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Chiropteran Diversity in Teluk Bahang Forest Eco Park: Additional Bat Species Records and Conservation Status

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ABSTRACT

Bats, which serve as crucial biological seed dispersers and pest controllers, have largely lost their main habitat due to human development and deforestation. Rapid population growth has resulted in increasing demand for human settlements and it has become particularly critical for small states, such as Penang. Hence, a study was conducted to update bat species records in Teluk Bahang Forest Eco Park, Penang. A total of 45 individuals were caught, consisting of two families and six species of bats. Compared to previous study, two additional bats species were recorded during this expedition; *Hipposideros armiger* and *Rhinolophus pusillus*. *Rhinolophus affinis* is the highest captured species in this study compared to others. In terms of conservation status, there are differences between global and national categorizations. *Rhinolophus pusillus* is listed as Least Concern on IUCN Red List however it is classified as Data Deficient (DD) at national level. Meanwhile, *Rhinolophus refulgens* is listed as Not Evaluated (NE) on the IUCN Red List and listed as Data Deficient (DD) nationally. Additionally, *Hipposideros kunzi* is categorized as Not Evaluated (NE) on IUCN Red List and Data Deficient (DD) at national level. The increased number of bat species at new localities demonstrates the need to conserve various habitat types in Penang.

Keywords: Bats diversity, Penang, conservation

1. Introduction

Bats habitat varied among ecosystems including mangroves, forests, orchards and even urban areas [1]. Generally, bats play a crucial role in tropical forest ecosystems as well as agriculture areas such as bats in the family Pteropodidae that help in dispersing seeds for various economically important plants [2]. On the other hand, insectivorous bats contributed to controlling pests and suppressing insect population [3]. For insectivorous bats, due to poor eye sight they have the ability to hunt and navigate in the darkness using echolocation [4].

Penang Island has undergone massive deforestation due to extensive development and high population density [5]. Despite this habitat loss, several areas have been gazetted as forest reserves, including Teluk Bahang Forest Eco Park (TBFEP), to protect remaining forest ecosystems. These reserves support diverse bat communities, with Rhinolophidae, Hipposideridae, and Vespertilionidae being the most commonly encountered families, reflecting their adaptation to tropical rainforest environments [6]. A recent scientific expedition was conducted to investigate flora and fauna diversity across two forest reserves on the island. As part of this effort, bat surveys were conducted at TBFEP to monitor current populations and document new species records for Penang Island.

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2. Methodology

2.1 Field Sites

The study was conducted at Teluk Bahang Forest Eco Park (TBFEP; 5°27'02.15"N, 100°13'07.75"E). Teluk Bahang Forest Eco Park is a lowland forest covered with dipterocarp trees with an area of 873 hectares [7].

2.2 Bat trapping

During the expedition (1st – 4th July 2025), three harp traps for bat trapping were deployed in Trail 2 with a distance of 50m for each harp trap. The harp traps were examined hourly starting from 1900h until 2200h and then left overnight at the location and re-examined the next morning. Light rain conditions (drizzle to light rain) were recorded on the first trapping night between 1730h and 1800h. Each captured bat was temporarily held in an individual cloth bag for processing. Species identification was performed using external morphological characteristics and standard measurements as described in [8] and [9]. All bats were released within 1–2 hours of capture, immediately upon completion of data collection, to minimize handling stress.

3. Results & discussion

A total of 45 individuals representing six bat species were captured, comprising two species from the family Hipposideridae and four species from the family Rhinolophidae (Table 1). A previous study recorded 72 individuals from seven species and three families [10]. The current study recorded a slightly higher capture rate (7.5 individuals per trap effort) compared to the previous study [10] (5.5 individuals per trap effort). Among the six bat species recorded during this expedition, two species (*Hipposideros armiger* and *Rhinolophus pusillus*) represent new records for Teluk Bahang Forest Eco Park (TBFEP). Compared with other protected areas near TBFEP, Penang National Park (PNP) has recorded 16 species (88 individuals), with *Cynopterus brachyotis* being the most abundant species. The higher bat diversity recorded in PNP compared to TBFEP is likely due to the combined use of mist nets and harp traps for bat sampling. In other fragmented forests on the island, eight bat species (30 individuals) were recorded in Bukit Genting Forest Reserve [10], with *Rhinolophus affinis* being the most frequently captured species.

Table 1

The number of bats captured during the expedition in Teluk Bahang Forest Eco Park (TBFEP), Penang

Species (Local name)	No. of Individuals		Conservation status	
	This study	Previous study*	IUCN	DWNP
Family Hipposideridae				
<i>Hipposideros armiger</i> (Great Roundleaf Bat)	1	-	Least Concern (LC)	Least Concern (LC)
<i>Hipposideros kunzi</i> (Kunz's Roundleaf Bat)	9	2	Not Evaluated (NE)	Data Deficient (DD)
Family Rhinolophidae				
<i>Rhinolophus affinis</i> (Intermediate Horseshoe Bat)	22	46	Least Concern (LC)	Least Concern (LC)
<i>Rhinolophus refulgens</i> (Glossy Horseshoe Bat)	11	11	Not Evaluated (NE)	Data Deficient (DD)
<i>Rhinolophus pusillus</i> (Least Horseshoe Bat)	1	-	Least Concern (LC)	Data Deficient (DD)
<i>Rhinolophus stheno</i> (Lesser Brown Horseshoe Bat)	1	3	Least Concern (LC)	Least Concern (LC)
Total	45	62		
Trap/night	7.5	5.5		
Trap effort	6	12		

Note: IUCN= International Union for Conservation of Nature; DWNP= Department of Wildlife and National Parks, *= Nur-Izzati *et al.* [10].

4. Conclusions

Teluk Bahang Forest Eco Park (TBFEP) serves as an important habitat for bats in Penang Island where most of the forest had been heavily fragmented. Species such as *Hipposideros kunzi*, *Rhinolophus pusillus* and *Rhinolophus refulgens* in Malaysia which according to DWNP 2017 highlight that data deficiency for bats and needed immediate conservation strategies particularly in maintaining bat population that are highly sensitive to habitat fragmentation and disturbance.

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