

Investigation of the Effects of Distance from River and Peat Depth on Tropical Wetland Forest Communities

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Asian tropical wetland forests

Peat swamp forest

Heath forest

Poor nutritional conditions

⇒shallow roots

Water level is very low in dry season

⇒deep roots

Some trees die in dry season

Introduction

Peat swamp forest



**Palangkaraya, Central Kalimantan,
Indonesia**



Heath forest (kerangas)



the prime determinant

**the prime determinant on plant community
distribution patterns in various wetlands**

- **peat depth**
- **distance from river**

The aims of this study is...

**Investigating the distribution pattern of
plant communities in relation to distance
from river and peat depth.**

Study area

Sebangau (10 plots)

Lahei (3 plots)

Tanjung Putting (1 plot)

Central Kalimantan,
Indonesia

rainfall : 2400mm/year

temperature : 25~33°C

humidity : up to 90%

Plot (n=14)

Size : 50m × 50m

Measurement parameter

Speacies

DBH

Distance from river

Peat depth

Diversity index (H')

$$H' = \sum_{i=1}^S p_i \ln p_i$$

S : genus

p_i : N_i/N

Diversity evenness (J')

$$J' = \frac{H'}{H'_{max}}$$

Result

Table 1. Number of species, density, basal area and diversity of fourteen 50 m _ 50 m plots in tropical wetland forests in Central Kalimantan. L = Lahei, S = Sebangau, TP = Tanjung Putting.

Plot code (tree ha ⁻¹)	Density (m ² ha ⁻¹)	Basal area of species	Number (<i>H'</i>)	Diversity (<i>J'</i>)	Evenness Distance from river (km)	Peat depth (m)
L1 2368	31.2	74	1.62	0.867	1.2	0.5
L2 1612	45.4	47	1.29	0.771	0.4	4.0
L4 2212	30.3	84	1.68	0.873	0.6	0.4
TP1660	44.6	87	1.64	0.846	2.0	0.8
S1 2160	26.5	80	1.68	0.883	2.5	2.5
S2 2892	27.9	74	1.66	0.888	3.3	3.0
S3 3116	31.0	79	1.58	0.833	3.8	3.0
S4 3700	34.8	76	1.50	0.798	4.4	3.5
S5 3704	34.3	67	1.47	0.805	4.8	4.5
S6 3088	34.8	68	1.59	0.868	5.7	4.0
S7 2956	20.7	70	1.53	0.829	2.1	2.0
S8 3072	29.4	67	1.62	0.887	1.6	1.5
S9 2304	30.9	48	1.53	0.910	1.5	1.5
S102800	18.5	41	1.39	0.862	1.2	1.5

Result

Table 2. Relationships between diversity and productivity parameters (y) and distance from river (x_1), peat depth (x_2), latitude (x_3), longitude (x_4), evaluated by forward ridge regression analysis. Partial correlation coefficients are shown in parentheses. e: constant.

y =	$+ax_1$	$+bx_2$	$+cx_3$	$+dx_4$	+e	r^2
Stem density =	$+226x_1^{P<0.05}$ (+0.643)		$+944x_3^{NS}$ (+0.308)	$+643x_4^{NS}$ (+0.500)	-73291	$0.502^{P<0.05}$
Basal area =		$+2.6x_2^{NS}$ (+0.542)	$-22.8x_3^{NS}$ (-0.545)	$-13.7x_4^{P<0.05}$ (-0.671)	+1586.5	0.332^{NS}
Species richness (S) =				$-8.02x_4^{NS}$ (-0.338)	+981.73	0.041^{NS}
Species diversity (H') =	$+0.042x_1^{P<0.05}$ (+0.551)	$-0.066x_2^{P<0.05}$ (-0.649)			+1.604	$0.327^{P<0.05}$
Evenness (J') =	$+0.008x_1^{NS}$ (+0.304)	$-0.020x_2^{P<0.05}$ (-0.578)			+0.881	0.226^{NS}

Result

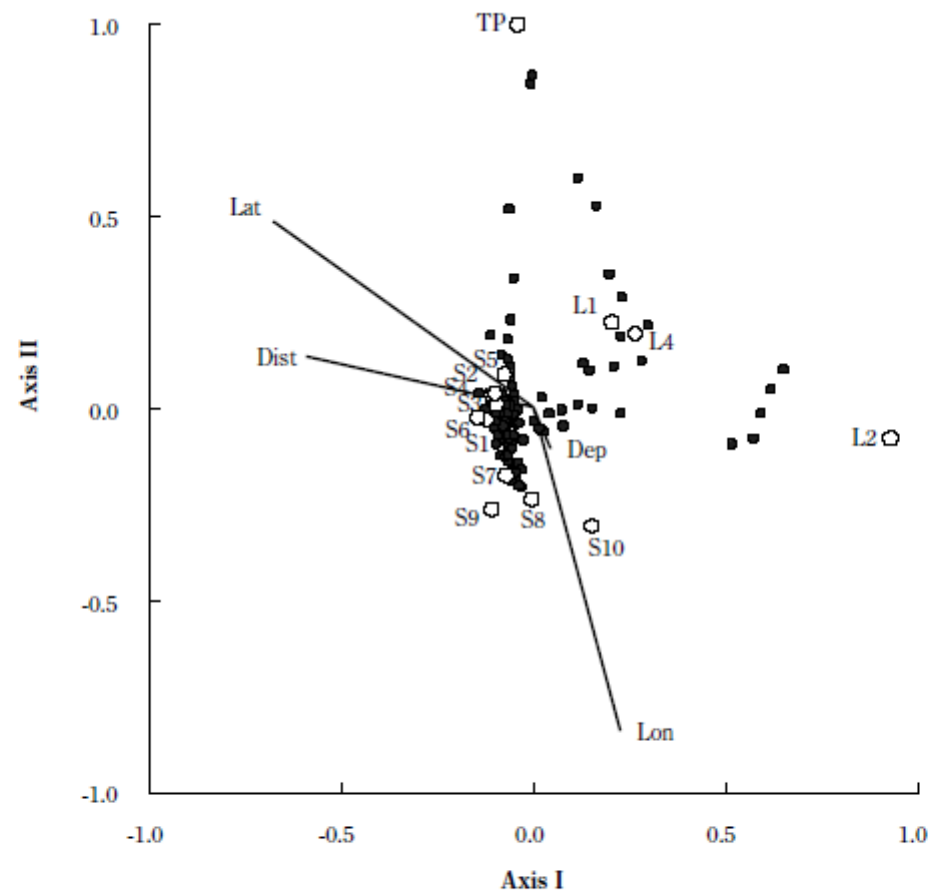


Fig. 1. DCCA ordination diagram on the first two axes. Open circles indicate plot scores and closed circles indicate species scores. For plot codes, see Table 1. Dst: distance from river, Dpt: peat depth, Lat: latitude, Long: longitude.

geographical factors

Geographical differences in species composition remained.

These facts imply that

- geographical factors greatly determined plant community distribution patterns, even when the distance between the locations is less than a few hundred kilometers.

While, on a smaller scale,
the local factors are also important.

Local factors

Distance from river and peat depth



Flooding frequency and intensity

Advantage = receive more nutrients from river flow

However, in this study,

stem density in the plots closer to the river was lower.

Disadvantages = inundation and physical disturbance

Local factors

Distance from river and **peat depth**

The thickness of surface peat affects
tree establishment pattern
when peat depth is longer than root depth.

While no significant correlations between distance to river and S were found in this study.

Further studies are required to confirm local-scale relationships between species diversity and environmental factors, including hydrological informatoin.