REDUNCINE FOSSILS FROM THE UPPER SIWALIKS OF TATROT

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ABSTRACT

Fossil remains of the reduncines are preserved in the Siwalik Tatrot Formation of northern Pakistan. The Tatrot fauna is dominated by the bovids, represent most abundant taxa found from the Siwaliks. These specimens were discovered by the first author in the well dated late Pliocene deposits of the Potwar Plateau, northern Pakistan. The Pliocene deposits of the Tatrot Formation yielded fossil remains of reduncines, which are now grazing antelopes found in habitats associated with the vicinity of water. This discovery adds weight to the suggestion that the Pliocene reduncines inhabited the riverine galleys rather than the dry regions and moreover the sedimentary deposits of the Tatrot were the wetland area during the Pliocene epoch that documents the ancient biome.

Key words: Reduncine, Bovids, Pliocene, Siwaliks, Tatrot.

INTRODUCTION

Bovids are the hollow-horned ruminants. They have a hollow keratinized sheath fitting over a separate bony core, which in some cases has internal sinuses but in most consists of spongy bones. In living bovids neither sheath nor core is branched or seasonally shed. Horns may occur in both sexes or in males only. Bovids have no upper incisors, and vestigial minute upper canines occur in only a minority of individuals (Gentry, 1990a). Upper and lower first premolars are also lacking. The cheek teeth are selenodont and the crescentic cusps join to one another earlier in wear than do in cervids or giraffids. Metapodials lateral and medial to the canon bone are absent and more reduced than in cervids. Compared with cervids and giraffids, many bovids show more hypsodont teeth, stronger cursorial characters in their limb bones, and territorial behavior (Gentry, 1990a).

Giraffids and bovids are best known from Africa and southern Asia. Bovids are better preserved in the later middle Miocene and we can see many lineages in both Eurasian and African assemblages. The bovids known in the Siwaliks during the Miocene, Pliocene and Pleistocene are boselaphines, caprines, reduncines, antilopines, bovines, ovines, neotragines, hipotragines, alcelaphini and tragelaphines. Reduncines are small to moderate or large sized bovids found in the Siwaliks (Pilgrim, 1937, 1939). The earliest bovids other than *Eotragus* and Boselaphini are the Caprini occur in pre-Hipparion faunas of Asia, Africa and Europe (Gentry, 1990b).

The Miocene epoch lasted from 23.0 until 5.0 Ma, with the middle Miocene starting at 16 Ma and the late Miocene at 10.0 Ma (Gentry, 2000). A set of Subcontinent biochronological zones includes the Miocene: Kamlial zone = lower Miocene, Chinji zone = middle Miocene, Nagri and Dhok Pathan zones = upper Miocene to early Pliocene. Within the early Pliocene Tatrot faunal unit succeeded the Dhok Pathan faunal unit. The Upper Siwaliks subdivided into three lithological and faunal stages: Tatrot, Pinjor and Boulder Conglomerate span the late Pliocene to Middle Pleistocene, ca. 3.3 – 0.6 Ma (Dennell *et al*., 2006).

The fossils described in this paper come from the Tatrot faunal stage (3.5 – 3.2 Ma), and add to the biostratigraphic range and distribution of fossil reduncines in Pakistan.

Abbreviations: PUPC – Punjab University Paleontological Collection; Ma – million years ago; m – lower molar; l – largest molar length; w – molar width; h – molar height; h/w – height/width (hypsodonty).

MATERIALS AND METHODS

Morphologic and metric characters of the specimens are described and their systematic determination discussed. The terminology of the tooth crown elements and manners of measurements follow Gentry (1994). Measurements are given in millimeters (mm). Tooth lengths and breadths were measured at occlusal level. Heights were measured on the metastylids of the lower molars. Hypsodonty is a ratio, determined by the height of unworn tooth divided into width of the tooth which is at least 1 or more than 1. Uppercase letter is for upper tooth and lowercase letter for lower tooth that is m stand for lower molar. The reduncine remains are housed in the Abu Bakr Fossil Display and Research Centre, Zoology Department, University of the Punjab, Lahore, Pakistan. The dating of the locality is based on the local biostratigraphy of the Siwaliks according to Barry *et al*. (2002) and Dennell *et al*. (2006).

SYSTEMATIC PALAEONTOLOGY

Family BOVIDAE Gray, 1821
Subfamily HIPPOTRAGINAE (Retzius & Loven, 1845) Brooke, 1876
Tribe REDUNCINI (Lydekker & Blaine, 1914) Simpson, 1945
Reduncini larger sp.

