

Fossil Bovids from the Late Miocene of Padri, Jhelum, Pakistan

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Abstract.- Three bovid genera have been identified from the late Miocene of village Padri, district Jhelum, Punjab, Pakistan. These comprise cf. *Selenoportax* or *Pachyportax*, cf. *Tragoportax*, and cf. *Gazella*. This fauna seems to date from the early late Miocene which would be the latter Vallesian or earliest Turolian of the European scale (10-8 Ma). The species in the collection are described, their significance assessed and the palaeoecology of the site is discussed.

Key words: Padri, Bovids, Late Miocene, Middle Siwaliks.

INTRODUCTION

The bovid fossils to be described in this paper come from continental Miocene deposits of Padri; the sediments belong to the Dhok Pathan Formation of the Middle Siwaliks (Barry *et al.*, 1982). It is the upper formation of the Middle Siwaliks and consists of fluvial deposits developed in a wetland environment composed of a mosaic land-scape with waters, reedy marshes, meadows of herbs and shrubs, woodlands and forests (Rossner, 2005, 2006; Barry *et al.*, 2002). It is especially famous for its Miocene mammal record and led to extensive scientific collections and detailed investigation of the vertebrate fauna (e.g. Colbert, 1935; Pilgrim, 1937, 1939; Flynn *et al.*, 1990, 1995; Akhtar, 1996; Khan, 2007).

The village Padri is situated in the north west of Hasnot and is considered to be the vicinity of Hasnot. Further details about the locality are given in Khan *et al.*, 2006. Excavations in the area of Padri by the author from 2003-2006 produced a bovid assemblage poor in specimens but diverse in species. In terms of lithology, this locality includes small to very large channels, levees, paleosols and rare pond or swamp deposits which are present in all the Siwalik formations but differ in their frequency of occurrence (Badgley and Behrensmeier, 1980;

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Badgley *et al.*, 1995). The specimens derive mostly from flood plain channel deposits and in a few cases from thin marls deposited in shallow pond environments. Morphologic and metric characters of the specimens are described and systematic determination discussed.

Abbreviations

PUPC – Punjab University Paleontological Collection; p – premolar; l – largest length; w – width; aw – anterior width; pw – posterior width.

MATERIALS AND METHODS

The available material of extinct bovids from Padri comprises six dental specimens. Determination at genus level can be attempted for the teeth, based on extensive and reliably determined material from different Siwalik localities. The terminology of the tooth crown element and manner of measurements follow Gentry (1994) and Rossner (2006). Measurements are given in millimeters (mm). The fossils are housed in the Zoology Department, Punjab University, Lahore, Pakistan catalogued by year of collection and specimen serial number. Uppercase letters are for upper teeth that are M1, M2, M3 stand for upper first, second and third molars respectively and

lowercase letters for lower teeth that are m1, m2, m3 stand for lower first, second and third molars respectively.

SYSTEMATIC PALAEOLOGY

Order Artiodactyla Owen 1848
 Suborder Ruminantia Scopoli 1777
 Family Bovidae Gray 1821
 Tribe Boselaphini Knottnerus-Meyer 1907

Genus cf. *SELENOPORTAX* or *PACHYPORTAX*
 Pilgrim, 1937
 (Figs. 1- 2, 4-5)

Material

PUPC 04/33 left m1 (l = 22.4, w = 14); PUPC 04/43 right M2 (l = 23.3, w = 22.3, aw = 21, pw = 21); PUPC 04/5 left mandibular ramus having m2 (l = 22, w = 14) and broken m3 (l = -, w = 12); PUPC 04/39 left mandibular ramus having m1 (l = 18, w = 14) and m2 (l = 20, w = 14).

Description

PUPC 04/33 shows hypsodonty and the ectostylid is moderately developed. The tooth is in early wear and the enamel is very rugose. The enamel is strongly plicated and the plications are more prominent on the buccal side than on the lingual side. The anterior and posterior central cavities are narrow lacking spurs. The cingulum is present posteriorly at the base of the crown. PUPC 04/43 is well preserved and seleno-hypsodont. The molar is at least slightly worn and originally higher crown having more slender styles. The median basal pillar is strong and expanded transversely. The tooth is 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 very well selenodonty. The enamel is thick and moderately rugose. PUPC 04/5 is somewhat crushed, partially damaged and poorly preserved specimen. The m3 hypoconulid is broken but the second molar of the specimen is preserved completely. The molars are in middle wear and have the median basal pillars. The ribs and styles are pronounced. PUPC 04/39 shows moderately seleno-hypsodonty. The enamel is rugose and the traces of cement are also present. The median basal pillars and the weak goat folds are present in the molars.

The labial lobes of the molars are constricted. The front and rear outbowings of lingual walls are prominent.

