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SHORT COMMUNICATION

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NEW RECORDS OF BATS (MAMMALIA: CHIROPTERA) FROM ASSAM, NORTHEASTERN INDIA WITH A DISTRIBUTION LIST OF BAT FAUNA OF THE STATE

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Abstract: Specimen based records of two vespertilionid bats namely *Pipistrellus ceylonicus* and *Tylonycteris fulvida* are provided for the first time from the state of Assam in northeastern India. Based on review of existing literature and examinations of museum specimens, we also furnish a checklist of the bat fauna of Assam with distribution, which includes 32 species in 17 genera.

Keywords: Checklist, Chiroptera, new records, northeastern India, Vespertilionidae.

The northeastern region of India exhibits exceptional mammalian richness including over 70 bat species some of which have been described or reported only recently (Sinha 1999; Bates & Harrison 1997; Thabah & Bates 2002; Ruedi et al. 2012a,b; Saikia et al. 2017; Thong et al. 2018). Although there is no consolidated account on the bat fauna of Assam, bat diversity of the state is apparently not very high comprising around 30 recorded species (Bates & Harrison 1997; Sinha 1999; Boro et al. 2013; Boro & Saikia 2015). But considering the lack of field studies for documenting the diversity, distribution and status of the bat fauna of the state, the reported

species richness in the region would be undoubtedly an underestimate. In the pre independence period (before 1947), most of the small mammalian collections in the erstwhile Assam were made outside the present political boundary of Assam State, i.e., Khasi Hills (Meghalaya), Lushai Hills (Mizoram) and the Daffla and Mishmi Hills (Arunachal Pradesh). During the Mammal Survey conducted by Bombay Natural History Society (1911–1923), however, some areas of eastern and western Assam were surveyed. The report of the above survey recorded 15 species of bats from the current political boundary of the state (Hinton & Lindsay 1926). In the subsequent period, very little information was generated on diversity and distribution of the bat fauna of Assam except for Kurup (1968) and Sinha (1999), the former dealing with the mammalian fauna of Assam as a whole and the latter providing a consolidated account of the bats of northeastern India. Twenty-eight species of bats from Assam find mention in the monographic work of Bates & Harrison (1997). Of late, a few species have been added to the bat fauna of Assam (Boro et al. 2013;

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Boro & Saikia 2015). But no up to date checklist of the bat fauna of Assam exists till date. In this communication, we provide specimen-based records of two species from Assam, namely *Pipistrellus ceylonicus* (Kelaart) and *Tylonycteris fulvida* (Blyth), which represent additions to the bat fauna of the state. Additionally, we also furnish a checklist of the bats of the state with recorded localities. Our compiled checklist includes 34 species from 17 genera (Table 2), which is primarily derived from published information supplemented by specimens deposited at Zoological Survey of India, Shillong (ZSIS).

MATERIALS AND METHODS

Adult specimens of *Pipistrellus ceylonicus* and *Tylonycteris fulvida* from two localities in Assam were collected (Fig. 1). The specimens were humanely euthanized with chloroform vapour and preserved in 70% alcohol and integrated in the collection of ZSIS. Standard morphological measurements of the specimens and craniodental measurements of the extracted skulls were taken using a digital caliper accurate to the nearest 0.1mm and 0.01mm respectively and were identified following Bates & Harrison (1997). For the checklist, information

is primarily based on published literature including the Chiroptera catalogue of Zoological Survey of India, Kolkata (Ghosh 2008). The chiropteran collection from Assam in ZSIS was also examined and the information incorporated which was supplemented by author's field observations in various parts of western Assam between August 2012 and September 2017. In view of recent taxonomic revisions and species delimitations (Benda & Gaisler 2015), published records of palearctic species like *Pipistrellus pipistrellus*, *Pipistrellus kuhlii* from Assam are omitted from the present account.

The acronyms of measurements are: Head and body length (HB); Tail length (T); Ear length (E); Tragus length (Tr); Hindfoot length, including claw (HF); Forearm length (FA); Tibia length (Tb); 3MT-3rd Metacarpel length; 4MT-4th Metacarpel length; 5MT-5th Metacarpel length; Greatest length of skull including incisors (GTLi); Condylbasal length (CBL); Condylcanine length (CCL); Maxillary tooththrow length (CM³); Width across third molars (M³M³); Width across canines (C¹C¹); Zygomatic breadth (ZB); Postorbital constriction (POC); Breadth of braincase (BB); length of mandible including incisors

