



Activity profile of a group of Hoolock gibbon (*Hoolock hoolock*) in a fragmented forest patch of Rosekandy tea garden, Barak valley, Southern Assam, India

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Abstract

Study carried out on one group of Western hoolock gibbon (*Hoolock hoolock*) to find out the activity profiles in relation to time allotment in different activities and its seasonal variation. The study group was selected from a fragmented forest patch in the Rose Kandy Tea Estate (24°42'14.84"N, 92°42'0.04"E) of Barak valley, Southern Assam, India. The home range of the study group was about 55 hectare. The vegetation profile of the forest patch is semi ever green type. A total of 12277 scan samples were recorded during December, 2011 to November, 2012 covering all the four distinct seasons. Annual activity profile revealed that the gibbon group spent highest time in feeding (33.6%) followed by movement (24.3%), resting (22.1%), social activities (14.6%) and calling (5.5%). The study revealed distinct seasonal variation in different activities. A little variation was found in age- sex wise time allotments in different activities in different seasons in the group. The activity profiles of the study group have revealed that feeding is the most crucial factor responsible for the variation in the activity profiles.

Keywords: *Hoolock hoolock*, rose kandy tea estate, activity profile, seasonal variation

Introduction

The activity budget is based on the idea that the day-time available is a limiting factor and primate must carry out maintenance behavior in addition to pursuing its social activities (Altmann, 1980) [1]. The activity budget is a summary of how an animal distributes its available time among different activities that are important for its survival and reproduction and may be useful in suggesting how a species utilize resources and adapts to its environment (Bernstein, 1980) [2]. "Time" is a hidden constrains and ultimately affects all behaviours of different species (Dunbar, 1992) [3]. Primates are known to invest time and effort in maintaining and reinforcing social relationships. Social bonding mechanisms vary between different primate species with regard to type and relative time investment (McComb and Semple, 2005) [4]. This is because the nature of conflict between individuals differs with the type of social organisation. While numerous studies have looked into the intricacies of interactions among individuals in group living primates such as macaques (Bovet and Washburn 2003) [5], few studies have looked into such interactions in gibbon societies, particularly in wild populations.

In this paper a quantitative analysis of activity budget of the forest group of hoolock gibbon has been carried out to find out the activity profiles in relation to time allotment and its fluctuations in inter seasonal variability. This variability is important to understand the nature of the adaptive strategy of the gibbon, which in turn is expected to help in species conservation.

Materials and Methods

Selection of study troop

One troop of gibbon was selected for study the activity profile.

The troop occurred in a fragmented forest patch in the Tea garden (Rose-Kandy Tea Estate; 24°42'14.84"N, 92°42'0.04"E). The home range of the study group was about 55 hectare.

Habituation of the animals

The troop was habituated during October, 2011. Habituation of the troops took about 3 weeks (21 days) and by the end of the 21st day, behavioral observations could be taken properly.

Troop composition

The troop consisted of three individuals- an adult male, an adult female and a sub-adult male.

Sampling regime

The time activity of each of the study individuals of the troop was recorded by instantaneous scan sampling (Altmann, 1974) [6] of the individuals' behavioral states, at 5 minutes interval from dawn to dusk (5 AM to 6 PM). Data was collected on the group of Hoolock Gibbon between December 2011 and November 2012. A 'scan' refers to a single recording of the behaviour of an individual at 5-minute intervals, which provided data on different activities, broadly classified into feeding, resting, movement, calling and other social activities (Hasan *et al.*, 2007) [7]. The group was followed for 12 days in a month for 12 months (a total 1,008 contact hours; ranging from 06-08 hours, mean 7 hours per day). The major activities as classified by Hasan *et al.*, (2007) [7] were as follows;

Feeding (FD): When an individual was actively manipulating a potential food source, putting food into the mouth or masticating, when moving and masticating at the same time.

Movement (MV): It included directed or non-directed movement from one place to another.

Resting (RS): It included inactive period when the individuals remained idle at a place.

Social activities (SA): Social activities included grooming, playing and mating.

Calling (CL): It is the loud territorial song.

For analysis the season wise variation in activities the whole year is divided into 4 seasons i. e. Winter (December to February), Pre-monsoon (March to May), Monsoon (June to August) and Post- monsoon (September to November). Data analysis was done using Excel 2010 and XLSTAT Pro software. To find there is any differences between activity patterns among the age –sex group and in different seasons Non Parametric Man- Whitney U test and Kruskal- Wallis test has been used assuming the samples are independent of each other.

