



# Utilization of forest flora by Phayre's Leaf-Monkey *Trachypithecus phayrei* (Primates: Cercopithecidae) in semi-evergreen forests of Bangladesh

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**Author Details:** MOHAMMAD ABDUL AZIZ is currently teaching students, undertaking and supervising various research activities. With background training in Wildlife Biology, his research endeavor includes human-wildlife interactions, bidirectional zoonotic disease transmission, mammalian ecology and conservation, sustainable protected area management approaches, etc. MOHAMMED MOSTAFA FEEROZ PhD is currently teaching students and developing, coordinating, and collaborating research design and activities with different educational and research institutions at home and abroad. His current research interest includes bidirectional zoonotic disease transmission, primate population genetics, ecology and conservation, avian influenza transmission and sustainable livelihood and protected area management.

**Author Contribution:** MAA conducted research in the field, analyzed data and wrote the manuscript. MMF helped design the study and provided necessary suggestions during manuscript preparation and write up.

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**Abstract:** *Trachypithecus phayrei* was observed to use 29 floral species belonging to 14 plant taxa for feeding, resting and sleeping in the semi-evergreen forest of Bangladesh. Principal food items were young and mature leaves (47%), shoots (19%), flowers and buds (16%), fruits and seeds (14%) and petioles (4%). *T. phayrei* preferred leaves in December (76%), fruits and seeds in June (57%) and flowers and buds in April (41%), respective lowest preferences were in April (49%), February (10%), and January (9%). There were two feeding peaks: early morning (0600-0800 hr) and late afternoon (1400-1600 hr). The studied group of *T. phayrei* divided into sub-troops during foraging and feeding.

**Keywords:** Bangladesh, forest flora, Lawachara National Park, utilization, *Trachypithecus phayrei*.

## INTRODUCTION

Phayre's leaf-Monkey *Trachypithecus phayrei* (Blyth 1847) is one of the three colobids found in Bangladesh. It is also found in Myanmar, China, India, Thailand, and Vietnam (Roonwal & Mohnot 1977; Gupta & Kumar 1994; Ruggeri & Timmins 1995/1996; Srivastava 1999). In Bangladesh, it is found in semi-evergreen and semi-deciduous forests (Gittins & Akonda 1982; Feeroz et al. 1995a; Feeroz 1999). Detailed studies have been conducted on various aspects of biology of this species in India (Mukherjee 1982; Choudhury 1987, 1988, 1994, 1996; Gupta & Kumar 1994; Raman et al. 1995; Srivastava 1999), Vietnam (Nisbett & Ciochon 1993;), Laos (Ruggeri & Timmins 1995/1996), China (MacKinnon & MacKinnon 1987; Xu & Tang 1990; Ye et al. 1989; Yuan et al. 1990) and in some parts of South Asia (Roonwal & Mohnot 1977). In Bangladesh, several studies have been carried out on other available primate species found in Lawachara National Park (Feeroz 1991, 1999, 2001; Kabir 1991; Feeroz & Islam 1992; Feeroz et al. 1994; Ahsan 1994, 2000; Hasan et al. 2005) as well as other areas of the country (Akonda 1979; Khan 1981; Islam & Husain 1982). However, as yet no ecological study has been carried out on this critically endangered species. The present study was taken up to explore the utilization of forest flora by *T. phayrei* in Lawachara National Park, Bangladesh.

## Methods

The study was conducted between September 2005 and June 2006 in Lawachara National Park (LNP), Bangladesh using the focal animal sampling method, as used by Altmann (1974), Werschkul (1979, 1982), Begum (2000) and Sultana et al. (2004). An individual of *T. phayrei* was followed throughout the day from dawn to dusk. When the animal was observed to eat parts of any plant species, the name and eaten parts were recorded. The plant parts used by the animal were categorized and recorded as mature and young leaves, shoots, flowers and buds, mature or ripe fruits, unripe or green fruits, seeds and pods, and petioles. Proportion of time spent on feeding of each food item was used to calculate the percentage of food items eaten at different hours of the day. The plant species used by the animal were also ranked on the basis of their categorical uses (feeding, resting, sleeping) and access to food sources in the respective study period (food availability in the studied months).

