



## A systematic list of mammals of Mizoram, India

H. Lalthanzara

Department of Zoology, Pachhunga University College, Aizawl 796001, Mizoram, India

A comprehensive systematic list of wild mammals of the state of Mizoram, northeast India, has been collated from historical records, primary and secondary information by incorporating reliable data after personal interview with elderly prominent hunters. A total of 126 species of wild mammals belonging to 32 families under 11 orders, including 8 primate species, 14 herbivores with ungulates, among carnivores - 3 ursids, 2 canids, 8 felids, 19 lesser carnivores; and 5 fossorial, 9 arboreal, 22 rodents, 35 chiropterans and 1 aquatic mammal are listed. Bats (Chiroptera) formed the largest group (28%) with 35 species under 7 families followed by carnivores (25%) with 32 species and rodents (24%) with 30 species. Furthermore, Cetacea, Proboscidea, Scandentia and Pholidota orders were represented by a single species each. The rats and mice family Muridae formed the biggest family with 16 species followed by the vesper bats family Vespertilionidae with 14 species. The list contains three critically endangered species including two locally extinct species, eight endangered species including two locally extinct species, 18 vulnerable species including one locally extinct species and 8 near-threatened species, i.e. a total of 37 threatened species. The list also provides the vernacular name, common English name and scientific name of each species, local status, IUCN (2016-3) threatened category, WPA schedule and CITES appendix were given. Five species were considered as locally extinct; habitat destruction and poaching being the major cause, and therefore, immediate conservative measures are suggested.

Received 10 May 2017  
Accepted 6 June 2017

\*For correspondence ✉:  
[hzara.puc@gmail.com](mailto:hzara.puc@gmail.com)

Contact us ✉:  
[sciencevision@outlook.com](mailto:sciencevision@outlook.com)

<https://doi.org/10.33493/scivis.17.02.06>

**Key words:** Mammals; Mizoram; species; diversity; wildlife; Indo-Myanmar.

### Introduction

Mammals are groups of vertebrates characterised by warm-blood, hairs, four-chambered heart, single jaw bone and sweat glands. Female nourished their babies with milk from their mammary glands. The smallest mammal is the hog-nosed bat (bumblebee bat, *Craseonycteris thonglongyai*), which weighs about 2.0 g and the largest is the blue whale (*Balaenoptera musculus*), which measures about 100 feet long and weigh about 140,000 kg. According to Wilson and

Reeder, there are 1,229 genera 5,416 species of living mammals in the world.<sup>1</sup> Out of these, a total of 423 species (i.e. 7.81% of the global mammalian species), belonging to 48 families and 14 orders have been reported from India by Sharma *et al.*<sup>2</sup> Meanwhile, Menon<sup>3</sup> reported about 400 species of mammals and Zoo's Print<sup>4</sup> has listed 417 species of Indian mammals under 48 families. The eastern neighbouring country Myanmar has a record of 257 mammal species.<sup>5</sup> The other neighbouring country in the west, Bangladesh recorded 138 mammals including 127 living and

11 extinct species.<sup>6</sup> Kerala state of India recorded 118 species of mammals, 15 of which are endemic to Western Ghats, and 29 species fall under the various threatened categories of IUCN.<sup>7</sup>

Northeast India is the transitional zone between the India, Indo-Malayan and Indo-Chinese biogeographic regions and represents the physical corridor for some of India's flora and fauna. Out of India's three biodiversity hotspots, northeast India falls within two worlds most diversity rich sites, i.e. the eastern Himalaya biodiversity hotspots and the Indo-Myanmar biodiversity hotspots. Being within the two biodiversity hotspots region, its high endemic species and a large number of rare and endangered species are of highly valued. Choudhury<sup>8</sup> reported that Assam has a rich mammalian diversity comprising 193 species of mammals belonging to 32 families, thus housing about 60% of the country's mammalian diversity. Meghalaya is known to harbour 139 species of mammals under 83 genera that belongs to 27 families.<sup>9</sup> Manipur has a list of 31 mammals.<sup>10</sup> Tripura is a home for around 90 species of mammals under 65 genera and 10 orders.<sup>11</sup> Nagaland has a record of at least 106 species of mammals, including 9 insectivores, 34 bats, 7 primates, 1 pan-golin, 34 carnivores, 1 elephant, 7 ungulates, 1 hare and at least 12 rodents.<sup>12</sup> A total of 105 species of mammals has been recorded from Arunachal Pradesh by De *et al.*<sup>13</sup>. These information definitely indicate the richness of mammalian species in northeast India.

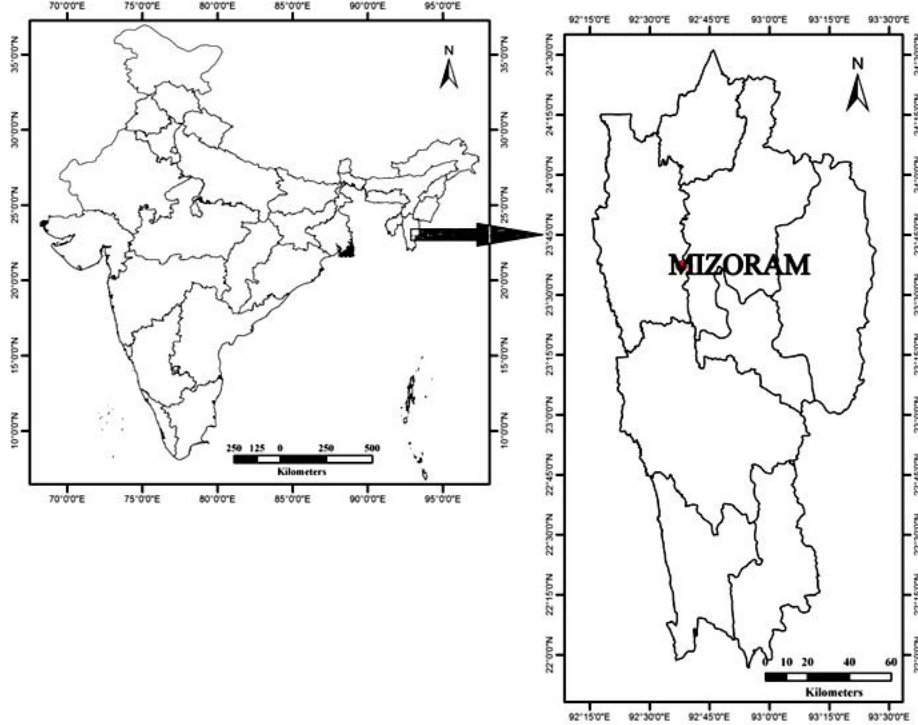
In regard to Mizoram, there is no comprehensive record of mammalian diversity in the state. The previous records includes the pioneering work of Sawmliana,<sup>14</sup> a few record of the Mizo Envis,<sup>15</sup> Zonunmawia and Pradhan,<sup>16</sup> Lalmuan-sanga,<sup>17</sup> works on rodents by Mandal *et al.*,<sup>18,19</sup> Zirliana,<sup>20</sup> works on bats (chiroptera) by Mandal *et al.*,<sup>21</sup> and Vanlalnghaka,<sup>22-23</sup> and mammals by Mandal *et al.*<sup>24</sup>; the reproductive biological study of *Macaca arctiodes* by Zothansiam and Solanki.<sup>25</sup> It is noteworthy to mention that Sawmliana<sup>14</sup> listed 98 mammal species updating the state forest department records of 54 species. Mandal *et al.*<sup>24</sup> listed 84 species of mammals

from Mizoram including 8 primates, 8 cats, 12 carnivores, 2 canids, 2 ursids, 7 herbivores with ungulates, 6 fossorial and 8 arboreal. It was generally believed and observed that due to certain anthropogenic activities like habitat destruction, poaching and infrastructural developments, some of the mammalian species starts dwindling from the state. In view of the above information, it was felt necessary that a comprehensive list of mammals have to be compiled from exiting literatures, historical records and interview with hunters and prominent citizens. Thus keeping the urgent need in mind, the present article has come up to motivate researchers and mammalogist.

