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A report on chiropterological investigations in some major caves of East Jaintia Hills, Meghalaya, India

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Abstract

An investigation was conducted to determine the diversity and abundance of bat fauna in some of the major caves of east Jaintia hills district of Meghalaya. A total of 11 bat species of 04 families were recorded from the surveyed caves. A few of the caves were found to be devoid of any discernable bat population while another few still harbour a significant populations of several bat species and thus could be priority areas for future conservation initiatives.

Keywords: Cave, Chiroptera, Conservation, Jaintia Hills, Meghalaya

Introduction

The north-east Indian state of Meghalaya harbours a tremendously diverse bat fauna with 65 reported species which constitute over fifty percent of the 127 bat species in India (Ruedi et al, 2012; Saikia et al., 2017; Thong et al., 2018; Saikia et al., 2018; Saikia, 2018). Besides its past zoogeographic history, presence of numerous caves and caverns in the state is another contributing factor for this astounding bat diversity. Caves are known to harbor large populations of myriad bat species throughout the world. Caves serve as an ideal breeding and roosting ground for bats and thus their availability is a major factor in determining diversity and distribution of bats (Kunz, 1982). This is because of the fact that caves offer relatively stable and safe microclimate for large populations of bats and protects them from environmental fluctuations. Since the availability of suitable roosting place is one of the determining factors of bat diversity in an area, Meghalaya with innumerable big and small caves is an ideal area for bats to colonize and thrive. Due to the geologic history, the state has vast tracts of limestone deposits spreading across the state especially in the Khasi and Jaintia Hills districts. This coupled with high annual precipitation offers suitable conditions for the formation of caves. Over 925 caves from the state were documented and mapped some of which are longest or deepest in the Indian subcontinent (Arbenz, 2012). Most of these limestone and a few sandstone caves are located in the East Khasi hills and Jaintia Hills districts of Meghalaya. A majority of the bat fauna of the state are dependent on caves for shelter including many obligatory cave roosting species (Saikia *et al*., 2018). In this backdrop, a study was initiated with an objective of exploring the bat diversity in some of the major caves of East Jaintia Hills district of Meghalaya.

Study Area

The state of Meghalaya is divided in to eleven administrative districts, among which the East Jaintia Hills district and West Jaintia Hills district have recently been carved out of erstwhile Jaintia Hills district. The present surveys cover areas in East Jaintia Hills District, which hold most of the major caves in the region. Jaintia Hills districts are situated in the easternmost corner of the state sharing an international boundary with Bangladesh. The districts occupy a total area of 3819 sq.km., and stretch across 25°30' - 25°45' North latitudes and 91°59' - 92°45' East longitudes. Geologically, Jaintia Hills constitute a part of Meghalaya Plateau with comparatively more flat topography than Khasi Hills. The elevation range stands between 1050 to 1630 m. Climate is influenced by the Southwest Monsoon and the Northeast winds with four distinct seasons namely Spring (March to April), Summer

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(May to September), Autumn (October to November) and Winter (December to February).

The vegetation of the district consists of subtropical pine forest of *Pinus kesya* at higher elevations and moist evergreen and broadleaf forest at lower elevations.

The study covers the following eight major caves in East Jaintia Hills (E.J.H.) district. Krem denotes cave in local dialect.

Krem Labit 1: This cave (25.350860N, 92.50350E, 1117m) is located in Shongrim area of East Jaintia Hills under Khliehriat block. Krem Labit is a long limestone cave, with a perennial water course. A few meters from the cave entrance is a narrow and low tunnel that opens in to the long cave passage that remains broad and high for most of the part.

Krem Labit 2: This cave (25.359550N, 92.512610E, 1050m) is located about 2 km east of Krem Labit 1 and situated in Shnongrim area. The cave is located on a rock face and is the cave opening is well camouflaged by rocks and vegetation.

Krem Labit 3: This cave is located (25.182860N and 92.376860E 550m) in the Lumshnong area.

Krem Synrang Labit: Located near Shnongrim (25.347110N, 92.524910E, 1080m), the cave is 3933m long.

Krem Umlawan: Cave mouth is located at 25.168830N and 92.382580E and 530masl. The Umlawan cave is the second longest and also the deepest in the sub-continent. The cave is interconnected with two other caves namely Kot-Sati and Umskor caves. The total length of these caves is more than 21 kms and about 100 m in depth.