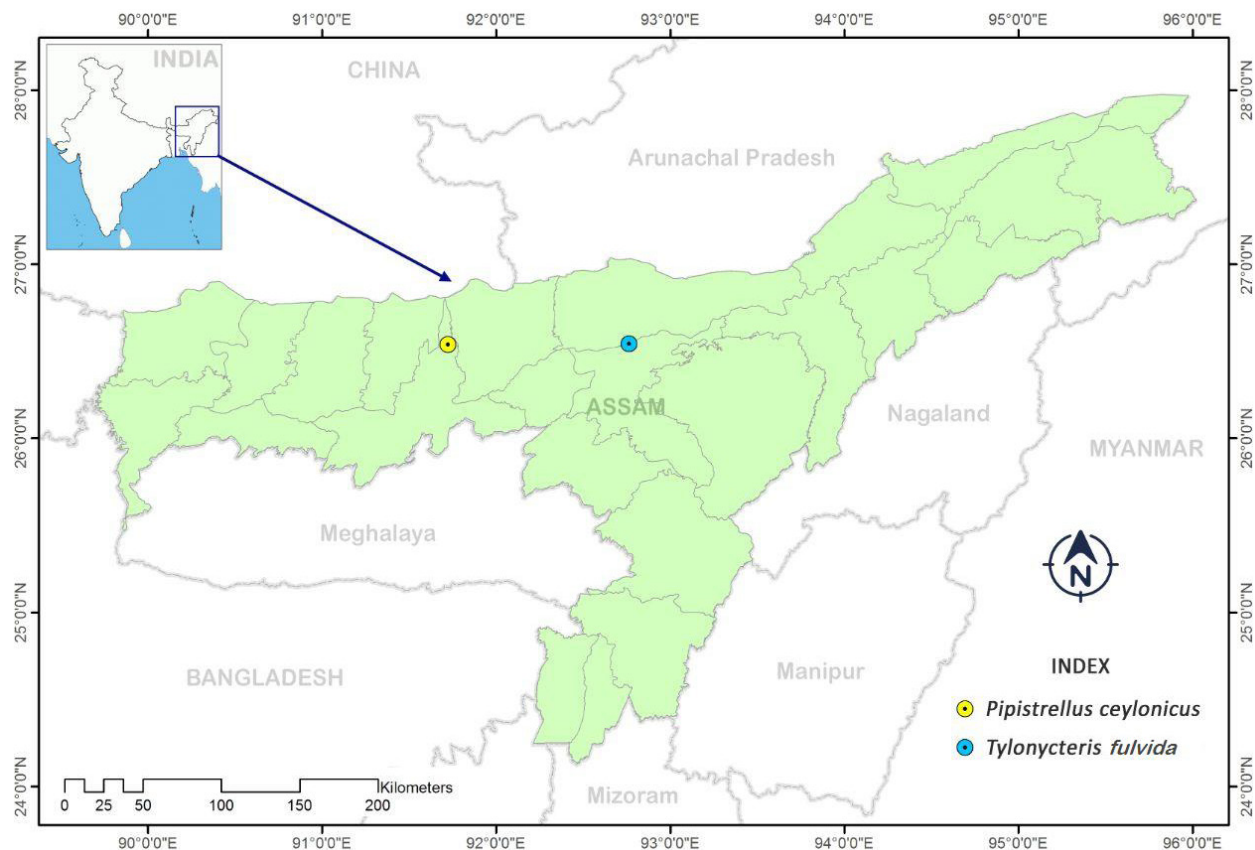


Figure 1. New distribution localities for *Pipistrellus ceylonicus* and *Tylonycteris fulvida* in Assam.

(MLi); Mandibular toothrow length (CM₃); Coronoid height (COH)

RESULTS AND DISCUSSION

Two vespertilionid species, namely, *Pipistrellus ceylonicus* and *Tylonycteris fulvida* were recorded for the first time from Assam State in northeastern India. For *P. ceylonicus*, this also constitutes the second record of the species from northeastern India. An updated checklist of bats of Assam State comprising 32 species in 17 families is also provided.

Pipistrellus ceylonicus

During field work around the periphery of Burachapari Wildlife Sanctuary in Sonitpur District of Central Assam, an adult male specimen of *P. ceylonicus* was caught at Sisuwati Village (26.54438°N & 92.76413°E, 50m) at the southern edge of the Sanctuary at 16.40hr on 28 November 2016. The village is situated on the sandy riverbank of Brahmaputra with scattered human settlements. The individual was captured while flying inside a school building by sweeping a butterfly net. Although we could not ascertain the roosting location of the bat, secondary sources informed that a colony of bats roosts on the ceiling of an occasionally used community health centre building nearby.

