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The Family Hipposideridae consists of roundleaf bats distributed in the old world tropics ranging from Africa through Asia to Australia (Simmons 2005). About 15 species of hipposiderids belonging to 4 genera are distributed in South Asia (Srinivasulu et al. 2010).

While conducting surveys to document hipposiderid bats in and around Hyderabad, Andhra Pradesh, we discovered a colony of large sized roundleaf bats in the cellar of an ancient temple near Maheshwaram (17°16’ N, 78°42’ E) on 23 March 2010. A voucher specimen (Fig. 1) was collected, identified as Hipposideros lankadiva using the South Asian Bat Key (Srinivasulu et al. 2010) and preserved and deposited (OUNHM.CHI.6.2010) in the Natural History Museum of Osmania University, Hyderabad.

Hipposideros lankadiva Kelaart, 1850 is endemic to South Asia and is distributed in Bangladesh, India and Sri Lanka (Simmons 2005). In India it is distributed in Andhra Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Rajasthan and West Bengal (Bates & Harrison 1997; Srinivasulu & Srinivasulu 2001; Molur et al. 2002). Chakraborty et al. (2004) reported its presence in Andhra Pradesh from Chennur in Adilabad district; Palakonda and Chintaranjanpally in Cudappah district; Jagtial in Karimnagar district; Diguvametta in Kurnool district; Borra caves and Lankapakalu in Visakhapatnam district of Andhra Pradesh. This species has also been collected from AkkamahadeviBilam Cave in Nagarjunasagar Srisailam Tiger Reserve in Mahabubnagar District from Andhra Pradesh (OUNHM.CHI.7.2003, specimen in Natural History Museum of Osmania University, Hyderabad). Through this paper, we report the presence of this species, for the first time from Hyderabad, Andhra Pradesh.

Acknowledgements
We thank the Head, Department of Zoology, Osmania University for providing necessary facilities. We are thankful to Shri Hitesh Malhotra (Principal Chief Conservator of Forest (Wildlife) and Chief Wildlife Warden, Andhra Pradesh), Dr. R. Hampaiah (Chairman, Andhra Pradesh Biodiversity Board) and Dr. S.N. Jadhav (Member Secretary, Andhra Pradesh Biodiversity Board) for their constant support and encouragement. We acknowledge the DBT, Govt. of India for financial grant and the C. Srinivasulu and P. Venkateshwarlu acknowledges the DBT-ISLARE, Osmania University, for financial assistance.

References
Taphozous nudiventris (Naked-rumped Tomb Bat) belongs to the family Emballonuridae that includes 51 species of sheath-tailed bats ranging from the Americas to Australia and Oceania including the major parts of Europe, Africa and Asia (Simmons 2005; Srinivasulu et al. 2010).

In South Asia, six emballonurid species, namely, Taphozous longimanus Hardwicke, 1825; T. melanopogon Temminck, 1841; T. perforatus E. Geoffroy, 1818; T. theobaldi Dobson, 1872; T. nudiventris Cretzschmar, 1830 and Saccolaimus saccolaimus Temminck, 1838 occur.

Taphozous nudiventris (Naked-rumped Tomb Bat) is a widely distributed species ranging from Mauritiana to Egypt in Africa to Arabia to Myanmar in Asia. In South Asia, it is distributed in Afghanistan, Bangladesh, India and Pakistan (Bates & Harrison 1997; Molur et al. 2002). It probably occurs in Bhutan and Nepal (Simmons 2005). In India, it is known from Bihar, Delhi, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Sikkim, Tamil Nadu, Uttar Pradesh and West Bengal (Bates & Harrison 1997; Molur et al. 2002).

Although Bates & Harrison (1997) did not report the presence of this species from Andhra Pradesh, Chakraborty et al. (2004) reported its presence based on a specimen collected from Siddavatam, Cuddapah district. Through this paper, we report the presence of this species, for the first time from Hyderabad, Andhra Pradesh and this constitutes second report of this species from Andhra Pradesh.

During faunistic surveys in different parts of Hyderabad, the ramparts of Golconda Fort were surveyed for bat presence and a colony of microchiropterans were located in the princesses quarters area of the fort. Mist nets were erected and individuals of bats were captured as they were flying out of their roosting sites at 1845 hr on 14 April 2010. Vouchers (two individuals both male) of the species were retained in cloth bags and brought back to the laboratory for identification and analysis.

The vouchers were euthanised, preserved in alcohol and deposited in Natural History Museum of Osmania University (OUNHM.CH.1.7.2010 and OUNHM.CH.1.8.2010). The voucher specimens were identified as Taphozous nudiventris (Fig. 1) using following Srinivasulu et al. (2010). Necessary morphometric and cranio-dental measurements were taken of the preserved specimen.

Morphometric measurements (in mm) of both male specimens are - Forearm (FA): 71.90 and 73.71; Head-Body length (HB): 97.31 and 101.97; Tail length (Tl): 27.15 and 27.79; Ear (E): 17.06 and 18.54; Hindfoot (Hf): 12.66 and 14.55. Cranio-dental measurements are - Greatest Length (GTL): 27.05 and

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Fig. 1. Taphozous nudiventris at Golconda Fort, Hyderabad.
Abstract

Pipistrellus identification is hectic because of quandary in complex at species levels. Pipistrellus sp. from Kusaha, Koshi Tappu Wildlife Reserve, Sunsari district as well as Eastern Nepal could not be identified in the field. The objective of this study was to identify the species through skull and baculum morphology and Polymerase Chain Reaction (PCR) approach comparative studies. This study was carried out from September 2008 to September 2010. The skull and baculum morphology revealed a new record of Scotozous dormeri Dobson, 1875 while Pipistrellus coromandra (Gray, 1838) and P. tenuis (Temminck, 1840) are new to Nepal. The initiation of PCR could not be successful. However, further detailed research deploying acoustic surveys and genetic approaches could discover new species to Nepal as well as to science from the study area.

Key Words: Pipistrellus, Koshi Tappu Wildlife Reserve, Skull and baculum morphology, PCR, Scotozous dormeri.
As part of the on-going Biodiversity Assessment Surveys in various places of Andhra Pradesh, we have been conducting regular surveys to document floral and faunal elements of the state since January 2008. During such surveys, we have sighted and photographed two specimens of the Indian Giant Squirrels *Ratufa indica* (Erxleben, 1777) (Fig. 1) from areas hitherto unreported in its distribution range (Molur et al. 2005).

The genus *Ratufa* Gray, 1867 was treated by Corbet & Hill (1992) under the subfamily Ratufinae Moore, 1959 in Family Sciuridae Gray, 1821. This genus is represented by three species *Ratufa bicolor* (Black or Malayan Giant Squirrel), *R. macroura* (Grizzled Giant Squirrel) and *R. indica* (Indian or Malabar Giant Squirrel) in India (Ellerman 1961; Srinivasulu et al. 2004). Among these, *Ratufa indica* is endemic to India and the others are restricted to South Asia (Srinivasulu et al. 2004). Clear felling, selective logging, construction of dam, hunting for local consumption, expansion of agro-industry making this a Vulnerable species as per IUCN (Molur et al. 2005). Indian Giant Squirrel *Ratufa indica* (Erxleben, 1777) is arboreal, diurnal and herbivorous. Its distribution range includes forested tracts in Andhra Pradesh, Chhattisgarh, Goa, Gujarat, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa and Tamil Nadu (Srinivasulu et al. 2004; Molur et al. 2005). In Andhra Pradesh, this species is reported from Sirpur in Adilabad district; Balapalli, Koduru, Palakonda, Seshachalam Hills in Cuddapah district; Bairluty, Additional site records of Indian Giant Squirrel
*Ratufa indica* (Erxleben, 1777) (Mammalia: Rodentia) in Godavari River Basin, Andhra Pradesh, India
M. Seetharamaraju*, C. Srinivasulu and Bhargavi Srinivasulu

Fig. 1. Indian Giant Squirrel *Ratufa indica* (Erxleben, 1777) near Tekulaboru village, Khammam District, Andhra Pradesh.
Pecheruvu, Peda Chama, Rollapenta, Thummalabailu, Veligode in Kurnool district; Appapur, Farahabad, Kolhapur in Mahabubnagar district; Diguvarmetta, Gundla Brahameshwaram, Isukagudem, Maddipenta in Prakasam district; Ananthagiri Hills in Vishakhapatnam district; and Etur, Pasra, Sarvai, Tadwai, Tupakulagudem, Venkatapuram in Warangal district (Molur et al. 2005). Through this report we add two more localities for the distribution of Ratufa indica in Andhra Pradesh.

During our surveys in Godavari River basin of Khammam district, we sighted a specimen of Ratufa indica (Fig. 1) sitting on a tall tree (17°39’ N, 81°13’E) on the northern bank of river Godavari, at the confluence of Shabari and Godavari rivers between Tekulaboru and Chinthuru villages. We also sighted this species from a few localities in the Kinnerasani Wildlife Sanctuary (17°41’ N, 80°42’E) located about 60km away from the former locality.

In the Godavari River basin this species is also present in Mahadevpur Reserve Forest in Karimnagar district, an area contiguous with Tupakulagudem and Sarvai in Etturnagaram Wildlife Sanctuary in Warangal district. These sighting reports add three more sites to the existing distribution range of the Indian Giant Squirrel Ratufa indica (Erxleben, 1777) in the Godavari River basin of Andhra Pradesh.

Acknowledgements
The authors are very much thankful to Shri Hitesh Malhotra, IFS, Principal Chief Conservator of Forest (Wildlife) and Chief Wildlife Warden, Dr. R. Hampaiah, Chairman, Andhra Pradesh Biodiversity Board and Dr. S.N. Jadhav, Member Secretary, Andhra Pradesh Biodiversity Board for constant support, encouragement and permitting us to conduct biodiversity studies. We also thank the Head, Department of Zoology, Osmania University for encouragement and providing necessary facilities. We also thank Mr. P. Venkateshwarlu, Harpreet Kaur, Asha Jyothi of Department of Zoology, Osmania University and Mr. R. Sreekar, Biodiversity Research and Conservation Society, Secunderabad for constructive suggestions and helping with references.

References
There are eight extant species of pangolins; among them population of four Asian pangolin species (Botha & Gaudin 2007; Lim & Ng 2008) including Indian Pangolin *Manis crassicaudata* is believed to have declined significantly in many areas due to hunting and trade (Broad et al. 1988). *M. crassicaudata* is widely distributed through the plains and lower slopes of hills south of the Himalaya to the southern extremity of India (Tikader 1983; Prater 2005). However, little is known about the status and activity pattern of the Indian Pangolin throughout its range (Burton & Pearson 1987). Pangolins are nocturnal and are adapted to have a highly specialized diet of ants and termites (Lekagul & McNeely 1988; Heath 1995; Prater 2005; Lim & Ng 2008; Pattnaik 2008). All species of Asian pangolins are rarely observed due to their secretive, solitary, and nocturnal habits, and there is not enough research on population densities or global population (WCMC et al. 1999; CITES 2000).

**Threats & Conservation Status**

Pangolins are regularly collected in hill forest areas for the scales and as a source of meat (Bangladesh CITES MA in litt. 1986). Hakims (practitioners of traditional medicine) consider various body parts of the pangolins to be a valuable source of medicines (Roberts 1977). Pangolin scales are highly valued for their alleged medicinal value, particularly for treating a wide variety of skin diseases (Harrison & Loh 1965). Considering the vulnerability, the species has been included in the Schedule I

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of the Indian Wildlife (Protection) Act, 1972, and thereby protected throughout the country (ENVIS 2002; Gaski & Hemley 1991; WCMC et al. 1999). Pangolins (Manis spp.) have been listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) which bans all international trade. The ban was implemented in 2000 (CITES CoP 11 2000; UNEP/ WCMC 2008). This species is also listed as Near Threatened (NT) in the IUCN Red List of Threatened Species (IUCN 2008)

A Pristine Habitat for Pangolins

Kambalakonda Habitat for Wildlife Sanctuary (17°47’– 17°50’N 83°04’–83°20’E) is ca. 20 km (by road) northeast of Visakhapatnam city, Andhra Pradesh (17°50’N 83°04’–83°20’E) is ca. 20 km (by road) northeast of Visakhapatnam city, Andhra Pradesh. It is a cluster of west–east running Eastern Ghats hills covering an area of 75km² along with an unprotected wilderness buffer zone of 80km² on its western side. Its topography is a steep and undulating terrain of rolling hills, thickly vegetated gorges and valleys with an average altitude of 200–300 m (Shekhar et al. 2008). The pristine vast expanses of hill forest, undulating terrain and thick canopy that offers excellent habitat for shy and elusive species like the Indian Pangolin which is shrouded by mystery and legend in the local folklore. The hills and boulders provide excellent cover for burrowing species. Termites and ants, which predominantly constitute the diet of the scaly anteater, are found in relative abundance in these forests owing to the rich supply of decomposing biomass. The burrows and scats of this elusive animal can be observed in the well protected valleys deep inside the sanctuary (Shekhar 2004). Large termite mounds dug open by the sharp claws of the anteater can also be seen in the reserve.

