A comparison of the mangrove forest essay

A study was conducted by using stratified haphazard sampling at secondary forest at Taman Alam, Kuala Selangor and primary lowland dipterocarp forest at Gombak Reserve. This study aimed to compare the distribution of different types of species and plants and also to investigate the links between abiotic and biotic factors with the density of species in both secondary forest and primary lowland dipterocarp forest. The secondary forest had higher number of species (1214 species) compared to the primary lowland dipterocarp forest at Gombak which only contained 248 species. In the secondary forest, the soil was grey clay whereas at Gombak the soil was clay and coarse sand and it was yellow-brownish in colour. The salinity obtained from the secondary forest was 2.

1‰ higher than primary forest which was zero because of the location of the secondary forest was nearer to the seawater that provided salts. The percentage of canopy cover and leaf litter cover were higher in primary lowland dipterocarp and the percentage of ground cover was higher in the secondary forest. The species that was highly abundant in the secondary forest were Asystasia intrusa (herb), Stenoclaena palustris(fern), Nephrolepis biserrata (fern) whereas the primary lowland dipterocarp rich in Tectaria semipinnata (fern), Licuala sp (fan palm), Hill Coconut, and etc. INTRODUCTIONSecondary forest is formed as consequence of human activities on forest lands. In this study, the secondary forest of Kuala Selangor Taman Alam and the primary lowland dipterocarp forest at Gombak Reserve were studied.

Originally, the Kuala Selangor Taman Alam was mostly developed with mangrove ecosystem extended along the coastline of the Selangor river

estuary. In the 1960’s, redevelopment was marked to this park and an embankment was built in order to drain the swampland habitats and reduce flooding of Kuala Selangor village. Then, the area had an extreme logging and occupied by secondary growth species including Acacia trees, creepers, and mangrove ferns and strangling figs. This area had now become a secondary forest and full with a lot of species such as Stenoclaena palustris. The primary lowland dipterocarp forest constitute to the primary forest of the plains, undulating land and about up to 300m altitude. Commonly, high proportions of emergent and dominant strata are formed from dipterocarps (Krishnapillay, 2004).

Dipterocarp species is suitable to grow in the equatorial climate and temperature of Malaysia which is 25ºC to 27 ºC (Manokaran ; Konchummen, 1992). This forest has diverse forest types and species up to 85% canopy layer and it has two-winged fruit structure mostly abundant with dipterocarpaceae family (Appanah, 1993). Lowland dipterocarp forest constitute mostly in Borneo, Sumatra, Java, and Peninsular of Malaysia. The purpose of this study was to differentiate between these two types of forests in the form of its structure and biodiversity and also to determine the links between biotic and abiotic factors. In order to study the individual plants distribution and the types of plants present in both forests, many studies had been performed.

For instance, Manokaran and Kochummen (1992) performed a study in the primary lowland and hill dipterocarp forest to investigate the growth of trees by calculating the diameter breat height (DBH) for each species. METHODS ; MATERIALSThere were two different forests chosen for this studies which

were secondary forest of Kuala Selangor and primary lowland dipterocarp forest of the Gombak Reserve. The total area studied in both secondary forest and primary lowland dipterocarp forest were 90m2. Three sites were chosen at the secondary forest which was near the chalets (N 3o20′ 19. 1″ E 101o14′ 36. 0″), at the mid region (N 3o20′ 19.

8″ E 101o14′ 33. 3″) and near the bund (N 3o20′ 10. 6″ E 101o14′ 278″). The other three sites of primary lowland dipterocarp forest were at the top of ridge (N 3o18′ 56.

4″ E 101o44′ 28″), at the mid region (N 3o18′ 57. 3″ E 101o44′ 26. 2″) and near the river (N 3o18′ 59. 4″ E 101o44′ 24. 4″). Each forest in each sites were used similar size of quadrat which were 30m2 quadrats and stratified haphazard sampling was used in this study.

Two factors were measured which were biotic and abiotic factors. Biotic factors such as number of species, diameter at breast height, percentage of canopy cover, ground cover and leaf litter cover were pooled. The quadrat was placed in every site based on the elevation to count the number of species exist in both forests. There were so many species present in the primary forest at Gombak, thus, in order to determine the existence of species easier, taxonomy was given to each group.

Estimation scale was given in the handout given to determine the percentage of canopy, ground and leaf litter covers in each site. The structure of the forest was determined by looking to the top layer of the forest and estimated whether the forest absent any layer such as emergent, canopy, understory or seedling layer. Besides, diameter at breast height

(dbh) of the plants species was also measured by using a ruler and the canopy height was determined by the estimation method using clinometer. Besides biotic factor, the plants species also were influenced by the abiotic factors such as air and soil temperature, type of soils, tidal range, and salinity of soil, depth of water table and density of light. Soil and air temperature were measured using an oven thermometer, whereas density of photosynthetically active radiation of light was measured using a light meter.

