COMMUNITY STRUCTURE IN SUNGAI LALANG FOREST RESERVE, SELANGOR, MALAYSIA

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master in Environmental Sciences

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ENVIRONMENTAL SCIENCE STUDY PROGRAM

POST GRADUATE

DIPONEGORO UNIVERSITY

SEMARANG

2010

THESIS

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PERNYATAAN

Saya menyatakan dengan sesungguhnya bawah tesis yang saya susun sebagai syarat untuk memperoleh gelar Magister dari Program Magister Ilmu Lingkungan seluruhnya merupakan hasil karya saya sendiri.

Adapun bagian-bagian tertentu dalam penulisan Tesis yang saya kutip dari hasil karya orang lain telah dituliskan sumbernya secara jelas sesuai dengan norma, kaidah dan etika penulisan ilmiah.

Apabila di kemudian hari ditemukan seluruh atau sebagian tesis ini bukan hasil karya saya sendiri atau adanya plagiat dalam bagian-bagian tertentu, saya bersedia menerima sanksi pencabutan gelar akademik yang saya sandang dan sanksi-sanksi lainnya sesuai dengan peraturan perundangan yang derlaku.

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ABSTRACT

In order to determine the species richness, the species composition, height, diameter class structure and tree species diversity were examined in a 1-ha area in lowland tropical rain forest in Sungai Lalang forest reserve, Selangor, Malaysia. However, some of trees with diameter at breast height (DBH) of 5 cm and above were measured and recorded to be analyzed. As a result, all species at the study site were compared with some results which were found equaled abundant according to Evenness Index that gave a value of 0.922; Margalef's Index reflected a value of 17.01. *Chaetocarpus castanocarpus* (Euphorbiaceae) was the most important species with an IVI (Important Value Index) of 4.643%, while Euphorbiaceae was the dominant family for the study area with IVI of 14.02%. The study is recommended that this study area should be managed and protected in the right way to ensure the continued existence and conservation of Malaysia natural resource.

Keywords: Species Composition, Species Diversity, Selangor, Malaysia.

ABSTRAK

Untuk menganalisis kekayaan hutan, maka komposisi spesies, diameter struktur kelas dan keragaman spesies pohon telah diuji pada sebuah plot di dalam hutan hujan tropis dataran rendah hutan lindung Sungai Lalang, Selangor, Malaysia. Begitu pula beberapa pohon dengan diameter DBH (Diameter Lingkaran Batang) 5 cm keatas diukur dan dicatat untuk kemudian dianalisis. Sebagai hasil, seluruh spesies pada tempat kajian telah dibandingkan dengan beberapa hasil yang ditemukan melalui persamaan kelimpahan yaitu berdasarkan pada indek kesamaan (Evenness Index) yang memberikan nilai 0.922 ; Indek Margalef memberikan nilai 17.01. *Chaetocarpus castanocarpus* (Euphorbiaceae) adalah spesies paling penting dengan INP (Indeks Nilai Penting) 4.643%, sementara itu Euphorbiaceae juga merupakan famili paling dominan pada area kajian dengan INP 14.02%. Kajian ini merekomendasikan bahwa area kajian harus di kelola dan dijaga dengan cara yang benar untuk menjamin kelestarian dan pemeliharaan sumber daya alam Malaysia.

Keywords: Komposisi spesies, keanekaragaman spesies, Selangor, Malaysia

ACKNOWLEDGMENT

Alhamdulillah, praise to Allah the Almighty for his blessing and will, this report is finally completed.

I would like to express the deepest appreciation to my supervisor, Dr Boedi Hendrarto; M. Sc who has the attitude and the substance of a genius: he continually and convincingly conveyed a spirit of adventure in regard to research, and an excitement in regard to teaching. Without their guidance and persistent help this dissertation would not have been possible.

I would like to express my deepest gratitude to my second supervisor, Dr. Muniffatul Izzati for her support and guidance throughout the research. Her continued support led me to the right way.

