

Selection and Shifting of Sleeping Sites by Hanuman Langurs in Morni Hills of Haryana, India

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Abstract

Selection and shifting of sleeping sites by three (two bisexual and one all male) groups of Hanuman Langur, *Semnopithecus hector* (Pocock, 1928) were studied in Morni Hills of Haryana, India from January 2010 to December 2010. All the studied groups were found to use 1-5 large and small trees species with long trunk and dense canopy, for roosting within their home ranges. Groups showed varied preference for species of sleeping trees. In all, 11 trees species were used by langurs as sleeping sites. The langurs were found to use highest branches of trees for sleeping as the main strategy to avoid predators which is the main factor influencing selection of sleeping tree by human langurs. The bisexual troop (ST), living in forest area along with potential predator(s), used maximum (5) number of trees while the all male band (MB) inhabiting near human settlements in the absence of potential predator(s) used the least (1) number of trees for sleeping. Periodic shifting of sleeping sites was also observed both in 'bisexual' and 'all male' groups. These groups used 3-5 sleeping sites during the study year. Vital factors influencing periodic shifting of sleeping sites by langurs in Morni Hills of Haryana appear to be environmental temperature variations, availability of food and water sources, disturbances from human beings and predators.

Introduction

The Hanuman langur is the most widely distributed and highly adaptive primate in the South Asia (Roonwal & Mohnot 1977; Chhangani 2000). It lives in a wide range of habitats from the Himalayas and peninsular forests to semi-arid lands, in villages and towns and in cultivated land (Roonwal & Mohnot 1977; Chalise 1995). It is an arboreal and diurnal species and prefers to jump from one tree to another through the branches when foraging but some may become accustomed to living close to the human settlements (Tritsch 2001). It has folivorous feeding habits, complex sacculated stomachs and lack cheek pouches (Thorington & Anderson 1984).

Hanuman langurs are social animals with variable social organization (Chhangani 2000). They are protected by laws in India which forbid their



Feeding: Hanuman langur feeding near sleeping site



Allogrooming: Allogrooming at sleeping site

killing and capture, alive or dead, although enforcement is a problem and most people do not even know that they are a protected species (Choudhury 2001). *Semnopithecus hector* (Pocock 1928) is one of the seven species of Hanuman langur

found in India. This species is listed as Near Threatened, as there are probably not more than 10,000 mature individuals, and it is experiencing a continuing decline (Molur & Chhangani 2008). In the state of Haryana, *Semnopithecus hector* is found in

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Sleeping site: Hanuman langurs at sleeping site



Tail carriage: Tail carriage characteristic of Hanuman langur



Troop: Troop of langurs along road side

Kalesor forest, Pinjore and Morni Hills and till date no scientific study has been carried out on ecology and behaviour of langurs in this area. Among diurnal non-human primates, the selection of safe sleeping sites within their available habitat is assumed to be of utmost importance as they spend their night at the top of high trees (Ruhayat 1983; Malik 1984; Stanford 1991; Tokayashy 1992; Tokahashi 1997). Keeping this in view, present study was designed to collect information on selection and shifting of sleeping trees by Hanuman langur in Morni Hills of Haryana.

Materials and Method

Study Area

Morni Hills (30°35' to 34°45' N and 70°00' to 75°15' E) form a part of lower Shiwalik Ranges in north-east Haryana with an altitude range from 300 to 1400 m above sea level (Fig. 1). The range includes two lakes that are situated within these mountain ranges. Besides, the area is known for the ruins of an old fort at Morni village which is located at the top of the hill. Morni comes under highly dissected region of Shiwalik with low lying hills that are sparsely vegetated. The river Ghaggar separates Morni Hills from Pinjore subdivision. The forest of the area is tropical deciduous. The summer temperature varies between 18-45 °C. Morni Hills have a fascinating range of flora and fauna. The area is rich in avian diversity. The prominent mammals which inhabit the Morni range are Leopard (*Panthera pardus*), Small Indian cat (*Viverricula indica*), Common mongoose (*Herpestes edwardsii*), Jackal (*Canis aureus*), Indian porcupine (*Hystrix indica*), Indian hare (*Lepus nigricollis*), Wild boar (*Sus scrofa*), Goral (*Nemorhaedus goral*), Blue bull (*Boselaphus tragocamelus*), Spotted deer (*Axis axis*), Barking deer (*Muntiacus muntjak*), Sambar (*Rusa unicolor*) and Rhesus macaque (*Macaca mulatta*).