Results

During the study period (December, 2011 to November, 2012) scan sampling yielded a total of 12277 scan records. The group of hoolock gibbon showed a distinct variation in their activity profiles in respect to different seasons.

Annual Activity budget

The Annual activity profile showed that the Hoolock gibbon group spent highest time in feeding followed by movement, resting, social activities and calling. In this study it was found that (33.6%) of their total annual time spend on feeding purpose, followed by movement (24.3%), resting (22.1%),

social activities (14.6%) and calling (5.5%) (Fig.1).

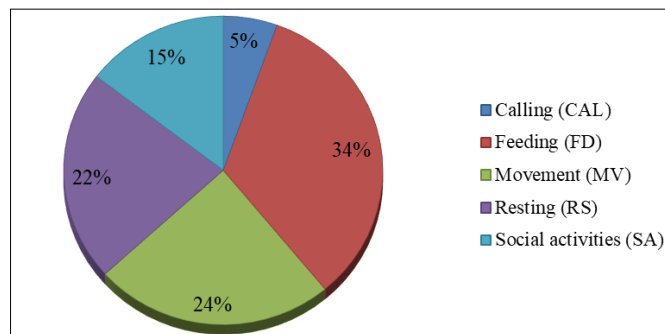
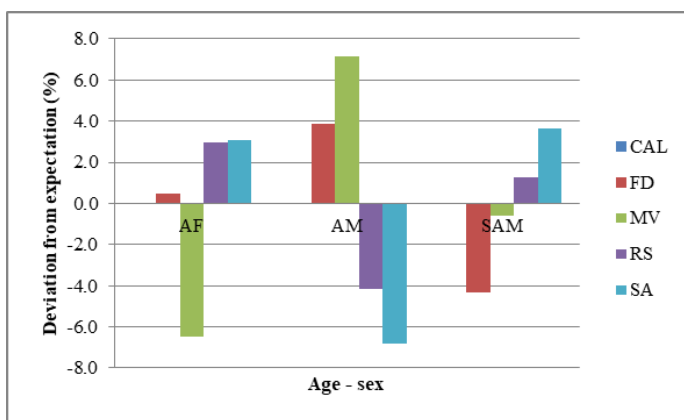
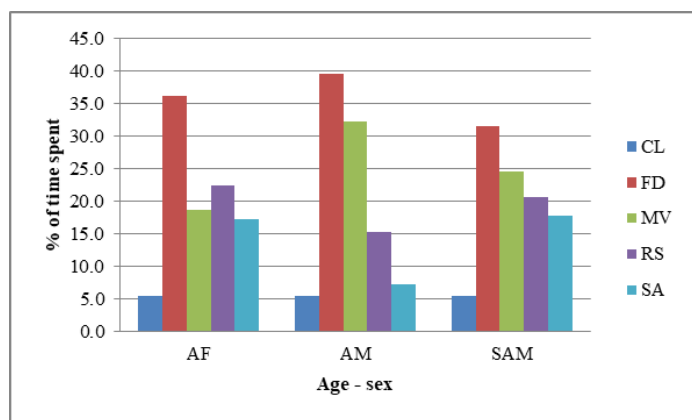


Fig 1: Annual activity budget of the Hoolock gibbon group.

Age – sex variation in annual activity budget

There was found to be significant differences in time spent in feeding, movement, resting and social activities among the age- sex group ($H_{observed} > H_{critical}$; Alpha= 0.05; df =2) and no difference was found in calling activity among the age- sex group ($H_{observed} < H_{critical}$; Alpha= 0.05; df =2). The adult male found to be spent more time in movement (32%) than resting (15%) while adult female spent more time in resting (22%) than movement (15%). Time spent in social activities was also found to be less in adult male (7%) than adult female (17%) and sub-adult male (18%) (Fig. 2). The deviation from average time (%) spent in different activities showed that the adult male spent more time in feeding while sub-adult male showed highest negative deviation in case of feeding, while adult male showed positive deviation in movement and adult female showed highest negative deviation in movement. In case of social activity, sub-adult male showed highest positive deviation while adult male showed highest negative deviation from the expectation (Fig. 2).



AM= Adult male; AF= adult female; SAM= sub-adult male; CL= calling; FD= feeding; MV= movement; RS= resting; SA= social activity

Fig 2: Age –sex variation in annual activity budget with deviation from expectation.

