



New Records and Ecological Observations of the Previously Unreported Small Long-fingered Bat (*Miniopterus pusillus*) in Kerala, India

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

This research contributes to the conservation efforts by shedding light on the presence of *Miniopterus pusillus* in Kerala, highlighting the need for continued habitat protection and species-specific studies. This study expands the bat species checklist of Kerala by documenting the previously unreported presence of *Miniopterus pusillus*. The study, conducted from 2016 to 2019 in the Idukki and Ernakulam districts of Kerala, India, covered three forest divisions: Malayattoor, Munnar, and Mankulam, characterized by diverse ecosystems, including tropical evergreen and semi-evergreen forests, moist deciduous forests, grasslands, and montane shola ecosystems. Morphologically, *M. pusillus* exhibits several distinct features that differentiate it from other insectivorous bats. These include a gracile skull, a slender jaw, a reduced coronoid process, a less

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developed sagittal crest, and a lower number of teeth. *Miniopterus pusillus*, commonly known as the Small long-fingered bat, is a rare species within the family Miniopteridae. This article emphasizes the potential for further research in the less-explored regions of the Western Ghats, underscoring the need for comprehensive biodiversity assessments in these areas.

Keywords: *Miniopterus pusillus*; biodiversity; habitat loss; species diversity.

1. INTRODUCTION

The Western Ghats, a globally recognized biodiversity hotspot, are home to a wide array of animal and plant species, significantly influencing regional environmental dynamics. Despite the ecological importance of bats within this ecosystem, the diversity of bat species in the southwestern Ghats remains relatively understudied, with some species receiving little research attention. Bat studies present unique challenges, requiring year-round fieldwork across diverse ecosystems. In India, 117 bat species have been officially recognized, with additional research revealing new locations where species can be found (Bates & Harrison, 1997; Wilson & Mittermeier, 2019). However, landscape-based data alone are insufficient for a comprehensive understanding of species diversity and distribution. Previous research in Kerala, for example, has documented dominant bat species in the region, providing critical insights into the state's bat fauna (Madhavan, 2000; Simmons & Cirranello, 2022). Furthermore, ongoing efforts to determine bat species in Kerala have identified 29 species, with additional species reported by researchers from Osmania University (Silent Valley National Park) (Nameer, 2015; Srinivasulu et al., 2017). A rare and endemic and endangered bat species *Salim Ali's fruit bat* (*Latiden salimalii*) reported from Kerala (Joy et al., 2018). Joy (2023) identified a total of 33 bat species within Munnar Kerala. Microchiroptera as the dominant group, making up 81.8% of the species, while Megachiroptera accounted for 18.2% (Joy & Jeyaprabha, 2023). This species diversity is notable, with Microchiroptera, or small bats, making up 81.8% of the observed population, while Megachiroptera, or fruit bats, comprised 18.2%.

This study expands the bat species checklist of Kerala by documenting the previously unreported presence of *M. pusillus* (Dobson, 1876), a member of the family Miniopteridae, which includes at least 38 species distributed across much of the Eastern Hemisphere (Burgin et al., 2018; Ibañez & Juste, 2019; Bates et al., 2005). In South Asia, three species are currently

recognized: the Small Long-fingered Bat (*M. pusillus*), the Large Bent-winged Bat (*M. magnater*), and the Eastern Bent-winged Bat (*M. fuliginosus*) (Srinivasulu et al., 2010). *M. pusillus* is a rare species, primarily found in specific habitats in Karnataka, Tamil Nadu, and the Nicobar Islands. It roosts in caves and forages in evergreen montane forests but faces significant threats from habitat loss due to commercial logging and agricultural expansion (Molur et al., 2002; Aul & Vijaykumar, 2003). This research contributes to the conservation efforts by shedding light on the presence of *M. pusillus* in Kerala, highlighting the need for continued habitat protection and species-specific studies.

2. MATERIALS AND METHODS

The study, conducted from 2016 to 2019 in the Idukki and Ernakulam districts of Kerala, India, covered three forest divisions: Malayattoor, Munnar, and Mankulam, characterized by diverse ecosystems, including tropical evergreen and semi-evergreen forests, moist deciduous forests, grasslands, and montane shola ecosystems. Bats were captured using 12m and 6m mist nets, as well as hoop nets, placed along flight routes and at roosting locations, including caves, crevices, and abandoned buildings. Captured bats were temporarily held in canvas bags and identified based on physical characteristics such as forearm and wing measurements, sex, weight. Identification followed established taxonomic methods described by Bates and Harrison (1997). Bats were promptly released after measurements were recorded.

