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Dorcabune nagrii (Ruminantia, Tragulidae) from the Upper Part of the Middle Siwaliks

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Abstract: *Dorcabune nagrii* is a smaller species of genus *Dorcabune* and is known only from the Middle Siwaliks. The described specimens in this study are collected from Hasnot which is the upper part of the Middle Siwaliks include three second molars and one last molar. All the described specimens belong to the lower dentition. *Dorcabune nagrii* agrees with the *Dorcabune latidens* in respect of size but differs by the smaller breadth of molars and inferior depth of the mandible. The aim of the study is to describe *Dorcabune nagrii* from the upper part of the Middle Siwaliks.

Key words: *Dorcabune nagrii*, *Dorcabune anthracotherioides*, Middle Siwaliks, tragulids, cones, hasnot

INTRODUCTION

Colbert (1935) reviewed the tragulids of the Siwaliks, criticized and partially disagreed with the work of Pilgrim (1915). He concluded that *Dorcabune hyaemoschoides* is synonymous with *Dorcabune anthracotherioides* and *Dorcabune latidens* is synonymous with *Dorcabune nagrii*, which is based on his following observations: The size of *Dorcabune hyaemoschoides* which is smaller than that of the *Dorcabune anthracotherioides* is criticized by Colbert (1935). He viewed that this difference is within the limits of individual variation. Another characteristic i.e., less bunodonty in lower molars is also considered negligible by Colbert (1935) as the difference is very small. Other characteristic such as narrowness of front arm of protoconid, a narrower talonid, extension of posterior cusp of P_4 towards inside, are regarded as variable characters. The specimen which is identified as last upper molar by Pilgrim (1915) is not verified by Colbert, he considered it as milk molar, so all the characteristic given i.e., slender cusp and less pronounced parastyle are false in view of Colbert (1935). *Dorcabune latidens* and *Dorcabune nagrii* are also criticized by Colbert. The depth of mandible which is greater in *Dorcabune latidens* than that in *D. nagrii* is also considered as a variable character. The difference in breadth of lower molars of both *D. nagrii* and *D. latidens* is presented by Colbert in terms of indices of length to breadth in M_2 is 73 and 70, respectively. The comparison of indices indicates the weakness of this differential characteristic. On the basis of above said arguments Colbert (1935) viewed that in Siwaliks the genus *Dorcabune* exists in two species i.e., *Dorcabune anthracotherioides* and *Dorcabune nagrii*. He distinguishes these two species on the basis of the following characters: Colbert (1935) first distinguished the *Dorcabune anthracotherioides* by possessing the large size. The upper molar bears well developed cingulum, bunodont cusps, heavy barrels on the outer cusps, heavy parastyle and mesostyle, a buccal ridge on the posterior side of the protocone and heavy rugose enamel. The lower molars are characterized by their bunodonty, markedly developed cingulum. *Dorcabune nagrii* is distinguished by its small size. The upper and lower molars are characterized by the slightly developed cingulum, otherwise similar to the foregoing species.

The chevrotains or mouse-deer (Tragulidae) are an ancient group of ungulates, with a shared history dating back to the Miocene. They are considered the sister-group of the remaining living Ruminantia (Groves and Grubb, 1982). In southern Asia, they are found in fossil assemblages dated at 18 million years before present (Myr), although they reached their highest diversity with five named and 52 unnamed species at around 11.5 Myr (Barry *et al*., 1991). Between 16 and 14 Myr, they were also common in the area that is now northern Thailand, although species diversity may have been low (Ducrocq *et al*., 1994). After 9 Myr, the tragulid family declined significantly in diversity in southern Asia (Barry *et al*., 1991), which may have been caused by the evolution of more open vegetation types. In the Siwaliks they are known from the sediments of 14 to 5 Myr, from Chinji Formation of the Lower Siwaliks to Dhok Pathan Formation of the Middle Siwaliks. Two genera *Dorcatherium* and *Dorcabune* of family Tragulidae are known from the Siwaliks. *Dorcabune* is comparatively larger than *Dorcatherium* and is know by two species *Dorcabune anthracotherioides* and *Dorcabune nagrii*.

