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## ***Selenoportax vexillarius* from Dhok Pathan, Chakwal District, the Punjab, Pakistan**

Khizar Samiullah\* Riffat Yasin<sup>1</sup>, Farhat Jabeen<sup>1</sup>, Sajid Yaqub<sup>1</sup>, Khurram Feroz<sup>1</sup>, Saleem Akhter<sup>1</sup>, Omer Draz<sup>1</sup>, Sana Yosouf<sup>2</sup>, Muhammad Akhtar<sup>2</sup>

<sup>1</sup>Department of Zoology, GC University, Faisalabad, Pakistan

<sup>2</sup>Zoology department, Quaid-e-Azam campus, Punjab University, Lahore, Punjab, Pakistan

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### **Abstract**

The fossil material belonging to genus *Selenoportax* has been described and discussed which was collected from Dhok Pathan, Chakwal district, the Punjab province, Pakistan. The studied material comprises left lower mandibular ramus having p4-m3. The genus *Selenoportax* basically consists of two species; *Selenoportax vexillarius* and *Selenoportax lydekkeri*. *Selenoportax* is an extinct genus of Boselaphines. Boselaphines have been reported from Middle Miocene and abundantly from the Late Miocene of the Siwaliks. *Selenoportax* is a moderate to large sized boselaphine. Thorough examination and measurements reveals that studied specimen belongs to species *Selenoportax vexillarius*. Its fossils have been also reported from the Miocene of Northern and Central Asia.

\*Corresponding Author: Khizar Samiullah ✉ [khizar502@yahoo.com](mailto:khizar502@yahoo.com)

## Introduction

Pilgrim (1910) established the species *Boselaphus lydekkeri*. Later on, All these specimens to the genus *Selenoportax* transferred by Pilgrim (1937) based on a collection from various Middle Siwalik localities in Pakistan and India and added two species in it, *S. vexillarius* and *S. lydekkeri*. Solounias (1981) referred a *Selenoportax* horn core from Pikermi which was not enough for a more specific determination. So, this supposed occurrence of a single horn core cannot be taken as indicative for the presence of *Selenoportax* in Europe. Qiu and Qiu (1995) list *Selenoportax* sp. from the Lufeng fauna (Chinese Miocene), age of 11.1–8.0 Ma (Flynn and Qi, 1982; Steininger, 1999). These specimens represent the sole record of *Selenoportax* from the Miocene of Northern and Central Asia (Tedford *et al.*, 1991; Nakaya, 1994; Qiu and Qiu, 1995). Thomas (1984) highlighted the *Helicoportax-Selenoportax* relationships and recommended the name “*Helicoportacina*” for them. According to Heissig (1972), *Selenoportax* is a progressive form of *Helicoportax tragelaphoides* reported from the Chinji Formation of the Siwaliks (Thomas, 1984) while According to Gentry (1974), the systematic position of *S. lydekkeri* is uncertain.

Pilgrim, 1937, 1939, 1947; Lydekker, 1876, 1884; Akhtar, 1992, 1995, 1996; Khan, 2008 recovered *Selenoportax* from Middle and Upper Siwaliks deposits of Pakistan. Akhtar (1992) included not only *S. vexillarius* and *S. lydekkeri* from the Middle and Upper Siwaliks in the genus *Selenoportax*, but also added two new species i.e. *S. dhokpathanensis* and *S. tatrotensis*, the former being based on a damaged cranium (PUPC 86/248) and the later upon a maxillary portion bearing right P3-M3 and left P4-M3 (PUPC 87/19). Akhtar (1992) in his Ph.D. thesis compared *S. dhokpathanensis* (PUPC 86/248) with *S. vexillarius* but did not compare it with *S. lydekkeri* and considered that its gigantic size noticeably made it different from *S. vexillarius*.