Study Groups

Initially, a thorough survey of Morni Hills was carried out and in all, 24 groups of Hanuman langur (18 Bisexual groups, 5 'All Male' bands & 1 solitary male) were found. Of these, three groups, i.e., Bangar Troop (BT), Sherla Troop (ST) and Morni Band (MB) were selected for the detailed study. The troops BT and ST were 'uni-male bisexual' troops while MB was an 'all male' band. These groups

Table 1. Location of types of langur groups, habitats used with / without human interference by them, predominant trees and availability of their possible predators in Morni Hills, Haryana.

Type of group and its size	Type of habitat occupied with/ without human interference [Altitude(m) Latitude, Longitude]	Dominant trees	Predator (s) present in the study area
Bisexual Group-BT (20)	Forest area having crop land nearby (with no human Interference) 993 30° 41'44 77° 03'54	Chhal (<i>Anogeissus latifolia</i>), Neem (<i>Azadirachta indica</i>), Shisham (<i>Dalbergia sisso</i>), Amaltas (<i>Cassia fistula</i>), Imli (<i>Tamarindus indica</i>), Amrud (<i>Psidium guajava</i>), Jhingan (<i>Lannea coromandelica</i>), Khair (<i>Acacia catechu</i>), Siris (<i>Albizia lebbek</i>), Semal (<i>Bombax ceiba</i>), Salai (<i>Boswellia serrata</i>), Papadi (<i>Holoptelea integrifolia</i>), Bargad (<i>Ficus benghalensis</i>), Gular (<i>Ficus racemosa</i>)	Leopard, Jackal
Bisexual Group-ST (30)	Forest Area (with human interference) 1012 30° 40'18 77° 06'28	Bargad (<i>Ficus benghalensis</i>), Chhal (<i>Anogeissus latifolia</i>), Neem (<i>Azadirachta indica</i>), Mango (<i>Mangifera indica</i>), Pipal (<i>Ficus religiosa</i>), Jamun (<i>Syzygium cumini</i>), Amaltas (<i>Cassia fistula</i>), Amrud (<i>Psidium guajava</i>), Jhingan (<i>Lannea coromandelica</i>), Bael (<i>Aegle marmelos</i>), Siris (<i>Albizia lebbek</i>), Semal (<i>Bombax ceiba</i>), Amla (<i>Emblca officinalis</i>), Bargad (<i>Ficus benghalensis</i>), Papadi (<i>Holoptelea integrifolia</i>)	Leopard, Jackal, Dogs
'All male' Group-MB (9)	Human Settlements & Temple 1138 30° 41'13 77° 04'54	Chhal (<i>Anogeissus latifolia</i>), Neem (<i>Azadirachta indica</i>), Mango (<i>Mangifera indica</i>), Pipal (<i>Ficus religiosa</i>), Jamun (<i>Syzygium cumini</i>), Amrud (<i>Psidium guajava</i>), Safeda (<i>Eucalyptus globulus</i>), Bargad (<i>Ficus benghalensis</i>)	Dogs

Figures in parenthesis in column 1 indicate number of individuals in a group

inhabited different habitats within same range of climate, rainfall, topography, altitude and plantation. The habitats of the groups differed with respect to human interference and predator absence/presence (Table 1). The habitat of BT (17 individuals) troop was a forest area with no human disturbance while in the case of ST (20 individuals) troop, it was a forest area having human settlements. The 'all male' band, i.e. MB (9 males) inhabited area near Morni fort with human presence and a temple.

Sleeping sites of Hanuman langurs were established in two ways: by directly following the focal groups periodically from morning till the time they settled on specific locations and

by recording presence of fresh faecal pellets of langurs under such locations. Each focal group of Hanuman langurs was followed for three consecutive days each month from January 2010 to December 2010. Of the total 108 days, sleeping sites could be identified only on 69 occasions of monitoring of focal groups from morning till evening. On rest of the days, particularly during monsoon season, the observer lost the sight of focal groups and hence data regarding their sleeping sites could not be obtained. Whether or not the same sleeping site was used for consecutive nights could be discerned on the basis of the amount of faecal patches and characteristics of faecal distribution. The geographical location of sleeping site was determined with hand held

GPS (Garmin) and the height of trees used as 'sleeping sites' was measured with Hypsometer.

