

Survey on Population Density of Indian Flying Fox (*Pteropus Giganteus*) in Different Roosting Sites in and Around Shivamogga, Karnataka

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Abstract: The Indian Flying Fox *Pteropus giganteus* is a species belongs to the Pteropodidae family under the order chiroptera. Indian flying fox has physical to that of a fox hence the name flying fox. They are actively in the evening and at night. During day sleeping hours, they have been observed hanging head down - words from the branches of roosting trees, and at that time patagium were wrapped around themselves. Current study has been aimed to know the population and its fluctuation in the six different roosting sites around Shivamogga in the month of June - 2023 to November - 2023. Generally "Direct roost count" method was followed to estimate the population size of the colony. Observations were done with the naked eyes and using binoculars, Bushnell laser range finder to estimate the average height of the roosting tree and Garmin GPS 64S device used to record the location of the sites. Highest population was recorded at site - 6 (17, 679) and lowest population was recorded at site - 5 (774). Out of nine different host plants, *Ficus benghalensis* was the most favored roost tree hosting the majority of colonies. The population at six different roosting sites was more or less stable during pre - monsoon and increased in breeding season (i. e June - November). The fluctuation in population size, roosting patterns and habitat preferences emphasizes the need for conservation efforts, particularly in protecting larger trees that serve as roosting sites.

Keywords: Indian flying fox, *Pteropus giganteus*, population, roosting sites, Shivamogga

1. Introduction

Bats are the second largest order of the mammals and display an extraordinarily large ecological and behavioral diversity. They can forage by areal hawking or gleaning; roost in trees, foliage, crevices caves, or man - made structures (McCracken and Wilkinson 2000). As per standard classification the bats belong to the order "Chiroptera". Forelimbs are modified into simple wings. Microchiroptera which include all the insectivore and carnivore bats. The Indian flying fox (*Pteropus giganteus*) is a species of Flying Fox of the Pteropodidae family. The Indian flying fox locally known as "bavali" in kannada language of Karnataka. It is one of the largest fruit bat species found in the Indian subcontinent stretching from Bangladesh, China, India, the Maldives, Nepal, Pakistan to Sri Lanka. Ecologically fruit bats are highly important species as they are one of the best pollinators and seed dispersers in tropical forests throughout the world.

This helps in maintaining forest diversity as well as forest regeneration. It is nocturnal and feeds mainly on ripe fruits and flower nectar. They are mammals and have live births. They have one to two young. Due to various anthropogenic and environmental causes their populations are declining and they are going to be extinct in the future. So proper measures in terms of awareness drive and habitat conservation is to be taken for rapid population growth. With this very aim, this short study has been planned to know the population and its fluctuation in the six different roosting sites in and around Shivamogga, Karnataka.

2. Materials and Method

Study Area

Study was conducted at the six different roosting sites of Shivamogga district of Karnataka. The present study was carried out from different sites in Shivamogga, Shankaragatta and Bhadravathi during June 2023 to November 2023. Shivamogga District is the gateway of Western Ghats of Karnataka. Including forests, riverine, hills, falls etc. The district has 207 per sq km. (As per 2011 census). The survey was conducted in six different sites (S1 to S6). The S1, S2, S3, S4, S5 and S6 are 29km, 22km, 21km, 19km, 20km and 1.5km away from Shivamogga respectively.

To estimate the population size of the Indian Flying Foxes (*Pteropus giganteus*) at six different roosting sites of the Shimoga district of Karnataka. Bats were counted in every 15 days once in a month starting from June 2023 to November 2023. During the breeding season. "Direct roost count" method was followed to estimate the population size of the colony. Observations were mostly done with the naked eyes and binocular when needed. Canopy cover and tree heights were qualitatively measured with the laser range finder (bushnell) and Garmin GPS map 64S device was used to record the location of the sites.

3. Results and Discussion

In the present study, during the entire study period, six roosting sites such as site - 1, site - 2, site - 3, site - 4, site - 5 and site - 6, the Indian Flying Foxes (*Pteropus giganteus*) are identified in the roosting sites of Shivamogga district of Karnataka. Ecological details of all the six sites were recorded 15 days once in a month with their population data are shown in the Table - 1.

