

Bats Assemblage and Lunar Phase Effect on Bat Activity at Mixed Dipterocarp Forest, Gunung Gading National Park, Sarawak, Borneo

(Himpunan Kelawar dan Kesan Fasa Cahaya Bulan terhadap Aktiviti Kelawar di Hutan Dipterokarpa Campuran, Taman Negara Gunung Gading, Sarawak, Borneo)

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ABSTRACT

*Bat surveys at Gunung Gading National Park (GGNP) were conducted for 29 non-consecutive nights, which consisted of five separate sampling sessions from November 2011 until November 2015. A total of 378 individuals representing 36 species from six families were captured, from an accumulated effort of 435 trapping nights. This corresponds to approximately 39% (n=36) of the total species recorded in Borneo. The most commonly captured species in GGNP for insectivorous bats was *Rhinolophus affinis* (20.1%), whereas for frugivorous bats *Penthetor lucasi* (14.3%) dominated the capture. Species accumulation curve reached asymptote on the 24th sampling night suggesting that sampling saturation has been achieved for the trapping sites studied here. The species diversity ($H' = 2.75$) showed relatively high diversity of bat species in the park compared to other actively surveyed sites in western Sarawak including Bako National Park (Bako NP), Kubah National Park (Kubah NP) and Mount Penrisen (Mt Penrisen). This was further supported through rarefaction analysis showing that GGNP has largest value of estimated species compared to other actively surveyed sites in western Sarawak. Lunar phase and bat capture rate correlation analysis showed that there is no statistically significant relationship between lunar phase and the bat capture rate at GGNP. This suggests that bat activity reported here were not affected by moonlight. The results from these surveys provided the most comprehensive list of bats for GGNP. Our study highlights the importance of GGNP as an important habitat for bat conservation including the rare bat species found in Borneo, *Phoniscus atrox*.*

Keywords: Abundance; bats diversity; mixed dipterocarp forest: western Sarawak

ABSTRAK

*Kaji selidik ke atas kelawar di Taman Negara Gunung Gading (GGNP) telah dijalankan selama 29 malam melalui lima sesi persampelan berasingan yang telah dijalankan bermula dari bulan November 2011 hingga November 2015. Sebanyak 378 individu kelawar yang terdiri daripada 36 spesies daripada enam famili telah ditangkap, daripada 435 malam usaha memerangkap. Jumlah spesies yang ditangkap ini bersamaan dengan kira-kira 39% (n = 36) daripada jumlah spesies yang pernah direkodkan di Borneo. Spesies yang paling kerap ditangkap di GGNP bagi kelawar pemakan serangga ialah *Rhinolophus affinis* (19.64%), manakala bagi kelawar pemakan buah ialah *Penthetor lucasi* (14.47%). Lekur akumulasi spesies mencapai asimptot pada malam ke-24 persampelan yang menunjukkan bahawa saturasi persampelan telah dicapai bagi kawasan kajian ini. Jumlah indeks kepelbagaian spesies ($H' = 2.75$) menunjukkan bahawa taman negara ini mempunyai kepelbagaian spesies kelawar yang lebih tinggi berbanding taman negara lain di bahagian Sarawak barat. Keputusan kajian ini juga disokong oleh analisis perenggangan yang menunjukkan bahawa persampelan di GGNP mempunyai nilai yang lebih besar berbanding taman negara lain di Sarawak barat yang dikaji secara aktif. Analisis hubung kait fasa bulan dan kadar kekerapan kelawar ditangkap menunjukkan bahawa tiada hubungan yang signifikan antara fasa bulan dan kadar kekerapan kelawar ditangkap di GGNP. Keputusan ini sekaligus menunjukkan tiada sebarang hubung kait antara jumlah cahaya bulan dengan kadar aktiviti kelawar. Kajian ini juga telah menghasilkan inventori spesies yang paling komprehensif dan terkini untuk GGNP. Keputusan kajian ini juga menunjukkan kepentingan GGNP untuk beberapa spesies kelawar yang jarang ditemui di Borneo seperti *Phoniscus atrox*.*

Kata kunci: Hutan dipterokarpa campuran; kelimpahan spesies; kepelbagaian kelawar; Sarawak barat

INTRODUCTION

Sarawak, Borneo supports one of the richest assemblages of flora and fauna in the Sundaland (Mohd-Azlan & Lawes 2011). However, Bornean forests are highly threatened due to habitat destruction through anthropogenic activities

such as monoculture plantations, industrialization, human resettlement, dam construction and timber extraction. As a result, Sarawak is experiencing rapid deforestation and habitat degradation (Mohd-Azlan & Lawes 2011) and this has caused population declines in various bat species