My sincere thanks to my family, brothers, sisters and especially my mother and to memory of my father,

Beside these, I would like to thank my favorite teacher Dr. Hartuti Purnaweni for her comments, suggestion, and encouragement throughout the first steps of this report, and to all my classmates in Department of Environmental Science in Diponegoro University, and finally to Semarang (the beautiful city).

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CHAPTER I

INTRODUCTION

1.1 TROPICAL RAIN FORESTS

For hundreds of years the stereotype of rainforest is lush jungle plants, colourful birds, humidity and heavy rainfall. According to the Longman and Jenik (1987), the word forest refers to three different concepts: a) Timbers or plants as trees, b) all plant community dominated by trees. c) All community areas that are dominated by trees which functions, including biotic substrate and atmospheric environment. The world's tropical forests circle the globe around the Equator. They are amazingly diverse and they consist of lush rain forests, dry savannas and containing complex ecosystems and millions of species of animals and plants. Tropical forests once covered some 6.2 billion ha (Mastrantonio & Francis 1997). In recent times, however, they have been cleared at a rapid rate to build urban areas, agriculture and to get their many valuable products. Between 1985 and 1990, 85 million ha of tropical forests were destroyed (Mastrantonio & Francis 1997). Forest covers 27.7% of expanse of Earth and as much as 53.4% of this forest area number is tropical forest, 21.2% is temperate forest and 25.4% is boreal forest (Longman & Jenik 1987). But according to Myers (1988) tropical rainforest total area in the world has been estimated as only 9 millions km^2, and about 76-92 thousand km^2, have been destroyed every year.

1.2 GLOBAL DISTRIBUTION

The largest remaining areas of tropical rain forests are found in Amazon Basin, Congo Basin, and Indo-Malaya Basin. Lowland rain forests are among the world's most productive of plant communities, giant trees may tower 60m in height and support thousands of species of plants and animals. The trees in the rainforests carry profusion of parasitic or heavy climbing plants, and, in some portions, a "jungle" of dense

undergrowth near the ground. For lack of marked climatic seasons, growth proceeds throughout the year (Mastrantonio & Francis 1997). Kindly check Figure 1.1 to verify the distribution of forests around the world

