

FIRST RECORD OF *DORCATHERIUM NAGRII* (TRAGULIDAE, MAMMALIA) FROM LOWER SIWALIKS OF RAMNAGAR AREA (J & K), INDIA.

R. N. VASISHAT¹, R. GAUR¹ AND S. R. K. CHOPRA²

1. DEPARTMENT OF ANTHROPOLOGY, PANJAB UNIVERSITY, CHANDIGARH-160014

2. PUNJABI UNIVERSITY, PATIALA

ABSTRACT

A nearly complete and well-preserved mandible of *Dorcatherium nagrii* is described. Besides being the first record of *D. nagrii* from the Chinji Formation at Ramnagar (Jammu and Kashmir), it is, so far, the most complete specimen of *D. nagrii* described from the Indian Siwalik.

INTRODUCTION

The Lower Siwalik deposits of Ramnagar area (J & K) are well-known to palaeontologists and palaeoanthropologists for their mammalian fossils, especially primates. Explorations of this area, over the years, have yielded a number of significant prosimians and hominoids, viz. *Sivaladapis palaeindicus*, *Sivapithecus indicus*, *Sivapithecus sivalensis*, and *Ramapithecus punjabicus*. Very recently, Chopra (1983) described for the first time a fossil orang, *Sivasimia chinjiensis*, from the Chinji beds of this area.

The Chinji deposits of this area are represented by sequences of fine to medium-grained sandstone and clay beds which are arranged in an alternate manner. The sandstones are grey, reddish and reddish brown while the variegated clays dominate over the sandstones. The sandstone units occasionally display ripple marks and desiccation fissures on the surface. As the rock units of this area have not been dated radiometrically or magnetostratigraphically, no absolute dates are available. However, the faunal assemblage of Ramnagar area shows a close similarity with the fauna from Chinji Formation of Potwar Plateau, Pakistan (Vasishat *et al.*, 1978) which is believed to be 11 to 13 Myr old (Pilbeam *et al.*, 1977).

Very little has been published about the fossil mammals from the Ramnagar area. Notable contributions to the palaeontology and geology of this region were made by Brown (1924), Pilgrim (1927), Colbert (1935), Dutta *et al.* (1976), Vasishat *et al.* (1978, 1979), Thomas and Verma (1979), Gaur (1985), and Chopra (1983). In the present communication we describe two mandibular halves, of the same individual, of *Dorcatherium nagrii* from the Chinji Formation exposed about

one kilometer east of Ramnagar (Fig. 1). This species, which is known from the Siwalik of Potwar plateaus

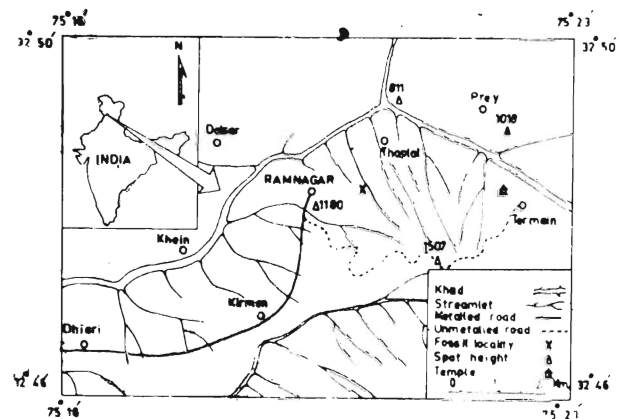


Figure 1. Generalised locality map of the area.

Pakistan and Haritalyangar area (H. P.), was hitherto unrecorded from Ramnagar area. The present discovery is the best preserved and the most complete specimen of *D. nagrii* described from the Siwalik deposits of the Indian Subcontinent. The relative completeness of the present material has enabled the authors to give a more complete diagnosis of *D. nagrii*.

Order Artiodactyla OWEN, 1848
Family Tragulidae MILNE EDWARDS, 1864
Genus *Dorcatherium* KAUP, 1833
Species *Dorcatherium nagrii* PRASAD, 1970.

(Plate I—a-f).