Krem Khlieshnong: The cave mouth is located at 25.180830N 92.394160E at an altitude of 550m.

Krem Kot-Sati: This cave system is interconnected with cave Umlawan and is 21530m long. There are at least 24 entrances to this cave, the major one has a deep pool of water in front and one has to swim across to enter it.

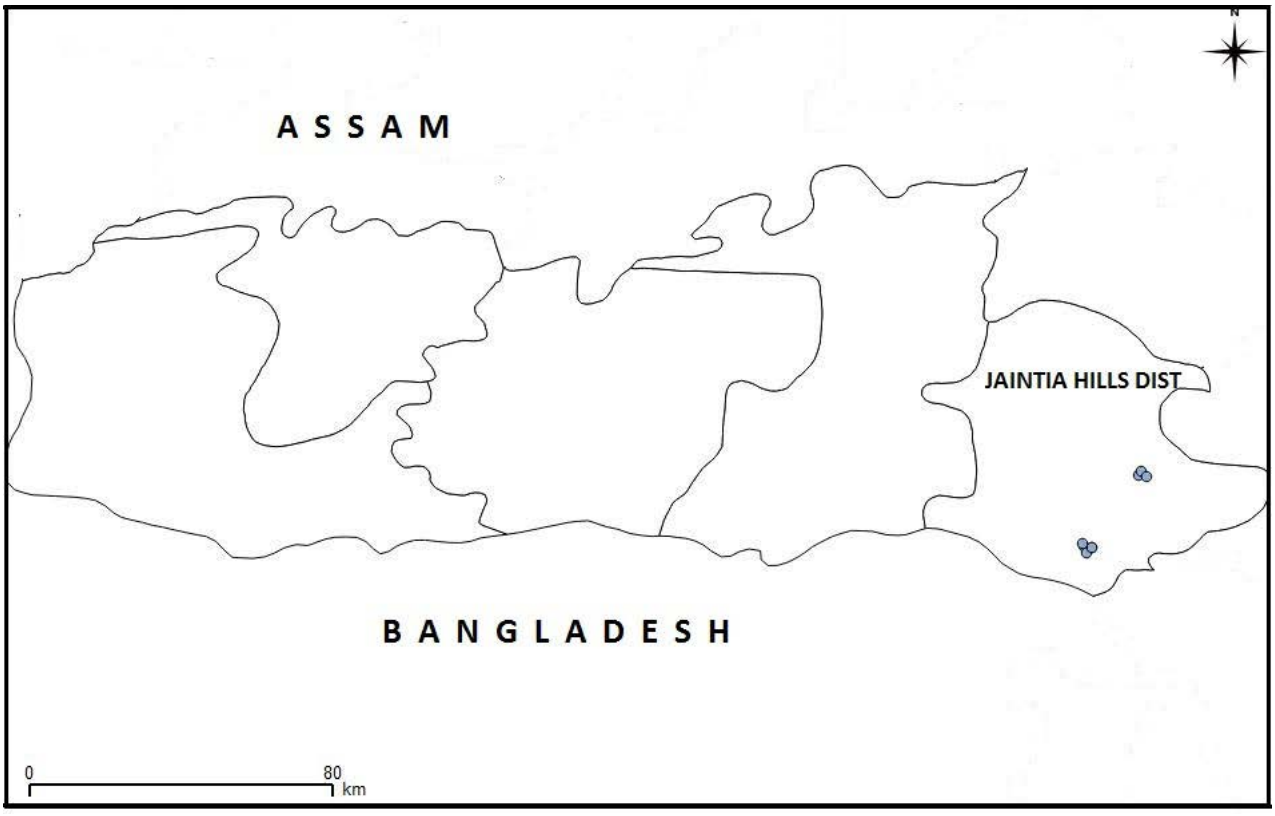

Figure 1. Map of Meghalaya State showing survey localities in East Jaintia Hills.

Krem Umadoh: The cave mouth is situated at 25.191380N 92.373330E at an altitude of 520 m near Lumshnong village.