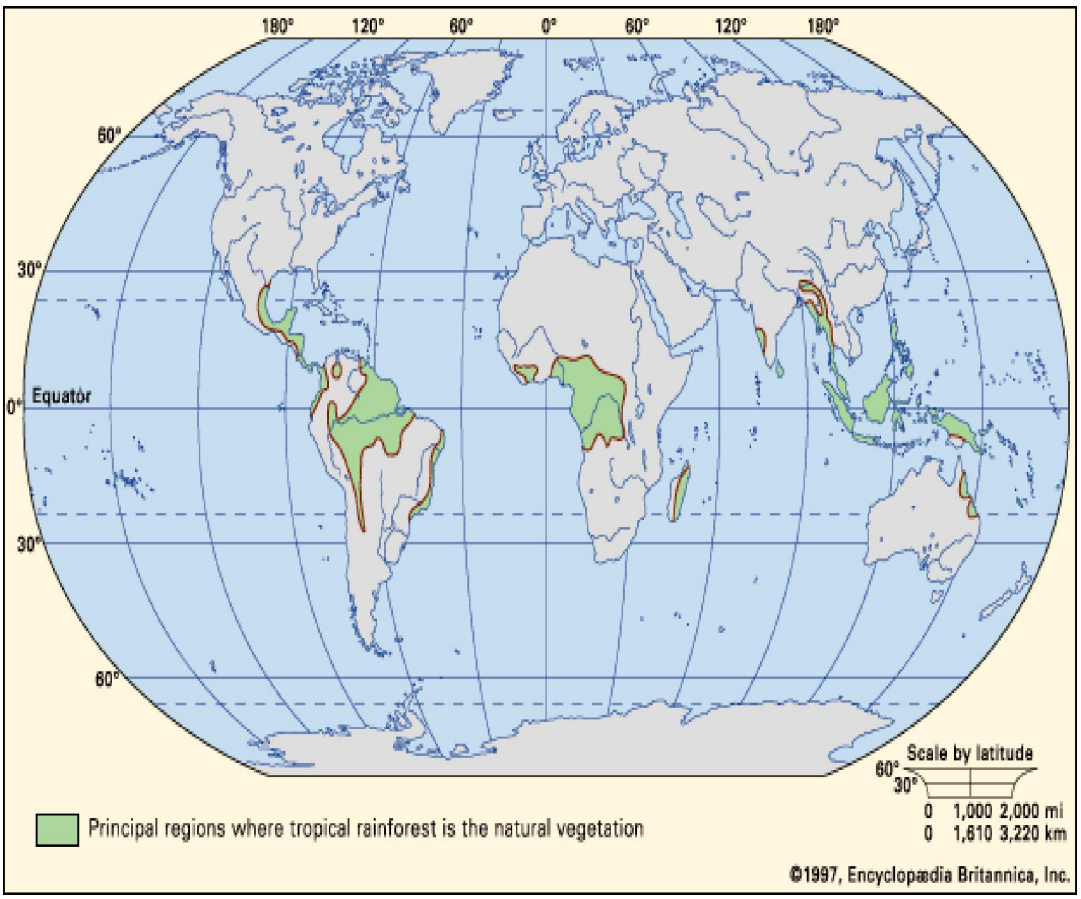

Figure 1.1Tropical rainforest: worldwide distribution, Source: Encyclopedia Britannica 1997.

1.3 IMPORTANCE OF TROPICAL FORESTS

Tropical forests have core role in the conservation of the ecosystem and biodiversity. These forests are the habitat of more than 70 percent of the world's plants and animals

and more than 13 million distinct species (Anon. 1996). They contain 70% of the world's vascular plants, 30% of all bird species and 90% of invertebrates. In tree species alone, tropical rain forests are extremely diverse, often having more than 200 species per hectare (Wilson 1992). Tropical forests do more than respond to local climatic conditions; they actually influence the climate. Through transpiration, the enormous numbers of plants found in rain forests return huge amounts of water to the atmosphere, increasing humidity and rainfall, and cooling the air for miles around. In addition, tropical forests replenish the air by utilizing carbon dioxide and giving off oxygen. By fixing carbon they help maintain the atmospheric carbon dioxide levels low and counteract the global "greenhouse" effect (Mastrantonio & Francis 1997). Forests also moderate stream flow. Trees slow the onslaught of tropical downpours, using and storing vast quantities of water, and helping hold the soil in place. When trees are cleared, rainfall runs off more quickly, contributing to floods and erosion (Mastrantonio & Francis 1997). Some 500 million people live in or at the edge of the tropical forests. They are some of the least privileged groups in our global society. They depend on the forests for many important products and environmental services (Anon. 1996). Tropical forests are also very important economically for plant-improvement breeding. For example, a species of wild maize has been found in Mexican woodlands that are resistant to five of the world's seven most important corn viruses for example Corn stunt virus (Leakey & Simons 1998). It is now an important genetic resource for corn-improvement programmes. Forests are also important sources of new pharmaceuticals used to fight cancer, AIDS, and other serious human diseases. The periwinkle plant from the Madagascar forests provides a drug that has proven very successful in treating lymphocytic leukemia (Leakey & Simons 1998). Forests are often important sources of foodstuffs, particularly in times of drought and famine when conventional agricultural crops have failed.

