

Notes on the Diurnal Activity of the Enggano Island Flying Fox *Pteropus hypomelanus enganus* (Chiroptera: Pteropodidae)

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Abstract

Enggano Island Flying Fox *Pteropus hypomelanus enganus* is an endemic subspecies of bats from Enggano Island, Sumatra, Indonesia. During a field visit to Enggano Island in 2020 and 2021, *P. hypomelanus enganus* was observed always active during daylight, including in flight, looking for food, puffing and cleaning the hair. Here, we report the diurnal activities of *P. hypomelanus enganus* that represent first report behavior for this taxa.

Keywords: behavior, Bengkulu, *Pteropus hypomelanus*, Small Flying Fox, Sumatra.

Introduction

Bats or taxonomic order Chiroptera are shortly recognizable as a modification of its forelimbs into wings that this trait makes bats certain clearly classified of the mammals group (Kunz & Pierson 1994; Taylor & Tuttle 2017). They representing about 20 percent of all known global mammal taxa, and the second largest taxa of mammals after order Rodentia (rodents) (Fenton & Simmons 2014). Order Chiroptera are so different with other mammals that to know their lives and their geographic history and to determine them adequately need much more information than that at hand about their morphology and their natural history (Jepsen 1970).

Indonesia is one richest country for mammals taxa, particularly for bat species (Suyanto 2001; Maryanto *et al.* 2019). Due to its geographic location and its past link with mainland of Asia, Sumatra provides the highest chiropterans taxa of any island (Suyanto 2001; Simmons 2005), but few researches have interested on Sumatra's bats ecology (Huang *et al.* 2014). There are at least 80 species recently listed for the Sumatra, from 238 species of bats in Indonesia recently (Kingston *et al.* 2003; Huang *et al.* 2014; Maryanto *et al.* 2019).

There are two Sumatra Islands, Simeulue and Enggano have possibly never had land connection with the mainland Sumatra (Whitten *et al.* 2000; Iqbal *et al.* 2022; Iqbal *et al.* 2023). Located in the Indian Ocean, Enggano is an isolated tiny island situated 100 km from mainland Sumatra, Indonesia (Iqbal *et al.* 2020a, b; Iqbal *et al.* 2021). This isolated island has 15 species of mammals, and few of them are endemic subspecies (Sody 1940; Maryanto *et al.* 2017). Enggano Island Flying Fox *Pteropus hypomelanus enganus* is one subspecies of mammals that only found in Enggano and its smaller islands (Miller 1906; Sody 1940). *Pteropus* or Flying Foxes are group of bats that highly distinctive Old World fruit bats and nocturnal (Almeida *et al.* 2014; Giannini 2019; Giannini *et al.* 2019). In this paper, we report diurnal activities of *P. hypomelanus enganus* that never reported before for this species.

Methods

In 2020 to 2021, We visited Enggano Island for a biodiversity survey. The field surveys were made on 28 February to 3 March 2020 and 25 to 31 March 2021. Enggano island (05°3'S, 102°25'E°) is a small island situated c. 100 km from southwest Sumatran Island. This island is administratively part of North Bengkulu (Bengkulu Utara), Bengkulu Province, Sumatra. There are few smaller islands in Enggano that formed from dead coral deposited by wave action (Iqbal *et al.* 2020c). Enggano island is inhabited by a small population speaking a language which is difficult to classify (Blench 2014). The island has 402,6 km² with 106,7 km coastal line and the highest elevation at 281 m above sea level (Maryanto *et al.* 2017).

During our surveys in Enggano Island, we found *P. hypomelanus enganus* always observed during daylight, and this observation nearly common in the entire island. Although the activities of *P. hypomelanus enganus* were observed commonly all day during daylight, but we did not noted and documented all of our observations. Data presented here is based from photographic documentations during fieldwork (Table 1).

Results and Discussion

The bat was identified as *P. hypomelanus enganus* by its large size of chiropteran species; lower back dark blackish; upper back, neck and back of head pale golden-brown to dark reddish-brown; underside varies from dark blackish-brown to buffy brown (Fig. 1-3). These morphological features are fitted well with the descriptions of *P. hypomelanus* in various guidebooks (Payne *et al.* 1985; Francis 2008; Phillipps & Phillipps 2016; Giannini *et al.* 2019). Miller (1906) described *P. hypomelanus enganus* (*P. enganus*) as here: back a rather dark hair-brown, darkest and clearest anteriorly, though everywhere somewhat lightened by a sprinkling of silvery hairs, and along edges of membranes a little suffused with ochraceous-buff; mantle pale tawny-ochraceous, darkening on sides of neck through hazel to chestnut, this in turn blackening on underside of neck; behind this blackish area the underparts are nuich like back, except that the brown is darker, the silvery hairs are absent, and the lighter suffusion is more nearly hazel. The documentations of diurnal activity of *P. hypomelanus enganus* in Enggano Island in 2020 and 2021 presented in Table 1.

Table 1. Observations of diurnal activity of *P. hypomelanus enganus* in Enggano Island in 2020 and 2021.

Date	Time	Activities	Habitat
28 Feb 2020	09.51 A.M.	In-flight	Mixed vegetation near the village
28 Feb 2020	04.33 P.M.	In flight, then stranded in a tree and looking for food	Coastal vegetation near sandy beach
28 Feb 2020	04.52 P.M.	In flight, then stranded in a branch and look like taking a rest	Vegetation near village and beach
29 Feb 2020	07.33 A.M.	In-flight	Mixed vegetation near the village
01 Mar 2020	08.04 A.M.	In-flight	Mixed vegetation near the village
02 Mar 2020	08.50 A.M.	Cleaning the hair, puff and looking for food	Mixed vegetation near the village
25 Mar 2021	10.24 A.M.	In-flight	Mixed vegetation near the village

There are two species flying foxes in Enggano Island, *P. hypomelanus enganus* and *P. melanotus modiglianii* (Sody 1940; Maryanto *et al.* 2017). Compare to *P. hypomelanus*, fur of *P. melanotus* is black with sprinkling's of white hairs on belly and mantle (Giannini *et al.* 2019). It has been reported that *P. hypomelanus enganus* occur in Mentawai Island (Mickleburgh *et al.* 1992; Jones & Kunz 2000; Tsang 2020), but it is look like refer to Enggano as part of Mentawai Island in western Sumatran Islands of West Sumatra Province. It should be interesting to carry out morphological and DNA analyses for two different populations on different islands.

All species seen active during daylight in Enggano Island are *P. hypomelanus enganus*, and no observation for *P. melanotus modiglianii*. In first impression, the common *P. hypomelanus enganus* seen during daylight is presumed as a raptor. According to Francis (2016), the flying foxes resembles a raptor in flight, but is distinguished by its distinctive shape and slow flapping wingbeat. In addition, no raptors were recorded in Enggano Island (Junge 1937), and also absent in the checklist during our visit.



Figure 1. *Pteropus hypomelanus enganus* hanging in a tree and looking for food on 28 February 2020 in Enggano Island, Bengkulu, Sumatra (Photograph: Muhammad Iqbal).



Figure 2. *Pteropus hypomelanus enganus* flight in the morning on 28 February 2020 in Enggano Island, Bengkulu, Sumatra (Photograph: Muhammad Iqbal).



Figure 3. *Pteropus hypomelanus enganus* flying around near a tree, roosting and then cleaning the hair on 2 March 2020 in Enggano Island, Bengkulu, Sumatra (Photograph: Muhammad Iqbal).

General habits of pteropodids are nocturnal as a rule (Giannini *et al.* 2019), including *P. hypomelanus* may disperse nightly from islands on which they roost to forage on a nearby mainland (Payne *et al.* 1985; Van Peenen *et al.* 1970). The observation of diurnal activities of *P. hypomelanus enganus* is first report of its predominantly diurnal habits. The diurnal activities observed during daylight, including in flight, looking for food, puff and cleaning the hair. *Pteropus hypomelanus enganus* was observed feeds in a head-down. *Pteropus hypomelanus* is a typically species feeds in a head-down position but it also may do so with its head held upward (Phillips 1958). This species is consider as one widespread species that especially usually in villages, agricultural areas and disturbed forests, indicating that this species has advantaged from large-scale habitat change (Wiles & Brooke 2009).

A few species of flying fox that inhabit remote islands are partially or predominatly diurnal: Christmas Island Flying Fox *Pteropus melanotus natalis*, Samoan Flying Fox *Pteropus samoensis samoensis*, Maldive Island Flying Fox *Pteropus hypomelanus maris*, Greater Mascarene Flying Fox *Pteropus niger*, Pohnpei Flying Fox *Pteropus molossinus*, Chuuk Flying Fox *Pteropus pelagicus* and Seychelles Flying Fox *Pteropus seychellensis* (Giannini 2019). It has been suggested that predation risk is low on these islands and temporal niche partitioning with some congeneric species, thus facilitating diurnal behavior.

Indonesia is habitat of more a third of all pteropodids (Simmons 2005), but not many studies have been carried out on these taxa (Tsang & Wiantoro 2019). *Pteropus hypomelanus* is classified as Near Threatened due to habitat loss and hunting pressure throughout Southeast Asia (Tsang 2020). As an isolated island, the Enggano island has been little explored by researchers, particularly for *P. hypomelanus enganus* and other chiropteran taxa. Further studies, particularly ecological research and population monitoring are recommended to learn possible threats combined with occurrence only on small islands in fragmentary landscapes vulnerable to environmental changes due to global climate change suggests a higher local extinction risk than currently recognized.

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