Results and Discussion

During the present study, the sleeping sites and tree species used for the roosting by three focal groups (two 'bisexual' troops and one 'all male' band) of Hanuman langur (*Semnopithecus hector*) were recorded. At the end of the day, all individuals of each group would gather around the sleeping sites and at the onset of darkness, they would climb the trees for sleeping. All the three studied groups used large tree species, with straight trunk and dense canopy, for roosting. In all, 11 tree species, namely, Papri (*Anogeissus latifolia*), Neem (*Azadirachta indica*), Gular (*Ficus racemosa*), Amaltas (*Cassia fistula*), Safeda (*Eucalyptus globulus*), Khair (*Acacia catechu*), Siris (*Albizia lebbek*), Bargad (*Ficus benghalensis*), Jhingan (*Lannea coromandelica*), Salai (*Boswellia serrata*) and Kala siris (*Albizia odoratissima*) were used as sleeping trees (Table 2). Focal groups of langurs revealed varied preference for different tree species as sleeping sites (Table 3). Average height of sleeping tree was 15.7m (range 8 - 25m). The individuals of a troop usually used one large tree or combination of 1-2 high trees and 2-3 small trees close to each other. This combination is thought to play a key role in protection of the troop during attack by predator as the langurs can

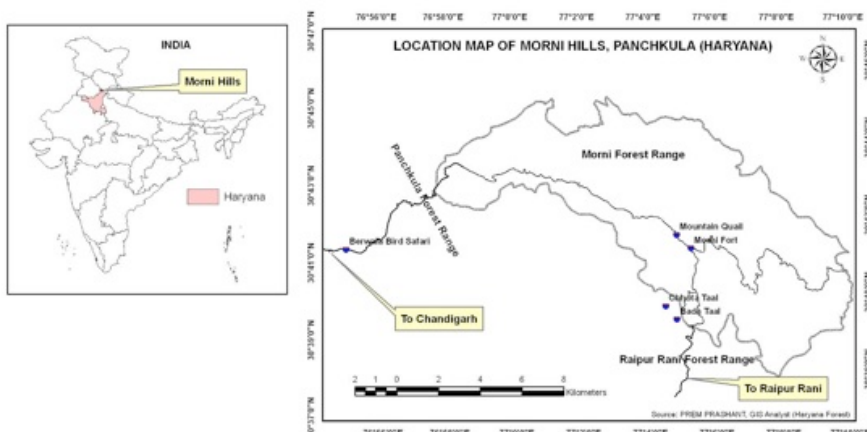


Figure 1. Location of the study area

Table 2. Location of sleeping sites, trees species and their heights used by the three studied groups of Hanuman Langurs in Morni Hills, Haryana

Type of Group	Location of sleeping sites & months of use	No. of trees used at the sleeping site		Tree Species used as sleeping sites	Approximate height of trees (m)
(BT)	1. Bottom of Hills (January – February)	4	2	<i>Lannea coromandelica</i> (Jhingan)	14, 16
			2	<i>Anogeissus latifolia</i> (Papri)	12,16
	2. Top of Hills (March – April)	4	1	<i>Ficus benghalensis</i> (Bargad)	18
			3	<i>Lannea coromandelica</i> (Jhingan)	14, 18, 18
	3. Top of Hills Near Water Source (May – June)	3	1	<i>Ficus racemosa</i> (Gular)	18
			2	<i>Azadirachta indica</i> (Neem)	10, 8
	4. Along road (July – October)	5	3	<i>Albizia lebbbeck</i> (Siris)	16,18,20,
			2	<i>Acacia catechu</i> (Khair)	16, 18
(ST)	1. Bottom of Hill (January– February & November-December)	4	1	<i>Boswellia serrata</i> (Salai)	16
			2	<i>Anogeissus latifolia</i> (Papri)	12,16
	2. Top of Hills (March – April)	3	2	<i>Cassia fustika</i> (Amaltas)	18, 22
			2	<i>Albizia odoratissima</i> (Kala siris)	16, 20
			1	<i>Azadirachta indica</i> (Neem)	10
	3. Top of Hills Near Water Source (May – June)	3	1	<i>Ficus racemosa</i> (Gular)	18
			1	<i>Anogeissus latifolia</i> (Papri)	14
			1	<i>Anogeissus latifolia</i> (Papri)	12
(MB)	1. Bottom of Hills (January– February& November-December)	2	2	<i>Lannea coromandelica</i> (Jhingan)	14,18
			2	<i>Ficus benghalensis</i> (Bargad)	!5
	2. Near Morni Fort (March to June)	1	1	<i>Ficus benghalensis</i> (Bargad)	20
	3. Along road (July – October)	1	1	<i>Eucalyptus globulus</i> (Safeda)	25
			1		

