NEW REMAINS OF *BRACHYPOTHERIUM FATEHJANGENSE* FROM LOWER SIWALIK HILLS, PUNJAB, PAKISTAN

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ABSTRACT

The new unpublished remains of *Brachypotherium* are described. The material collected from the Chinji Formation includes four upper premolars; two upper molars; one lower premolar and a fourth lower milk molar. On the basis of brachydont teeth, the large size, wide and evenly flat or slightly concave ectoloph surface behind the rather insignificant paracone rib in the lower milk molar, persistence of internal cingula on its upper cheek teeth and of the external cingula on its upper and lower molars, the specimens are assigned to *Brachypotherium fatehjangense*.

Keywords: *Brachypotherium fatehjangense*, Chinji Formation, Lower Siwaliks.

INTRODUCTION

The genus *Brachypotherium* is well known from the Western Europe, Central Europe, Anatolia (Turkey) and from Dhok Pathan, Nagri, Upper Chinji and Middle Chinji Groups of the Siwaliks (Heissig, 2003). Heissig (1972) claimed to have identified *Brachypotherium* as far back as in the Kamlial Formation of the Lower Siwaliks. *Brachypotherium* have a dental formula of 1.0.4.3 / 1.0.4.3., with well-developed upper and lower tusks. The lower tusks of the genus are long, sub-parallel and pointing upwards (Cooper, 1934). *Brachypotherium* has rather primitive teeth but developed some specializations of its own (Gentry, 1987).

The new remains are collected from the Chinji Formation of the Lower Siwaliks during various field works made by the students of the Zoology Department, Punjab University, Lahore, Pakistan for the last decade. Therefore, exact locality positions are not known and prefer to use the Chinji Formation for the material; the only locality information is known from the preliminary data. The “Chinji Zone” of Pilgrim (1913) and “Chinji Stage” of Pascoe (1963) consists of interbedded sandstone, silty clay and siltstone were later on reformed as “Chinji Formation”. The type section is exposed near Chinji village (Late. 32° 41’ N., Long. 72° 22’ E.). The Chinji Formation in the Potwar Plateau is dominantly composed of bright red and brown orange siltstone interbedded with ash-gray sandstone (Willis and Behrensmeyer, 1994).

SYSTEMATIC PALAEONTOLOGY

Superfamily RHINOCEROTOIDEA Gray, 1825
Family RHINOCEROTIDAE Gray, 1821
Tribe RHINOCEROTINI Gray, 1821
Genus *BRACHYPOTHERIUM* Roger, 1904
*Brachypotherium fatehjangense* (Pilgrim, 1910) (Plate 1, figs 1-7; Table 1-2)

Type specimen: 1956, 2: 428, a second right lower premolar.

Distribution: Lower to Middle Siwaliks.

Referenced Material: PUPC 07/105 and PUPC 07/109 right upper second premolars, PUPC 02/148 a damaged right upper second premolar, PUPC 07/106 a left upper third premolar, PUPC 07/108 a left upper first molar, PUPC 02/151 a damaged right upper third molar, PUPC
PUPC 07/104 is a left second lower milk molar, PUPC 08 a right lower second premolar (PUPC-Punjab University Palaeontological Collection).

**Locality:** Chinji Formation of Pakistan (Lower Siwaliks).

**Description:** PUPC 07/105, the median valley is very open, antecrochet is moderately present, ectoloph is broken and the metaloph is complete. The premolar is in late wear. Cingulum and crista are absent. The premolar is slightly worn on the anterior side. Crochet is prominently present. Posterior fossette is also present. Anterior fossette is present but it is in late wear. Protocone is slightly extended.

The median valley is moderately deep in PUPC 07/109 and the ectoloph is broken completely. The cingulum is present heavily on the anterior side. The tubercles are present very prominently on the lingual and on the posterior side. Anterior fossette is very prominent. Protocone is slightly extended. Antecrochet is very prominent. Crista and crochet are absent.

PUPC 02/148 is a damaged specimen however, the crochet is absent. The protocone is slightly extended as compared to the hypocone in PUPC 07/106. The metaloph is incomplete and the protoloph has broken away. The protocone is a strong lingual-anterior pillar, well separated from the hypocone pillar due to the presence of a medisinus. Crista and crochet are absent. Parastyle has broken off. Medifossette is present.