## Methodology

Mizoram (area 21,087 sq. km., location 21° 58'N to 24°35'N latitude and 92°15 to 93°29'E longitude) is located in north-east India. It has a state boundary in the north with Manipur, Assam and Tripura and an international boundary with Bangladesh in the west and south (318 kms) and Myanmar in the east and south (404 kms) (**Figure 1**). It lies within the Indo-Myanmar Biodiversity Hotspot area. Mizoram is rich in wild flora and fauna, both in variety and abundance. The dense natural forest covers 3,158.57 sq. km. (i.e. 14.98% of the total area), and is divided into tropical wet evergreen, tropical semi-evergreen and montane subtropical pine forests with an annual rainfall of about 2,500 mm.<sup>26</sup> The medium dense forest accounts for 2,628.08 sq. km. and the bamboo forest accounts for a further 6,707.37 sq. km. Thick canopy forest with dense undergrowth and the high altitude, rugged and steep landscape covered by forest are home for many important threatened animals as well as ornamental plants.

In addition to personal experience, information was collated mainly from literatures and by interview with local hunters, prominent citizens from different parts of the state and through intensive field survey within the state during 2010-2016. Local status of each species was proposed after seven years of survey. Diversity of bats was confirmed and finalised by C.



**Figure 1 | Map of India, showing location of study site (Mizoram).**

Vanlalnghaka, Chiropterologist, Department of Zoology, Government Serchhip College, Mizoram. M. Sawmliana, retired Forest Officer and author of the *Book of Mizoram Plants* has contributed a large amount of information. Nomenclatures were mainly based on IUCN Red List<sup>27</sup> and Wilson and Reeder<sup>1</sup> and the publication of *Zoos' Print Checklist of Indian mammals, Revised and updated*<sup>2</sup> was followed in taxonomy. The threatened category of each species was given based on IUCN Red List of threatened Species 2016-3,<sup>27</sup> IWPA schedule<sup>28</sup> and CITES appendices<sup>29</sup> were given based on latest versions.

## Results and Discussion

A total of 126 species of wild mammals belonging to 32 families under 11 orders have been listed (**Table 1**). The list includes one proboscidea (elephant), one scandentia (treeshrew), eight primates (i.e. 6%), 30 rodentia (rodents) i.e.

24% , 35 chiroptera (bats) i.e. 28%, one pholidota (Pangolin), 32 carnivora (carnivores) 25%, three perissodactyla (rhinoceros), 10 artiodactyla (herbivores with ungulates) i.e. 8% and one cetacean (dolphin, the only aquatic mammal record of the state) (**Figure 2**).

Mizoram harbours as many as eight species of primates, while the whole country of India housed 15 species. All the species, with the exception of Rhesus Macaque, are endemic to the northeast region and are under threatened category.<sup>27</sup> Two species, viz. Phayre's leaf-monkey (*Trachypithecus phayrei*) and hoolock gibbon (*Hylobates hoolock*) are endangered category of IUCN red list, slow loris (*Nycticebus bengalensis*), pig-tailed macaque (*Macaca leonina*), stump-tailed macaque (*M. arctoides*) and capped langur (*T. pileatus*) are under vulnerable category. Assamese macaque (*M. assamensis*) belongs to near-Threatened category. Four species are under WPA schedule I and three species are catego-

Table 1 | Mammals of Mizoram

Sl. No.	Zoological name	Authority	Common name	Mizo name	Family	IUCN	Local status	IWPA	Schedule	CITES	Appendix
<b>Order I : Proboscidea (Elephants)</b>											
1	<i>Elephas maximus</i>	Linnaeus, 1758	Indian elephant, Asian elephant	Sai	Elephantidae	EN	R	I	I	I	
<b>Order II : Scandentia (Tree shrews)</b>											
2	<i>Tupaia belangeri</i>	Wagner, 1841	Northern tree shrew, northern tree shrew	Che-pa	Tupaiaidae	LC	C	*		II	
<b>Order III : Primates (Lorises, Old World Monkeys, Langurs, Leaf-monkeys &amp; Gibbons)</b>											
3	<i>Nycticebus bengalensis</i>	Lacépède, 1800	Slow loris, Bengal slow loris, Ashy slow loris, northern slow loris	Sahuai	Lorissidae	VU	UC	I	I	I	
4	<i>Macaca mulatta</i>	Zimmermann, 1780	Rhesus monkey, rhesus macaque	Phai-Zawng	Cercopithecidae	LC	UC	II	II	II	
5	<i>Macaca assamensis</i>	M'Clelland, 1840	Assamese macaque	Zo-Zawng	Cercopithecidae	NT	UC	II	II	II	
6	<i>Macaca leonina</i>	Blyth, 1863	Pig-tailed macaque, northern pig-tailed macaque	Zawng bakbuk /Zawng hmeltha	Cercopithecidae	VU	UC	II	II	II	
7	<i>Macaca arctoides</i>	I. Geoffroy, 1831	Stump-tailed macaque, bear macaque	Zawngmawt (Zawng mei-bul) Zawng hmaisen	Cercopithecidae	VU	UC	II	II	II	

8	<i>Trachypithecus phayrei</i>	Blyth, 1847	Phayre's leaf-monkey, Phayre's leaf-monkey, Phayre's langur	Dawr/Ngau tarmit bun/Kawr dae Ngau	Cercopithecidae	EN	UC	I	II
9	<i>Trachypithecus pileatus</i>	Blyth, 1843	Capped langur, capped leaf monkey, capped monkey, bonneted langur	Ngau/Ngaubuan g/ Ngau awm-eng	Cercopithecidae	VU	UC	I	I
10	<i>Hylobates hoolock</i>	Harlan, 1834	Western hoolock gibbon, western hoolock, hoolock gibbon	Hauhók	Hyllobatidae	EN	UC	I	I
<b>Order IV : Rodentia (Rodents - Porcupines, Squirrels, Rats, Mice &amp; Bamboo Rats)</b>									
11	<i>Hystrix brachyura</i>	Linnaeus, 1758	Himalayan crestless porcupine / Malayan porcupine	Sakuh/Kuhpui	Hystriidae	LC	UC	II	*
12	<i>Atherurus macrourus</i>	Linnaeus, 1758	Asiatic brush-tailed porcupine	Kuhsi	Hystriidae	LC	UC	II	*
13	<i>Ratufa bicolor</i>	Sparrman, 1778	Black giant squirrel / Malayan giant squirrel	Aw-r-rang	Sciuridae	NT	C	II	II
14	<i>Belomys pearsonii</i>	Gray, 1842	Hairy-footed flying squirrel	Biang	Sciuridae	DD	UC	II	*
15	<i>Petaurista philippensis</i>	Elliot, 1839	Indian giant flying squirrel / common flying squirrel	Vahluk	Sciuridae	LC	UC	*	*
16	<i>Petaurista petaurista</i>	Pallas, 1766	Red giant flying squirrel	Vahluk (Hlukpui)	Sciuridae	LC	UC	*	*
17	<i>Hylomys alboniger</i>	Hodgson, 1836	Particolored flying squirrel	Biangte	Sciuridae	LC	UC	II	*
18	<i>Callosciurus pygerythrus</i>	I. Geoffroy Saint Hilaire, 1832	Hoary-bellied squirrel	Hlei-zawng/ Hlei lubial/Hleimei- par	Sciuridae	LC	C	*	*
19	<i>Callosciurus erythraeus</i>	Pallas, 1779	Pallas's squirrel	Hleikapsen	Sciuridae	LC	C	*	*
20	<i>Dremomys loriah</i>	Hogson 1836	Oranged-bellied Himalayan SQUIRREL	Thehlei	Sciuridae	LC	C	*	*
21	<i>Tamias maclellandi</i>	Horsfield, 1840	Himalayan striped squirrel	Hleimualrang/	Sciuridae	LC	UC	*	*
22	<i>Bandicota indica</i>	Bechstein, 1800	Greater bandicoot rat bandicoot rat	Zutâm/Tampui	Muridae	LC	UC	IV	*

