

REPRODUCTIVE BEHAVIORS OF INDIAN FLYING FOX, *PTEROPUS GIGANTEUS* (BRUNNICH, 1782) AT MUNICIPAL COMPOUND IN PYAY TOWNSHIP

Than Than Htay¹, Aung Aung², Moe Moe Aung³

Abstract

Reproductive behaviours of *Pteropus giganteus* was conducted at Municipal compound in Pyay Township from July, 2018 to June, 2019. A total of 469 copulations were observed consists of more than 2300 individuals of both sex. During day they take rest in roosting trees. The maximum number of pairing were observed in September. Courtship displays and copulatory behaviours were observed throughout the day at the diurnal roost. Two modes of copulatory behaviours (frontal and dorsal) were observed during copulatory of *P. giganteus*. During copulation of *P. giganteus* and also used auditory, olfactory and tactile communications during pre and post-copulation period. The bats were more active before 12:00AM and reproduced single individuals. The lactating females retained their pups with them until the latter become three months old.

Keywords: Reproductive behaviours, mating season, *Pteropus giganteus*, roosting

Introduction

Most species of mammals live in the tropics, and many breed seasonally. Mammals in seasonal environments have evolved two general strategies of reproductive timing. Seasonally breeding species with a long gestation cannot use an opportunistic strategy, since the long delay between copulation and birth would cause them, consistently to miss the optimum periods for the most difficult parts of their reproductive cycle (Heideman and Bronson, 1994).

Reproduction is an important aspect of a species biology (Bong *et al.*, 1999). There have been many studies of bat reproduction in the tropics but very little has been reported for flying fox from Myanmar.

Reproduction plays an essential role to contribute survival and growth in the life cycle of vary species of living animals in the world. The fruit bats are mostly similar to many of the general reproductive characteristic found in other mammalian species. They reproduce sexually, give birth to live young and females nurse their young from one of two mammae located on each side of their thorax.

The objectives of the present study

- to study and record the sexual behaviours that normally occur at roost site
- to observe the quantify of their reproductive behaviours

Materials and Methods

Study area and site

Reproductive behaviours of *Pteropus giganteus* was conducted at Municipal compound in Pyay (N 18°49' 19.663" E 95° 12' 47.368") which was located on the Eastern bank of Ayeyarwady River, in Pyay Townshi Four roosting sites were focused to study the reproductive behaviours of *Pteropus giganteus*.

¹ Lecturer, Department of Zoology, Pyay University

² Dr, Lecturer, Department of Zoology, Taungoo University

³ Dr, Associate Professor, Department of Zoology, University of Mandalay

Study period

Study period lasted from July, 2018 to June, 2019.

Data collection

Survey was carried out to study the mating behaviour of Indian flying fox. The observation was made for whole day, from 6:00 AM to 4:00 PM. After every 50 minutes study time, take a rest for 10 minutes. The behaviours were observed from vantage points through binocular. In addition, the frequency, time and duration of copulations were observed. At least 8 days per month were spent under the tree to study and record the different reproductive behaviours. The observation was made for 30 minutes in each roosting trees at the day time. The time of mating was investigated followed by the time consumed during copulation. Behaviour of both males and females were recorded during the entire course of, pre-mating, mating and post-mating behaviours.



Source from (Geography Department, Pyay University)

Figure 1 Map of the study area (Pyay Township)



A. *Ficus virens* Aitom-I



B. *Ficus virens* Aitom-II



C. *Terminalia catappa* L



D. *Albizzia lebbek* Benth

Plate 1 Four roosting site

Results

The individuals of *Pteropus giganteus* were actively involved in courtship display throughout the day. Courtship behaviours were divided into pre-copulatory phase, copulatory phase and post-copulatory phase.

Courtship and mating behaviours

The reproductive behaviours of Indian flying foxes occurred during annual mating seasons and was conducted predominantly at the day roosts. Courtship commenced early in the morning

and occurred in repetitive sequences throughout the day. Copulation was always initiated by a male.

