

Original Article

New molars of *Elachistoceras* (Cetartiodactyla, Bovidae) from the Late Miocene Padhri, Northern Pakistan: rare finding

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Abstract

Elachistoceras is the smallest bovid recorded from the Mio-Pliocene of the Siwaliks. Fossil record of *Elachistoceras* is poor. Two lower molars belonging to the tiny bovid are collected from the Padhri outcrops of the Middle Siwaliks, northern Pakistan. The description of the newly collected sample is the focus of the article.

Key words: Mammalia, Boselaphini, vertebrates, Middle Siwaliks, Miocene.

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INTRODUCTION

The described fossil molar have been discovered from the Padhri outcrops belonging to Middle Siwaliks. The Middle Siwaliks has Neogene Tertiary sediments having age span 11.2-3.5 Ma (Barry, 1987; Barry et

al., 1982, 2002). The Middle Siwaliks is divided into two formations, the lower one is the Nagri Formation and the upper one is the Dhok Pathan Formation. The Padhri sediments belongs to the Dhok Pathan Formation of the Middle Siwaliks (Barry et al., 1982).

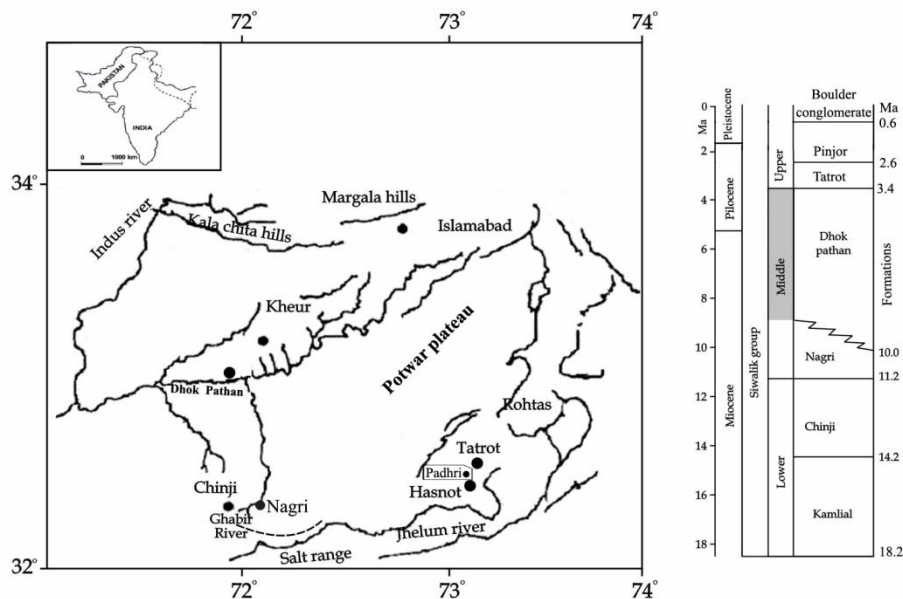


Figure 1: Map of the Potwar Plateau, northern Pakistan with synthetic stratigraphic dates of the Siwaliks formations; the studied areas are encircled.

The Padhri village is situated at about 67 km west of the Jhelum city in the Potwar Plateau of the northern Pakistan (Fig. 1). The village is represented by the highly exposed Neogene freshwater sequence and yields a diversified assemblage of the Dhok Pathan Formation. The tiny bovid fossils are collected from the Chasma site (Lat. 32° 52' 009 N: Long. 73° 18' 297 E), situated southeast of the Padhri village at an altitude of about 1083 ft.

The sediments are deposited by the fluvial system in a wetland environment and characterized by hard, orange red claystone, light gray sandstone with small conglomerates in upper part.

These sediments are composed of a mosaic of land-scape with waters, marshes meadows of herbs and shrubs, woodlands and forests (Barry *et al.*, 2002). Lithologically, this locality consists of small to large channels, levees, paleosols and rare pond or swap deposits which are present in all the Siwalik formations but differ in their frequency of occurrence (Badgley and Behrensmeyer, 1980; Badgley *et al.*, 1995).

The Padhri outcrops are famous for its Miocene mammal's record, scientific collection and detailed investigation of the vertebrate's fauna (Colbert, 1935; Pilgrim, 1937, 1939; Flynn *et al.*, 1990, 1995; Akhtar, 1996; Khan, 2007, 2008). The associated fauna includes fishes, reptiles, proboscideans, rhinocerotids, hipparions, suids, bovids, giraffids, and tragulids (Colbert, 1935; Pilgrim, 1937, 1939; Flynn *et al.*, 1990, 1995; Akhtar, 1992, 1996; Khan, 2007, 2008, Khan *et al.*, 2012).

