

## Bats of Mount Silabur, Sarawak, and Its Potential for Conservation

EMY RITTA JINGGONG<sup>\*1</sup>, PRAVEENA RAJASEGARAN<sup>1,2</sup>, MUHD AMSYARI MORNI<sup>1</sup>, JULIUS WILLIAM-DEE<sup>1</sup>, AZROIE DENEL<sup>3</sup> & FAISAL ALI ANWARALI KHAN<sup>\*1</sup>

<sup>1</sup>Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia; <sup>2</sup>Tropical Infectious Diseases Research and Education Centre (TIDREC), University of Malaya, 50603 Kuala Lumpur, Malaysia; <sup>3</sup>Sarawak Forestry Corporation, Lot 218, KCLD, Jalan Sungai Tapang, Kota Sentosa, 93250 Kuching, Sarawak, Malaysia

\*Corresponding authors: [rittaemy@gmail.com](mailto:rittaemy@gmail.com); [akfali@unimas.my](mailto:akfali@unimas.my)

Received: 26 November 2021

Accepted: 8 April 2022

Published: 30 June 2022

### ABSTRACT

Karst landscape is recognised as one of the biologically important areas especially for bats. The limestone caves and forest within the landscape provide essential resources for the local bat fauna, albeit bat populations are severely threatened by anthropogenic disturbances occurring within and surrounding the ecosystem. In Sarawak, studies on bat diversity are biased towards protected areas, leaving aside non-protected areas including private lands such as Mount Silabur. Surveys on bat diversity were conducted at the limestone outcrop and the surrounding matrix of Mount Silabur with the primary aim of developing the first checklist of bats at Mount Silabur. A total of 27 species were recorded from 12 sampling nights representing approximately 34% of the total bat species recorded in Sarawak. The Cox's Roundleaf Bat (*Hipposideros coxi*), a rare Bornean endemic species, was recorded from the cave system, signifying an important record for the area and also Sarawak. Furthermore, this is the sixth locality record for the species in Sarawak, Borneo. Interestingly, the total number of bat species recorded from Mount Silabur represented about 72% of the total bat species recorded (27 out of 38 species) from other major touristic caves in western Sarawak; Fairy Cave Nature Reserve and Wind Cave Nature Reserve. This warrants a need to develop an action plan to protect and conserve Mount Silabur cave system and the surrounding forest for its potential to serve as a shelter for bats and other cave and forest dependent taxa. The local community should implement and adhere to guidelines for cave related activities to minimise human driven disturbances on the ecosystem and its inhabitants.

Keywords: Conservation, endemic, nature reserve, private land, species diversity, threatened

Copyright: This is an open access article distributed under the terms of the CC-BY-NC-SA (Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License) which permits unrestricted use, distribution, and reproduction in any medium, for non-commercial purposes, provided the original work of the author(s) is properly cited.

### INTRODUCTION

In Southeast Asia, limestone karst is a prominent feature and area of biological importance, covering over 40 million hectares, but only about 13% is nominally protected (Day & Urich, 2000; Wong *et al.*, 2003; Gillieson, 2005; Struebig *et al.*, 2009). Karst landscape provide important roosting resources for bat population and the availability and distribution of the cave systems greatly influence the local bat fauna (Struebig *et al.*, 2009).

Limestone karst have always been one of the main interests for bat research in Borneo. Situated in western Sarawak, Wind Cave and Fairy Cave which is part of the Bau Limestone massif, provide important roosting resources for bats,

making it one of the main sites for bat conservation (Mohd-Azlan *et al.*, 2005). Bats utilize myriads of structures for roost (Kunz & Pierson, 1994; Francis, 2008), hence the surrounding matrix of limestone karst is as important to maintain viable bat population.

Bats are highly diverse with over 1400 described species worldwide (Burgin *et al.*, 2018; Senawi *et al.*, 2020). However, many bat species are subject to threats. Over a third of bats are either threatened or listed as Data Deficient on the IUCN Red List, and over half of the species ranked with either unknown or decreasing population trends (Frick *et al.*, 2019). Overall, bat populations are severely threatened by habitat loss and logging (Jayaraj *et al.*, 2011; Kingston *et al.*, 2012). If prolonged, cave disturbance will

lead to negative impacts on bats especially cave-roosting species. Likewise, land clearing and fires around the caves, quarrying of limestones, and guano extraction and edible swiftlet nests harvesting are significant threats to the cave bat colonies (Struebig *et al.*, 2010). Forest-roosting bats show more immediate responses to forest disturbance as it affects both roost availability and their foraging success (Kingston, 2013). Therefore, protected area is essential for conserving and managing flora and fauna, maintaining natural ecosystems' functioning, acting as refuges for species, and maintaining ecological processes (Dudley, 2008; Naharuddin *et al.*, 2015).

A large number of protected areas are established in attempt to conserve biodiversity hotspots (Gray *et al.*, 2016), and research efforts mostly focused on the protected areas, undermining the values of non-protected areas (Avigliano *et al.*, 2019). In Malaysia, Sarawak has 13 national parks, eight nature reserves, and five wildlife sanctuaries (Sarawak Forestry Corporation, 2022). Most studies on bat diversity in Sarawak focuses on protected areas. Protected areas historically consist of public land or a combination of both public and private lands. A large proportion of private land forest remain unprotected. These unprotected areas often assumed to have less diversity because of the continuous pressure from human led disturbances (McCune *et al.*, 2017). In Sarawak, these disturbances are associated with cultural practices and economic development. However, species diversity in private land is comparable, if not higher than protected areas (Rayner *et al.*, 2014). For example, most Old World bat species from the family Pteropodidae are generalist that can be found in various habitats, including non-protected and heavily modified areas such as oil palm plantation (Kumaran *et al.*, 2011; Mohd-Azlan *et al.*, 2019). Therefore, it is essential to survey non-protected areas to better understand patterns of global biodiversity, their response to human driven disturbances, and also to develop appropriate conservation management to allow long-term sustainable developments (Avigliano *et al.*, 2019).

The karst system and the surrounding matrix of Mount Silabur is a private land managed by local community. It is also one of the potential nature tourism sites managed by local community recognised by the Ministry of Tourism, Arts, and Culture of Sarawak. Although Mount Silabur offer various kinds of nature-based activities, it is not until recently that the site gained popularity among visitors.

The site's attraction derived primarily from the limestone karst landscape that can offer visitors various outdoor activities including cave exploration and hiking experiences while appreciating the plethora of biodiversity including cave inhabitants. Nevertheless, natural history information for Mount Silabur is still lacking. Previously, Khalik *et al.* (2020) had done a study on morphological parallelism of sympatric cave-dwelling microsnailes at Mount Silabur. Interestingly, their study showed a degree of parallelism of a third, possibly new, cryptic *Georissa* species, diverged from its above-ground sister species, *Georissa pyrrhoderma*. This is one of the many examples of the importance of biodiversity surveys in providing valuable information that will help inform the locals on the value of their land, subsequently promoting the protection and preservation of the unique biodiversity of Mount Silabur and the surrounding landscape.

The continuous loss of forest landscape in Borneo has seen an increase in research interests on the values of secondary and regenerated forest as a potential sink for local biodiversity recovery (Senawi *et al.*, 2020). The heterogeneous landscape of Mount Silabur may provide essential roosting sites and foraging ground to support viable bat population. To assess the potential of Mount Silabur as one of the sites for bat conservation in western Sarawak, bat surveys have been conducted to document bat diversity as part of an initial step in developing a management and conservation framework for the area. Two bat surveys were conducted at Mount Silabur in 2019. The result from this study was compared to two protected caves within Bau Limestone massif in western Sarawak, Fairy Cave Nature Reserve and Wind Cave Nature Reserve. The results from this study provided insights on the bat community