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New Boselaphini (Mammalia) Remains from the Middle Siwaliks of Pakistan

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ABSTRACT

The new Late Miocene boselaphine remains have been recovered from the outcrops of the Padhri village, which belongs to the Middle Siwalik Subgroup. The specimens comprise mandible fragments and isolated dentitions. The material has been assigned to *Pachyportax latidens, P. nagrii, Selenoportax vexillarius* and *Tragoportax punjabicus*. Their morphometric features are discussed and compared to the material from the Siwalik Group.

Key Words: Artiodactyla, Bovidae, *Tragoportax*, *Pachyportax, Selenoprtax, Gazella*.

INTRODUCTION

The abundant mammalian fauna from the deposits of the Dhok Pathan Formation of the Middle Siwaliks characterize the evolution, biostratigraphy, and palaeogeography of Neogene bovids (Bruce & Woodburne, 1982; Bibi *et al.,* 2009; Khan *et al.*, 2010; Bibi, 2011). Bovids have occupied a variety of habitats including closed forests, a variety of woodland biomes, and open plains. The bovids as habitat indicators have been widely studied and their value as habitat indicators in ancient ecosystems has been well-established (Gentry, 1970, 1980; Thomas, 1979; Vrba, 1980, 1995; Scott, 1985; Solounias & Dawson-Saunders, 1988; Plummer & Bishop, 1994; Kappelman *et al.*, 1997; Scott *et al.,* 1999). The bovids are among the most abundant taxa at the Dhok Pathan Formation of Chakwal.

Boselaphines remained abundant during the Tertiary period in Eurasia, Africa and the Siwaliks (Pilgrim, 1937, 1939; Khan *et al.,* 2009a, 2014). The Siwalik boselaphines *Pachyportax, Selenoportax* and *Tragoportax* were found abundantly in the Middle Siwalik Subgroup. Species of these genera range throughout the Siwalik during the age of 10.5 – 5.5 Ma, and are found across Eurasia (Pilgrim, 1939; Moya-Sola, 1983; Thomas, 1984; Bibi, 2007; Bibi *et al*., 2009; Khan *et al*., 2009a, 2010, 2014).

The studied locality is situated in the Jhelum district of the Potwar Plateau, Pakistan. It is situated about 35 km east of the Jhelum city. The locality is characterized by number of fossil pockets. The age of the locality is between 7 and 5 Ma (Badgley & Behrensmeyer, 1980; Barry *et al*., 1982, 2002; Barry, 1987; Khan, 2008). The aim of present study was to discover new remains of Bosalepnini (Bovidae) from the late Miocene of Padhri, northern Pakistan. The fossil sites were excavated at the Padhri village (Fig., 1). The bovid remains were discovered in addition to other fossil specimens. The terminology follows Gentry *et al*. (1999).

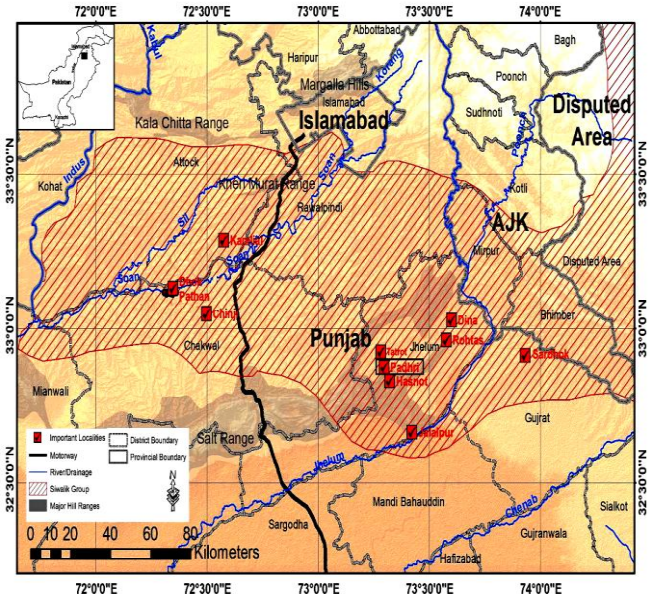

Fig., 1: The studied area of Padhri (encircled), Jhelum district, Punjab province, Pakistan.

