



Original Research Article

Sex related Seasonal Patterns of Time and Activity Allocation in the Northern Five Striped Palm Squirrel, *Funambulus pennanti* in Jammu (Jammu and Kashmir), India

Deep Novel Kour*, D.N.Sahi and Rachna Sharma

Department of Zoology, University of Jammu, Jammu- 180006, India

*Corresponding author

ABSTRACT

Keywords

Seasonal behavioural pattern; activity budget; Five Striped Palm Squirrel.

The study encompasses the seasonal behavioural patterns of different sexes of Northern Five Stripped Palm Squirrel in Jammu. The prominent activities studied were classified into various categories viz. sleeping, feeding, resting, grooming, chasing, travelling, exploring, freezing and others. Seasonal fluctuations in activity budget did not show a consistent trend. Group composition appeared to be rather fluid, because fission and fusion of groups were observed frequently. The present assignment on activity budget provides valuable information on the behaviour of free-ranging squirrels, which could be useful in the conservation and management of this species.

Introduction

Activity budgets can provide valuable insights into how animals interact with each other and their environment. They provide information on how a population is affected by changes in habitat, food supply, reproductive efforts, and many other physiological, social, or environmental parameters (Neumann, 2001). Activity budgets have contributed to a better understanding of a wide range of species: from birds (Mock, 1991; Stock & Hofeditz, 1996) to squirrels (Wauters *et al.*, 1992), antelope (Maher, 1997), bighorn sheep (Goodson *et al.*, 1991), otters (Ostfeld *et al.*, 1989), and bats (Charle-Dominique, 1991). This activity budget produced a “first look” at typical

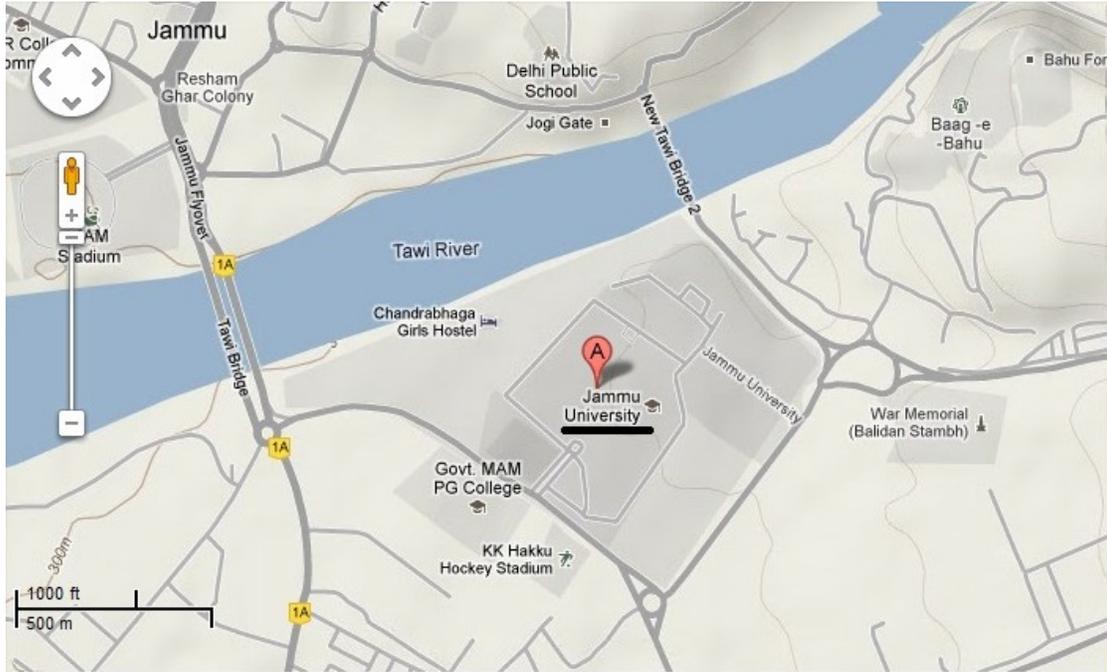
behavioural patterns of Northern Five Striped Palm Squirrels and could serve as a baseline against which the influence of environmental, or demographic factors can be tested. It also will prove valuable in determining the effects of human disturbance on the behaviour of squirrels. Activity budget studies can play an important role in species conservation and management, as proven by Stock & Hofeditz (1996).

Materials and Methods

Study area (Fig. 1)

The study was conducted from April, 2001 to March, 2002 in and around the campus

Fig.1 Map showing the study area (Courtesy Google Earth)



of University of Jammu, Jammu. The University is located on the banks of the Tawi River. Geographically, the area lies at $32^{\circ}67'N$ longitude and $76^{\circ}50'E$ latitude and approximate height above sea level is 340 mts. The climatic conditions in and around the area are dry sub humid.

