

## DISTRIBUTION OF INDIAN FLYING FOX *PTEROPUS GIGANTEUS* BRÜNNICH, 1782 IN FOUR DISTRICTS OF KHYBER PAKHTUNKHWA

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### ABSTRACT

The Indian flying fox *Pteropus giganteus* (Brünnich, 1782) is Indomalayan in distribution. Present study documents its range extension towards west of the Indus in Pakistan. Five colonies of the Indian flying foxes were recorded in four districts of Khyber Pakhtunkhwa (KP) that form eastern boundary of Palaearctic region. The bats preferred to roost on *Populus nigra* (100%), *Eucalyptus globulus* (88.8%), *Dalbergiasisso* (76.0%) and *Platanus orientalis* (48.4%). Population size varied from June (n = 5478) to December (n = 912).

**Key words:** Indo-Malayan, Indus, Khyber-Pakhtunkhwa, flying fox

### INTRODUCTION

Mammals are the most successful creatures that have exploited land, water and air (Kalko, 1997; Ramirez-Pulido *et al.* 2005). Among the mammals, the Order Chiroptera exhibits a remarkable diversity and broad geographic distribution (Simmons, 2005). The Order Chiroptera is the main contributor to mammalian diversity with more than 1200 known extant taxa (Schipper *et al.* 2008). The genus *Pteropus* Brisson, 1962 has 65 species and consists of medium to large fruit bats (Simmons, 2005). It is distributed from Mafia and Pema Islands (off the Tanzania), Madagascar, the Islands of the Indian Ocean, Indian subcontinent, Southeast Asia, Philippines and Australia (Bates and Harrison, 1997). Of the 65, five species of the flying foxes are reported from the Indian subcontinent which include the Indian flying fox *P. g. giganteus* Brünnich, 1782, *P. g. ariel* G. Allen, 1908, *P. g. leucocephalus* Hodgson, 1835, the large flying fox *P. vampyrus* Linnaeus, 1758, the Nicobar flying fox *P. faunulus* Miller, 1902, the Island flying fox *P. hypomelanus* Temminck, 1853, *P. h. satyrus* K. Andersen, 1908, the Blyth's flying fox *P. melanotus melanotus* Blyth, 1863 and *P. m. tyleri* Dobson, 1874 (Bates and Harrison, 1997). The status and geographical limits of this taxon are still uncertain (Bates and Harrison, 1997). *Pteropus giganteus* is included in Appendix II in IUCN SSC Action Plan (1992)-Not Threatened and is Lower Risk-IUCN 2003 (Mickleburgh *et al.* 1992; Walker and Molur, 2003).

In Pakistan, this species has been reported from Rawal Lake, Saidpur and Margalla Hills in Islamabad, Sialkot, Lahore, Changa Manga and Renala Khurd in Punjab, and from Jacobabad, Shahpur and Clifton Railway Bridge in Karachi (Eates, 1968; Roberts, 1997; Bates and Harrison, 1997). It has recently been reported

from Peshawar and Charsadda districts (Mahmood-ul-Hassan *et al.*, 2011). The species is widely distributed across India, Maldives, Nepal, Bangladesh and Sri Lanka (Bates and Harrison, 1997). Body measurements of the *P. giganteus* have been recorded by Roberts (1997), Bates and Harrison (1997), Aziz *et al.* (2007) and Molur *et al.* (2007).

This study documents occurrence of *P. giganteus* in four districts of Khyber-Pakhtunkhwa (KP) formerly known as Northwestern Frontier Province of Pakistan. The province constitutes eastern most limit of the Palearctic region and existence of *P. giganteus* in this region indicates range extension of the species (Figure 1).

### MATERIALS AND METHODS

The present study was conducted in four districts of KP where five roosts were identified during the exploratory phase of this study (June to December, 2008). These roosts were located at Fishing hut (N34°38.900' E72°01.941'; 667.51m a.s.l.), Pul Chowkai (N34°38.586' E72°01.781'; 682.44m, a.s.l.), southern edge of the Poji ground adjacent to Upper Swat Canal Bridge (N34°30.599' E71°53.820'; 466.95m a.s.l.), Chail Kandoa babanear Baizo Kharki Police Station (N34°27.392' E72°00.511'; 444.09m a.s.l.) and Shakur (N34°22.824' E71°44.091'; 409.96m a.s.l.). First two of these roosts were located in Dir (N35°12' E71°52') while the remaining three were located in Malakand (N34°34' E71°57'), Mardan (N34°19' E71°65') and Charsadda districts (N34°09' E71°49'), respectively. Climate and vegetation of the area varies from dry sub-tropical mixed deciduous scrub-forests to temperate semi-ever green scrub forests (Roberts, 1997). The average annual temperature ranges from -6°C to 23°C in winter and 10°C

to 38°C in summer while annual rainfall ranges from 800-1500 mm (Ali and Iqbal, 2012).