**Study area:** Lawachara National Park, a part of the West Bhanugach Forest Reserve, is located approximately 160 km northeast of Dhaka and 60 km south of the city of Sylhet in the civil administrative units of Kamalgonj Police Station and Maulvibazar District of Sylhet Forest Division. It lies in the Bio-ecological zone of 9b-Sylhet Hills (Nishat et al. 2002). The park is situated within 24°03'0"-24°03'2"N & 91°03'7"-91°03'9"E



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Image 1. *Trachypithecus phayrei* sitting on *Artocarpus chaplasha* at Lawachara National Park

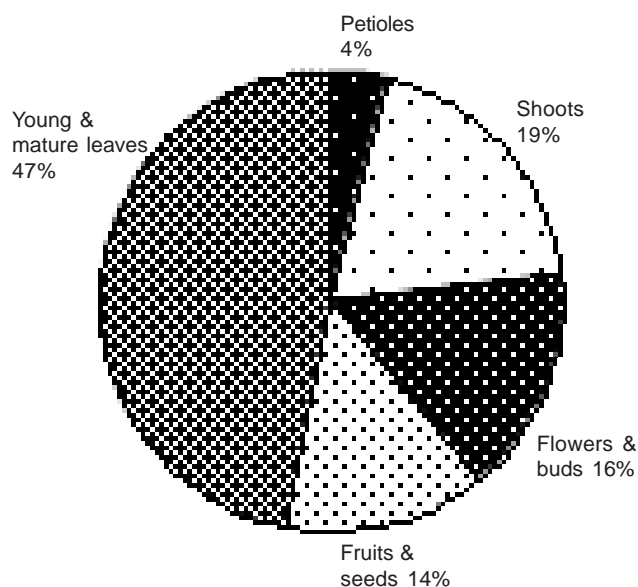


Image 2. *Trachypithecus phayrei* feeding on *Albizia lebeck* at Lawachara National Park

Table 1. Plants species used by *Trachypithecus phayrei*

Species	Local name	Family	Plant parts eaten*
<i>Acacia auriculiformis</i>	Akashmoni	Leguminosae	ml, yl
<i>Acacia mangium</i>	Akashmoni	Leguminosae	ml, yl
<i>Albizia chinensis</i>	Shirish	Leguminosae	fl, pl, sd
<i>Albizia procera</i>	Sil Koro	Leguminosae	fl, pl, sd
<i>Anthocephalus chinensis</i>	Kadam	Rubiaceae	yl
<i>Artocarpus chaplasha</i>	Chapalish	Moraceae	yf, bd
<i>Artocarpus heterophylla</i>	Kathal	Moraceae	bd, ml
<i>Artocarpus lakoocha</i>	Deowa	Moraceae	yf, bd
<i>Bambusa tulda</i>	Mitinga	Graminae	yl, ml, sh
<i>Chickrassia tabularis</i>	Chickrass	Meliaceae	yl, sh
<i>Clerodendrum</i> sp.	—	Verbenaceae	pl
<i>Dillenia indica</i>	Chalta	Dilleniaceae	pl
<i>Dillenia pentagyna</i>	Hargoja	Dilleniaceae	pl
<i>Dioscorea bulbifera</i>	Chupri alu	Dioscoreaceae	yl, sh
<i>Ficus hispida</i>	Kakdumur	Moraceae	y f
<i>Ficus benjamina</i>	Chuta Dumur	Moraceae	y f
<i>Ficus racemosa</i>	Bot	Moraceae	y f
<i>Garcinia cowa</i>	Kao	Guttifereae	yf, bd
<i>Gmelina arborea</i>	Gamari	Verbenaceae	bd
<i>Mangifera sylvatica</i>	Uriam	Anacardiaceae	yf, bd
<i>Melocanna baccifera</i>	Tengra muli	Graminae	yl, sh
<i>Melocanna bambusoides</i>	Jhai bansh	Graminae	yl, sh
<i>Mikania cordata</i>	Taralata	Compositae	yl, sh
<i>Syzygium fruticosum</i>	Khudi jam	Myrtaceae	yl, ml, rf, yf
<i>Syzygium cumini</i>	Jam	Myrtaceae	yf, rf,
<i>Syzygium grande</i>	Banjam	Myrtaceae	yf, rf
<i>Tectona grandis</i>	Segun	Verbenaceae	yl, ml, sh
<i>Terminalia catappa</i>	Kat badam	Combretaceae	yl, ml, sh
<i>Toona ciliata</i>	Rangi	Meliaceae	yl, ml