Plate 1, Figs 1-2

Referred Material. **-** PUPC 07/44 a left mandibular ramus having m2-3 and posterior part of m1 (m2: l = 18.7, w = 11.4, h = 11, h/w = 1.4; m3: l = 26.2, w = 12.4, h = 16.5, h/w = 1.3); PUPC 07/45 an isolated left 2nd lower molar (l = 19.5, w = 12.5, h = 19.9, h/w = 1.5).
Locality. **-** Tatrot (the Upper Siwaliks).
Distribution. - Miocene to Recent.
Stratigraphic Range. - Middle and Upper Siwaliks.

Abbreviated Diagnosis. - A large sized antelope, upper and lower molars with basal pillars, constricted lateral lobes in lower molars; upper molars with strong styles; localized ribs between the styles, central fossettes of upper molars with indentations (spurs) of their outlines and tending in later wear to have long, labially directed, transverse arms; lower molars with goat folds and front and rear outbowings of lingual walls; upper and lower p2s small; lower premolars with an appearance of anteroposterior compression; p4s with a strongly projecting hypoconid and often a deep and narrow labial valley in front of it; p4s usually without paraconid-metaconid fusion to form a complete lingual wall (Gentry, 1990b).

DESCRIPTION

The specimens are heavy and larger in size belonging to lower dentition. The distinction features of the molars are the presence of the median basal pillars which is stronger labially and weaker lingually. The goat fold is very prominent and present obliquely. The goat folds are primitively present in reduncines. The lingual ribs are weak in the specimens. The posterior transverse flange is also present. The great size, relative weakness of the lingual ribs and greatly developed ectostylids refer them as Reduncini. Based on the metrical and morphological characteristics, the specimens attribute to Reduncini. The molars from the Tatrot nevertheless appear to be truly reduncine and come from a larger species. However, the material is not complete enough to be specific determination and difficult to assign at genus level.

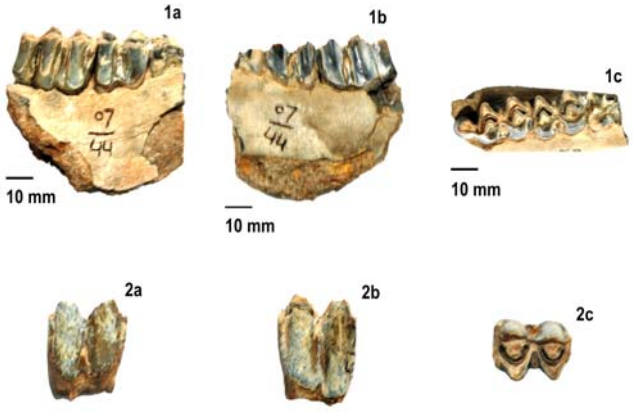
The reduncines are very common in the Upper Siwaliks alongside with the bovines and might the Siwalik reduncines be a parallel evolution to those in Africa but the further fossil finds might be explain more on the mystery.

Explanation of Plate 1. - 1: PUPC 07/44 left lower jaw having m2-3 and posterior part of m1, a = labial view, b = lingual view, c = occlusal view. 2: PUPC 07/45 m2 (natural size), a = lingual view, b = labial view, c = occlusal view.

DISCUSSION

It is well known to Paleontologists that the Reduncini had represented a dominant fossil fauna in Pliocene epoch. Many studies have shown that the present day fauna of bovids is less diversified than in the Plio-Pleistocene (Azzaroli *et al*., 1988; Vrba, 1985, 1995; Rossner, 2006) and the phylogenetic relationships of all bovid tribes remain uncertain. This is especially true for Reduncini (Gentry, 1990b). Geologically earlier reduncine bovids do not have a more primitive morphology than their later relatives (Gentry, 1981). However, reduncine teeth are so primitive as to be problematical (Gentry, 1980). Near the end of the Miocene and shortly afterwards modern tribes of antelopes become recognizable in Africa and Pakistan. Some bovids of probable African origin spread into southern Europe very late in the Miocene (Gentry, 1999). This second stage of bovid evolution may be connected with environments becoming more open and/or with the arrival of hipparionine horses (Gentry, 1990b).

Reduncini appear in Africa at Lukeino and Mpesida and in the Siwaliks at the same time as the bovine *Proamphibos*, that is, when boselaphines diminish. Reduncines continue into the Pinjor Formation of the Upper Siwaliks wherein some more complete remains are known. Here they show quite strong temporal ridges on the braincase roof, reminiscent of Boselaphine and possess preorbital fossae, as known in *Menelikia* but not in living reduncines that support a boselaphine ancestory for reduncines(Gentry, 1990b). However, the teeth at Langebaanweg apparently associated with reduncine horn cores and the crania are like tragelaphines (Gentry, 1980).



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