The Kelaart's Pipistrelle *Pipistrellus ceylonicus* (Kelaart, 1852) is a widely distributed species in South Asia, Southeast Asia and China (Bates et al. 2008a). In India, this bat is known from the states of Andhra Pradesh, Bihar, Goa, Gujarat, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu and West Bengal (Bates et al. 2008a). The International Union for Conservation of Nature (IUCN) categorizes this species as Least Concern (Bates et al. 2008a). This species has recently been recorded from Umlyngsha area (25.20783°N & 92.26216°E) of East Jaintia Hills in Meghalaya State (Saikia et al. in press). Thus, the present record of this species from Assam is the second report of this species from northeastern India and it is quite likely that the species is more widely distributed in India than previously documented.

Description of the specimen

The live specimen had a golden yellow pelage around the anterior part of the dorsum (Image 1). The posterior region especially around the flanks was chocolate brown. The ventral pelage was golden yellow, individual hairs had a yellowish tip and darker roots. The bright golden colour of the specimen may indicate its advanced age as noted by Philips (1980) who stated that older individuals

Table 1. External and cranial measurements of *P. ceylonicus* and *T. pachyus* specimens from Assam.

Measurements (mm)	<i>Pipistrellus ceylonicus</i> ZSIS-382, male	<i>Tylonycteris fulvida</i> ZSIS-407 male, ZSIS-408 female
FA	33.4	27.2, 28.6
HB	47	-
T	35.1	25.3, 26
E	12	9.1, 9.3
Tr	4.1	3.2, 4.2
HF	8.6	5, 5.2
Tb	11.7	12, 13
3 rd MT	33.4	27.4, 27.7
4 th MT	33.5	27.3, 26.3
5 th MT	32.2	25.6, 26.5
GTLi	13.82	11.92, 12.40
CBL	13.40	11.10, 12.14
CCL	13	11, 11.50
CM ³	5.32	3.81, 4.00
M ³ M ³	6.53	5.37, 5.45
C ¹ C ¹	4.73	4.08, 4.14
ZB	9.95	8.77, 8.81
BB	7.18	6.58, 6.76
POC	4.20	3.81, 3.90
MLi	10.48	8.55, 8.85
CM ₃	5.57	4.10, 4.53
COH	3.46	2.35, 2.68

tend to assume a more reddish or golden hue. Muzzle, ears and interfemoral membranes were dark brown. The ears are triangular in profile with roundish tips. Tragus is curved and blunt and the muzzle is naked. Compared to the size of the individual, the penis is long (shaft length of 8.25mm). The interfemoral membranes join to the base of the phalanges. The animal weighed 6.5g. The animal was registered in the collection of ZSIS under the registration number V/M/ERS/382.

The skull is robust with a condylocanine length of 13mm (Table 1), and the dorsal profile is slightly convex in the anterior region. The zygomata, however, are comparatively thin and flared outward. The supraorbital ridge is well defined. The dentition of the individual is significantly worn out; especially the canines whose tip is almost at the level of the posterior premolar indicating its old age. Mastication over the lifespan of an individual continually wears down tooth surfaces and as a result, cheek teeth become short as cusps are worn down, canines become short and dull, and the width of the tip increases (Brunet-Rossini & Wilkinson 2009). The



Image 1. Portrait of *Pipistrellus ceylonicus* (ZSIS-382)



Image 2. *Tylonycteris fulvida* dorsal view (ZSIS-407)

first upper premolar (pm^2) is prominent and its crown area is almost equal to that of the first upper incisor (i^2). This is in contrast to similar sized species like *Hypsugo anthonyi*, *H. joffrei*, *Pipistrellus cadornae* and *Arielulus circumdatus*, which have diminutive first upper premolar (Pearch & Writer 2009).

Tylonycteris fulvida

Two adult individuals of Club-footed Bat *Tylonycteris fulvida* were caught in the evening of 24 July 2017, by

mist netting inside a bamboo grove at Balahati Village (26.53555°N & 91.71861°E, 60m) of Baksa District in western Assam. The bamboo grove (*Bambusa balcooa*) is surrounded by agricultural fields on all sides. It may be mentioned that on an earlier occasion in July, 2013 we found 14 pups of this bat along with a single female roosting inside the intermodal space of a bamboo cut from the same bamboo grove. The female was observed trying to enfold the pups with the wings and was reluctant to fly away and was later released on the

Table 2. Checklist of bat fauna of Assam comprising 32 species in seventeen genera with recorded distribution localities in the state.