It is noticed that flying foxes mate throughout the year however it was recorded that the frequency was maximum during the months of September. The difference in size and colour between male and female is a symbol of sex. The males are larger than the females and their abdomen are pale in colour and tinged with gray while the females are bright buff.

Based on the observation of a number of pairing bats it was recorded that during courtship the male first approach prospective a female and relay the message by grooming the wings and body of female, and by licking the valva of the female (Plate 2). At first the female usually warn the male by vocalization and attempt to avoid the approaching male by various ways. She may then shift her roosting place however is pursued by the ardent male. Though the first attempt usually is not successful, the 2nd and 3rd attempts let the female get the message.

The male mounted from the rear and hold down the female until the final act of coitus (Plate 3,4). Courtship and coitus took approximately (30-45) minutes. females often appeared to resist copulation attempts through struggling and evasion of the male. During copulation, female simultaneously produced loud vocalizations "Ghee". After copulation, female fled to other branches and the male again followed the female to attempt copulation. Moreover, courtship and mating behaviours were more observed than normal when flying foxes were alerted by disturbances.

Monthly observation of courtship and mating behaviour of *P. giganteus* started to record in first week of July, 2018 in this study. Medium mating pair occurred July, 2018, May and June, 2019 in study periods. During the study period, maximum number of 197 mating pairs was recorded in September 2018 and minimum number of two, mating pairs in March 2019 (Table 1).

Maximum numbers of mating pairs were observed before 12:00 AM in the day roost in every month. (Table-2). The incident mating and incident breeding during the year 2018-2019 was shown in (Table 3).

Gestation

Pregnancy period lasted approximately six months, since young pups were encountered from March to May, after a lapse of six months from the period of maximum mating frequency throughout the colony. (Plate 5).

Parturition

Along the study period it was noticed that pregnant female gave birth to a single young synchronously between early March and May. After parturition the young was oriented in the same position like the mother and clinged to one of the two nipples. During suckling session the mother groomed her young pup occasionally before wrapping the pup with her wings in protection. (Fig.5).

Lactation

The lactation period lasted approximately 15 weeks. During this period the mother nursed her young and gave protection from the various disturbances. The pup was carried everywhere by the mother while it clings by gripping her with the claw of feet and by grasping her axillary teat in the mouth. After a few weeks, the young was left with other pups in the roost trees at night while the mother venture out to foraging site.



Plate 2 Male and Female, Male trying to stimulate the female for submission of *Pteropus giganteus*



Plate 3 Courtship behaviour, copulatory phase (abdominal) of *Pteropus giganteus* within Municipal compound



Plate 4 Courtship behaviour, copulatory phase (dorsal) post copulatory phase of *Pteropus giganteus* within Municipal compound

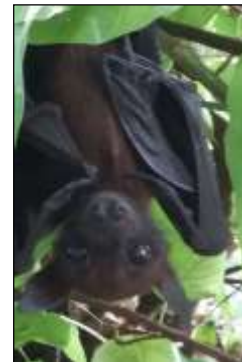


Plate 5 Pregnant female bat, infant attach and two months old bat

Table 1 Monthly total number of courtship and mating pairs of *Pteropus giganteus* (from July-2018 to June-2019)

Months	Courtship	Mating
July , 2018	14	12
August	53	55
September	240	197
October	153	52
November	95	31
December	71	33
January , 2019	33	21
February	79	44
March	3	2
April	14	5
May	16	6
June	17	11

