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First record of Asiatic Lesser Yellow House Bat, *Scotophilus kuhlii* Leach, 1821 (Mammalia: Chiroptera: Vespertilionidae) from Delhi, India

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ABSTRACT

The Asiatic Lesser Yellow House Bat *Scotophilus kuhlii* is recorded for the first time from Delhi region, India. A solitary female was collected on October 25th 2015, from the academic building of Guru Gobind Singh Indraprastha University, Dwarka, South-west region, Delhi. Cranial measurements and other morphological characters clearly indicate that the specimen differs from Greater Yellow House Bat *Scotophilus heathii* in outer morphology as well as in cranial characters, with smaller in size and lack of characteristic yellow tinge belly pelage which is profoundly found in *S. heathii*. Therefore we report it as the first record of *Scotophilus kuhlii* from Delhi region.

Key words: *Scotophilus kuhlii*, insectivorous bats, Delhi region.

INTRODUCTION

Bats make up for almost a quarter of the world's mammal species with more than 1300 species reported from all over the world (Fenton & Simmons 2014). India, with 124 species (Saikia et al. 2017) of bats accounts for more than 90 percent of bats in South Asia. The bat fauna of Delhi region had not explored systematically and extensively. Delhi is also home to many historical buildings and monuments of archeological importance, which provide safe roost to large bat populations. To understand bat fauna of this region, a systematic survey of bat diversity was started in 2012, to document the present bat species in Delhi region with updates on old roosting sites as well as a collection of information on new bat roosting sites along with habitats used by bats. The genus *Scotophilus* includes ten species with a geographical range expanding from South Africa to

Senegal, Sudan, Somalia and Arabia, Madagascar, Afghanistan to Indonesia, Philippines and Taiwan (Koopman 1993).

STUDY AREA AND METHODS

Delhi, located in the northern part of the country and having a distinct mixture of ecological zones of Aravalli hill range as well as Yamuna river plains. Being on the ecotone of these specific zones, biodiversity of Delhi reflects the presence of flora and fauna of both sides. Delhi is a very dynamic city in term of urban expansion, infrastructure growth and loss of natural habitat. As per the Master Plan of Delhi-2001 notified by the Central Government under the Delhi Development Act 1957, the National Capital Territory of Delhi is systematically divided into 15 zones out of which 8 zones (A-H) are in urban Delhi, 6 zones (J to N & P) are in urban extension or rural area and Zone-O

