BUTTERFLY COLOURATION PREFERENCE IN CANOPY HEIGHT

DEWI SUPROBOWATI AND EKA FATMAWATI TIHURUA

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ABSTRACT

Maliau Basin, known as *Sabah's Lost World,* is one of the richest mixed dipterocarp forests in terms of overall biodiversity. A previous study found a total of 33 butterflies in this area. Canopy as a part of tropical forest habitat support many lifehood include butterflies. We held direct observation of butterflies colorization preference on vertical distribution at the canopy level (understorey and upperstore). Our first analysis showed that abundance of light color butterflies significantly corelated with uppercanopy, while dark color buterflies had no significant correlation. But the second analysis show there are no significant differences in canopy preference and either with the abundance of light and dark color butterflies. The second result showed no significant different in color preference. However there still high tendency for light butterflies to have vertical distribution in uppercanopy level, since the highest number of abundance was occur in the uppercanopy parts.

Key words: *butterflies, colorisation, canopy*

INTRODUCTION

Maliau Basin known as *Sabah's Lost World* was an impressing mixed dipterocarp forest with the richest wildlife habitat. These forest rise from about 300m to above 1800m above sea level in an uninterrupted sequence of forest type from lowland to montane. Maliau is one of the richest tropical island on earth. According Lantoh (1989) in Enthomologist Expedition found a total of 33 species of butterflies (Hazebroek *et al*, 2004) from a total of 944 buterflies species of 272 genera among 5 families have been identified in Borneo (Otsuka, 2001). The most interesting citation we found was; Hovanizt butterflies research in 1940 conclude that vertical scale observation in butterflies in North America (Temperate forest) indicated the variation shade of color darkest at the top and lightest at the bottom(www.tropical-biology.org/admin/documents/pdf files/Uganda %20abstract/BUTTERFLIESxx.pdf,2007). Interestingly this result are opposite with our slight observation during tracking to the camp which found that light we often find in high level and dark color in understorey level. So we would like to test wether this phenomenon also occur in tropical rain forest in Maliau Basin. So our hypothesis are dark color butterly will tendence to occur in uppercanopy, since the light color will tendence occur in understorey; butterflies abundance in uppercanopy tendence higher than butterflies in understorey.

The canopy is the combination of all leaves, twigs and small branches in a stand of vegetation, it is the agregate of all the crowns Carol (1980) *cit.* Parker (1995). Several categories of canopy levels (stories) are recognized. The *overstorey* comprises the crowns that are fully (dominant) illuminated from above. The *midcanopy* is a transisional region betwen understorey and overstorey and has crown that are partly illuminated or overtopped (suppressed). The *understorey* (or *subcanopy*) includes the woody plants in the lowest shady layers. The *ground layer* includes the seedlings of woody plants and other, herbaceous vegetation just above the forest flor, which include the litter (Paker, 1995).

Our studies classified canopy level into two different part: *uppercanopy* wich include the definition of *overstorey* and *midcanopy* and *understorey* wich consist of *understorey* and *ground layer.* By this distinction we hope can overcome missinterpreting of overlapping butterflies.

METHODS

The observation of butterflies was conducted in Maliu Basin Conservation Area from 21 until 23 August 2007. We used modified point count in two canopy level categories; *uppercanopy* and *understorey.* We used three site to represent each canopy level, with replication in three day observation. Each observation took 30 minutes within range of observation 6 meter diameter of circle plot.We distinct the butterflies color into two major type: dark (consist of light brown until dark brown and black), light (consist of other color beside mentioned in dark) and we also using precentage of dark and light color to justified, butterflies with more than 50% dark classified into dark group. We standardized the color scoring within the upper surface of the wing. We measured the light exposure variable by making photograph of the site where the observation held. We also noted every wheather changing along the observation. We analyzed our data into two different way: first put in categories that just as we set before (dark and light). Secondly, we classiffied the intermediate data (color between dark and light).We analyzed our data with Anova and Chi-square test used R statiscal program R.2.5.1.

