

Research maGma

(An International Multidisciplinary Journal)

UGC Approved Journal No: 63465



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An International Multidisciplinary Journal

ISSN- 2456-7078

IMPACT FACTOR- 4.520

VOL-1, ISSUE-10, DEC-2017

ROOSTING TREES AND FOOD PLANTS OF PTEROPUS GIGANTEUS (INDIAN FLYING FOX) IN THIRTHAHALLI REGION OF SHIVAMOGGA DISTRICT, KARNATAKA

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ABSTRACT

The present study deals with the various roosting trees and food plant species used by the Indian flying foxes *Pteropus giganteus* in Thirthahalli region of Shivamogga district. A total of 14 different roosting tree species and 26 types of food plants were found associated with the Indian flying foxes (*P. giganteus*) in the study area. They play an important role in the seed dispersal and pollination of plants. They chew the fruit to obtain the juice. Very soft fruits such as bananas are swallowed, but usually the bat spit out the fruit pulp and seeds once it has extracted all the juice. Bats travel 40-50 Km per day around the nesting area. During day time they were roost in various host plants such as *Bamboo vulgaris*, *Albizia saman*, *Ficus bengalensis*, *Ficus religiosa*, *Tectona grandis*, *Pongamia pinnata* etc. There is an urgent need to create awareness among common peoples to protect these useful animals to maintain ecological balance.

KEYWORDS:

Roost trees, Food plants, *Pteropus giganteus*, Thirthahalli region.

INTRODUCTION

The fruit eating bat *Pteropus giganteus* is a flying nocturnal mammal; primarily consume

fruit, nectar and pollen. They are able to locate food using highly developed sense of vision and smell. Once food is located, the bat will take it to nearby roosts and eat while hovering or hang from a branch using one foot and hold the fruit and begin to suck the juice as the chief source of food. It is obtained by compressing bits of pulp against the rigid plate of the mouth, swallowing the juice and spitting out the pulp and seeds. If the pulp is soft, however it may be occasionally eaten as well. The teeth are adopted to bite through hard fruit skins. Large fruit bats must land in order to eat fruit, while the smaller species are able to hover with flapping their wings in orchards (Jeevan et al.,2013). All pteropus species are exclusively phytophagus, feeding on floral resources (primarily nectar and pollen), fruits, leaves, bark and seeds (Marshall,1985).

Pteropus giganteus belongs to family pteropodidae of order megachiroptera. Family pteropodidae consists of 43 genera and about 165 species which are distributed throughout the world. India has a rich diversity of bat fauna comprising approximately 119 species of bats, out of which 14 species are fruit-eating or megachiropteran (Pteropodidae) belongs to 8 genus and the remaining are insect-eating or microchiropteran bats (Bates and Harrison, 1997). *P. giganteus* is the largest fruit bat and the largest flying mammal in India. In general, *P. giganteus* is widely distributed and commonly seen bat species throughout the entire country (Srinivasulu and Srinivasulu, 2001; Kumar and Kanaujia, 2017).

They are highly susceptible to environmental disruption and they have declined drastically in response to human activity. Bats generally prefer to roost during daytime in diversified roosting habitats. Roosting site selection depends on their abundance, risk of predation, availability and distribution of food resources, body size and physical environment (Kunz, 1982; Jeyaprabha,2016).

During the day time Indian flying foxes roost in large camps in trees. Each camp may contain several hundreds to several thousands of flying foxes. The colony size changes within the seasons become smaller during the summer and increase during the rainy seasons. These bats typically keep the same roost sites year after year for many years. Ecologically, fruit bats are highly important species as they are one of the best pollinators and seed dispersers in tropical forests throughout the world (Jeevan et al.,2013). The present paper deals with roosting trees and food plants preferred by *Pteropus giganteus* for the first time in Thirthahalli area of Shivamogga district.

MATERIALS AND METHODS

Thirthahalli is a beautiful area with agricultural background. It is close to the Western ghats. *P. giganteus* are well flourished in Thirthahalli it has roosting sites. site 1 is Thirthahalli town and site 2 is Humcha located 30 kms away from the Thirthahalli at North direction. Shivamogga has its geographical location from 13o 17' to 114o 39' north latitude and from 74o 37' to 75o 52' east longitude. The district covers an area of 8476.55 Sq. km. the study was carried out in Thirthahalli roosting site in the Shivamogga district. observations were made on various three species at Thirthahalli locations during July and November 2014

The study on the roosting trees and feeding trees were carried out independently at the roosting and foraging areas of Thirthahalli, Karnataka. For identification and naming of plants species botanical manual book was referred. The collected plant specimens were identified with the help of recent and relevant floras and confirmed from the authentic specimens. Plant specimens with their botanical names with their family are depicted in Table 1. In a few cases, helps of local peoples were also taken. Food plants of bats (Table 2) were marked in the foraging areas with the help of naked eyes through direct spot observation method during foraging hours. An indirect method of food plant

identification was also used where partially consumed food plant were collected from the floor of traditional roosting trees as *P.giganteus* sometime returned with food items to their traditional roosts to eat the food material at night (Azad Ali,2014).