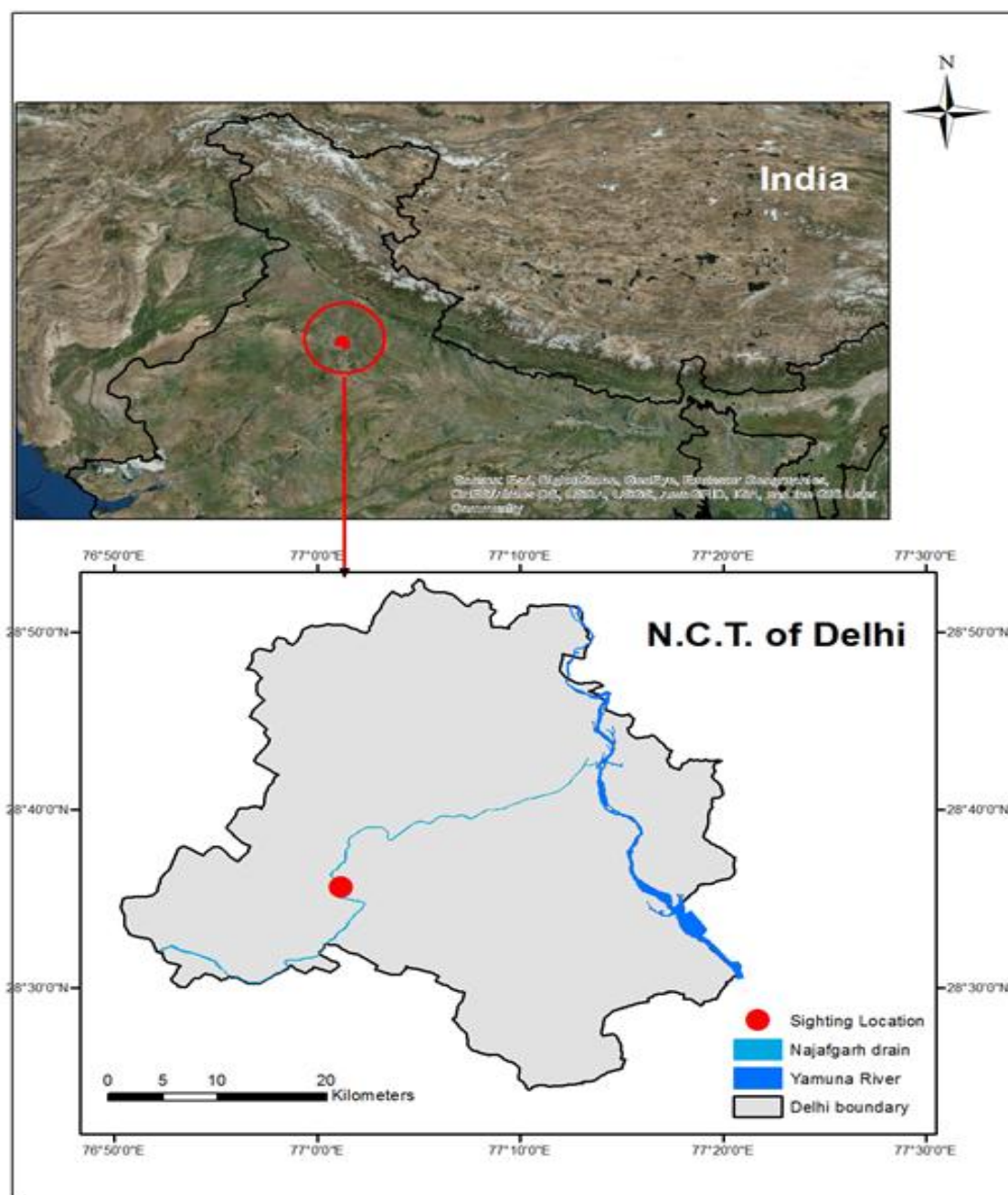


Fig.1. Sighting location of *Scotophilus kuhlii* in Delhi region.

is for River Yamuna (River Front Area). Dwarka sub-city lies in part of zone-K and forms part of the urban extension plan and developed by Delhi Development Authority as residential cum educational area after undertaking more than 20 small as well as large villages and their agriculture land in 1999. The Dwarka Sub-city is situated in close proximity to Najafgarh nalah (extension of the long channel of Najafgarh Lake) in the west, an open vast area in the east as International Airport, semi urbanized area in the south and highly urbanized areas in the north. Guru Gobind Singh Indraprastha University campus, from where the individual was captured, is located extreme west of

Dwarka sub-city and just adjoining Najafgarh nalah, surrounded by large plantation under CAMPA fund with more than 70% area under open and green cover. The present campus was constructed in 2009 and became fully functional in 2010. Prior to the establishment of the University and its close by area was majorly consisted of agricultural fields, brown-field sites, road side or avenue plantation done by the Delhi Development Authority (Fig.1&2).