Road Ecology – Automobile Toll

Many wild animals including small mammals like the pangolin risk daily encounters with fast-moving vehicles plying on the National Highway 5 which runs along the Kambalakonda Wildlife Sanctuary traversing a discontinuous chain of hills (Figure 2). This highway crossing is turning out to be a death knell for the resident population of pangolins for as many as 3 road kill cases were documented in a span of 3 months during the peak monsoon season from July to September 2010 (Figure 1). The three road kills were recorded on 21.07.2010, 18.08.2010 and 07.09.2010 respectively within a stretch of 10 kilometers. Such incidents, no matter how unobtrusive they may appear, can have a profound effect on the population of a species which has already been grappling with various human induced threats for their survival. Although pangolins have arboreal adaptation, they are strictly nocturnal in nature, foraging actively at night in search of their specialized food of termites and ants. For this reason, they need to scour the ground for termite mounds to feed on which makes them particularly vulnerable to running over by vehicles. Fatal encounters of wildlife with automobiles are bound to happen when man-made roads and highways crisscross the age old animal paths, migratory routes and feeding trails. Invariably, pangolins are among the worst hit in road kills.

Conclusion and Recommendations

Roads are well known to cause various ecological changes, leading to a wide range of impacts including many, often unnoticed, detrimental effects on wildlife (Spellerberg 1998). Road kill peaks in areas like this highway crossing at Kambalakonda Wildlife Sanctuary where natural habitats are intersected by roads turning them into ecological death traps for native wildlife. Many small mammals and reptiles fall prey regularly to the unruly traffic. Moreover, lack of consideration of ecological aspects while constructing roads is one of the glaring failings of the authorities. No studies on the road ecology have been carried out as yet in the area. In fact, studies on road ecology in India are also scanty.

Temporary solutions to control road killings include proper deployment of speed breakers at strategic locations, creation of underpasses and overpasses which are designed accordingly to address the ecological and behavioral needs of the species. Besides, placing signboards, spreading awareness among public, especially in suburbia and measures to curb over speeding vehicles also helps in mitigating the mortality rate to certain extent. Nevertheless, a more comprehensive scientific approach with a deeper understanding of the species and road ecology of the area can ameliorate the chances of securing the long term survival of these secretive nocturnal mammals in the sanctuary.

References


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**Call for papers and posters**

**Second Seminar on Small Mammal Conservation Issues, Nepal**

Small Mammal Conservation and Research Foundation (SMCRF) announce the second seminar on small mammal conservation issues and call for submission of paper for the seminar to be held on 15 May, 2011. The theme for this year is "Conserve Small Mammal for Sustainable Forest". We request all interested researchers, free lancers, students and biologists to send your research papers for oral and poster presentations on Small Mammal conservation issues for the seminar. Deadline for submission of the abstract for oral and poster presentation is 29 January 2011 and the deadline for submission of full paper is 28 February 2011. Abstract must not be more than 250 words.

For more details contact:

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URL: [http://www.smcrf.org](http://www.smcrf.org)

Note: We encourage all the participants to send their papers via electronic mail.
Rodents in paddy fields: pros and cons of some indigenous ways to control them
M. Mathivanan & T. Ganesh

Rodents, mainly rats, are a major pest for a variety of crops in India which results in substantial revenue loss to farmers and the government. People since ancient times have evolved several indigenous methods to tackle this issue. Here we document some such ways to control rats in paddy fields in Singampatti, Ermalpuram, Moolachi and Pottal villages that are situated close to the Kalakkad-Mundanthurai Tiger Reserve (KMTR) in the Tirunelveli district of Tamil Nadu. Agriculture is the major sources of income for the farmers from these villages and paddy is the major crop grown by most farmers due to availability of water while a few others cultivate banana, chilly, groundnut and sugarcane. Rat is the main pest for paddy and according to farmers it destroys almost one-third of the yield. Some of the methods used to control rats by the people are discussed below.

**Owl perch**
This is a traditional method of rat control, need 3-4 feet stump on which a ball made of dried paddy straw and covered with bright white cloth tied to the end of the stump (Fig. 2). These perches are erected in places where heavy crop damage by rats are noticed in the field, bait is kept near the perch and the ground around the perch is cleared so that the owl easily sees the rat that comes to the bait and catches them. According to elders of these villages ‘horned owl’ (koogai) uses these perches to hunt the rats, this method was supposed to be successful in early days.

**Mud pot trap**
This method was also practiced earlier. Cow dung slurry was filled in small mud pots and two small and thin sticks were kept horizontally on mouth of the pot which is covered with small leaf with bait on top of it. When rat try to eat bait it falls in the pot. This method was difficult to practice and no longer used today.

**Rat trap**
The most commonly used method these days is trapping rats with bamboo trap which is
also very successful. Most of the farmers follow this method as they can see rats killed and is welcomed by them (Fig. 1). The drawback of this method is that it is very expensive compared with other ways of rat control. Professional rat catchers are the ones who are skilled to make these indigenous traps and deploy them in the field and charge Rs.15/- per rat. One professional rat catcher from Moolachi village told us this is his main income source and earns minimum of Rs. 10000/- per season. Though the farmers are happy with this method it sometime kills non target species such as frog, snake, birds etc (Fig. 3).

Rodenticide
Since trapping rats is expensive some of the small farmers are not able to afford this cost, they have started using rodenticide, which is cheap and available in the local pesticide shops. Farmers report good results from the use of rodenticides, it is very popular. But this kills non target species and has other deleterious effects.

Conclusion
The local farmers are apprehensive of using the indigenous methods of rat control because they feel it is not effective anymore. Moreover, people feel that with the owl perch method they haven’t seen any owl hunting rats in their field and according to them the owl population has decreased. They also question the utility of such owl perches in controlling large populations of rats. These villages situated in the foothills of the Tiger Reserve, farmers should try to follow ecofriendly ways of rat control rather than resort to rodenticide that could have long term impact on people and the environment.

Acknowledgement: This study was funded by the National Geographic Conservation Trust grant.
Notes on Hispid Hare *Caprolagus hispidus* in Suklaphanta Wildlife Reserve, Nepal

Achyut Aryal

The Hispid Hare *Caprolagus hispidus* is one of the threatened lagomorph species distributed in tall grasslands of Nepal and India. We conducted a survey on hispid hare and setup camera traps in the grasslands of Suklaphanta Wildlife Reserve (SWR; latitude 28°49’ - 28°57’ N, longitude 80°07’- 80°15’ E) Nepal. The reserve covers an area of 305km² in Kanchanpur district, southwestern Nepal.

Twenty camera traps were set up in *Saccharum spontaneum* and *Imperata cylindrical* dominated grassland (38km²) for 10 days. The main aim of setting up the camera trap method was to collect photo evidence of presence of Hispid Hare in SWR. We succeeded to capture Hispid Hare photographs (Fig. 1) on two cameras on 14-15 April 2010.

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Species richness, distribution, and threats of bats in Palpa and Kaski districts of western Nepal

Hari Adhikari

Abstract
Eight species of bats were identified from Palpa and Kaski districts for the first time, during the field work conducted from January to October 2009. Altogether 116 individuals were captured and released and 11 wet specimens were prepared and preserved. This research provides information on species richness, their distribution and threats on bats that exist in their natural habitat. External and craniodental measurements of the specimen and range of measurements of captured individuals is given in Tables.

Introduction
In context of excessive survey of bats from the Indian subcontinent, present knowledge on bats of Nepal is incomplete. Based on published literatures and research done on different parts of Nepal, 58 species of bats belonging to 25 genera are reported to exist and other 23 species of 18 genera of bats have possibility of presence from this country (Article under review). Nepal has high diversity in geographical and topographical features, which led to high presence of bat species.

History of Chiroptera research dates back to 1823 A.D. when Brian H. Hodgson collected mammals till 1843 which laid the foundation of Himalayan mammalogy (Hinton and Fry, 1923). Hodgson reported 11 genera and 17 species (Gray, 1863) and Scully (1888) recorded 9 genera and 19 species (Referenced by Mitchell, 1980). Collection of mammals was done in 1920 to 1921; altogether 23 species of bats were identified (Hinton and Fry, 1923). N. A. Baptista working in the districts lying to the west of Kathmandu between 1922 to 1923 collected three new bat species (Fry, 1925). In 1948-1949, S. Dillon Ripley led a field party to Nepal to collect natural history specimens for Yale University and the Smithsonian Institution (Johnson et al., 1980). The long-eared bat, *Plecotus homochrous* was collected from the area of Nepal (Myers, 1999).

On the second half of last decades of 20th Century, some Russian and Hungarian expeditions came to Nepal for the purpose of collecting voucher specimens of bats for museum collections and making field observations, three new species *Ia io, Murina cyclotis* and *Kerivoula hardwickii* were recorded for the first time while *Myotis csorbai* proved to be new species to science. 23 species were confirmed for their existence in Nepal and checklist of 51 bat species known to date from the territory of Nepal was provided (Csorba et al. 1999). *Myotis csorbai* was collected 4 km E of Syangja, 1300 msl., Syangja District, about 30 km S of Pokhara town, Nepal by Dr. G. Csorba on 23 July 1995 and deposited in the Department of Zoology, Hungarian Natural History Museum, Budapest (Topal, 1997).

Myers collected specimens from around the Royal Chitwan National Park, Chitwan District, and a small collection in Kathmandu was done during March 1990, *E. spelaea* and *E. dimissus* were reported from the first time from Nepal, and the presence of *Miniopterus pusillus* and *Kerivoula picta* was verified. Based on the distributions in neighboring areas, however, we suspect that at least 40 additional species might be expected to occur in Nepal (Myers, 1999).

Books on mammals of Nepal including bats species (Shrestha, 1997) is full of taxonomic inconsistency. Compilation on bats of Nepal based on museum specimens and literature reviews is provided by Bates and Harrison (1997). Based on the literature review, the most recent compilation of mammals of Nepal is supplied by Baral and Shah (2008) with 53 species of bats.

Materials and Methods

Study area
Palpa District lies in the hilly region in Lumbini Zone of Nepal, between 27°34’ to 27°57’ N and 83°15’ to 84°22’ E, with altitude 200 - 2000 meters above m s l. The area is covered with 18% Chure Hills and 82% Mahabharat Range with annual temperature ranges from 8°C to 28°C and average rainfall 1903.2 mm (DP, 2005). This area is very sensitive in case of biodiversity and large key stone mammals like Tiger, Bear, Elephant uses the Churia forest for movement and as a green corridor.

Kaski District lies in Gandaki Zone, between 28°06’ to 28°36’ N and 83°40’ - 84°12’ E, with altitude from 450 m to 8091m, (Annapurna-I). The temperature ranges of Pokhara is from 13°C in January and a maximum of 25.5°C in July and the annual rainfall averages 3,353 mm (June 2007- May 2008) with seventy seven percent of precipitation occurring during the summer months from June to September (Adhikari, 2008). The

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geology of Pokhara is very fragile, surrounded by mountains, with many caves present and distributed throughout this district. This provides favorable places for bat species and some caves are of tourist importance.

Bats were observed and collected from the following localities:

Tansen Municipality, N 27°52'03.9", E 083°32'52.3", elevation 1221m, Narathan, roosting site of Pteropus giganteus was found in the Ficus religiosa, in the middle of the town, within the boundary of the Narathan Temple. No specimen of Pteropus was prepared, because of its protection in CITES Appendix II. This is the largest species of bats in Nepal and can be easily identified by eyesight.

Argali V.D.C., N 27°55'03.0", E 083°28'16.3", elevation 553m, cave named "Chamere Dhulo Kharbare or Arbhu Gufa" situated on the private grassland land of a person. The cave lies on the right hand side of the Tamghas Highway, (at the border of Argali V.D.C), 2 km away along the earthen road which starts from the border, right to the small stream that follows the road. The cave is 50 meter long with wide opening and goes upward around 10 meters from the opening of the cave. Two species were found in huge numbers inside the cave. Specimens of Miniopterus schreibersii (NaReCon 20.03.2009.01) and Hipposideros armiger (NaReCon 21.03.2009.02; NaReCon 21.03.2009.03) were prepared.

Madan Pokhara Valley, Damkada, N 27°49'31.5", E 083°34'17.5", elevation 704 m, Pteropus giganteus were found roosting on the Ficus religiosa, 33 m in height. They have been living in that village for more than 70-80 years based on the information from the local people. During the observation for one year, there was drastic decrease in the number of individuals. They were found sharing their habitat with Little Egrets and crows. But later the egret left the tree. Earlier this species were all living in one colony in the same tree, but later they get dispersed and started living in different tree near by earlier roost. People of this area were aware of positive impacts of bat role in ecosystem, but most of Pteropus died due to the electricity lines which go near by the roosting sites. This roost was usually disturbed by the hives of bees which was sharing the lower portion of crown of the same tree. They fly around the tree by producing loud sound and get back to the tree after all the bees return to their hives. They used to leave the roost 30 – 40 minutes after the sunset and return back before 4 A.M. in the morning. The tree is surrounded by the agricultural lands and house. Specimens of Hipposideros armiger was also present in huge numbers inside the cave.