SYSTEMATIC PALEONTOLOGY

Bovidae Gray, 1821
Bovinae Gill, 1872
Boselaphini Simpson, 1945
Pachyportax Pilgrim, 1937

***Pachyportax latidens* (Lydekker, 1876) Pilgrim, 1937**

Author's Contribution: M.A.K., & M.A., Designed and planned the project; **M.A.B., & S.G.A**., Acquired data; **T.I., & K.M.**, Analyzed and interpreted data; **R.M., & R.S**., Drafted manuscript. **Corresponding author: babar_fcc2005@yahoo.com*

New material: PUPC 13/49, lM1; PUPC 13/50, rM3; PUPC 09/7, left mandibular fragment with p4-m3.

Description and comparison

The upper molars have thick rugose enamel (Fig., 2). The molars are quadrangular having no constricted neck. The fossettes are broad. The entostyle is extended transversally. The styles are strong. The mesostyle is more robust than other ones. The postprotocrista is clearly united to the praehypocrista.

The lower dentition comprises a premolar and molar series (Fig. 2). The mandible fragment is thick and massive. The 4th premolar has a strong conids: paraconid, metaconid and entoconid. The valleys are open. The prefossette is wider than the postfossette. The entoconid is extended transversely. The molars are large and narrow (Fig., 2). The ribs and stylids are moderately strong. The fossettes are crescent. The transversely extended median basal pillar is present in the lingual valley. The hypoconulid is present posteriorly in third molar. The described fossils coincide with the Siwalik boselaphine *Pachyportax* and the species *P. latidens* (Table I).

cf. *Pachyportax nagrii* Pilgrim, 1939

New material: PUPC 13/51, rM2.

Description and comparison

The hypocone is missing in the molar (Fig., 2). The molar represents shiny enamel lingually. The entostyle is extended transversally. The mesostyle and metastyle are strong. The paraconus and metaconus ribs are weak. The anterior and posterior cavities are broad. The median basal pillar is large, one of the key features of *Pachyportax* (Pilgrim, 1937). The two species of *Pachyportax*: *P. latidens* and *P. nagrii,* are recorded from the Middle Siwalik Subgroup (Pilgrim, 1937, 1939; Khan *et al*., 2009a). Morphometrically, the studied molar attributes to cf. *P. nagrii* (Table I).

Discussion

Pachyportax is a gigantic sized Siwalik boselaphine (Pilgrim, 1937, 1939; Khan *et al*., 2009a, 2014). The two species of the Siwalik *Pachyportax* differs by size (Pilgrim, 1937, 1939; Khan *et al.,* 2009a). Metrically, *Pachyportax latidens* is a large species whereas *Pachyportax nagrii* is a small one (Pilgrim, 1939; Akhtar *et al*., 1997). Gentry (1974) noted that there was only one valid species of *Pachyportax* in the Siwaliks i.e., *Pachyportax latidens.* Nevertheless, Akhtar *et al*. (1997) explained that *Pachyportax nagrii* was a rare taxon found in the early Late Miocene of the Siwaliks. No doubt, *Pachyportax nagrii* is a rare taxon and a few specimens have been recorded from the Late Miocene of the Siwaliks (Khan *et al*., 2010).

Selenoportax Pilgrim, 1937

***Selenoportax* cf. *vexillarius* Pilgrim, 1937**

New material: PUPC 09/5, right mandible fragment with m1-2; PUPC 09/9, rm3.

Description and comparison

The dentition comprises mandible fragment with lower molars (Fig., 2). The conids are narrow. The anterior transverse flange is present. The ectostylid and ribs are prominent. The stylids are divergent and strong. The hypoconulid is present in the m3. The hypoconulid is present posteriorly. The morphology of the studied specimens excludes them from *Pachyportax* and confirms their inclusion in *Selenoportax* (Pilgrim, 1937, 1939; Khan *et al*., 2009a, 2014). The teeth *of Selenoportax lydekkeri* are larger than those of *Selenoportax vexillarius* (Table II; Fig., 2). Metrically, they differentiate from *Selenoportax lydekkeri* in having small size and may be attributed to *Selenoportax vexillarius.*

***Tragoportax* Pilgrim, 1937**

***Tragoportax* cf. *punjabicus* (Pilgrim, 1910)**

New material: PUPC 96/2, lM1.