Revised specific diagnosis : A small species of *Dorcatherium* about 40 to 50% smaller than *D. majus*, 20-30% smaller than *D. minus*, and about 30% larger

than *D. minimus*. Upper molars with strong mesostyle ; cingulum slightly developed but well-developed on M^3 ; M^1 comparatively small. Differs from *D. majus* and *D. minus* in the absence of basal internal pillars on maxillary molars. Mandible thin and slender, thickest below M_3 . Lower molars less hypsodont with anterior and posterior cingular developments. Basal external pillar on lower molars vestigial and much less developed than in *D. majus* and *D. minus*. Lower molars with double folds on the distal side of protoconid and paraconid. M_1 comparatively small (Revised after Prasad, 1968 ; Vasishat, 1985).

Material : PUA 89/76 RN, left and right mandibular halves with P_2 , dm_4 and M_1 - M_3 .

Description : Present specimen consists of left and right mandibular halves of the same individual. The right half is better preserved than the left. The left ramus consists of dm_4 and M_1 - M_3 and right ramus is comprised of P_2 , dm_4 and M_1 - M_3 . The specimen belongs to a young individual as P_3 and P_4 have not erupted yet.

The mandible is thin and shallow. The non-alveolar part of the horizontal ramii has thinned down due to compaction within the sediments. The horizontal and ascending ramii form an angle of less than 90° with each other. The horizontal ramus is thin anteriorly and gradually thickens towards the posterior side. The left mandibular half is broken in front of dm_4 and its ventral border is damaged. The right half lacks a major portion of the ascending ramus and a part of the ventral border. It is broken at the symphysis exposing a roughly oval surface of the symphyseal joint. The buccal surface of the horizontal ramus is smooth. The lingual surface shows a shallow depression which commences faintly below dm_4 and gradually widens posteriorly. A comparatively thin ascending ramus starts immediately behind M_3 and moves upwards and backwards to terminate superiorly at the posteriorly directed coronoid process. The mandibular condyle is expanded laterally with a nearly flat superior surface. On its lingual surface the ascending ramus shows a small depression which lodges an anteriorly and inferiorly directed mandibular foramen. As the horizontal ramus is broken anteriorly, the mental foramen is not preserved. A comparatively narrow and shallow groove starts at the mandibular foramen and travels antero-inferiorly for a little distance. The sigmoid notch of the ascending ramus is small and opens posteriorly. The maximum depth of the mandible is below M_3 .

P_2 :

It is elongated in shape and shows a slight but gradual increase in breadth from the mesial to the distal end. The anterior accessory cuspid is slightly chipped.

The principal cuspid and the posterior accessory cuspid are well-preserved. There is no wear on the tooth.

dm_4 :

This tooth is roughly rectangular in outline and exhibits deep wear, much more than the preceding P_2 and succeeding M_1 . The anterior part of the left dm_4 and the distal part of right dm_4 is damaged. Due to high wear most of the crown details have been obliterated. Traces of distal fossettid are however visible in the form of a bucco-lingually compressed enamel island. Faint buccal cingular developments can be observed between the middle and posterior lobes.

M_1 :

The right M_1 is damaged but the left one is beautifully preserved. It is rectangular in shape and all the four major conids, viz. protoconid, paraconid, metaconid and hypoconid, are well-developed. The mesial half of the molar exhibits more wear than the distal half. The tooth shows slightly outbowed ribs on the lingual side. The stylids are however indistinguishable. The mesial wall of the molar is tightly pressed against the distal wall of dm_4 . Nevertheless, traces of anterior cingulum can be noticed at the mesio-buccal and mesio-lingual angles of the molar. The posterior cingulum is more easy to differentiate. Due to differential wear on the mesial and distal halves of the tooth, the prefossettid has become relatively shallow. A weakly-developed external basal pillar can be seen on the buccal side between the mesial and distal halves of M_1 .

The distal parts of protoconid and paraconid show two enamel folds each. In the middle of the molar, the buccal fold of protoconid meets with the mesial enamel crest leaving the top of hypoconid. The lingual fold of protoconid along with the buccal fold of paraconid joins with the anterior crest of metaconid in the middle of the tooth. The double enamel fold of protoconid is more pronounced than that of paraconid. The mesial and distal barrels of M_1 seem to be set slightly obliquely to the long axis of the tooth row. The tooth enamel is smooth and shining.

