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BEETLES AS BIODIVERSITY INDICATORS AT DIFFERENT ELEVATIONS IN FRASER'S HILL, MALAYSIA

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ABSTRACT

Malaysia is described as one of the twelve mega-store of biological diversity in the world however, very little is known about the forest reserves and their beetle diversity in relation to elevation. Two elevations ranging from 500 to 600 m and 1000 to 1100 m were selected for sampling with light traps, malaise traps and pitfall traps. Altogether 222 individuals were collected from 23 families from these two elevation clines. *Oxyletus lucidulus* Cam is the dominant species found at lower elevation. While *Chlaenius* species showed dominance at higher elevation gradient at Fraser's hill. The overall result shows that, lower elevation range (500-600 m) showed lower abundance (Margalef Index; 7.217), diversity

(Shannon-Weaner Index; 2.546) and Evenness Index; 0.510 while higher lavational range (1000-1100 m) showed slightly higher values for all. Not suitable in abstract. This study can be utilized to evaluate the suitability of selected beetle species diversity as a possible biodiversity indicator at Fraser's hill.

Keywords: bio indicator, beetle diversity, elevation, fraser's hill

ABSTRAK

Malaysia dikelaskan sebagai salah satu negara megabiodiversiti dunia tetapi maklumat mengenai hutan simpan dan kepelbagaian kumbang berdasarkan kecerunan adalah kurang. Dua cerun dengan julat 500 hingga 600 m serta 1000 hingga 1100 m telah dipilih dan dipasang dengan perangkap cahaya, perangkap malaise dan perangkap lubang. Sebanyak 222 individu daripada 23 famili telah berjaya dikumpul. *Oxyletus lucidulus* Cam merupakan spesies dominan pada kecerunan manakala spesies *Chlaenius* direkodkan sebagai spesies dominan pada kecerunan tinggi di Bukit Fraser. Hasil keseluruhan menunjukan kecerunan yang rendah (500 m-600 m) mencatat taburan (Indeks Margalef: 7.217), kepelbagaian (Indeks Shannon-Weiner: 2.546) dan Indeks kesamarataan 0.510 yang rendah berbanding dengan kecerunan yang tinggi (1000-1100 m). Kajian ini boleh digunakan untuk menilai kesesuaian kepelbagaian spesies kumbang yang terpilih sebagai alat indikator biodiversiti di Bukit Fraser.

Kata kunci: bioindikator, kepelbagaian kumbang, kecerunan, Bukit Fraser.

INTRODUCTION

Malaysia is described as one of the twelve mega-store of biological diversity in the world however; study on elevation patterns in the forest reserves is scarce. Fraser's hill's (Bukit Fraser) is a pristine, permanently protected natural reserve located at the Raub district of Pahang state. Due to the undisturbed nature the Fraser's hill fauna and flora are renowned for rich biodiversity (Forestry Department of Peninsular Malaysia, 2014). It has been a haven for bird watchers and related scientists, apart from its diverse fauna and flora. Highly diverse fauna of Fraser's hill consisted of beetles, moths and butterflies (Malaysian Nature Society, 2013), unfortunately beetle fauna of Fraser's hill has been poorly addressed. Hence, the study of species diversity and distribution in elevation gradient pattern in Malaysia would enlighten our understanding. The objectives of this study were: (1) to determine beetle diversity and distribution at different elevation gradients and (2) to identify the dominant indicator species at different elevation clines at Frasers's Hill.

MATERIALS AND METHODS

Study sites

Main mountains in Malaysia are located at the middle like ridge from Pahang to Kelantan states. Fraser's hill, Malaysia is located at N3° 43', E101°45' coordinates, bisecting Pahang and Selangor States.

Sampling Methods

Samplings were carried out at 500m-600m and 1000m-1100m asl at Fraser's hill. At each elevational gradient two light traps, four malaise traps and 20 pitfall traps were placed. The data

collected from these samples were analyzed using Margalef index, Shannon Weaner diversity index and evenness index for the diversity and distribution across the different elevations.