Description and comparison

The only one molar can be attributed to *Tragoportax*. The tooth is larger than *Miotragocerus* and smaller than *Pachyportax* and *Selenoportax* (Gaudry, 1865; Arambourg & Piveteau, 1929; Pilgrim, 1937). Morphometrically, the tooth coincides with *T. punjabicus* (Table III; Fig., 2) and may be attributed to *Tragoportax* cf. *punjabicus.*

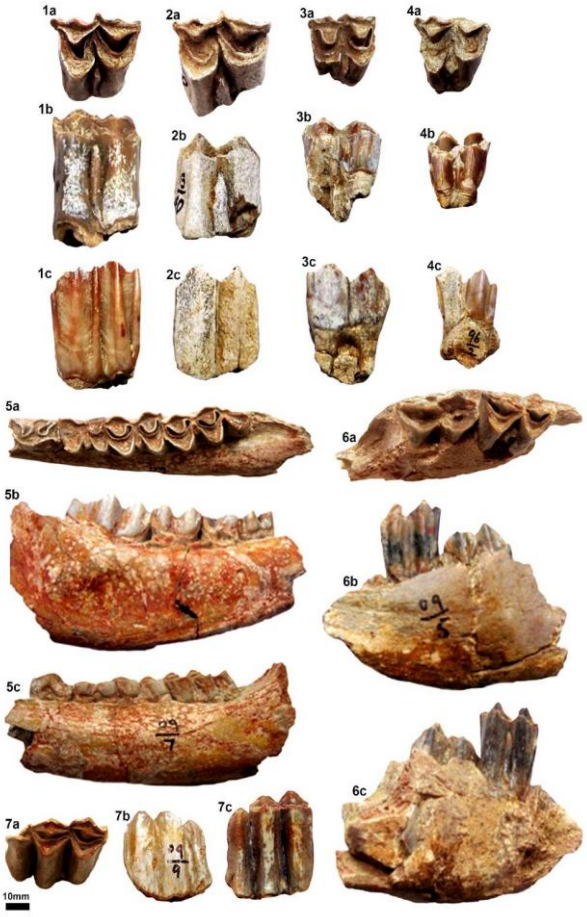

Fig., 2: Cheek teeth of Boselaphini Upper dentition: *Pachyportax latidens,* 1. PUPC13/49, lM1; 2. PUPC13/50, rM3; *Pachyportax nagrii,* 3. PUPC 13/51, rM2; *Tragoportax punjabicus,* 4. PUPC 96/02, lM1. Lower dentition: *Pachyportax latidens,* 5. PUPC 09/07, left mandible fragment with p4-m3; *Selenoportax vexillerius,* 6. PUPC 09/5, right mandible fragment with m-m2; 7. PUPC 09/09, rm3. a. Occlusal view, b. lingual view, c. buccal view. Scale bar of 10mm.

DISCUSSION

The systematic study resulted in three boselaphine genera *Pachyportax, Selenoportax* and *Tragoportax* from the Late Miocene Padhri locality of the Jhelum district. In fact, the Padhri fauna resembles the bovid fauna of Hasnot and Dhok Pathan localities of northern Pakistan (Khan, 2008; Khan *et al*., 2008, 2009a). Nevertheless, the Padhri locality is slightly older than Hasnot (Pilbeam *et al*., 1977). The fossil locality is considered "geologically contemporaneous representing most probably a time slice of only a few years" in the European Land Mammal Zone-MN9 (Pilbeam *et al*., 1977).

Palaeoecologically, the large bodied animals (e.g. *Pachyportax, Selenoportax*) can be interpreted for the savanna environment as in living bovids (Scott, 1985). *Tragoportax* (medium sized) may be adapted to a life in wood more or less dense forests (Kohler, 1993; Khan *et al*., 2010). Tragulids were predominant in Hasnot which is situated in the south of Padhri (Farooq *et al*., 2007; Khan *et al.,* 2012, Batool *et al*., 2014) but they are less in number in Padhri. The faunal composition indicates some partial and patchy drier habitats with small pockets of dense forests and wet lands.