Seasonal variation in activity budget

There are also variations found in time allotment in different activities in respect to different seasons in the group;

Feeding (FD): The feeding activity has been found as the major activity profile in the group of hoolock gibbon. They spent about 37% and 36% of their total time in feeding activity in winter and post-monsoon respectively followed by

29% in monsoon and 32% in pre-monsoon. These differences of feeding activity have been found statistically significant between the four seasons ($H_{observed} > H_{critical}$ at 95% significant level). The deviation from average feeding activity showed that the study group spent more time during winter and post-monsoon season while spent less time than average time spent during pre-monsoon and winter season. However, a highest negative deviation was recorded during monsoon (Fig. 3).

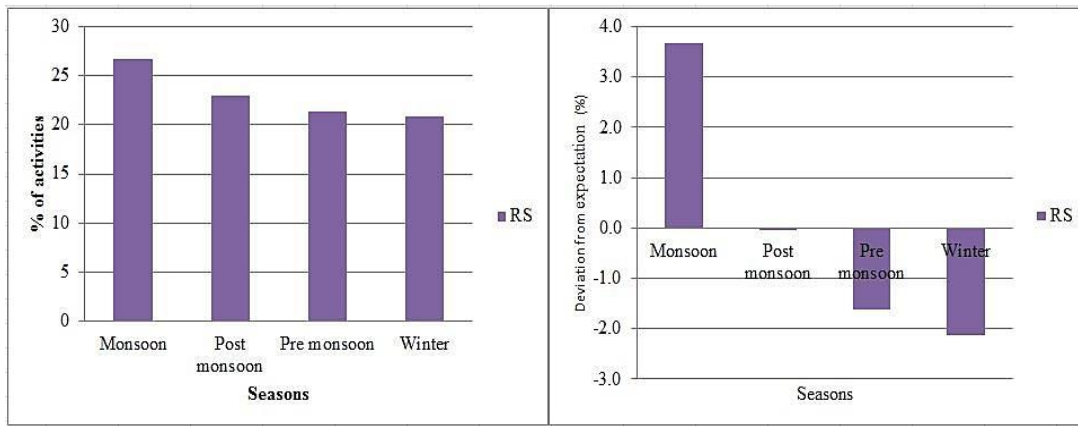


Fig 3: Seasonal variation of feeding activity pattern with deviation from the expectation.

Movement (MV): The movement activity has been identified as the major activity next to feeding. The study group spent 26.53% of their total time in movement in winter; 24.27% in pre-monsoon, 22.83% in post-monsoon; and 20.26% in monsoon. Although the difference in average time spent in

movement in different season is not statistically significant ($H_{observed} < H_{critical}$ at 95% significant level), the deviation from average movement activity indicated that the group spent lowest time than average during monsoon and more than average (highest) during winter (Fig. 4).

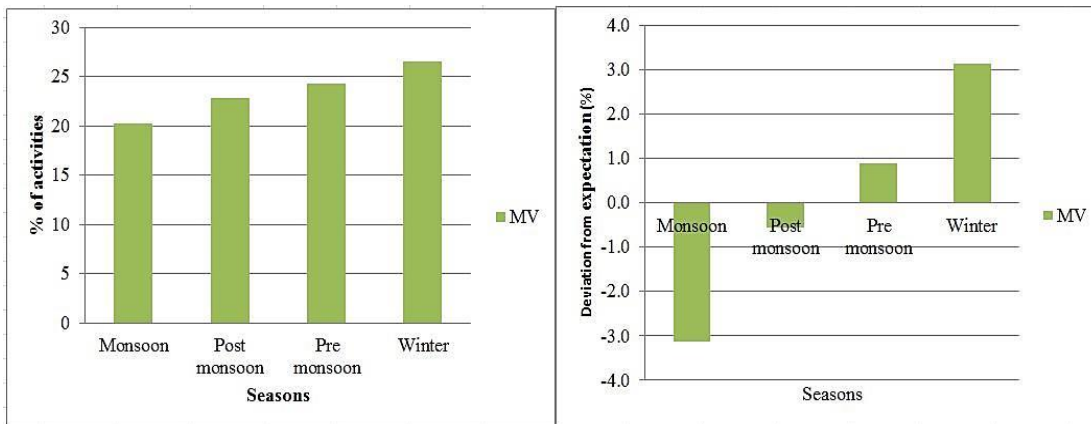


Fig 4: Seasonal variation of movement activity with deviation from the expectation.