	Family	Species	Locality records	Data source/Remarks
1	Pteropodidae	<i>Pteropus giganteus</i> (Brünnich, 1872)	Widely distributed throughout the state. Some reported localities include Guwahati City, Palasbari, Kamrup District; Dalgaoon, Darrang District; Lakhimpur, Lakhimpur District; Mahuri Para, Baksa District; Rongjuli, Goalpara District; Bilasipara, Kacharighat, Dhubri District, Cachar, Cachar District; Golaghat, Golaghat District; Doom Dooma, Tinsukia District.	ZSIS-9340, 9341; Ali 2015; Sinha 1999; Bates & Harrison 1997; Anderson 1912; Hinton & Lindsay 1926.
2		<i>Cynopterus sphinx</i> (Vahl, 1797)	Balahati near Goreswar, Salbari, Baksa District; Khamtighuli near Guijan; Tinsukia District; Golaghat, Golaghat District.	ZSIS-315, 316, 385; Hinton & Lindsay 1926
3		<i>Rousettus leschenaulti</i> (Desmarest, 1820)	Goreswar, Baksa District; Kherkheria, Darrang District; Kaziranga, Golaghat District; Rongjuli, Golapara District.	ZSIS-9465, 9466; Sinha 1999
4		<i>Eonycteris spelaea</i> (Dobson, 1871)	Kherkheria, Darrang District.	Ghose & Bhattacharyya 1974
5	Megadermatidae	<i>Megaderma lyra</i> E. Geoffroy, 1810	Guijan, Tinsukia District; Tamulpur, Baksa District; Bornadi WS, Udalguri District; Bokakhat, Manas NP; near range office, Orang NP, Darang District; Dhania range office, Burachapari WS, Sonitpur District; no exact locality, Kamrup & Goalpara districts.	ZSIS-310, 384, 429; Sinha 1999; Uttam Saikia pers. obs. October 2016.
6		<i>Megaderma spasma</i> (Linnaeus, 1758)	Kulsi, Rajpara, Kamrup District.	Hinton & Lindsay 1926
7	Emballonuridae	<i>Taphozous longimanus</i> Hardwicke, 1825	Salbari Village, Baksa District; Narikuchi Village, Nalbari District.	ZSIS-314, 9231, 9233; Sinha 1999
8		<i>Saccolaimus saccolaimus</i> (Temminck, 1838)	Balahati Village, Baksa; Dhubri Town, Dhubri District.	Boro & Saikia 2015; Ali 2016
9	Rhinolophidae	<i>Rhinolophus pusillus</i> Temminck, 1834	Sibsagar, Sibsaigar District; Golaghat, Golaghat District; Rani, Kamrup District.	Hinton & Lindsay 1926; Sinha 1999; ZSIS-317
10		<i>Rhinolophus lepidus</i> Blyth, 1844	Sibsagar, Sibsaigar District.	Sinha 1999
11		<i>Rhinolophus luctus</i> Temminck, 1834	Gunjung, Dima Hasao District.	Sinha 1973
12		<i>Rhinolophus trifolius</i> Temminck, 1834	Sibsagar, Sibsaigar District.	Sinha 1973
13	Hipposideridae	<i>Hipposideros cineraceus</i> Blyth, 1853	Golaghat, Golaghat District; Margherita, Tinsukia District.	Hinton & Lindsay 1926
14		<i>Hipposideros pomona</i> Anderson, 1918	Gaurisagar Temple, Sibsaigar, Nazira, Sibsaigar District; Guwahati, Rajapara, Kamrup District; Golaghat, Golaghat District; Margherita, Tinsukia District; no exact locality, Cachar District.	Sinha, 1999; Hinton & Lindsay 1926; Kurup 1968. (Records of <i>H. fulvous</i> from northeastern India are referable to <i>H. pomona</i>) (Bates and Harrison, 1997)
15		<i>Hipposideros larvatus</i> (Horsfield, 1823)	Rajapara, Kamrup District; Goalpara, Goalpara District.	Hinton & Lindsay 1926; Kurup, 1968
16		<i>Hipposideros armiger</i> Hodgson, 1835	Rajapara, Kamrup District.	Hinton & Lindsay 1926
17	Vespertilionidae	<i>Myotis formosus</i> (Hodgson, 1835)	Goalpara, Goalpara District.	Sinha 1986
18		<i>Myotis muricola</i> (Gray, 1846)	Lokhra near Balipara, Sonitpur District.	Nath 1952
19		<i>Myotis horsfieldii</i> (Temminck, 1840)	Barangabari, near Manas NP, Baksa District.	ZSIS -318, 319; Boro & Saikia 2015
20		<i>Scotophilus heathii</i> Horsfield, 1830	Balahati, Salbari, Barangabari Tea Estate, Baksa District; Rajapara, Jalukbari, Kamrup District; Mahuripara, 6km from Goreswar, Baksa District; Dudhnoi, Goalpara District.	ZSIS -312, 313, 430 9578, 9234, 9235; Sinha 1999; Ghosh 2008
21		<i>Scotophilus kuhlii</i> Leach, 1821	Musalpur, Baksa District.	ZSIS-311
22		<i>Eptesicus serotinus</i> (Schreber, 1774)	Darang, Darang District.	Anderson 1881
23		<i>Pipistrellus paterculus</i> Thomas, 1905	Rajapara, Palasbari, Kamrup District.	Bates & Harrison 1997
24		<i>Pipistrellus javanicus</i> (Gray, 1838)	Lokhra near Balipara, Sonitpur District; Rajapara, Palasbari, Kamrup District; Basbari, Baksa District; Sibsaigar, Sibsaigar District; Margherita, Tinsukia District.	Kurup, 1968; Sinha 1999 (as <i>P. babu</i>), Bates & Harrison 1997; Hinton & Lindsay 1926; ZSIS- 410
25		<i>Pipistrellus coromandra</i> (Gray, 1838)	Tamulpur, Goreswar Town, Naokata, 16km from Goreswar, Baksa District; Goalpara, Rongjuli, Goalpara District.	ZSIS-307, 326, 327, 328, 329, 9577; Sinha 1999