3. RESULTS

M. pusillus is a rare species typically found at higher elevations above 3000 feet, predominantly in forest interiors. Morphologically, *M. pusillus* exhibits several distinct features that differentiate it from other insectivorous bats. These include a gracile skull, a slender jaw, a reduced coronoid process, a less developed

Table 1. Measurement of external morphology, bodyweight, age and sex

SL. No	Species Name	Sex	Age	Body Weight (g)	Forearm (mm)	Tibia (mm)	Ear (mm)	Tail (mm)	Foot (mm)	Head to the body (mm)
1	<i>Miniopterus pusillus</i>	Male ♂	Adult	6±0.3	40±1	16±1	8±1	40.08±1	6±0.2	52±2.0
		Female ♀	Adult	5.7±0.3	40±1.1	15±1	7±1	37.08±1.02	6±0.2	49±1.5

(Value: Mean ± standard deviation)

Table 2. Measurement of external morphology

SL. No	Species Name	Sex	Wingspan (mm)	Finger (mm)										
				Thumb	2 Meta carpal	3 Meta carpal	4 Meta carpal	5 Meta carpal	1ph 3mt	2ph 3mt	1ph 4mt	2ph 4mt	1ph 5mt	2ph 5mt
1	<i>Miniopterus pusillus</i>	Male ♂	287±2	6±0	40±2	32±2	31.5±1	28±1	9±0.5	32±0	7±2	17±.5	7±2	8±0.5
		Female ♀	287±2	6±0	37.5±0.5	32±0	31.5±0.5	28±1	9±0.5	31.5±0.5	7±0	17±1.5	7±0.5	8±0.5

(Value: Mean ± standard deviation)

sagittal crest, and a lower number of teeth. Notably, both the upper and lower canines are weak, suggesting an inability to process hard food items. Based on these characteristics, it is hypothesized that *M. pusillus* may specialize in feeding on soft-bodied prey, such as moths. However, direct evidence of their feeding habits remains unavailable. These morphological adaptations, indicative of specialization for soft prey, suggest that *M. pusillus* may have a more restricted dietary niche compared to hard-object feeders, which exhibit greater versatility in prey selection due to their generalized feeding capabilities.

4. DISCUSSION

Family Miniopteridae Miller, 1907

***Miniopterus pusillus* (Dobson, 1876) Small long fingered bat:** *M. pusillus*, commonly known as the Small long-fingered bat, is a rare species within the family Miniopteridae. Its distribution in India is restricted primarily to Karnataka, Tamil Nadu, and the Nicobar Islands (Kock, 1996). Historically, this species was treated as a subspecies of *M. australis* (Ellerman & Morrison-Scott, 1951), but it is now recognized as a distinct species (Hill, 1983; Corbet and Hill, 1992; Koopman, 1993; Bates and Harrison, 1997; Simmons & Cirranello, 2020). While *M. pusillus* is locally common in Southeast Asia, with significant colonies recorded in Thailand, Myanmar, and Vietnam (Borissenko & Krushkop 2003) little is known about the ecology or population trends of this species in South Asia (Molur et al., 2002). It has been recorded in protected areas such as the Kalakkad-Mundunthurai Tiger Reserve in Tamil Nadu (Vanitharani, 2006), yet in South Asia, it faces threats from habitat loss due to commercial logging, agricultural expansion, and human disturbance at roosting sites (Molur et al., 2002).

5. CONCLUSION

Chiropteran, a mammalian order that has gained increasing attention in recent studies, particularly within the Western Ghats of Kerala, is the focal point of this research. This study makes a significant contribution by documenting *M. pusillus*, a bat species previously unreported from Kerala. The updated checklist provides a valuable resource for ongoing research efforts and offers crucial insights for future investigations. Furthermore, this article emphasizes the potential for further research in the less-explored regions of the Western Ghats,

underscoring the need for comprehensive biodiversity assessments in these areas.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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