23	<i>Bandicota bengalensis</i>	Gray, 1835	Lesser bandicoot rat, Indian mole-rat,	Zuhrei	Muridae	LC UC	IV	*
24	<i>Rattus rattus</i>	Linnaeus, 1758	House rat, ship rat, roof rat, black rat	Zu-in/Zu-hang/Zu-dum	Muridae	LC AB	IV	*
25	<i>Rattus nitidus</i>	Hodgson, 1845	Himalayan field rat	Zu-chang	Muridae	LC UC	IV	*
26	<i>Rattus exulans</i>	Peale, 1848	Polynesian rat	Sazu	Muridae	LC UC	*	*
27	<i>Berylmys mackenziei</i>	Thomas, 1916	Kenneth's white-toothed rat, Mackenzie's berylmys, Mackenzie's rat	Zuhrei/Zu-rul	Muridae	DD UC	*	*
28	<i>Berylmys bowersi</i>	Anderson, 1879	Bower's white-toothed rat, bower's rat, bower's berylmys	Sa-zu	Muridae	LC UC	*	*
29	<i>Niviventer niviventer</i>	Hodgson, 1836	Himalayan white-bellied rat, white-bellied rat	Zu-pâwl	Muridae	LC C	IV	*
30	<i>Niviventer tenaster</i>	Thomas, 1916	Indochinese mountain niviventer, Tenasserim white-bellied rat	Sazu (Zu-eng)	Muridae	LC UC	*	*
31	<i>Mus musculus</i>	Linnaeus, 1758	House mouse	Chaite	Muridae	LC C	IV	*
32	<i>Mus nagarum</i> (may be a synonym of <i>Mus cookii</i> )	Ryley 1914	Cook's mouse, ryley's spiny mouse	Chaichim	Muridae	LC C	*	*
33	<i>Mus booduga</i>	Gray, 1837	Common Indian field mouse, little Indian field mouse	Lo Chaite	Muridae	LC C	IV	*
34	<i>Mus pahari</i>	Thomas, 1916	Sikkim mouse Gairdner's shrewmouse,	Chaichim	Muridae	LC C	*	*
35	<i>Vandeleuria oleracea</i>	Bennett, 1832	Asiatic long-tailed climbing mouse, Indomalayan Vandeleuria, long-tailed tree mouse	Chimbuang	Muridae	LC UC	*	*
36	<i>Chiropodomys gliroides</i>	Blyth, 1856	Indomalayan pencil-tailed tree mouse, pencil-tailed	Ram Chaite	Muridae	LC C	*	*
37	<i>Leopoldamys edwardsi</i>	Thomas, 1882	Edward's rat, Edwards's long-tailed giant rat	Tâmpui	Muridae	LC UC	*	*

38	<i>Cannomys badius</i>	Hodgson, 1841	Lesser bamboo rat, bay bamboo rat	Buisen	Spalacidae	LC UC	*	*
39	<i>Rhizomys pruinosus</i>	Blyth, 1851	Hoary bamboo rat	Bui Luangpar	Spalacidae	LC UC	*	*
40	<i>Rhizomys erythrogenys</i> (may be synonym of <i>Rhizomys sumatrensis</i> Raffles, 1821)	Anderson, 1877	Red-cheeked bamboo rat	Buipui	Spalacidae	NE UC	*	*
<b>Order V : Soricomorpha (Shrews &amp; Moles)</b>								
41	<i>Crocidura attenuata</i>	Milne-Edwards, 1872	Grey Shrew, Indo-Chinese shrew	Chhimtir	Soricidae	LC UC	*	*
42	<i>Suncus murinus</i>	Linnaeus, 1766	House shrew, Asian house shrew	Chhimtir	Soricidae	LC C	*	*
43	<i>Parascaptor leucura</i>	Blyth, 1850	White-tailed mole / Indian mole / Assamese mole	Zubui	Talpidae	LC UC	*	*
44	<i>Euroscaptor micrura</i>	Hodgson, 1841	Himalayan mole / short tailed mole	Buikerek	Talpidae	LC UC	*	*
<b>Order VI : Chiroptera (Bats)</b>								
45	<i>Pteropus giganteus</i>	Brünnich, 1782	Indian Flying Fox	Bak-sai	Pteropodidae	LC R	IV	Large st India n bat
46	<i>Megaerops niphanae</i>	Yenbutra & Felten, 1983	Niphan's fruit bat, northern tailless fruit bat, Ratanaworabhan's FRUIT BAT	Bak meibul	Pteropodidae	LC UC	*	*
47	<i>Macroglossus sobrinus</i>	K. Anderson, 1911	Hill long-tongued fruit bat, greater nectar bat, greater long-tongued fruit bat, greater long-nosed fruit bat	Bak Hmuisei	Pteropodidae	LC C	IV	*
48	<i>Rousettus leschenaultii</i>	Desmarest, 1820	Leschenault's roussette, Leschenault's roussette, Shortridge's roussette Indian fulvous fruit bat	Bak-sazu/Zu-bak	Pteropodidae	LC C	*	*

