper Pleistocene times when the area was a vast basin (Chauhan, 2003). The Siwalik sediments in Pakistan are particularly widespread in the Potwar Plateau (72°30' E, 33°00' N). The Potwar Plateau is a high area of 20,000 km² attached to a belt ranging from the Salt Range (south) to the Margala Hills (North) and from the Jhelum River (east) to the Indus River (west) (Barry *et al.*, 2002).

The studied specimens came from the deposits of the Dhok Pathan type locality (Lat. 33° 07'N: Long. 72° 14'E), district Chakwal, Punjab, Pakistan (Fig. 1) in the Potwar Plateau. The type locality is situated at Soan River about 75 km from Rawalpindi on Rawalpindi-Sargodha road and it is surrounded by extensive Neogene freshwater sedimentary rocks. The actual Dhok Pathan fossiliferous site is situated in the vicinity of the Dhok Pathan Rest House near the Soan River at an altitude of 1073 feet. The region of the Dhok Pathan exposes the most complete sequence of the Siwalik Group and yields a diversified assemblage of Middle Siwalik faunas. The magnetic polarity and stratigraphic dating has controlled the age of the Dhok Pathan Formation to be between 10.1 Ma and

ca. 3.5 Ma (Khan *et al.*, 2010). The Dhok Pathan bed near the Dhok Kundrali is one of the most fossiliferous beds of the Siwaliks (Akhtar, 1992).

The additional fossils of the Late Miocene bovids are documented in this article. The aim of the article is to provide the description of new fossils from the Late Miocene of the Siwaliks.

METHODOLOGY

The samples were collected in various field tours. The primary means of collecting the bovid remains was surface collection. The measurements are in millimeters (Table 1). The collected fossils represent good preservation. The specimens are stored in the Dr. Abu Bakr Fossil Display and Research Centre, Zoology Department, University of the Punjab, Lahore, Pakistan. The diagnostic characters of the recovered fossils are discussed. Terminology follows Gentry & Hooker (1988) and Akhtar (1992).

SYSTEMATIC PALAEONTOLOGY

Ruminantia Scopoli, 1777

Bovidae Gray, 1821

Genus *Pachyportax* Pilgrim, 1937

***Pachyportax latidens* Pilgrim, 1937**

New material: PUPC 16/55, rM1; PUPC 16/52, IM2; PUPC 16/51, right mandible fragment with p4-m2.

Description and comparison: The upper molars are well preserved, representing seleno-hypsodonty

(Fig. 2). The molars are in early wear with slender styles. The median basal pillar is strong and expanded transversely. The teeth are almost quadrate and the cavities are simple in outline. There is no sign of posthypocrista and neocrista. The precristae and postcristae of the principal cones show selenodonty very well. The enamel is thick and moderately rugose. The major cusps are pointed. The p4 is asymmetrical in shape. The protoconid is well developed. A small eyelet is present in the entoconid. The cingulum is distinguishable at the base of the protoconid (Fig., 2). The median basal pillar is well developed in the lower molars (Fig., 2). The molars have pointed conids. The metaconid and enoconid are higher than the protoconid and hypoconid. The metastylid is less developed than the entostylid.

The studied specimens reflect the morphology of the genus *Pachyportax*. However, they are of appropriate size to match that of *P. latidens*. The molars show all the basic features of this species: strong styles and median ribs, no constricted crown neck, which is also common in *Selenoportax* and *Tragoportax*, transversely extended entostyle and comparatively large size (Pilgrim, 1937, 1939; Bibi, 2007; Khan *et al.*, 2009a).

Genus *Selenoportax* Pilgrim, 1937

***Selenoportax vexillarius* Pilgrim, 1937**

New material: PUPC 16/53, left maxillary fragment with P4-M1; PUPC 16/54, IM1.

Description and comparison: The 4th premolar has a deep valley labially (Fig. 2). The parastyle and mesostyle are present in the P4. The fossette is deep. The preprotocrista is smaller than the postprotocrista. The M1 is quadrate in shape (Fig. 2). The median basal pillar is strongly developed. The parastyle is more prominent than the metastyle. The mesostyle is moderately developed. The cones are crescentic in appearance. The median ribs are strong. The spur is present in the fossettes.

The studied specimens show rugosity of enamel, strong median ribs, constriction of labial lobes and strong and divergent styles. These are the main features on the basis of which specimens were placed in the genus *Selenoportax* and conversely excluded the genus *Pachyportax* (Pilgrim, 1937; Khan *et al.*, 2009a). The genus *Selenoportax* includes two species *S. vexillarius* and *S. lydekkeri*. In the studied specimens the P4 shows a deep posterolingual fold and a posterior re-entrant. The comparative study of these specimens revealed that the configuration of the premolar and molars as well as their dimensions correspond to that of *S. vexillarius* (Pilgrim, 1937).

Genus cf. *Gazella* Blainville, 1816

New material: PUPC 16/56, IM2.

