

A review on species diversity and distribution of bats fauna, threats and conservation problems

Narayan Lal Choudhary¹, Nadim Chishty^{2*} and Rehana Parveen³

^{1,2*}Wildlife, Limnology & Toxicology Research Laboratory, Department of Zoology, Govt. Meera Girl's College, MLSU, Udaipur-313001 (India)

³Department of Zoology, Government Meera Girl's College, MLSU, Udaipur-313001 (India)

E-mail- narayanlalchoudhary1995@gmail.com, agrparveen126@gmail.com

Corresponding author E-mail- nadimchishty@gmail.com

Abstract

This study provides the primary information about the population of (Indian flying fox) *Pteropus giganteus*, feeding, diversity, survival and conservation of bats. Disturbance at roosting places, hunting and use of pesticides are main causes for its declination. Bats are strictly vegetarian and mainly devour fruits, nectar and pollen grains. Bats are bio-indicator species and very sensitive to change in environment.

Chiropteran are mammals and mostly named as bats, they are true flying mammals which include in total, 1116 species of 202 genera over 18 families. They are globally distributed and constitute about a one-fourth of the total mammals species³⁷. Many bats species when come in contact with human and live stocks, It may increase virus mediated and zoonotic diseases. Recently Henipa and Paramyxo viruses were spreads in humans and livestock's due to bat^{6,9,12}. The Indian *Giaganteus* species of *Pteropus* is the biggest and most important in all fruit baits of world²². They display different kinds of behaviors such as rest, groom, chitchat, crawling between twig to twig and fight with crow in the morning and evening time. They go away from the roost and come back before sunrise and all individuals come almost two hours after sunrise¹⁷. Naturally,

the emergence of *Pteropus giganteus* behavior pattern is mainly affected by different climatic factors such as clouds, fog, moon light³⁶, light intensity⁵, rain⁸, food availability¹⁹, predatory risk and age structure³⁶. Generally pregnant and lactating females spend more time in breeding colonies as compare to other individuals of bats⁷. *Pteropus* resides in almost in every part of the world like tropical, temperate except in polar region and in some isolated islands. Bats are large in size in tropical forests while smaller in cold temperate areas of the world. Maximum diversity of bates were found in tropical countries as compare to temperate region. In temperate region bates usually migrate in winter from colder to warmer region (Temperate countries to tropical counties) and temperate bates hibernate in summer season¹³.

2. Threats of its Survival and Conservation:

In recent years, population of bats has experienced a decrease globally, a trend linked to extensive recent habitat loss and habitat modification²⁴. 20% of the bats species in Southeast Asia are predicted to become extinct in 21 century¹⁸. Habitats of bats have been affected by agricultural land expansion in the world. 'Slash and burn' traditional cultivation techniques of agriculture have also affected bats 'population in recent time. Presently India and some other countries have a traditional agricultural methods, for that primary forests use to burn by nomadic peoples name Et-highlands is given to crops. The vegetation covers are destroyed by slash & burn and many also kill individuals of bats that use tree crevices such as roots, affecting many of the threatened species of bats. Beside, pesticides are used in agriculture land with declined mammalian diversity, where highly toxic alternative such as, DDT are even used in developing countries¹⁰. Community structure, biodiversity and ecosystem functions may ultimately be affected by a loss or significant decline in population of bats²⁹. Moreover, the destruction of forests habitat is temporary phase in the process of destroying causing geographical and temporal disintegration among flora and fauna hence preparing bad ecological situation which are insufficient for the survival of bat species^{20,31}. Generally the species are listed as least concern (LC) in the IUCN red list categories and locally these species reported as threatened because its habitat destroying such as cutting and logging of roosting trees for road development and human settlements²⁵. The species are also hunted in many places for meat for medicinal purpose noticed by Molur, *et al.*,²⁶.

Development of industrial activities, agriculture and other pressure from increasing of human population mainly are common threats for fruit bats throughout the world¹⁴.

3. Species Diversity and Abundance :

The Indian flying fox is the greatest and famous of all fruits bats in Nepal and one of the biggest bats in the world^{21,22}. Indian flying fox is widespread found across most of Nepal. Mainly Indian flying fox is reported in China, India, Pakistan, Myanmar, Maldives, Bangladesh, Bhutan and Shrilanka¹⁶. Bats have been found in the almost all geographic areas of the world, but they are not reported in the Arctic and Antarctic desert area and a few isolated oceanic islands^{15,23}. Bats are affected by habitat disturbance and land-space change from anthropogenic activities^{32,38} and could be used as single species.