49	<i>Cynopterus brachyotis</i>	Muller, 1838	Lesser dog-faced fruit bat, common short-nosed fruit bat, lesser short-nosed fruit bat smaller short-nosed fruit bat	Bak Bengtawi/Bak hnar tawi	Pteropodidae	LC	C	IV	*
50	<i>Cynopterus sphinx</i>	Vahl, 1797	Greater short-nosed fruit bat, short-nosed fruit bat	Bak-hnar-ner / Bak-hnar-tawi	Pteropodidae	LC	AB	IV	*
51	<i>Sphaerias blanfordi</i>	Thomas, 1891	Blandford's fruit bat, Blandford's fruit bat	Bak Hmuitawi	Pteropodidae	LC	UC	IV	*
52	<i>Eonycteris spelaea</i>	Dobson, 1871	Dawn bat, common dawn bat, common nectar bat, lesser dawn bat Dobson's, long-tongued fruit bat	Bak parzu-dawt	Pteropodidae	LC	C	IV	*
53	<i>Rousettus aegyptiacus</i>	E. Geoffroy, 1810	Egyptian fruit bat, Egyptian rousette	Bak sazu hmu tawi	Pteropodidae	LC	UC	*	*
54	<i>Rhinolophus lepidus</i>	Blyth, 1844	Blyth's horseshoe bat	Bak hnar chat	Rhinolophida	LC	UC	*	*
55	<i>Rhinolophus pearsonii</i>	Horsfield, 1851	Pearson's horse-shoe bat	Bak hnar chat buang	Rhinolophida	LC	C	*	*
56	<i>Rhinolophus rouxii</i>	Temminck, 1835	Rufous horse-shoe bat	Bak hnar chat	Rhinolophida	LC	UC	*	*
57	<i>Rhinolophus yunnanensis</i>	Dobson, 1872	Dobson's horse-shoe bat	Bak hnar chat benglian	Rhinolophida	LC	UC	*	*
58	<i>Rhinolophus hipposideros</i>	Bechstein, 1800	Rufous horse-shoe bat, lesser horseshoe bat	Bak Hnar chat meisei	Rhinolophida	LC	UC	*	*
59	<i>Tylonycteris pachypus</i>	Blyth, 1895	Lesser bamboo bat, club-footed bat, flat-headed bat, lesser flat-headed bat	Changel Bak/mau bak	Vespertilioni	LC	UC	*	*
60	<i>Barbastella leucomelas</i>	Cretzschmar, 1826	Eastern barbastelle, Asian barbastelle	Bak hnar chat beng zum	Vespertilioni	LC	UC	*	*
61	<i>Harpiocephalus mordax</i>	Thomas, 1923	Greater hairy winged-bat, (broad-skulled hairy-winged bat)	Bak lu lian	Vespertilioni	NT	R	*	*
62	<i>Myotis formosus</i>	Hodgson, 1835	Hodgson's bat, Bartel's myotis, Hodgson's myotis	Bakte thlarang	Vespertilioni	LC	UC	*	*



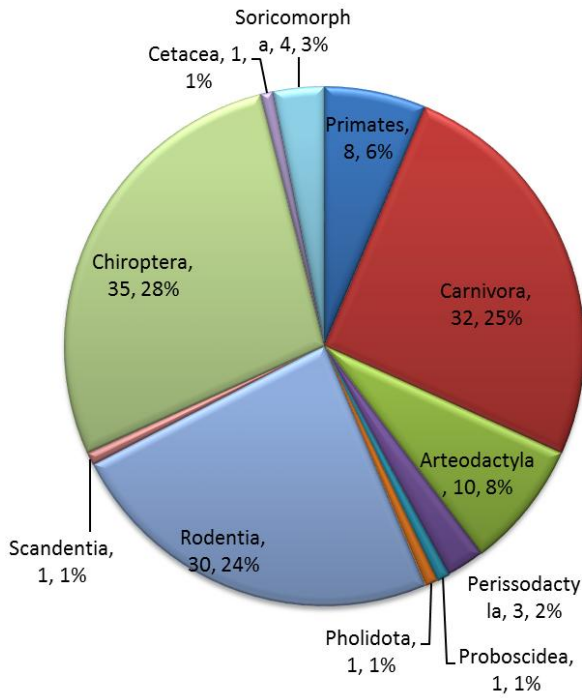
63	<i>Myotis montivagus</i>	Dobson, 1874	Burmese whiskered bat Burmese whiskered myotis, large brown myotis	Bakte bengparh	Vespertiloni dae	LC UC	* *
64	<i>Myotis muricola</i>	Gray, 1846	Whiskered myotis Nepalese whiskered bat, Nepalese whiskered myotis,	Bakte hmui tawi	Vespertiloni dae	LC UC	* *
65	<i>Eptesicus pachyotis</i>	Dobson, 1871	Thick-eared bat	Bak beng chhah	Vespertiloni dae	LC UC	* *
66	<i>Arielulus (Pipistrellus) circumdatus</i>	Temminck, 1840	Large black pipistrelle	Bakte/Ditip Bak	Vespertiloni dae	LC C	* *
67	<i>Pipistrellus tenuis</i>	Temminck, 1840	Indian pygmy bat, least pipistrelle	Bakte/Ditip Bak	Vespertiloni dae	LC, C	* * Small est India n Bat
68	<i>Pipistrellus pipistrellus</i>	Schreber, 1774	Common pipistrelle	Dutip Bak buang	Vespertiloni dae	LC UC	* *
69	<i>Scotozous dormeri</i>	Dobson, 1875	Dormer's bat, Dormer's pipistrelle	Bakte rawng eng	Vespertiloni dae	LC R	* *
70	<i>Murina tubinaris</i>	Scully, 1881	Scully's tube-nosed bat	Bak bengbial / Bak hnarbial	Vespertiloni dae	LC UC	* *
71	<i>Murina cyclotis</i>	Dobson, 1872	Round-eared tube-nosed bat	Bak hnarbial hmul sei	Vespertiloni dae	LC C	* *
72	<i>Harpiola grisea</i>	Peters, 1872	Peter's tube-nosed bat	Bak hnarbial	Vespertiloni dae	DD R	* *
73	<i>Megaderma lyra</i>	É. Geoffroy, 1810	Greater false vampire, greater false vampire bat, indian false vampire bat	Bek-beng-hlai	Megadermati dae	LC UC	* *
74	<i>Miniopterus magnater</i>	Sanborn, 1931	Western long-fingered bat large bent-winged bat, western bent-winged bat	Bak thla kum	Miniopteri dae	LC C	* *
74	<i>Hipposideros lankadiva</i>	Kelaart, 1850	Indian leaf-nosed bat, indian roundleaf bat	Kurung Bak	Hipposiderid ae	LC UC	* *
76	<i>Hipposideros cineraceus</i>	Blyth, 1853	Least leaf-nosed bat, ashy roundleaf bat	Bak beng bial	Hipposiderid ae	LC C	* *

