Bio Palembanica 3(1): 1-8 (2026)
This journal is available online at: https://ejournal.uigm.ac.id/

Rediscovery of the Simalur Island Flying Fox *Pteropus hypomelanus simalurus* (Chiroptera: Pteropodidae) after 113 Years

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Received 25 May 2026 | Accepted by *G. A. Widayanti*: 8 June 2026 | Published online 30 June 2026.

Abstract
The Simalur Island Flying Fox *Pteropus hypomelanus simalurus* is a poorly known insular taxon historically recorded from Simeulue Island in the early twentieth century. However, since the original record, no confirmed scientific observations had been reported for more than a century, leading to considerable uncertainty regarding its persistence and conservation status. In April 2026, field surveys across Simeulue Island and several surrounding satellite islands documented two colonies of *Pteropus* sp. within the archipelago. More than 500 individuals were recorded on 9 April 2026 on Linggam Island, while approximately 100 individuals were observed on 17 April 2026 in Labuhan Bakti, Simeulue Island. The observed flying foxes are provisionally assigned to *P. h. simalurus* based on external morphology and geographic distribution. Individuals closely matched the original description of the taxon, exhibiting a predominantly black head, dark underparts, black back and rump, and a dull golden to chestnut mantle. Although morphometric and molecular confirmation is still required, the observed individuals correspond closely with the historical description and known range of *P. h. simalurus*. These records represent the first confirmed scientific observations of this taxon in more than a century and provide the strongest available evidence that *P. h. simalurus* persists within the Simeulue Archipelago.

Keywords: insular mammals, Megachiroptera, *Pteropus hypomelanus simalurus*, Simeulue Island, Sumatra.

Introduction

Indonesia is recognized as one of the world's megabiodiversity countries, harboring exceptionally high levels of species richness and endemism, particularly within its archipelagic islands (Kiera *et al.* 2009; Suyadi *et al.* 2021). Small islands along the western coast of Sumatra, including Simeulue and surrounding satellite islands, possess unique ecological conditions that often drive geographic isolation and subspecies differentiation (Amey *et al.* 2024; Huda *et al.* 2026). However, many insular taxa from these regions remain poorly studied due to limited biological surveys, difficult access, and historical gaps in field exploration (Iqbal *et al.* 2021, 2024; Anasari *et al.* 2025).

Despite the exceptionally high mammalian diversity of the Indonesian archipelago, many mammal species remain insufficiently studied and poorly documented (Maryanto *et al.* 2020; Setiawan *et al.* 2023). Biological research on mammals in many regions of Indonesia is still limited due to uneven

survey coverage, difficult access to remote areas, logistical constraints, and the scarcity of long-term field exploration (Morib *et al.* 2025; Flannery *et al.* 2026). In addition, several historical records have never been reassessed through recent scientific investigations, resulting in substantial gaps in taxonomic, ecological, and distributional information (Clayton 2016; Gerrie & Kennerley 2016). Consequently, the current status of numerous mammal taxa remains uncertain, including their population trends, habitat preferences, geographic distribution and conservation significance (Nater *et al.* 2017; Rachman *et al.* 2024). This lack of updated information continues to hinder biodiversity assessment and the development of effective conservation strategies for Indonesian mammals (Esselstyn *et al.* 2021; Novriyanti *et al.* 2025).

The Simalur Island Flying Fox *Pteropus hypomelanus simalurus*, represents one of the least documented insular forms of the Island Flying Fox in Indonesia (Mickleburgh *et al.* 1992; Jones & Kunz 2000). This taxon was historically recorded from Simeulue Island in the early twentieth century, yet no confirmed scientific documentation had been reported for more than a century (Thomas 1923; Tsang 2020). The absence of recent records created uncertainty regarding its continued existence, population status, and distribution, raising concerns that the subspecies may have experienced severe decline or even local extinction. In this paper, we report recent sightings of *P. h. simalurus* on Simeulue Island, representing its rediscovery after more than a century since it was last documented.

