

## **Project Update: November 2023**

### **1.0 Project summary**

Baseline data on *Pteropus vampyrus* is limited in Sabah, the Malaysian state in Borneo. The objectives of this study are:

1. To determine the roosting locations, population size, and home range of *P. vampyrus* within the Sandakan Division.
2. To assess the hunting practices, conflicts, and consumption of this species in local communities within the Sandakan Division.

The Sandakan Division consists of five main districts: Beluran, Sandakan, Kinabatangan, Telupid, and Tongod. An extensive field survey will determine the roosting sites (permanent and seasonal) and colony size. The home range will be determined through satellite telemetry for 1 year. Interviews with the local community will be conducted to understand the threats to this species in the region. This project is expected to be completed in 2024.

### **2.0 Project Updates**

#### 2.1 Activities, timescale and updates

##### **Activity 2.1.1: Pilot study**

**Date: April 2022 – December 2022 (8 months)**

**Progress remarks:**

A pilot study has been completed, covering various locations in the Sandakan Division of Sabah. The presence locations were collected based on interviews (with forest reserve personnel and local communities) and ground surveys. The roosting locations can be divided into three types: foraging, temporal, and maternal roosting areas. In total, 25 sites were identified in the Sandakan Division.

##### **Activity 2.1.2: Research access permit**

**Date: May 2022 – July 2022 (2 months)**

**Progress remarks:**

This project received the Sabah Biodiversity Access Permit (Reference number: JKM/MBS.1000-2/2 JLD.15 (18)) and permits for the satellite telemetry devices from the Standards and Industrial Research Institute of Malaysia (SIRIM) and the Malaysian Communications and Multimedia Commission (MCMC) in June 2023.

##### **Activity 2.1.3: Telemetry Fieldwork & Monitoring**

**Date: September 2022 – June 2024 (21 months)**

**Progress remarks:**

In general, we experienced a delay in our initial planning. We faced a delay in receiving the transmitters due to compliance policy and permit applications from SIRIM and MCMC; hence, we received the transmitters in July 2023. One colony that we intended to collar is no longer in their roosting sites in our study area as the fruiting season is starting, and we need time to track them manually through ground surveys.

**Activity 2.1.4: On-site roosting & population survey**

**Date: September 2022 - December 2023 (15 months)** \*possibly extended to June 2024, following the satellite telemetry tracking data.

**Progress remarks:**

At this stage, the presence and absence patterns can be observed. The large flying fox colonies frequently shift their roosting sites. One colony was observed to have a maternal roosting site in Deramakot Forest Reserve, but it has not been used by the colony from 2021 to 2023.

**Activity 2.1.5: Community survey assessing the hunting practices, conflicts, and consumption of this species in local communities within the Sandakan Division.**

**Date: August and October 2022 (2 months)**

**Progress remarks:**

For the initial plan, this study was to cover the local communities in the Sandakan Division. However, logistical constraints and limited village access resulted in a small sample size. An alternative approach was adopted to include villages in other divisions using an online survey. Two methods were employed for the community survey: face-to-face interviews and an online questionnaire survey. A pilot survey was conducted to refine the questionnaire. Face-to-face interviews adhered to the terms and conditions of the access permit, covering three villages (Kinabatangan, Tongod, and Tambunan) and two local markets in Ranau and Telupid. Seventy-eight on-site survey respondents were interviewed (15 from Kinabatangan, 13 from Telupid, ten from Tongod, 25 from Tambunan, and 15 from Ranau). An additional 223 online respondents were obtained. A representative from each district was appointed to coordinate and share the online survey link via Google Forms, with one response allowed per email.

**Activity 2.1.6: Data Analysis.**

**Date: August 2022 – July 2024 (23 months)**

**Progress remarks:**

The data collection for roosting locations and population size records within the Sandakan Division need to be improved due to the challenges in locating the maternal roosting sites. The population size could not be accurately estimated as the records are mainly based on the observation at the foraging sites, with the number of individuals ranging from one to ten bats foraging on the same tree. The home range analysis cannot be completed at this stage, and it will be done following the satellite telemetry tracking data. Data analysis was done for the community survey, covering both the on-site and online surveys.

**Activity 2.1.7: Manuscript Objective 1, 2, writing, & Final report**

**Date: December 2022 to August 2024 (20 months)**

**Progress remarks:**

Currently, the manuscript for objective 2, a community survey, has been completed, covering data not only in the Sandakan Division but also in other Sabah divisions. This manuscript is still under review by the co-authors and is expected to be submitted to publishers by January 2024.

In general, the project is still ongoing, especially for the ecology objective, which involves determining the roosting locations, population size, and home range of *P. vampyrus* in the Sandakan Division of Sabah, Malaysia, Borneo. The following steps will involve capturing and collating the species at the foraging sites. From here, we

can locate the main roosting sites and initiate monitoring. Extensive fieldwork will be conducted within November and December of this year to collar at least one individual. Meanwhile, for the community survey, the final manuscript is expected to be submitted to a local indexed publisher by January 2024.

**Table 1: Project updates summary for the year 2022-2023.**

Objective	Not achieved	Data collection	Data analysis	Writing	Complete	Summary
1. to determine the roosting locations, population size, and home range of <i>P. vampyrus</i> within the Sandakan Division		✓				Satellite telemetry equipment had been purchased and received. Locating the target colony for capturing collaring and monitoring in the Sandakan Division is ongoing.
2. to assess the hunting practices, conflicts, and consumption of this species in local communities within the Sandakan Division.				✓		Data collection had been completed. The full manuscript is still under the co-authors' review.