RESULTS AND DISCUSSION

Over three days of observation, we found 97 butterfly individuals. Based on our methods for color scoring we have 56 dark and 41 light color butterflies distributed in two canopy levels. Using the Anova test, we found that dark colored butterflies were not influenced significantly by the canopy level condition (p-value 0.4252). They dispersed only slightly different in the upper canopy and understorey. However, the light colored butteflies showed a significant correlation with canopy level (p-value 0.0336). They were mostly found in the canopy level, based on our observation. It fulfills our expectation that light butterflies mostly occur in upper canopy. This may be an

environmental adaptation to avoid predator threat by blending in with the macrohabitat appearance. Total number of color individuals in different canopy level showed no differences, so butterfly distibution is fairly similiar in every level of the canopy (p-value 0,396), which could be because weather is one of crucial abiotic factors that influences the presence of butterflies. In the observation when light exposure constant and maximum reaches the understorey level, we encounter numbers of butterflies in both canopy level, but in the cloudy and rainy weather conditions we saw fewer butterflies.

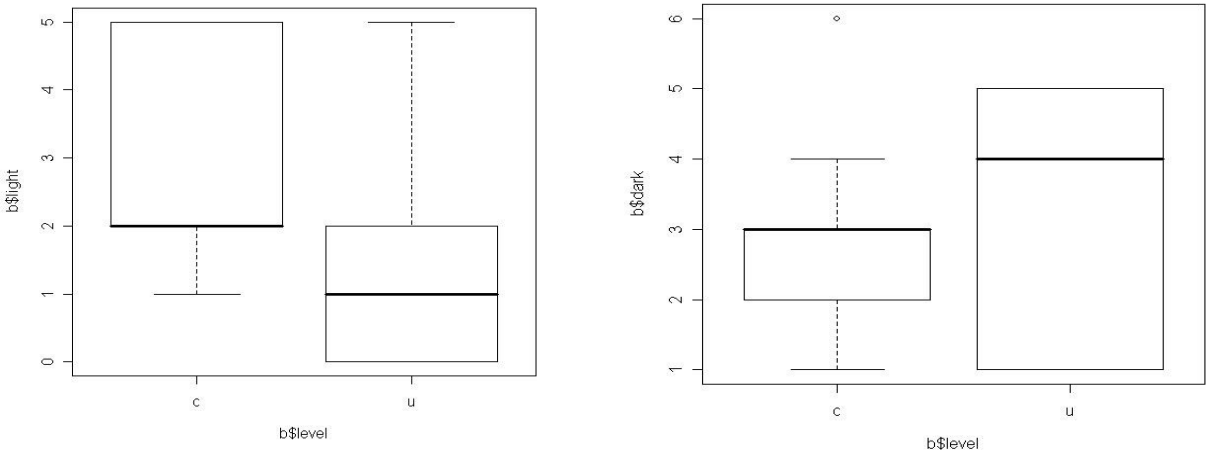

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Figure 1. Plot abundance of light color butterflies vs canopy (left) and understorey(right) (a); plot abundance of dark color butterflies vs canopy (left) and understorey (right) (b).

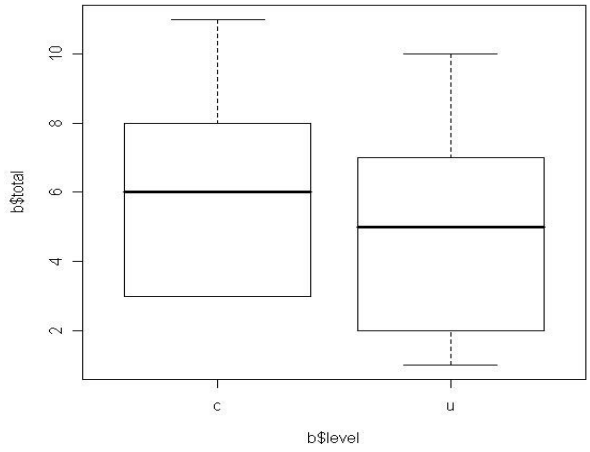

Figure 2. Plot total abundance of butterflies vs canopy (left) and understorey (right)

One of the interesting matters that we found in our obsevation is, we found that some butterflies have intermediate color which could be classified as either dark or light. Throughout the observations we kept our measurments based on method standarization so we put them into dark

group, but we also wanted to see how our results would change if we put them outside our definition. This showed slightly different results where neither light nor dark colored butterflies had significant preference in canopy level. Based on these results we might conclude that butterflies have a broad spectrum of canopy preference, where they can range from the understorey until the uppercanopy.