In PUPC 07/108, protocone is somewhat constricted. Metaloph has broken away. The hypocone is not constricted and the molar is covered with thin irregular cement on its anterior and posterior sides. Protocone slightly extended. Hypocone slightly cracked due to prolonged seasonal weathering. The entrance of the median valley is open but it is narrow anteriorly owing to the presence of antecrochet. The median valley is much more widely open. The anterior, posterior and lingual cingulum is well developed. The lingual cingulum forms a weak pillar at the entrance of the median valley. The anterior fossette is very prominent. Crochet is absent. Ectoloph has broken off. The enamel is rugose and is mostly present all over the crown. The molar is in late wear. Crista is absent. Medifossette is present. Antecrochet is weakly present. Metastyle and parastyle are broken.

PUPC 02/151 is a right third upper molar. The molar is largely broken. The parastyle is marked forming an obtuse angle with the ectoloph. The protoloph is present with strong anterior constriction. The molar is roughly triangular shaped due to the bending back of the ectoloph and its fusion with the metaloph. The protocone and medisinus have broken away. Two spur-like enamel projections are present in the broken medisinus and extend along its vertical height. The enamel is moderate in thickness. Vertical groove is present prominently on the labial side. Cingulum is present on the posterior side.

Posterior fossette is also present. Parastyle fold is weakly present. Crochet is absent. Hypocone is broken. Paracone is present.

PUPC 07/104 is a left second lower milk premolar. Median valley is present on the lingual side and it is moderately deep. The median valley possesses a V-shaped profile in the lingual view. Anterior side of the premolar is slightly extended. The premolar is mostly broken posteriorly. Ectolophid is complete. The ectolophid (labial) groove is U-shaped, prominent and smooth. Posterior valley is weakly present because it is in late wear. Crista is absent. Labial and lingual cingula are present. The premolar is in late wear, so most of the characters are inconspicuous.

The observed characters in the new remains that are reduced paracoon and an open posterior valley, low and asymmetrical anterior cingulum (less than half of the apparent height of crown most of it being situated labially to the anterior crest), the posterior cingulum extends until the posterior groove of the ectolophid (its height is important on the posterior side and decreases anteriorly until the level of the anterior cingulum) correspond to B. fatehjangense. All these characters are observed in the studied material, which clearly identify it to genus Brachypotherium. The specimens morphologically and metrically (Table 1-2; Figs, 1-7) resemble to B. fatehjangense and the new remains recovered from the Chinji Formation are assigned to B. fatehjangense.

**COMPARISON AND DISCUSSION**

B. fatehjangense shows many similarities with B. brachypus on the basis of the characters discussed below. Compared to B. brachypus from France, described by Cerdeño (1993), the lower second milk premolar seems smaller in width as compared to the premolars and molars. The left lower second milk premolar in B. fatehjangense is also smaller in width and compressed as compared to premolars and molars. The lower second milk premolar in B. brachypus is also smaller in size and a little conical. B. fatehjangense is also of small size and is mostly conical.

B. fatehjangense also show dissimilarities with B. brachypus on the basis of the characters discussed below. In B. brachypus cingulum is present at the ends of the labial face. In B. fatehjangense labial and lingual cingulum is present. Some convexity is also present on the labial furrow of B. brachypus. But the labial furrow of B. fatehjangense shows very prominent convexity. Teeth of B. brachypus are larger than the teeth of B. fatehjangense. B. brachypus has great dimensions; very thick enamel and furrow of the ectolophid is very conspicuous (Antoine et al., 2000). B. fatehjangense has smaller dimensions; moderate enamel and furrow of the ectolophid is very conspicuous. The upper second premolars of B. brachypus differs from B. fatehjangense.
Table 1. Dimensions of *Brachypotherium fatehjangense* from the Miocene of Pakistan. All measurements are expressed in millimeters. In case of width, maximum crown width has been taken. * From Heissig (1972).

