New records and present status of bat fauna in Mizoram, North-Eastern India

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Abstract

Aim: The present study aimed to investigate the diversity of bat fauna in Mizoram and prepare a checklist for future references. This study also investigated threats and suggested recommendations for implementing conservation measures for bat fauna in Mizoram.

Methodology: The present study was carried out in different parts of Mizoram between January 2012 - October 2019. Bats were trapped by using mist nets and hoop nets. Diagnostic morphological characters of bat were used for species identification. Digital camera and video camera were also used for further identification and documentation of bats.

Results: During January 2012 – December 2016, eighteen bat species were identified. Recently, from January 2017 - October 2019 insectivorous bat species, *Scotomanes ornatus* was first time documented in Serchhip District (23.3°N 92.83°E), Mizoram. In total nineteen bat species were identified in this study, out of which ten species were first time recorded and nine species were rediscovered from the previous documentation. From the previous and present data, total of thirty-six bat species were recorded in Mizoram- nine species of frugivorous bats and twenty-seven species of insectivorous bats.

Interpretation: To protect and conserve the bat fauna in Mizoram human activities should be restricted and may even be banned in and around the bat roosting sites. Plantation of edible fruits for frugivorous bats is highly recommended. This study reveals that there is an urgent need for public awareness of the beneficial aspects of bats and removing the century-old misconception about bats.

Key words: Bats, Conservation, Diversity, Mizoram, *Scotomanes ornatus*

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Introduction

Bats are one of the most widespread animals found almost everywhere, except in some Oceanic Islands. At present, 1240 species in 202 genera under 18 families of bats are recognized worldwide, comprising the second largest mammal species, next to rodents (Wilson and Reeder, 2005). They belong to the order Chiroptera (meaning hand-winged), divided into two major groups: suborder Megachiroptera (consisting 186 species in one family), and suborder Microchiroptera (consisting 1054 species in 17 families) (Mickleburgh *et al.*, 1992; Koopman, 1993; Srinivasulu and Srinivasulu, 2001; Hutson *et al.*, 2001; Mickleburgh *et al.*, 2002). They usually live in colonies and mainly rely on fruits and insects for food, hence designated as frugivorous and insectivorous respectively.

In India, 117 species and 100 subspecies of bats under 39 genera belonging to 8 families have been identified (Simmons, 2005). Since 1960, various dedicated mammalogists have been investigating the diversity, taxonomy, geographical distribution, status survey and ecology of bats from different parts of India (Brosset, 1962; Bhat, 1974; Bastawde and Mahabal, 1976; Marimuthu, 1998; Srinivasulu and Srinivasulu, 2001; Nameer, 2003; Korad, 2005; Vanitharani and Praba, 2011). Study of foraging range, strategies and pollination of bats were investigated (Elangovan *et al.*, 1999; Nathan *et al.*, 2009; Korad, 2014; Rathinakumar *et al.*, 2016). Investigation of vectors, parasites and diseases of bats were also carried out by many scientists (Banerjee *et al.*, 1984; Sarkar and Chakravarty, 1991; Agarwal, 2006; Yadav *et al.*, 2012).

The north eastern region of India exhibits rich abundance of mammalian fauna including 70 bat species (Bates and Harrison, 1997; Thabah and Bates, 2002; Ruedi *et al.*, 2012; Lalthanzara, 2017; Bora *et al.*, 2018). The Zoological Survey of India, Kolkata contributed immensely in the study and succeeded in recording 44 bat species from Meghalaya, Mizoram and Tripura during the 1990s (Das *et al.*, 1995; Sinha, 1999; Mandal *et al.*, 2000). Agarwal and Bhattacharya (1977) undertook a detailed study on the ecology and biodiversity of bats in Tripura. A comprehensive study of bat fauna was also carried out in Meghalaya by Das *et al.*, (1993). The geographical distribution and habitat preference of the Dobson's Long-tongued fruit bat, *Eonycteris spelaea* from Meghalaya, Manipur and Nagaland was studied (Sinha, 1990; Sinha, 1994a). Similarly, ecological information on the sub-tropical cave dwelling bat, *Myotis longipes* from Meghalaya was reported (Sinha, 1994b).

Owing to various factors, bats remain among the least studied group of mammals in Mizoram in spite of the ongoing interest in the said study worldwide. Nevertheless, from 1993 to 1997, Zoological Survey of India undertook to enlist the mammals of Mizoram which include several bat species (Mandal *et al.*, 1997; Mandal *et al.*, 2000). Bhattacharya and Ghosh (2001)

painstakingly collected data on biodiversity of bat fauna in three districts - Aizawl, Lunglei, Chhimitupui, and enlisted 24 bat species and concluded that the diversity of bat species is mind boggling.