	Family	Species	Locality records	Data source/Remarks
26		<i>Pipistrellus tenuis</i> (Temminck, 1840)	Balahati near Goreswar, Goreswar Town, Mahuripara, Baksa District; Guwahati, Rajapara, Angarkhata, Kamrup District; Golaghat, Golaghat District; Rangjuli, Goalpara District; Mangaldoi, Darrang District, Sadiya, Tinsukia District.	ZSIS-308, 324, 325, 9561, Sinha 1999; Hinton & Lindsay 1926, Ghosh 2008
27		<i>Pipistrellus ceylonicus</i> (Kelaart, 1852)	Sisuwati Village, Sonitpur District.	Present study, ZSIS-382
28		<i>Tylonycteris fulvida</i> (Blyth, 1850)	Balahati, near Goreswar, Baksa District.	Present study, ZSIS-407, 408
29		<i>Harpiocephalus harpia</i> (Temminck, 1840)	Ripu, Kokrajhar District.	Kurup 1968
30		<i>Kerivoula picta</i> (Pallas, 1776)	Kaziranga NP, Golaghat District; Hapjan Tea Estate, Lakhimpur District.	Chaturvedi 1969; Uttam Saikia pers. obs. 03 March 2008
31		<i>Kerivoula hardwickii</i> (Horsfield, 1824)	Sibsagar, Sibsaigar District; Rajapara, Kamrup District.	Sinha 1999; Hinton & Lindsay 1926
32		<i>Murina huttoni</i> (Peters, 1872)	Ripu, Kokrajhar District	Kurup 1968



Image 3. *Tylonycteris fulvida* ventral view (ZSIS407)

same spot. On several earlier occasions, this bamboo patch was visited and flight and roosting activity of this bamboo bat was noted only during the wet season especially between June–August.

Although hitherto not recorded in Assam, *Tylonycteris*

fulvida (as *T. pachypus*) has been reported from a few localities in Manipur, Meghalaya and Mizoram, Sikkim and Tripura states of northeastern India (Molur et al. 2002). In view of its widespread distribution in China, South and Southeast Asia, the IUCN Red List of

Threatened Species categorizes it as a Least Concern species (Bates et al. 2008b).

Description of the specimens

The two captured specimens of *T. fulvida* were golden brown dorsally except for the muzzle which was darker while the ventral pelage was little paler (Images 2 & 3). The muzzle and ears were dark brown. The wing membranes were dark brown and hairless. The dorsal pelage is thick and short, however, it is not so dense in the venter. They are uniformly coloured throughout the length. The typically flattened head and the whitish thumb pads is very discernible. The feet are small and the wing membrane attaches to the base of the metatarsus and around the middle of the roundish thumb pad.

The skull is very broad and flattened which possibly developed in these bats as an adaptation to facilitate entry and exit through small fissures in bamboos. In fact, the cleft in the bamboo from where these individuals were caught was barely 5mm wide. The nasal notch does not extend posteriorly to the level of infraorbital foramina and the supraorbital process is poorly developed, which are distinguishing characteristics of *T. fulvida* (= *T. pachypus*) (Bates & Harrison 1997). The craniodental measurements (Table 1) fit well to the mensural data reported in Bates & Harrison (1997). The specimens were deposited in the collection ZSIS under registration numbers V/M/ERS/407 and 408

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