*S. dhokpathanensis* shares the same characteristics with *S. lydekkeri*, and both of them are larger in size

than *S. vexillarius*. Moreover, a large number of *S. vexillarius* and *S. lydekkeri* cheek teeth have been described until now, still not even one single molar has been described for the species *S. dhokpathanensis* yet (Bibi, 2007). Thus, *S. dhokpathanensis* is considered a junior synonym of *S. lydekkeri*. The description of *S. tatrotensis* was based on the upper premolars and molars: strong and extended transversely entostyles and ectostylids, styles that are slightly weaker and less divergent, weaker median ribs and less rugose enamel with traces of cement. All these variations can be observed in *S. vexillarius*, which evidently supports its inclusion within *S. vexillarius*. Therefore, the genus *Selenoportax* consists only of two valid species in the Siwaliks: *S. vexillarius* and *S. lydekkeri*, the former being the smaller one (Khan *et al.*, 2009). According to Bibi (2007) the characters Pilgrim (1937) listed to distinguish between isolated teeth of *Selenoportax* and *Pachyportax*, such as crown flare and enamel folding, are insufficiently diagnostic as such features are entirely variable even within single individuals of living Bovini. This research work specifies the presence of extinct genus *Selenoportax* from the Miocene of Central Asia (Pakistan) and the main objective is to describe fossil fauna from Middle Siwaliks (Late Miocene) of Dhok Pathan, district Chakwal, Punjab, Pakistan.

## Materials and methods

A number of field trips to various localities of Middle Siwaliks were carried out. The specimen was collected from the Dhok Pathan, Chakwal district, the Punjab province, Middle Siwalik hills of Pakistan. The embedded material was carefully excavated with the help of chisels, hammers and fine needles. The specimen was transported to Paleontological lab in the department of Zoology, University of the Punjab Lahore. The specimen was properly cleaned and washed in the laboratory. Fine needles, camel hair brushes as well as light hammer were used to remove unwanted siliceous or clay material from the Paleontological samples. The broken parts were assembled using various gums and adhesives such as

Araldite, Elphy and Peligon. The specimen under study was catalogued as PUPC 2010/26 i.e. the upper figure denotes the collection year and lowers one the serial number of the respective year. The measurements of the specimens were made by metric Vernier Calipers and then table is formulated. The photographs of the described specimens were taken with Digital Camera and hard copies were prepared by using Adobe Photoshop.

#### Abbreviations

Anterio-posterior length of the crown (L); Transverse width of the crown (W); Width/Length (W/L); Millimeter (mm); Punjab University Paleontological Collection (PUPC); American Museum of Natural History, New York, USA (AMNH); Million years ago (Ma); Lower fourth premolar (p4); Lower first molar (m1); Lower second molar (m2); Lower third molar (m3).

#### Results

##### Systematic Palaeontology

Family	Bovidae Gray, 1821
Order	Artiodactyla Owen, 1848
Suborder	Ruminantia Scopoli, 1777
Infraorder	Pecora Linnaeus, 1758
Family	Bovidae Gray, 1821
Subfamily	Bovinae Gill, 1872
Tribe	Boselohini Simpson, 1945
Genus	<i>Selenoportax</i> 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

##### Distribution

The genus *Selenoportax* is well known from the Nagri and Dhok Pathan zones of the Middle Siwaliks of Pakistan and India (Pilgrim, 1937). Solounias (1981)

refers a horn core specimen from Pikermi, described by Gaudry (1865) as *Selenoportax*. According to him the material is not diagnostic enough for a more specific determination.

##### Diagnosis (*Pilgrim 1937; Akhtar 1992*)

Moderate to large-sized Siwalik bovid with hypsodont to extremely hypsodont teeth, upper molars quadrate with strong divergent styles, median ribs well developed, entostyle strongly developed and ectostylid moderately developed, enamel very rugose.

##### *Selenoportax vexillarius* (Pilgrim, 1937)

##### Type Specimen

A skull lacking maxilla and dentition and most of the basicranium (AMNH 19748).

##### Material

Lower left mandibular ramus having p4-m3 (PUPC 2010/26).

##### Locality

Dhok Pathan, Chakwal district, the Punjab province, Pakistan (Fig. 2).

*Stratigraphic Range:* Middle Siwaliks.

##### Diagnosis

Cheek teeth large and strongly hypsodont, enamel very rugose. Lower molars elongated with strong and divergent styles near the neck of crown, ribs quite large, ectostylid strongly developed. Fossettes without indentations are simple in outline, transverse anterior goat folds poorly developed at front of lower molars.