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Specimen</th>
<th>Locus/level</th>
<th>Age</th>
<th>Length</th>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Brachypotherium fatehjangense</em></td>
<td>PUPC 07/105 right P2</td>
<td>Chinji (Lower Siwalik, Pakistan)</td>
<td>Lower Miocene</td>
<td>27.1</td>
<td>-</td>
</tr>
<tr>
<td><em>B. fatehjangense</em></td>
<td>PUPC 07/109 right P2</td>
<td>Chinji (Lower Siwalik, Pakistan)</td>
<td>Lower Miocene</td>
<td>25.2</td>
<td>-</td>
</tr>
<tr>
<td><em>B. fatehjangense</em></td>
<td>PUPC 02/148 right P2</td>
<td>Chinji (Lower Siwalik, Pakistan)</td>
<td>Lower Miocene</td>
<td>25.4</td>
<td>-</td>
</tr>
<tr>
<td><em>B. fatehjangense</em></td>
<td>PUPC 07/106 left P3</td>
<td>Chinji (Lower Siwalik, Pakistan)</td>
<td>Lower Miocene</td>
<td>27.9</td>
<td>-</td>
</tr>
<tr>
<td><em>B. fatehjangense</em></td>
<td>PUPC 07/108 left M1</td>
<td>Chinji (Lower Siwalik, Pakistan)</td>
<td>Lower Miocene</td>
<td>33.2</td>
<td>-</td>
</tr>
<tr>
<td><em>B. fatehjangense</em></td>
<td>PUPC 02/151 right M3</td>
<td>Chinji (Lower Siwalik, Pakistan)</td>
<td>Lower Miocene</td>
<td>26.2</td>
<td>-</td>
</tr>
<tr>
<td><em>B. fatehjangense</em></td>
<td>PUPC 07/104 left dp/2</td>
<td>Chinji (Lower Siwalik, Pakistan)</td>
<td>Lower Miocene</td>
<td>28.1</td>
<td>19.4</td>
</tr>
<tr>
<td><em>B. fatehjangense</em></td>
<td>PUPC 08 right P/2</td>
<td>Chinji (Lower Siwalik, Pakistan)</td>
<td>Lower Miocene</td>
<td>29.0</td>
<td>22.0</td>
</tr>
<tr>
<td><em>B. fatehjangensea</em></td>
<td>1956, 2: 428 right P/2</td>
<td>Middle Chinji (Lower Siwalik, Pakistan)</td>
<td>Middle Miocene</td>
<td>27.0</td>
<td>16.0</td>
</tr>
</tbody>
</table>

In case of width, maximum crown width has been taken. * From Heissig (1972).

Table 2. Comparative measurements of the cheek teeth of *Brachypotherium fatehjangense*, *Brachypotherium brachypus*, *Brachypotherium perimense* in millimeters.

<table>
<thead>
<tr>
<th>P4</th>
<th>P3</th>
<th>M1</th>
<th>M3</th>
<th>dp/2</th>
<th>P/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>W</td>
<td>L</td>
<td>W</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td><strong>B. fatehjangensea</strong>*</td>
<td>25.2</td>
<td>-</td>
<td>27.9</td>
<td>-</td>
<td>33.2</td>
</tr>
<tr>
<td>25.4</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.1</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B. brachypus</strong></td>
<td>32.6</td>
<td>-</td>
<td>35.5</td>
<td>-</td>
<td>46.3</td>
</tr>
<tr>
<td>34.5</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.9</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B. perimense</strong></td>
<td>32.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>B. fatehjangenseb</strong>*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

In case of width, maximum crown width has been taken. *B. fatehjangense* from chinji formation. * from Chavasseau et al., (2006).

Plate 1: Figs. 1-7, *Brachypotherium fatehjangense*, Scale bar 20mm
because in *B. fatehjangense* labial cingulum and crista are present. While crista is absent in the premolars of *B. fatehjangense*. This character separates *B. fatehjangense* from *B. brachypus*. In the upper third premolar of *brachypus* from Chevilly, cingulum and crista are present, but crista is absent in the premolars of *B. fatehjangense*. This character separates *B. fatehjangense* from *B. brachypus*. The upper first molar of *B. brachypus* from Baigneaux, differs from *B. fatehjangense* due to presence of a continuant lingual cingulum and crista (Cerdeño, 1993). While crista is absent in the molars of *B. fatehjangense*. The upper third molar of *B. brachypus* from Baigneaux, differs from *B. fatehjangense* due to presence of antecrochet; continuous lingual cingulum and crista; the third molar of *B. brachypus* is a little broader as compared to other *Brachypotherium* species (Cerdeño, 1993).

The lower second milk premolar of the *B. perimense* differs from *B. fatehjangense* because smooth external groove is present but is hardly marked (Heissig, 1972). While in *B. fatehjangense* the external or vertical groove is prominently marked. The lower second milk premolar of *B. perimense* differs from *B. fatehjangense* by having wider milk premolars with close dimensions (Cerdeño and Hussain, 1997).

*B. Fatehjangense* has been discovered from the Chaungtha, Burma (Chavasseau et al., 2006) and from the chinji formation (Heissig, 1972). *Brachypotherium fatehjangense* is also found in nagri, upper chinji and lower chinji of the siwalik regions (Heissig, 2003). The chinji formation of the lower siwaliks shows drier habitat (Heissig, 2003), because of which *B. Fatehjangense* of the chinji formation, lower siwaliks, is morphologically different (smaller in size) from *brachypotherium perimense* from the manchar formation of sind and dang valley of Nepal, which is larger in size because of having humid/swampy habitat (West et al., 1978). The *brachypotherium* is supposed to have a preference for soft diet and a more forested environment (Andrew et al., 1996, 1997), which is comparable to the middle miocene dhok pathan formation in the siwaliks.

**REFERENCES**


