COPULATORY ACTIVITY OF THE INDIAN FLYING FOX PTEROPUS GIGANTEUS IN THIRTHAHALLI REGION OF KARNATAKA

E. N. Jeevan[1], K.L. Naik[2], B.B. Hosetti[3], H.A Sayeswara[4], B.R.Kiran[5]
[1,2,4] Department of Zoology, Sahyadri Science College (Autonomous) Shivamogga, Karnataka India
[3]Department of PG Studies and Research in Applied Zoology, Bioscience Complex, Jnana Sahyadri, Shankaraghatta, Shivamogga, Karnataka, India.
[5]Research & Teaching Assistant in Environmental Science, DDE, Kuvempu University, Shankaraghatta, Karnataka, India.

Abstract

This paper deals with study of copulatory behaviour of fruit eating bat *Ptropus giganteus* in Thirthahalli area of Karnataka. A total of 76 copulations were observed during July to November 2014 in Thirthahalli roosting area. This colony consists of more than 2500 individuals of both the sexes of *P. giganteus.* During day they take rest in roosting trees. Roosts provide sites for mating, hibernation and rearing young ones. Individuals of *P.giganteus* were actively involved in courtship display and copulation throughout the day, However, peak copulation was observed at 11.00 hrs. The male *P. giganteus* was very aggressive during copulation and produced long cry while the female tried to relay herself from the male using force and screams. After successful copulation they can produce single young one by the long period of gestation. The babies stay with their mother and after two months they can fly their own.

Keyword: Copulation, Thirthahalli, Humcha, *Ptropus giganteus*, Indian flying fox.

INTRODUCTION

Bats live longer than other placental mammal, with respect to their body mass (Bouliere 1958, Austad and Fircher 1991; Wilkinson and South 2002). The longevity of bats is influenced by reproductive rate (Wilkinson and South 2002). Thus bat that either produce multiple pups per year have shorter longevity, while those that produce a single pup per year live longest.

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).

Bats play a crucial role in pollination, seed dispersel and pest control , although fruit bats damage a small percentage of agricultural and horticultural crops. The giant fruit eating bat, *Pteropus giganteus* is a native of the tropics

and sub tropics with day roost on large canopied trees like *Ficus benghalensis. F. religiosa* etc. in South India. Roost provide sites for mating, hibernation and rearing of young ones, they expose bats to adverse weather, predators and conditions that balance birth rate, death rates and enhance survivorship.

Mating occurring from July to October and births occurring from January to April. Gestation period is typically 140 to 150 days after that *P. giganteus* give birth to a single young during January to March (Neuwiler,1969). Other study suggest that *P. giganteus* gives birth to one or two young from February to March with 140-150 days of gestation(Nowak, 1999, Koil Raj *et. al*, 2001).

Birth occurs during the day when it is immanent the female hangs by her thumbs and feet and licks her genital area until the pups head begins to emerge this can last up to several hours. After birth the pup moves itself into a suckling position and attaches itself to a nipple. The mother will fly with her young for about two or three weeks. The pups has light fur, the eyes are closed and the ear flaps are down. The mother keeps her wing wrapped around the pup for warmth. After approximately three weeks it becomes too heavy to carry with her and is left with the other young. Upon the mother's return, she is able to recognize her off spraying by its unique vocalizations (Kate Kretschmann and Robin Hayes, 2016-www.encyclopedia.com). The present paper describes the copulatory behaviour of *P. giganteus* for the first time in Thirthahalli area of Karnataka.

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 area. Site-1 is Thirthahalli town about 60 km West of Shivamogga and site-2 is Humcha located 30 kms away from the Thirthahalli at North direction. Shivamogga has its geographical location from 13^{o} 17' to 14^{o} 39' North latitude and from 74^{o} 37' to 75^{o} 52' East longitude. The district covers an area of 8476.55 Sq. km.

Observations were made during July to November 2014. A total of 76 copulation were observed. A field Binocular Nikon 13243CN was used to observe the copulatory behavior and data were recorded(Binocular Nikon action 10x50 6.5^{o}). In this study, the copulatory behavior was recorded with the help of video tape and analyzed in the laboratory and tabulated.

RESULT AND DISCUSSION

Table 1 and 2 depicts the copulatory activity of *P.giganteus* during July to November 2014.The colony size changes within the seasons and they become lesser during summer and increase during the rainy season. These bats typically keep the same roost sites for many years. Sometimes they have been changed or temporarily shifted to other places due to disturbance of human activities, natural disorders and deforestation.

A large colony of *P. giganteus* was located at Thirthahalli area. The colony consisted of about 2500 individuals roosting in *Bamboo vulgaris, Pongamia pinnata, Artocarpus hirsutus*. A total of 76 copulation were observed during July to November 2014 every Sundays. A large colony of *P. giganteus* was located at Thirthahalli site of Shivamogga district.

More number of copulatory activity were found in the month of August and September. Less number of activity occurred in July, October and November. The continuous wing fanning during pair formation might favor the male *P. giganteus* to spread the odor from the scent gland. The shoulder gland secretion of *P. giganteus* consist of 65 odors compounds (Wood et. al., 2005). Earlier report suggest that auditory, olfactory and tactile stimuli are important before and during copulation (Fenton,1985). A characteristic release sound made by females followed by mating success. (Bradbury,1977; Virendra Mathur et al.,2011).