M_2 :

It is similar to M_1 in its basic crown morphology. However, it is larger (Table 1) and displays only traces of wear. The double enamel folds on the protoconid and paraconid are better developed. The anterior and posterior cingular developments are more pronounced. On the lingual side, at the mesio-lingual angle, the lingual cingulum is developed in the form of a small enamel tubercle. The external basal pillar is comparatively less developed.

Table 1 : Comparative measurements (in mm) of the lower teeth of some species of *Dorcatherium*

Sr. No.	Measurement	<i>D. nagrii</i>			<i>D. minus</i>	<i>D. majus</i>		<i>D. sp.</i>		
		Present specimen	Prasad, 1970		Colbert 1935	Colbert, 1935		Gaur <i>et al.</i>		
			GSI No.	GSI No.	GSI No.	Amer. Mus. No.	Amer. Mus. No.	Amer. Mus. No.	MN.	
		89/76	K21.658	18079	K21.744	Mus. No. 19613	Mus. No. 19365	19524	19369	10/78A
1.	Max. length of molar series (M ₁ -M ₃)	22.00	—	23.10	—	—	—	—	—	—
2.	Max. mesio-distal dia. P ₂	6.00	—	—	—	—	—	—	—	—
	dm ₄	9.00	—	—	—	—	—	14.50	—	—
	M ₁	7.10	7.00	6.50	—	—	—	13.50	—	—
	M ₂	8.30	7.50	6.60	7.50	8.00	13.00	16.00	17.50*	—
	M ₃	10.50**	—	10.00	9.00	11.50	18.00	—	21.50*	15.70
3.	Max. bucco-lingual dia. P ₂	2.10	—	—	—	—	—	—	—	—
	dm ₄	3.30	—	—	—	—	—	5.00	—	—
	M ₁	4.10	4.00	3.60	—	—	—	9.00	—	—
	M ₂	4.90	4.50	4.00	4.00	4.70*	7.50	11.00	9.90*	—
	M ₃	5.20	—	4.50	4.50	5.00*	8.00	—	11.00*	8.40
4.	Max. crown height P ₂	3.20	—	—	—	—	—	—	—	—
	dm ₄	1.90	—	—	—	—	—	—	—	—
	M ₁	3.70	—	—	—	—	—	6.80*	—	—
	M ₂	5.50	—	—	—	3.30*	8.00*	12.00	13.00*	—
	M ₃	—	—	—	—	5.40*	10.00*	—	13.70*	—
5.	Index (max. buco-lingual dia/ max. mesio-distal dia. ×100) P ₁	35.00	—	—	—	—	—	—	—	—
	dm ₄	36.66	—	—	—	—	—	34.48	—	—
	M ₁	57.74	57.14	55.38	—	—	—	66.66	—	—
	M ₂	59.03	60.00	60.60	53.33	58.75	57.69	68.75	56.16	—
	M ₃	49.52	—	45.00	50.00	43.47	44.44	—	51.16	53.40
6.	Height of ramus below M ₂	13.00	—	12.50	—	—	—	—	24.00*	—

*calculated from the figure. **approximate.

M₃ :

This tooth has not completely erupted. Two mesial conids, viz. protoconid and paraconid, are fully visible while the metaconid and hypoconid are partially exposed. The posterior talonid has not yet cut the bone.

Horizon : Chinji Formation of Lower Siwaliks.

Locality : About 1.0 km. east of Ramnagar.

