Scientific Reports in Life Sciences 3 (4): 1-7

DOI: http://doi.org/10.5281/ zenodo.7324225

Foraging and feeding behavior of Indian flying fox at Dhubri district of western Assam

Azad Ali
Associate Professor and Former Head, Biodiversity and Ecological Research Centre (BERC), Department of Zoology, B. N. College, Dhubri, Assam, India.
Email:azadali82889@gmail.com

Received: 15 June 2022 / Revised: 10 July 2022 / Accepted: 15 July 2022/ Published online: 15 July 2022.

How to cite: Azad, A. (2022). Foraging and feeding behavior of Indian flying fox at Dhubri district of western Assam, Scientific Reports in Life Sciences 3(4), 1-7. **DOI:** http://doi.org/10.5281/zenodo.7324225

Abstract

Indian flying fox (*Pteropus giganteus*) is a fruit bat species under the order Chiroptera and family Pteropodidae. The species is locally known as 'Pholkhowa Borbaduli' in Assamese means frugivorous big bat. Data on foraging and feeding behavior, the phenology of our fruit plants, and the complex role the Indian flying foxes play in the northeast Indian forest ecosystem are very scanty. Looking, at the dearth of information, the study was conducted at the subtropical mixed forest patches found at residential areas of Nathpara, Khalilpur part of Dhubri district of western Assam to enumerate the foraging and feeding behavior of Indian flying foxes on the ripe fruits of *Anthocephalus cadamba* (Kadam Plants), a potential food item of *Pteropus giganteus* in the study which is mainly observed during monsoon and retreating monsoon period of the wet season. The study will also reveal the role of the fruit bat species in forest regeneration through their pollination and seed dispersal activities ultimately maintaining a healthy forest ecosystem by enhancing the forest coverage of Northeast India, a 'Biodiversity Hotspot'.

Keywords: *Anthocephalus cadamba*, Kadam, Indian flying fox, *Pteropus giganteus*, Northeast India

Introduction

Indian flying fox (*Pteropus giganteus*) is a fruit bat species under the order Chiroptera and family Pteropodidae. The Indian flying fox locally known as Pholkhowa Borbaduli (in Assamese) means Frugivorous big bat, Borobadur (in Bengali), and Bora Samgadar (in Hindi) (Ali, 2013). It is one

of the largest fruit bat species found in the Indian subcontinent stretching from Bangladesh, China, India, the Maldives, Nepal, and Pakistan to Sri Lanka. Fruit bats are a highly important species as they are one of the best pollinators and seed dispersers in tropical forests worldwide (Fujita & Tuttle 1991; Marshall, 1983; Marshall, 1985). According to Goyal & Sale (1992), in Dehradun of India, Indian flying foxes' feeds on the fruits of *Ficus glomerata, F. religiosa,* and an exotic *F. Benzamina*. Sinha (1999), also reported a couple of casual incidents observed in the feeding activities of *P. giganteus* from the northeastern parts of India. The first report was from the Rongjuly area of Goalpara district of Assam where he saw an Indian flying fox feeding on the floral resources of banana plant (*Musa* sp) and the second report was from the Dharam Nagar area of Tripura State where he saw a *P. giganteus* individual running on a bunch of Dumra tree (Local name in Tripura) and taking of a fruit in its mouth and immediately flew away from the tree. Ali (2013; 2014), also reported about 51 food plant species used by the Indian flying foxes at the lower Brahmaputra valley of Assam. However, data on foraging or feeding behavior, the phenology of our forest ecosystem, and the complex role played by the Indian flying foxes in our northeastern forest ecosystem are very scanty. The emerging picture however indicates that they have an extremely important role in maintaining our forest diversity as informed by Cox et al. (1992), in their study areas. Looking at the dearth of information, a study was conducted at the subtropical mixed forest patches found in residential areas of the Nathpara area which falls under the Khalilpur part of the Dhubri district of western Assam to enumerate the foraging behavior of Indian flying foxes in the ripe fruits of *Anthocephalus cadamba* (Kadam Plants), a potential food item of *Pteropus giganteus* in the study which is mainly observed during monsoon and retreating monsoon period of the wet season. The study will also reveal the role of the fruit bat species in forest regeneration through their pollination and seed dispersal activities ultimately maintaining a healthy forest ecosystem by enhancing the forest coverage of Northeast India, a 'Biodiversity Hotspot'.

Material and methods

Study area

The study was conducted in the year 2014 in the Nathpara area which falls under the Khalilpur part of the Dhubri district of western Assam at their subtropical mixed forest patches found in the residential areas. This district is located on the globe between 89.42-to-90.12-degree east longitude and 26.22-to-25.28-degree north latitude. The district is situated 30 meters above sea level on average. The Nathpara area is exclusively a human habitation with lots of planted trees.