77	<i>Hipposideros armiger</i>	Hodgson, 1835	Great roundleaf bat, great Himalayan leaf-nosed bat, great leaf-nosed bat	Bak beng kuallian	Hipposiderid ae	LC	C	*	*
78	<i>Taphozous melanopogon</i>	Temminck, 1841	Black-bearded tomb bat	Bak Khabe hmul dum	Emballonurid ae	LC	C	*	*
79	<i>Taphozous longimanus</i>	Hardwicke, 1825	Long-winged tomb bat	Bak thla sei	Emballonurid ae	LC	C	*	*
<b>Order VII : Pholidota (Pangolin)</b>									
80	<i>Manis pentadactyla</i>	Linnaeus, 1758	Chinese pangolin	Saphu	Manidae	CE	R	I	I
<b>Order VIII : Carnivora (Cats, Canids, Ursids, Badgers, Otters, Weasels, Mertens, Civets, Bear-cat, Linsang, Mongoose)</b>									
81	<i>Panthera tigris</i>	Linnaeus 1758	Tiger / Royal Bengal tiger	Sakei/Keipui	Felidae	EN	R	I	I
82	<i>Panthera pardus</i>	Meyer, 1794	Leopard	Keitê/Kâwikei /Kei arsi / Kâwlsa / Keivawm	Felidae	VU	R	I	I
83	<i>Neofelis nebulosa</i>	Griffith, 1821	Clouded leopard	Kelral / Zawngral	Felidae	VU	R	I	I
84	<i>Catopuma (Felis) temminckii</i>	Vigors & Horsfield, 1827	Golden cat	Keisen	Felidae	NT	R	I	I
85	<i>Felis chaus</i>	Schreber, 1777	Jungle cat	Sa-uak	Felidae	LC	UC	II	II
86	<i>Prionailurus (Felis) bengalensis</i>	Kerr, 1792	Leopard cat	Sanghar	Felidae	LC	UC	I	I
87	<i>Pardofelis marmorata</i>	Martin, 1837	Marbled cat	Sa tê / Pavak (Pawi)	Felidae	NT	R	I	I
88	<i>Prionailurus viverrinus</i>	Bennett, 1833	Fishing cat	Ngharbawr	Felidae	VU	UC	I	II
89	<i>Cuon alpinus</i>	Pallas, 1811	Indian wild dog, Asiatic wild dog, dhole	Chinghnia	Canidae	EN	R	II	II
90	<i>Canis aureus</i>	Linnaeus, 1758	Asiatic jackal/common jackal/ golden jackal	Sihal	Canidae	LC	R	II	III
91	<i>Ursus thibetanus</i>	G. [Baron] Cuvier, 1823	Himalayan black bear / Asiatic black bear	Savawm/Vawms ai /Mangpui	Ursidae	VU	UC	II	I
92	<i>Helarctos malayanus</i>	Raffles, 1821	Sun bear / Malayan sun bear	Samang/Mangte	Ursidae	VU	UC	I	I

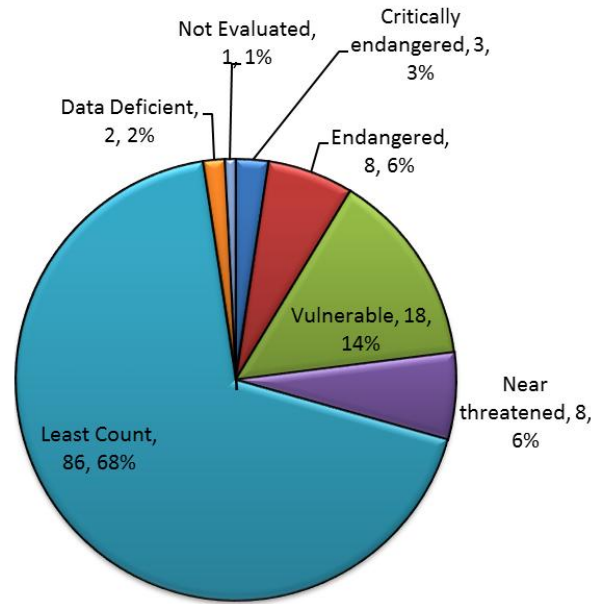
93	<i>Melursus ursinus</i>	Shaw, 1791	Sloth bear	Savawm bak-buk	Ursidae	VU	R	I	I
94	<i>Melogale moschata</i>	Gray, 1831	Small-toothed ferret-badger, Chinese ferret-badger	Sahmaiṭha	Mustelidae	LC	UC	II	*
95	<i>Melogale personata</i>	I. Geoffroy Saint-Hilaire, 1831	Large-toothed ferret Badger, Burmese ferret badger, large-toothed ferret-badger	Sahmaiṭha	Mustelidae	LC	UC	II	*
96	<i>Arctonyx collaris</i>	F.G. Cuvier, 1825	Greater hog badger, hog badger	Phivawk	Mustelidae	VU	UC	I	*
97	<i>Lutra lutra</i>	Linnaeus, 1758	European otter, Old World river otter, Old World common otter	Sahram	Mustelidae	NT	UC	II	I
98	<i>Lutrogale perspicillata</i>	I. Geoffroy Saint-Hilaire, 1826	Smooth-coated otter, smooth-coated otter	Indian Sahram(Hrampu i)	Mustelidae	VU	UC	II	II
99	<i>Aonyx cinereus</i>	Illiger, 1815	Asian small-clawed otter, small-clawed otter, Oriental small-clawed otter	Hramte	Mustelidae	VU	UC	I	II
100	<i>Martes flavigula</i>	Boddaert, 1785	Yellow-throated marten	Safia (Sa-fe tumbungrang)	Mustelidae	LC	UC	II	III
101	<i>Mustela kathiah</i>	Hodgson, 1835	Yellow-bellied weasel	Sarivaithun	Mustelidae	LC	UC	II	III
102	<i>Mustela strigidorsa</i>	Gray, 1853	Stripe-backed weasel, back-striped weasel	Sarivaithun	Mustelidae	LC	UC	*	*
103	<i>Viverra zibetha</i>	Linnaeus, 1758	Large indian civet	Tlumpui	Viverridae	LC	UC	II	III
104	<i>Viverricula indica</i>	É. Geoffroy Saint-Hilaire, 1803	Small Indian civet, Oriental civet	Tlumtherh	Viverridae	LC	UC	II	III
105	<i>Paradoxurus hermophroditus</i>	Pallas, 1777	Common palm civet, Mentawai palm civet	Zawhang / Zawrêng / Zawtia	Viverridae	LC	UC	II	*
106	<i>Paguma larvata</i>	C.E.H. Smith, 1827	Himalayan palm civet, masked palm civet, gem-faced civet	Sazaw/Zawbuan g	Viverridae	LC	UC	II	III

107	<i>Arctogalidia trivirgata</i>	Gray, 1832	Small-toothed palm civet, three-striped palm civet	Sazaw / Zawhang / Zawbengvar	Viverridae	LC	UC	II	*
108	<i>Arctictis binturong</i>	Raffles, 1821	Binturong, bear cat	Zamphu	Viverridae	VU	UC	I	III
109	<i>Prionodon pardicolor</i>	Hodgson, 1841	Spotted linsang	Ngharthingawn	Prionodontidae	LC	R	I	I
110	<i>Herpestes edwardsii</i>	É. Geoffroy Saint-Hilaire, 1818	Indian grey mongoose, grey mongoose, common mongoose	Sarivaithun	Herpestidae	LC	UC	II	III
111	<i>Herpestes javanicus</i>	É. Geoffroy Saint-Hilaire, 1818	Small Indian mongoose, Javan mongoose	Sarivaithun	Herpestidae	LC	UC	II	III
112	<i>Herpestes urva</i>	Hodgson, 1836	Crab-eating mongoose	Saphairuang	Herpestidae	LC	UC	II	III
<b>Order IX: Perissodactyla</b>									
113	<i>Rhinoceros unicornis</i>	Linnaeus, 1758	Indian rhinoceros, greater one-horned rhino, great Indian rhinoceros	Samak	Rhinocerotidae	VU	LE	I	I
114	<i>Rhinoceros sondaicus</i>	Desmarest, 1822	Javan rhinoceros	Samak	Rhinocerotidae	CE	LE	*	I
115	<i>Dicerorhinus sumatrensis</i>	G. Fischer, 1814	Sumatran rhinoceros, hairy rhinoceros, Asian two-horned rhinoceros	Samak ki hnih nei	Rhinocerotidae	CE	LE	*	I
<b>Order X: Artiodactyla (Herbivores with angulates)</b>									
116	<i>Rusa (Cervus) unicorn</i>	Kerr, 1792	Sambar, Indian sambar, sambar deer, sambar	Sazuk (Zukpui)	Cervidae	VU	UC	III	*
117	<i>Rucervus eldii</i>	M'Clelland, 1842	Eld's deer, thamin, brow-antlered deer	Sangai	Cervidae	EN	LE	*	I
118	<i>Axis porcinus</i>	Zimmermann, 1780	Hog deer, Thai hog deer, Indochina hog deer, Indochinese hog deer, Indian hog deer	Sapeng / Te-re	Cervidae	EN	R	III	I
119	<i>Muntiacus vaginalis</i>	Boddaert, 1785	Northern red muntjak, Indian red muntjak, barking deer	Sakhi (zâng hang)*	Cervidae	LC	C	III	*