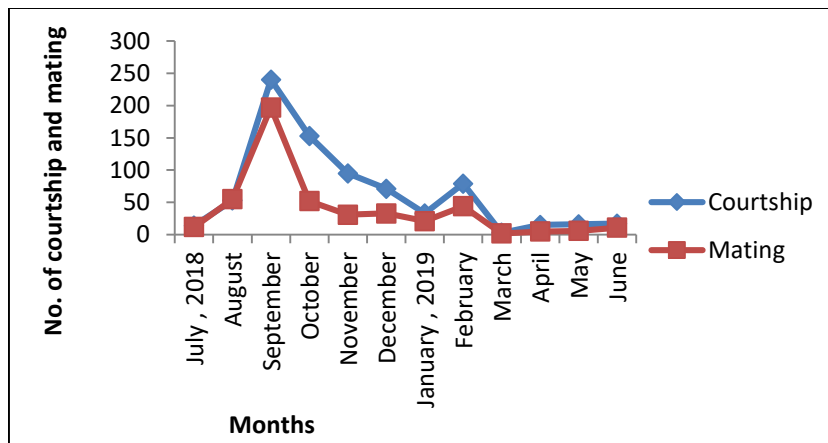


Figure 2 Monthly numbers courtship and mating pairs of *Pteropus giganteus* during study period

Table 2 Relation of paring numbers and day roosting time of *Pteropus giganteus* during study period

Months	Numbers of paring	
	Before-Noon	After-Noon
July , 2018	10	2
August	47	8
September	149	48
October	47	5
November	29	2
December	33	0
January , 2019	21	0
February	39	5
March	1	1
April	3	2
May	4	2
June	8	3

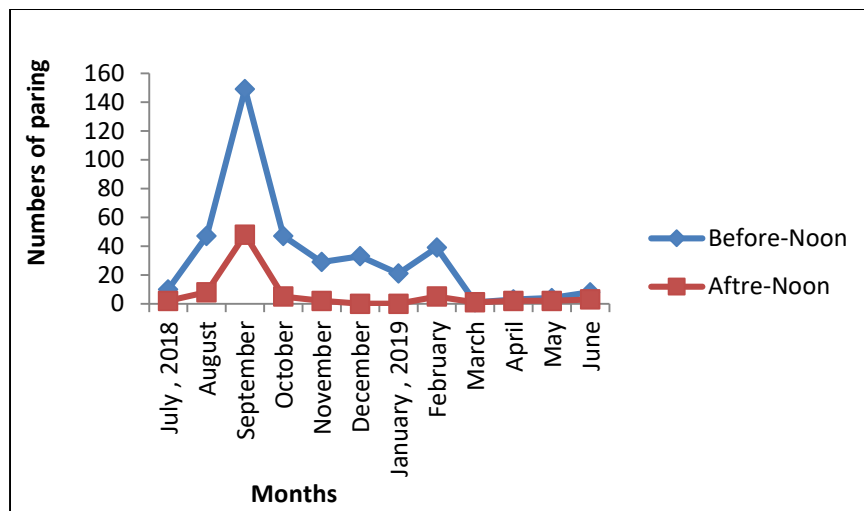


Figure 3 Relation of pairing numbers and day roosting time of *Pteropus giganteus* during study period

Table 3 Recorded frequency of incident mating and incident breeding during study period

Months	Frequency		Mating	Courtship
	Incident mating	Incident Breeding		
July, 2018	++	—	12	14
August	+++	—	55	53
September	+++	—	197	240
October	+++	—	52	153
November	+++	—	31	95
December	+++	—	33	71
January, 2019	+++	—	21	33
February	+++	—	44	79
March	+	+	2	3
April	+	++	5	14
May	++	+++	6	16
June	++	—	11	17

+ = minimum frequency

++ = medium frequency

+++ = maximum frequency

Discussion

Courtship and mating behaviours were observed throughout the morning and then these behaviour delayed after 12:00 am. This may be due to more active in the morning than afternoon, because more mating activities were found when the bats were alerted. Moreover mating behaviours were less observed when there was very windy and rainy.

Neuweiler (2000) reported that the mating behaviour of Indian flying fox, *P.giganteus* follows the first period of sleep in the morning, a few males start attempting to copulate with females. This activity is accompanied by long and loud intimidation cries. By stimulating nearby males with these cries, the entire colony is a mass of screeching and copulating pairs. Half an hour later, the colony is again peaceful and quiet. Sein Sein Win (2006) describe that a similar event was found in her study. Males always started to couplate with females and during this time loud

sounds were continuously produced. May Myo Nyunt (2007) stated that copulation usually took place in the morning with vocalization of the males throughout the colony. Some males were also found flying around the roost trees as though in search of the prospective female. In present study, female simultaneously reproduces loud vocalization during copulation.