1.4 THE FOREST AND THE ENVIRONMENT

Forests are an integral part of the environment which contributes to its stability, but unfortunately they lost out of our hands and gradually being lost because of the violations committed by human beings day after day towards the environment. Forests not only as

cover of a vast green but the significance of economic and industrial and even a tourist too, as they prevent soil degradation and erosion, protect water springs, and maintains the stability of the mountains, they also limit the impact of greenhouse-green, which contribute to global warming through the green plains which absorbs carbon dioxide. Forests are the environment and the natural habitat of animals and plants which contains about 2/3 of the total population of animals and birds, so it helps to protect biodiversity from extinction, and contribute as a source of energy and raw materials. The environment is not to be seen as a stand-alone concern. It cuts across all sectors of development. The rapid increase in greenhouse gases in the atmosphere, land degradation, increasing floods and droughts, advancing deserts and deteriorating conditions of fragile ecosystems, deforestation, loss of biodiversity and environmental pollution have become subjects of serious global concern. The overall impact of these phenomena is likely to result in depletion of ozone layer, change of climate, rise in sea-level, loss of natural resources, reduction in their productivity ultimately leading to an ecological crisis affecting livelihood options for development and overall deterioration in quality of life. Development based on utilization of natural resources, pressure of population and their growing demands and poverty of the people took a heavy toll of our environmental assets. While natural assets have shrunk, demands have grown resulting in overdrawals being unsustainable. The tropical countries have to improve their own economic growth rate, provide basic minimum life support services to a large section of population and deal with the problems of poverty and unemployment. At the same time, the haveto pay attention to conserving our natural resources and also improving the status of our environment, they need to tackle the environmental degradation in a holistic manner in order to ensure both economic and environmental Sustainability. This is a most challenging task for the country and in particular for their planners and policy

1.5 MALAYSIAN RAIN FOREST

Malaysia lies between latitude 1° and 7° North and longitude between 100° and 119° East. This position makes Malaysia a very rich tropical country with nature’s floral and faunal diversity. The environment with humidity makes an ideal area to this high

diversity (Richards 1952). According to Latiff (1997) the plant species number in Malaysia ranges between 12,000-15,000. Faridah-Hanum and Tipot (1993) said that the number of tree species in Peninsular Malaysia is 2,830 species, 532 genera and 100 families.

Of 2,830 tree species, 746 species (24.4%) are endemic to Peninsular Malaysia. The total forests areas in Malaysia was estimated to be 20.20 million ha or 61.5% of the total land area, of which 14.45 million ha, which covers 44.0% of the total land area are designated as Permanent Reserved Forest (Ahmad *et al.* 1999) out of 14 .45 million ha, about 3.81million ha are classified as protection forest, while the remaining is production forest. These forest lands are secured in their tenure as they are gazetted in accordance with the National Forestry Act 1984 (Ahmad *et al.* 1999).

1.6 CONSERVATION STATUS AND ISSUES

Traditionally, forest provides the need of communities living within and close to forest environment. Forest dependent communities use natural resources for their food and material needs, and they sell forest products for cash income. Forest and its resources provide the bases for the continuity of their culture, beliefs and identity. However, the quest for modern development driven by monetary gains has increasingly affected the ecological functions of forest and the traditional utilization of resources. Expansion of exploitative activities into forests has affected these traditions. Construction of roads into the forest frontier has indirectly attracted people to further open up forest for cultivation, having contributed to the economic growth of Malaysia; decades of unsustainable and large-scale forest utilization have led to massive forest degradation that in turn leads to declining revenue and conversion of forest into other land use (Hirsch 1987, Pasuk & Chris 1995). One other pressing conservation issue is habitat loss, Primack *et al* (2005) stated that the primary cause of the loss of biological diversity is not direct human exploitation or malevolence, but the habitat destruction that inevitably results from the exploitation of human population and human activities, when a habitat is degraded or

lost, the animals, the plants and other organisms living there will have nowhere to go and will just die off (Biggs *et al.* 2005).