There are a few man-made ponds or fisheries in the area. Open lowlands are also available near the Nathpara roadside. During summer, these areas are inundated with rain waters and it persists for about six months. The study was conducted covering both the monsoon and retreating monsoon periods (August-September-October) of the rainy or wet season. The rainy or wet season was recorded as the longest one, which begins in the later part of March and ends in November. Monsoon season was the longest of all the three sub-seasons of the wet season. It begins in the latter part of May and continued till the end of September. The mean temperature and rainfall of the monsoon were highest in comparison to the other seasons; they were recorded as 28.19° c and 216.28 mm rainfall respectively. Relative humidity was also very high, which was recorded at 81.01%. The main characteristic feature of the monsoon season was the heavy rains throughout the seasons; the major portion of the rainfall resulted from the southwest monsoon. Occurrences of flood in low-lying areas of the Brahmaputra valley happen to be another characteristic feature of the monsoon season of Assam. The retreating monsoon started in the early part of October and continued till the end of November. The amount of rainfall in the retreating monsoon was very low (70.28 mm). With the advancement of the season, the temperature goes down. Mists and fog start appearing. The mean maximum and minimum were recorded at 28.39°C and 20.46°C. Relative humidity was recorded at the highest with 82.15% in comparison to other seasons in a year during the study period.

The overall studies on food and feeding behavior were studied following the works of Ali (2013). For the foraging behavioral study and two learning the phenology of the *Anthocephalus cadamba*, some of the food plants were scanned and verified in the study area for a month. After verification, the main behavioral studies were conducted at the Nathpara area which was situated near the district headquarters 'Dhubri'. For recording foraging behavior, a high point was selected during day time from where feeding activities on the ripe fruits of the Kadam tree (*Anthocephalus cadamba*) can be best observed maintaining a viable distance to minimize the disturbance at the site so that feeding activities can be recorded by a digital camera. One Nikon DSL Camera was used to photograph the feeding bats. Depending on the need, a high-powered binocular was also used from time to time to observe the feeding activities of Indian flying foxes on the ripe fruits of *Anthocephalus cadamba*in at the study site.

Results

The distribution of Kadam plants (*Anthocephaluscadamba*) is very high (approx. 70%) in western Assam. It is one of the main trees in roadside boundaries and every household in the Dhubri district. During the study, the maximum ripening of Kadam fruits (*Anthocephalus cadamba*) was observed at the end of the monsoon period in the Dhubri district of the lower Brahmaputra valley (LBV) of Assam. Ripe Kadam fruits of *Anthocephalus cadamb* have emerged as the potential food item of the Indian flying fox (*Pteropus giganteus*) in the Nathpara area of Khalilpur part as most of the individuals of Indian flying foxes were seen using this fruit item in their diet during that time. One of the interesting phenology of the *Anthocephalus cadamba* was that two batches of fruits were observed during the same period of a season. One newly arrived while the fruits of the other batch were in the ripening stage. So, the phenology of *Anthocephalus cadamba* (Kadam trees) has been found to be very supportive for the Indian flying foxes in the study areas to minimize the food scarcity and to provide their potential food item for a longer duration during the retreating monsoon period of the wet or rainy season in western Assam. Fruiting of *Anthocephalus cadamba* can be seen from May onwards till October end. However maximum feeding was seen in September and October months.

Just after sunset, Indian flying fox individuals were seen starting to come to the feeding site for feeding purposes. Feeding activities were seen as more prevalent during the first two hours of foraging. Both intra and inter-specific competition for food resources were observed in the feeding grounds. Often individuals of *P. giganteus* were seen establishing feeding territories to get their best food items and they have been observed engaging in fights when new intruders (some unwanted members) from the same species or other species entered into the feeding territory. McWilliam (1985-1986), also reported that the feeding behavior of three highly colonial species of *Pteropus* such as *P. poliocephalus, P. Alecto,* and *P. scapulatus* in Australia was dominated by the establishment and subsequent defense of long-term feeding territories.

Only in-situ type of feeding behavior was shown by the individuals of *P. giganteus* in the selected study area of Dhubri districts. Another interesting behavior noticed was that before landing on the fruiting tree foraging bats used to fly around the fruiting tree in a circular path two to three times and then they directly landed just nearby the preferred fruiting branches. Apparently, they used smell to select the ripe fruits during foraging. During feeding members of the Indian flying foxes (*P. giganteus*) were seen mainly ingesting the soft pulp and juices from the food resources and the solids are discarded or spitted out from the sides of the mouth. Anderson (1983), and Bates &

Harrison (1997), also supported the above mentioned behaviour through their studies conducted on *P. giganteus* individuals.