Remarks :

Tragulus, the Asian chevrotian, and *Hyemoschus*, the African water chevrotian, are the two surviving genera of the many Mio-Pliocene tragulid genera. Two tragulid genera, namely *Doracabune* and *Dorcatherium*, are known from the Neogene Siwalik deposits. Genus *Dorcatherium* is represented by four species, viz. *D. majus*, *D. minus*, *D. nagrii* and *D. minimus*, in the Siwaliks. Another species of *Dorcatherium* *D. sp.*, suggested by Colbert (1935), was renamed as *D. nagrii* by Prasad (1970). The present mandible differs from *D. majus*

and *D. minus* by the absence of a strong accessory pillar. It differs from *D. minus* by its smaller size, being 20-30% smaller (Table 1), and relatively less hypsodont teeth. It further differs from *D. minus* by the vestigial nature of its external basal pillar, which is comparatively more prominent in *D. minus*. *D. minimus* reported from the Chinji Formation of Daud Khel, Pakistan by West (1980), is known by maxillary last molars. Therefore, direct morphological comparison of the present specimen with *D. minimus* is not possible. However, the size of *D. minimus* is about 70% that of *D. nagrii* (West, 1980).

In its morphology the specimen under study comes more close to *D. nagrii*. Metrically too, it is very much comparable to the mandibular teeth of *D. nagrii* (Table 1). In view of its morphological and metrical similarities with *D. nagrii*, the present specimen is assigned to *Dorcatherium nagrii*.

In the Siwalik Group of India the tragulids probably first appeared in the Chinji Formation of Lower Siwalik.

Out of the two Siwalik tragulid genera, *Dorcabune* is relatively larger and displays more primitive characters. In the Chinji deposits *Dorcabune* is known by a single species, *D. anthracotherioides*. This species probably gave way to a smaller form, viz. *Dorcabune nagrii*, in the Nagri Formation of Middle Siwalik, which persisted into the Dhokpathan Formation and then probably became extinct.

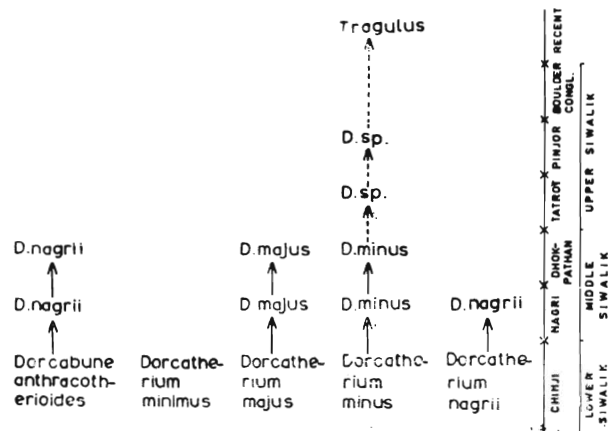


Figure 2. Evolutionary sequence of Siwalik tragulids.

The other tragulid genus *Dorcatherium* is represented in the Chinji sediments by four species, viz. *D. minus*, *D. nagrii*, *D. minus* and *D. majus*. *D. minus* is the smallest Siwalik tragulid and is restricted to the Chinji Formation. The remaining three tragulid species are abundant in the Nagri Formation of Middle Siwalik and two of these, *D. minus* and *D. majus* continue into Dhokpathan Formation of Middle Siwalik where these are less frequent. The existence of *Dorcatherium nagrii* in the Dhokpathan Formation is not confirmed. In the Upper Siwalik the tragulids are very rare and only two reports are available, one of *Dorcatherium* sp. from Tatrot Formation by Pilgrim (vide Prasad, 1970) and the second also of *Dorcatherium* sp. from Pinjor Formation of Upper Siwalik by Gaur *et al.* (1980). The *Dorcatherium* sp. of Gaur *et al.* (1930) has been assigned to *D. minus* by Sankhyan (1981). Due to their fragmentary and insufficient nature, the phylogenetic relationships of Upper Siwalik tragulids have not been worked out in detail. Nevertheless, the circumstantial evidence suggests that these could be the ones in line leading to the modern Indian tragulid *Tragulus*. A hypothetical

model of the evolution of Siwalik tragulids is presented in figure-2.

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EXPLANATION OF PLATE

PLATE I

Mandible of *Dorcatherium nagrii* from Lower Siwalik of Ramnagar.

a-c. Left ramus

a—occlusal view; b—lingual view; c—buccal view.

d-f Right ramus

d—occlusal view; e—buccal view; f—lingual view.

(Bar represents one cm.)