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SYSTEMATIC PALEONTOLOGY

Order	Artiodactyla Owen, 1848
Suborder	Ruminantia Scopoli, 1777
Infraorder	Tragulina Flower, 1872
Superfamily	Traguloidea Gill, 1872
Family	Tragulidae Milne-Edwards, 1864
Genus	*DORCABUNE* Pilgrim, 1910

Type species: *Dorcabune anthracotherioides* Pilgrim, 1910.

Generic diagnosis: The genus includes very large sized tragulids having bunodont teeth. Isolated parastyle and mesostyle, prominent cingulum and enamel rugosity are the diagnostic characteristics of the upper molars, whereas lower molars are characterized by their broadness, a wide talonid in the third molar. There is a pyramidal protoconid with two posteriorly directed folds (Pilgrim, 1910, 1915; Colbert, 1935).

Included species: *Dorcabune anthracotherioides* Pilgrim (1910); *Dorcabune nagrii* Pilgrim (1915); *Dorcabune sindiense* Pilgrim (1915); *Dorcabune liukengense* Han. De-Fen (1974).

Distribution: The genus *Dorcabune* is known from the Lower Siwaliks of Chinji, the Middle Siwaliks of Nagri and Dhok Pathan Formations and Lower Manchar of Bhagothoro, Pakistan (Pilgrim, 1910, 1915; Colbert, 1935). This genus is also known from China (De-Fen, 1974).

Dorcabune nagrii PILGRIM, 1910

Type specimen: GSI B590, a right M^3 (Colbert, 1935).

Referred specimens: An isolated M_2 of a left mandibular ramus (PUPC 85/31), An isolated M_2 of left mandibular ramus (PUPC 87/38), An isolated M_2 of a right mandibular ramus (PUPC 87/75), A fragment of left mandible bearing M_3 (PUPC 70/13).

Locality: Hasnot, Jhelum district, the Punjab province, Pakistan.

Stratigraphic range: Middle Siwaliks.

Diagnosis: *Dorcabune nagrii* is smaller than *D. anthracotherioides* with less developed cingula.

DESCRIPTION

PUPC 85/31 (Fig. 1a and b), PUPC 87/38 and PUPC 87/38 are isolated second lower molars and well preserved.

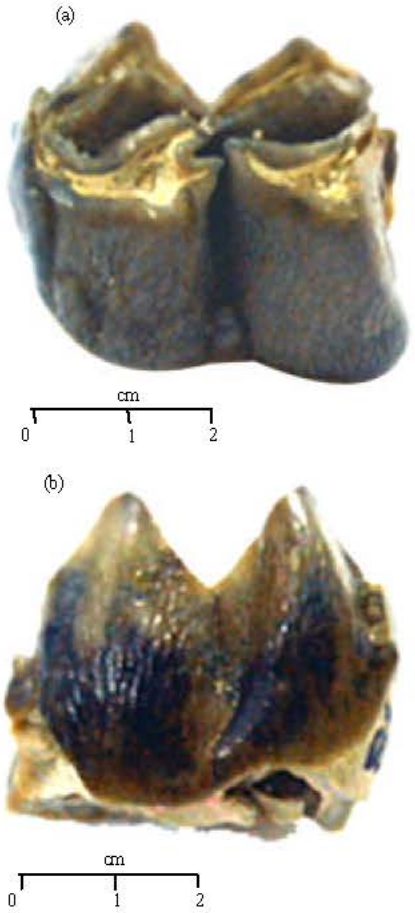

Fig. 1: (a) *Dorcabune nagrii*, occlusal view of the second lower molar (PUPC 85/31). (b) Lingual view of the second lower molar (PUPC 85/31)