Resting (RS): The time spent in resting depends upon movement and feeding activities. The group spent 26.67% of their total time in resting activity in monsoon, 22.96% in post-monsoon, 21.38% in pre-monsoon and 20.88% in winter. The differences in time spent in resting are not statistically

significant in all respective seasons ($H_{observed} < H_{critical}$ at 95% significant level). The deviation from expectation indicates that the group spent more time in resting in monsoon (highest) while less than expectation (lowest) in winter. No deviation found in post-monsoon (Fig. 5).

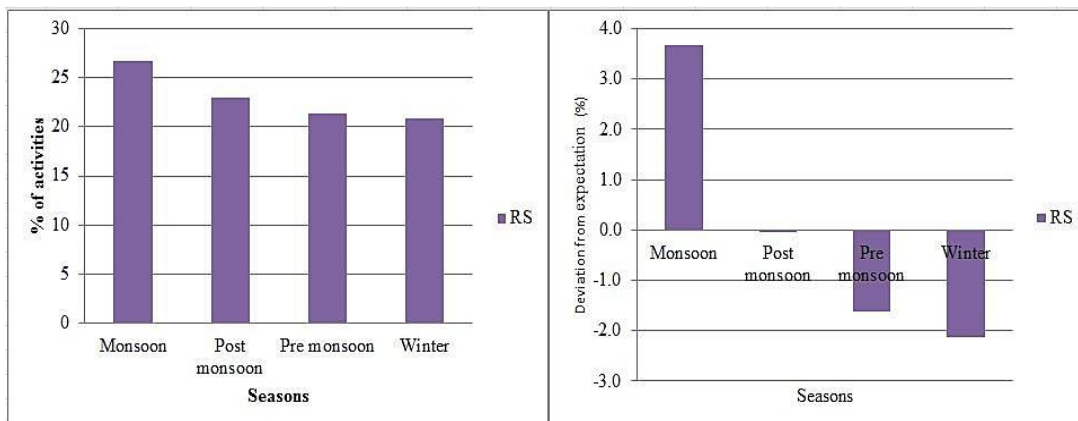


Fig 5: Seasonal variation of resting activity pattern with deviation from the expectation.

Social activity (SA): The time spent in social activity by the forest group was 16.49% in pre-monsoon, 15.59% in winter, 13.68% in post-monsoon and 12.79% in monsoon season respectively. These differences are not statistically significant

in all seasons. The deviation from expectation shows that the group spent more time in social activity than expectation in pre-monsoon and winter while a less than expectation in monsoon and post monsoon (Fig. 6).

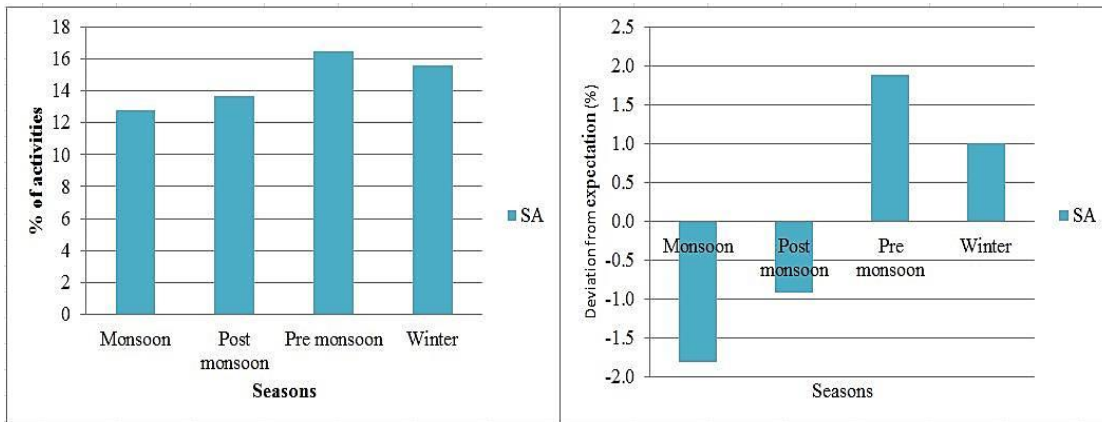


Fig 6: Seasonal variation of social activity with deviation from the expectation.