Langat Basin considered as one of the areas under habitat destruction, the hill dipterocarp, lowland dipterocarp, mangrove forest and peat swamp forest have maintained an area of about 30% of the entire basin. In 1991 the forest land use was calculated as 90,342.04 ha about 30.80%. In 1996 the forest areas decline to 82,690.20 ha about 28.19% but increased again to 89, 89,136.27 about 30.39 % in 2001 (Omer *et al.* 2002). Nowadays, forest policies are made at the state level. That is to say, the respective state governments have jurisdiction over land, forests, fisheries, agriculture, water resources and local authority areas, including the power of disposal. Theoretically, this means that forests are public lands administered by the states. Thus they, not the federal government, are empowered to gazette reserves, issue logging permits, collect royalties and premiums, decide on the use and allocation of the forest and its development (Yong. 2001). Many conservation efforts, i.e. the insitu and ex-situ conservations have been carried out by the relevant authorities to conserve the biodiversity in Malaysia, look at Figure 1.1 in the next page to know the national parks site in Malaysia. As for the in-situ conservation, various kinds of forests have been gazetted as National Parks, Wildlife Reserves, Virgin Jungle Reserves, etc., and it has been estimated that a total of 1.39 million ha (about 7.6%) of all types of the forests are set aside for these purposes. Nowadays Malaysia still has about half of its primary habitats and has established extensive protected areas as Bangi Permanent Forest Reserve which received its reserve status on December 31, 1906's and The Krau Wildlife Reserve which established on 9th June1923, but the forces of habitat destruction and degradation continue because of human (Primack *et al* 2005). Malaysia as it stands now is fully aware of the importance of the wealth of biological diversity presently available within its shores and is therefore making every effort with full commitment to preserve and sustainably utilize them such that this wealth is ensured to perpetuity. The National Policy on Biological Diversity for Malaysia was developed and launched in 1998. This national policy aims to provide direction for the nation to implement strategies, action plans and programmes on biological diversity for the conservation and sustainable utilization of the resources

(Soepadmo & Wong 1995). The study was focused on the specific information of the species composition (the percentage of each recognized tree species comprising the forest type based upon the gross volume, the relative number of stems per hectare or basal area), the biomass estimation and species diversity which reflect the conservation value of the study area; all can be assessed to identify the conservation status for that area. The estimation of biomass and stand structure of the forest would give a better understanding of the changes in ecosystem. The information of species composition will give knowledge on the richness of the forest. From this study, it is presumed that the outcome will add to the present list of tree species in Selangor and provide an understanding of the ecology of Sungai Lalang Forest Reserve. In order to be able to visualize those areas, which stated as protracted areas in Malaysia, kindly see Figure 1.2.