The molars are in the early stage of wear. The crown of the specimens is high enough that it can be labeled as extremely hypsodont and narrow crowned. The enamel is very finely wrinkled, thick and almost uniform in thickness. The wrinkles are more confined to the buccal sides than the lingual sides. The cingulum is completely lacking on the lingual as well as on buccal sides except at the entrance of the transverse valley where it is present in the form of a tubercle. The cingular tubercle is moderately developed and high enough. The transverse valley is deep enough. Its entrance is completely blocked by the tubercle. The principal conids are well developed and prominent. The lingual conids are vertically higher than the buccal ones. The protoconid is looking less crescentic due to the wear. It is high in the center with an anterior and a posterior limb. Both the limbs are running down from the apex of the conid. Its anterior limb is continuous with the anterior limb of the metaconid. Whereas its posterior limb is divided into two daughter limbs, one

running down to meet the anterior limb of the entoconid and other seems to touch the anterior limb of the hypoconid but not actually touching. The inner boarder of anterior limb of the protoconid is not straight but rather wavy. The metaconid is spindle-shaped with very thick and strong median rib in the center and a style-like structure at its anterior end. It is vertically higher than the protoconid. It is also pointed in the middle with two sharp sloping arms running down anteriorly as well as posteriorly. The entoconid is as high as the metaconid. Like the metaconid, it is also high and pointed in the middle with an anteriorly and a posteriorly sloping arms. The anterior arm is more worn than the posterior one. The entoconid is relatively thinner than the metaconid. The hypoconid is strongly crescentic in its general appearance. Like the other conids, it is also high in the middle with two sloping anterior and posterior limbs. The hypoconid is slightly smaller antero-posteriorly than the protoconid. Both of its limbs are free and isolated. The central cavities are well developed. The anterior central cavity is broad anteriorly and narrows posteriorly. The posterior central cavity is closed anteriorly and opens posteriorly towards the inner side. The anterior median rib is more prominent and distinct than the posterior one. There is an isolated dwarf and very weakly developed entostylid. Other stylids are almost absent.

PUPC 70/13 (Fig. 2a and b) is lower third molar with complete and very nicely preservation. The mandible is badly damaged so it is not possible to describe its certain measurements. The tooth is almost unworn, or just touches the attrition. Wrinkling of enamel is very fine and slight on all sides of the tooth except the anterior side of the protoconid, where it is comparatively prominent. Cingulum is thin and is present on anterior and posterior sides of the tooth. Two very small tubercles of cingulum are present at the entrance of the transverse valley. Due to unworn condition, the thickness of enamel is not measurable. The outer conids are selenodont, whereas the inner ones are conical. The protoconid is crescentic in appearance. It is not oblique but upright in position. Its anterior arm is continuous with the anterior ridge of the metaconid, whereas its posterior arm is characteristically deeply bifurcated into two free daughter limbs. The metaconid is higher than the protoconid. Its posterior ridge is also bifurcated by a vertical groove. Metastylid is not developed; only median rib of the metaconid is massively developed. Mesostylids and entostylids are also absent. Entoconid seems to be the highest among all the conids. Its anterior ridge slightly proceeds between the two daughter limbs of the posterior arm of the protoconid, whereas its posterior ridge is free. The hypoconid is more crescentic than the protoconid. Its

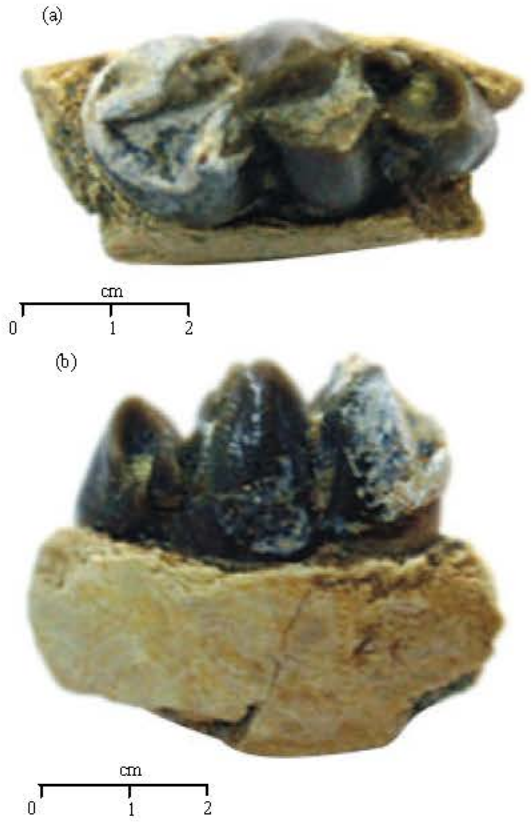

Fig. 2: (a) Lingual view of the third lower molar (PUPC 70/13). (b) Lingual view of the third lower molar (PUPC 70/13)