Methods

Field surveys were conducted between 9 and 17 April 2026 on Simeulue Island and several surrounding satellite islands, including Linggam, Babi, Lasia, and Simuat Islands, Aceh Province, Indonesia, as part of a biodiversity and conservation fieldwork. Surveys involved visual searches for flying fox roosts in potential habitats, including coastal vegetation, coconut plantations, mangrove forests, and lowland forest areas. Searches were conducted on foot and by boat, and information from local residents was used to identify potential colony locations. Flying fox colonies were surveyed through direct observations of daytime roosting sites following standard approaches commonly applied in flying fox ecological surveys and roost monitoring studies (Kunz & Parsons 2009; Kingston 2013).

Two colonies of *Pteropus* sp. were documented during the survey (Fig. 1). The first colony, comprising more than 500 individuals, was recorded on 9–10 April 2026 on Linggam Island (2°36'28"N, 95°52'05"E) near Nasreuhe Village, Salang Subdistrict. The bats were observed roosting in coastal vegetation, forming a large and active colony. The second colony, estimated at approximately 100 individuals, was documented on 17 April 2026 in Labuhan Bakti (2°24'15"N, 96°28'51"E), where the bats occupied a smaller and more localized roosting area near a coastal settlement. Colony sizes were estimated through direct visual counts of roosting individuals, a method widely used in flying fox population assessments (Vanderduys *et al.* 2024).

In addition to these records, surveys were conducted on Babi, Lasia, and Simuat Islands; however, no individuals of *Pteropus* sp. were detected during the survey period.

Results and Discussions

The flying foxes recorded from the Simeulue Archipelago are most likely referable to *P. h. simalurus* based on external morphology and geographic distribution (Fig. 2 and 3). The observed individuals closely matched the original description provided by Thomas (1923), including the predominantly black head, dark underparts, black back and rump, and a dull golden to chestnut mantle. These characteristics distinguish *P. h. simalurus* from several other recognized subspecies of *P. hypomelanus*, which generally exhibit paler head and body coloration (Payne *et al.* 1985; Kunz & Pierson 1994; Francis 2008, 2016; Phillipps & Phillipps 2016). Furthermore, *P. h. simalurus* remains the only member of the genus *Pteropus* historically reported from Simeulue Island and its associated satellite islands (Thomas 1923; Mickleburgh *et al.* 1992; Giannini *et al.* 2019).

Nevertheless, we acknowledge that our identification is based exclusively on field observations and photographic documentation, without supporting morphometric measurements, voucher specimens, or molecular data. Consequently, the possibility of unrecognized variation within *P. hypomelanus* populations or the occurrence of previously undocumented *Pteropus* taxa cannot be entirely excluded. We therefore consider the present identification to be provisional pending confirmation through detailed morphometric and genetic analyses. Despite this limitation, the observed individuals correspond closely with the historical description and known geographic range of *P. h. simalurus*, providing the strongest currently available evidence that this poorly known insular taxon persists within the Simeulue Archipelago

after more than a century without confirmed scientific records.

Colony size estimates were obtained through direct visual counts of roosting individuals during daylight hours when bats were aggregated at their roost sites. Observers systematically scanned the colony using cameras and counted visible individuals occupying trees within the roosting area, following standard approaches used in flying fox roost monitoring and population surveys (Kunz & Parsons 2009; Vanderduys *et al.* 2024). For large aggregations, counts were repeated from different vantage points to reduce the likelihood of overlooking individuals and to verify consistency among estimates. The Linggam Island colony was estimated to contain more than 500 individuals, whereas the Labuhan Bakti colony comprised approximately 100 individuals. These values should be regarded as approximate minimum estimates because some bats may have been obscured by dense foliage, overlapping roosting clusters, or limited visibility within the canopy, sources of uncertainty commonly recognized in flying fox censuses. Although no photographic census or mark–recapture methods were employed, the estimates provide a reasonable indication of colony size and confirm the persistence of substantial populations of *P. h. simalurus* within the Simeulue Archipelago.