A highest population of 43, 072 was recorded in six months. There were major fluctuations seen in the population of

Indian Flying Foxes at the six different sites. Total population of the roosting site was ranged from 774 to 17,679 during the entire study period. Average no. of bats in the sites 1, 2, 3, 4, 5 and 6 were recorded as 10134, 1457, 789, 12239, 774 & 17679 respectively. The average population of *Pteropus giganteus* are recorded in site - 1 was 1689, site - 2 was 242.83, site - 3 was 131.5, site - 4 was 2039.83, site - 5 was 129 and in site - 6 2946.5 (Table 1). there is a gradual increase in the population in site '6' (Gandhi park) and decrease in site - 5 (Court) due to favorable and unfavorable conditions like temperature, water source, humidity, human habituation, traffic, food availability etc (Fig 1).

The correlation comparison was observed from S1 to S6. The lowest correlation was recorded in S6 (- 0.895) and the highest correlation was recorded in S4 (0.887). S4 has positive correlation and S6 has negative correlation (Table 2 and Fig 2). The number of bats population always greater in site 6 than that of the other five sites throughout the study period.

A total of 43072 individuals were recorded in nine host trees for were located nearby water body and rest of them were located near to residential area and arterial road etc. In site 1,

the maximum height of the tree *Ficus benghalensis* was 72ft with contrast to this *Ficus religiosa* was 50ft and *Mangifera indica* was 65ft. In HK Junction, the height of the trees *Tamarindus indica* was 45ft and *Bambusa vulgaris* was 48ft. In site 3, the height of the tree is *Nilgiri eucalyptus* was 73ft and *Ficus religiosa* was 64.5ft. In site 4, the height of the trees *Ficus benghalensis* was 64ft, *Ficus religiosa* was 68ft and *Delonix regia* was 69ft. In site 5, the height of the trees *Ficus religiosa* were 43.5ft. The site 6 has five trees *Ficus benghalensis*, *Ficus religiosa*, *Leucaena leucocephala*, *samean saman* and *Bambusa vulgaris* followed by the height 48, 64, 18, 24 and 26 respectively (Table 2).

As the fluctuations in the monthly populations were recorded so it can be concluded that populations of Indian flying fox colonies at the different Roosting site during breeding season is to be more or less stable. Still we need this kind of study for a complete year covering all the climatic seasons for final interpretation and therefore we recommend more and more population related study for proper understanding of the population regime of the site which in turn will give us the holistic overview on the population status of *Pteropus giganteus* in Shivamogga district of Karnataka.

Table 1: Number of *Pteropus giganteus* recorded in roosting sites during the study period

Sites	Months						Total	Mean
	June	July	August	September	October	November		
S 1	1994	1962	1660	1509	1514	1495	10, 134	1689
S 2	260	316	288	215	219	159	1, 457	242.83
S 3	-	-	161	139	146	343	789	131.5
S 4	5525	2834	1111	1021	1099	649	12, 239	2039.83
S 5	196	142	159	104	110	63	774	129
S 6	1858	2171	3548	3565	3525	3012	17, 679	2946.5