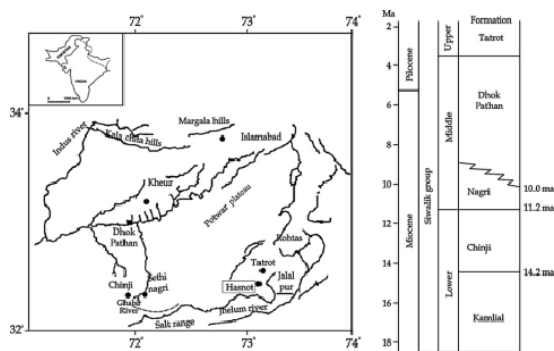
##### Description

##### Left Mandibular Ramus (Fig. 1)

PUPC 2010/26 is lower left mandibular ramus having well preserved p4-m3. The length of preserved mandibular ramus is 99.5 mm while total preserved length of horizontal ramus = 158.7 mm. Depth below m2 is 34 mm and m3 is 37 mm. The width of the ramus below m2 is 21.7 mm and m3 is 25.4 mm.



**Fig. 1.** *Selenoportax vexillarius*, PUPC 2010/26, left mandibular ramus having p4-m3, A) lingual view, B) buccal view, C) occlusal view. Scale bar 30 mm.



**Fig. 2.** Map showing the study section Dhok Pathan, Chakwal District, Punjab, Pakistan.

*p4*

It is part of the lower left mandibular ramus (PUPC 2010/26). It is well preserved. The buccal side is more rugose as compared to the lingual side which has quite thick and shiny enamel. Layer of cement is prominent at the base of the crown. The median basal pillar is absent in the tooth. All the conids of tooth are well preserved. The metastylid and entostylid are well developed and prominent. The conids are narrow and buccal conids are very similar to the lingual conids. The metastylid is strong. In p4 the posterior median rib is strongest among all the series of teeth.

*m1*

It is also part of the lower left mandibular ramus (PUPC 2010/26). The molar is well preserved and in the middle stage of wear. The buccal side has more rugosity as compared to the lingual side. Tooth has quite thick enamel which is shiny on the lingual side.

The principal conids are well preserved except entoconid which is broken at its tip. The hypoconid is forwardly directed as compared to the protoconid. The lingual conids are broad and the buccal conids are roughly V-shaped. The inner conids are also vertically higher. The lingual conids are broad in the middle while narrow antero-posteriorly. The anterior median rib is more prominent and strong than that of posterior one. The metastylid and entostylid are well developed. The well preserved and prominent median basal pillar is present in the tooth and is touching the apex of the crown in the molar. There is a fold like structure in its outline between protoconid and hypoconid.

*m2*

Second lower molar is well preserved and lie at the middle stage of wear. The buccal side of tooth has more rugosity as compared to the lingual side. Tooth has thick enamel which appears shiny on the lingual side. The hypoconid is forwardly directed as compared to the protoconid. The lingual conids are broad and the buccal conids are roughly V-shaped. The foremost conids are well preserved and prominent. The metastylid and entostylid are well developed. The central cavities are well preserved and these are narrow in the middle while broad antero-posteriorly. The median basal pillar is present in the tooth. The anterior median rib is more prominent than posterior one.

*m3*

Third lower molar is also well preserved. The buccal side of the tooth has more rugosity as compared to the lingual side. Tooth has quite thick enamel which is shiny on the lingual side. The principal conids are well preserved and prominent. The hypoconid is forwardly directed as compared to the protoconid. The lingual conids are wider and the buccal conids are roughly V-shaped. The metastylid and entostylid are well developed. Both median ribs are equally developed and strong. The median basal pillar is present in the tooth. It is broad at the base while narrow towards the crown. The central cavities are

well preserved and these are narrow in the middle while broad antero-posteriorly. The posterior central cavity is very prominent starting from the posterior border of protoconid and metaconid and till reaching the anterior border of talonid. It is narrow anteriorly while broad posteriorly. There is also a well-developed talonid. It is opened anteriorly and roughly circular posteriorly. It is very similar to entoconid in its general appearance and is the postero-external extension of hypoconid.

**Table 1.** Comparative measurements (in mm) of the cheek teeth (PUPC 2010/26) of *Selenoportax vexillarius* (data taken from Pilgrim, 1937, 1939; Akhtar, 1992, Khan, 2007; 2008 and Khan *et al.*, 2009); (\* Studied specimen).

