

VEGETATION OF FRESH WATER SWAMPY AREAS IN WEST AND CENTRAL KALIMANTAN

Eizi Suzuki,¹ ✉ Takashi Kohyama² and Herwint Simbolon³

¹Department of Earth and Environmental Sciences, Faculty of Science, Kagoshima University, Kagoshima 890-0065 Japan; ²Graduate School of Environmental Earth Science, Hokkaido University, Sapporo 060-0810 Japan; ³Research and Development Center for Biology, LIPI.

ABSTRACT

Vegetation types in fresh water swampy areas: Mandor in West Kalimantan and Lahei in Central Kalimantan, were compared. There were three types: kerangas, kerangas shrub and peat swamp forest. Kerangas forests in both areas had similar flora in some extent. That of peat swamp was very different from kerangas though both vegetations distributed in adjacent area.

Keywords: Vegetation, freshwater swampy, kerangas, peat forest, ecosystem, Central Kalimantan.

INTRODUCTION

On lowland of Kalimantan, fresh water swampy forests extend widely (MacKinnon *et al.*, 1996). Hundreds of kilometers inland the land is still low-lying, poorly drained and swampy. Though the wide swampy areas have unique ecosystem and flora, the studies of the vegetation are not so many. Especially the comparison of swampy forests between different provinces was rare. Thus we compared the vegetation of fresh water swampy forests between West and Central Kalimantan to detect how the forests were diversified between sites.

STUDY SITES AND METHODS

We made study plots at two sites, Mandor Nature Reserve in West Kalimantan, and Lahei in Central Kalimantan. Mandor Nature Reserve is located 25 km north of Pontianak, and the most area is covered by Kerangas forest. In 1987, four plots (M-1 to M-4) of 0.09 to 0.6 ha in area were made. We made three plots in Desa Lahei, Kacamatan Mentagai, Kabupaten Kapuas in 1997. It locates 50 km northeast of Palangka Raya. L-1 and L-2 of 1-ha were established in kerangas and peat swamp forests, respectively. L-3 of 0.04 ha was on a shrub land. L-1 was about 1 km west of L-2, and several meters higher in altitude. For the comparison, the

data from dipterocarp forest on dry land at altitude of 250 m on Gn. Berui, Serimbu of West Kalimantan (Suzuki *et al.*, Unpublished data) were used.

The species name, girth at 1.3 m above ground (GBH) and the location were recorded for the trees with GBH > 15 cm in M-1, M-2, M-3, L-1 and L-2 and trees with GBH > 6.28 cm and 6cm in M-4 and L-3, respectively.

RESULTS AND DISCUSSION

Table 1 shows the study plots. In all plots, we found 6,320 trees of 392 species. Mandor and Lahei had 287 and 192 species, respectively, and 87 distributed in both areas. In Dipterocarpaceae, we found 15 and 14 species in Mandor and Lahei, respectively, and five species distributed both areas. In fresh water swampy areas, we found three vegetation types: kerangas forest, kerangas shrub, and peat swamp forest. Kerangas forests are usually dominated by dipterocarp species, and tallest trees exceed 40 m. Near the kerangas forest, shrub lands distributed. The boundary between them was usually very clear. The tallest trees were lower than 25 m, and no dipterocarp species were found. It is not yet known whether the shrub land is natural or human disturbed vegetation. Though the two vegetation types were found on white

sandy soil covered thin humus layer, peat swamp forests dominated on peat of several meters thick. Two kinds of diversity indices, Fishers' (Fisher *et al.* 1943) and Shannon-Weaver function H' (Margalef, 1958) were calculated to compare the diversity between plots. In both diversity indices, the dry land dipterocarp forest had the highest diversity. Its emergent trees are taller than 60 m and it had about 300 tree species bigger than 15 cm in girth in 1-ha. The second was kerangas forest and its species number was about half of dry land. The secondary forest and peat swamp followed it, and the least diversified vegetation was shrub land of Kerangas. Peat swamp forest was a little taller and bigger than Kerangas forest, but its species number was only half of kerangas forest. In kerangas forests, West Kalimantan had a little taller canopy and higher diversity than Central Kalimantan.

CLUSTER ANALYSIS

Figure 1 shows the similarity of vegetation of plots. Two plots in Kerangas forest of West Kalimantan were similar to each other, and dry land dipterocarp forests were also similar. The kerangas forest in Central Kalimantan was only 1 km distant from peat swamp forest, but it was more similar to kerangas in West Kalimantan than Peat swamp. Kerangas forest was even more similar to dipterocarp forest on dry land than to peat swamp forest. Though both of kerangas and peat swamp forest were existed in swampy area, the vegetations were very different. We called vegetation dominated by small trees as the kerangas shrub land, but the flora on shrub land at different sites was very different. Then shrub lands may include several vegetation types.