4. Food and Feeding :

The Indian flying foxes staying in enormous colonies have been found to feed on fruits, leaves, shoots, buds, nectar and pollen of tropical trees and shrubs^{1,4,33}. Bats are strictly vegetarian such as foraging for fruits, nectar and pollen using their sight and sensitive sensory system²⁸. The roost of bats can be different types into day roosts, night roosts, maternity and hibernation roots² (Davis, 1969; Humphrey *et al.*, 1977; Kumar, 1982; Barclay and Kurta, 2007) whenever they feed (Neuweiler, 2000; Taylor and Tuttle³⁴). Drink water bates in captivity maintain a constant body temperature³⁰.

This study introduces a baseline data which might be considered as a primary step to a broad line of issue that concerns our

environment. This will also be helpful in understanding the effect on the health of humans and threats to biodiversity in particular using bats as a bio-indicator and pointing out the effect of their destruction.

References :

1. Banack S.A. (1996). Flying foxes, genus *Pteropus*, in the Samoan Islands: interaction with forest communities. Ph.D thesis. University of California, Berkeley.
2. Barbour, R.W. and W.D. Davis (1969). *Bats of America*. The University of Kentucky Press, Lexington, Kentucky, 286pp.
3. Barclay R.M.R. and A. Kurta (2007). Ecology and behavior of bats roosting in tree cavities and under bark, pp. 17-59. In: Lacki, M.J., J. P. Hayes & A. Kurta (eds.). *Bats in forests: Conservation and management*. John Hopkins University Press, Baltimore, Maryland. USA.
4. Bonaccorso F.J. (1998). *Bats of Papua New Guinea*. Conservation International, Washington D.C.
5. Downs, N.C., V. Beaton, J. Guest, J. Polanski, S.L. Robinson, and P.A. Racey. (2003). *Biological Conservation 111*: 247–252.
6. Drexler, J. F., V.M. Corman, M.A. Muller, G.D. Maganga, P. Vallo, T. Binger, F. Glozaraus, A. Rasche, S. Yordanow, A. Seebens, S. Oppong, Y. Adu Sarkodle, C. Pongombo, A.N. Lukashew, J. Schimidtchanasit, A. Stocker, A.J. Carnerio, S. Erbar, A. Maisner, F. Fronhoffs, R. Buettner, E.K. Kalko, T. Kruppa, C.R. Franke, R. Kallies, E.R. Yandoko, G. Herrler, C. Reusken, A. Hassanin, D. H. Kruger, S. Matthe, R.G. Ulrich, E.M. Leroy and C. Drosten (2012). *Nature communication*. 3: 796.
7. Duverge, P.L., G. Jones, J. Rydell, and R.D. Ransome (2000). *Ecography 23*: 32–40.
8. Entwistle, A.C., P.A. Racey, and J.R. Speakman (1996). *Philosophical Transactions of the Royal Society of London B: Biological Sciences 351*: 921–931.
9. Epstein, J.H., V. Prakash, C.S. Smith, P. Daszak, A.B. Mc Laughlin, G. Meehan,, H.E. Field and A.A. Cunningham (2008). *India Emerg. Infec. Disease 14*: 1309–1311.
10. Fenton M.B. and I.L. Rautenbach (1998). Impacts of ignorance and human and elephant populations on the conservation of bats in African woodlands. Smithsonian Institution Press, Washington DC. 261–270pp.
11. Hahn, M., J.H. Epstein, E. Gurley, M. S. Islam, S. Luby, P. Daszak, and J.A. Patz (2014). *Journal of Applied Ecology 51*: 376–387.
12. Hahn, M.B., J.H. Epstein, E.S. Gurley, M.S. Islam, S.P. Luby, P. Daszak and J.A. Patz (2014). *Journal of Applied ecology, 51*: 376-387.
13. Hill J.E. and J.D. Smith (1984). *Bats: A Natural History*, British Museum (Natural History), London.
14. Hutson, A.M. (2002). A feasibility study on additional bats Agreements under CMS. Submitted to the 11th Meeting of the CMS Scientific Council (UNEP/ScC11/ Doc.7).
15. Hutson, A.M., S.P. Mickleburgh and P.A. Racey (2001). *Microchiropteran Bats: Global Status, Survey and Conservation Action Plan*. International Union for