Ramdi Area, Shree Siddha Cave, N 27°54'17.9", E 083°37'54.2", elevation 460 m. This cave is present inside the temple, and people are only allowed to enter into this cave by permission. Hipposideros armiger, around 500 in numbers were present inside this cave. Status of bats in this cave is not threatened. The cave is situated on the border of Palpa District and Syangja District, along the Kali Gandaki River. There is a huge hill forest (Castaonopsis indica and Schima wallichii) and small plots of agriculture land near by the caves.

Butwal, N 27°41'20.2", E 083°27'50.0", 184m, Milan chowk, Amarmarg, 3 Cynopterus sphinx were found roosting on the banana cervices, in a small garden with Guava and Mango plants. One specimen was prepared NaReCon 06.04.2009.07. They used to leave the banana plant soon after the sunset and return back in the morning 3 to 4 A.M.

Shree Siddha Gufa, Awal, N 27°53'41.0", E 083°32'11.0", elevation 930 m, Located on the border of Bougha Ghumba V.D.C and Bougha Pokharathok V.D.C., inside the holy cave, on the bank of a Stream at a height of around 50 meters from the stream, on the way to famous place Ranighat. Specimen of Rhinolophus pearsonii (NaReCon 29.03.2009.04) was prepared. This species was found alone in the cave. This cave is protected by the management committee as a religious place. Inside this cave various images of gods were present and people used to enter from the small opening to the cave. Due to high flow of people, the species existence is endangered.

Sahalkot V.D.C., N 27°48'57.5", E 083°58'10.7", elevation 1101m, Ghising Odar (Cave), Sukukot 9, on the private agriculture land. The cave is surrounded by the forest of Castanopsis indica, and Schima wallichii. Specimens of Rhinolophus affinis (NaReCon 31.03.2009.05) were prepared from this cave. Hipposideros armiger was also present in huge numbers inside the cave.

Siliwa V.D.C, Siliwa Bat Cave, N 27°47'08.3", E 083°48'33.6", elevation 781, probable site for Rhinolophus sinicus, based on the interview of the local people, and the photo identified by them. Bat present in this caves are greatly threatened by the local people as they kill the bat using gun for the source of meat. And only 5 to 10 individuals were flying on the top of the cave (>25 m). They were fully confident on Rhinolophus sinicus, when photos of other Rhinolophus species found in Nepal were also shown to them. But the species could not be captured from this cave.

Madanpokhara Valley, 27°49'31.5", 83°33'24.04", elevation 704m. This cave is protected by the management committee as a religious place. Inside this cave various images of god were present and people used to enter from the small opening to the cave. Due to high flow of people, the species existence is endangered. Specimens of Rhinolophus pearsonii, when photos of other Rhinolophus species found in Nepal were also shown to them. But the species could not be captured from this cave.
plants were present in huge numbers, 200 meter below the house and in between agriculture plots for season food production was present.

Electricity Tunnel, Dhovan V.D.C. elevation 200 m, 27°44'3.76" N, E 083°27'56.73" The electricity tunnel is on the bank of Tinau river, 150 meter from the small dam, or site from where fossil of Ramapethucus was found. This tunnel is a water supply channel to the electricity power plant, 20 meter from the bank of Tinau River. The tunnel is situated 350 m NW from Sidda baba Temple of Palpa District and around 1 km from border of Palpa and Rupendehi District. Specimens of Miniopterus schreibersii (NaReCon 13.10.2009.08, NaReCon 13.10.2009.09, NaReCon 13.10.2009.10) were prepared from the dead bats that were found from the tunnel.

Kaski District, Pokhara, Batule Chour, 28°15'59.3" N, 83°58'12.3" E at 981 meters (3188 feet) in Bat Cave. This cave is a famous tourist destination for local and international tourist and named as Bat Cave due to huge presence of Hipposideros armiger in the cave. The cave lies on the base of the hill. The cave is made of calcium carbonate and lime, with perennial flow of water inside the forest. During the rainy seasons, most of the bats leave the cave and come back in winter season for hibernation.

Kaski District, Pokhara, Batule Chour, 28°16'03.3" N, 83°58'25.6" E at 962 meters (3126 feet) in Mahendra Cave. This is also a famous tourist destination in Pokhara near the human settlement and base of the hill forest. The cave is around 200 meter long with large opening and easily accessible for moving. Bat population has been decreased due to electric lights kept on the caves. Few individuals were observed deep inside the cave, less accessible to people to enter inside. Hipposideros armiger, Rhinolophus affinis and Rhinolophus ferrumequinum (Specimen preserved in Institute of Forestry) had been recorded for the first time from this cave.

Kaski District, Pokhara, Chindada, at 28°12'17.3" N, 84°01'25.3" E at elevation of 793 meters (2577 feet), few bamboo plants and Bombax ceiba are present at the roosting sites in the middle of the small village. Earlier the roosting trees of bats had been cut down because they made sound in the morning and disturb the local people. So, they were compelled to roost on Bamboo plants.

Data Collection
Five episodes (30 minutes each) of F.M program was developed and lunched through Srinagar F.M to cover millions of people in and around study area in order to create awareness on bat conservation and gather information on roosting sites from listener in their locality. Field visit to these sites was done for three times during this research project to check the species richness and status of the bat population. Besides that map reading, Literature on District profile, interview with village representative and Wildlife conservation organization was done as a source of Secondary data.

GPS location of the roosting sites of bat was collected with the help of GPS (Garmin Vista) to the accuracy of 5 meters and these locations were plotted on digitized map. Analogue map of Palpa District (Modified UTM projection) was digitized with the help of heads up digitization in Arc GIS 9.3(Map on the last page).

Specimen of each species were collected after taking permission from Department of National Park and Wildlife Conservation and Department of Forest (Government of Nepal) and revenue was paid to the District Forest Office, Palpa. Specimens were preserved for 3 days in 10% Buffered Formalin and later transferred to 70 % Alcohol (Ethanol) (Simmons et al., 2008). Ten specimens are deposited in Natural Resources Research and Conservation Center (NaReCon) and one in Institute of Forestry, Pokhara Campus, Zoology Lab.

Most of the collections and identification were done by entering inside the cave and with the help of hand net. Mist nets (9 and 12 meters) were set from 6 P.M. to 9 P.M. for 30 days in the primary forest, across small streams, edge of the forest and agriculture lands, opening of the caves and the tunnel, forest pathway.

(NaReCon 13.10.2009.08) refers to the Specimen Number. Here 'NaReCon' means Natural Resources Research and Conservation Center; 13 means Year of Capture, 10 means Months of capture, 2009 means Year of Capture and 08 means Specimen Number.

Data from each bat were collected to the nearest to millimeter with the help of Vernier Caliper and Skull were extracted from the specimens and detailed measurements were done. These measurements were compared with data given on “Bats of the Indian Subcontinent” (Bates and Harrison, 1997) to identify the species.

Specimen and measurements
The following measurements were taken from all the specimen and this definition are on the basis of Bates and Harrison (1997). HB: head and body length – from the tip of the snout to the base of the tail, dorsally; T: tail length – from the tip of the tail to its base adjacent to the body; HB: foot – from the extremity of the heel behind the os calcis to the extremity of the longest digit, not

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including the hairs or claws, TIB: length of tibia; FA: fore arm – from the extremity of the elbow to the extremity of the carpus with the wings folded; E: ear – from the lower border of the external auditory meatus to the tip of the pinna, not including any tuft of hair; 3mt (MET): third metacarpal – from the extremity of the carpus to the distal extremity of the metacarpal; 4 mt (MET): as above but for the forth and fifth metacarpals respectively; 1ph3mt: first phalanx of the third metacarpal – taken from the proximal to the distal extremity of the phalanx; 2ph3mt: second phalanx of the third metacarpal – taken from the proximal to the distal extremity of the phalanx; 1ph4mt / 2ph4mt: as above but for the fourth metacarpal; GTL: greatest length of skull: the greatest antero – posterior diameter of the skull, taken from the most projecting point at each extremity, regardless of what structure forms these points; CCL: - condylo-canine length – from the exoccipital condyle to the anterior alveolus of the canine; ZB: - Zygomatic breadth – from the exoccipital condyle to the anterior alveolus of the canine; N = Number of individual measured.

Results
Following species of bats were recorded from different sites of Palpa, Kaski and Rupendehi District in Western part of Nepal for the first time.

**Hipposideros armiger** Hodgson, 1835
Great Himalayan Leaf - nosed bat

**Rhinolophus armiger** Hodgson, 1835: 699; Nepal

Kathmandu Valley; Syangja; near Pokhara; Bimalnagar (HNHM); Pattibhagan; Bouzini (Hinton and Fry, 1923); Bacheek; Hathiban; Dano Kharka (Fry, 1925); Godhavari (HZM); near Baglung; Gari; Num (FMNH). It was collected at 1030 meters (3348 feet) near Pokhara (Kock, 1996); 1200 meters (3900 feet) at Gari and at 2031 meters (6600 feet) in Suk Talay Forest, near Num (FMNH) (Bates and Harrison, 1997); 1410 meters at Balaju Forest Reserve, 1400 meter at Chobar in Kathmandu; 750 meters at Bimalnagar in Tanahun District; 1300 meters at 4 Km E of Syangja and at 1100 meters at Saldanda in Syangja District; 1150 meters at 8 km N of Pokhara, Batule Chour in Kaski District (Crorba et al. 1999); Hemja 2 (World Peace Cave), Kaski District on the bank of Yamdi River (Phuyal, 2005, Daniel, 2007); Bhalam 2, Kaski District (Birendra Cave) (Daniel, 2007); 1579 meters at Sundarijal Area in Kathmandu (Thapa et al.,2009).

In Palpa District this species was observed in most of the caves surveyed. It was collected from caves at 553 meters (1797 feet) at Argale V. D.C, 460 meters (1495 feet) at Ramdi Area and at 1101 meters (3578 feet) at Sahalkot V.D.C. In Kaski District, Pokhara, it was collected from Batule Chour at 981 meters (3188 feet) in Bat Cave, at 962 meters (3126 feet) in Mahendra Cave and 815 meters (2648 feet) forest of Banpale Dhada near Institute of Forestry. In Rupendehi District, Butwal, they appeared in the evening after sunset in huge numbers to feed on flying insects and disappeared at around 7 P.M. in the summer seasons.

Five individuals were captured on Mist nets, placed above a small stream inside the Primary forest and on the trial path at the edge of the forest and the agriculture land. Inside the caves, they were found in huge colony (> 500), living together with other species of bats. In Argali V.D.C, together with *Miniopterus schreibersii*, in Ramdi Area the caves was only occupied by this species, in Sahalkot V.D.C along with *Rhinolophus affinis*. In Pokhara Valley, these bats were observed at Mahendra cave along with *Rhinolophus affinis* and *Rhinolophus ferrumequinum* and Bat Cave the whole caves was occupied by this species. Around 1500 individuals were present in Bat Cave in Pokhara in the winter season. During summer season, only few individuals around hundred were present in the cave. On the basis of field visit, their survival is not threatened.

**Miniopterus schreibersii** (Kuhl, 1819)
Schreibers’ Long – fingered bat

**Verspertilio fuliginosa**, Hodgson, 1835: 700; Nepal

The presence of this species in Nepal has been noted by (Scully, 1887) in Kathmandu Valley. Later by Frick (1969), Mitchell (1978), Kock (1996). Specimen are collected from Kakani; Bimalnagar; Syangja (HMNH); Kathmandu at 1340m, (Myers, 1999); Tanahoun District, Bimalnagar, at 750m, Kathmandu, Hattisar, at 1400 m, Syangja District, 4 km E of Syangja at 1300m, Annapurna Himal, 40km NW of Pokhara, vicinity of Banthanti at 2200 m, vicinity of Sudame at 1500 m (Csorba et al., 1999).

In Palpa District this species were observed in the cave in Argali V.D.C at 553 meters (1797 feet)
along with *Hipposideros armiger*. These two species were found in two separate colonies in two different corners of the caves. In Dhovan V.D.C, they were found at an elevation of 200 meters (650 feet) roosting in the electricity tunnel, near by the river. Specimens were prepared from these two places. Parasites were found on the hairs of all the captured bats in the caves. Seven Species were captured in mist net kept on the trail path of the forest.

**Rhinolophus affinis** Horsfield, 1823
Intermediate Horseshoe bat

*Rhinolophus affinis himalayanus*

Bouzini (Fry, 1925); Kathmandu; Dulegounda; Syangja; Bimalnagar (HNHM); Barabissé; Shebu (FMNH); specimens from Parchung and Thankot, listed as *R. a. himalayanus* by Hinton and Fry (1923) are referable as *R. rouxi* (Bates and Harrison, 1997). It is recorded from 1410 meters at Balajju Forest Reserve, 1400 meter at Chobar in Kathmandu; 750 meters at Bimalnagar; 670 meters at Chon Pahad, 10 km W of Dulegounda in Tanahun District; 1300 meters at 4 Km E of Syangja and 1150 meters at 14 E of Syangja in Syangja District, 1200 meters at Tawa in Taplejung District (Csorba et al. 1999).