During a regular roost exploration survey on 25th October, 2015 in South-west Delhi, a bat was spotted and trapped for confirmation of species in the staircase of 3rd floor of an academic building of

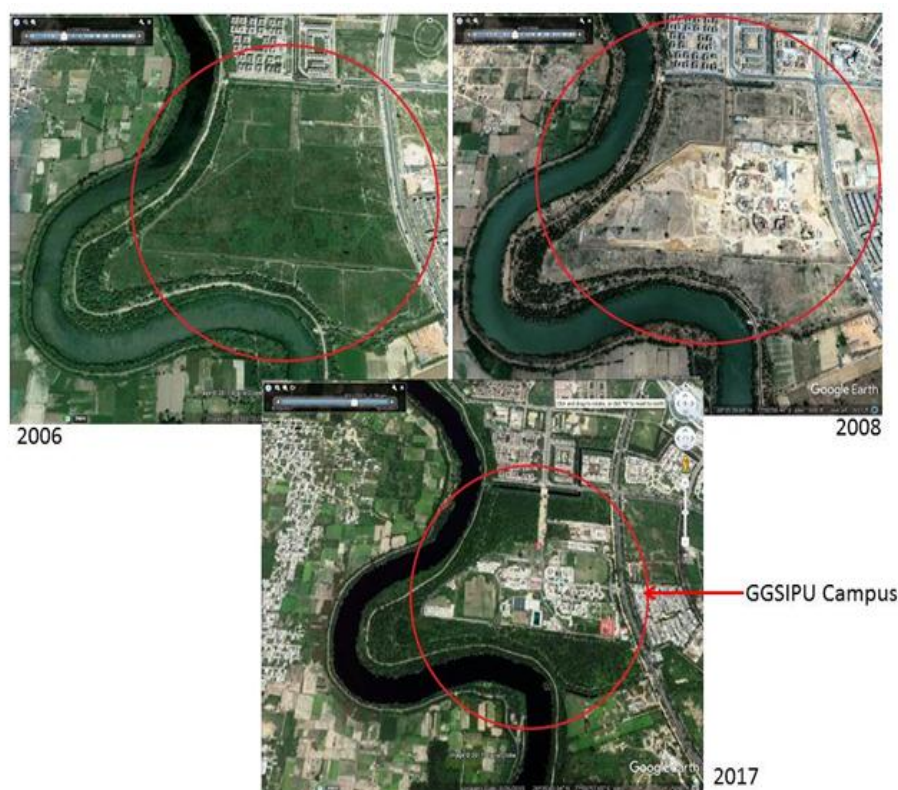


Fig.2. Real time satellite imagery showing the gradual development and construction of GGSIPU campus from 2006 to 2017 (Courtesy: Google Earth).

GGs Indraprastha University Campus (28.594119° N and 77.020344° E), which is located in the Dwarka sub city of New Delhi. The female was found on the floor of the main educational building and appeared very weak on close examination. It became unresponsive a few minutes after it was picked up. The mammary glands were visibly developed confirming the individual as an adult female. The striking yellow colour on the ventral pelage was missing and the smaller length of the forearm ruled out its possibility of being a specimen of *Scotophilus heathii*. It died next day due to weakness and later was preserved following the standard protocol (Bates et al. 2005) as a voucher specimen and was assigned the voucher number IPU-Chiro-DL-32. External measurements were carried out with the help of Mitutoyo™ digital Vernier caliper with the nearest to 0.01 mm. It became unresponsive a few minutes after it was picked up. The mammary glands were visibly developed confirming the individual as an adult female. The striking yellow colour on the ventral pelage was missing and the smaller length of the forearm ruled out its possibility of being a specimen of *Scotophilus heathii*. It died next day due to weakness and later was preserved following the standard protocol (Bates et al, 2005) as a voucher specimen and was assigned the voucher number IPU-Chiro-DL-32.

RESULT AND DISCUSSION

The external morphometric and the craniodental measurements confirmed it as *Scotophilus kuhlii* Leach 1821. Careful morphometric observation (external as well as cranial) revealed as the bat of Genus *Scotophilus* Leach, 1821 (Bates & Harrison 1997, Srinivasulu et al. 2010).

