



The Distribution and Community's Perception of Flying Fox, *Pteropus vampyrus* in Limbang, a Transboundary Area in Sarawak

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Highlights

- The occurrence of flying fox (*Pteropus vampyrus*) is confirmed in Limbang area via surveys and interviews.
- The surveys did not record any permanent flying fox roosting sites within the national park and was instead observed to fly from Menunggul Island, Brunei into the national park.
- Respondents believed that flying foxes could uplift the local economy through bat-watching ecotourism opportunities that could improve public perception on conservation of this species.

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Abstract: Flying foxes are threatened throughout their geographic range, and there are large gaps in the understanding of their landscape-scale habitat use. This study identified potential habitats in Limbang, Sarawak and informed potential distribution based on dispersal and interview surveys. Here, biological surveys were combined with interviews of local communities in Limbang Mangrove National Park (LMNP), Sarawak to illustrate distribution and the communities' perception on the protected flying fox (*Pteropus vampyrus*). Mangrove forest areas were surveyed for the presence of flying foxes and villagers were interviewed regarding the use by flying foxes of agricultural areas and instances of conflict. Boat and questionnaire surveys were conducted for nine days from 18 to 27 February 2021. The surveys did not record any flying fox roosting sites within the national park and was instead observed to fly from Menunggul Island, Brunei into the national park in the evenings and back to Brunei in the mornings. A total of 27 flying foxes were recorded during the boat survey. Flying foxes were detected from 8/154 survey points and their spatial distribution appeared to be concentrated along Sungai Limpaku Pinang. Most respondents were aware of the species while some have directly observed them in fruit orchards, mangroves, rivers and mixed dipterocarp forests. Eleven perception-based questions were presented, and results showed that locality and income were the most influential parameters exhibiting conservation awareness through Boosted Regression Trees (BRT) analysis. Most respondents believe that flying foxes can uplift the local economy through ecotourism opportunities. However, these findings need to be carefully interpreted as the species has a large home range. Hence, long-term monitoring should be established to generate a larger dataset for stronger analysis to better represent the distribution and occurrence of this species in LMNP.

Keywords: Flying Fox, Chiroptera, Mangroves, Spatial Distribution, Community Perception

Abstrak: Keluang adalah spesies terancam di seluruh kawasan taburan mereka, dan terdapat jurang yang besar dalam pemahaman penggunaan habitat berskala landskap spesies ini. Kajian ini bertujuan untuk mengenal pasti habitat berpotensi untuk keluang di

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Limbang, Sarawak serta menyelami persepsi masyarakat terhadap spesies ini. Gabungan tinjauan bot dan soal selidik di Limbang dapat menggambarkan taburan dan persepsi masyarakat terhadap keluang di Limbang, Sarawak. Tinjauan terhadap keluang di kawasan hutan bakau di Limbang telah dilakukan dan penduduk kampung tempatan di sekitar Taman Negara Bakau Limbang (TNBL) telah disoal selidik selama sembilan hari dari 18 hingga 27 Februari 2021. Tinjauan tidak merekodkan kawasan sarang keluang di dalam taman negara. Namun, keluang kelihatan terbang dari Pulau Menunggul, Brunei ke taman negara tersebut pada waktu petang dan kembali ke Brunei pada waktu pagi. Sebanyak 27 ekor keluang telah direkodkan melalui tinjauan bot. Keluang dikesan dari 8/154 tempat tinjauan dan taburannya didapati tertumpu di sepanjang Sungai Limpaku Pinang. Kebanyakan responden mengenali spesies tersebut manakala ada yang memerhati secara langsung di kebun buah-buahan, bakau, sungai dan hutan dipterokarp. Sebelas soalan berasaskan persepsi telah dikemukakan dan keputusan menunjukkan lokaliti dan pendapatan merupakan parameter yang paling berpengaruh melalui analisis *Boosted Regression Trees* (BRT). Kebanyakan responden percaya bahawa keluang mampu meningkatkan ekonomi tempatan melalui peluang eko-pelancongan. Walau bagaimanapun, hasil soal selidik ini perlu ditafsirkan dengan teliti kerana spesies ini mempunyai kawasan taburan yang luas. Oleh demikian, pemantauan jangka panjang harus dijalankan bagi menjana set data yang lebih besar untuk analisis yang lebih kukuh untuk mewakili pengedaran dan kejadian spesies ini dengan teliti dalam TNBL.

Keywords: Keluang, Chiroptera, Paya Bakau, Taburan Ruang, Persepsi Masyarakat

INTRODUCTION

The large flying fox (*Pteropus vampyrus*) is known to occur throughout Sarawak, but its rarity has been reported since the late 80s (Fujita 1988). In the past, large flying foxes were reported to be common in many areas within Borneo (Payne *et al.* 1985; Phillips & Phillips 2018). However, according to Gumal (2004), all colonies in Sarawak are found to be in remote and inaccessible locations, such as peat swamp forests, mangrove forests and freshwater swamps. The large flying fox prefer to roost in mangrove swamp as this ecosystem shelters them from hunting pressure (Epstein *et al.* 2009). It has been postulated that hunting, habitat loss, decreasing food resources and the foraging patches of the large flying fox in Sarawak may have caused this species to be vulnerable to small changes in their preferred habitats (Kessler *et al.* 2018; Phillips & Phillips 2018). The locations of the colonies in Sarawak are poorly known due to their frequent temporal shift in roost site occupation, as the species is comparatively nomadic, with few permanent camps. Their colonies continuously shift across a large landscape from year to year, making any assessment and monitoring of population sizes and trends challenging. This in turn has resulted in Sarawak's flying fox to be poorly studied, with most research focusing on zoonotic diseases and ecology instead (e.g., Gumal 2004). As such, relatively little is known about the recent distribution and community perception of this species.