The individuals of *P. giganteus* were actively involved in courtship display throughout the day. However peak copulation was observed at 11.00 hours.

A male bat was considerably larger than the adult female. The male is frequently approached its selected mate, stretched and fanned the wing towards the female and sniffed her. The female always attempted to repel from the male by screaming and leaving the branch of the tree (Jitendra Kumar and Amita

Kanaujia,2015). However, the male followed her persistently for about 20 to 45 minutes with physical contact. When the female stopped moving the male started licking her vagina typically each bout of cunnilingus lasted for about 50 seconds.

After the continuous approach of male and pair formation, the female accepts the male for mating. Both male and female bats settled about 15 cm apart each other. Thereafter, the male seized the female using wings and copulation held for 85 ±19.5 sec. Individuals of *P. giganteus* were actively involved in courtship display and copulation throughout the day. However peak copulation was observed at 11.00 hr. After completion of copulation, the male again continued cunnilingus for 94 to 180 sec. gestation period is typically 140 to 150 days (Koil Raj et. al, 2001). Other studies suggests that *P. giganteus* gives birth to a single young during January to March (Neuweiler,1969), April to early June (Bates and Harrison,1997).

The females which had given birth during summer involved in mating during autumn reproductive season. Young learn to fly at about 11 weeks of age and are weaned 5 months. Male do not participate in parental care and female involved in parental care.

Both roosting sites are nearer to Agumbe region and these are closed to the Western Ghats. The most preferred roosting trees are *Bamboo vulgaris, Phoenix sylvestris* and *Artocarpus hirsute,Ficus bengalansis* etc. These plant gives chance to accommodate more than 750 species. Generally, copulatory period is from July to November. Table 1-2 and Figure 1 shows the copulatory activity of *P. giganteus* in different months and sites.

The number of copulation in *P. giganteus* was observed during day time on the roosting trees. After copulation both individuals were silent rest of the day. Copulation lasted for 30 to 40 seconds.

Table 1 :Number of copulation in *P. giganteus*.

	Jul-14	Aug14	Sept-14	Oct-14	Nov-14	Total
Thithahalli area	13	18	20	15	10	76

Table 2: Copulation in *P. giganteus* in different roosting sites.

	Jul-14	Aug14	Sept-14	Oct-14	Nov-14	Total	Grand Total
Site 1	9	13	14	10	7	53	76
Site 2	4	5	6	5	3	23	

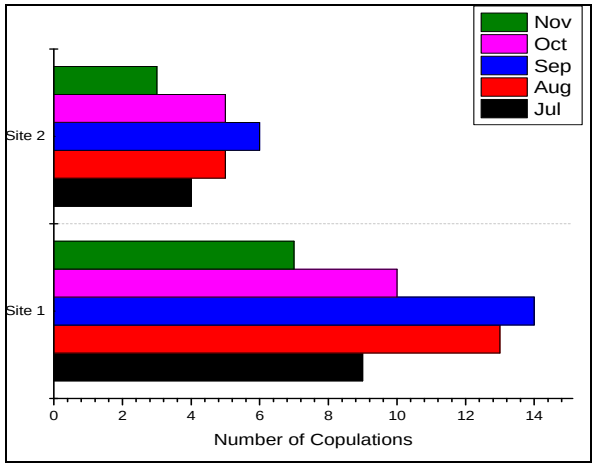

Figure 1: **Number of copulation in different roosting sites of *P. giganteus***

Figure 2: The roosting sites of *Pteropus giganteus* in Thirthahalli region

Discussion

The results of this study are consistent with the earlier report on reproductive behavior of flying foxes (Nelson 1965, Neuweiler 1969, Marimuthu 1988, Koilraj el.al. 2001, Cayunda et.al. 2004; Virendra Mathur et al.,2011). A detailed study reported that *P. giganteus* undergoes mass copulations between July and November and gives birth during March (Neuweiler,1969). Consistent with previous reports mass copulations were observed in the current study during August and September.

In the month of July thirteen copulations were observed. Out of 13, in site 1 nine copulation were observed, in site 2 , four copulations were observed. In August 18 copulations were recorded. Out of 18, in site 1 thirteen copulation were observed, in site 2 five copulations were recorded. In the month of September, 20 copulations were observed. out of which 14 in site 1 and 6 in site 2 respectively. In October, 15 copulations were observed. out of which 10 in site 1 and 5 in site 2. In November least number of copulations were observed. It was 7 in site 1 and 3 in site 2. Total 76 copulations were recorded. In August and September months more number of copulations were recorded.

The constant physical approaches such as licking the scruff face and vaginal regional of the female suggest that *P. giganteus* also use tactile communication during mating (Marimuthu 1988; Virendra Mathur et al.,2011). In the current study reproductively active male bats snuffled the vaginal region of female at the beginning at pair bonding and it suggest that the olfactory communication plays a crucial role in *P. giganteus* reproduction.

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. 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.

Copulatory activity of Indian flying fox *Pteropus giganteus* were studied in Thirthahalli region of Karnataka. General maintenance behaviors such as wing fanning, wing stretching, grooming, locomotion, sleeping, urination and defecation were observed. Peak copulation was observed at 11.00hr. A total of 76 copulation were observed. After copulation both individuals were silent rest of the day. Copulation lasted for 30 to 40 seconds. Male do not take part in parental care and female involved in parental care. *Pteropus giganteus* used auditory, olfactory and tactile communications during pre and post-copulation period.

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