Table I: Comparative measurements (mm) of the cheek teeth of *Pachyportax latidens* in mm (millimeters). * The studied specimens. (Referred data taken from Pilgrim 1937, 1939; Akhtar 1992; Khan *et al*., 2008, 2009).

Taxa	Number	Position	Length	Width	W/L ratio
P. latidens	PUPC 09/7*	p4	21.7	13.3	0.61
		m1	21.7	15.8	0.72
		m2	26.5	19.2	0.72
		m3	39.8	18.5	0.46
	PUPC 13/49*	M1	28.8	29.3	1.01
	PUPC 13/50*	M2	3.3	28.7	0.94
	PUPC 83/744	M2	30.2	21.9	0.72
	PUPC 97/103	M2	24.5	17.7	0.72
	PUPC 86/36	M2	30.0	23.0	0.76
	PUPC 04/14	M2	29.3	20.6	0.70
	PUPC 86/7	m3	33.0	14.0	0.42
	PUPC 96/41	m3	38.0	16.3	0.42
	PUPC 83/640	m3	33.0	14.8	0.44
	AMNH 29913	M3	31.0	29.0	0.93
	AMNH 19730	M3	29.5	27.0	0.91
cf. *P. nagrii*	PUPC 13/51*	M2	24.4	27.8	1.31

Table II: Comparative measurements of the cheek teeth of *Selenoportax vexillarius* in mm (millimeters). * The studied specimens. (Referred data taken from pilgrim 1938, 1939; Akhtar 1992; Khan *et al*., 2008, 2009).

Taxa	Number	Position	Length	Width	W/L ratio
S. vexillarius	PUPC 09/9*	m3	40.4	18.0	0.44
	PUPC 09/5*	m1	23.5	20.9	0.88
		m2	26.0	16.5	0.63
	PUPC 87/90	m3	38.0	16.5	0.43
	PUPC 98/78	m2	25.0	16.0	0.64
		m3	36.0	15.0	0.41
	PUPC 04/12	m2	20.0	12.5	0.62
	PUPC 07/135	m1	26.0	19.0	0.73
		m2	26.6	15.0	0.58
		m3	32.0	15.0	0.46
	AMNH 19844	m2	25.9	16.5	0.63
	GSI B2 11	m1	25.0	17.0	0.68
S. lydekkeri	AMNH 19933	m2	30.0	30.0	1.0
	AMNH 19908	m3	37.5	19.5	0.52
	AMNH 29916	m3	37.5	20.5	0.54

Table: III: Comparative measurements of the cheek teeth of *T. punjabicus* in mm (millimeters). *The studied specimens. Referred data are taken from Pilgrim (1939) and Akhtar (1992).

Taxa	Number	Position	Length	Width	W/L ratio
T. cf. *punjabicus*	PUPC 96/2*	M1	22.9	21.9	0.95
	PUPC 83/671	M1	17.4	16.2	0.93
	PUPC 00/80	M1	17.0	16.0	0.94
	PUPC 83/676	M1	16.4	15.0	0.91
	PUPC 83/275	P3	14.0	13.0	0.92
		P4	11.0	13.7	1.2
		M1	17.0	16.0	0.94
		M2	18.0	17.0	0.94
		M3	18.4	16.5	0.89
T. browni	PUPC 83/689	M1	18.0	18.0	1.00
	PUPC 83/861	M1	16.0	16.0	1.00
	AMNH 19662	P2	15.5	12.5	0.80
		P3	15.0	17.0	1.13
		P4	12.5	17.0	1.36
		M1	18.0	18.0	1.00
		M2	20.0	20.0	1.00
		M3	21.0	20.0	0.9

CONCLUSIONS

Three genera *Pachyportax, Selenoportax* and *Tragoportax* are reported from the Middle Siwalik Subgroup of Pakistan. The collected remains at the Padhri locality of the Middle Siwaliks are housed in the Palaeontology laboratory, Zoology Department, University of the Punjab, Lahore, Pakistan. The boselaphine community structure of Padhri recommends mixed habitats comprising woodland to riverine and forest settings.

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