Methodology

Three field surveys were carried out in the study area during April, 2014, November, 2014 and December, 2015. Surveys involved locating the major caves in the area and determining bats presence from local informants. Most of the caves visited during the surveys found to contain bat colonies although species diversity and population size varied considerably. Those caves with bat populations were surveyed in the daytime by entering inside and observing bat colonies. Opportunistic voucher collections were also made during daytime. However, it was ensured to cause least possible disturbances to the roosting bat colonies. In the afternoon, Nylon mist nets of various lengths were put up in front of the cave entrance. Mist netting was continued till around 8-9pm. Bats were mainly caught during emergence from the day roosting while a few were also trapped while re-entering the caves. Most of the specimens caught were released at the site after obtaining standard sets of external measurements and a few were preserved as vouchers and deposited in the collections of Zoological Survey of India, Shillong (ZSIS). The deposited vouchers were identified following available taxonomic literature (Bates and Harrison, 1997; Csorba, Ujhelyi and Thomas, 2003)

Results and Discussion

A total of eleven bat species in three families were recorded from the survey sites as follows

Family HIPPOSIDERIDAE

1. *Hipposideros armiger* Hodgson, 1835

Material examined: ♂ ZSIS-360, Krem Khlieshnong, E.J.H., Meghalaya, Coll. U Saikia, 15.12.2015 and three released individuals.

Remarks: Apparently a common bat in cave Labit 1 although no roosting colonies were observed. On 11th November, 2014, several dead animals caught for consumption were observed with local hunters who regularly kill these bats using improvised fishing nets set in front of the cave mouth. A preferred catch for local hunters, they informed about the existence of a large colony of this bat until a few years back in Krem Labit but their population has significantly declined in recent time because of hunting. A small colony of 15-20 individuals of this bat was observed inside cave Khlieshnong.

2. *Hipposideros pomona* Anderson, 1918

Material examined: ♀ ZSIS-362, ♀ ZSIS-363, Krem Labit 3, EJH, Meghalaya, Coll. U. Saikia, 16.12.2015; ♀ ZSIS-343, ♂ ZSIS344, Krem Umadoh, EJH, Meghalaya, Coll. U. Saikia, 14.12.2015

Remarks: A small colony of this species was observed in Krem Labit 3. Another two specimens were caught from the entrance of cave Umadoh during evening emergence although no roosting colony was detected.

3. *Hipposideros cineraceus* Blyth,1853

Material examined: ♀ ZSIS-349, ♀ ZSIS-361, Krem Labit 3, E.J.H., Meghalaya, Coll. U. Saikia,

Remarks: Two individuals of this smallest Hipposiderid in India were caught in front of Krem Labit 3 by sweeping a butterfly net. Many other individuals of this bat were seen flying around the cave entrance. A deft flyer, could avoid the mist nets easily. Not observed in any other caves surveyed.

4. *Hipposideros* cf. *larvatus* (Horsfield, 1823)

Material examined: ♂ ZSIS-297, ♂ ZSIS-305, Krem Labit 2, E.J.H., Meghalaya, Coll. U. Saikia, 12.11.2014

Remarks: Eight individuals of this species were caught in the mist net in front of Krem Labit 2 of which two were retained as vouchers. This bat shares the cave with a huge colonies of *Miniopterus magnater* and comes out of day roosting only when darkness sets fully.

Family RHINOLOPHIDAE

5. *Rhinolophus pearsonii* Horsfield, 1851

Material examined: ♂ ZSIS-296, Krem Synrang Labit , E.J.H., Meghalaya, Coll. U. Saikia, 30.04.2014

Remarks: This bat was encountered in cave Synrang Labit and a small group of 7-8 individuals were seen hanging in a corner near the entrance.

6. *Rhinolophus sinicus* Anderson, 1905

Material examined: ♀ ZSIS-341, Krem Khlieshnong, E.J.H., Meghalaya, Coll. U. Saikia, 15.12.2015

Remarks: A single specimen of this bat was caught inside Krem Khlieshnong in a butterfly net. Although a small colony of medium sized *Rhinolophus* bat was also observed inside this cave, its identity could not be established.

7. *Rhinolophus affinis* Horsfield, 1823

Material examined: ♂ ZSIS-364, Krem Umlawan, E.J.H., Meghalaya, Coll. U. Saikia, 16.12.2015

Remarks: The male specimen was caught in the daytime near the entrance of cave Umlawan by scooping a butterfly net.