In view of the above, the present study was conducted to investigate the diversity of bat fauna in Mizoram and make a checklist for future references. This study also investigated threats and suggested recommendations for implementing conservation measures of bat fauna in Mizoram.

Materials and Methods

Study site : Mizoram (21°56'N to 24°31'N and 92°16'E to 93°26'E) is a small state (21,087 sq km approximately) in the north-eastern part of India having interstate boundary with Tripura, Assam and Manipur. It also shares 722 km international border with the neighbouring countries of Bangladesh and Myanmar. The state has a moderate climate, with temperatures ranging from 20 °C to 29 °C during summers and 7 °C to 22 °C during winters, and annual rainfall of 254 cm.

Nearly 90.68% (1,594,000 ha) of Mizoram's total land area is under forest and tree cover. Tropical Semi Evergreen, Tropical Moist Deciduous, Subtropical Broadleaved Hill and Subtropical Pine Forests adorn its beautiful hills, thus enabling the state to become one of the Biodiversity hotspots in India, providing home to several flora and fauna diversities, including bat fauna.

Field survey and species identification : Several surveys were carried out in wildlife sanctuaries, national parks and popular bat caves in different parts of Mizoram covering four districts, Aizawl (23°43'38"N and 92°43'04"E), Lunglei (22.88°N and 92.73°E), Champhai (23.456°N 93.329°N), Serchhip (23.3°N 92.83°E) from January, 2012 to October, 2019. Bats were trapped using mist-net (Avinet-Dryden NY 13053-1103, US) in wild banana forest, bamboo thicket, moist deciduous forest, forest stream and caves. Depending on the space availability, different number of Mist-nets (10x3 m) mounted on bamboo poles were placed randomly at the study sites usually in the evenings at 18:30 hrs and the bats hence caught in the nets were collected at around 05:30 hrs in the mornings. Hoop-nets were also used to capture bats inside the caves. Netted bats were placed in cloth bags and weighed using spring balance. Morphological characters such as fore-arm length, body length, head-body length, ear length, hind foot length and tail length were then employed to identify the bat species with the help of millimeter graded steel scale to the nearest 1 mm (Bates and Harrison, 1997; Srinivasulu *et al.*, 2010). Photographs of captured bats were also taken by using Video Camera (Sony HDR-XR350V, Japan) and Digital Still Camera (Cannon DS126291, Taiwan) for further identification and documentation. They were then released immediately after identification. Also, dead bats found in the study area were immersed in 10%

formaldehyde solution for further identification and preservation. The checklist, data is fundamentally based on Chiroptera catalogue published by Zoological Survey of India, Kolkata (Ghosh, 2008). In order to estimate and photograph bat population in the colonies, search was also made inside caves, old buildings, tree barks, hollows, bamboos, wild banana leaves and rock crevices during daytime. Furthermore, threats to bats were monitored by visiting the known roosting sites and observing their population throughout the year. Different reasons for declining bat population were also identified.

Results and Discussion

During the study period, from January 2012 to October, 2019, nineteen bat species were identified, out of which ten were recorded for the first time and nine were rediscovered from the previously recorded species (Table 1). Newly recorded species include *Pteropus giganteus* (Brunnich), *Rousettus aegyptiacus* (E. Geoffroy), *Pipistrellus tenuis* (Temminck), *Pipistrellus pipistrellus* (Schreber), *Miniopterus magnater* (Sanborn), *Rhinolophus hipposideros* (Bechstein), *Taphozous melanopogon* (Temminck), *Taphozous longimanus* (Hardwicke), *Hipposideros armiger* (Hudgson) and *Scotomanes ornatus* (Blyth). Among these, a male bat species, *Scotomanes ornatus*, was recently recorded, whose identification was made during January 2017 and October 2019 in Serchhip District, to become the first record of its kind in Mizoram. Morphologically, this bat is endowed with orange-brown and white coloured dorsal pelage, meandering streak, white spots on head and shoulders, icy white coloured ventral surface, pink coloured face, forearm 57 mm long and body weight 24 g. A single pair of upper incisors and upper premolars is the distinctive characteristics of this bat.

The findings of the present study along with the existing data resulted in the documentation of thirty six bat species in Mizoram till date (Table 2). These include nine species of frugivorous bats and twenty seven species of insectivorous bats. Vespertilionidae family contributed the maximum number which includes fifteen bat species, followed by Pteropodidae (9 species), Rhinolophidae (5 species), Hipposideridae (3 species), Emballonuridae (2 species), Megadermatidae (1 specie) and Miniopteridae (1 specie) respectively. This might be a direct consequence of the abundant availability of habitats viz. caves, crevices, tree bark, etc., and feeding habits in Mizoram. Various habitats play an important role in the diversity of bats (Nameer, 2003). The mixed vegetation in the forest may also help the bats to exploit the area efficiently (Verboom and Spoelstra, 1999). The water resources, abundant roosting sites and food availability can also be the factors that support the rich abundance of bat species in Mizoram. The study reveals that the bat diversity of Mizoram could be much more than what is presently known, at the same time a drastic decline in the population of bats is also gravely observed. Thus, there is great scope for more research in the area of identification and conservation of different species of bats in the region.