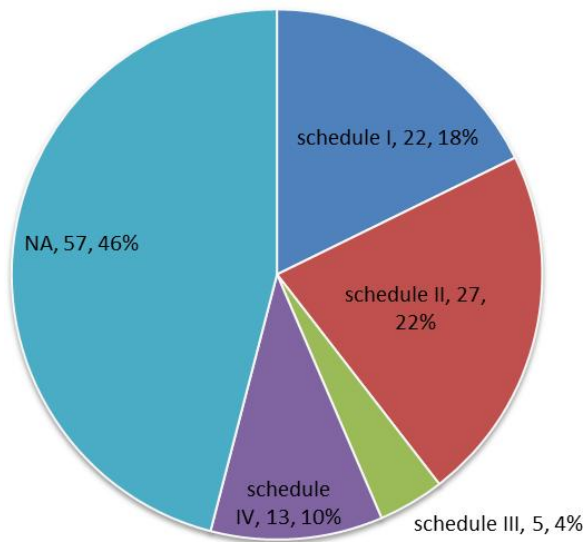
120	<i>Muntiacus muntjak</i>	Zimmermann, 1780	Southern red muntjak Indian muntjak Sundaland red muntjak	Sakhi (Khi-sen) **	Cervidae	LC	UC	III	*
121	<i>Capricornis rubidus</i>	Temminck, 1836	Red serow ( <b>State Animal?</b> )	Saza	Bovidae	NT	UC	*	I
122	<i>Capricornis thar</i>	Hodgson, 1831	Himalayan serow	Saza hang	Bovidae	NT	R	*	I
123	<i>Naemorhedus griseus</i>	Milne-Edwards, 1871	Chinese goral, goral	Sathar	Bovidae	VU	UC	*	I
124	<i>Bos gaurus</i>	C.H. Smith, 1827	Indian bison/gaur	Ramsial/Sele/ Tumpang Sial	Bovidae	VU	R	I	I
125	<i>Sus scrofa</i>	Linnaeus, 1758	Wild pig/Wild boar, wild pig,	Eurasian Sanghal	Suidae	LC	C	III	*
<b>Order XI : Cetacea (Dolphin)</b>									
126	<i>Platanista gangetica</i>	Roxburgh, 1801	Ganges river dolphin, river dolphin, blind river dolphin, South Asian river dolphin	Indus Zawngduli Nu	Platanistidae	EN	LE	I	I



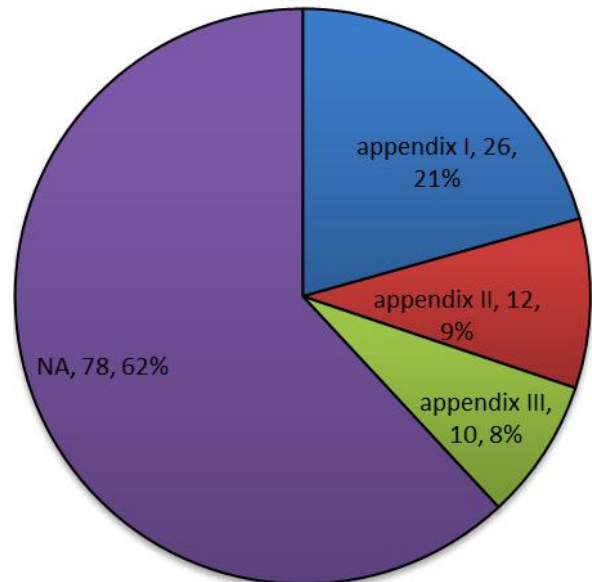
**Figure 2 | Order-wise composition** of mammals of Mizoram.



**Figure 3 | Mammals of Mizoram** under IUCN Threatened category.



**Figure 4 | Mammals of Mizoram** under WPA schedule (1972) (NA, not available)



**Figure 5 | Mammals of Mizoram** under CITES Appendix (NA, not available)

rised under CITES appendix I. The endangered status of *T. phayrei* is not aware by the villagers that might perhaps, wipe-off the whole population from the state since poaching is illegally practice in remote areas.

Out of the recorded 126 mammals, 3 species are critically endangered (2%), out of which two species are categorised as locally extinct; 8 endangered (6%) including three locally extinct species; 18 vulnerable species (14%) with one locally extinct species; and 8 near threatened species (6%), i.e. a total 37 threatened species are included in the list and the rest 88 species were least concerned, data deficient and not evaluated in the IUCN Red List category<sup>27</sup> (Figure 3). According to IWPA schedule<sup>28</sup> 22 species belongs to category I (18%), 27 species in category II (22%), 5 species in category III (4%), 13 species in category IV (10%) and the status of 57 species, mostly rodents and chiropterans, are not available (46%) (Figure 4). According to Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 48 species are categorized under different appendices viz. 26 species under appendix I (21%), 12 species under appendix II (9%) and 10 species under appendix III<sup>29</sup> (8%) (Figure 5). The local status given in this paper categorised Mizoram mammals as follows - two species of the mammals of Mizoram as abundant, 27 species as common, majority (74 species) are categorised to be uncommon (UC) in the state, 18 species as rare and 5 species are considered to be locally extinct at local (state) level.

Among the reported extinct species *Platanista gangetica*, Ganges river dolphin (Zawngduli Nu) has been reported from Chhingtuipei (Kolodyne river) (Sawmliana, Pers. comm.) and Tuerial river (Liankima pers. comm.). *Rucervus eldii*, Eld's deer (sangai) has been recorded in Mizoram by Sawmliana<sup>14</sup> and Pachuau.<sup>26</sup> There is a report of two-horned rhinoceros from Mizoram.<sup>30</sup> Occurrence of rhinoceros was also recorded by Sawmliana,<sup>14</sup> Pachuau<sup>26</sup> and Choudhury.<sup>31</sup> According to Sawmliana<sup>14</sup> *Rhinoceros sondaicus* (Javan rhinoceros) became extinct since 1925 and *Dicerorhinus sumatrensis* (Samutran rhinoceros) extinct since 1935. The latest rhinoceros

report dated back to 1947 where it was killed by a hunter in Khawbel village area, Serchhip district (R. Zalinga pers. comm.).

There is no record of monotremes and marsupials, only placental mammals are recorded in Mizoram. *Axis porcinus* hog deer (Sapeng/Tere) is also recorded by Sawmliana<sup>14</sup> and R. Zalinga and others (pers. comm.), this species is considered to be disappeared from the state, but a recent report indicates its presence in western border of the state (Lalrinmawia, pers. comm.). There are reports that a small sambar-like deer, locally called 'Ria-Nu/Zasuk te chi' is also present (H. Zahmingthanga & Lalrinmawia pers. comm.). This may be confusion with that of hog deer and/or further confirmation is needed.