The salinity of soil in both forest were measured using a conductivity meter and auger was used to determine the type of soils and the depth of water table. The tidal range was determined and calculated by the distance from the ground to the lowermost lichen growing on the trees in both secondary and primary forests. All the data of biotic and abiotic factors were pooled and the standard deviation, mean, and standard error were calculated statistically by using Excel. RESULTSIn the secondary forests, there were canopy, understory and seedlings layers found. However in the primary lowland dipterocarp forest, there had complete forest layers which were emergent, canopy, understory and seedlings layers.

The average canopy height in secondary forest was 21 meters which was lower than primary lowland dipterocarp forest at Gombak Reserve which was 34 meters. In the secondary forest, the average thickness of humus layer was 2 cm whereas the average thickness of humus layer for primary lowland dipterocarp was 2. 3 cm. For the average thickness of leaf litter layer in both forests, the primary lowland dipterocarp forest at Gombak had thicker leaf litter layer which was 3. 8cm than the secondary forest which was 2.

35cm.; The average mean percentage of canopy cover in the primary lowland dipterocarp forest was 87. 33% which 6. 5% higher than the mean percentage of secondary forest which was 87. 33 (Figure 1).

As shown in Figure 2, the average mean percentage of ground cover in secondary forest was 50. 5% which 19. 3% higher than in primary lowland dipterocarp which was 31. 2%.

Furthermore, the average mean of leaf litter cover for primary lowland dipterocarp forest was 95. 2% and for secondary forest was 90. 8%, thus, the average mean of leaf litter cover for primary lowland dipterocarp forest was 4. 4% higher than in secondary forest (Figure 3).

; There were total of 1214 number of species live in the secondary forest including trees, shrubs, herbs, palms, grasses, ferns and fungi (Figure 4), while 248 species live in the primary lowland dipterocarp forest which was less than in the secondary forest including trees and saplings, shrubs and herbs, climbers, palms, mosses, ferns, and fungi (figure 5). The species that was most abundant in the secondary forest were Asystasia intrusa (herb), Stenoclaena palustris(fern), Nephrolepis biserrata (fern) and etc, whereas the primary lowland dipterocarp rich in Tectaria semipinnata (fern), Licuala sp (fan palm), Hill Coconut, and etc.; As shown in Figure 6 and Figure 7, based on the relative abundance in an area of 90m2, the species were ranked in descending order. The most abundant species in the secondary forest was herbs, followed by ferns, trees, fungi, grasses, and palms whereas no shrubs were found in this forest.

Conversely, in the primary lowland dipterocarp forest, trees and saplings were the most abundant followed by palms, shrubs and herbs, ferns, climbers, and moss. The least abundant in lowland dipterocarp forest was fungi. In the primary lowland dipterocarp, large species like trees and palms were abundant compared to secondary forest, small species like herbs and ferns were abundant. In the secondary forest, the mean air temperature decrease as nearer to the bund (Site 1) as well as in the primary lowland dipterocarp forest, the mean air temperature decreased slightly as nearer to the river (Figure 8). Though, the average mean air temperature in secondary forest (31.

6ºC) was higher than primary lowland dipterocarp forest (28. 7ºC). Furthermore, the mean soil temperature in secondary forest was slightly decreased but constant after the mid region, yet, it was higher than the mean soil temperature in primary lowland dipterocarp that was increased slightly and constant after the mid region (Figure 9).; The tidal range in both forests was none and the salinity in secondary forest was 2. 1‰ which higher than in primary lowland dipterocarp forest which was 0‰. Besides, the texture and colour of soil were also determined by using auger.

The colour of the soil in secondary forest was grey and the texture was clay compared to the texture of soil in primary lowland dipterocarp which was muddy and the colour was yellow-browninsh. However at Site 3 of primary lowland dipterocarp forest, the texture and colour of the soil were different from Site 1 and 2. The colour was pale grey and the soil consisting coarse sand. The mean depth of water table at the secondary forest was 37cm but

at Site 1 and 2 of primary lowland dipterocarp forest, it was too deep to measure the water table.

However, at Site 3, the depth of water table was able to measure which was 0-10 cm. At the secondary forest, the photosynthetically active radiation of light was 81. 8fluxes which higher than at the primary lowland dipterocarp which was 1. 13fluxes.; DISCUSSIONAs shown in the results, the forest layer of secondary forest was made up of canopy, understory and seedlings layers but absent in emergent layer. However in the primary lowland dipterocarp, there was a complete forest layer consisting, emergent, canopy, and understory and seedling layers.

Both forest had a canopy layer however they was different in the mean height where primary lowland dipterocarp forest had mean canopy height which was 34m higher than the mean canopy height of secondary forest which was 21m. Besides, the diameter of breast height in primary lowland dipterocarp forest was 95cm compared in the secondary forest which was 80cm. In addition, the average mean percentages of canopy cover in the primary lowland dipterocarp forest was 87. 33% which 6.