Data on the feeding activities of *P. giganteus* was obtained by collecting fruits, seeds, leaves, flower parts and pellets dropped beneath the roosts and feeding trees (Win and Mya,2015). It is observed that *P. giganteus* was foraging on nectar of *Magnolia champaka*. Most observations were aided by diffuse illumination from nearby street lamps. During dark hours Nikon digital handy camera D40X 8065345 was employed for observation. Additionally foraging events of bats also photographed using Nikon FM10 2497857 camera to investigate the feeding behavior.



Figure 1: The roosting site of *Pteropus giganteus*

RESULTS AND DISCUSSION

A total of 14 different roosting tree species belonging to 08 families along with 26 different species of food plants under 12 families were found associated with the *P.giganteus* in Thirthahalli region of Karnataka.

Figure 2 shows the percentage composition of roosting trees of *Pteropus giganteus* and Figure 3 depicts the number of food plants in each family preferred by *P.giganteus* in Thirthahalli region of Karnataka.

Roosting trees are depicted in Table-1 and the food plants are shown in the Table-2 with their various parts consumed by the Indian flying fox. From the present study, it has been clearly came out that Indian flying fox (*Pteropus giganteus*) is an exclusively plant dependent bat species. This flying fox *P. giganteus* is play an important role in pollination cum seed dispersal purposes. Through their activities, are definitely helping us in reforestation thereby balancing the forest ecosystem (Azad Ali,2014).

Kumar and Kanaujia (2017) reported that during day hours, most of bats were busy in sleeping and some were actively involved in cleaning by tongue and scatching with claws as well as fighting to each other. They left their day roosts after sunset and foraged to the feeding sites. The young ones of *P. giganteus* were found feeding on fruits of their roost trees. The behaviour such as wing fanning during summer and wing wrapping as well as basking during winter is associated with thermoregulation.

FOOD RESOURCES

Pteropus giganteus fed on the food plants of 26 species, the blossom and the flowers of 4 species (Table 2). The dominant families in the fruits/figs eaten by *P. giganteus* were Moraceae (6

species) and Anacardiaceae, Arecaceae and Annonaceae with 3 species. Fruits of *Ficus sp.*, *Carica papaya*, *Musa species* and *Psidium guajava* were available abundantly. About 17 varieties of fruits (54.84%) are eaten by fruit bat followed by Ripe figs (16.13%), Blossom (12.9 %) and Flower (12.9 %) (Figure 4).

FEEDING ACTIVITY

Feeding events were recorded on video tape and analyzed in the laboratory and tabulated. Field based studies of feeding behavior are relatively new development in the study of feeding mechanism in bat. In Thirthahalli region, the fruit bat *P. giganteus* have been found feeding on fruits of *Punica granatum*, *Carica papaya*, *Anacardium occidentale*, *Annona squamosa*, *Annona reticulate*, *Manilkara zapota*, *Cocos nucifera*, *Areca catechu*, *Ficus mysorensis*, *Ficus infectoria*, *Semicarpus anacardius*, *Magnolia champaka*, *Phyllanthus emblica*, *Mimusops elengi*, *Syzygium cumini*, *Musa paradisiaca*, *Mangifera indica*, *Psidium guajava*, *Ficus racemosa*, *Phoenix sylvestris*, *Artocarpus hirsutus* plants (Table 2). A comprehensive revival of the relationship between bats and flowers is given by Marshall (1985). It has been estimated that bats play important role in cross pollination of at least 130 species belonging to 16 genera (Freeman, 1995).

The nectar feeding ecology of *P. giganteus* was under natural conditions on *Michelia champaka* through out night. Peak visits occurred at 2000h -2100h for *P.giganteus*. Similar observations were noticed by Singaranvelan and Marimuthu (2004).