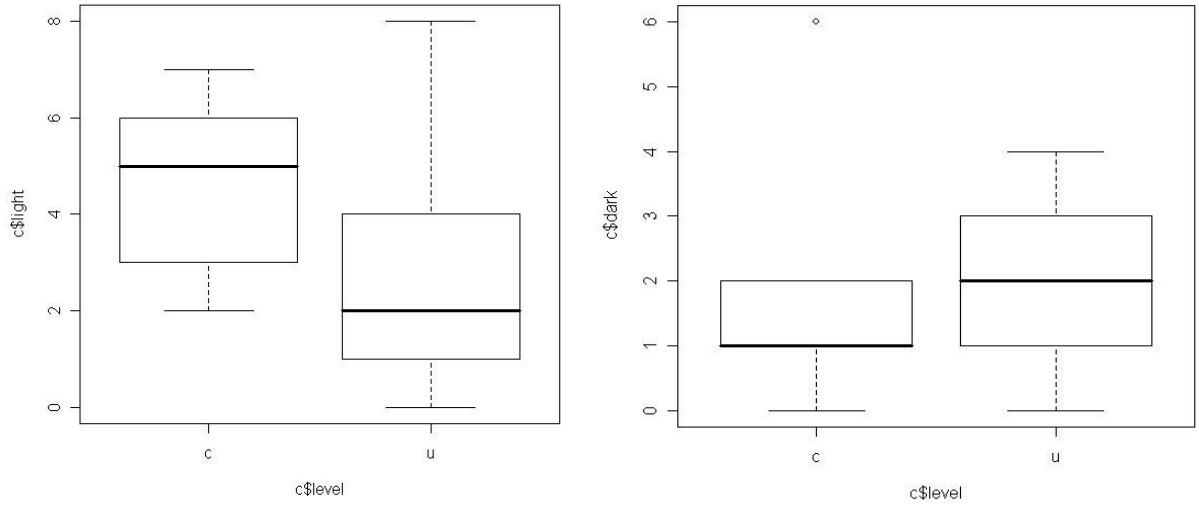

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Figure 3. Plot abundance of light color butterflies vs canopy (left) and understorey (right) (a); Plot abundance of dark color butterflies vs canopy (left) and understorey (right) (b).

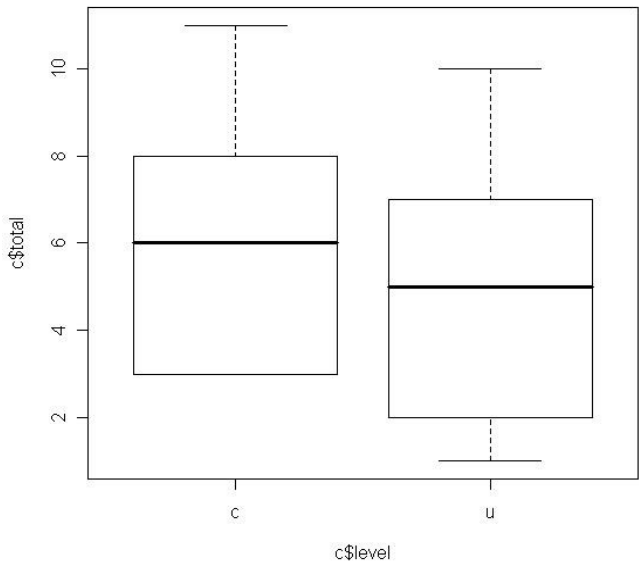

Figure 4.Plot abundance of total butterflies vs canopy (left) and understorey (right)

From the first analysis above, our result was against Hovaniest's where dark colored butterflies corelated significantly with upper canopy level. Our results suggest that this pattern cannot be generally applied in the tropical rain forest. Even though the second result showed no significant difference in color preference, it still showed the overall tendency of light colored butterflies distribute vertically in upper canopy level. Higher abundance of butterflies in the uppercanopy might be supported by higher light exposure with percentage 34-50 % from six circular plots with radius 3 meters. Since the understorey has a percentage of light exposure between 10-17 %. These support by the results show above and reject our hypothesis.

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