5% higher than the mean percentage of secondary forest which was 87. 33 (Figure 1). This might due to more forest layers present; the canopy layer at primary lowland dipterocarp forest was thicker and 248 species present in this forest including Pinanga sp, Tectaria semipinnata, Shorea curtisii and so on (Refer to Appendix 1). However, there were 1214 species exist in the secondary forest mostly herbs and ferns and this might due to the absent of emergent layer where high amount of light penetrated into the understory

and seedling layer was high. The DBH was needed to determine the species growth at each site for instance; the DBH of Anisoptera levis at Site 2 in primary lowland dipterocarp forest was 95cm. The link between the PAR of light reaching the ground and percentage of canopy cover was shown in the Figure 10 and 11 where there was link between these biotic and abiotic factors.

Penetration of direct sunlight through small openings in the canopy is called sunflecks. If the percentage of canopy cover was higher, less sunflecks reached the ground layer (Denicola, et. al, 1992). The average mean percentage of ground cover in secondary forest was 19. 3% higher than in primary lowland dipterocarp which was (Figure 2).

High intensity of light could lead to high percentage of ground cover where herbs, ferns, and etc. They could grow as they used the sunlight to undergo photosynthesis. However, because of the presence of shade adapted species such as tracheophytes which adapted itself to protect from high light intensity due to its thick, wavy cuticle and epidermis. Leaf litter cover is due to the falling of leaves form the trees forming a ‘ carpet-like’ cover that provides shelter to the tiny creatures such as mollucs (Appanah, 1993). Furthermore, the average mean of leaf litter cover for primary lowland dipterocarp forest was 4. 4% higher than in secondary forest (Figure 3).

This might cause by the effect of higher percentage of canopy cover in the primary lowland dipterocarp. When there was higher percentage of canopy cover, the leaf fell down to the ground was increased. As shown in Figure 4 and 5, there were abundant of species present in an area for both forests. In

the secondary forest, there was more species present in Site 1 compared to the other two sites whereas in the primary lowland dipterocarp there was also more species in Site 1. However, the total abundance per m2 for secondary forest was 40.

47 higher than in primary lowland dipterocarp which was 4. 60 only. Soil temperature is a significant factor that controls or has a strong impact on plant growth and soil formation. The mean soil temperature is rather closely related to mean air temperature (Smith, et al., 1964) and may affect by the amount and distribution of rain and, shade and leaf litter layers in the forests.

The mean soil temperature at Gombak primary lowland dipterocarp was 24. 4 ºC where it was lower than at secondary forest which was 26. 8 ºC. This could be linked to the intensity of light reaching the ground. Soil temperature low was due to more shaded area where intensity of sunlight such as in the secondary forest low, the PAR of light was 81.

8fluxes. Thus, the soil temperature in the forest was slightly higher. Species diversity was determined by the abiotic factor because the soils in both forest was different. In the secondary forest, the colour of the soil was grey and with clay texture compared to the texture of soil in primary lowland dipterocarp which was muddy and the colour was yellow-browninsh.

While at Site 3 of primary lowland dipterocarp forest, the texture and colour of the soil were different from Site 1 and 2. The colour was pale grey and the soil consisting coarse sand. The factor that affects the colour and texture of soil in the secondary forest was the plants which they supplied upper layers

of soil with an organic substance and recycling nutrients from lower to upper layers. Basically, leaves, branches, and bark from huge plants fall onto the soil and were decomposed by fungi, bacteria, insects, earthworms, and burrowing animals.

They were releasing plant nutrients by eating and breaking down organic substance. Besides, some of them changed into certain elements, such as sulfur and nitrogen which were usable for plants. In contrary, the soil characteristics in the primary lowland dipterocarp forest were affected by the present of iron, aluminium oxides and acid silicate. Whereas at Site 3 it was slightly different, this might be due to the deposition of sand in the soil as it was nearer to the river. The mean thickness of humus layer in the secondary forest was 2 cm whereas the mean thickness of humus layer for primary lowland dipterocarp was 2.

3 cm. For the mean thickness of leaf litter layer in both forests, the primary lowland dipterocarp forest at Gombak had thicker leaf litter layer which was 3. 8cm than the secondary forest which was 2. 35cm. These might cause by the rate of leaf litter decomposition was faster in the primary lowland dipterocarp forest compared to the secondary forest.

The rate of leaf litter decomposition was influenced by the soil and microorganisms present in the soil for the reabsorption of plants (Sekyere, et al., 2006). Salinity is how much of salt in soil and water. The salinity was the conductivity of water table times 0.

648 and the result was in part per thousand (‰). In secondary forest, the salinity was 2. 1‰ which higher than in primary lowland dipterocarp forest

which was 0‰. This might be due to the location of the secondary forest itself where it was nearer to the sea and mangrove forests. There were some deficiencies that might occur in this study like the ruler might cause inaccuracy of diameter at breast height measurement.

This could be overcome by using meter tape instead of ruler. The temperature measured by an oven thermometer was not reliable as it could give an inaccurate results and this can be replaced by using an air temperature sensor for air temperature measurement and use soil digital thermometer to measure soil temperature. Furthermore, some of the species names and its types in the taxonomy were unusual could lead to imprecision of species identification. The stratified sampling method also could lead to bias selection because the site was chosen based on personal or group choices and this could be substituted using random sampling method.

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