# Riverine peat swamp forest diversity in Tanjung Puting National Park: Structure, composition and aboveground carbon stocks

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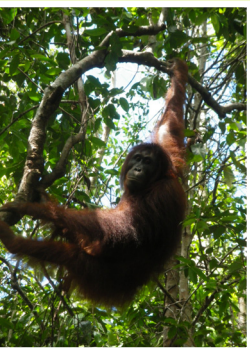

## Introduction

Peat swamp forests are important ecosystems for both timber and non-timber products. They also play an important role in regulating and providing ecosystem services, such as hydrological cycling and habitat provision for rare and endangered species of fauna and flora.

In this study, we investigated the structure, forest composition, and total carbon stock in riverine peat swamp forests in Tanjung Puting National Park in central Borneo.

## Methods

### *Field surveys*

Five 250-meter transect lines were surveyed, with each transect consisting of 6 plots spaced at 50 m intervals. We measured diameter at breast height (DBH, 1.4 m above ground) of all trees > 5 cm in diameter in a 10 m radius circle within each plot. We also measured the DBH of all trees < 5 cm in diameter within a 2 m radius inner circle. Local forestry experts identified species using regional common names and collected specimens for species, genus and family identification.

### *Data analysis*

Tree data were used to calculate the relative density, relative frequency, and relative dominance by species; these were then combined into a single importance value index (IVI) (Curtis and McIntosh 1951). Species diversity was estimated using both Shannon-Wiener's and Thompson's diversity indices.

To estimate aboveground biomass of trees (AGBT), we used the equation for wet forest published by Chave *et al.* (2005):

$$AGBT = \rho^{*}\exp(-1.239+1.98\ln(DBH)+0.207(\ln(DBH))^{2} - 0.0281(\ln(DBH))^{3})$$

Where ρ is species-specific wood density (g/cm³) obtained from the literature. A conversion factor of 0.464 was used to convert AGBT into aboveground carbon in tree mass.

## Results

Across all 30 plots, we measured 2,478 trees representing 60 species and 28 families. In term of species diversity, Shannon-Wiener's and Thompson's diversity indices were 3.29 and 0.94, respectively—both were high relative to other swamp forest ecosystems. The distribution of tree diameters shows a typical reverse J-shaped pattern, with a right skew. Approximately 60% of trees had a DBH of less than 10 cm.

Table 1 shows the number of trees, basal area, wood density and aboveground carbon of the 10 tree species with the highest IVI. *Ganua mottleyana* (family Sapotaceae) has the highest IVI and aboveground carbon. Although *Ixora tenelliflora* has lower IVI than *Ptemandra azurea*, it has higher aboveground carbon due to its higher basal area and wood density. In general, increases in IVI corresponded strongly to increasing aboveground carbon of trees (Figure 2).

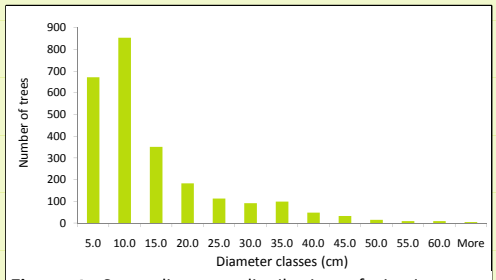


**Figure 1.** Stem diameter distribution of riverine peat swamp forest trees by 5 cm diameter classes.

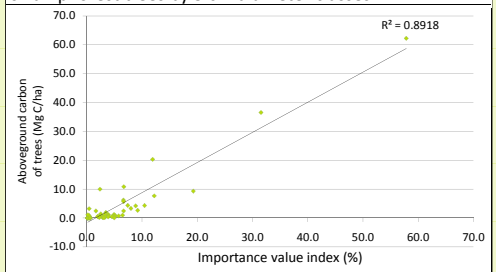


**Figure 2.** Relationship between IVI and aboveground carbon of trees in riverine peat swamp forests.

## References

Chave, J., Andalo, C., Brown, S. *et. al.* 2005 Tree allometry and improved estimation of carbon stocks and balance in tropical forest. Oecologia 145: 87-99.

Curtis, J.T. and McIntosh, R.P. 1951 An upland forest continuum in the prairie-forest border region of Wisconsin. Ecology 32: 476-496.

**Table 1.** Structure, composition and aboveground carbon of 10 species with the highest importance value index

| Family | Species | Local name | Number of trees | Relative density (%) | Relative frequency (%) | Relative dominance (%) | IVI (%) | Total basal area (m²/ha) | Wood density (g/cm³) | Aboveground tree carbon (Mg C/ha) |
|---|---|---|---|---|---|---|---|---|---|---|
| Sapotaceae | *Ganua mottleyana* Pierre ex Dubard | Ketiau | 429 | 17.3 | 4.4 | 36.2 | 57.8 | 568.9 | 0.6 | 62.2 |
| Sapindaceae | *Gluta wallichii* (Hook.f.) Ding Hou | Rengas | 227 | 9.1 | 4.4 | 18.0 | 31.6 | 283.4 | 0.7 | 36.6 |
| Euphorbiaceae | *Ptemandra azurea* (DC.) Burkill | Pesulan | 242 | 9.7 | 4.4 | 5.2 | 19.3 | 92.1 | 0.7 | 9.3 |
| Euphorbiaceae | *Diospyros maingayi* | Laminaduk | 105 | 4.2 | 3.9 | 4.1 | 12.2 | 64.9 | 0.7 | 7.7 |
| Lauraceae | *Ixora tenelliflora* Merr. | Bentuka | 60 | 2.4 | 3.2 | 6.3 | 12.0 | 99.3 | 1.0 | 20.3 |
| Clusiaceae | *Diospyros frutescens* Blume | Bekunyit | 110 | 4.4 | 3.8 | 2.3 | 10.5 | 38.1 | 0.7 | 4.3 |
| Fabaceae | *Baccaurea macrophylla* Mull.Arg. | Puak | 83 | 3.3 | 4.1 | 1.8 | 9.2 | 29.3 | 0.6 | 2.6 |
| Symplocaceae | *Symplocos adenophylla* Wall. | Habu - Habu Rawa | 72 | 2.9 | 3.6 | 2.3 | 8.9 | 36.1 | 0.8 | 4.2 |
| