

Research Article

## New distribution record of the Greater False Vampire Bat (*Megaderma lyra*, Geoffroy 1810) from North-Western Himalaya

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**ABSTRACT**

India has been stated to have 10% of the world's total bat's diversity. The present survey was aimed to study the bat species diversity, distribution and activity patterns in north-western Himalayan region of India. Field surveys were conducted and echolocation calls were recorded using bat detector, Echometer touch 2 in Shiwalik ranges of Himalaya. The Greater False Vampire Bat (*Megaderma lyra*) has a broad distribution range that stretches from south to south east Asia. In India the distribution of the species was mostly recorded from southern subtropical coastal regions and north-eastern subtropical moist evergreen forests. In the present study The Greater False Vampire Bat (*Megaderma lyra*) has been recorded for the first time from Garhwal region of north-western Himalayas. Greater False Vampire Bat (*Megaderma lyra*) having long forearm ( $>6.63 \pm 0.03\text{cm}$ ) and lengthy ear ( $>3.66 \pm 0.08\text{cm}$ ), which is a distinguishable feature of the family Megadermatidae. The peak frequency (FMaxE) of echolocation was recorded as  $50.295 \pm 9.18\text{ kHz}$ . This frequency was initiated at  $108.20 \pm 2.51\text{ kHz}$  and terminated at  $30.76 \pm 1.37\text{ kHz}$ . The call structure recorded was very distinguishable and specific to this family.

**Keywords:** Bioacoustics, Chiropterans, Himalaya, Morphometry, Taxonomy

### Introduction

Bats are an ecologically important and taxonomically diverse group present within the order Chiroptera of class Mammalia, contributing almost 1/5th of mammalian diversity [1,2]. Relatively larger population and the long distance flight (several kilometres per night) by bats play a significant ecological role in prey-predator relationship, insect suppression, seed dispersal, pollination (Chiropterophily) and nutrient recycling from foraging area (mainly side by areas of water bodies) to the roosting area [3–5]. India contributes about 120 bat species, [6] out of which approximately 50 species has been reported from North-West Himalaya in Uttarakhand as per the global database of bat taxonomy [7].

The family Megadermatidae in India consist of two species of bats generally known as Greater False Vampire and Lesser False Vampire bats [8]. Majorly the bats from the Family Megadermatidae roost in forts, old buildings and limestone caves

[9,10]. The distribution of The Greater False Vampire Bat (*Megaderma lyra*) is wide in Asia; from Afghanistan, China, Pakistan, Sri Lanka, Malaysia. In India the species has been reported from southern coastal subtropical and north-eastern subtropical moist Himalayan forests. The echolocation calls with data were recorded from Kerala[11], a southern coastal state only. The species has been reported without acoustic data [8] from Khamaria, Ranibagh (Nainital District) (Figure1). The present research findings with echolocation acoustic data have been recorded for the first time from the Garhwal region of northern Indian Himalayan Sal (*Shorea robusta*) forests.

### Material and Methods

The extensive field survey was carried out from July 2021 to September 2021. During the field survey, we observed a colony (15-20 individuals) of bats in an old building situated in an

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ecotone region of urban and forest area (30°06'45"N, 78°18'45"E, altitude-359m asl) in Rishikesh city (Figure 2a). Three individuals were collected by using hand-nets [12] for morphometric analysis. The handling procedures for bats follow [13]. Age was classified based on the ossification of finger joints following [12]. Morphometric measurements were taken using Vernier calliper, a methodology similar to [8] and [6]. Body weight has been measured using Digital Weighing Scale (Health Sense Chef-Mate KS 33). Echolocation calls were recorded by using Echometer touch 2 (256k sample/second at 16-bit, wildlife

acoustics) in full spectrum (.wav file format). These recorded audio files were then processed by Kaleidoscope (wildlife acoustics) software. Start frequency/Initial frequency, End frequency/Terminal frequency, Peak frequency or Frequency of Maximum Energy (FMaxE) and call duration of call were calculated using the power spectrum [14–16]. After taking morphometric measurements, all individuals were released into their natural habitat. The echolocation calls were recorded when the individuals were released from nets and were in flight.