8. *Rhinolophus pusillus* Temminck, 1834

Material examined: ♂ ZSIS-339, ♂ ZSIS-340, Krem Umadoh, E.J.H., Meghalaya, Coll. U. Saikia, 14.12.2015

Remarks: Two individuals of this species were caught from Krem Umadoh. A small colony of this bat was located and was found to share roosting space with *Hipposideros pomona* in the cave.

9. *Rhinolophus luctus* Temminck, 1835

Material examined: ♂ ZSIS-306, Vatesuandung Bakhur, E.J.H., Meghalaya, Coll. U. Saikia, 13.11.2014

Remarks: A single individual was collected from a large rock fissure at Vatesuandung Bakhur, 6km West of Saipung near river Kunda and a large colony of around 100 individuals were observed roosting there. Although, not observed inside any cave, locals reported occasional occurrence of this species in a few caves in the area.

Family MINIOPTERIDAE

10. *Miniopterus magnater* Sanborn, 1931

Material examined: ♂ZSIS-298, ♂ ZSIS-299, ♂ZSIS-300, ♂ZSIS-301, ♀ZSIS-302, ♀ZSIS-303 Krem Labit 2, E.J.H., Meghalaya, Coll. U. Saikia, 12.11.2014 and three released individuals from Krem Khlieshnong.

Remarks: This species has recently been reported from India by Ruedi *et al*. 2012. During this study, this bat was found to be very abundant in Krem Labit 2 with a population of many hundreds animals. A few individuals were also caught at the mouth of Krem Khlieshnong. Based on re-examination of the material in ZSIS, earlier records of *Miniopterus schreibersii* from Siju cave in South Garo Hills (Sinha, 1999) are also found to represent this species. Therefore, this species may be quite widespread and abundant in the state.

Family VESPERTILIONIDAE

11. *Ia io* Thomas, 1902

Material examined: One male individual in Krem Labit 3

Remarks: A specimen was caught in the mist net in Krem Labit 3 but escaped while taking measurements. Not observed in any of the other caves surveyed. Although relatively rare in other parts of India, this bat may widespread in karstic regions of Khasi and Jaintia Hills (Ruedi *et al*., 2012)

Threats and Conservation Issues

A majority of the bat species in Meghalaya are associated with caves either as obligatory or facultative cave dwellers (Saikia *et al*., 2018). Therefore, caves are critical for the survival of a large number of bat species in the state. At the same time, cave ecosystems are also very fragile in nature since they have evolved in a relatively constant environmental regime and least adapted to abrupt changes. The Jaintia Hills in Meghalaya harbours the highest number of caves per unit area, with the Shnongrim Ridge being the home of some most spectacular ones (Tringham, 2012). Unfortunately many of the caves in Jaintia Hills area are facing imminent threat from large scale mining. Since the area is rich in coal and limestone deposits, uncontrolled and unscientific mining activities flourishing in the area are causing irreparable damage to the local ecology. The green cover is almost lost and the soil and water is being contaminated with toxic wastes from mining activities. Besides, the ground vibration caused by blasting activities in mining is a serious hazard to the caves that could result in caving in of the underground chambers.

Table 1. External mensural data of the specimens from the study area. (Measurements in mm)

	Number of exs.	HB	TL	E	HF	TB	FA	3mt	4mt	5mt
H. armiger	1♂	73	50	26.7	16.7	36.5	83.3	58.6	59	52.2
H. pomona	3♀1♂	35	29.8-33	18.6-22.3	7.5-9	18.6-19.5	41-42.4	30.7-32.2		32.3-33.2
H. cineraceus	2♀	40-42	26	14.8-15.9	6.4-6.5	15.9	34.6-35.7	26.7-26.9	28.9-29.1	27.9-28.5
*H.*cf. *larvatus*	2♂	60-63	36.5-40.1	23-24	12-12.5	25.3-27	61.4-62.7	47.2	45.2	44.4
R. luctus	1♀	62.8	58.1	37	15.6	37.5	71	51.8	58.2	59.2
R. pusillus	2♂	29-30	19-23	15.2-15.7	7-7.3	15.7-16.4	36.7-37.4	28.4-29.1	29.6-29.8	29.6
R. pearsoni	1♂	45	21	26.7	12.2	27.4	50.7	37.3	41.5	43.2
R. affinis	1♂	49.4	21.3	18.8	11.6	22.8	52.45	40.2	41.3	42.4
R. sinicus	1♀	42.4	24.5	19.3	9	19	46.7	36.6	37.3	38.5
Miniopterus magnater	4♂, 2♀	55-59.6	57-61	12.5-13.3	9.2-10.8	20.8-23	49-51.8	45.8-47.9	42.9-46.6	38.6-41.5
Ia io	1♂	-	-	-	17.2	-	73.2	-	-	-