This species was captured from only one cave (presence >600 in numbers) in Sahalkot V.D.C. at elevation 1101 meters (3578 feet) from Ghising Odar (Cave) along with the *Hipposideros armiger* deep inside the cave and specimen was prepared. Three individuals were also captured from the agriculture land near the forest during mist netting. In Pokhara, these species were observed in Palpa District at elevation 789 meters (2564 feet) in Madan pokhara Valley in the store room of one house. Four individuals used to visit the room at 8 P. M and leave before 12 at midnight. Seven individuals were captured in the mist nets set across the small stream and the forest trials. They were all released after careful observations and measurement taken. In Rupendehi District, Buwal, they were captured at the height of 18 meters above ground level at around 6: 45 P.M. when mist net was placed in the openings between two buildings. One live juvenile stage individual was found floating on the bank of Nisti River, near the suspension bridge of Kirtipur Village at 12:30 P.M. at the Border of Gandakot V.D.C and Darcha V.D.C. The wing of this bat had many holes and was wet too.

**Rhinolophus pearsonii** Horsfield, 1851
Pearson’s Horseshoe bat

*Pipistrellus mimus*

In Nepal, it was recorded as *Pipistrellus mimus* from Bairia, Hazaria and (Hinton and Fry, 1923) and at an altitude of 160 meters (520 feet) in Banke district (Mitchell, 1980) (Cited in Bates et al., 1997); Sauraha, Dudra Nala, Tamar tal and Tigertops at Dhandari Khola in Chitwan at an elevation of 200 meters (650 feet) (Mayers, 2000).

These species were observed in Palpa District at an elevation of 789 meters (2564 feet) in Madan pokhara Valley in the store room of one house. Four individuals used to visit the room at 8 P. M and leave before 12 at midnight. Seven individuals were captured in the mist nets set across the small stream and the forest trials. They were all released after careful observations and measurement taken. In Rupendehi District, Buwal, they were captured at the height of 18 meters above ground level at around 6: 45 P.M. when mist net was placed in the openings between two buildings. One live juvenile stage individual was found floating on the bank of Nisti River, near the suspension bridge of Kirtipur Village at 12:30 P.M. at the Border of Gandakot V.D.C and Darcha V.D.C. The wing of this bat had many holes and was wet too.

**Pteropus giganteus** (Brunnich, 1782)
Indian Flying Fox

*Pteropus leucocephalus* Hodgson, 1835: 700; Central Region of Nepal

It has been recorded from Japa (FMNH) and according to Scully (1887), it is an autumn migrant to the Kathmandu Valley in Nepal (Bates et al., 1997). Two roosting sites were found in the foothills of the Annapurna Range and at an altitude of 2738 meters (8900 feet) at Num (FMNH); 2900 meters (9425 feet) at Ghorepani in the foothills of the Annapurna Range and at 3500 meters (11375 feet) on the edge of the Tibetan Plateau. (Bates et al., 1997).

This species was collected from Mahendra cave at 962 meters (3126 feet) and found together with *Rhinolophus affinis* and *Hipposideros armiger* in Kaski District, Pokhara. Wet specimen is prepared and stored in the Institute of Forestry, Zoology lab. Three individuals were captured by using butterfly nets deep inside the cave. Each species were living on different corner of the cave.

**Pipistrellus tenuis** (Temminck, 1840)
Least Pipistrelle; Indian Pygmy bat

*Pipistrellus ailurus*

In Nepal, it was recorded as *Pipistrellus ailurus* from Bairia, Hazaria and (Hinton and Fry, 1923) and at an altitude of 160 meters (520 feet) in Banke district (Mitchell, 1980) (Cited in Bates et al., 1997); Sauraha, Dudra Nala, Tamar tal and Tigertops at Dhandari Khola in Chitwan at an elevation of 200 meters (650 feet) (Mayers, 2000).

These species were observed in Palpa District at an elevation of 789 meters (2564 feet) in Madan pokhara Valley in the store room of one house. Four individuals used to visit the room at 8 P. M and leave before 12 at midnight. Seven individuals were captured in the mist nets set across the small stream and the forest trials. They were all released after careful observations and measurement taken. In Rupendehi District, Buwal, they were captured at the height of 18 meters above ground level at around 6: 45 P.M. when mist net was placed in the openings between two buildings. One live juvenile stage individual was found floating on the bank of Nisti River, near the suspension bridge of Kirtipur Village at 12:30 P.M. at the Border of Gandakot V.D.C and Darcha V.D.C. The wing of this bat had many holes and was wet too.

**Rhinolophus ferrumequinum** (Schreber, 1774)
Greater Horseshoe bat

*Rhinolophus tragatus* Hodgson, 1835: 699; Nepal

Kathmandu Valley (type loc. of *tragatus*); Najarkot; Annigera (BMNH); Langtang (HNHM); Ramechhap (Kock, 1996). In Nepal, it was found at an altitude of 2738 meters (8900 feet) at Num (FMNH); 2900 meters (9425 feet) at Ghorepani in the foothills of the Annapurna Range and at 3500 meters (11375 feet) on the edge of the Tibetan Plateau. (Bates et al., 1997).
Madan Pokhara Valley and Tansen Municipality. As per the local respondent, they have been living in this place for more than 70 years. In Argali V.D.C, a large colony of this species (around 2000) disappeared from that place before 8 years due to high human disturbance. Personal observation for last 10 years on these roosting sites of Pteropus giganteus, suggests that this species is decreasing drastically from their roosting places and no further information on their new roosting sites has been received. No specimens were prepared for this species because of their listing in Appendix 2 of CITES. In Kaski District, Pokhara they were observed in Chindanda at an elevation of 793 meters (2577 feet) on Bamboo plants. Some roosting bamboo trees and Bombax Ceiba plant had been cut by the land owner, which caused these species to move to other plants near by the roosting sites.

_Cynopterus sphinx_ Vahl, 1797

Short–nosed Fruit bat

_Cynopterus sphinx gangeticus_

Chisapani (Johnson et al., 1980); Saltar (BMNH); Barabisse; Shebu; Wana; Tumingtgar (FMNH) (Bates and Harrison, 1997).

Two individuals (1 Male and 1 Female) were recorded from Palpa District in Madan Pokhara valley at elevation 750 meters (2437 feet) in the cervices of banana and 3 individuals (2 Male and 1 Female) were captured in mist net set in Siliwa V.D.C at elevation of 800 meters (2600 feet). They were captured at around 7:30 P.M., in the orchard of Mango and Litchi. In Rupendehi District, Butwal three males, they were found roosting on the banana cervices in the orchard of mango and guava and one specimen was prepared from this site. In Kaski District, Pokhara, they were found roosting on the banana cervices at elevations of 790 meters (2567 feet) at Hario kharka in Institute of Forestry compound.

**Discussion**

Nepal is rich in biodiversity and survey of fauna and flora is very limited to the accessible parts of the country. Remote areas have almost never been surveyed and flora of this locality are unknown at present. There is huge possibility of finding new species to the country and new to the science. This research is a preliminary project to identify the distribution of these species. Most of the bats in the study sites were found roosting in the caves and two permanent tree roosts of _Pteropus giganteus_ were found in Madanpokhara Valley and Tansen Municipality. Further research on status and distribution of roosting sites should be done in different parts of Nepal. Species like _Pteropus giganteus_ which is loosing roosting sites every year should have strict legal protection. Awareness program on the bat conservation should be lunched using mass media, which is cost effective and large number of people could be reached at the same time. Further survey should be done with the combine use of mist net, canopy net and harp net.

**Acknowledgement**

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**References**


Myers, P., J.D. Smith, H. Lama and K.F. Koopman (1999). A recent collection of bats from Nepal, with


Map of Study Area
## External Measurements of different species of bats prepared as voucher specimen

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<td>(F T)</td>
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<td>11</td>
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<td><em>Rhinolophus ferrumequinum</em></td>
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<td>20.9</td>
<td>11.10</td>
<td>25.18</td>
<td>56.92</td>
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<td>18.8</td>
<td>31.18</td>
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### Craniodental Measurements of different species of bats prepared as voucher specimen

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<tr>
<th>No.</th>
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<th>CCL</th>
<th>ZB</th>
<th>BB</th>
<th>PC</th>
<th>M</th>
<th>C - M^n</th>
<th>M^n - M^(n)</th>
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**Measurement range of captured bats and number of individuals measurement taken (N)**

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<th><em>Miniopterus schreibersii</em></th>
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<th><em>Rhinolophus pearsonii</em></th>
<th><em>Rhinolophus affinis</em></th>
<th><em>Rhinolophus ferrumequinum</em></th>
<th><em>Pipistrellus tenuis</em></th>
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Book Review: The Biology of Small Mammals by Joseph F. Merritt

Reviewed by Rajith Dissanayake

Publisher: The Johns Hopkins University Press, 2010. ISBN 13:9780801879500 / 10:0801879507 c. $60.00, 313pp

At under 5kg, ninety percent of mammals are small and the subject is difficult to circumscribe. This book qualifies as a guide to the biology of most mammals, their survival, adaptations and ecology. Instead of lions, wolves, cattle and elephants the smaller representatives of groups that receive particular attention in this compendium include marsupials, “insectivores”, bats, selected rodents, primates, small carnivores, hyraxes and sengis (African elephant shrews). An introduction covers the taxonomic spectrum of small mammals, highlighting them from the 29 orders of living mammals.

These “protagonists” are interspersed within a tripartite framework: Feeding, Environmental Adaptations and Reproduction. Feeding incorporates insectivory, herbivory, carnivory and omnivory exploring dentition, modes of digestion, coprophagy, food storage and sensory adaptations especially amongst shrews and moles including underwater adaptations as those found in the platypus. A case study describes the mysterious Hero shrew, Scutisorex somereni at 90g that can withstand being stood on by a 70kg man given its extraordinary backbone.

Adaptations cover thermoregulation in hot and cold environments such as body insulation, hibernation, sweating and accommodation in nests or under snow. Trends in adaptations based on latitudes, climates and habitat are explored such as Bergmann’s rule.

Reproduction deals with mating strategies and delaying the times of birth such as delayed implantation to suite the seasonal availability of resources. Social systems and life cycles are highlighted such as Brandt’s bat (Myotis brandti) living for a reported 40 years despite its small size. We learn that lemmings do not commit suicide but that their cyclical population explosions remain somewhat mysterious.

Merritt uses examples from mammals most familiar to him, or those that have been well researched with the best geographical coverage centred across North and South America followed by Eurasia, Africa (including Madagascar), Australia with a relative dearth of studies from tropical Asia reflecting gaps in knowledge or research. The style is rather turgid, leavened with greyscale photos and line illustrations echoing Walker’s Mammals of the World. Illustrations could have been better and more descriptive (the bicornuate uterus in the appendix would have been better illustrated than described). The text is strong on physiology, adaptations, behaviour, habitats and whole animal treatments as opposed to anatomy or detailed summaries and comparisons. Coverage of primates is measured given extensive treatment elsewhere and conservation aspects are highlighted. Whereas there is a large amount of information, the treatment is rambling rather than focussed; greater partitioning of topics could have helped. There is a useful glossary at the end and an extensive reference list.

It is often difficult to envision the tiny marsupials described such as Burramys parvus (Mountain pygmy possum, 45g) or a rodent such as the Acouchi. Readers will however be familiar with several groups dealt with such as pocket mice, flying squirrels or Tasmanian devils, even if they don’t know exactly what distinguishes these taxa from allied forms. The diversity and ecology of bats is particularly well treated and the roles that small mammals play in perpetuating the biotic environment such as pollination or seed dispersal. Also impressive is the coverage of habitats and microhabitats, occupied by mammalian denizens that are largely invisible under cover or at night when they may be most active.

This work would be a useful companion volume to related works (Knut Schmidt-Nielsen) rather than a primary source highlighting topical research and areas for further work. It is a useful academic reference or textbook rather than a popular guide given the broad sweep of the subject that often superimposes diverse taxonomic groups.

Taxa living in S. Asia or associated with the Oriental realm mentioned in the text include Suncus etruscus (Etruscan shrew), Suncus murinus (House shrew), Rhinolophus rouxii (Rufous Horseshoe bat), Pteropus pumilus (Little golden-mantled flying fox), Megaderma lyra (Greater false vampire bat), M. spasma (Lesser false vampire bat), Chimarrogale (Asian water shrew), Tupaia (Scandentia, tree shrew), Melursus ursinus (Sloth bear, large mammals do receive an airing) and binturongs (Asian bear cats). The generic name of the African Golden mole should be Amblysomus rather than Amblysomus.

Being highly divergent and unobserved as miners, swimmers or nocturnal flyers, Merritt’s contribution will bring these creatures and their roles much needed exposure.

Department of Zoology, The Natural History Museum, Cromwell Road, London
*email: rajith@clara.co.uk
Indian Flying Fox (*Pteropus giganteus*) is distributed in India, Pakistan, Nepal, Sir Lanka, Bangladesh and West Myanmar. It is largest and the most well known of Nepalese bats. It has long snout and well developed nostril, big ears and massive wings. First digit and second digit possesses claw, blackish fur in back, under part from the neck is brown.

*Pteropus giganteus* is colonial in habitat in a fixed site of landscape since long duration. A colony of this species has been existing in Kathmandu district at Lainchaur. We visited this Ptero-camp on Dec 16 and monitored in two sections:

Section-1: Inside Social welfare council (SWC) compound, located at 0629677 meter Easting, 3067398 meter Northing and elevation- 1299m.