The IUCN and local status of bats in Mizoram are shown in Table 2. From the present study the local status of bats are as follows: one species as abundant (A), nine species as common (C), twenty two species as uncommon (UC), four species as rare (R). The declining bat population in Mizoram may be attributed in greater percentage to indiscriminate killing by locals for meat. Since, some bat species roost in exposed areas such as branches of trees, palm leaves and banana leaves, they are easy

Table 1 : Different type of bats identified in Mizoram between January 2012 to October 2019

Species	Family	Remarks
<i>Pteropus giganteus</i>	Pteropodidae	New record
<i>Rousettus leschenaultia</i>	Pteropodidae	Rediscover
<i>Rousettus aegyptiacus</i>	Pteropodidae	New record
<i>Cynopterus sphinx</i>	Pteropodidae	Rediscover
<i>Cynopterus brachyotis</i>	Pteropodidae	Rediscover
<i>Macroglossus sobrinus sobrinus</i>	Pteropodidae	Rediscover
<i>Eonycteris spelaea</i>	Pteropodidae	Rediscover
<i>Tylonycteris pachypus fulvida</i>	Vespertilionidae	Rediscover
<i>Murina cyclotis</i>	Vespertilionidae	Rediscover
<i>Pipistrellus tenuis</i>	Vespertilionidae	New record
<i>Pipistrellus pipistrellus</i>	Vespertilionidae	New record
<i>Scotomanes ornatus</i>	Vespertilionidae	New record
<i>Miniopterus magnater</i>	Miniopteridae	New record
<i>Hipposideros lankadiva</i>	Hipposideridae	Rediscover
<i>Hipposideros armiger</i>	Hipposideridae	New record
<i>Taphozous melanopogon</i>	Emballonuridae	New record
<i>Taphozous longimanus</i>	Emballonuridae	New record
<i>Rhinolophus hipposideros</i>	Rhinolophidae	New record
<i>Rhinolophus rouxii</i>	Rhinolophidae	Rediscover