- Conservation of Nature and Natural Resources, Chiroptera Specialist Group (IUCN/SSC). Gland, Switzerland.
16. Jnawali, S., H.S. Baral, S. Lee, K.P. Acharya, G.P. Upadhyay and M. Pandey, *et al.* (2011). The status of Nepal's mammals: the national red list series. Kathmandu: Department of National Parks and Wildlife Conservation.
 17. Koju, N.P. and M.K. Chalise (2010). *Nepal. Journal of Natural History Museum* 25: 256–265.
 18. Lane D.J.W., T. Kingston, BPY-H Lee (2006). *Biol. Conserv.* 16: 584-593.
 19. Lee, Y.F., and G.F. McCracken. (2001). *Zoological Studies* 40: 309-316.
 20. Lovejoy T.E., R.O. Bierregaard, A.B. Rylands, J.R. Malcom, C.F. Quin-tela, L.H. Harper, K.S. Brown, A.H. Powell, G.V.N. Powell, H.O.R. Schubart and M.B. Hays (1986). Edge and other effects of isolation on amazon forest fragments. In: Soule, M. E. (ed.), Conservation biology: sciences of scarcity and diversity. Sinauer Assoc., Sunderland, Massachusetts. PP. 257-285.
 21. Marimuthu, G. (1996). Nature watch. *Resonance* 1: 103. doi: 10.1007/BF02835626.
 22. Mathur, V., Y.S. Priya, H. Kumar, and V. Elangovan (2012). *Journal of Threatened Taxa* 4 (7): 2699–2704.
 23. Mickleburgh, S. P., A. M. Huston, and P. A. Racey. (1992). Old World Fruit Bats: An Action Plan for their Conservation. International Union for the Conservation of Nature and Natural Resources (IUCN), Gland, Switzerland.
 24. Mickleburgh S.P., A.M. Hutson and P.A. Racey (2002). *Oryx*. 36: 18-34.
 25. Molur S and S. Walker (1998). Conservation Assessment and Management Plan (C.A.M.P.) workshops. Mammals of Indian report summary. Z.O.O. India.
 26. Molur, S., C. Srinivasulu, P. Bates, and C. Francis. (2008). *Pteropus giganteus*. The IUCN Red List of Threatened Species.
 27. Neuweiler, G (2000). The Biology of Bats. Oxford University board. Oxford, United Kingdom, 310pp.
 28. Nowak, R. M. (1999). Walker's mammals of the world, Volume I, 6th ed. Baltimore, MD: The Johns Hopkins University Press.
 29. Rainey W.E. (1998). Conservation of bats in remote Indo-Pacific Islands, In: Bats Biology and Conservation. Smithsonian Institution Press, Washington, D.C.
 30. Robinson, K.W. and P.R. Morrison (1957). *Journal of Cellular and Comparative Physiology* 49: 455–478.
 31. Saunders D.A., R.J. Hobbs, C.R. Margules (1991). *Cons. Biol.* 5: 18-32.
 32. Struebig, M. J., T. Kingston, A. Zubaid A. Mohd-adnan and S. J. Rossiter (2008). *Biological conservation*, 141: 2112-2116.
 33. Tan K.H., A. Zubaid, T.H. Kunz (1998). *J. Trop. Ecol.* 14: 299 – 307.
 34. Taylor, D.A.R. and M. D. Tuttle (2007). *Animal Behaviour* 34: 1880–1889.
 35. Welbergen, J.A., (2006). *Behavioral Ecology and Sociology* 60: 311.
 36. Welbergen, J.A. (2008). *Animal Behaviour* 75: 1543-1550.
 37. Wilson, D. E. and D. M. Reeder (2011). Class Mammalia Linnaeus, 1758. In: Zhang, Z.-Q. (Ed.) *Zootaxa*, 3148: 56–60 (23 Dec. 2011) Mangolia Press.
 38. Zubaid, A. (1993). *Malaysia. Mammalia*, 57: 201-206.