Section -2: Along the road sites of Jamal-Lainchor road section, located at E- 0629765, N-3067322 and elevation-1295m

On Dec 17 we reached the selected sites in morning (9:00 am) for monitoring the status of Indian flying fox. At 10:00 am we started counting.

In order to count number of bats we adopted two ways i.e. 1) direct count which counter tallied with 2) Photo observed count. The process was repeated 4 times in each tree. The moments of the bats if any were recorded. The observation was continued until 4:09 pm.

**Result**
The first day 16 Dec site selection and identification of method for bat monitoring was done and on the second day 17 Dec direct eye counting and photography count method was carried out that showed the overall population of bat in the study area. During monitoring we recorded the roosting trees, preference of bats for roosting were observed. We estimated 983 numbers of individuals in roosted within 62 trees. 244 individuals were found roosting at Jamal-Lainchaur road section while rest was observed inside the Social welfare council (SWC) compound section.

As per the local respondents, the bat colonies along Jamal-Lainchaur road sections has shifted to SWC compound during last three year. Most of the roosting tree along road site has been cut by Kathmandu Metropolitan. Also their personal observation within last three year shows the population of bat colonies was decreasing from roosting place.

<table>
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<tr>
<th>SN</th>
<th>Name of trees</th>
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<th>No. of observed bats</th>
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<tr>
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<td>Dhupi (<em>Juniperus recurva</em>)</td>
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<td>Thigre Salla (<em>Tauga dumosa</em>)</td>
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<td>-</td>
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<td>Sisso (<em>Dalbergia sissoo</em>)</td>
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<td>51</td>
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<td><strong>Total</strong></td>
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<td><strong>91</strong></td>
<td><strong>62</strong></td>
<td><strong>983</strong></td>
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</table>

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* Small Mammals Conservation and Research Foundation, New Baneshwor, Kathmandu
e-mail: rameshwor@hotmail.co.uk
An extensive survey was conducted in some villages of four districts (i.e., Nadia, North 24-Parganas, Hooghly and Burdwan) of the Gangetic plain of West Bengal, India, in the year 1998-2002 to know the types of rodent species present in these districts and their nature of damages. Within the districts, fields, housing complexes, grocery shops and market complexes were selected for the collection of data. All these four districts are agriculture dependent. Paddy, wheat, potato, parwal, gourd, vegetables, jute, cabbage, cauliflower and brinjal were the main agricultural products. Our survey report revealed that maximum people cultivate parwal, dal, cabbage and jute in Nadia; potato, paddy and wheat in Hooghly; vegetables and paddy in North 24-Parganas; Paddy and gourd in Burdwan District.

The results of this survey indicate that these districts are badly infested by five types of important rodent species. Among them Rattus rattus is quite preponderant followed by Mus musculus, Rattus norvegicus, Bandicota bengalensis and Bandicota indica. The Rattus norvegicus in the district North 24-Parganas, Rattus rattus, Mus musculus and Bandicota sp. in the District Burdwan were reported to be maximum in percentage. Rattus rattus mostly inhabits the buildings, crop field, garden, grain houses and trees. They usually prefer both kharif and rabi crops. Their burrows were almost found in the floor or wall in semi dry or dry soil. They hoard panicles of paddy, wheat and tomato into the burrows. Rattus norvegicus were found near the water source of dry and wet soils and fields. They hoard paddy, wheat, crabshell, snail etc into the burrows. They were also found in the buildings. Mus musculus mainly inhabits in houses, kitchen, and storerooms but they were also found in the paddy fields. Their burrows were always found in the mud floor and mud walls. Only hoarded rice was found from its burrows. They always built their burrows in dry soil. Amount of soil are small with very fine granules. Bandicota sp. usually lives in buildings, garden, water source, paddy and potato fields. Burrows were found in the floor and in wet soil. Huge amount of soil with large size granules were found outside the burrows. They hoard snail, fish and fewer amounts of paddy and wheat.

Rodents cause damages (8-12%) in young plants, fruits, seeds, panicles of the paddy and wheat both in the field and houses. In these districts maximum damages were noticed in the paddy, potato, wheat, gourd, cauliflower, cabbage and jute by the rodents. Household properties e.g., books, clothes, utensils and electronic goods were also destroyed by the rats. Damages were maximum in the mud built houses. These observations points out that certain caution should be taken to control the rodents on an emergency basis through some integrated approach. It is assumed that these information will help the future rodent ecologist to continue further work on the wild murine species of West Bengal, India.
Fig. 3. Extensive damages of the gourd in the field.

Fig. 4. Series of holes along with heaps of soil in the potato field.

Fig. 5. Extensive damages on the potatoes.

Fig. 6. Fungal infection on the cauliflower after the damage by the rats in the field.

Fig. 7. Damages of pomegranate fruit in the mature condition.

Fig. 8. Series of stock books and other valuable papers were damaged by the Rattus rattus within the strong room of the University of Kalyani.

Fig. 9. One of the villagers showing the bedding damaged by the rodent species.

Fig. 10. Figure represents the nesting materials along with paddy in the storing place (shelf made of bamboo sticks) of the villagers.
Second Record of *Hipposideros fulvus* in Nepal

Narayan Lamichhane\(^1\) and Rameshwor Ghimire\(^2\)

From Mid-Western region, Salyan district a virgin area for bat studies districts in Nepal. Literature shows, short surveys were carried out at Dang and Banke districts and some scattered information from Jumla and Dolpa districts.

The current study "**Bats Study in Salyan and Dang districts: Status, Distribution, and conservation and Conservation initiative.**" Conducted by two members of Small Mammals Conservation and Research Foundation (SMCRF) and CDES-Small Mammals Conservation Club (CDES-SMCC) from 31 October to 5 November 2010 recorded six species of bats from this regions. The study team recorded *Hipposideros fulvus* first time from this region. *H. fulvus* was reported about 590km away from previously reported (Kathmandu valley). This is the second record of *H. fulvus* in Nepal since Scully, 1887.

Chameri Cave (28°24’6.46”N, 82°34’7.28”E) located at an altitude of 1299m from sea level, of Dang is an important site for bat study in Mid-western Nepal and it is located in Halwar VDC, 5 Mulok in the boundary of Dang and salyan district and the area is dominated by Magar community with some other minor communities. The temperature & humidity ranges from 17.2°C-17.6°C and 86%-99% inside the mouth of Cave during the study period. The major vegetation of the surrounding area of cave was *Aesandra butyracea, Psididium guajava, dendrocalamus strictus, Bombax cieba, Shorea robusta, Musa spp., Cirtus aurantifolia, Phyllanthus emblica*. The area is dominated by *Aesandra butyracea* forest.

Study was carried out in early morning from 4:15 to 7:30, Nov 5 2010. During three hours of study periods Mist-netting in the mouth of cave entrance, Roost survey of the Cave, Recording of Temperature and Humidity and Morphometric measurement were the study methods deployed.

Single individual of *Hipposideros fulvus* was netted at 5:15 am in the morning. And another big species was netted and escaped away by forming large hole in our net when we were busy in roost survey inside the cave. About 300-400 individuals were localized roosting in the ceiling (Topmost wall) 30-40 feet above. Thus we could not focus on roosting sites. About 50-60 individuals of bats were observed flying and encircling the area.

*Hipposideros fulvus* Colonies of Chameri cave of Dang district from Mid-western, Nepal is important documentation for bat studies in Nepal. Therefore

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\(^{1}\) CDES-Small Mammals Conservation Club, Central Department of Environmental Science, TU, Kirtipur  
\(^{2}\) Small Mammals Conservation and Research Foundation, New Baneshwor, Kathmandu  
email: rameshwor@hotmail.co.uk
Fig. 4. Bat Mis-netted at Chameri cave, Dang

Fig. 5. Hipposideros fulvus

Further detailed monitoring of bats, from this cave concerning its roosting ecology and prevailing population should be carried out, and also from unexplored area of this region is recommended.

Acknowledgements
We would like heartily thanks to Mr. Indra Bhadhur Garti for supporting us in the field at early morning of 4 am. We would like to heartily acknowledge Prof. Paul A. Racey, Chair, IUCN SSC Chiroptera Specialist Group, and Regius Professor of Natural History, School of Biological Sciences, Aberdeen for providing us a mist-net, and Dr. Gabour Csorba, Deputy Director and Curator of Mammals, Department of Zoology, Hungarian Natural History Museum, Busdapest, Hungary and Mr. Sanjan Thapa of Small Mammals Conservation and Research Foundation (SMCRF), Nepal for review comments. We express sincere gratitude to Ms. Sally Walker and Dr. B.A. Daniel from Zoo Outreach Organization, Coimbatore, India.

Table: Morphometric measurement of Netted individual Bat.

<table>
<thead>
<tr>
<th>Bat Species External Measurements (mm)</th>
<th>Hipposideros fulvus</th>
</tr>
</thead>
<tbody>
<tr>
<td>HB</td>
<td>36</td>
</tr>
<tr>
<td>T</td>
<td>30</td>
</tr>
<tr>
<td>TIB</td>
<td>20</td>
</tr>
<tr>
<td>HF</td>
<td>5</td>
</tr>
<tr>
<td>FA</td>
<td>40</td>
</tr>
<tr>
<td>Thumb</td>
<td>7</td>
</tr>
<tr>
<td>5MT</td>
<td>32</td>
</tr>
<tr>
<td>1Ph 5MT</td>
<td>13</td>
</tr>
<tr>
<td>2Ph 5MT</td>
<td>11</td>
</tr>
<tr>
<td>4 MT</td>
<td>30</td>
</tr>
<tr>
<td>1Ph 4MT</td>
<td>10</td>
</tr>
<tr>
<td>2Ph 4MT</td>
<td>8</td>
</tr>
<tr>
<td>3MT</td>
<td>28</td>
</tr>
<tr>
<td>1Ph 3MT</td>
<td>21</td>
</tr>
<tr>
<td>2Ph 3MT</td>
<td>21</td>
</tr>
<tr>
<td>WSP</td>
<td>268</td>
</tr>
<tr>
<td>E</td>
<td>26</td>
</tr>
<tr>
<td>Tragus</td>
<td></td>
</tr>
<tr>
<td>NL(L)</td>
<td>5</td>
</tr>
<tr>
<td>NL(H)</td>
<td>6</td>
</tr>
<tr>
<td>Age (A/Y)</td>
<td></td>
</tr>
<tr>
<td>Sex (M/F)</td>
<td>M</td>
</tr>
<tr>
<td>Wt.</td>
<td></td>
</tr>
<tr>
<td>Ectoparasites (P/A)</td>
<td></td>
</tr>
</tbody>
</table>

Note: HB= Head Body; T= Tail; TIB= Length of Tibia; HF= Hind foot; FA= Forearm; WSP=Wingspan; 5MT= Fifth Metacarpal; 4MT= Fourth Metacarpal; 3MT= Third Metacarpal; 1Ph 5MT= First Phalange Fifth Metacarpal; 1Ph 4MT= First Phalange Fourth Metacarpal; 1Ph 3MT= First Phalange Third Metacarpal; 2Ph 5MT= Second Phalange Fifth Metacarpal; 2Ph 4MT= Second Phalange Fourth Metacarpal; 2Ph 3MT= Second Phalange Third Metacarpal; E= Ear ( pinna from base to tip); Wt.= Weight.
Published!
Bats of Nepal-A Field Guide
Compiled and edited by: Pushpa R. Acharya, Hari Adhikari, Sagar Dahal, Arjun Thapa and Sanjan Thapa

It is our pleasure to share our latest effort to print the first edition of Bats of Nepal-A field guide. The book included the latest update of bat related information of Nepal. The book is primarily divided into two sections – general section included the historical review of bat diversity and sincere inspection on current bat related activities as well as future possibilities in Nepal. While the main section bestowed primarily species profile to almost 53 bat species that sporadically described from Nepal. Each species are profiled with their distinguishing features, general ecology, conservation status, distributional map and a clear photograph. The book mainly targets the readers of Nepal. It is the foremost and first hand published bat literature in Nepal. We assure that, the book will be valuable priesthood to governmental policymaker to screen bat like small mammals in their priority list, Non governmental conservation stakeholders, community based conservation negotiator, students and universities. Precisely, the book is the complete overview of Nepalese bat research and conservation actions of the date and a clear hint for the further direction of Chiropteroology in Nepal. We hope, the book will strengthen the issue of bat conservation at national level and facilitate to correct the current situation of least known and most neglected valuable fauna of the nature.