Calling (CL): Calling has been identified as one of the least time spending activity in hoolock gibbon. The study group spent less than 6% of their total time in calling in all seasons. These differences are not statistically significant in different

seasons. The deviation from expectation shows that the group spent less time than expectation in monsoon and post-monsoon while a little bit more in winter (Fig. 7).

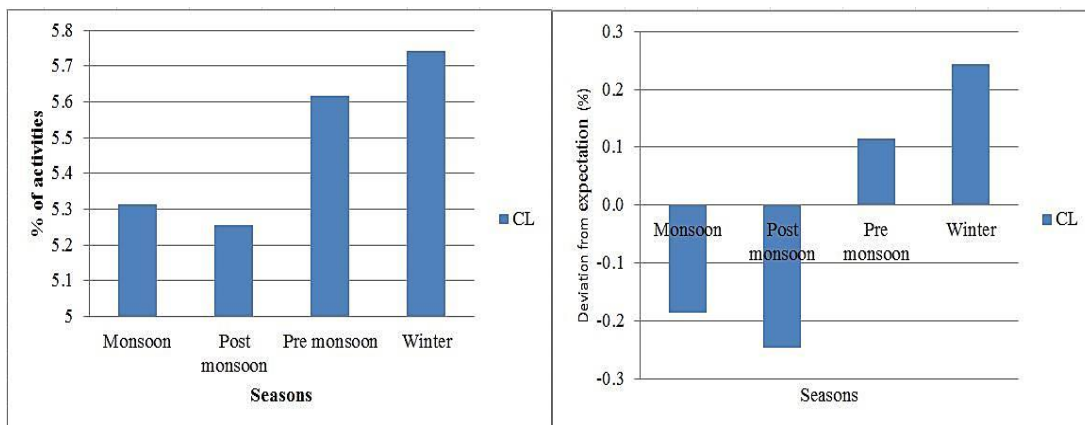
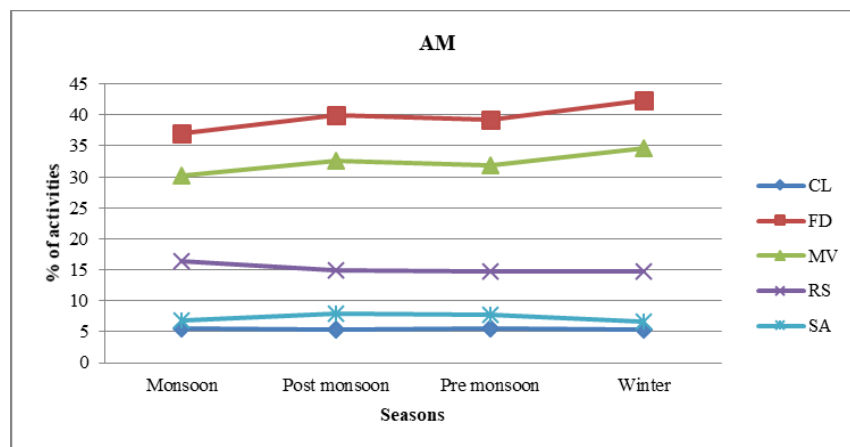
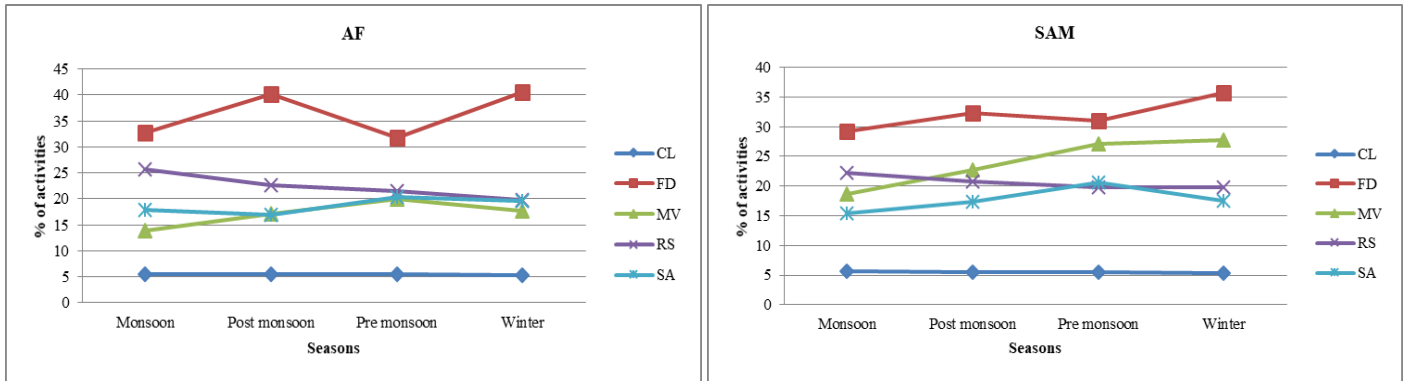


Fig. 7. Seasonal variation of calling activity with deviation from the expectation.