Discussion

Morphological and metrical features of the specimens clearly indicate a large sized Miocene bovid. To this group belong *Selenoportax* and *Pachyportax* of the Middle Siwaliks. Crown is narrow at the base and broad at the apex in *Selenoportax* whereas in *Pachyportax* the crown is not constricted at the apex. PUPC 04/33 is narrow at the base and somewhat less bulky which agree with the *Selenoportax/Pachyportax*. PUPC 04/43 is a quadrate tooth and a strong entostyle much extended transversely, relatively strong styles and ribs, enamel moderately thick and rugose with traces of cement is probably distinctive for the type material of *P. latidens* (GSI B219) from the lower part of the Upper Siwaliks housed in Calcutta, India, studied by the author. Compared to PUPC 04/5 wear stage the specimen is relatively high crowned which shows hypsodonty. The specimen morphology differs from tragulids, cervids and giraffids. The specimen has hypsodonty, greater strength of external lobes and ribs, and fairly rapid increase in antero-posterior diameter from base to summit of crown. The seleno-hypsodonty pattern of PUPC 04/39 confirms its inclusion to Ruminantia. But because of further missing morphological characters (fossettes indentations, p4 morphology, third lingual conids of m3) a more precise determination is impossible and of course, the assignment to species on the basis of the specimens is impossible. As the width and length measurements of the studied specimens correspond to genus cf. *Selenoportax* or *Pachyportax*.

Genus cf. *TRAGOPORTAX* Pilgrim 1937
 (Fig. 3)

Material

PUPC 04/7 left mandibular ramus having p4 (l = 11, w = 6.5) and m1 (l = 14, w = 9).

Description

The teeth show seleno-brachydonty. The p4 is medium worn and has a postprotoconulidcristid, a metaconid, and a postmetacristid. The prominence

of the hypoconid is noteworthy and have a deep and narrow valley in front of it. The first molar is completely preserved with all its morphological



Figs. 1-6. **1**, PUPC 04/33, a = occlusal view, b = labial view, c = lingual view. **2**, PUPC 04/43, a = occlusal view, b = lingual view, c = labial view. **3**, PUPC 04/7, a = occlusal view, b = labial view, c = lingual view. **4**, PUPC

04/5, a = occlusal view, b = labial view, c = lingual view. **5**, PUPC 04/39, a = occlusal view, b = labial view, c = lingual view. **6**, PUPC 04/8, a = occlusal view, b = labial view.

features. The metastyle and parastyle are prominent whereas the mesostyle is absent. The median basal pillar is present but weak. The anterior transverse flange is also present.

Discussion

The teeth are small size and seleno-brachydont. The teeth may be distinguished at a glance from teeth of *Pachyportax* and *Selenoportax* by their smaller size, their more brachydont character and the weaker basal pillar (Pilgrim, 1937; Gaudry, 1865; Arambourg and Piveteau, 1929). The studied p4 displays a simple an inner cusp and quite open internal valley. The described character somewhat corresponds to numerous medium-sized boselaphines from the Siwaliks to which this specimen could be attributed. The teeth are probably similar in size and general morphology to *Tragoportax*.

Tribe Antilopini Gray, 1821
Genus cf. *GAZELLA* Blainville 1816
(Fig. 6)

Material

PUPC 04/8 left mandibular ramus with m3 (l = 20, w = 9).

Description

The specimen is broken anteriorly and posteriorly. The hypoconulid of the third molar is also broken at its apex. The goat fold is very strong and prominent. The neck of the crown is much less pronounced so that folds do not diverge so much. The enamel is rugose and the basal pillar is absent in the molar. The fossettes are narrow, deep and fairly simple in outline. The stylids and ribs are moderately developed.

Discussion

The presence of a goat fold, rudimentary ectostylid, hypsodonty, fossettes outline, stylids and ribs confirm its inclusion to genus *Gazella*. There are so many species of *Gazella* named from the late Miocene, most of which overlap greatly in size and

morphology so the material is assigned to cf. *Gazella*.

BIOSTRATIGRAPHY AND PALAEOECOLOGY

The systematic study resulted in the three bovid genera (cf. *Selenoportax/Pachyportax*, cf. *Tragoportax*, and cf. *Gazella*) for the single locality. The site yielding fossil assemblages are 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, pp. 687). Due to taphonomic conditions and sampling methods the taxonomic composition of the bovid remains does surely not reflect the complete community, but nevertheless three species are documented. In fact it resembles the bovid fauna from Hasnot and the locality is slightly older than Hasnot (Pilbeam *et al.*, 1977). The overlapping range of the single stratigraphic occurrences (*Selenoportax*, *Pachyportax*, and *Gazella*) clearly indicates the late Miocene as the most probable age of the site (Barry *et al.*, 2002).

Palaeoecologically the extremely long legs with relatively long metapodials of *Selenoportax* can be interpreted as adapted to more open habitats as in living bovids (Scott, 1985). *Tragoportax* has been interpreted to have a duiker like habits adapted to a life in more or less dense forests (Kohler, 1993). Tragulids were predominant in Hasnot (Farooq *et al.*, 2007) but their lesser numbers in neighboring Padri indicate strongly moist conditions in a habitat with lots of small open standing water bodies for Hasnot, and, some partial and patchy drier habitat conditions for neighboring Padri. The interpretation of changing of climatic conditions from wet to dry is also in congruence with faunal data from the Dhok Pathan Formation of the Middle Siwaliks (Barry *et al.*, 2002).

CONCLUSION

The bovid remains from the late Miocene site of Padri document the occurrence of cf. *Selenoportax/Pachyportax*, cf. *Tragoportax*, and cf.

Gazella. Finally, it testifies a change in the composition of bovid communities between the middle Miocene, known from a previous investigation (Khan *et al.*, 2005) and the late Miocene towards increasing adaptation to more dry and partially more open habitat conditions.

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