Acknowledgement
We are grateful to Critical Ecosystem Partnership Fund and World Wildlife Fund, Nepal to arrange the essential cost for printing the book. Thanks to National and international reviewers, supporters and bat experts for their valuable suggestions, comments and guidelines.
The diet of Indian flying-foxes (Pteropus giganteus) in urban habitats of Pakistan
Muhammad Mahmood-ul-Hassan¹,³, Tayiba L. Gulraiz¹, Shahnaz A. Rana², and Arshad Javid¹

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We studied the diet of the Indian flying fox (Pteropus giganteus) in Pakistan from March 2008 to February 2009 and found that the bats fed on 20 species belonging to 11 plant families. Of these, four families (Anacardiaceae, Bignonaceae, Malvaceae, and Sapotaceae) were identified from remnants of flower petals in food boluses while the remaining families (Annonaceae, Arecaceae, Ebenaceae, Meliaceae, Moraceae, Myrtaceae, and Sapindaceae) were identified from the seeds in the boluses and from guano samples. Plants in the family Moraceae (50.7%) comprised most of the bat’s diet. Fruit of Ficus retusa (27.5%) and F. carica (23.0%) during winter, F. glomerata (30.9%) and F. religiosa (28.1%) during spring, Psidium guajava (19.6%), F. bengalensis (18.7%) and Diospyros peregrina (17.8%) during summer, and D. peregrina (71.9%) during autumn, were the most frequently identified items. The four seasonal diets varied significantly (χ² = 435, d.f. = 18, P < 0.01). Results confirm that the ecological services rendered by P. giganteus, such as pollination and seed dispersal, outweigh its losses, such as damage to the ripe fruit. Hence, the species should not be regarded as a pest; rather efforts should be made to ensure its conservation.

Key words: conservation, Ficus, fruit bat, Pakistan, pest, seed dispersal, urban habitat

Introduction
The Old World fruit bats (Chiroptera: Pteropodidae) are important for the survival of more than 114 plant species of the world (Mickleburgh et al., 1992). Their positive roles as pollinators, seed dispersers, and as agents for maintaining plant community diversity has been acknowledged universally (van der Pijl, 1982; Marshall, 1983; Cox et al., 1991; Fujita and Tuttle, 1991; Mickleburgh et al., 1992; Rainey et al., 1995; Eby, 1996; Banack, 1998). Pteropodids are represented by three genera and four species in Pakistan (Roberts, 1997; Mahmood-ul-Hassan et al., 2009) and includes the shortnosed fruit bat (Cynopterus sphinx), the Indian flying fox (Pteropus giganteus), the Egyptian fruit bat (Rousettus aegyptiacus) and the fulvous fruit bat (Rousettus leschenaultii).

Distributed in Maldive Isles, India (including Andaman Isles), Sri Lanka, Pakistan, Bangladesh, Nepal and Burma, P. giganteus is one of the

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largest bats in the world (Simmons, 2005). It is often labeled as ‘vermin’ on the assumption that it poaches ripe fruits from orchards and defecates in public places (Chakraverty et al., 2009; Mahmood-ul- Hassan et al., 2009). This bat is thought to cause heavy economic losses to arecanut (Areca catechu), sapota (Achras zapota), guava (Psidium guajava), mango (Mangifera indica), and jaman (Syzigium jambolanum) (Roberts, 1997; Chakraverty and Girish, 2003). Pteropus giganteus is given no protection by Pakistani law and is hunted for its body fat to be used as potions and as putative cures for rheumatic pains, by local medical practitioners known as ‘hakeems’ (Roberts, 1997). Pteropus giganteus is included in the fourth schedule of the Punjab Wildlife (Protection, Preservation, Conservation and Management) Act 1974 section 2 (v), which lists the species among those that are given no legal protection and can be hunted.

Although extensive literature exists on the food habits of some Pteropus species (e.g., Dobat and Peikert-Holle, 1985; Marshall, 1985; Mickleburgh et al., 1992; Wiles and Fujita, 1992), few studies offer a detailed investigation of their diet in a single area (Banack, 1998). Information is particularly scanty regarding the diet of P. g. giganteus in urban landscapes and no attempt has been to quantify the ecological role of this species. The present study was designed to determine whether P. giganteus can indeed be considered a pest to fruit crops and, if so, then to what extent. This study also provides baseline information about the food preferences of this species from Pakistan and its roles in seed dispersal and pollination.

**Materials and Methods**

**Study Area**

The study was conducted in Lahore (31°33’N and 74°19’E, about 210 m a.s.l.) at the eastern border of Pakistan, within the Punjab Province, 24 km away from the Pakistan–Indian border. The city covers an area of 1,775 km$^2$ and is the second most populated city in Pakistan. The average annual precipitation is 500 mm. May, June, and July are the hottest months of the year, with mean maximum temperature reaching 39°C and maximum daily temperatures up to 49°C. The monsoon rains mostly fall in July and August, and maximum daily temperatures up to 49°C. June, July, and August are the hottest months of the year, with mean maximum temperature reaching 39°C and maximum daily temperatures up to 49°C. The city is the oldest known roosts of P. giganteus in Pakistan (Roberts, 1997). The garden is divided into 47 plots of varying sizes. At present, the P. giganteus roosts in four of 47 plots. These four plots cover 8.5% of the total garden and harbor 12.3% of the total trees ($n = 4,119$) present in the park.

**Food Analysis**

The boluses and guano of P. giganteus were sampled between March 2008 and February 2009 by spreading polythene sheets on the ground directly below feeding perches and diurnal roost sites (Hodgkison et al., 2003). Four polythene sheets, each covering an area of 1 m$^2$, were placed one night per month in each of four plots in the Jinnah Garden below permanent bat roosts. Each sheet was in place for 10 hours from 20:00 h until 06:00 h Pakistan Standard Time. The recovered food remains were removed the subsequent day for analysis. Two samples each of guano and bolus were collected randomly from each sheet and were air-dried before being placed in polythene bags.

These samples were transferred to 20 ml distilled water and shaken well to separate the undigested food items. The petals and seeds thus separated from the boluses and guano were counted and identified by matching them with a reference collection of petals and seeds collected from plants in the Jinnah Garden and within a circumference of 30 km; the distance the flying foxes can commute per night (van der Pijl, 1957).

The majority of the seeds were identified through visual inspection or by using a hand lens and by comparisons with the reference seeds. However, the seeds that could not be identified visually were germinated. The germination experiments involved transferring the unidentified seeds to small plastic pots containing wet cotton under natural conditions of temperature and day length (Hodgkinson et al., 2003). The seedlings were later transferred to pots containing soil and were allowed to grow for 3–4 weeks until they could be identified.

**Statistical Analysis**

A $\chi^2$-test was used to compare seasonal importance of different plant families in the diet of P. giganteus. Data obtained in December, January, and February were classified as winter; March, April, and May as spring; June, July, and August as summer; and September, October, and November as autumn.

**Results**

Pteropus giganteus utilized (introduced plants are followed by ‘*’) flowers of Mangifera indica and Pistacia chinensis* (Anacardiaceae), Kigelia
while the remaining fruits were consumed during winter and spring, respectively (Fig. 1B), and *Areca catechu*, *Diospyros peregrina* and *D. kaki* (Ebenaceae), *Melia azedarach* (Meliaceae), *Ficus bengalensis*, *F. carica*, *F. glomerata*, *F. religiosa*, *F. retusa*, *Morus nigra* (Moraceae), *Psidium guajava* (Myrtaceae), and *Nephelium lappaceum* (Sapindaceae) while both the flowers and fruits of *Polyalthia longifolia* (Annonaceae) were also consumed.

**Analysis of Regurgitated Pellets**

The regurgitated pellets samples consisted of flower petals (Table 1) and seeds (Table 2). The petals of *F. chinensis* were the most frequently consumed food item in July and October. The other plants identified from the petals in the regurgitated pellets of *P. giganteus*, in order of their decreasing importance, included *C. pentandra* (January), *M. zapota* (April) and *K. pinnata* (September), *P. guajava* (September) and *S. jambolanum* (April), and *M. longifolia* (March), and *M. indica* (April) (Table 1).

A total of 503 seeds were recovered from the regurgitated pellet samples that belonged to the following plant families, in order of their decreasing frequency, Moraceae (63.4%), Myrtaceae (15.9%), Ebenaceae (13.2%), Sapindaceae (4.4%), and Meliaceae (3.0%). Within family Moraceae, the seeds of *P. retusa* were the most abundant, while those of *M. nigra* were the least frequent in the regurgitated pellet samples. *Psidium guajava* formed the bulk of this species’ diet by frequency (Table 2).

*Ficus retusa* was the only plant species recovered from the samples during winter; *F. glomerata*, *F. religiosa*, and *M. nigra* during spring, while *M. azedarach* and *F. bengalensis* were consumed during summer. The fruits of *P. guajava* were used during winter and summer, *D. kaki* during spring and autumn, and *N. lappaceum* during autumn (Fig. 1A).

**Guano Analysis**

The seeds of 12 species belonging to seven families were identified from the guano of *P. giganteus* (Table 3). The families Moraceae (37.4%), Ebenaceae (36.1%), and Myrtaceae (14.9%) jointly formed 88.4% of the bats’ diet. The seeds of *Diospyros peregrina* were the most frequent of all the plant species identified from the guano of *P. giganteus* (Table 3).

The guano analysis revealed that of the 12 plant species, the fruits of *M. nigra*, *P. longifolia*, *F. glomerata*, and *A. catechu* were consumed only during winter and spring, respectively (Fig. 1B) while the remaining fruits were consumed for at least two other seasons. The bats ate fruits of *F. religiosa* during winter and spring, *F. carica* during winter and autumn, *D. kaki* during winter and summer, *M. azedarach* and *F. retusa* during spring and summer and — *N. lappaceum* and *D. peregrina* during summer and autumn, respectively (Fig. 1B).

The combined analysis of the regurgitated pellets and guano revealed that *P. giganteus* depends heavily on plants in the families Moraceae, Ebenaceae, and Myrtaceae that jointly formed 90.5% of its total diet throughout the year (Table 4). Fruit in the family Moraceae formed the main component during the winter (62.4%) and spring (68.4%). Fruits in the Ebenaceae family became almost equally important during the summer (27.4%), and served as a staple food item during the autumn (71.9%). The seasonal importance of different plant families varied significantly ($\chi^2 = 435, d.f. = 18, P < 0.01$). The winter diet was similar to the spring diet and the autumn diet to that of the summer.

**Discussion**

Large flying foxes are among the most threatened groups of bats, particularly in southeast Asia (Mildenstein, 2002), where some taxa are considered vermin because they are assumed to poach ripe fruits from orchards (Chakraverty and Girish, 2003; Mahmoud-ul-Hassan and Nameer, 2006; Chakraverty et al., 2009). In comparison to many studies that simply provide lists or tabulations of dietary items used by bats (e.g., Mick leburgh et al., 1992; Eby, 1998), only a few studies actually quantify various dietary components of flying foxes (Stier and Mildenstein, 2005) which showed that the fruits of various *Ficus* spp. are a consistent, ubiquitous, and nutritious dietary component of *P. giganteus* and are presumed to be the limiting components in its diet (Stier and Mildenstein, 2005).

*Ficus carica* and *F. retusa* during winter, *F. glomerata* and *F. religiosa* during spring, *F. bengalensis* during summer, and *F. carica* during autumn are the staple food items of *P. giganteus*. Different *Ficus*, when consumed in combination, have the ability to fulfill the major nutritional requirements of fruit bats (Wendeln et al., 2000). These fruits are rich in calcium (Nelson et al., 2000), an element that is important for bone development and maintenance, and also vital during parturition and nursing (Barclay, 1994, 1995; Palmer et al., 2000). The bats also supplement their food with leaves and flower petals at some part of the year to fulfill their protein requirements (Law, 1992; Kunz and Diaz, 1995; Ruby et al., 2000), which is considered to be a limiting nutrient for fruit eating bats as fruits are generally low in nitrogen (Thomas, 1984; Courts, 1998). The *Ficus* and *Diospyros* spp. are the keystone resources for *P. giganteus* as they sustain bats during times of overall resource
Pakistan exported 55,000 tons of mangoes from the fact that during the fiscal year 2007 pollinators of commercial fruit can be illustrated. The economic importance of the flying foxes as species (Mahmood-ul-Hassan et al., 2003; Chakraverthy et al., 2009). The population status and trends in the abundance of P. giganteus in the last decade indicate that its population is declining and the bat is under a serious threat of becoming endangered associated with the misconception of being a pest species (Mahmood-ul-Hassan et al., 2009).

The economic importance of the flying foxes as pollinators of commercial fruit can be illustrated from the fact that during the fiscal year 2007 Pakistan exported 55,000 tons of mangoes (Mangifera indica) worth $16.5 million (US) to the United Kingdom, continental Europe, United States, Saudi Arabia, and some other countries (Anonymous, 2007). Morus is another economically important multipurpose genus; the leaves of M. alba and M. nigra are used for rearing silk worms, and a multitude of other purposes.

There are nearly 200 species of pteropodids across the Old World (Simmons, 2005) that feed primarily on a combination of fruit, nectar, and pollen and are persecuted by farmers to protect their fruit production (Fujita and Tuttle, 1991). While the decline of the pteropodids raises serious concerns throughout the world and especially in Paleotropical forests (Strat and Marshall, 1976; Marshall, 1983, 1985; Richards, 1987), there is no current action to legally protect them in Pakistan (Roberts, 1997; Mahmood-ul-Hassan et al., 2009). However in India, persistent efforts by bat biologists and non-governmental organizations have resulted in providing legal protection to all 13 species of pteropodid bats (Singaravelan et al., 2009).

On the basis of this study we strongly recommend that Jinnah Garden, Lahore should be declared as sanctuary for P. giganteus before it declines locally to endangered status and its numbers become insufficient to service forests and cause economic damage to agricultural and medicinal practices that depend on fruits and plants which it disperses and pollinates. We also urge that the species is protected throughout Pakistan.