Table 1: Comparative measurements of the cheek teeth of *Dorcabune nagrii* in millimeters

Number	Position	Length	Width	Height
PUPC 85/31	M^2	19.30	12.60	15.40
PUPC 87/38	M^2	19.20	12.30	11.60
PUPC 87/75	M^2	19.20	10.55	13.90
GSI B591	M^2	15.20	11.00	-
PUPC 70/13	M_3	22.65	10.40	11.80
GSI B591	M_3	21.70	11.40	10.00

anterior and posterior arms are free. The talonid is very wide and broad. Both of its arms are equal in height and length. Its median valley faces towards the antero-lingual side. An enamel tubercle is present at the entrance of its median valley. The talonid lies in the line of outer conids. The comparative measurements are provided in Table 1.

DISCUSSION

The dental material shows that cusps are modified into crescentic form to some extent, so the cusps exhibit selenodonty which is present in artiodactyls. The cusps are not completely crescentic form but they exhibit some bunodonty which is the characteristics of the family

Tragulidae of artiodactyls. Thus the collected remains belong to family Tragulidae. The specimens under study, which are referred to *Dorcabune nagrii* Pilgrim (1910) include lower second and upper molars (M_2 and M_3), both are in isolated form as well as along with a small base of mandible. These specimens have almost all the characteristics being exhibited by the *Dorcabune anthracotherioides* with the differences such as the molars have comparatively faint cingulum and there is less defined fold on the inner side of the protocone. The lower molars have higher, more slender cusps and smaller in size. The studied lower dentition comprising three specimens of M_2 i.e., PUPC 85/31, PUPC 87/38 and PUPC 87/38 are compared with the type specimen GSI B591 (Table 1). The comparison exhibits the variations in lengths and widths, but all are within the range of the normal limits. Third lower molar is represented by only PUPC 70/13, which is compared with the type specimen GSI B591 (Table 1). Again their lengths and widths are close to each other, which display a closer relationship among them. On the basis of both qualitative and quantitative comparisons, it is concluded that all the specimens described are correctly *Dorcabune nagrii* (Pilgrim, 1910). Their inclusion to the said species is beyond any doubt. *Dorcabune nagrii* is only known from sedimentary rocks of India and Pakistan, present in the foothills of Himalayas and not discovered from any other part of the world.

Abbreviations: Punjab University Palaeontological Collection (PUPC) housed in the Department of Zoology, Punjab University, Lahore, Pakistan; American Museum of Natural History (AMNH), New York; Geological Survey of India (GSI); Million years ago (Ma); first upper and lower Molar (M^1_1); second upper and lower molar (M^2_2); third upper and lower molar (M^3_3); premolar (P).

REFERENCES

Barry, J.C., M.E. Morgan, A.J. Winkler, L.J. Flynn, E.H. Lindsay, L.L. Jacobs and D. Pilbeam, 1991. Faunal interchange and Miocene terrestrial vertebrates of southern Asia. Paleobiology, 17: 231-245.

Colbert, E.H., 1935. Siwalik mammals in the American museum of natural history. Trans. Am. Phill. Soc., 26: 1-401.

De-Fen, H., 1974. First discovery of *Dorcabune* in China. Vertebrate Palasiat., 12: 217-221.

Ducrocq, S., Y. Chaimanee, V. Suteethorn and J.J. Jaeger, 1994. Ages and paleoenvironment of Miocene mammalian faunas from Thailand. Palaeogeogra. Palaeoclimatol. Palaeoecol., 108: 149-163.

Groves, C.P. and P. Grubb, 1982. Relationships of Living Deer. In: Biology and Management of the Cervidae. Wemmer, C.M. (Ed.), Research Symposia of the National Zoological Park. Washington, DC: Smithsonian Institution Press, pp: 21-80.

Pilgrim, G.E., 1910. Notice of New mammalian genera and species from territories of India. Rec. Geol. Surv. India, 40: 63-71.

Pilgrim, G.E., 1915. New Siwalik primates and their bearing on the question of the evolution of man and Anthropoidea. Rec. Geol. Surv. India, 45: 1-74.