### 3.0 Preliminary results and challenges

#### 3.1 Roosting Locations, Population Size, and Home Range of *P. vampyrus*

The roosting locations can be divided into three types: foraging, temporal, and maternal roosting areas. In total, 25 sites were identified in the Sandakan Division: Beluran, n=3 (foraging=3; temporal=0; maternal sites=0); Kinabatangan, n=6 (foraging=5; temporal=1; maternal sites=0); Sandakan, n=5 (foraging=4; temporal=1; maternal sites=0); Telupid, n=4 (foraging=4; temporal=0; maternal sites=0); Tongod, n=7 (foraging=3; temporal=2; maternal sites=2). Dead large flying foxes were also recorded at the power line in Sandakan (n=2) and Kinabatangan (n=1). The population size could not be accurately estimated, as the records are mainly based on observations at the foraging sites. With the help of a botanist for identification, eight tree species/types had been observed as foraging trees for this species: *Ficus subcordata*, *Ficus racemosa*, binuang tree (*Octomeles sumatrana*), lanzone/langsat trees (e.g., *Lansium domesticum*), rambutan tree (*Nephelium lappaceum*), durian flowering trees, longan trees (e.g., *Euphoria malaiense*), and marang/tarap tree (*Artocarpus odoratissimus*). This species can be found in many locations within the Sandakan Division, but the home range is yet to be determined.

The biggest challenge for this study is locating the main roosting sites. This includes maternal roosting sites (where female bats give birth to or take care of their pups) and communal roosts, where they roost in that area for a longer period (1 month or more) or permanently. This is due to the behaviour of this species, which tends to

roost in areas with hardly any access by humans. Besides that, the prolonged fruiting season in Sabah (cultivated species such as rambutan, langsung, durian, and longan) started as early as May 2023 and is still ongoing within the Sandakan Division. These accessible food resources attract the large flying foxes to fly out from their remote roosting sites and shift their roosting sites frequently, following the food resources in Sabah. This leads to irregular roosting patterns of this species and makes monitoring harder, as one colony was observed to have a maternal roosting site in Deramakot Forest Reserve, but it was no longer used by the colony from 2021 to 2023. Based on onsite observation, the large flying foxes prefer to visit the fruiting trees in the orchards at dusk, where less human activity occurs during that time. So far, foraging sites have been recorded frequently based on the onsite survey, and temporal roosting sites are limitedly recorded, as these sites are only used for a maximum of one week, just for temporal sites to access the food resources nearby in Sandakan and Kinabatangan Districts.

We are planning to change the sampling approach from catching the bats at their roosting sites to catching the bats and doing the collaring for at least one individual at the foraging sites by this year. This will be done at the identified fruiting or flowering trees in forest reserves such as Deramakot Forest Reserve and Kabili-Sepilok Forest Reserve. After collaring at least one individual, this will lead us to its colony, and we will be able to determine its roosting sites. The ground survey will be done to study the roosting sites of the collared individual, and more bats will be able to be caught to determine the distribution and home range of this species within the Sandakan Division."

### 3.2 Hunting Practices, Conflicts, and Consumption of *P. vampyrus*

As for the preliminary results, the hunting and trading of flying foxes occur in the region. The reasons for hunting are mainly for meat (own consumption) (52%, n=13), followed by protecting fruiting trees (24%, n=6), game (20%, n=5), and medicinal purposes (4%, n=1). The locals consume flying fox meat mainly for food, 79.4% (n=50), and some for medicinal purposes, 19% (n=12). The locals prepare flying fox meat in several steps before cooking it into dishes such as porridge. The discreet availability of flying fox meat in local markets and its transport to meet demand in other districts suggests varying levels of awareness and enforcement. The final draft will be completed and is expected to be sent to the publishers by January 2024.

One of the challenges for community surveys is that the sample size needs to be higher due to logistical constraints and limited village access. After the pandemic, it was challenging to involve the villages, especially in accepting outsiders who came to their towns, and some villages had limited access logistically, as they were in remote areas, limiting our communication with the village representatives. Other than that, not many locals are willing to be interviewed. We came up with an alternative to cover the villages in different divisions and using an online survey. There are some biases in the online survey as we cannot reach the communities with limited internet access and limitations based on respondents' literacy level.

## **4.0 Conclusion**

This project is ongoing, and we expect to complete it by 2024. Data collection for the ecology objective is still underway. We are planning to change the sampling

approach from catching the bats at their roosting sites to catching the bats and collaring at least one individual at the foraging sites this year. This will be done at identified fruiting or flowering trees in forest reserves such as Deramakot Forest Reserve and Kabili-Sepilok Forest Reserve. Meanwhile, for the community survey, data collection was completed with 78 on-site survey respondents interviewed (15 from Kinabatangan, 13 from Telupid, 10 from Tongod, 25 from Tambunan, and 15 from Ranau), and 223 online respondents were obtained. The hunting, trading, and consumption of flying foxes occur in the region, and the final manuscript will be sent to the local indexed publisher for publication by 2024.

## 5.0 Appendices



Figure 1: Large flying fox fed on fruiting fig trees in Deramakot Forest Reserve.



Figure 2: Dead large flying fox electrocuted at power lines in Sandakan.



Figure 3: Dead large flying fox hunted shown during an interview in Tongod.



Figure 4: Onsite interview done in a village in Kinabatangan.



Figure 5: Three satellite transmitters, Allinco Receiver and Yagi antenna bought for satellite tracking.