Sein Sein Win (2006) stated that peak mating frequency started in September. Moe Moe Aung (2006) stated that copulation occurred throughout the year, but peak from September through February. May Myo Nyunt (2007) described that, it is noticed that flying foxes mate throughout the year however it was recorded that the frequency was maximum during the months of September through December.

In the present study, *P. giganteus* was observed the mating behaviour is throughout the year however it was recorded that the maximum number of mating pairs were in September during the study period.

Neuweiler (2000) stated that copulation of *P. giganteus* occurred within a 30 to 40 minutes period each morning. May Myo Nyunt (2007) stated that courtship and coitus took approximately 60 minutes. In the present study, courtship and coitus took approximately (30-45) minutes.

In present study peak frequency of mating pairs were found in September through February. Moe Moe Aung (2006) and May Myo Nyunt, (2007) reported that peak mating period occurred in September. Therefore mating period of *P. giganteus* in the study revealed uniformly the same although in different localities and regarded optimum conditions favoured for reproduction of this species in Myanmar.

Based on the peak mating period in September and the onset of parturition time in March, the gestation period of *P. giganteus* was estimated as 150-160 days. Sein Sein Win (2006) and May Myo Nyunt (2007) also reported that the pregnancy period lasted about six months.

Conclusion

A total of 469 copulations were observed during July, 2018 to June 2019, four roosting sites in Municipal compound at Pyay Township. This colony consists of more than 2300 individuals of both the sexes of *Pteropus giganteus*.

In the present study, mating pairs were recorded in every month of study period. Of these months, the maximum numbers were recorded in September 2018 and minimum in March to May 2019.

In the present study, there was 35-40min long duration in the courtship from start to end. Maximum number of mating pairs were observed before 12 am than 12 pm in every month of study period.

Acknowledgements

We are greatly indebted to Dr. Aye Mi San, Head of Zoology Department, University of Yangon for her invaluable suggestions.

We would like to express our profound thanks to Dr. Thwel Linn Ko, Pro-Rector, Pyay University, for their kind permission and encouragement to carry out this work.

We would like to express our gratitude to Professor Dr. Thida, Professor and Head, Department of Zoology, Pyay University for providing the available facilities in Department. We also grateful to Professor Dr. Myint Myint Than, Department of Zoology, Pyay University for supporting and advice to my research work.

Thanks are also due to staffs of Municipal Office, Pyay Township who cordially helped us in various ways during this work.

References

- Bong, S.M., Yew G.S., Zubaid, A. and Kamis, A.B. (1999). The reproductive cycle of male insectivorous bat, *Scotophilus kuhlii*, from Peninsular Malaysia. *Malays Apple. Biol.* 28 (1 and 2):
- Heideman, P.D. and Bronson; F.H (1994). An endogenous circannual rhythm of reproduction in a tropical bat, *Anoura geoffroyi*, is not entrained by photoperid. *Biology of reproduction* 50.607-614
- Moe Moe Aung. (2006). Autecology of Indian Flying fox (*Pteropus giganteus* Brunnich, 1782), in Pha Ya Phyan villlage, Wetlet Township, Sagaing Division, *Ph.D Thesis*, Department of Zoology University of Mandalay.
- May Myo Nyunt. (2007). Ecology and Seasonal Abundance of Indian Flying fox, *Pteropus giganteus* (Brunnich, 1782), in Nyaug Hla Village, Nyaung Oo Township. *Ph.D Thesis*, Department of Zoology University of Mandalay
- Neuweiler, G. (2000). *The Biology of Bats*. Oxford University Press, New York and Oxford
- Sein Sein Win. (2006). Autecology of Indian Flying fox (*Pteropus giganteus* Brunnich, 1782), in Sintgu Township Mandalay Division, *Ph.D Thesis*, Department of Zoology, University of Mandalay.