Another severe threat to the bat populations in the Jaintia Hills is the rampant hunting for bushmeat. Although the larger *Hipposideros* and *Rhinolophus* bats are preferred hunt, even smaller and smelly species like *Miniopterus magnater* are also hunted (Saikia et al. 2018). The famous bat cave, Krem Labit 1 in Shnongrim area now hardly harbours any significant bat population. It is apparent that severe hunting pressure have resulted dwindling of the bat populations in these caves or forced them to seek refuge in other safer places. Various improvised bat catching mechanisms are easily observed in most of the cave entrances. Locals informed that bat meat fetch high value in the local market for their purported medicinal value.

It is worth mentioning that recently a few caves with a considerable population of rare *Otomops wroughtoni* has been discovered in Jaintia Hills (Ruedi et al., 2014) and this is a silver lining for conservation of this protected bat species. With the mining ban imposed by the National Green Tribunal, things can look a little better with proper strategy for restoration of the damaged ecology of the region. Also legal provisions are urgently required for ensuring protection of the caves of Jaintia Hills. Scientific management plan for conservation of these threatened cave ecosystems can be formulated in consultations with the scientific community.

Sensitizing the local people about the importance of cave ecosystems and involving them in the conservation efforts can also be of fruitful. Recent efforts by the Forest Department in declaring cave Umthalong (holding a breeding population of *O. wroughtoni*) and the nearby forest area in East Jaintia Hills as a Community Reserve is a welcome initiative. However, in view of the fragile nature, any tourism related activities in and around the caves must be strictly regulated.

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References

Arbenz T. 2012. Cave pearls of Meghalaya. A cave inventory covering Jaintia Hills, Meghalaya, India. Volume 1: Pala Range and Kopili River. Replika Press, India, p 265

Bates, P.J.J. and Harrison, D.L. 1997. Bats of the Indian subcontinent. Harrison Zoological Museum, Kent, 268pp.

Csorba, G., Ujhelyi P. and Thomas N. 2003. Horseshoe bats of the world (Chiroptera:Rhinolophidae). Alana Books, 160pp

Kunz, T.H. 1982. Roosting ecology of bats. In: Kunz T.H. (ed): Ecology of Bats, Plenum Press, New York, pp 1-55 https://doi.org/10.1007/978-1-4613-3421-7_1 PMid:7061994

Ruedi M., Biswas, J., Chachula, O. and Arbenz, T. 2012. A winter survey of bats from the Jaintia Hills with a synopsis of their diversity in Meghalaya In: Arbenz T. (Ed). Cave pearls of Meghalaya. Vol I Pala Range and Kopili Valley, 87-105, Abode of Cloud project, Switzerland. PMCid:PMC3415991

Ruedi, M., Mukhim, K.B.,Chachula, O., Arbenz, T. and Thabah, A. 2014. Discovery of new colonies of the rare Wroughton's free-tailed bat Otomops wroughtoni (Mammalia: Chiroptera: Molossidae) in Meghalaya, northeastern India. *J. Threat. Taxa,* **6**: 6677–6682. https://doi.org/10.11609/JoTT.o4164.6677-82

Saikia U., Csorba, G. and Ruedi, M. 2017. First records of Hypsugo joffrei (Thomas, 1915) and the revision of Philetor brachypterus (Temminck, 1840) (Chiroptera: Vespertilionidae) from the Indian Subcontinent. *Rev. suisse Zool*, **124**(1): 83-89

Saikia, U., Thabah, A., Chachula, O.M. and Ruedi, M 2018 The bat fauna of Meghalaya, Northeast India: Diversity and conservation. In Venkataraman and Sivaperuman (Eds): Indian Hotspots: Vertebrate faunal diversity, conservation and management, Springer Nature Singapore, 263-286pp