\* yl - young leaves; ml - mature leaves; yf - young fruits; rf - ripe fruits; sh - shoots; bd - buds; pl - petioles

Figure 1. Diet composition of *Trachypithecus phayrei*

coordinates. The current notified area of the park covers an area of 1250 hectares and proposed area includes 281 hectares of West Bhanugach Reserved Forest (FSP, 2000a).

The forest type in this region is semi-evergreen (Craig 1991). The floral diversity in the area includes 89 species of plants (Feeroz 1999; 107 species were recorded by Leech & Ali 1997). The canopy height varies from 10 to 30 metres (Ahsan 1995; Feeroz 1999). The top canopy comprises mainly *Tectona* sp., *Ariocarpus chaplasha*, *Tetrameles* sp., *Hopea odorata*, *Toona ciliata*, *Pygenum* sp, the second canopy primarily includes *Quercus* spp.,

*Syzygium* spp., *Gmelina arborea*, *Dillenia pentagyna*, *Grewia cowa*., *Ficus* spp. and the underneath is comprised mainly of *Bambusa* spp., *Alsophila* sp., *Geodorum* sp., *Eupatorium odoratum* with several ferns and epiphytes (Feeroz & Islam 1992, 2000). The average tree density was recorded as 271 trees/ha with average species diversity 11.2 species/ha (Feeroz 1999). Average maximum temperature (33.6°C) was recorded in March and average minimum temperature of 10°C was recorded in January. The highest rainfall (456mm) was recorded in June during the study period.

## RESULTS

**Food plants:** *T. phayrei* consumed a variety of plant species as its food during the study period. It obtained food from 29 plant species in 14 botanical families. Among the recorded plant taxa, Leguminosae and Moraceae provided the highest proportion (32%) of their food plants. The Graminae provided mostly the leaves and shoots while the Leguminosae provided flowers, pods, leaves, and seeds. Ranking analysis revealed that plant species of Leguminosae and Graminae ranked top in high usage category while most of fruit trees were used moderately.

**Diet composition:** The study revealed that young and mature leaves along with shoots provided the highest portion (66%) of diet followed by flowers and buds (16%), and fruits and seeds (14%; Fig. 1). The flowers and buds of two leguminous species, *Albizia procera* and *A. chinensis* provided a large amount of food during April (30%). The young and mature leaves along with shoots of *Melocanna baccifera*, *M. bambusoides*, *Bambusa tulda*, *Toona ciliata*, *Chickrassia tabularis*, *Mikania corda*, *Gmelina arborea*, *Tectona grandis*, *Terminalia catappa* and *Acacia mangium* provided supplemental food throughout