There are four well defined seasons in a year around the study area namely Winter (Mid November to Mid March), Summer (Mid March to the end of June), Monsoon (July to September) and Autumn (October to Mid November). The flora of the campus of university is dominated by:

Native Species: *Acacia modesta*, *Acaia arabica*, *Dalbergia sisso*, *Ficus religiosa*, *Ficus bengalensis*, *Mangifera indica*, *Zizyphus mauritiana*, *Lantana camara*, *Grevillea robusta*, *Dedonia viscose*, *Cannabis sativa*, *Sacchrum munjum*, *Psidium guajava*, *Melia azadiracta* and *Tamarindus indica*.

Exotic and planted species: *Eucalyptus* spp., *Albizia lebbek*, *Terminalia arjuna*, *Cassia siama*, *Cassia fistula*, *Alstonia scholaris*, *Anthocephalus cadamba*, *Citrus lemon*, and *Morus alba*. An experimental fish stream and a turtle pond exist in the study area with a large number of aquatic plant species in it.

Methodology

Seasonal time activity budget of *Funambulus pennanti* was prepared by keenly observing their various activities in the study area in different months with the help of binoculars (Bushnell 7x50 U.S.A. made). Squirrels inside the dreys or nests were designated as sleeping and those sitting motionless outside were categorised in resting category.

Activities of the squirrels were recorded after every five minutes and the first activity which extended beyond ten

seconds within that time frame of 5 minutes was taken to be lasted for that full five minute period.

But the observations were discarded if the squirrels got disturbed by the presence of the present observer or by other human interference. By summing the time spent on each activity for each hour of the day, a measure of the total time spent in a particular activity was calculated. Percentage time allocated to a particular behavioural activity was calculated by:

$$\frac{\text{Time spent in a particular activity}}{\text{Total time of observation}} \times 100$$

Results and Discussion

Activity patterns may differ between the sexes. Sex differences in time budgets and activity patterns can suggest differential constraints that affect each sex. Both adult male and female showed difference in activities in the four seasons of the year. Percentage time spent in various activities by adult male and female in different seasons of the year is represented in Table 1, Fig. (2) & (3). From the study, it emerges that squirrels were less active in winter when the day length was considerably reduced. As the day length increased from April to July, the squirrels' activities also increased. During summer, they came out of their dreys in early hours i.e. 0630 hours while they came out during winter around 0830- 0900 hours. After an early morning peak, the level of activities declined around late morning hours as squirrels went for rest before resuming their activities in the evening bouts. This was to avoid the heat of the midday sun. During rains, their activities get delayed which has also been observed during these studies.

Squirrels spent maximum time in sleeping during winter and autumn in comparison

to summer and monsoon, due to reduced photoperiod and lower temperature condition in winter and non availability of suitable feeding material in autumn. Due to shedding of leaves and thus canopy becoming thin during autumn which add to the visibility of their predators, they felt it safer to stay in the nests than outside. They spent less time in feeding during winter in comparison to summer, monsoon and autumn. This was due to reduced daylength which forced them to procure the food items quickly and hurriedly. Resting was more prolonged during summer and monsoon as compared to autumn and winter due to very hot temperature in summer and heavy rainfalls in monsoon.

Freezing was more in autumn due to easy visibility to the prey in autumn. Travelling was more in summer and monsoon as compared to autumn and winter. Exploring was minimum in winter as compared to other seasons. Chasing activity in females was observed only during breeding season that too for a very small duration. In case of males, much difference was not observed in chasing percentage in all the four seasons of a year.

Grooming was not observed during autumn in both the sexes. However, grooming percentage was less in winter as compared to summer and monsoon seasons both in males and females. When the comparison was drawn between adult males and females activities in different seasons, it was found that sleeping percentage was higher in females than males in all the four seasons, whereas feeding percentage was more in males than in females in all the seasons. Resting percentage was less in females in summer than males but was more during monsoon and autumn and equivalent during winter.

Table.1 Seasonal time activity budget of adult male and female *Funambulus pennantii* (Wroughton)

Activity	Summer (Mid March to the end of June)		Monsoon (July to September)		Autumn (October to Mid November)		Winter (Mid Nov. to mid March)	
	Male	Female	Male	Female	Male	Female	Male	Female
Sleeping	55 %	57%	51%	53%	66%	68%	70%	72%
Feeding	22%	18%	19%	17%	17%	15%	15%	12%
Resting	16%	14%	18%	20%	10%	11%	8%	8%
Grooming	1%	2%	2%	3%	-	-	1%	1%
Chasing	0.50%	0.50%	-	0.50%	1%	-	1%	-
Travelling	3%	3%	4%	2%	2%	2%	2%	3%
Exploring	2%	3%	3%	1%	2%	1%	1%	1%
Freezing	-	2%	2%	3%	2%	3%	1%	2%
Others	0.50%	0.50%	1%	0.50%	-	-	1%	1%

Figure.2 Seasonal time activity budget of adult males *Funambulus pennantii* during 2001-2002.