BT - Bangar Troop; ST - Sherla Troop; MB - Morni Band

jump from one tree to another when in danger. In most cases, the langurs selected highest branches of sleeping trees for roosting. The bisexual troop (ST), inhabiting forest area along with potential predator(s), used maximum 5 trees while the 'all male' band (MB) living near human settlements in the absence of potential predator(s), used the least (1) tree as roosting site (Table 2). The sleeping sites of non-human primates seem to be selected to reduce the chance of being preyed upon during night, with sleeping trees being very tall as well as free of low branches with long trunk, providing effective physical barriers to potential terrestrial predators (Anderson 1984, 2000). Similar patterns have been found in a number of primates (Anderson 2000, Cui *et al.*, 2006; Li *et al.*, 2010; Phoonjampa *et al.*, 2010) including langurs (Chhangani & Mohnot 2006; Minhas *et al.* 2010). Major factors likely to influence selection of sleeping site by primates are protection from predators, accessibility to food and water sources, physical comfort in terms of shelter from cold wind, snow and rain, avoidance of biting insects, parasite avoidance and human disturbance (Stolz & Saayman

1970; Boggess 1980; Hausfater & Meade 1982; Anderson 1998; Chhangani & Mohnot 2006; Li *et al.* 2006; Minhas *et al.* 2010). In the present study, the 'all male' band (MB) used trees near Morni fort and temple for sleeping; being near human settlements this area had zero predator risk. Ramakrishnan and Coss (2001) also observed that Bonnet macaques and Hanuman langurs preferentially

selected sleeping trees close to human settlements to reduce the risk of night time attacks from predators that tend to avoid humans.

Shifting of sleeping sites was observed in all the three studied groups. During the study period, BT, ST and MB groups used 5, 4 and 3 sleeping sites respectively (Table 2). Both abiotic and biotic factors may be the reasons of

Table 3. Selection of different tree species by Hanuman langurs as sleeping sites in Morni Hills Haryana.

Tree species used as sleeping site	Number of trees used as sleeping site	Per cent selection
<i>Lannea coromandelica</i> (Jhingan)	7	20.59
<i>Anogeissus latifolia</i> (Papri)	6	17.65
<i>Ficus benghalensis</i> (Bargad)	3	8.82
<i>Ficus racemosa</i> (Gular)	2	5.88
<i>Azadirachta indica</i> (Neem)	5	14.71
<i>Albizia lebbbeck</i> (Siris)	3	8.82
<i>Acacia catechu</i> (Khair)	2	5.88
<i>Boswellia serrata</i> (Salai)	1	2.94
<i>Cassia fistula</i> (Amaltas)	2	5.88
<i>Albizia odoratissima</i> (Kala siris)	2	5.88
<i>Eucalyptus globulus</i> (Safeda)	1	2.94

such shifting of sleeping sites in different months by langurs. During winter, langurs shifted from high trees on the top of hills to trees at the bottom of hills. Although the predation risk is high in the bottom of hills, shifting of roosting sites to trees at the bottom of hills has been observed in all the study groups perhaps to cope severe cold conditions on the top of hills during the months of November to February. During summer months, the langurs used to sleep on high trees on the top of hill to avoid the excessive heat during the months of May and June. Earlier workers have reported that temperate zone primates move to lower altitudes with warmer climates in the cold season and show a reverse pattern in the warm season (Bishop 1979; Wada & Ichiki 1980; Li *et al.* 2000; Liu & Zhao 2004; Cui *et al.* 2006; Liu *et al.* 2010). Availability of water source was another important factor observed for shifting in the sleeping sites in the present study. In Morni Hills, in general, there is no shortage of water throughout the year. However, in hot months of May and June, the natural water sources get dried up. During extreme hot weather the langurs shifted to the trees around Bavadi (man-made water source). This kind of shifting was recorded in both the 'bisexual' groups (BT & ST). Sometimes human disturbance also forced the langur troops to shift their sleeping sites. For instance, at the time of crop harvesting, bisexual troop (BT) living in the vicinity of crop fields, shifted to the trees near the crops fields to raid them for food. When chased by the farmers and their pet dogs, the individuals repeatedly reverted to the roosting sites. Chhangani and Mohnot (2006) also have observed temporary shifts in sleeping sites of hanuman langurs near to crops fields to raid mature crops in Rajasthan.

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