Description and comparison: PUPC 16/56 is an upper molar. The tooth is quadrate in shape (Fig. 2). The major cusps are pointed and the cones are crescent in shape. The protocone is extended lingually. The metacone is higher than the other cones. The median basal pillar is absent. The mesostyle is more developed than the parastyle and metastyle. The posthypocrista is longer than the praehypocrista. The fossettes are narrow and crescent. The studied sample shows resemblance with the Siwalik gazelle, however, the exact identification based on a single molar is uncertain. The collected specimen is assigned to cf. *Gazella* on the basis of metric and morphological features (Table 1) (Pilgrim, 1937, 1939; Akhtar, 1992).

DISCUSSION

The fossils of *Selenoportax*, *Pachyportax* and *Gazella* had been continuously excavated from the Siwaliks by the researchers of Dr. Abu Bakr Fossil Display and Research Center, Zoology Department, University of the Punjab, Lahore, Pakistan (Bakr & Akhtar, 1985; Akhtar, 1992, 1995, 1996; Khan *et al.*, 2006; Khan, 2007). More than 500 teeth of the genera *Selenoportax*, *Pachyportax* and *Gazella* have been collected from the Potwar Plateau of Pakistan. *Pachyportax*, *Selenoportax* and *Gazella* were present abundantly in the Middle Siwalik Subgroup. The second most abundant taxon after boselaphines is *Gazella lydekkeri* (Pilgrim, 1937, 1939; Khan *et al.*, 2008, 2009a, b, 2010, 2011, 2012, 2013, 2014, 2015).

Pachyportax and *Selenoportax* were large bodied animals during the Late Miocene of the Siwalik. These animals got extinct before the end of the Pliocene (Barry *et al.*, 2002). At the end of the Late Miocene, bovine or bovine-like bovids originated from the boselaphines (Gentry, 1999). The genus *Pachyportax* was recorded from the Middle Siwaliks (Lydekker 1876, 1884; Pilgrim, 1937, 1939; Akhtar, 1992, 1995, 1996; Khan, 2008; Khan *et al.*, 2009a). *Pachyportax* is represented by two species *P. latidens* and *P. nagrii*, relatively small size (Pilgrim, 1937, 1939; Khan *et al.*, 2009a). *Selenoportax* also represented by two species; *S. vexillarius* and *S. lydekkeri*. *Gazella* was abundantly found in the Hasnot region of the Middle Siwaliks (Pilgrim, 1937, 1939; Akhtar, 1992; Barry *et al.*, 2002; Khan, 2007, 2008, Khan *et al.*, 2009, 2010).

Table I: The comparative measurements (mm) of the cheek teeth referred to *Pachyportax nagrii*, *Slenoportax vexillarius* and cf. *Gazella*. *the studied specimens. Referred data are from Pilgrim (1937, 1939), Akhtar (1992) and Khan et al. (2009b).

Taxa	Number	Nature/Position	L	W	W/L
<i>Pachyportax la tidens</i>	PUPC 16/52*	M2	30.1	30.2	1.00
	PUPC 83/744	rM2	30.2	21.9	0.72
	PUPC 00/100	rM2	25.5	25.0	0.98
	PUPC 97/103	rM2	24.5	17.7	0.72
	PUPC 86/210	rM2	26.0	17.1	0.65
	PUPC 86/203	rM2	26.4	17.9	0.67
	AMNH 29964	rM2	28.0	25.0	0.89
	AMNH 19730	rM2	28.5	28.5	1.00
	PMNH 86/215	M2	26.0	28.0	1.08
	PUPC 05/07	M2	23.6	19.3	0.82
	PUPC 16/51*	p4	10.8	10.0	0.93
		m1	20.5	10.5	0.52
		m2	20.2	10.6	0.82
	PUPC 16/55*	M2	20.2	20.5	1.01
<i>S. vexillarius</i>	PUPC 16/53*	P4	10.4	20.1	1.93
		M1	20.3	20.7	1.02
	PUPC 16/54*	IM2	20.7	20.8	1.00
	PMNH 87/19	P4	19.0	17.0	0.89
	AMNH 29946	P4	21.0	11.0	0.52
	AMNH 29917	P4	21.7	10.0	0.46
	PMNH 85/09	M1	22.0	24.0	1.09
	PMNH 83/91	M2	25.7	23.8	0.93
	PMNH 83/93	M2	23.0	22.6	0.98
	PMNH 83/638	M2	23.0	24.0	1.04
	PMNH 85/07	M2	23.5	22.0	0.94
	PMNH 85/12	M2	24.6	25.6	1.04
cf. <i>Gazella</i>	PUPC 16/56*	IM2	10.1	10.6	1.05
<i>Gazella lydekkeri</i>	PUPC 97/22	IM2	13.5	13.0	0.96
	PUPC 84/65	IM2	18.0	17.3	0.96
	PUPC 97/21	IM2	12.0	12.0	1.00
	AMNH 19663	IM2	13.5	11.5	0.85
	PUPC 84/133	rM2	15.5	10.0	0.64
	PUPC 02/37	rM2	14.5	9.00	0.62
	AMNH 19663	rM2	13.0	7.50	0.57

