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# Description of *Selenoportax vexillarius* Molars from Dhok Pathan Village (Middle Siwaliks), Pakistan

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**Abstract:** Four molars of *Selenoportax vexillarius* are collected from village Dhok Pathan of the Middle Siwaliks. Out of four, two belong to upper dentition and the rest of two belong to lower dentition. The enamel plications vary owing to the ecological conditions and this feature can not be used for the comparison. The median basal pillars and median ribs are well developed in the molars and the comparative study is made with the type specimens of the species. The third molar of the species is broken anteriorly.

**Key words:** Dhok Pathan, molars, Middle Siwaliks, specimens

## INTRODUCTION

Siwalik Formations are more important as regard to its mammalian fauna. The most distinct and unique feature of the Siwalik rocks are the abundance of vertebrate fossils pertaining to almost all the major eutherian groups. Due to its palaeontological and geological importance, it has attracted a number of paleontologists, geologists and even zoologists from abroad (Lydekker, 1876, 1878; Colbert, 1935; Pilbeam *et al*., 1977; Barry *et al*., 2002, 2005; Bibi, 2007). Ruminant fossils in the American Museum of Natural History have been systematically studied by Pilgrim (1937 and 1939). He named several new genera and species of the Siwalik bovids; the genus *Selenoportax* is one of them. The genus *Selenoportax* is based upon two species i.e., *Selenoportax vexillarius* and *Selenoportax lydekkeri*. The genus *Selenoportax* is unknown from outside the Siwaliks. *Selenoportax vexillarius* is known by a partial skull and mandibular fragments and also isolated upper and lower teeth. The present collection consists of upper and lower molars of the species. The specimens are collected from village Dhok Pathan which is the type locality of the Middle Siwaliks (Dhok Pathan Formation). The Dhok Pathan village is situated in Chakwal district at 27 km from Talagang to Rawalpindi road. The village is highly fossiliferous and is known for the presence of tertiary fauna since the 19th century.

## MATERIALS AND METHODS

A number of field trips carried out to various localities of village Dhok Pathan. During field work by the author most of the specimens were found partly exposed and were excavated, while a few more were found lying completely exposed on the surface. The embedded material was carefully excavated with the help of chisels, geological hammers, fine needles, pen knifes, hand lances and brushes. In the laboratory, the material was carefully washed, cleaned, prepared and broken parts were assembled by using various types of gums (resins) such as Elfy, Elite and Fixin. The specimens catalogued number consists of series i.e., yearly catalogued number and serial catalogued number, so figures on the specimen represents the collection year and serial number of that year. For example, 86/211, numerator denotes the collection year and denominator the serial number of the respective year. Various measurements of the specimens in millimeters were taken with the help of metric vernier. Tooth length and breadth were measured at occlusal level. Heights were measured on the metastylid/metastyle of the lower molar/upper molar. Tooth cusp nomenclature in this study follows that of Gentry (1994).

**Systematic palaeontology:**

| | |
|---|---|
| Family | Bovidae Gray, 1821 |
| Subfamily | Bovinae Gill, 1872 |
| Tribe | Boselaphini Simpson, 1945 |
| Genus | *Selenoportax* Pilgrim, 1937 |

**Type species:** *Selenoportax vexillarius* Pilgrim, 1937.

**Included species:** *Selenoportax vexillarius* Pilgrim, 1937; *Selenoportax lydekkeri* Pilgrim, 1937; *Selenoportax tatrotensis* Akhtar, 1992; *Selenoportax dhokpathanensis* Akhtar, 1992.

***Selenoportax vexillarius* Pilgrim, 1937:**

**Type specimen:** A skull lacking maxilla and dentition and most of the basicranium (AMNH 19748).

**Referred specimens:** Left $M_1$ (PUPC 86/211; PUPC 02/132), left $M_2$ (PUPC 98/69), left $M_3$ (PUPC 86/213).

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

**Stratigraphic range:** Middle Siwaliks.

**Diagnosis:** Cheek teeth large and strongly hypsodont, enamel very rugose. Upper molars quadrate with strong and divergent styles near the neck of crown, ribs quite large, entostyle/ectostylid strongly developed. Fossettes without indentations and simple in outline, transverse anterior goat folds poorly developed at front of lower molars.