The taxonomic position of some species of mammals seems controversial. For instance, *Capricornis sumatraensis* is recorded as the serow species of Mizoram for a long time and is named as the state animal. However, as per IUCN the distributional ranges are narrow and limited, confining to Indonesia only, a far distant from the present study area. Furthermore, *Capricornis thar*, the Himalayan serow found in most parts of the Himalayan ranges in India is also recorded from the present investigation. However, the present study revealed that the most common serow in Mizoram is the *Capricornis rubidus*, red serow, that is commonly called 'Saza' in Mizo, it may represent the serow species of Mizoram as state animal, pending further study on its molecular identification. Moreover, Dey<sup>32</sup> reported the sighting of red serow *C. rubidus* at Hmuifang, Mizoram. The distributional range of *Capricornis rubidus* being Assam hills south of Brahmapurta River,<sup>32</sup> marks the possibility of its occurrence in the neighbouring area, including Mizoram. *C. rubidus* is the only serow species recorded from the neighbouring Bangladesh.<sup>6</sup>

Similar case has been revealed in giving scientific names to muntjac (barking deer) of Mizoram. This needs careful and thorough scientific study. The present record of barking deer is the *Muntiacus muntjak*,<sup>15,16</sup> but the distribution range of this species is far south east-Asia, i.e. Malaysia and Indonesia. However, Mandal et al.<sup>24</sup> reported a subspecies of *M. muntjak*, i.e. *M. m.*

*vaginalis* as the barking deer of Mizoram. In contrast, Sawmliana<sup>14</sup> identified the barking deer of Mizoram as *M. vaginalis*, the northern red muntjak. I strongly agreed with the latter since the morphological appearance of the common barking deer observed in and around Mizoram is more close to *M. vaginalis* and further it is in accordance with the IUCN red list distribution map<sup>33</sup>. The neighbouring state Tripura also records *M. vaginalis*.<sup>34</sup> During the survey, many sources told me about the presence of two kinds of barking deer in Mizoram which they named them as 'Sakhi' (Khi-sen) and 'Sakhi zâng-hang'. 'The latter have a darker dorsal hairs and bigger in size,' they told (H. Zahmingthanga, Lalrinmawia & R. Zalinga pers. comm.). The taxonomic case of muntjak/barking deer is a complicated one as slight variations observed in morphology. Groves<sup>35</sup> and other authors like Giao *et al.*<sup>36</sup> have suggested that northern barking deer, *M. vaginalis* may constitute more than one species. Later, Groves and Grubb<sup>37</sup> separated the taxon into four species, *M. vaginalis* ssp. (central range, the most widespread of the four), *M. malabaricus* (extreme southwest of range), *M. aureus* (western range with an outlier in the central part of the range) and *M. nigripes* (eastern parts of the range). Recently, from their molecular analysis results, Martins *et al.* reported the occurrence of three distinct mitochondrial lineages of red muntjacs in Indian subcontinent *viz.* Sri Lankan red muntjacs (including the Western Ghats) diverged first from other muntjacs about 1.5 Mya; later northern red muntjacs *M. vaginalis* (including North India and Indochina) and southern red muntjacs *M. muntjak* (Sundaland) split around 1.12 Mya.<sup>38</sup>

Furthermore, a similar circumstance has been seen in case of goral. The existing record of goral of the Mizoram is the Himalayan goral *Naemorhedus goral*. But recent photographs of the animals appear to be the Chinese goral *Naemorhedus griseus*, and therefore presented as the goral of Mizoram. This observation was in accordance with the assessment of Duckworth and MacKinnon in the IUCN Red List category, who described the distribution range of *N. griseus* as south of Brahmapurta river in northeast India.<sup>39</sup>

These cases obviously revealed the need of further research on identification and diversity of mammals of Mizoram at species and genetic levels.

Altogether 37 species i.e. 29% of Mizoram mammals are under IUCN Red list of threatened species; 49 species belongs to IWPA schedule I and II and 38 species falls under CITES appendix I&II. These data reveals the vulnerability of mammals of Mizoram, they are prone to vanish from the state. It is generally observed that Mizoram is rich in species diversity, but very poor in abundance! Due to various infrastructural development, particularly road and Dam construction and many other anthropogenic activities, including illegal poaching and trade, wildlife resources of Mizoram has been found to dwindle rapidly in recent years. Particularly large mammals are prone to vanishing as they lost their habitats; food, shelter and safety are major concern for these wild mammals in the state. Even the protected sanctuaries are not safe for the wild animals as they were illegally trapped, killed and threatened by various means using traditional traps and modern guns and other tools. Many local inhabitants had feared the animals without considering their roles in the ecosystem and food chains. Despite of the fact that the concern department of the state government and authorities tried their best and some NGO came up to conserve and preserve the precious wildlife; but, obviously environmental and wildlife deterioration continues as in other parts of the world! So, it is the responsibility of every citizen to take wildlife conservation activity in every possible ways.

Owing to its strategic location, Mizoram has a diverse species of mammals inhabiting all parts of the State. However, the status and distribution, rather study of Mizoram mammals is almost left untouched by researchers. This preliminary survey work came up to motivate and challenge young Mizo researchers and any other enthusiasts to face the challenge. The taxonomic dilemma of mammals in Mizoram is an issue since long time back and the sporadic taxonomic status needs to resolve using a thorough and advance technology studies.



## Acknowledgement

I express my sincere thanks to Dr. C. Vanlalnghaka, Assistant Professor, Department of Zoology, Government Serchhip College, Mizoram and Mr. M. Sawmliana, retired Forester, Chanmari West, Aizawl for rendering their immense help in technical component of the paper. Thanks to all those officers and staff of Environment and Forest department, all eminent citizens, hunters, village heads and teachers all over Mizoram for sharing their valuable experience and knowledge. I am grateful to Dr. Lalramliana, Department of Zoology, Pachhunga University College for critical review and suggestions.