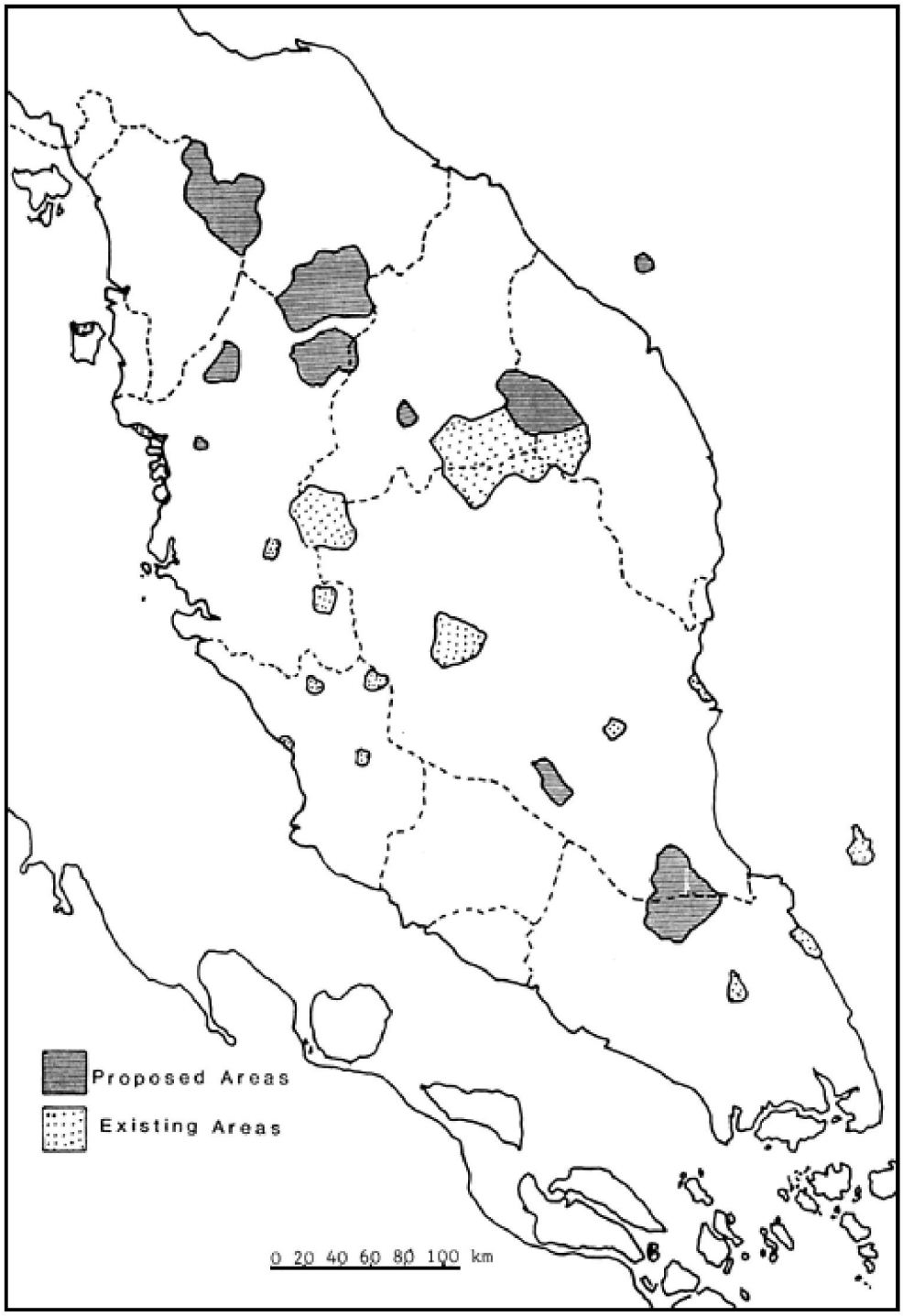

Figure1.2 National Parks and Wildlife Reserves in Peninsular Malay Source: Kochummen (1990)

1.7 OBJECTIVES

This study is to assess the diversity and tree species in Sungai Lalang forest reserve, with the following objectives.

1. To assess plant species composition.
2. To estimate the above-ground biomass
3. To evaluate the tree species diversity in 1.0 ha area in Sungai Langat forest reserve.
4. To estimate the new generation in 1.0 ha in Sungai Lanag forest reserve.
5. And to assess where there are any seedlings or sapling belonging to the mature trees at the study area.

1.8 THE IMPORTANCE OF THE STUDY

The importance of this study is to help the relevant authorities including the Forestry Department of Selangor to have better knowledge and understanding of the nation's biological resources. With better knowledge and understanding, the relevant authorities can create a plan or improve certain areas in conservation biology management strategies such as adopting guidelines by the forestry departments to incorporate volume and area control, such that harvesting must be base on joint consideration of area, volume and silvicultural conditions. In this manner, timber volume for a specific area will base on a prefelling forest inventory offering various cutting options. Actual logging volume will supervise via forest checking stations which check timber harvested versus specific licenses. To ensure accountability, a tagging system will be implemented. The strength of this research is that the finished documentation can be a reference for anyone who is interested in having better understanding of the nation's rich and unique natural heritance. With the new addition to the collection of forests' resources documentation, Malaysian government can develop better steps and strategies to utilize its biological resources towards realizing the nation's vision of becoming a developed country by the year 2020 while maintaining a stable and untarnished environment.