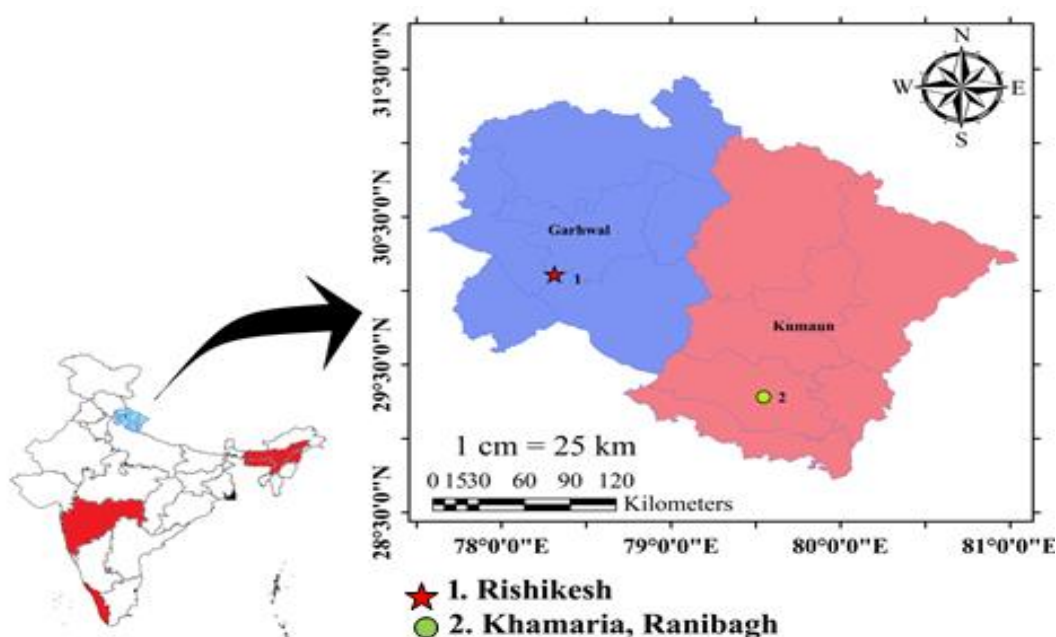


Figure 1. Known locations of *Megaderma lyra* in India (left). The red star indicates the new location (most northern) recorded in this study and green dot indicate old location where *Megaderma lyra* was reported by Bates and Harrison in 1997 from Uttarakhand (right).



Figure 2. Habitat of *Megaderma lyra* (a) and Google Earth V 7.3.4.8642. (11/14/2021) (b). Rishikesh Uttarakhand, India. 30°06'45"N, 78°18'45"E Eye alt 359 meter. Digital Globe 2022. <http://www.earth.google.com> [April 26, 2012]. Yellow pin showing the location of habitat.

### Results and Discussion

The subtropical region where old buildings and the whole area surrounding the species recorded is covered by deciduous forest. This habitat is located adjacent to the Ganga River and mainly has *Shorea robusta* (Sal), *Ficus religiosa* (Fig) and *Ficus benghalensis* (Banyan) trees. The other side of River Ganga is highly urbanized (Figure 2b, Google Earth), which provides more prey density

(flying insects attracted by streetlights) leading to foraging success of insectivorous bats. Their body hair had mouse grey colour in appearance and possessed many parasites on their body.

Megadermatidae family are easily distinguishable from other micro-chiropterans' family by their morphological appearances. *Megaderma lyra* have long nose leaf (Figure 3) and relatively



Figure 3. Greater False Vampire Bat (*Megaderma lyra*) front view (a) and Greater False Vampire Bat (*Megaderma lyra*) roosted in their habitat (b).

Table 1. Morphological characters of three individuals of *Megaderma lyra*, caught at Rishikesh.

Individual Number	Weight (g)	Sex	Age	Forearm length(cm)	Ear length (cm)
1	51	M	Adult	6.7	3.8
2	49	M	Adult	6.6	3.7
3	48	F	Adult	6.6	3.5
Mean(SE)	49.33 ± 0.8			6.63 ± 0.03	3.66 ± 0.08

