

# Roles of Heterogeneous Habitat for Conservation of Nymphalidae in Sarawak (East Malaysia)

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**Abstract**— Species diversity characterises an area or a targeted habitat and provides information on the species assemblages, which is a primary reflection of habitat diversity. It incorporates both species richness and abundance and may rely on factors, such as host-plant availability and food resources. Kubah National Park is a lowland mixed dipterocarp forest, and uniquely offers various vegetation types, which includes heath and submontane forests. In the present study, four contrasting forest habitats were selected along forest trails, namely, primary forests, secondary forests, heath forests and forest edges. Forty baited traps were used within a six-months of sampling period. The highest abundance was recorded at the heath forest while the least was at the secondary forest. However, there was no significant difference in terms of species abundance between forest habitats for subfamilies, as well as for the 15 most abundant nymphalid species sampled, except for *Mycalesis mnasicles*. This satyrine was regarded as being able to differentiate habitat, apart from sensitive to canopy openings. Secondary forest provides a heterogeneous habitat for nymphalids, and thus highest diversity was observed here. This study implies that habitat association of the family is crucial, as it will provide information for both species inventory as well as the fluctuation patterns of the nymphalids diversity. Similar study is suggested to be carried out in the future, which incorporates more than one habitat types and in a more extensive period.

**Keywords**—Borneo, diversity, fruit-feeding butterflies, habitat, Kubah, Sarawak

## I. INTRODUCTION

**B**IODIVERSITY is represented as the variability of living organisms in a particular area, from all kind of sources [1], [2]. In moist tropical regions, forests harbour the most species-rich habitat where it is home for a vast assemblage of

flora and fauna. The terrestrial diversity on Earth is dominated by arthropods in tropical rainforests, mostly supported by the various functional niches offer in this habitat [3]. Comparatively, little is known however, regarding the factors that impacts the spatial distribution of species. Quantifying spatial distribution of arthropods in tropical rainforests may serves as the initial step in studying more on the global distribution of biodiversity on Earth [3]. So as to conduct a proper study on biodiversity, suitable taxa need to be selected. The taxon should be sufficiently diverse in that area, yet the diversity should not be too high, and efficiently sampled [4].

Butterflies are commonly used especially in studying how logging impacts species diversity [5]. They act as a biological indicator for forest disturbance or a flagship species for biological conservation [5], [6]. Being host-plant specific, the butterflies respond almost immediately to certain even minute changes in their environment [6], [7]. Among this group, the nymphalids or the fruit-feeding butterflies are widely studied as bioindicators mainly due to their sensitivity to environmental modifications [8].

In tropical rainforest, spatial factors such as branch height, light levels and tree species are unique and varied. Any form of disturbances whether it is natural or manmade, may influence the spatial pattern of the nymphalids assemblages. Certain nymphalid species may be affected by the humidity at the lower stratum of a closed-canopy forest, and others may strive here because of the plentiful food resources [8], [9]. The vast forest heterogeneity offered in the tropical rainforest provides habitat to the nymphalids, and indirectly play an important role in the conservation of both the flora and fauna. The objectives for this study were to assess the species diversity and abundance of the nymphalids in contrasting forest habitats in the Kubah lowland rainforest, and to observe the distribution of singletons and Bornean endemic species. Habitat preference of these nymphalids was also observed and analysed on the 15 most abundant nymphalid species sampled.