Three important western tributaries of the Indus viz. the Panjkora, the Swat and the Kabul traverse through study area. The Panjkora passes through Dir district while the Swat and the Kabul cross Malakand and Charsadda districts. A network of irrigation canals emerging from these rivers further intensified agriculture in these districts and as such they have become a horticultural hub of the country (Khan *et al.* 2010).

Bat colonies were monitored from June through December, 2008 and populations of *P. giganteus* were ascertained through direct roost counts following Kunz *et al.* (1996). Counts were made either soon after sun rise or late afternoon when wind velocity was low and cloud cover was minimal. Count was started when bats were not disturbed due to the presence of observer. Three counts from different angles were taken to assure that all bats on the tree were counted. A list of trees harboring bat roosts was prepared during the first surveys. The additional tree roosts in successive months were added to preexisting list of tree roosts to find out the monthly variations in the number of bats on different tree roost. GPS location and elevation was also recorded at each roost (Table 1).

## RESULTS AND DISCUSSION

Five roosts of the Indian flying fox (*Pteropus giganteus*) were identified during the exploratory phase of this study. Of these, one each was located in Malakand, Mardan and Charsadda districts while the remaining two were located in Dir district.

**1. Dir District.** Two bat roosts were recorded in this district, one at fishing hut on the bank of the river Swat while the other was located on the other side of the same river close to Pul Chowkai at the junction of Dir-Swat highway.

**(a) Fishing hut.** The area of fishing hut was in the form of rectangle. The length and width of which was 310m and 210m respectively while the total area covered by these bats was 65100 m<sup>2</sup>. The bats used 50 trees as roost that belonged to six species. These included, in alphabetical order, the white mulberry *Morus alba* (n = 4), the black mulberry *M. nigra* (n = 4), the Persian lilac *Meliaazedarch* (n = 1), *Olea ferruginea* (n = 1), the chenar *Platanusorientalis* (n = 10), and the black poplar *Populusnigra* (n = 30). The total number of bats varied in each month from June to December. It was 2358 in June, 1685 in July, 1720 in August, 946 in September and 374 in October. No bat was observed in November and December. The maximum number of bats was recorded on the chenar *Platanusorientalis* (48.4 %) during this month (Table 2). Combined monthly variations in relative abundance (%) of the Indian flying fox roosting on different trees in four districts of Khyber Pakhtunkhwa were showing in figure 2.

**(b) Pul Chowkai.** All the 21 trees belonged to a single species i.e. the black poplar *Populusnigra* at Pul Chowkai (Table 2). The total area of this roost was 6200 m<sup>2</sup>. No bat was however recorded in this roost during November and December (Table 2). The total number of bats recorded in different months varied. It was 504 in June, 529 in July, 382 in August, 178 in September and 195 in October.

### 2. Malakand District

**Dargai Bridge.** The bats used 55 trees as roost that belonged to five species. These included, in alphabetical order, *Acacia arabica* (n = 2), *Brousonetia papyrifera* (n = 25), *Dalbergia sissoo* (n = 24), *Ficus palmata* (n = 1), and *Melia azedarch* (n = 3). The total number of bats varied in each month from June to December. It was 838 in June, 743 in July, 846 in August, 355 in September, 829 in October, 1323 in November and 912 in December (Table 2). *Dalbergia sissoo* (76.0 %) was the most often used bat roost during August (Table 2).