The Indian subcontinent is represented by two species of genus *Scotophilus* i.e., *S. heathii* and *S. kuhlii*. While *S. heathii* is a robust bat with an average forearm length of 60.7 mm; *S. kuhlii* with an average forearm length of 49.0 mm can only be distinguished with certainty from *S. heathii* by its overall smaller size (Bates & Harrison 1997). The forearm length of the captured individual is 49.00 mm and, the dorsal pelage is chestnut brown in colour, detailed measurements are given in Table 1. The ventral pelage is a pale buffy brown and lacks the characteristic yellowish tinge found in *S. heathii* alongwith other measurements (Fig. 4 A&B), indicates that the captured bat is of *S. kuhlii*. In India, *S. kuhlii* has been reported so far from the states of Rajasthan, Gujarat, Maharashtra, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Odisha, Madhya Pradesh, Uttar Pradesh, Bihar, West Bengal, Meghalaya, Tripura and Nicobar Islands (Srinivasulu and Srinivasulu 2005, 2012, Bates & Harrison 1997). There are few studies on bats of Delhi area, Brosset (1962a,b,c); Bates and Harrison (1997), Sinha & Sati (1997); Molur et al. (2002); Ghosh (2005) and Srinivasulu &

Srinivasulu (2007) but none of them reported *S. kuhlii* from this part, hence the present sighting followed by specimen collection is noteworthy. It was never been reported from nearby areas like Punjab, Haryana and Uttar Pradesh (West UP). The closest sighting locality is Bharatpur and Alwar in Rajasthan (Adwani 1982). Hence, we report the presence of *S. kuhlii* in Delhi on the basis of a female individual.

Though there is no historical data available on *Scotophilus sp.* from the area, the construction of urban structures has resulted in an increase in the many roosting and foraging habitats of bat species like *Pipistrellus* and *Scotophilus* which are globally known to forage in urban environments. *Scotophilus kuhlii* is known to roost in crevices and holes in walls of huts and old buildings, caves, old temples, palm fronds, hollows in palm trees and dried leaves on trees and is found both in urban and rural landscapes (Brosset 1962; Sinha 1986).

A brief description of a specimen provided below:

External characters – A medium bat with a forearm length of 49.68 mm. The pelage on the dorsal side is chestnut brown in colour and a paler buff brown on the ventral side. The characteristic yellowish tinge found in *S. heathii* is missing. Ears are smaller as compared to the head with a crescent shaped tragus.

Cranial characters: The skull is broad and robust with well developed lambdoidal crests. The sagittal crest is also well defined in the posterior region.

All the morphometric measurements were compared with the measurements provided by Bates and Harrison (1997) and Srinivasulu et al (2010). The measurements were all in the range for *S. kuhlii*. The slight deviations from the mean have been found which is may be due to geographic variation (Fig. 2).

Table 1: Morphometric measurements for *Scotophilus kuhlii* (female)

Morphometric Character		Measurement (in mm) (Specimen IPU-Chiro-DL-32)
External characters (Body)		
1.	Fore Arm	49.68
2.	Head Body	61.49
3.	Tail	37.72
4.	Ear	11.05
5.	Hind Foot	9.21
6.	Tibia	19.40
External Characters (Wing)		
7.	3 rd Mt	48.44
8.	4 th Mt	45.83
9.	5 th Mt	42.15
10.	1Ph 3 rd Mt	16.71
11.	2Ph 3 rd Mt	19.00
12.	1Ph 4 th Mt	13.66
13.	2Ph 4 th Mt	9.79
Cranial Characters		
14.	GTL	18.96
15.	CBL	17.64
16.	CCL	15.84
17.	ZB	12.75
18.	BB	9.38
19.	CM ³	6.50
20.	CM ₃	7.45
21.	M	13.31
23.	C ¹ – C ¹	5.21
24.	C ₁ – C ₁	4.21