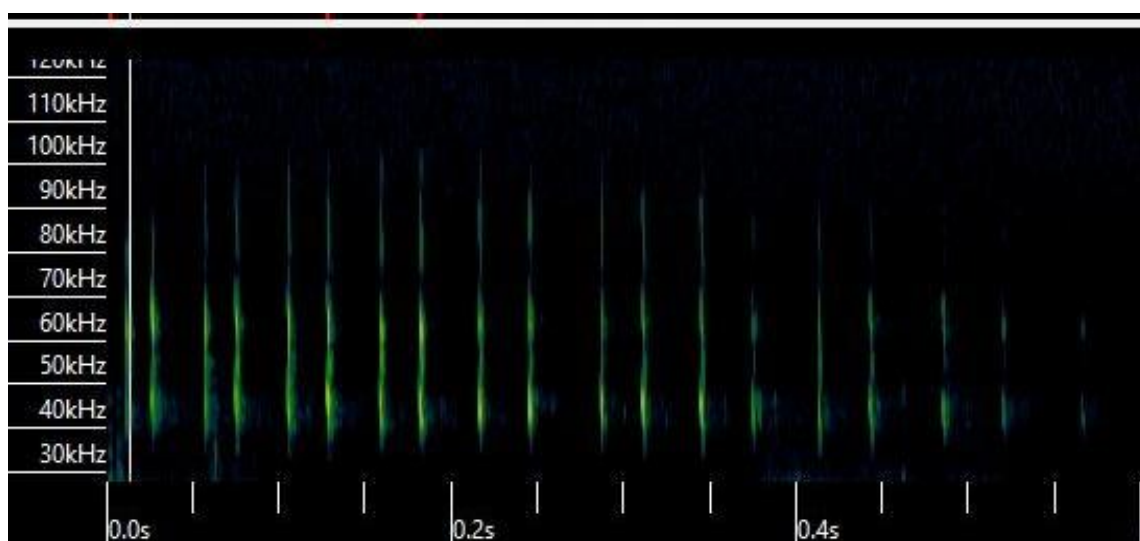


Figure 4. Echolocation calls of free-flying individuals

Table 2. Echolocation call parameters of *Megaderma lyra*, from this study given as mean (SE)

S. No.	Echolocation Call Structure	Method of Recording	Start frequency/Initial frequency (kHz)	End frequency/Terminal frequency (kHz)	Peak frequency (FMaxE) (kHz)	Duration (ms)
1	FM	Free flying	108.20 ± 2.51	30.76 ± 1.37	50.295 ± 9.18	0.3-1.5

Table 3. Echolocation calls parameters of *Megaderma lyra*, from past study

Data source	Echolocation Call Structure	Method of Recording	Start frequency/Initial frequency (kHz)	End frequency Terminal frequency (kHz)	Peak frequency (FMaxE) (kHz)	Duration (ms)
Hughes <i>et al.</i> , 2011	FM	Hand released	106.00	35.00	62.10	1.8
Raghuram <i>et al.</i> , 2014	FM	Hand released	113.1, 119.2	33.8, 33.6	46.8, 44.8	1.0, 0.6
David López-Bosch <i>et al.</i> , 2020	FM	-	-	-	>40	-

narrow round base of nose compared to *Megaderma spasma*, which is another only species of Megadermatidae family reported from Indian sub-continent [17]. Long forearm ( $>6.63 \pm 0.03$ cm) and lengthy ear ( $>3.66 \pm 0.08$ cm) fused at 30% of ear's length are other distinct characteristics by which it can be differentiated from *Megaderma spasma* [18]. Similar morphometric characteristics including FA (Forearm) length  $6.64 \pm 2$  cm (SE), Ear Length  $3.79 \pm 1.8$  cm (SE) and weight  $52.40 \pm 3.58$  g (SE) were given by [8] and [24] respectively, from different parts of Indian sub-continent. These morphometric measurements corroborate our study, authorising that species is *Megaderma lyra*.

Peak frequency (FMaxE) is  $>40$  kHz for the family Megadermatidae according to [20]. We have recorded a similar peak frequency (Table 2) of *Megaderma lyra* with a similar spectrographic structure (Figure 4). These echolocation calls were made up of multi-harmonic frequency-modulated sweeps of different frequencies [21]. Every multi-harmonic frequency lies between 30.76(1.37) kHz to 108.20 (2.51) kHz with very short length duration from 0.3 to 1.5 milliseconds (Table2). The recorded peak frequency (FMaxE)  $50.295 \pm 9.18$  is higher than 46.8, 44.8 kHz and 40 kHz recorded by [11,20] while lower than 62.10 kHz, recorded by [15] (Table 3). This high-frequency range is

helpful for this species to catch small flying insect and glean large prey from the ground or water surface [22].

### Conclusion

The present study reports a new record of *Megaderma lyra* with acoustic data and photographs from Garhwal region (Uttarakhand) in north-western Himalaya. The envisaged study is also going on in the urban and non-urban areas of the north-western Himalaya to estimate the populations of different bats species. Long term monitoring and acoustic data will provide detailed information on the population status and distribution of the species from different habitats and altitudes in the coming years.

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