**Distribution:** Middle to Upper Siwaliks.

## RESULTS

PUPC 86/211 (Fig. 1A) and PUPC 02/132 (Fig. 1B and C) include first molars of left maxilla. The molars are excellently preserved and shows fully developed major cusps. These are early stage of wear. The molars are extremely hypsodont, narrow crowned and the enamel is very thick and rugose. The rugosity is more prominent and well evident on the buccal side than on the lingual side due to weathering effect. The median basal pillars are situated at the transverse valley between the protocone and hypocone. The principal cusps are well developed. The protocone is somewhat pointed in the later stage of wear. It is narrow transversely than the hypocone. The paracone is well developed and pointed in the middle with two running ridges. The metacone is also pointed in the middle with two running ridges anteroposteriorly. The hypocone is crescentic in shape. The styles are well developed. The parastyles and mesostyles are very strong and prominent. The anterior median ribs are more prominent than the posterior ribs. The central cavities are very narrow due to early stage of wear.

PUPC 98/69 (Fig. 1D and E) is the second molar of left mandibular ramus. It is well preserved except hypocone which is missing. It is in the middle early stage of wear and extremely hypsodont. The enamel is moderately thick and rugose. The median basal pillar is small and not well developed. It is practically unworn. It is narrow at the apex and broad at the base. It is situated in the transverse valley between the protoconid and the hypoconid. The principal conids are well developed and crescentic in their general appearance. The anterior ridge of protoconid is

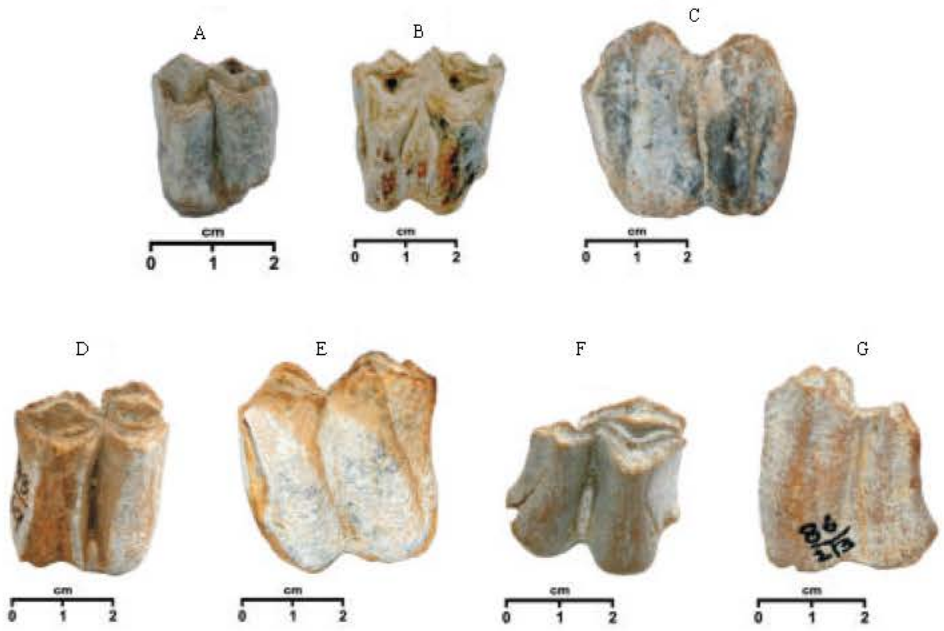


Fig. 1: *Selenoportax vexillarius*; A: Lingual view of the first upper molar (PUPC 86/211); B: Occlusal view of the first upper molar (PUPC 02/132); C: Buccal view of the first upper molar (PUPC 02/132); D: Buccal view of the second lower molar (PUPC 98/69); E: Lingual view of the second lower molar (PUPC 98/69); F: Occlusal view of the broken third lower molar (PUPC 86/213); G: Buccal view of the broken third lower molar (PUPC 86/213)