Abbreviations used:FA (Fore-arm); HB (Head-Body); E (Ear); T (Tail); TIB (Tibia); HF (Hind-foot); 3Mt (Third Metacarpal); 1Ph3 Mt (1st Phalange of third metacarpal); 2Ph3Mt (2nd Phalange of third metacarpal); 4Mt (Fourth Metacarpal); 1Ph4Mt (1st Phalange of fourth metacarpal); 2Ph4Mt (2nd Phalange of fourth metacarpal); 5Mt (Fifth Metacarpal). For Cranio-dental measurements the parameters studied are: GTL (Greatest Length of the skull); BB (Breadth of Brain-case); ZB (Zygomatic Breadth); CBL (Condylar-basal length); CCL (Condylar-canine length); C-M³ (Canine-molar distance); C¹-C¹ (Canine to canine distance); M (Mandible length)

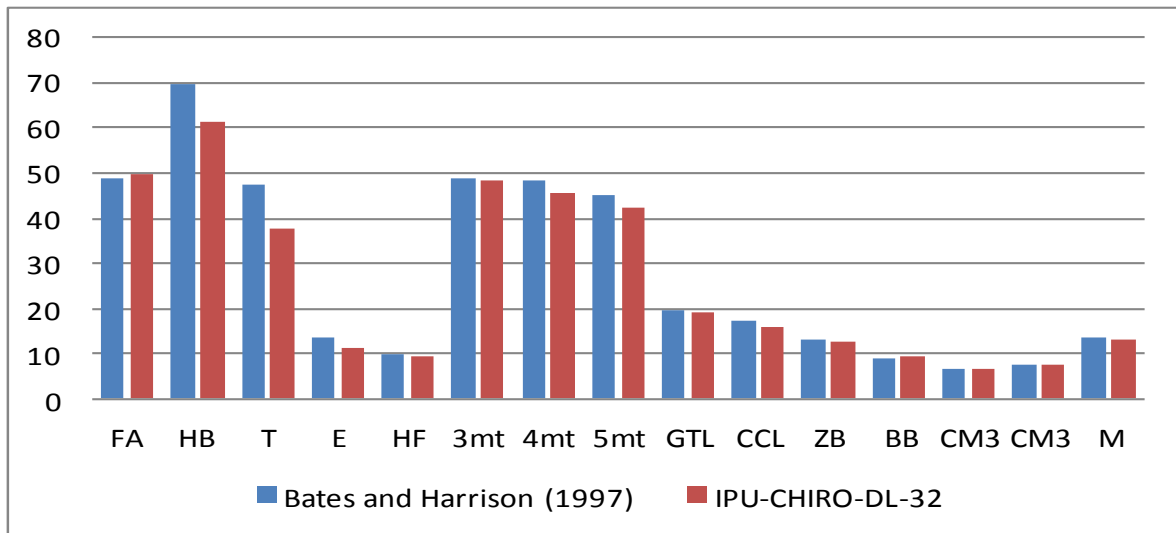


Fig. 3: Morphometric comparisons with Bates and Harrison (1997).