Table 2 : A checklist of bat species of Mizoram and their IUCN and local status

Zoological name	Common name	Family	IUCN and Local Status
<i>Pteropus giganteus</i>	Indian Flying Fox, Indian Flying-fox.	Pteropodidae	LC, R
<i>Rousettus leschenaultia</i>	Leschenault's Rousette, Leschenault's Rousette, Shortridge's Rousette Indian Fulvous Fruit Bat.	Pteropodidae	LC, C
<i>Rousettus aegyptiacus</i>	Egyptian Fruit Bat, Egyptian Rousette.	Pteropodidae	LC, UC
<i>Cynopterus sphinx</i>	Greater Short-nosed Fruit Bat, Short-nosed Fruit Bat.	Pteropodidae	LC, A
<i>Cynopterus brachyotis</i>	Lesser Dog-faced Fruit Bat, Common Short-nosed Fruit Bat, Lesser Short-nosed Fruit Bat, Smaller short-nosed Fruit Bat.	Pteropodidae	LC, C
<i>Megaerops niphanae</i>	Niphan's Fruit Bat, Northern Tailless Fruit Bat, Ratanaworabhan's Fruit Bat.	Pteropodidae	LC, UC
<i>Sphaeris blanfordi</i>	Blanford's Fruit Bat, Blandford's Fruit Bat.	Pteropodidae	LC, UC
<i>Eonycteris spelaea</i>	Dawn Bat, Common Dawn Bat, Common Nectar Bat, Lesser Dawn Bat Dobson's, Long-tongued Fruit Bat.	Pteropodidae	LC, UC
<i>Macroglossus sobrinus</i>	Hill Long-tongued Fruit Bat, Greater Nectar Bat, Greater Long-tongued Fruit Bat, Greater Long-nosed Fruit Bat.	Pteropodidae	LC, UC
<i>Tylonycteris pachypus</i>	Lesser Bamboo Bat, Club-footed Bat, Flat-headed Bat, Lesser Flat-headed Bat.	Vespertilionidae	LC, UC
<i>Barbastella leucomelas</i>	Eastern Barbastelle, Asian Barbastelle.	Vespertilionidae	LC, UC
<i>Harpiocephalus mordax</i>	Greater Hairy Winged-Bat, (Broad-skulled Hairy-winged Bat).	Vespertilionidae	NT, R
<i>Myotis formosus</i>	Hodgson's Bat, Bartel's Myotis, Hodgson's Myotis.	Vespertilionidae	LC, UC
<i>Myotis montivagus</i>	Burmese Whiskered Bat, Burmese Whiskered Myotis, Large Brown Myotis.	Vespertilionidae	LC, UC
<i>Myotis muricola</i>	Whiskered Myotis, Nepalese Whiskered Bat, Nepalese Whiskered Myotis.	Vespertilionidae	LC, UC
<i>Eptesicus pachyotis</i>	Thick-eared Bat.	Vespertilionidae	LC, UC
<i>Pipistrellus circumdatus</i>	Large Black Pipistrelle.	Vespertilionidae	LC, UC
<i>Pipistrellus pipistrellus</i>	Common pipistrelle.	Vespertilionidae	LC, C
<i>Pipistrellus tenuis</i>	Indian Pygmy bat, Least Pipistrelle.	Vespertilionidae	LC, C
<i>Scotozous dormeri</i>	Dormer's Bat, Dormer's Pipistrelle.	Vespertilionidae	LC, R
<i>Murina tubinaris</i>	Scully's Tube-nosed Bat	Vespertilionidae	LC, UC
<i>Murina cyclotis</i>	Round-eared Tube-nosed Bat	Vespertilionidae	LC, UC
<i>Harpiola grisea</i>	Peter's Tube-nosed Bat.	Vespertilionidae	DD, UC
<i>Scotomanes ornatus</i>	Harlequin bat	Vespertilionidae	LC, UC
<i>Rhinolophus lepidus</i>	Blyth's Horseshoe Bat.	Rhinolophidae	LC, UC
<i>Rhinolophus pearsonii</i>	Pearson's Horse-shoe Bat.	Rhinolophidae	LC, UC
<i>Rhinolophus rouxi</i>	Rufous Horse-shoe Bat.	Rhinolophidae	LC, C
<i>Rhinolophus yunnanensis</i>	Dobson's Horse-shoe Bat.	Rhinolophidae	LC, R
<i>Rhinolophus hipposideros</i>	Rufous Horse-shoe bat, Lesser Horseshoe Bat.	Rhinolophidae	LC, UC
<i>Megaderma lyra</i>	Greater False Vampire, Greater False Vampire Bat, Indian False Vampire Bat.	Megadermatidae	LC, UC
<i>Miniopterus magnater</i>	Western Long-fingered bat, Large Bent-winged Bat, Western Bent-winged Bat.	Miniopteridae	LC, C
<i>Hipposideros lankadiva</i>	Indian Leaf-nosed Bat, Indian Roundleaf Bat.	Hipposideridae	LC, C
<i>Hipposideros cineraceus</i>	Least Leaf-nosed Bat, Ashy Roundleaf Bat.	Hipposideridae	LC, UC
<i>Hipposideros armiger</i>	Great roundleaf bat.	Hipposideridae	LC, C
<i>Taphozous melanopogon</i>	Black-bearded tomb bat.	Emballonuridae	LC, C
<i>Taphozous longimanus</i>	Long-winged tomb bat.	Emballonuridae	LC, UC

Conservation status of each species under IUCN in the table are NT = Near Threatened, LC = Least Concern, DD = Data Deficient; Local Status: R = Rare, UC = Uncommon, C = Common, A = Abundant.

target for hunters. For example, the Indian Flying Fox, *Pteropus giganteus*, which was previously abundant in Mizoram, roosting under the exposed branches of trees, is declining rapidly in number. A local farmer in Serchhip claimed that they usually

succeeded in killing five to ten bats (*P. giganteus*), at a time while foraging for wild bananas. It is worth mentioning that during the entire study period, only one dead body of Indian flying fox, *P. giganteus* was found, entangled in electric cable. Frugivorous

bats are considered vermin of orchards, contrary to their beneficial role in the entire pollination process (McCann, 1940; Vanlalnghaka, 2015). The present study has findings in support of the aforementioned fact. Also, the century old misconception that the consumption of bat meat can permanently cure kids of nocturnal enuresis (bed-wetting) is still prevalent, resulting in the hunting of bats for this so-called medicinal value. Loss of habitat arising from human activities like deforestation facilitating shifting cultivation and other undertakings in the name of development is another important factor contributing to decline of bat population. Constant disturbance of bat-roosting sites (caves, crevices, old building, etc.) by visitors resulting in the subsequent abandonment of roosting sites resulted in the decreasing number of bats within the state. It can, thus, be inferred that population monitoring, habitat management and awareness of policy makers are critical measures for conservation of bats in India (Molur *et al.*, 2002). In order to protect and conserve the bat fauna in Mizoram, human activities should be strictly restricted in regions of remarkable bat population; natural caves of all kinds should be systematically documented and all human activities in the caves should be banned. Furthermore, plantation of edible fruits for frugivorous bats is recommended. This study reveals the urgent requirement for public awareness of the beneficial aspects of bats while simultaneously eliminating the lingering misconception associated with them.

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