MATERIAL AND METHODS

Many field trips were carried out to the various sites of the Padhri village (Dhok Pathan Formation), Jhelum district, Punjab, Pakistan and only two specimens of the tiny bovid were discovered.

Dust particles, clay and other hardly adjoined sedimentary particles were removed with the help of fine needles and brushes. The specimens were washed and cleaned in the Palaeontology laboratory of Zoology Department, University of the Punjab, Lahore.

A hand lens was used for keen observation of very small and ambiguous morphological characters. The specimen

catalogue comprises the collection year and the serial number of that year (e.g. PUPC 09/19: numerator denotes the collection year, denominator denotes the serial number of the respective specimen, and PUPC is an institutional abbreviation - Palaeontological collection of University of the Punjab, Lahore, Pakistan).

Measurements were expressed in millimeters. Tooth length and width were measured at occlusal level. The terminology follows Gentry and Hooker (1988). Upper case letters are used for upper dentition and lower case letters for lower dentition.

SYSTEMATIC PALAEOLOGY

Mammalia Linnaeus, 1758

Cetartiodactyla Montgelard, Catzefflis and Douzery, 1997

Pecora Linnaeus, 1758 sensu Webb and Taylor, 1980

Family Bovidae Gray, 1821

Subfamily Bovinae Gray, 1821

Tribe Boselaphini Knottnerus-Meyer, 1907

Genus *Elachistoceras* Thomas, 1977

***Elachistoceras cf. kauristanensis* Thomas, 1977**

Type specimen: GSP 4262 – left horn-core with partial frontal.

Type locality: YGSP 182, situated at the right bank of Soan river near Ganda Kas, district Chakwal, Punjab, Pakistan.

Stratigraphic range: Lower and Middle Siwaliks (Thomas, 1977, 1984; Khan *et al.*, 2009; unpublished data).

Diagnosis: Bovid of very small size, close to that of Steenbok (*Raphicerus campestris*). Rectilinear horn cores of very small dimensions, has oval section.

The teeth reflect typical Boselaphini pattern: Molars rather brachydonts; definitely convex, non smooth lingual wall; rugose enamel; presence of a weak caprine fold (or antero-stylid); less developed lingual furrows distinguished from Cephalophinae (Thomas, 1977).

Studied material: PUPC 69/284, rdm (L - 10, W - 4); PC-GCUF 09/20, lm1 (L - 9.5, W - 5.7).