Acknowledgements
The financial support provided by the Higher Education Commission of Pakistan and Rufford Small Grants, UK, for conducting this study is gratefully acknowledged. We also thank Prof. Paul A. Racey, Prof. Gareth Jones, Prof. John O. Whitaker, Jr. and an anonymous referee for improving the quality of this manuscript. We also acknowledge Prof. Wiesław Bogdanowicz, Editor-in-Chief Acta Chiropterologica for his cooperation and consistent encouragement.

References
Table 1. Percentage frequency of occurrence (followed by \( n \)) of the remnants of petals of different species identified from the regurgitated pellets samples of *P. giganteus* collected from Jinnah Garden, Lahore, Pakistan, in decreasing order of their frequency of occurrence. * — Species that are introduced to the region. Petals were recorded in the ejecata of *P. giganteus* only during the below mentioned monthly samples.

<table>
<thead>
<tr>
<th>Tree species</th>
<th>Mar (6)</th>
<th>Apr (21)</th>
<th>Jul (27)</th>
<th>Sep (15)</th>
<th>Oct (47)</th>
<th>Jan (15)</th>
<th>Total (131)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pistacia chinensis</em></td>
<td>-</td>
<td>-</td>
<td>100 (27)</td>
<td>-</td>
<td>100 (47)</td>
<td>-</td>
<td>56.5 (74)</td>
</tr>
<tr>
<td><em>Ceiba pentandra</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100 (15)</td>
<td>11.5 (15)</td>
</tr>
<tr>
<td><em>Manilkara zapota</em></td>
<td>-</td>
<td>29.6 (8)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6.1 (8)</td>
</tr>
<tr>
<td><em>Kielia pinnata</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>53.3 (8)</td>
<td>-</td>
<td>-</td>
<td>6.1 (8)</td>
</tr>
<tr>
<td><em>Polyalthia longifolia</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100 (7)</td>
<td>-</td>
<td>-</td>
<td>5.3 (7)</td>
</tr>
<tr>
<td><em>Syzygium jambolanum</em></td>
<td>-</td>
<td>25.9 (7)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5.3 (7)</td>
</tr>
<tr>
<td><em>Madhuca longifolia</em></td>
<td>22.2 (6)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4.6 (6)</td>
</tr>
<tr>
<td><em>Mangifera indica</em></td>
<td>-</td>
<td>22.2(6)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4.6 (6)</td>
</tr>
</tbody>
</table>

Table 2. Monthly variations in the percent frequency of occurrence (\( n \)) of the seeds belonging to different plant species identified from the regurgitated pellets samples collected from Jinnah Garden, Lahore, Pakistan, of *P. giganteus* in decreasing order of their frequency of occurrence; \( n \) is the number of seeds collected from regurgitated pellets; * — species that are introduced to the region.

<table>
<thead>
<tr>
<th>Tree species</th>
<th>Jan (15)</th>
<th>Feb (79)</th>
<th>Mar (81)</th>
<th>Apr (22)</th>
<th>May (75)</th>
<th>Jun (41)</th>
<th>Jul (39)</th>
<th>Aug (45)</th>
<th>Sep (45)</th>
<th>Oct (0)</th>
<th>Nov (31)</th>
<th>Dec (45)</th>
<th>Total (503)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Psidium guajava</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>50 (15)</td>
<td>51.3 (20)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100 (45)</td>
<td>15.9 (80)</td>
</tr>
<tr>
<td><em>Ficus retusa</em></td>
<td>-</td>
<td>100 (79)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>15.7 (79)</td>
</tr>
<tr>
<td><em>F. glomerata</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>14.9 (75)</td>
</tr>
<tr>
<td><em>F. religiosa</em></td>
<td>-</td>
<td>-</td>
<td>92.3 (75)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>14.9 (75)</td>
</tr>
<tr>
<td><em>Diospyros peregrina</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100 (22)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100 (45)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>13.2 (67)</td>
</tr>
<tr>
<td><em>F. carica</em></td>
<td>100 (15)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>90.3 (28)</td>
<td>-</td>
<td>8.5 (43)</td>
</tr>
<tr>
<td><em>F. bengalensis</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>8.2 (41)</td>
</tr>
<tr>
<td><em>Nephelium lappaceum</em>†</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>48.7 (19)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4.4 (22)</td>
</tr>
<tr>
<td><em>Melia azedarach</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>50 (15)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3.0 (15)</td>
</tr>
<tr>
<td><em>Morus nigra</em>†</td>
<td>7.9 (6)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
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<td>-</td>
<td>-</td>
<td>1.2 (6)</td>
</tr>
</tbody>
</table>

† — Species identified through germination experiments
Table 3. Monthly variations in the percent frequency of occurrence ($n$) of the seeds belonging to different plant species identified from the guano samples collected from Jinnah Garden, Lahore, of *P. giganteus* in decreasing order of their frequency of occurrence. $n$ is the number of seeds collected from regurgitated pellets; * — species that are introduced to the region

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Diospyros peregrina*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diospyros guajava*</td>
<td>- (6)</td>
<td>18.1 (21)</td>
<td>45.7 (28)</td>
<td>48.8 (28)</td>
<td></td>
<td></td>
<td></td>
<td>27.6 (8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. kaki</td>
<td>42.5 (28)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ficus carica</td>
<td>43.9 (29)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>36.0 (9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9.5 (45)</td>
</tr>
<tr>
<td>F. retusa</td>
<td>- (6)</td>
<td>61.5 (24)</td>
<td></td>
<td></td>
<td>100 (21)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F. religiosa*</td>
<td>- (6)</td>
<td>75.7 (25)</td>
<td>38.5 (15)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8.4 (40)</td>
</tr>
<tr>
<td>Melia azedarach</td>
<td>- (6)</td>
<td>- (6)</td>
<td>36.2 (21)</td>
<td></td>
<td></td>
<td>20.3 (12)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.9 (33)</td>
</tr>
<tr>
<td>F. glomerata</td>
<td>- (6)</td>
<td>- (6)</td>
<td>54.3 (24)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.0 (24)</td>
</tr>
<tr>
<td>Nephelium lappaceum*†</td>
<td>- (6)</td>
<td>- (6)</td>
<td>- (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13.6 (8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.3 (11)</td>
</tr>
<tr>
<td>Areca catechu*</td>
<td>- (6)</td>
<td>- (6)</td>
<td>- (6)</td>
<td>15.5 (9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.9 (9)</td>
</tr>
<tr>
<td>Morus nigra*†</td>
<td>13.6 (9)</td>
<td>- (6)</td>
<td>- (6)</td>
<td>- (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.9 (9)</td>
</tr>
<tr>
<td>Polyalthia longifolia*†</td>
<td>- (6)</td>
<td>6.2 (2)</td>
<td>- (6)</td>
<td>- (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.4 (2)</td>
</tr>
</tbody>
</table>

† — Species identified through germination experiments

Table 4. Combined monthly variations in the percentage frequency of occurrence ($n$) of the seeds belonging to different plant families identified from the regurgitated pellets and guano samples collected from Jinnah Garden, Lahore, of *P. giganteus* in decreasing order of their frequency of occurrence

<table>
<thead>
<tr>
<th>Tree species</th>
<th>Jan (81)</th>
<th>Feb (112)</th>
<th>Mar (120)</th>
<th>Apr (67)</th>
<th>May (133)</th>
<th>Jun (62)</th>
<th>Jul (89)</th>
<th>Aug (68)</th>
<th>Sep (84)</th>
<th>Oct (13)</th>
<th>Nov (56)</th>
<th>Dec (94)</th>
<th>Total (979)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moraceae</td>
<td>65.4 (53)</td>
<td>92.9 (104)</td>
<td>100 (120)</td>
<td>35.8 (24)</td>
<td>56.4 (75)</td>
<td>100 (62)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50.7 (497)</td>
</tr>
<tr>
<td>Ebenaceae</td>
<td>34.6 (28)</td>
<td></td>
<td></td>
<td>32.8 (22)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myrtaceae</td>
<td>- (6)</td>
<td>5.4 (6)</td>
<td>31.3 (21)</td>
<td>21.1 (28)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meliaceae</td>
<td></td>
<td>- (6)</td>
<td></td>
<td>15.8 (21)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.9 (48)</td>
</tr>
<tr>
<td>Sapindaceae</td>
<td>- (6)</td>
<td>- (6)</td>
<td>- (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arecaceae</td>
<td>- (6)</td>
<td>- (6)</td>
<td>6.8 (9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.9 (9)</td>
</tr>
<tr>
<td>Annonaceae</td>
<td>- (6)</td>
<td>- (6)</td>
<td>- (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.2 (2)</td>
</tr>
</tbody>
</table>
In Nepal most of bat study was focused from Eastern Nepal to Western Nepal. But in Far Western Nepal, the study of bat was not conducted till now.

From Mid Western Nepal rare studies had been carried out from Ringmo in Dolpa district (Kock. 1996), Bhojbhanapur of Banke district (Agrawal and Chakraborti, 1971), Banke district, Darakhuti of Dang-Deukhari (FMNH), Dang – Deukhari district (Mitchell 1980) Bairia.

This is the first attempt of bats study from Far-western Development Region, Nepal. This study was conducted from 26-29th Oct 2010, in four different sites of kanchanpur district: Purina Lake (Tal), Mandipur (Ashok Tree line), Daijee Prem Chaudhary House and Vegetable Field. The study methodology included: Roost Survey, Mist-netting and direct eye observation for tree roosting bats.

Major Field Activities
26th Oct 2010, Mist-netting at Purina Tal:
Purina Tal (28°56'36.30"N, 80°16'32.90"E) is located at elevation of 202m from sea level, lies in Jay Shankar Community forest, Daijee V. D. C, Kanchapur district. The temperature of the study area was 28.0°C and humidity was 63% during the study period. The major tree species in study area are Bambusa tulda, Shorea robusta, Eugenis jamddana, Dalbergia sissoo, Psididium guajava, Melia azedarach, Eucalytus sp., Bauhinia malabarica Ficus nemoralis, Calotropis gigautenus, Mangifera indica, Schleichera trijuga, Musa paradissica, Moras alba, Dalima etc.

We set the mist-net at the edge of lake at 17:00 hrs until 19:00hrs. At 18:04 hrs flight of an individual bat at about 50-60 feet above the ground was observed, while at 18:14 hrs about 2-3 individuals were seen flying above the ground. At last 6-7 individuals were found flying and they entered the village at 18:30 hrs but no –individual could be mist-netted. About 18:50 hrs we started to pack-up the net and left the place at 19:00 hrs.

27th Oct 2010, Roost survey of Bat in Mandipur:
Mandipur (28°57'45.4"N, 80°13'36.9"E) is located at 204m above the sea level and lies in Suda V.D.C, Mandipur. The major vegetation of the area are Ashoka (Saraca asoka), Psididium guajava, Mangifera indica etc.

We observed a colony of about 15-16 individuals of Cynopterus sphinx roosted on Saraca asoka and in another tree we observed two and last one tree contained single individual in Ashok tree in front of Guddhu Rana house. We photographed the roosting tree with bats. Then we measured one dead individual of Cynopterus sphinx (juvenile) which was found dead fallen under the same tree.

28th Oct 2010, Roost survey of Bats in Daijee Prem Chaudhary House
Daijee Prem Chaudhary House (28°56'46.9"N, 80°16'36.8"E) is located at the altitude of 189 m (706.66 feet) above sea level, which lies in the Daijee V.D.C Ward No 1, Kanchunpur district.

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1 Small Mammals Conservation and Research Foundation, SMCRF, New Baneshwor, Kathmandu, Nepal. email: rameshwar@hotmail.co.uk
The temperature of the study area is 21°C and humidity ranged between 69%-80% during the study period. The major vegetation encircling the house are *Dalbergia Sissoo*, *Psidium guajava*, *Mangifera indica*, *Citrus aurantifolia* etc.

During roost survey, we came to know that bats lies in the roof hole of Prem dai’s house. We set up the mist-net covering the hole at roof from 17:30 - 19:00 hrs. At 18:05 hrs 3-4 individuals were seen flying the house area, from other sites. At 18:15 hrs one individual coming out of the roof hole was mist-netted. We measured and photographed the individual and released it. Then at 18:39 hrs another individual was mist-netted but it flew away during handling before measurement. The maximum number of bats were flying around the mist-netted area at 18:29. At 18:45 we started to Pack-up and left the place at 19:00. The measured species was identified as *Scotophilus heathii*.

29th Oct 2010, Mist-netting at Vegetable Field, Mandipur: Vegetable field (28°57'4.1"N, 80°13'41.00"E) of Mandipur V. D. C is located at altitude of 196 m above sea level. The temperature & humidity ranges 19.9°C-24.3°C and 77%-99% during the study periods of this study site. The major vegetation of the area including 23 species of trees with dominated trees as *Dendrocalamus strict*, *Eucalyptus sp.*, *Dalbergia sissoo* etc.