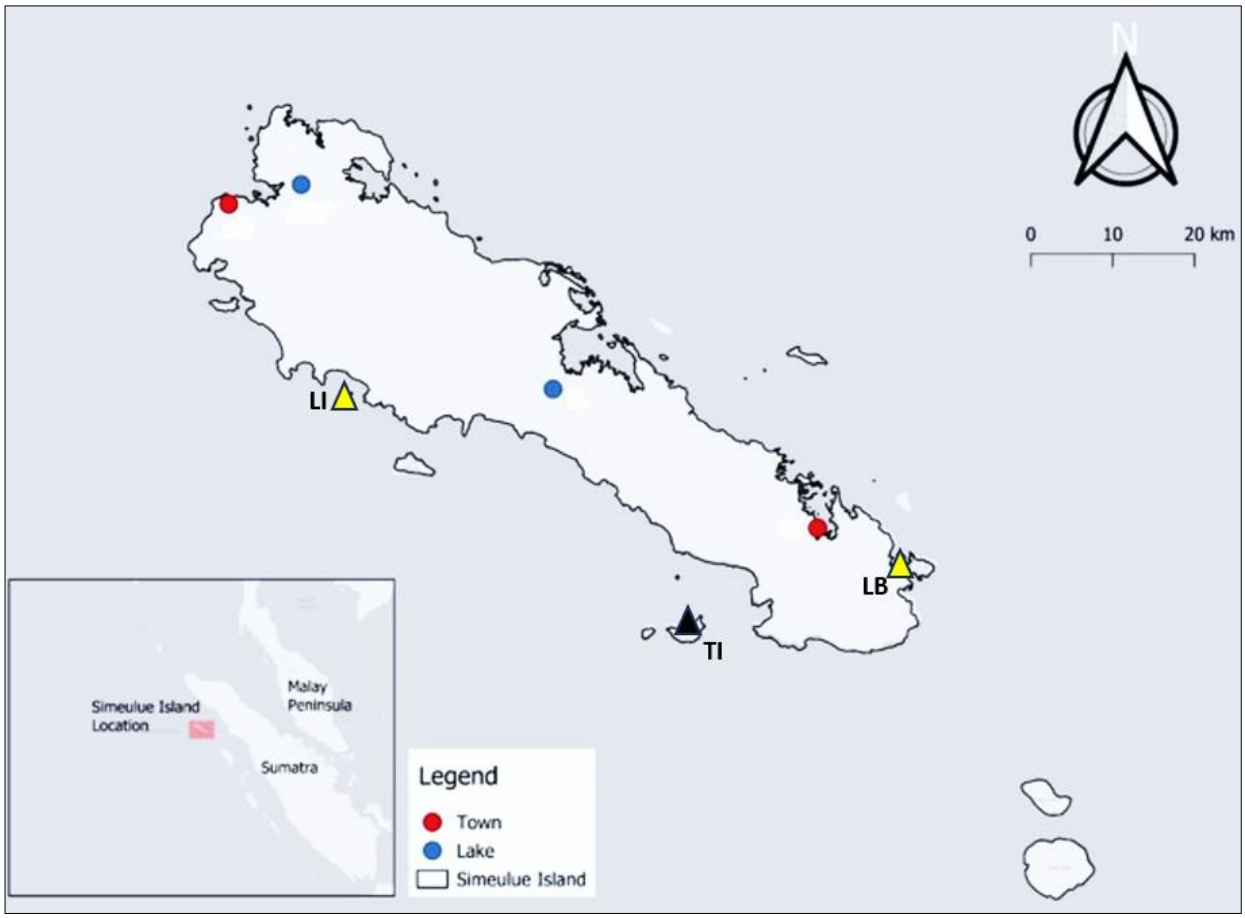


Figure 1. Historical and recent records of the Simalur Island Flying Fox, *Pteropus hypomelanus simalurus*, on Simeulue Island, Aceh, Indonesia. Yellow triangles denote recent records, and the black triangle indicates the historical record. Abbreviations: LI = Linggam Island, LB = Labuhan Bakti Village, and TI = Teupah (Tapah) Island.

Based on our observations, *P. h. simalurus* may have been overlooked by previous researchers due to a combination of factors, including its tendency to roost in relatively remote and concealed habitats and its predominantly nocturnal behavior. Species of the genus *Pteropus* generally depart from their daytime roosts around sunset to forage and return before or shortly after dawn (Jones & Kunz 2000; Hengjan *et al.* 2018; Elangovan 2023). Consequently, colonies may remain difficult to detect outside known roosting sites. In contrast, the Enggano Island Flying Fox *P. h. enganus* is known to exhibit daytime activity (Iqbal *et al.* 2024), while the Large Flying Fox *Pteropus vampyrus* in mainland Sumatra is often still observed before sunset and after dawn (*Pers. Obs*.). These behavioral differences may have contributed to the limited detection and historical underreporting of *P. h. simalurus*.