RESULTS AND DISCUSSION

A total of 222 beetle specimens of 23 families were collected from these two elevation clines at Fraser's hill. At 500-600m elevation families Staphylinidae, Scolytidae and Cicinelidae were abundant, while at 1000-1100m elevation were dominated by family Carabidae and Scarabidae. Figure 1 shows that Staphylinidae has the highest individuals (n=84) collected at 500-600m elevations followed by Scolytidae (n=41). *Oxyletus lucidulus* Cam (n=43) was the dominant species among the Staphylinidae collected. At the higher elevation *Chlaenius* spp. (n=20) was the highest catch. Margalef index, Shannon Weaner index and evenness index for the 500-600m elevation clines showed 7.214, 2.546 and 0.510 values respectively. Whereas, the value for Margalef index was 8.570, Shannon Weaner index; 3.25 and evenness index showed 0.752 at 1000-1100m gradient cline.

This study displayed higher beetle diversity and abundance at higher elevation gradient (1000-1100m) compared to the lower levels (500-600m) via Margarlef index, Shannon Weaver diversity index and evenness indices. Abdullah *et al* (2011) reported that around 1300 m asl beetle diversity is higher than the lower elevations in Cameroon Highlands. According to Fraser's hill results presented, at higher elevations Carabidae showed slightly dominant with a high abundance of *Chlaenius* spp. This could be due to the climatic conditions such as temperature, canopy cover, soil organic matter content but not easily distinguishable suggested by Niemelä (1996). At the lower elevations *Oxyletus lucidulus* was observed high in number which reflected forest moisture, soil texture, type of litter and presence of ephemeral resources. In the forest primary habitats of rove beetles were mainly disturbed by wildfire and anthropogenic imbalances (Abdullah *et al* 2012) which was also

discussed by Sakchoowong *et al* (2014) from Thailand. This study is an important contribution to understanding species distribution and niche according to different elevation in Fraser's Hill hence the forests of Malaysia. In conclusion, *Oxyletus lucidulus* can be considered as the bioindicator species at lower elevations whereas; *Chlaenius* spp. may be the indicator species at higher elevations.

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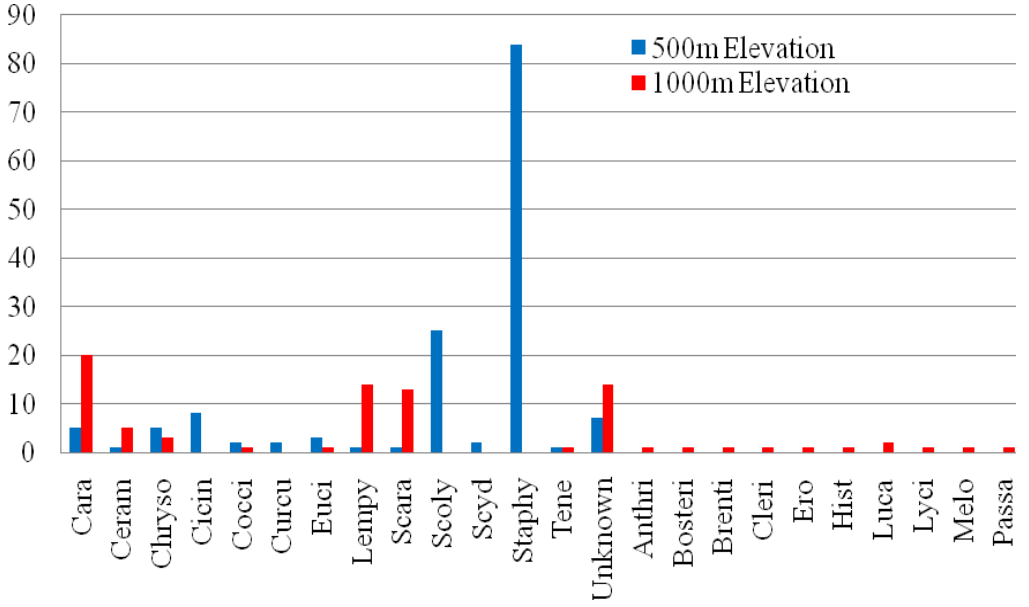

Figure 1: Number of individuals versus family sampled at Fraser's Hill