A little variation was found in age- sex wise time allotments in different activities in different seasons in the group, which

have shown in Figure No. 8.





AM= Adult male; AF= adult female; SAM= sub-adult male; CL= calling; FD= feeding; MV= movement; RS= resting; SA= social activity

Fig 8: Age- sex seasonal variation in activity budget of the gibbon group.



a. Feeding

b. Social activity

c. Movement

Plate 1: Photographs of different activities



a. Feeding

b. Social activity

c. Feeding

Plate 2: Photographs of different activities



a. Feeding

b. Feeding

c. Movement

Plate 3: Photographs of different activities



Plate 4: Photographs of different activities

Discussion:

Behavioral activity is the response of both the physical as well as habitat condition of the animal. It varies from habitat to habitat depending upon the resource distribution. In primates, food, mates, and roosting trees are the most important resource, which controls activity (Sarkar, 2000) [8]. Among these resources, food seems to be the most crucial primary factor regulates day-to-day activity profiles. So, an allocation of time to various activities that is important to identify the interaction of species with environment (both habitat and weather). The amount of time spent on locomotion is determined primarily by the distribution of food and food plant species in the habitat and by the nature of food items. Individuals of the forest group had to move from one feeding site to another in order to get appropriate quantity of food (Sarkar, 2000) [8]. Of the total activity period the Hoolock generally spends 15–25% of its time moving either for foraging, feeding, sun basking or resting (Alfred and Sati, 1986, 1990a) [9, 10]. In this study the hoolock gibbons have been found to spend about 24% of total activity time on movement. Of the total locomotion nearly 70–80% is by brachiation, about 16–25% by jumping, leaping or climbing and about 4–5% by acrobatic or bipedal movement (Alfred and Sati, 1986, 1990a; Islam and Feeroz, 1992) [9-11].

Gibbons are arboreal, live in a family unit and maintain a definite territory, which is defended by loud territorial songs (Marler, 1968) [12]. Singing announces the occupation of a specific area of the forest by a mated pair and functions as a distance maintaining signal. In our study the annual activity budget revealed that the gibbon group spent about 5% of the total time on territorial song (calling). The frequency pattern and timing of singing behaviour ranges from 4 to 32 minutes and on an average 15 minutes a day (Tilson, 1979; Gittins and Tilson, 1984) [14, 13]. Usually the singing was observed in the morning and occasionally in the afternoon. In this study calling also found to be highest in the early morning (5 – 9AM), about 71% of total calling activity was recorded from this time period. About 2–3% of the waking time is spent in its territorial calls, which usually forms 90% of all the vocalizations (Alfred and Sati, 1990a) [10], which is also similar with this study.

Social activity (grooming, playing, mating etc.) is one of the major activities of social behaviour, which forms nearly 15% of the total activity period (Alfred and Sati, 1986) [9] and may occur between members of the group. This is also found to be

similar with this study (i. e. 15% spent in social activities). Hoolock gibbon spends nearly 25–45% time in feeding of the total activity period, which ranges from 120–300 minutes in a day (Alfred and Sati, 1994) [10]. In our study feeding is also found to be one of the major activities and gibbons spend about 34% time on feeding.

Thus, the study of the activity profiles of the forest group has revealed that feeding is the most crucial factor responsible for the variation in the activity profiles. In forest, as the food was randomly distributed, the group cost-effectively arranged their total time and spent more time on feeding, and locomotion. So, the time remains for resting and social activities is less in the forest group. On the other hand, high locomotion and foraging activity cost more energy expenditure and therefore, the group re-allocates the time budgeting for higher resting activity, and allocates a less time for social activities like grooming and play activities. Besides, as the social tension does not develop much, such strong social networking is not required when food is not clumped and randomly distributed in the habitat, and therefore, forest group was devoting less time to grooming, monitoring and playing activities. These findings clearly demonstrated that nature of distribution of food resource is the guiding force for allocating time to various activities in different habitats.

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