DOMINANT SPECIES

Table 2 shows the order of dominance of the first to the fifth dominant species in basal area of each plot. If the dominant species existed in other plots, the orders of dominance are also shown. Anacardiaceae dominated peat swamp forest, and *Shorea balangeran* was the second dominant species. *Vatica oblongifolia* was also a common species, though it rarely became canopy trees. None of the five dominant species in peat swamp forest existed in other plots. Then the vegetation was very different from other plots. Though the plots in Kerangas had many common species to each other, each plot had its own most dominant species, *Cotylelobium lanceolatum*, *Palaquium leiocarpum*, and *Dryobalanops rappa*. And no species became the first dominant species in two or more plots. It means that vegetation in Kerangas areas were rather similar to each other, but still had some difference, and not uniform vegetation.

In conclusion, the flora in swamp areas was not so rich as that on dipterocarp forests on dry land at low altitude. However the areas had still diversified vegetation types. We need more study to understand the forest structure and the dynamics in swamp areas.

REFERENCES

- Fisher RA, Corbet AS and Williams CB. 1943.** The Relation between the Number of Species and the Number of Individuals in a Random Sample of an Animal Population. *Journal of Animal Ecology*, 12, 42-58.
- MacKinnon K, Hatta G, Halim H and Mangalik A. 1996.** *The Ecology of Kalimantan*. 802pp. Periplus Editions, Jakarta.
- Margalef DR. 1958.** Information Theory in Ecology. *Genet. Syst.* 3, 36-71.

Table 1. Description of plots. Data of dipterocarp forests on dry land were added for comparison

Province	Central Kalimantan			West Kalimantan					
	L-1	L-2	L-3	M-1	M-2	M-3	M-4	S-1	S-2
Plot	K	Peat	SK	K	K	S	SK	DL	DL
Vegetation type*									
Fishers'	39	15	4	64	58	15	8	102	126
H'BA	5.45	3.92	1.58	5.78	5.60	4.56	3.53	5.92	5.89
Plot area (ha)	1	1	0.04	0.6	0.3	0.09	0.09	1	1
Species no.	150	70	16	177	127	53	34	270	314
Max. height (m)	37	39	20	45	42	14	24	73	65
Max. DBH (cm)	70	100	26	94	71	22	39	159	123
BA (nrVha)	31.6	45.6	20.1	32.1	32.4	13.4	12.3	42.2	44.3
Tree no. (/plot)	2146	1557	168	966	473	501	509	1332	1408
Identified tree no.	1739	1557	168	945	460	499	509	1330	1406
Slope	flat	flat	flat	flat	flat	22	flat	gentle	
Minimum girth**	15	15	6	15	15	6.28	0	15	15

* Peat: peat swamp. K: kerangas forest. SK: shrub land of kerangas. S: secondary forest. DL: dry land dipterocarp forest at low altitude. ** Minimum size in girth to measure tree.

Table 2. Dominance order in BA of species from first to fifth

Species	Vern	Fam	Peat		Kerangas		K Shrubs		S	
			L-2	L-1	M-1	M-2	M-4	L-3	M-3	
<i>Semecarpus</i>	Umpa	Anac	1							
<i>Shorea balangeran</i>		Dipt	2							
<i>Buchanania sessifolia</i>		Anac	3							
<i>Madhuca cf. Sericea</i>		Sapo	4							
<i>Vatica oblongifolia</i>		Dipt	5							
<i>Corylelobium lanceolatum</i>		Dipt		1						
<i>Calophyllum</i>	Bintangor	Gutt		2						
<i>Agathis borneensis</i>		Arau		3						
<i>Shorea rugosa</i>		Dipt	41	4	5	9				
<i>Engelhardia serrata</i>		Jugl		5	128					
<i>Shorea teysmanniana</i>		Dipt		44	3	69				
<i>Lithocarpus</i>	(K11472)	Faga		71		3				
<i>Calophyllum cf. Dasypodium</i>		Gutt	17	94	21	83	2	6		
<i>Palaquium leiocarpum</i>		Sapo		104	1	74				
<i>Whiteodendron moultonianum</i>		Myrt			2	54				
<i>Alstonia angustiloba</i>		Apoc			4					46
<i>Shorea macrophylla</i>		Dipt			6	5				
<i>Dryobalanops rappa</i>		Dipt			7	1				
<i>Chionanthus</i>	(K5015)?	Olea			as	4				
<i>Eugenia</i>	(WK649)	Myrt				2				
<i>Xanthophyllum cf. Obscurum</i>		Poly			60	35	1			
<i>Ilex wallichii</i>		Aqui		39		81			5	
<i>Cratoxylum glaucum</i>		Gutt		25			3	2	3	
<i>Casuarina nobilis</i>		Casu					4			
<i>Combretocarpus rotundatus</i>		Rhiz					5	1		
<i>Ficus cf. Stupenda</i>		Mora							3	
<i>Eugenia</i>	(K11520)	Myrt	54						4	
<i>Eurya nitida</i>		Thea								1
<i>Alstonia angustifolia</i>		Apoc								2
<i>Dillenia suffruticosa</i>		Dill								4
<i>Artocarpus dadah</i>		Mora								5