P. giganteus have an invaluable ecological role in the nature which is less understood among the people. Ecologically, fruit bats are highly important species as they are one of the best pollinators and seed dispersers in tropical forests throughout the world (Fugita and Tuttal, 1991; Azad, 2010). This helps in maintaining forest diversity as well as forest regeneration (Cox et al., 1992).

Flowers pollinated by bats characteristically bloom at night, have a strong odour and dull color and are in an exposed position outside dense foliage. These are large, produce copious quantities of nectar and pollen and are either tube like with protruding anthers or brush shaped. Fruits bats feed almost exclusively on plants taking floral resources largely nectar and pollen but also petals, bracts, fruits and often seeds themselves and leaves (Marshall, 1985).

Bates and Harrison (1997) described as *P. giganteus* always roost near human settlements. All the preferred roosting trees are comparatively large and tall. In the present study *P. giganteus* prefers tall trees for roosting near the human habitations as their diurnal roost. Similar observation also has been made by Richardson (1990) that *Pteropus conspicillatus* in Australia prefers tall trees like *Eucalyptus* and *Acacia* species. This tall nature of the tree can give protection and further enable them to become air borne and also to escape from enemies (Jeyaprabha, 2016). These arguments also supported by Wiles et al (1991) in *Pteropus mariannus* of the Pacific Islands and Jeyaprabha (2016) in *Pteropus giganteus* of Tirunelveli, Tamil Nadu.

CONCLUSION

Thirthahalli area is most beautiful and safety for all natural calamities. It is very closed to the Western Ghats. It has two sites in the Thirthahalli area. and one is Thirthahalli town and another one is Humcha. In this zone roosting sites are well established and protected area. these sites are near to the water bodies and very close to the agricultural fields. Fruiting plants are more in the surrounding area. Well established and very delicious fruiting plants are identified as *Ficus bengalensis*, *Ficus mysorensis*, *Artocarpus hirsutus*, *Syzygium cumini*, *Mimusops elengi*, *Phoenix sylvestris*, *Areca catechu*, *Mangifera*

indica, *Musa* species etc.

The important role of the *P. giganteus* is seed dispersal and pollination. Reforestation is one of the major role of *P. giganteus* in mid Western ghats of Karnataka. Many plants depend on bats for their survival. The flying foxes have developed working relationship with several plants within their habitat. Flower pollination and dispersal of seeds is beneficial to these organisms and certain fruits and trees are specialized to attract fruit bats. Deforestation is the threat to them because it causes habitat destruction which could cause them to be endangered later but luckily bats are largely responsible for reforestation in the forest. So there is an urgent need to create awareness among common public to protect these useful bats.

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Table 1: Roosting tree species of *Pteropus giganteus* in Thirthahalli region, Karnataka

SI No	Scientific Name	Family
1.	<i>Albizia saman</i>	Fabaceae
2.	<i>Pongamia pinnata</i>	
3.	<i>Delonix regia</i>	
4.	<i>Acacia auriculiformis</i>	
5.	<i>Ficus religiosa</i>	Moraceae
6.	<i>Ficus benghalensis</i>	
7.	<i>Ficus racemosa</i>	
8.	<i>Artocarpus integrifolia</i>	
9.	<i>Bamboo vulgaris</i>	Poaceae
10.	<i>Aegle marmelos</i>	Rutaceae
11.	<i>Mangifera indica</i>	Anacardiaceae
12.	<i>Cocos nucifera</i>	Arecaceae
13.	<i>Tectona grandis</i>	Verbenaceae
14.	<i>Terminalia sp.</i>	Combretaceae

Table 2: List of food plants and their parts consumed by *Pteropus giganteus* in Thirthahalli region, Karnataka

SI No	Family	Botanical Name	Plant parts consumed by bat
1	Musaceae	<i>Musa paradisiaca</i>	Flower, Nectar & Fruit
2	Moraceae	<i>Ficus religiosa</i>	Ripe figs
3		<i>Ficus benghalensis</i>	Ripe figs
4		<i>Ficus racemosa</i>	Ripe figs
5		<i>Ficus mysorensis</i>	Ripe figs
6		<i>Ficus infectoria</i>	Ripe figs
7		<i>Artocarpus hirsutus</i>	Fruit
8		Anacardiaceae	<i>Anacardium occidentale</i>
9	<i>Mangifera indica</i>		Blossom & Fruit
10	<i>Semicarpus anacardium</i>		Fruit
11	Magnoliaceae	<i>Magnolia champaca</i>	Blossom, Flower
12		<i>Magnolia sp.</i>	Blossom, Flower
13	Arecaceae	<i>Cocos nucifera</i>	Flower
14		<i>Areca catechu</i>	Blossom, Flower
15		<i>Phoenix sylvestris</i>	Flower & Fruit
16	Annonaceae	<i>Annona squamosa</i>	Fruit
17		<i>Annona reticulata</i>	Fruit
18		<i>Polyalthia longifolia</i>	Fruit