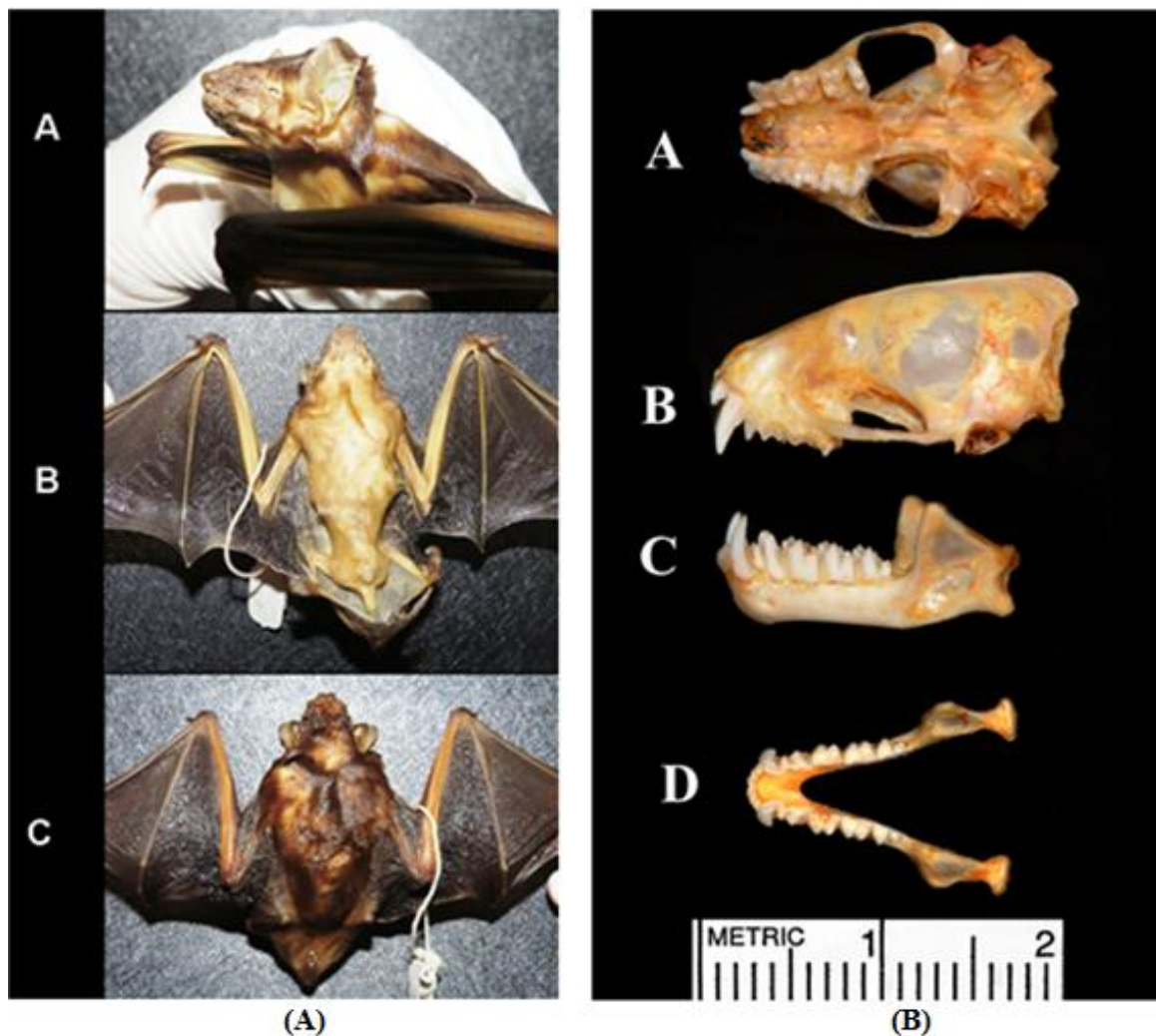


Fig. 4: (A) Specimen photographs A. Lateral face showing targus, B. Ventral body showing pale colour peliage and C. Dorsal side shoing dark brown peliage; (B) The skull and mandible of *Scotophilus kuhlii*. A. B. Skull of adult female, C. Side view of lower jaw or mandible, D. Occlusal view of the mandible of an adult female.

CONCLUSION

This is the first specimen-based record of *S. kuhlii* Leach, 1821 from Delhi region. During a 5 year long survey and examination of specimen did not yield sightings of this taxon from any other locality except Dwarka region. The nearest sighting location for this species is in Bharatpur (Rajasthan), which is more than 200 km away. The existence of the *S. kuhlii* Leach, 1821 from a single locality in Dwarka, Delhi from a relatively green region with intermixing of many medium to high rise residential as well as educational buildings is enigmatic and requires further surveys.

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