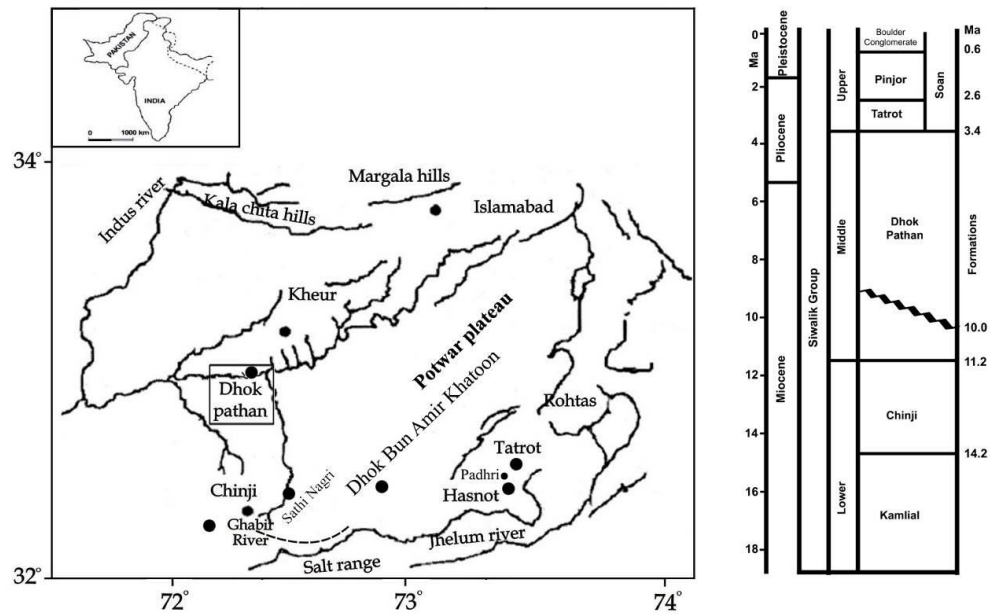


Fig., 1: Map of Potwar Plateau showing the Dhok Pathan type locality (enboxed).

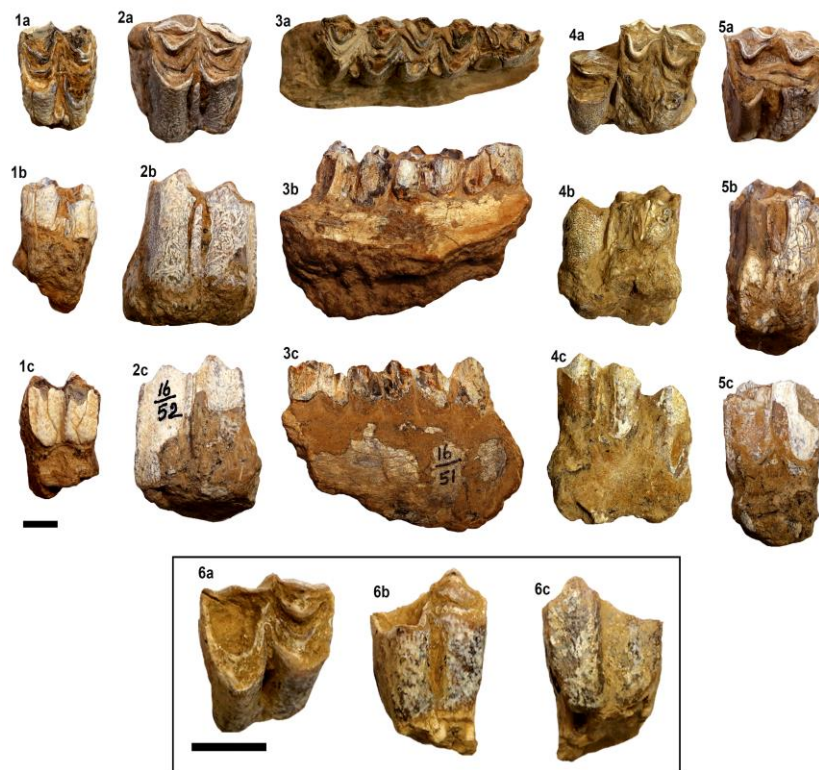


Fig., 2: *Pachyportax latidens*: 1. PUPC 16/55, M1; 2. PUPC 16/52, M2; 3. PUPC 16/51, p4-m2. *Selenoportax vexillarius*: 4. PUPC 16/53, P4-M1; 5. PUPC 16/54, M1.cf. *Gazella*: 6. PUPC 16/56, M2. a = occlusal, b = lingual, c = buccal. Scale bar 10mm.

CONCLUSIONS

New fossils of *Pachyportax latidens*, *Selenoportax vexillarius* and cf. *Gazella* were recovered from the Middle Siwalik Subgroup. The studied site is situated in district Chakwal, Punjab, Pakistan. The new fossils provide evidence of the diverse bovid faunal elements in the Siwalik Middle Miocene to Pliocene of Pakistan

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