Table 1: Comparative measurements of the cheek teeth of *Selenoportax vexillarius* (mm)

| No. | Nature | Position | Length | Width | W/L ratio |
|---|---|---|---|---|---|
| PUPC 86/211* | Left molar | $M_1$ | 22.0 | 18.5 | 0.84 |
| PUPC 02/132* | Left molar | $M_1$ | 19.5 | 16.0 | 0.82 |
| GSI B 569 | Left molar | $M_1$ | 22.0 | 23.0 | 1.04 |
| PUPC 98/69* | Left molar | $M_2$ | 23.5 | 14.0 | 0.59 |
| AMNH 19844 | Left molar | $M_2$ | 25.9 | 16.5 | 0.63 |
| AMNH 19514 | Left molar | $M_2$ | 22.0 | 15.5 | 0.70 |
| AMNH 29917 | Left molar | $M_2$ | 21.0 | 15.0 | 0.71 |
| PUPC 86/213* | Left molar | $M_3$ | 23.5 | 16.0 | 1.40 |
| AMNH 19514 | Left molar | $M_3$ | 33.0 | 21.5 | 0.65 |

* The studied specimens; $M_1$: First upper molars; $M_2$: Second lower molars; $M_3$: Third lower molars

narrower than posterior one. The metaconid is pointed in the middle with the running ridges anteroposteriorly. The metaconid is somewhat higher vertically than entoconid. The entoconid is also pointed in the middle, but less than metaconid. The stylids are moderately developed. The anterior and posterior central cavities are narrow and filled with sandstone. PUPC 86/213 (Fig. 1F and G) is well preserved except the metaconid and protoconid which are damaged. Talonid is well preserved and look like a pillar. The comparative measurements of all the specimens are provided in Table 1.

## DISCUSSION

Four isolated teeth are described and discussed in this study, which are collected from the Dhok Pathan Formation of the Middle Siwaliks, Pakistan. The collected molars have crescentic cusps and conids. Proboscideans show lophs and plates in their crown pattern where as Perissodactyls are characterized by lophs in their molars but Artiodactyls have crescentic cusps and conids. The collected molars exhibit selenodonty (crescentic pattern) which confirm their inclusion to Artiodactyls. The specimens have complete crescentic pattern of cones which is present in ruminants, the Artiodactyl sub order. The sub order Ruminantia has four extinct families found from the Siwaliks: Tragulidae, Cervidae, Giraffidae and Bovidae. The tragulids and cervids are small but giraffids and bovids are large in size. The studied molars are large enough to exclude them from tragulids and cervids but not enough to include those giraffids. So the collected specimens on the basis of size, styles/stylids, median basal pillars and enamel rugosity are included to family Bovidae. In bovids the genera *Selenoportax* and *Pachyportax* are larger than the other genera but the *Pachyportax* is characterized by quadrate and heavy styles/stylids molars comparatively than *Selenoportax*. The specimens are narrow and have less bulky styles/stylids so they belong to genus *Selenoportax*.

The described specimens show all typical morphological features of the species *Selenoportax vexillarius* as stated by Pilgrim (1937) such as quadrate with strong and divergent styles near the neck of crown, ribs quite large, median basal pillar strongly developed. All the specimens resemble in anteroposterior length but slightly differ in transverse crown width (Table 1). The first molars compare metrically and morphologically with the GSI (Geological Survey of India) B569 type specimen and found close resemblance with the type specimen. The described second lower molars PUPC (Punjab University Palacontological Collection, housed in the Department of Zoology, Punjab University, Lahore, Pakistan) 98/69, PUPC 86/213 are extremely hypsodont and narrow crowned. The lower second molar and third molar compare with the AMNH (American Museum of Natural History, New York) 19844, AMNH 19514, AMNH 29917 and AMNH 19514 and found close similarities with the referred specimens (Table 1). The enamel is wrinkled externally as well as internally. However the wrinkles are more prominent on the protoconid and hypoconid than on the inner side. The median basal pillars are present in both lower molars and very prominent. All these morphological features exhibited by the studied specimens are the characteristics of the species *Selenoportax vexillarius*. So, the specimens belong to the species *Selenoportax vexillarius* and the presence of the species in the village Dhok Pathan is confirmed. Janis (1982) noted that Siwalik bovids show increases in size, hypsodonty and molarization, suggesting a move towards more fibrous diets and more open habitats. The evolution of large body size and robust dento-gnathic morphology in the panbovine clade was a consequence of climatic changes, namely the intensification of the dry season in southern Asia during the late Miocene. More arid conditions, even if present only seasonally, would have increased inter-specific competitive pressures among herbivores and driven the evolution of morphologies allowing for greater niche differentiation within the large herbivore guild (Bibi, 2007).

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