**Table 1.** Location and elevation of the five roosts of *Pteropusgiganteus* in Khyber-Pakhtunkhwa.

Sr.#.	Exact Location	District	GPS	Elevation
1	Dargai Bridge	Malakand	N 34°30.599' E 71°53.820'	1532 ft
2	ChailKandov Baba	Mardan	N 34°27.392' E 72°00.511'	1457 ft
3	PulChowkai	Dir	N 34°38.586' E 72°01.781'	2239 ft
4	Fishing hut	Dir	N 34°38.900' E 72°01.941'	2190 ft
5	Shakur	Charsadda	N 34°22.824' E 71°44.091'	1345 ft

### 3. Charsadda District

**Shakur.** The total area of this roost was 30975 m<sup>2</sup>. A total of 39 trees belonging to four species were present at this roost. These included *E. globulus*, *M. alba*, *P. Nigra* and *D. sissoo* (Table 2). No bat was however recorded in this village roost during November and December. The

total number of bats recorded in different months varied. It was 1057 in June, 514 in July, 417 in August, 260 in September and 247 in October (Table 2).

### 4. Mardan District

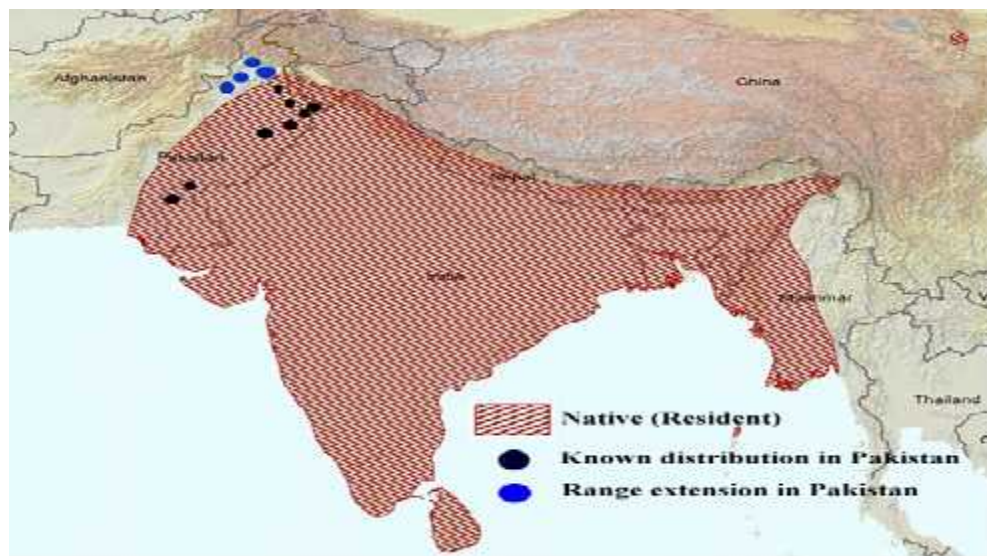
**ChailKondov Baba.** All the 32 trees belonged to a single species i.e. the blue gum *Eucalyptus globulus* at

ChailKondov Baba village (Table 2). The total area of this roost was 9585 m<sup>2</sup>. No bat was however recorded in this village roost during November and December (Table

2). The total number of bats recorded 721 in June, 414 in July, 369 in August, 196 in September and 135 in October.

**Table 2.** *Pteropus giganteus* counted on different tree species in five roosting sites of Khyber Pakhtunkhwa from June 2008 through December 2008 (<sup>1</sup>Fishing Hut, <sup>2</sup>Pul Chowkai, <sup>3</sup>Dargai Bridge, <sup>4</sup>ChailKandoa Baba <sup>5</sup>Shakur).