K Shrub: Shrubs of Kerangas; S: secondary forest; L: Lahei, M: Mandor.

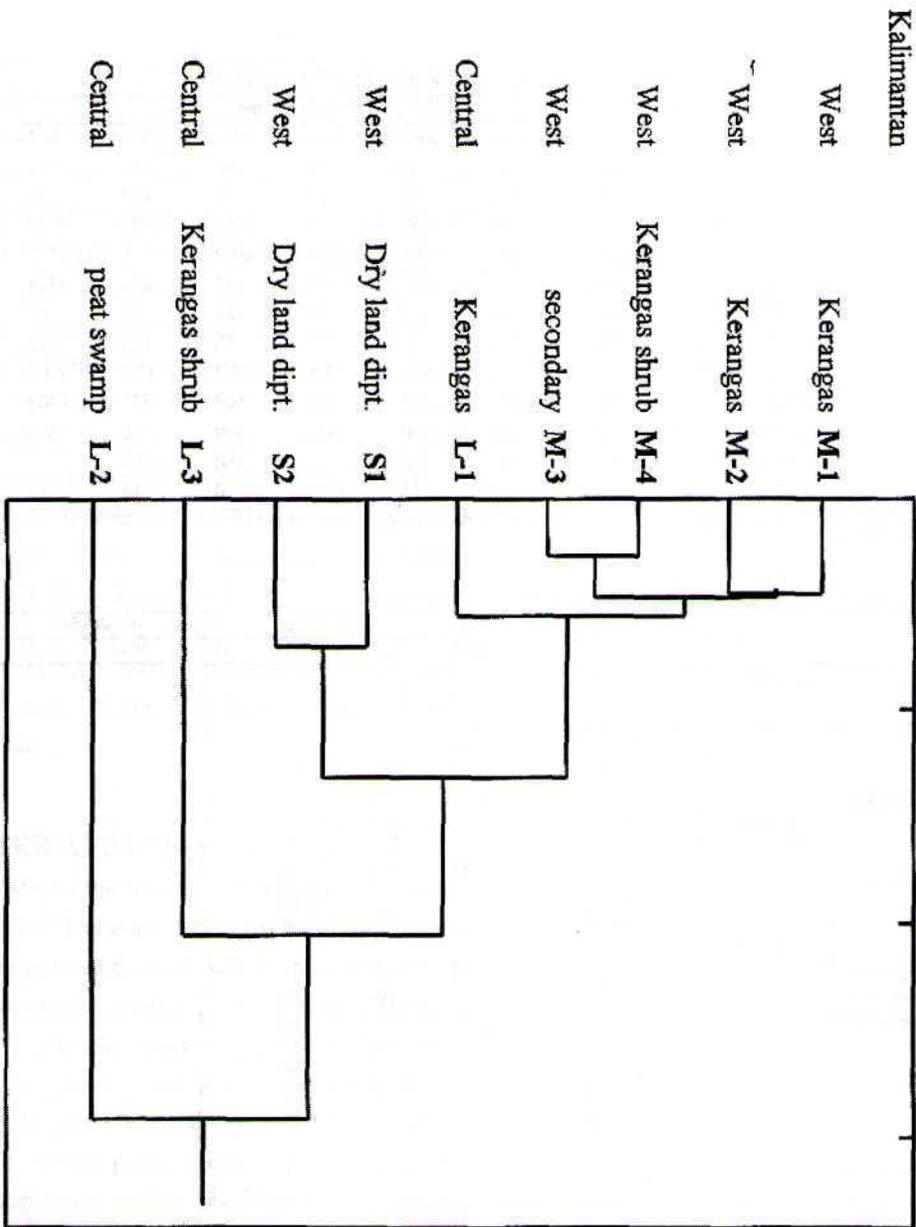


Figure 1. Cluster analysis of vegetation of wet land. Group average method was used for clustering based on dissimilarity of squared euclidean distance of basal area at each species. For comparison, data of dry land dipterocarp forest at low altitude, Serimbu, West Kalimantan (S-1 and S-2) were calculated together.