Specimen Number	Position	Length	Width	W/L
*PUPC 2010/26	p4	17.8	10.5	0.58
PUPC 04/1	p4	20.0	12.4	0.62
AMNH 29946	p4	21.0	11.0	0.52
AMNH 29917	p4	21.0	10.0	0.46
*PUPC 2010/26	m1	19.4	14.6	0.75
PUPC 85/40	m1	19.7	12.5	0.63
AMNH 29917	m1	18	13	0.72
*PUPC 2010/26	m2	25.3	15.8	0.62
PUPC 04/1	m2	27.9	16.1	0.57
PUPC 98/78	m2	25.0	16.0	0.64
PUPC 04/12	m2	20.0	12.5	0.62
PUPC 98/69	m2	23.5	14.0	0.59
AMNH 19844	m2	25.9	16.5	0.63
AMNH 19514	m2	22.0	15.5	0.70
AMNH 29917	m2	21.0	15.0	0.71
*PUPC 2010/26	m3	37	16.7	0.45
PUPC 04/1	m3	31.4	16.0	0.50
PUPC 98/78	m3	36.0	15.0	0.41
PUPC 87/90	m3	38.0	16.5	0.43
PUPC 86/213	m3	23.5	16.0	0.68
AMNH 10514	m3	38.0	16.5	0.43
AMNH 19514	m3	33.0	21.5	0.65

**Discussion**

Boselaphines are known infrequently from the Middle Miocene and abundantly from the Late Miocene. The large sized Siwalik Boselaphini includes the genera

*Selenoportax* and *Pachyportax*. The *Selenoportax* is a moderate to large sized Boselaphini, while *Pachyportax* is a huge sized form. The general outline of the studied specimen, the rugosity of the enamel, the strong entostyles, the prominent median ribs, the strong and divergent styles evidently prove the specimen inclusion in the genus *Selenoportax* (Akhtar, 1992, 1995, 1996).

Pilgrim (1937) described this genus on the basis of a collection from the various Siwalik localities of Pakistan and India. Pilgrim referred all the collected specimens to the genus *Selenoportax* and added two species in it, *S. vexillarius* and *S. lydekkeri*. Afterward, Akhtar (1992) added two new species in it, *S. dhokpathanensis* (PUPC 86/248) on the basis of a damaged cranium and differs from *S. vexillarius* by its extremely large size and *S. tatrotensis* (PUPC 87/19) is based upon a maxillary portion bearing right P3-M3 and left P4-M3. *S. dhokpathanensis* have same characteristics as *S. lydekkeri*. Their size is larger than *S. vexillarius*, slight variation in the breadth of skull at the orbits, the breadth of the brain case and the breadth of the occipital condyle. Akhtar (1992) compared specimen PUPC 86/248 with *S. vexillarius* and not with *S. lydekkeri*. Many cheek teeth of the species *S. vexillarius* and *S. lydekkeri* have been described up to now, and not even a single molar for the species *S. dhokpathanensis* has been described yet. So, *S. dhokpathanensis* is considered a synonym of *S. lydekkeri*. *S. tatrotensis* was described on the basis of the upper premolars and molars, having strong and extended transversely entostyles/ectostylids, styles that are slightly weaker and less divergent, weaker median ribs and less rugose enamel with traces of cement. These variations are observed within the species.

Therefore, the genus *Selenoportax* consists of only two valid species and these are *S. vexillarius* and *S. lydekkeri*. Generally, the cheek teeth of *S. vexillarius* are smaller than those of *S. lydekkeri*. Specimen PUPC 2010/26 resembles with almost all the earlier studied specimens of *Selenoportax vexillarius* such as

PUPC 85/40, PUPC 04/1, PUPC 98/78, PUPC 87/90 AMNH 29917, AMNH 19844, and AMNH 10514 (Table 1). All the measurements reveal that the studied specimen falls within the genus *Selenoportax* and it belongs to species *Selenoportax vexillarius*.

### Conclusions

*Selenoportax* fossils are common in the Dhok Pathan Formation. The genus *Selenoportax* basically consists of two species; *Selenoportax vexillarius* and belongs to Boselaphines. The dimensions of the studied material reveal all the features of *S. vexillarius* as cited by Pilgrim in 1937. The specimen is hypsodont and narrow crowned tooth as indicated by its measurements. Specimen PUPC 2010/26 shows the same basic features of the species like the increased Antero-posterior diameter near the summit of the crown and the strong development of the styles and ribs. However, the wrinkles are more conspicuous on the buccal side than on the lingual side.

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