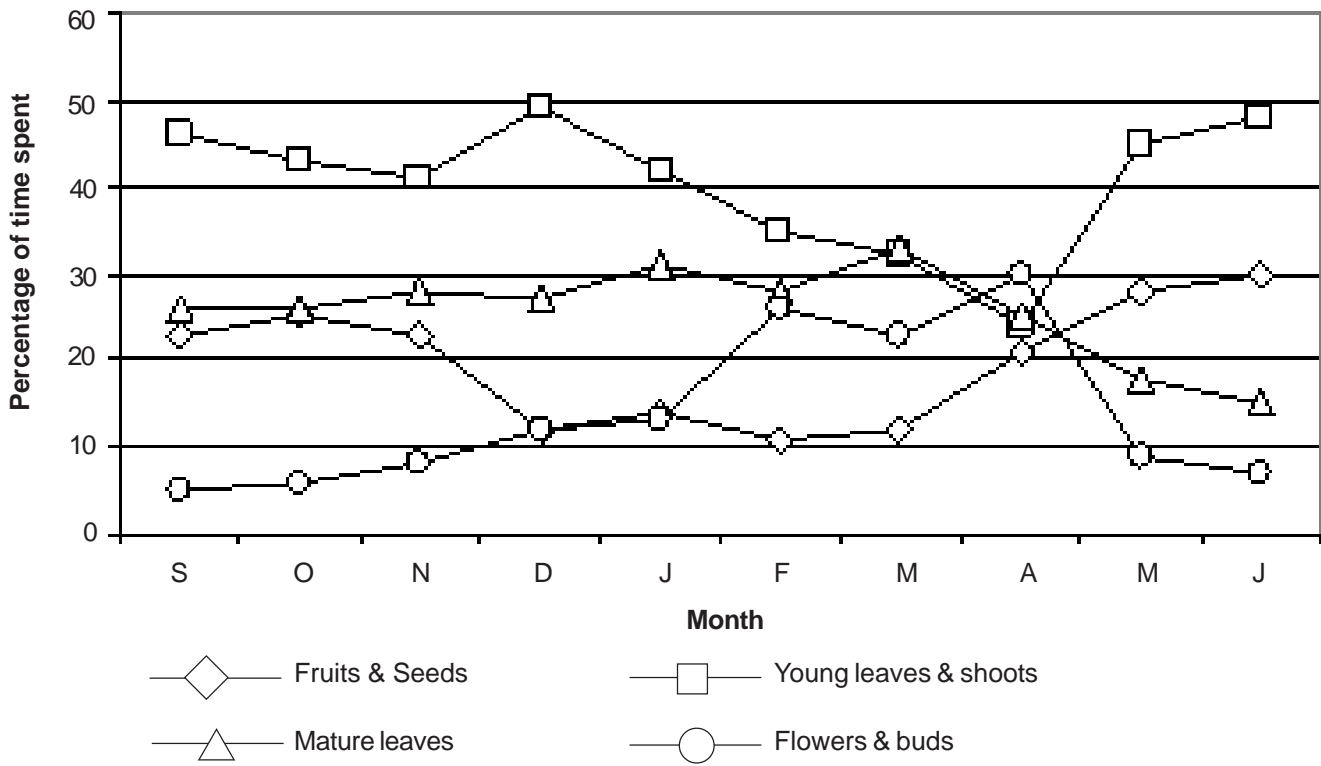


Figure 2. Monthly variation of feeding of *Trachypithecus phayrei*

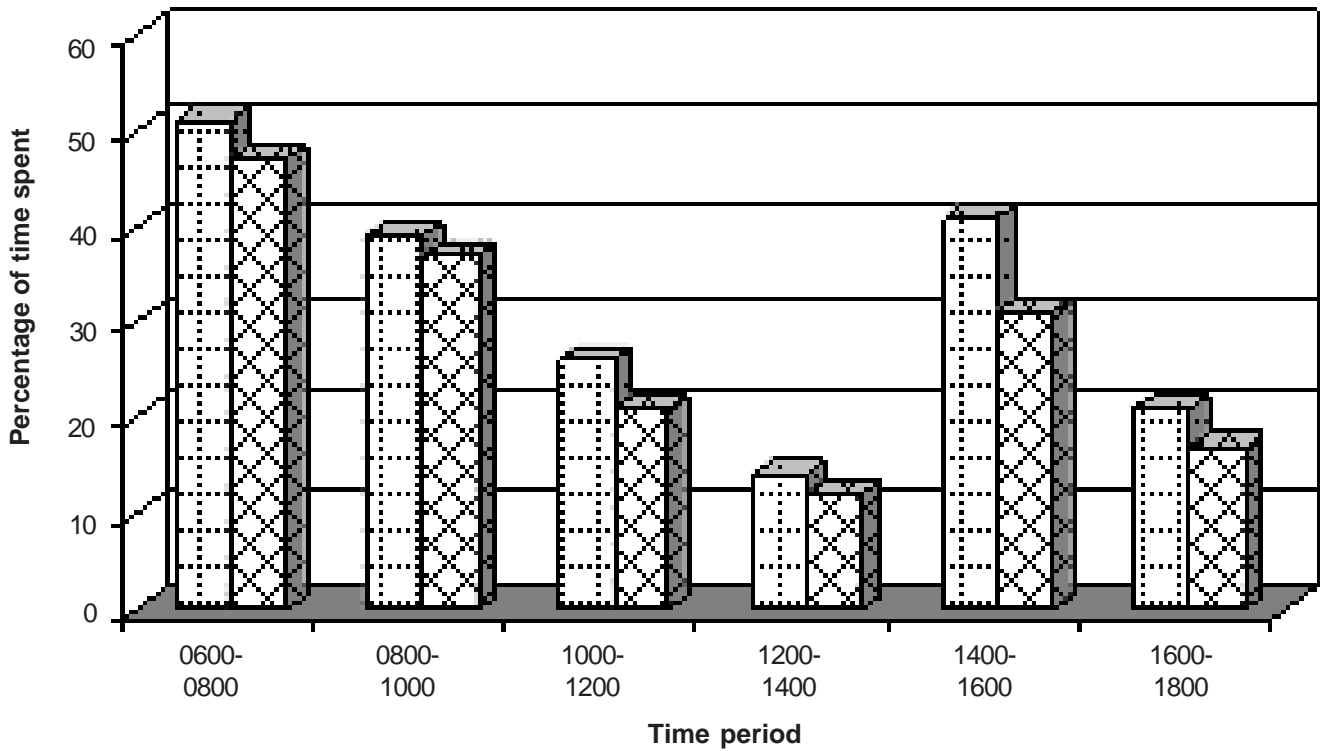


Figure 3. Diurnal variation of feeding and foraging of *Trachypithecus phayrei*

the study period. The unripe fruits of *Garcinia cowa*, *Ficus* spp., and *Mangifera sylvatica* were eaten to some extent.

**Diurnal and monthly variation of feeding and foraging:** the proportion of time spent feeding on different food items varied across months during the study period (Fig. 2). Leaves were consumed mostly in December (76%) and least in April (49%) (mean = 66.2%, range = 49–76%, sd = ±28.29). Fruits and seeds were eaten mostly in June (57%) when consumption of mature leaves was comparatively low (15%). Feeding on flowers and buds peaked in April (41%) and was less in January (9%). Bamboo shoots provided substantial amount (19%) of diet throughout the study period.

Time spent feeding on different food items also varied at different hours of the day (Fig. 3). *T. phayrei* had two feeding peaks: one in early morning (0600–0800 ht) and another in late afternoon (1400–1600 hr). During foraging and feeding, langurs divided into sub-troops but maintained a liaison among the dispersed members through visual and vocal contact. When feeding on *Melocanna baccifera*, *M. bambusoides*, *Bambusa tulda*, *Acacia chinensis* and *A. procera*, group members foraged by sub-trooping dispersion. *T. phayrei* used several plant species for resting purposes during daytime (Table 1). They selected resting plants with extensive (*A. chaplasha*, *G. arborea*) and moderate shade (*A. chinensis*, *M. baccifera*, *M. bambusoides*, *B. tulda* or *A. mangium*).

## CONCLUSION

Like most monkeys, *T. phayrei* feeds on fibre-rich foliage, shoots, petioles, leaves, flowers and buds. Some plant species provide food throughout the year, others are seasonal. Thus survival of this species depends on the continued availability of food trees, and replacement of indigenous flora with exotic plants poses a threat to this and other primate species. Disturbances created by tourist activities, plantation encroachment, trains and motor vehicles passing through the park provide further challenges to their survival.

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