Saikia, U. (2018) A review of chiropterological studies and a distributional list of the bat fauna of India. *Rec. zool. Surv. India,* **118**(3):242-280

Sinha, Y.P. (1999) Bats of the Siju cave, South Garo Hills, Meghalaya, India: Taxonomy and Bionomics. *Rec. Zool. Surv.India*, **97**(1): 101-122

Tringham, M.E. 2012. Geology In: Arbenz T (ed): Cave pearls of Meghalaya. Vol I Pala Range and Kopili Valley, Abode of Cloud project, Switzerland, pp. 16-19

Thong, Vu Dinh, Xiuguang Mao, Gabor Csorba, Paul Bates, Manuel Ruedi, Nguyen Van Viet, Dao Nhan Loi, Pham Van Nha, Oana Chachula, Tran Anh Tuan, Nguyen Turong Son, Dai Fukui, Vuong Tan Tu and Uttam Saikia, 2018. First records of Myotis altarium (Chiroptera:Vespertilionidae) from India and Vietnam. *Mammal Study*, **43**: 67-73 https://doi.org/10.3106/ms2017-0076

Figure 1. *Miniopterus magnater* Sanborn.

Figure 2. *Hipposideros pomona* Anderson.

Figure 3. *Rhinolophus sinicus.* Anderson.

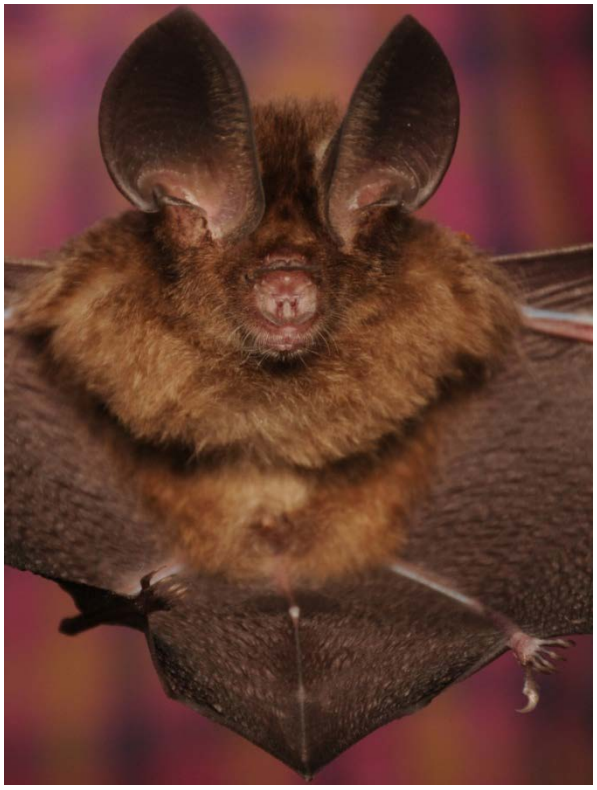

Figure 4. *Hipposideros cineraceus* Blyth.

Figure 5. *Hipposideros* cf. *larvatus* (Horsfeild).

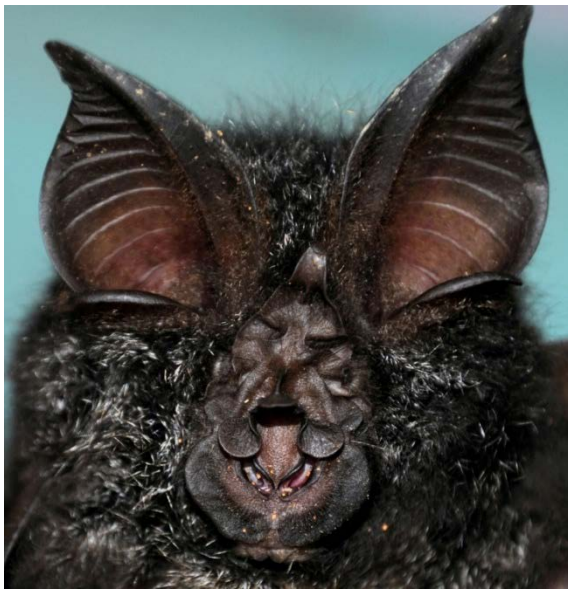

Figure 6. *Rhinolophus luctus* Temminck.