Figure 1. *P. giganteus* individual just after arrival in the food plant near the food resource (left), and feeding activities on the ripe fruits of *Anthocephalus cadamba* (right)

Discussion

In the lower Brahmaputra valley (LBV) of Assam, *P. giganteus* individuals were seen to visit as many as 51 plant species of 35 genera and 24 families (Ali, 2014). Foraging time and feeding frequency are very important for any species. Marimuthu (1988) stated that just after sunset the bats start leaving their tree roost for feeding. They return at about two hours before sunrise after feeding on a wide variety of fruits, including figs, mango, guava, and neem (*Azadirachta indica*), a tree native to India, whose seeds are dispersed by bats. However, in the current study, feeding activities were seen continued till dawn by different members maintaining a gap in between apparently to minimize the intra-specific fights. On feeding territories, as has been observed in the present study, McWilliam (1985-1986), also reported that in Australia, *P. poliocephalus, P. Alecto,* and *P. scapulatus* were dominated by the establishment and subsequent defense of long-term feeding territories. At the end of the study, it can be concluded that *Anthocephalus cadamba* is one of the potential food of the Indian flying foxes at the western Assam counterparts. Looking at the large-scale distribution of Kadam plants, the interrelation between Indian flying fox and *Anthocephalus cadamba* has been found to be very strong. While one is giving its fruits to the bat species as its food, the bat species have been definitely involved in seed dispersal activities for the plant species in the lower Brahmaputra valley of western Assam. It is also seeming to be

strengthening the population of the *Pteropus giganteus* in the nearby roosting sites since the persistence of the food item is the large-scale period in the wet season, which facilitates healthy growth of the juveniles or sub-adults. So, looking at the importance of Kadam food plants (*Anthocephalus cadamba*) for the conservation of the *Pteropus giganteus*, I would like to advise the government to take initiative for large-scale afforestation drive in such areas where there is no previous tree cover with this species.

Although in the current study in-situ type of feeding was observed, however, there are reports of both in-situ and ex-situ type of feeding behavior of *P. giganteus* in other parts of the lower Brahmaputra valley of Assam for other food resources (Ali, 2013). The use of sight or smell, or both is a big question in the case of fruit bats as they can see very well. For that, I recommend technical analysis of this behavior by using required electronic gadgets for the future bat researcher of this region.

Acknowledgment

I would like to convey my gratitude to my wife and two daughters for their extreme support and patience shown during my study period as I had to be away from them and other family duties for longer periods at night hours. At the same time, I would like to extend my heartfelt respect to Paul J.J. Bates, Tony Hutson, Paul Racey, Sally Walker, G. Marimuthu, P. K. Saikia, P.C. Bhattacharjee, T.C. Deka, R. Deka, and Bibhab Kumar Talukdar for their training, research materials, guidance, helps and encouragement to start my batty career as a pioneer in Northeast India (Biodiversity Hotspot) with special reference to Assam.

References

Ali, A. (2013). Indian flying fox of Assam. Scholars' Press.

Ali, A. (2014). Interaction of Indian Flying Foxes *Pteropus giganteus* (Brunnich, 1782) with the plant species in the Lower Brahmaputra Valley of Assam. Small Mammal Mail, 6(1), 12-14.

Anderson, S. (1983). Species: *Pteropus giganteus* in Simon and Schuster's Guide to Mammals. 54p.

Bates, P.J.J., & Harrison, D.L. (1997). Bats of the Indian Subcontinent. Harrison Zoological Museum.

Cox, P. A., Elmqvist, T., Rainey, W. E., & Pierson, E. D. (1992). Flying foxes as pollinators and seed dispersers in Pacific Island ecosystems. U.S. Fish and Wildlife Service Biological Report 90 (23), 18-23.

Fujita, M.S., & Tuttle, M.D. (1991). Flying foxes (Chiroptera-Pteropodidae): Threatened animals of key ecological and economic importance. Conservation Biology, 5(4), 455–463.

Goyal, S.P., & Sale, J.B. (1992). Ecology of Indian Flying fox (*Pteropus giganteus*) around Dehradun (Final Project Report). Wildlife Institute of India.

Marimuthu, G. (1988). The sacred flying fox of India. Bats (Austin) 6(2), 45 – 54.

Marshall, A.G. (1983). Bats, Flowers and Fruits: evolutionary relationships in the Old World. Biol. J. Linn. Soc. 20, 115–135.

Marshall, A.G. (1985). Old World phytophagous bats (Megachiroptera) and their food plants: a survey. Zool. J. Linn. Soc. 83, 351–369.

McWilliam, A.N. (1985-1986). The feeding ecology of Pteropus in north-eastern New South Wales, Australia. Myotis, 23&24, 201-208.

Sinha, Y.P. (1999). Contribution to the knowledge of bats (Mammalia: Chiroptera) of North East Hills, India Records Zool. Sur. India. Occasional Paper No. 174, 1 – 52.