Figure 2. The Simalur Island Flying Fox *Pteropus hypomelanus simalurus* roosting in a daytime colony on 10 April 2026 on Linggam Island, Simeulue Island (Photograph by Muhammad Iqbal).



Figure 3. The Simalur Island Flying Fox *Pteropus hypomelanus simalurus* observed roosting in a coconut tree on 17 April 2026 in Labuhan Bakti Village, Simeulue Island (Photograph by Muhammad Iqbal).

Vegetation on Linggam Island, a small island situated northwest of Simeulue, Aceh, Indonesia, is dominated by coconut plantations interspersed with patches of mixed lowland forest (Ecosystem Impact 2022). *Pteropus h. simalurus* was observed utilizing both coconut groves and other forested habitats, suggesting a degree of habitat flexibility across the island. In Labuhan Bakti, the species was recorded within a coastal settlement area inhabited by local communities. The surrounding vegetation is primarily composed of coconut plantations, the principal agricultural commodity along the southwestern coast of Aceh, together with Clove *Syzygium aromaticum*, Rubber *Hevea brasiliensis*, and Areca nut *Areca catechu* plantations (*Pers. Obs.*). In addition to these cultivated terrestrial habitats, the coastal zone of Labuhan Bakti supports extensive natural mangrove forests dominated by *Rhizophora* spp. and *Avicennia* spp., which form a dense and ecologically important component of the local coastal landscape (Suriani *et al.* 2023). During our surveys, all observed individuals of *P. h. simalurus* were found roosting in coconut trees, indicating that this species may preferentially use coconut palms as day-roost sites within these human-modified coastal habitats.

Historical accounts recognized *P. h. simalurus* as an insular form restricted to the Simeulue region, yet no confirmed scientific observations had been reported for more than a century. The present records therefore represent an important rediscovery of this poorly known taxon. During the expedition, additional surveys were also conducted on Babi Island, Lasia Island, and Simuat Island, but no flying foxes were observed on these islands. The absence of *Pteropus* records on Babi, Lasia, and Simuat Islands does not necessarily indicate true absence, as detectability may vary seasonally and colonies can shift roosting sites in response to food availability or disturbance. Nevertheless, these findings suggest that the distribution of *P. h. simalurus* colonies within the Simeulue archipelago may be patchy and potentially influenced by habitat availability, roosting suitability, and human disturbance, factors previously recognized as important determinants of flying fox colony persistence and distribution (Mildenstein *et al.* 2016; Aziz *et al.* 2021).

According to Thomas (1923), twenty specimens of *P. h. simalurus* were collected in April 1913 from Simalur Island (now known as Simeulue Island), located northwest of Sumatra, and several neighbouring islets, with the type specimen originating from Pulu Tapah (currently known as Pulau Teupah or Teupah Island). Following this early twentieth-century collection, no confirmed scientific records of the taxon were reported for more than a century, resulting in uncertainty regarding its continued persistence within the archipelago (Mickleburgh *et al.* 1992; Tsang 2020).

Field surveys undertaken in April 2026 across Simeulue Island and nearby satellite islands recorded two colonies of *P. h. simalurus*, representing the first confirmed observation of the taxon in more than a century since its original documentation in 1913. These findings provide important evidence for the continued survival of this poorly known insular flying fox after 113 years (1913 to 2026) without confirmed scientific documentation (Thomas 1923; Tsang 2020). Given the extremely limited information available for *P. h. simalurus*, further research is urgently needed to clarify its population size, ecology, and conservation requirements. Conservation measures should prioritize the protection of roosting habitats and the reduction of human disturbance, particularly on islands that continue to support large colonies such as Linggam Island. Future studies should prioritize the collection of morphometric data, high-resolution diagnostic photographs, and genetic samples to verify the taxonomic identity of the Simeulue population and evaluate its relationship to other populations of *P. hypomelanus* throughout Southeast Asia and Indonesia.

Acknowledgments

We thank ASAP (The Asian Species Action Partnership) for facilitating our visit to Simeulue Island in April 2026. We are also grateful to the anonymous reviewers for their valuable comments and suggestions, which greatly improved this manuscript.

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