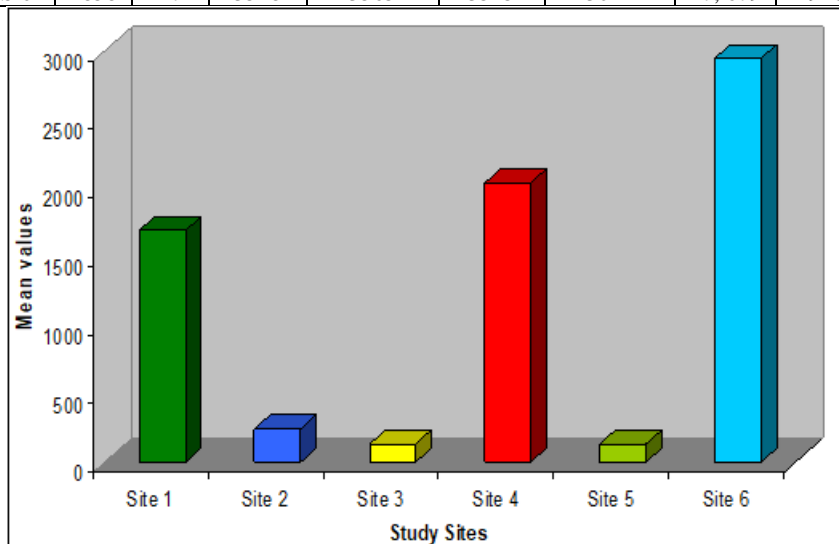


Figure 1: Average number of *Pteropus giganteus* recorded in different roosting sites

Table 2: Correlation coefficient among different roosting sites of *Pteropus giganteus*

Sites	S1	S2	S3	S4	S5	S6
S1	1	.751	-.828*	.887*	.808	-.895*
S2		1	-.802	.459	.766	-.395
S3			1	-.763	-.812*	.603
S4				1	.804	-.880*
S5					1	-.541
S6						1

*. Correlation is significant at the 0.05 level (2 - tailed)

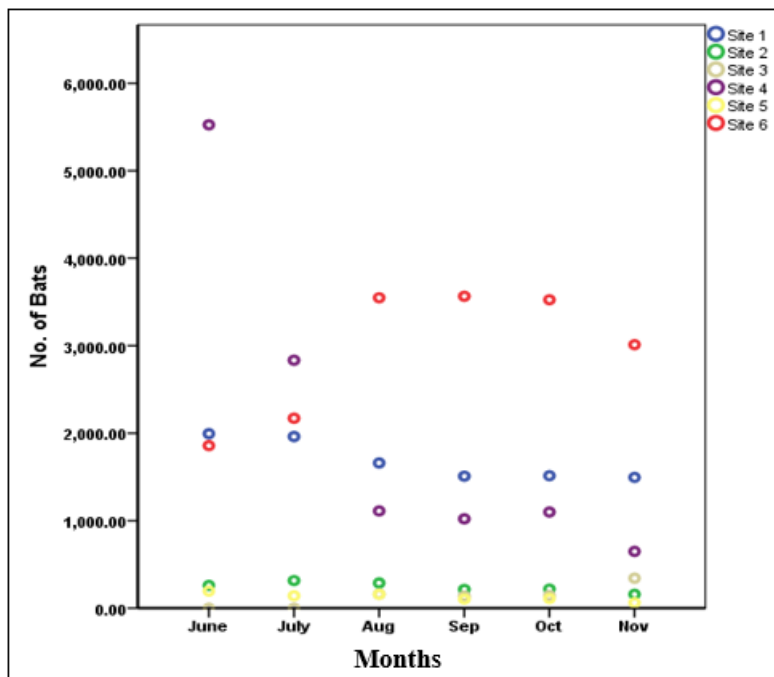


Figure 2: Correlation coefficient among different roosting sites of *Pteropus giganteus*

4. Summary and Conclusion

In the present study, a gradual increase in population of bats at site - 6 (Gandhi Park) and a decrease at site - 5 (Court), highlighting the impact of various factors on bat populations. The breeding season led to a dramatic increase in population due to the influx of immigrants seeking mating opportunities, while dispersal of emigrants and other factors contributed to population decreases.

The study on *Pteropus giganteus* provides valuable insights into the ecology and behavior of the species. The fluctuation in population size, roosting patterns and habitat preferences emphasizes the need for conservation efforts, particularly in protecting larger trees that serve as roosting sites.

The findings suggested that, public awareness regarding the significance of flying foxes in ecological processes such as pollination, seed dispersal and nutrient distribution could contribute to habitat preservation. Overall, the study provides a comprehensive understanding of the behavior and population density of contributing valuable information for the conservation and management of these ecologically important mammals.

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