Roost species	No. roosts tree	Jun	Jul	Aug	Sep	Oct	Nov	Dec	% RA
(1) Dir district									
<sup>1</sup> <i>Morus alba</i>	4	264	89	234	154	22	-	-	10.8
<sup>1</sup> <i>Morus nigra</i>	4	224	140	73	27	74	-	-	7.6
<sup>1</sup> <i>Melia azedarch</i>	1	2	3	6	1	3	-	-	0.2
<sup>1</sup> <i>Olea ferruginea</i>	1	7	16	11	22	10	-	-	0.9
<sup>1</sup> <i>Platinus orientalis</i>	10	1118	864	902	471	83	-	-	48.4
<sup>1</sup> <i>Populus nigra</i>	24	743	573	494	271	182	-	-	32.1
<sup>2</sup> <i>Populus nigra</i>	21	504	529	382	178	195	-	-	100
<b>Total bats</b>		2358	1685	1720	946	374	-	-	
(2) Malakand district									
<sup>3</sup> <i>Acacia Arabica</i>	2	40	37	55	3	100	220	35	8.3
<sup>3</sup> <i>Brousonetia papyrifera</i>	25	147	90	63	89	11	82	110	10.5
<sup>3</sup> <i>Dalbergia sisso</i>	24	626	603	714	250	617	939	713	76.0
<sup>3</sup> <i>Ficus palmate</i>	1	1	3	0	10	93	50	26	3.1
<sup>3</sup> <i>Melia azedarch</i>	3	24	10	14	3	8	32	28	2.1
<b>Total bats</b>		838	743	846	355	829	1323	912	
(3) Charsadda district									
<sup>5</sup> <i>Dalbergia sisso</i>	1	10	16	28	17	4	-	-	3.0
<sup>5</sup> <i>Euclayptus globulus</i>	36	977	418	363	183	263	-	-	88.8
<sup>5</sup> <i>Morus alba</i>	1	42	58	0	40	7	-	-	5.9
<sup>5</sup> <i>Populus nigra</i>	1	28	22	26	20	-	-	-	3.8
<b>Total bats</b>		1057	514	417	260	274			
(4) Mardan district									
<sup>4</sup> <i>Euclayptus globulus</i>	32	721	414	369	196	135	-	-	100
<b>Total Number of Bats</b>	191	5478	3885	3734	1935	1807	1323	912	
<b>Bats/m<sup>2</sup></b>		0.025	0.018	0.017	0.009	0.008	0.006	0.004	
<b>Bats/roost tree</b>		28.7	20.3	19.5	10.1	9.5	6.9	4.8	



**Fig. 1.** Distribution map of the Indian flying fox (*Pteropus giganteus*) showing extension in its range towards the Palearctic region. Courtesy: <http://www.iucnredlist.org/redlist/18725/0/rangemap>.

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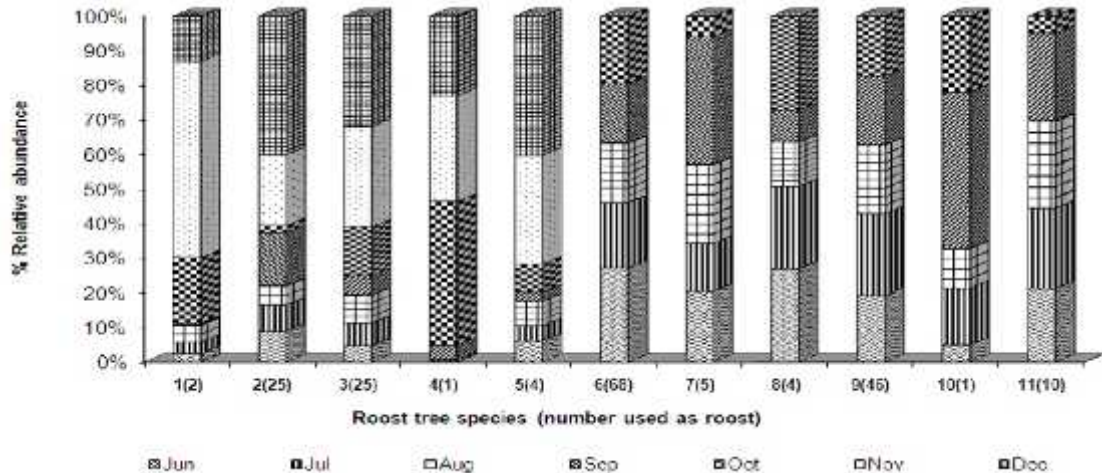


Figure 2. Combined monthly variations in relative abundance (%) of the Indian flying foxes roosting on *Accacia arabica*<sup>1</sup>, *Brousentia papyrifera*<sup>2</sup>, *Dalbergia sisso*<sup>3</sup>, *Eucalyptus globulus*<sup>4</sup>, *Ficus palmate*<sup>5</sup>, *Melia Azedarch*<sup>6</sup>, *Morus alba*<sup>7</sup>, *M. nigra*<sup>8</sup>, *Olea ferruginea*<sup>9</sup>, *Platanus orientalis*<sup>10</sup> and *Populus nigra*<sup>11</sup> in four districts of Khyber Pakhtunkhwa.

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