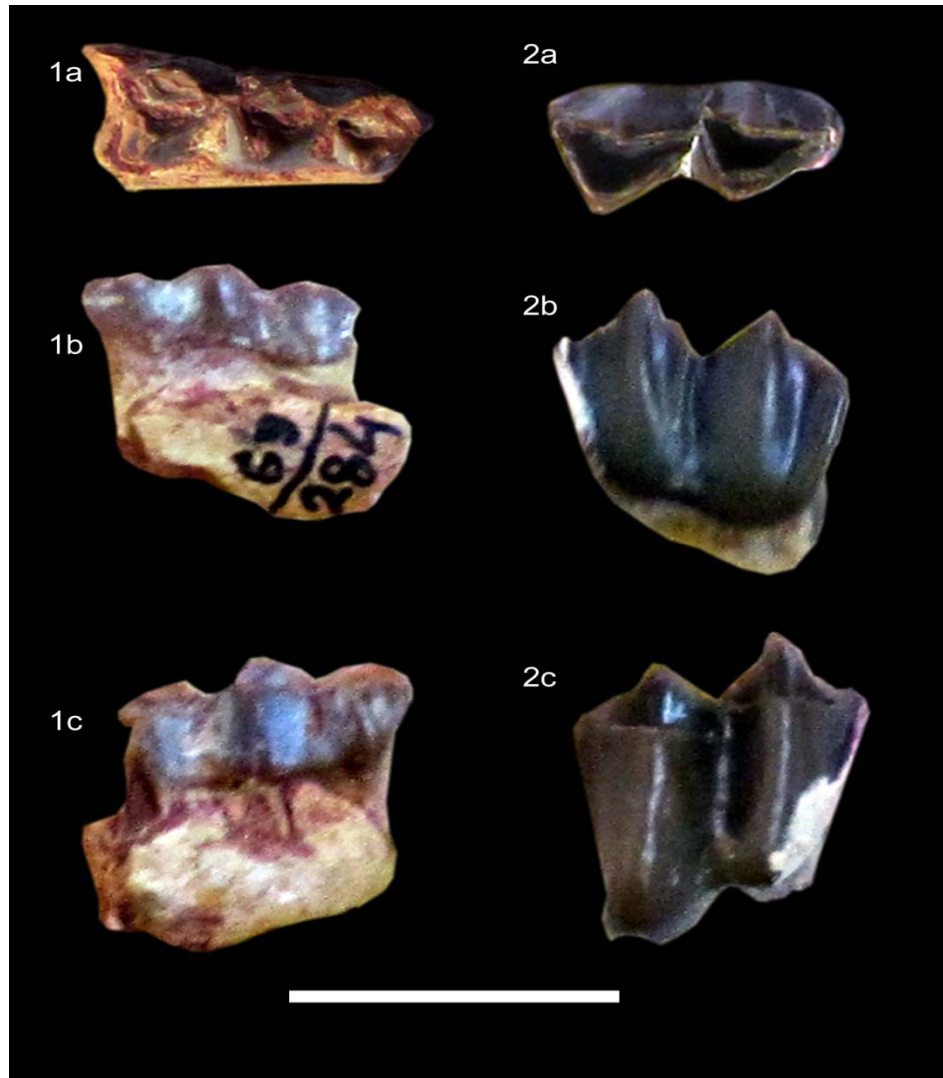


Figure 2 *Elachistoceras cf. khauristanensis*; 1, PUPC 69/284, right deciduous molar. 2, PC-GCUF 09/20, left first molar. Scale bar 10 mm.

DISCUSSION

DESCRIPTION AND COMPARISON

The deciduous molar is elongated with three lobes embedded in a thin fragment of mandible (Fig. 2(1)). The deciduous molar is extremely narrow crowned, nicely preserved and probably it is reported first time from the Middle Siwaliks. A weak transverse flange is present anteriorly. The tubercle like cingulum looks in the anterior and posterior valleys labially. The anterior lobe reflects semiselenodont crestid

pattern. The medial lobe is more selenodont than the antero-posterior lobes. The labial conids are constricted than the lingual ones occlusally. The weak ribs and stylids are present lingually. The slight traces of the cingulid are present postero-lingually. The molar is excellently preserved, unworn and delicate (Fig. 2(2)). The enamel is rugose. The entoconid is highest and sharply pointed. The main cusp apices are sharp and conical. The protoconid is the smallest among all the conids. The posterior conids are slightly higher than the anterior ones. The metastylid, mesostylid and entostylid are well developed and divergent. The ribs are well

differentiated. The transverse valley is very deep. A rudimentary median basal pillar is present at the base of the transverse valley. A weak cingulid is present lingu-labially.

The studied molars are reflected selenodonty, small-sized, rough lingual walls and weak anterior transverse flange. These characters associate them to the smallest Siwalik bovid *Elachistoceras*. The sample resembles the already described sample of *Elachistoceras khauristanensis*, morphometrically (Thomas, 1977, 1984; Khan *et al.*, 2009; Ali *et al.*, 2012). Nevertheless, the material is scarce and can be assigned to *Elachistoceras* cf. *khauristanensis*. The small size antelopes like *Elachistoceras* are rare in the Siwalik late Miocene sediments (Thomas, 1977, 1984; Khan *et al.*, 2009, Ali *et al.*, 2012). The large size antelopes like *Tragoportax*, *Selenoportax*, *Pachyportax*, *Prostrepsiceros*, *Gazella*, *Kobus*, *Kobikeryx*, reported by the earlier authors, are common in the Dhok Pathan Formation of the Siwaliks (Pilgrim, 1937, 1939; Khan *et al.*, 2010). *Elachistoceras* is not recorded from outside of the Siwaliks. The presence of *Elachistoceras* only in the subcontinent Siwaliks implies that at this time, the Himalayan mountains acted as a barrier in the dispersal of the fauna out of Southern Asia (Barry *et al.*, 1982; Bernor, 1984; Brunet *et al.*, 1984). The range contraction of the genus suggests that they remained confined in the Siwaliks during the latest Miocene.

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