## References

1. Wilson, D.E. & Reeder, D.M. (2005). *Mammal Species of the World: A Taxonomic and Geographic Reference. 3rd Edition, Vol. 1 & 2*. The Johns Hopkins University Press, Baltimore, i-xxxv+i-743pp & pp.i-xvii+745-2142.
2. Sharma, G., Kamalakannan, M. and Venkataraman, K. (2013). A Checklist of Mammals of India with their distribution and conservation status. *ZSI e-publication*. Published by the Director, Zool. Surv. India, Kolkata-700 053, India. 121 pp.
3. Menon, V. (2009). Field Guide to Indian Mammals. Christopher Helm, A&C Black Publishers Ltd. London. Pp. 1-200.
4. Zoos' Print. Checklist of Indian Mammals Revised and Updated 2008. XXIII(8) August 2008, (RNI 9:11).
5. [https://en.wikipedia.org/wiki/List\\_of\\_mammals\\_of\\_Myanmar#cite\\_note-1](https://en.wikipedia.org/wiki/List_of_mammals_of_Myanmar#cite_note-1) accessed on 21<sup>st</sup> March 2017
6. IUCN Bangladesh (2015). *Red List of Bangladesh Volume 2: Mammals*. IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh, pp. xvi+232.
7. Nameer, P.O. (2015). A checklist of mammals of Kerala, India. *Journal of Threatened Taxa* 7(13), 7971-7982; <http://dx.doi.org/10.11609/jott.2000.7.13.7971-7982>
8. Choudhury, A. (1997). *Checklist of the Mammals of Assam*. Gibbon Books and Assam Science Technology and Environment Council, Guwahati. 103p.
9. Meghalaya Biodiversity Board. 139 sp under 83 genera that belongs to 27 families in Meghalaya <http://megbiodiversity.nic.in/faunal-biodiversity.html> accessed on 2017-03-21
10. Envis centre, Manipur. List of mammals. [http://manenvis.nic.in/Database/Mammals\\_2908.aspx](http://manenvis.nic.in/Database/Mammals_2908.aspx) accessed on 24.3.2017
11. Tripura Biodiversity Board. The latest estimate by them put the number of land mammal species at 90, from 65 genera and 10 Orders (Gupta, 2000). <http://biodiversity.tripura.gov.in/Fauna> accessed on 21.3.2017
12. Envis Centre, Nagaland. Fauna. [http://www.nagenvis.nic.in/Database/fauna\\_852.aspx](http://www.nagenvis.nic.in/Database/fauna_852.aspx) accessed on 24.3.2017
13. De, J.K., Mandal, A.K. and Ghosh, M.K. (2006). Mammals In. Director Ed. *Fauna of Arunachal Pradesh, State Fauna Series, 13(Part-1)* Published by the Director, Zool Surv. India, Kolkata. Pp. 1-396.
14. Sawmliana, M. (2013). The Book of Mizoram Plants. 2<sup>nd</sup> edn. P. Zakhuma, Aizawl, pp. 447-463.
15. Mizo ENVIS Newsletter. Mizoram State Pollution Control Board (MPCB). Volume 3, No. 1, Pages 3-5.
16. Zonunmawia, A.C. and Pradhan, N. (2004). Mizoram and its Wildlife (Checklist of mammal, amphibian, reptile, bird, fish, invertebrate faunal and flora). Centre for Environment Protection, Aizawl. Pp. 1-69.
17. Lalmuansanga, K. (2009). Nungchate Chanchin Volume 1. K. Bawlliana, Aizawl. Pp. 1-90.
18. Mandal, A.K, Poddar, A.K. and Bhattacharyya, T.P. (1997). Some New Records of Bats from Mizoram, India, *Record of Zoological Survey of India*, 96 (1 - 4), 7 - 13.
19. Mandal, A.K, Poddar, A.K. and Bhattacharyya, T.P. (2000a). Further New Records of Bats from Mizoram, India. *Record of Zoological Survey of India*, 98(Part-2), 147-154.
20. Zirliana, K. (2009). Brief Record on Mizoram Mautam, 2007-2008 (A compiled Information and Datas, Directorate of Agriculture (CH), Govt. of Mizoram, Aizawl. p. 5
21. Mandal, A.K, Poddar, A.K. and Bhattacharyya, T.P. (2000b). Some New Records of Rodents from Mizoram, India. *Record of Zoological Survey of India*,

- 98(Part-I), 131-135.
22. Vanlalngkhaka (2013). Study on bat diversity in and around Lengteng Wildlife Sanctuary, Mizoram, India. *Science Vision* **13**(2), 70-75.
  23. Vanlalngkhaka (2014). Nectar-feeding bat, *Cynopterus sphinx* pollinate *Parkia speciosa* flowers and increase fruit production. *Sci Vis*, **14**(2), 67-73.
  24. Mandal, A.K., Poodar, A.K. and Bhattacharya, T.P. (2007). Mammals In: *Fauna of Mizoram*. Zoological Survey of India, State Fauna Series 14 (Eds. Director, ZSI, Kolkata). pp 609-653.
  25. Zothansiana and Solanki, G.S. (2011). Male-male sexual behaviour in adult captive stump-tailed macaque, *Macaca arctiodes*. *Science Vision* **11**(1), 31-39.
  26. Pachuau, R. (2009). Mizoram - A study in Comprehensive Geography. Northern Book Centre, New Delhi. pp.94-95
  27. IUCN. 2017. IUCN Red List of Threatened Species. Version 2016.3. International Union for Conservation of Nature. Accessed at <http://www.iucnredlist.org>, 12 April 2017.
  28. IW(P)A Schedule. Scheduled Species of mammals Indian Wildlife (Protection) Act, 1972. Schedule I <http://envfor.nic.in/legis/wildlife/wildlife2s1.pdf>; Schedule II <http://envfor.nic.in/legis/wildlife/wildlife2s2.pdf>; Schedule 3 [http://vindhyabachao.org/wildlife\\_guidelines/schedule\\_species\\_mammals.pdf](http://vindhyabachao.org/wildlife_guidelines/schedule_species_mammals.pdf) and Schedule IV <http://www.moef.nic.in/legis/wildlife/wildlife2s4.html>
  29. CITES. 2017. Convention on International Trade in Endangered Species of Wild Fauna and Flora. Appendices I, II and III. Accessed at <http://www.cites.org>, 13 April 2017.
  30. Chatterjee, S. (1995). Mizo Chiefs and the Chiefdom, MD Publications Pvt. Ltd. New Delhi) p.55.
  31. Choudhury, A. (1997). The status of the Sumatran rhinoceros in north-eastern India. *Oryx*, **31** (2), 151-152.
  32. Dey, A. (2016). Red Serow at Hmuifang, Mizoram. Conservation India <http://www.conservationindia.org/gallery/red-serow-hmuifang-mizoram> Accessed on 2.3.2017
  33. IUCN (International Union for Conservation of Nature) 2016. *Muntiacis vaginalis*. The IUCN Red List of Threatened Species. Version 2016-3. <http://maps.iucnredlist.org/map.html?id=136551>
  34. Agarwal, V.C. & Bhattacharya, T.P. (1977). Report on a collection of mammals from Tripura. *Record of Zoological Survey of India*, **73**, 135-157.
  35. Groves, C. (2003). Taxonomy of ungulates of the Indian subcontinent. *Bombay Natural History Society*. **100**, 341-61. Available from: <http://hdl.handle.net/1885/76187>.
  36. Giao, P.M, Touc, D., Dung, V.V., Wikramanayake, E.D., Amato, R., Arcander, P. and MacKinnon, J.R. (1998). Description of *Muntiacus truongsongensis*, a new species of muntjac (Artiodactyla: Muntiacidae) from Central Vietnam, and implications for conservation. *Animal Conservation*. **1**, 61-68.
  37. Groves, C. and Grubb, P. (2011). *Ungulate Taxonomy*, Johns Hopkins University Press, Baltimore, Maryland, 317. pp. ISBN-13 978-1-4214-0093-8 and ISBN-10 1-4214-0093-6
  38. Martins, R.F., Fickel, J., Le, M., van Nguyen, T., Nguyen, H.M., Timmins, R., Gan, H.M., Rovie-Ryan, J.J., Lenz, D., Förster, D.W. and Wilting, A. (2017). Phylogeography of red muntjacs reveals three distinct mitochondrial lineages. *BMC Evolutionary Biology*, **17**:34. DOI: 10.1186/s12862-017-0888-0
  39. Duckworth, J.W. & MacKinnon, J. (2008). *Naemorhedus goral*. The IUCN Red List of Threatened Species 2008:e.T14296A4430073. <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T14296A4430073.en>. Downloaded on 23 May 2017.