19	Meliaceae	<i>Azadirachtha indica</i>	Fruit
20	Myrtaceae	<i>Psidium guajava</i>	Blossom & Fruit
21		<i>Syzygium cumini</i>	Flower & Fruit
22	Caricaceae	<i>Carica papaya</i>	Flower & Fruit
23	Phyllanthaceae	<i>Phyllanthus emblica</i>	Fruit
24	Punicaceae	<i>Punica granatum</i>	Fruit
25	Sapotaceae	<i>Manilkara zapota</i>	Fruit
26		<i>Mimusops elengi</i>	Fruit

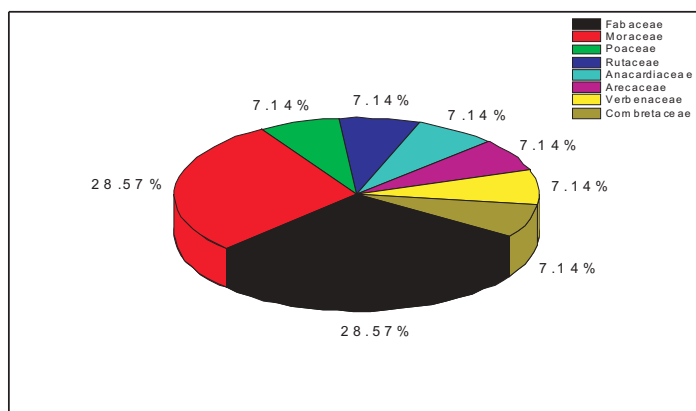


Figure 2: Percentage composition of roosting trees used by *Pteropus giganteus* in Thirthahalli region, Karnataka

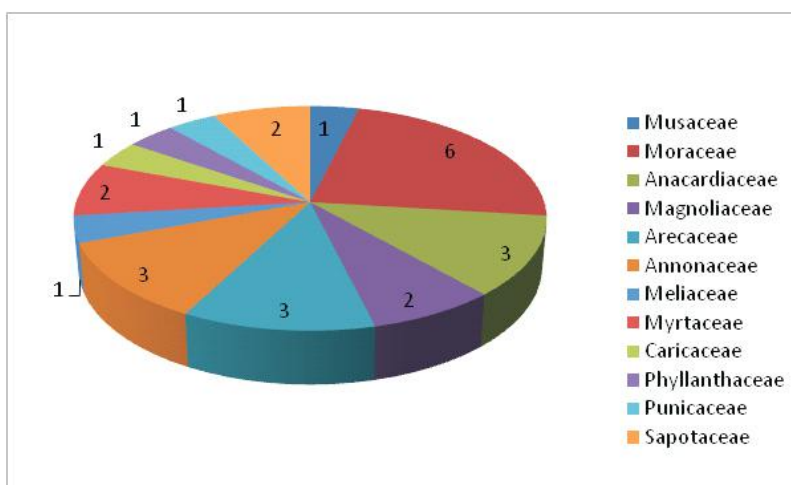


Figure 3: Number of food plants in each family preferred by *P. giganteus* in Thirthahalli region, Karnataka

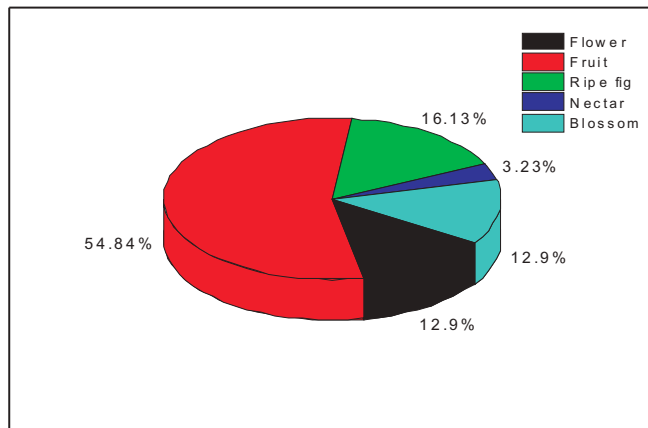


Figure 4: Preference of plant parts by *P.giganteus*