We set Mist-net at 18:10 – 19:30 hrs. At first bat was seen emerging at 18:15 hrs, while Maximum flight was observed at 18:22 hrs of about 13-14 individuals. First bat was mist-netted at 18:26 hrs and 2nd and 3rd were mist-netted 18:34 hrs and 18:46 hrs respectively. We released the net and measured all three individual bats, Photographed and release them. All measured species were identified to be *Cynopterus sphinx*.

**Photo 3**: Daijee Prem dhangora house

**Photo 4**: Mist-netting at Mandipur vegetable field

**Photo 5**: *Scotophilus heathii*

**Photo 6**: *Cynopterus sphinx*
## Result

### Table: Measurement of bats captured in the study area.

<table>
<thead>
<tr>
<th>Bat Species</th>
<th>Cynopterus sphinx</th>
<th>Scotophilus heathi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cs1</td>
<td>Cs2</td>
</tr>
<tr>
<td>External Measurements (mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HB</td>
<td>93</td>
<td>43</td>
</tr>
<tr>
<td>T</td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>TIB</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>HF</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>FA</td>
<td>73</td>
<td>72</td>
</tr>
<tr>
<td>Thumb</td>
<td>32</td>
<td>26</td>
</tr>
<tr>
<td>5MT</td>
<td>42</td>
<td>46</td>
</tr>
<tr>
<td>1Ph 5MT</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>2Ph 5MT</td>
<td>26</td>
<td>23</td>
</tr>
<tr>
<td>4 MT</td>
<td>46</td>
<td>45</td>
</tr>
<tr>
<td>1Ph 4MT</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>2Ph 4MT</td>
<td>29</td>
<td>27</td>
</tr>
<tr>
<td>3MT</td>
<td>49</td>
<td>47</td>
</tr>
<tr>
<td>1Ph 3MT</td>
<td>31</td>
<td>33</td>
</tr>
<tr>
<td>2Ph 3MT</td>
<td>46</td>
<td>44</td>
</tr>
<tr>
<td>WSP</td>
<td>510</td>
<td>496</td>
</tr>
<tr>
<td>E</td>
<td>21</td>
<td>23</td>
</tr>
<tr>
<td>Tragus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (A/Y)</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Sex (M/F)</td>
<td>F</td>
<td>M</td>
</tr>
<tr>
<td>Wt.</td>
<td>55 gm</td>
<td>48 gm</td>
</tr>
<tr>
<td>Ectoparasites (P/A)</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>

Note: HB = Head Body; T = Tail; TIB = Length of Tibia; HF = Hind foot; FA = Forearm; WSP = Wingspan; 5MT = Fifth Metacarpal; 4MT = Fourth Metacarpal; 3MT = Third Metacarpal; 1Ph 5MT = First Phalange Fifth Metacarpal; 1Ph 4MT = First Phalange Fourth Metacarpal; 1Ph 3MT = First Phalange Third Metacarpal; 2Ph 5MT = Second Phalange Fifth Metacarpal; 2Ph 4MT = Second Phalange Fourth Metacarpal; 2Ph 3MT = Second Phalange Third Metacarpal; E = Ear (pinna from base to tip); Wt. = Weight.

## Conclusion

Altogether 36 individuals were observed and 4 were captured and released from the four sites of study area. Two species *Cynopterus sphinx* and *Scotophilus heathii* were identified from external morphometric measurements. A colony of about 16 individuals of *Cynopterus sphinx* was observed in single Ashok Tree of Mandipur, Suda V.D.C. We were unable to cover larger part of Kanchunpur district. Thus detail study of bats should be conducted not only in Kanchunpur district but also within the whole Far-western Development Region. This area probably seems to be an important area for assemblage of new species of bat to Nepal as well as to science.

## Acknowledgements

We would like heartly thanks to Mr. Aman Dangaura (Graduate Student CDES, TU), Prem Dangaura, Nishant Dangaura and Rup Singh Dangaura for supporting us in the field. We would like to heartly acknowledge Prof. Paul A. Racey, Chair, IUCN SSC Chiroptera Specialist Group, and Regius Professor of Natural History, School of Biological Sciences, Aberdeen for providing us a mist-net, and Dr. Gabour Csorba, Deputy Director and Curator of Mammals, Department of Zoology, Hungarian Natural History Museum, Budapest, Hungary; Mr. Malcolm Pearch of Harrison Zoological Museum and Mr. Sanjan Thapa of Small Mammals Conservation and Research Foundation (SMCRF), Nepal for review comments. We express sincere gratitude to Sally Walker Mam; Dr. B.A. Daniel, Dr. Sanjay Molur, Zoo Outreach Organization, Coimbatore, India.
Philippine Bat Conservation Forum
Wednesday, 26th January 2011, Camp Holiday, Babak, Island Garden City of Samal
8:00am-5:00pm

*Prizes to be raffled to those who are at the venue by 8:00 am!

The Philippines has at least 74 species of bats, of which 26 are found nowhere else in the world!
Learn about Philippine bats and the bats in the Monfort cave on Samal Island, Guinness World Record holders for the largest colony of Geoffroy’s rousette bats.

The Bats of Monfort Cave
Dr. Rick Sherwin (Christopher Newport University),
Mr. Jim Kennedy (Bat Conservation International),
Dr. Dave Waldien (Bat Conservation International)

Status of Philippine Cave Bats: a preliminary report
Ms. Lisa Paguntalan, Philippine Biodiversity Conservation Foundation, Inc.

Threats to Caves and Philippine Cave Bats
Mr. Gil Madronero Jr., Philippine Speleological Society, Inc.

Bat Conservation in South-East Asia
Dr. Tigga Kingston, South-East Asian Bat Conservation Research Unit and Texas Tech University

Bat Conservation: an international perspective
Ms. Nina Fascione, Bat Conservation International

The Way Forward for Bat Conservation in the Philippines
Director Theresa Mundita Lim, Protected Areas and Wildlife Bureau

Departure for Monfort Cave, Babak, Samal to observe Bat Emergence Night
at 5:00 pm (for those interested)

Camp Holiday is at Kinawitnon Ferry Terminal, Babak, Samal. Take the barge at the Vehicle Ferry Terminal in Sasa or the Island City Express bus to Samal from Magsaysay Park.

This event is being conducted in partnership with and support from:
Monfort Bat Cave and Conservation Foundation, Philippine Bat Conservation, the Department of Environment and Natural Resources, Philippine Speleological Society, Texas Tech University, Christopher Newport University, Philippine Biodiversity Conservation Foundation, Disney Friends For Change Program Green and the Beneficia Family Foundation.

RSVP. Please contact Bernie at (082) 234-7958 302-8696 or via mobile at 0923-723-4117 to confirm your slot.
In Celebration of the
YEAR OF THE BAT 2011
BAT CAMP 2011 - January 22-30, 2011
Monfort Conservation Park (MCPARK)
Island Garden City of Samal

DAY TO DAY ACTIVITIES

January 22 (Saturday)  -  Blessing of “Bat Packers Inn”, Coffee and Gift Shop
-  Volleybats Batch 1
-  Awarding for Volleybats Batch 1
-  Opening of Biodiversity and Conservation Exposition
-  Open Public Fun Outdoor Activities (Zip line etc.)
-  Open Public Art Workshop
-  Henna Painting
-  Start of Outdoor Retreat “Together with Bats” Bonfire
-  BEN Tour (Bat Emergence Night Tours) 6pm to 8pm

January 23 (Sunday)  -  Bike for Bats Fun Ride
-  Raffle Draw for Bike for Bats Fun Ride
-  Volleybats Batch 2
-  Tree Planting Activities Day 1
-  Awarding for Volleybats Batch 2
-  Open Public Fun Outdoor Activities (Zip line etc.)
-  Open Public Art Workshop
-  Henna Painting
-  Biodiversity and Conservation Exposition Day 2
-  “Together with Bats” Outdoor Retreat Bonfire
-  BEN Tour (Bat Emergence Night Tours) 6pm to 8pm

January 24 (Monday)  -  Cave Bats Workshop (By invitation Participants Arrival/Registration)
-  Tree Planting Activities Day 2
-  Open Public Fun Outdoor Activities (Zip line etc.)
-  Open Public Art Workshop
-  Biodiversity and Conservation Exposition Day 3
-  BEN Tour (Bat Emergence Night Tours) 6pm to 8pm
-  “Together with Bats” Outdoor Retreat Bonfire

January 25 (Tuesday)  -  Cave Bats Workshop Day 2 (By invitation only Marex Resort)
-  Tree Planting Activities Day 3
-  Arrival of Conservation Migration Eco Tour From USA
-  Open Public Fun Outdoor Activities (Zip line etc.)
-  Open Public Art Workshop
-  Biodiversity and Conservation Exposition Day 4
-  BEN Tour (Bat Emergence Night Tours) 6pm to 8
-  “Together with Bats” Outdoor Retreat Bonfire

Small Mammal Mail - Bi-Annual Newsletter of CCINSA & RISCINSA
Volume 3, Number 1, Jan-Jun 2011
January 26 (Wednesday)  - Cave Bats Workshop Day 3 (By invitation only Marex Resort)  
- Tree Planting Activities Day 4  
- Open Public Fun Outdoor Activities (Zip line etc.)  
- Open Public Art workshop  
- Biodiversity and Conservation Exposition Day 5  
- Bat Conservation Forum at Camp Holiday, Babak (By Invitation)  
- BEN Tour (Bat Emergence Night Tours) 6pm to 8pm  
- Dinner: Leaders Eco-Tour Participants and VIP Guests  
- “Together with Bats” Outdoor Retreat Bonfire

January 27 (Thursday)  - JAPAN DAY – Japanese Conservation Group Presentation  
- Cave Bats Workshop Day 4 (Wrapping Up)  
- Tree Planting Activities Day 5  
- Open Public Fun Outdoor Activities (Zip line etc.)  
- Open Public Art workshop  
- Biodiversity and Conservation Exposition Day 6  
- BEN Tour (Bat Emergence Night Tours) 6pm to 8pm  
- “Together with Bats” Outdoor Retreat Bonfire

January 28 (Friday)  - Teachers Workshop: Educators for Bat Education in Mindanao  
- Tree Planting Activities Day 6  
- Open Public Fun Outdoor Activities (Zip line etc.)  
- Open Public Art workshop  
- Biodiversity and Conservation Exposition Day 7  
- BEN Tour (Bat Emergence Night Tours) 6pm to 8pm  
- “Together with Bats” Outdoor Retreat Bonfire

January 29 (Saturday)  - Teachers Workshop Day 2 and Integration with  
- Teens Camp (Arrival and Registration)  
- Tree Planting Activities Day 7  
- Open Public Fun Outdoor Activities (Zip line etc.)  
- Open Public Art workshop  
- Biodiversity and Conservation Exposition Day 8  
- Poetry Reading with Mutya Ng Dabaw  
- BEN Tour (Bat Emergence Night Tours) 6pm to 8pm  
- “Together with Bats” Outdoor Retreat Bonfire

January 30 (Sunday)  - Teens Camp Day 2  
- Kids Bat Club Day organized at Eco-Conservation Fair, April 2010  
- Tree Planting Activities Day 8  
- Bamboo Rafting Race  
- Open Public Fun Outdoor Activities (Zip line etc.)  
- Open Public Art workshop  
- BEN Tour (Bat Emergence Night Tours) 6pm to 8pm  
- “Together with Bats” Outdoor Retreat  
- BAT CONSERVATION - Closing of Bat Camp 2011

For information:  Globe 09177054295, Smart 09299693299, Sun 09237234117,  
Landlines 2351298, 3021424
SMALL MAMMAL NETWORKS

Chiroptera Conservation and Information Network of South Asia (CCINSA)

CCINSA is a network of South Asian Chiroptera specialists, educators and enthusiasts. The network aims to enhance communication, cooperation and collaboration among chiroptera specialists of this region and thereby create a chiroptera conservation “community” for better biodiversity conservation.

Chair: Sripathi Kandula
Convenor and Administrator: Sally Walker
Red List and Technical Expert: Sanjay Molur

Rodentia, Insectivora, and Scandentia Conservation & Information Network of South Asia (RISCINSA)

RISCINSA network of South Asia was suggested by interested biodiversity conservation specialists and the purpose of this network, then is to link together rodent field researchers and their field knowledge throughout South Asia (Afghanistan, Bangladesh, Bhutan, India, Nepal, Maldives, Pakistan and Sri Lanka) so the pooling of information can lead to conservation action.

Scientific Chair: Sujit Chakraborty
Convenor and Administrator: Sally Walker

Small Mammal Mail

SMM is bi-annual Newsletter celebrating the most useful yet most neglected Mammals for both CCINSA & RISCINSA -- Chiroptera, Rodent, Insectivore, & Scandens Conservation and Information Networks of South Asia

Editor: Sally Walker; Technical Advisors: Sanjay Molur, B.A. Daniel, R. Marimuthu; and Publication Assistants: Latha Ravikumar, Ravichandran, Pravin Kumar

CCINSA and RISCINSA are an activity of Zoo Outreach Organisation (ZOO) and Wildlife Information Liaison Development (WILD) in association with CBSG, South Asia and RSG, South Asia.

Note: ZOOS’ PRINT Magazine, Journal of Threatened Taxa, Newsletters and a variety of reports can be found on our websites: www.zooreach.org and www.zoosprint.org.

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