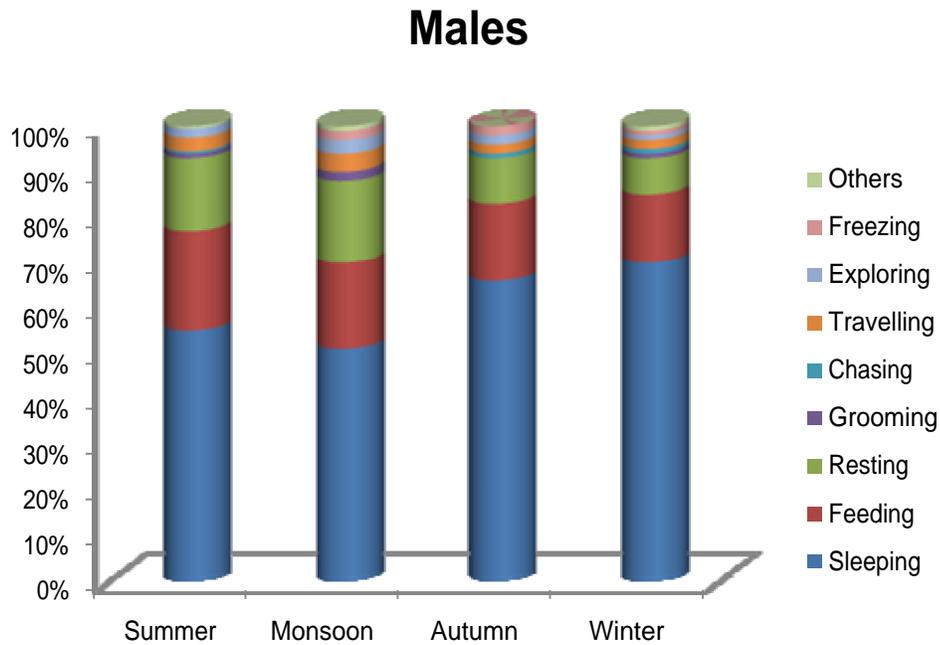
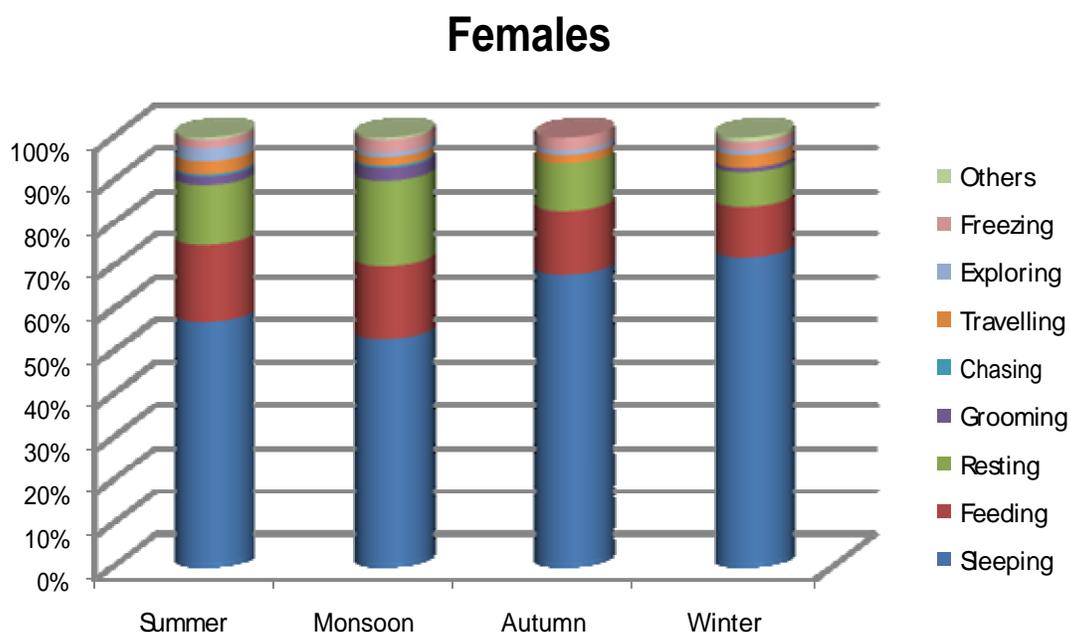


Figure.3 Seasonal time activity budget of adult females *Funambulus pennantii* during 2001-2002.



Grooming was not observed in autumn in any of the sexes, however, grooming percentage was higher in females in summer and monsoon as compared to males and equivalent in winter. Much difference was not observed in travelling activity in both the sexes. Exploring percentage calculated was more in males in monsoon and autumn and less in summer than in females. Time allocated to freezing activity was more in females than the males. Other activities were more or less same in both males and females.

Not much work has been done on daily and seasonal time activity budgets of *Funambulus pennanti* (Wroughton). However, Banerji (1955-57), Agrawal (1965) and Manan *et al.* (1994) have worked on certain aspects pertaining to daily activity budgets of *Funambulus pennanti* but seasonal time budgets have not been studied by any of these workers.

Conclusion

The species is a significant pest of fruit and vegetable crops in both its native and introduced ranges and it has been known to ruin electrical wiring and damage amenity trees. Northern Five Striped Palm Squirrels are listed as an 'extreme' threat under the Vertebrate Pest Committee's threat categories. Understanding the behaviour of the species will help managers to devise strategies in order to manage this tolerant species in an effective manner in the study area.

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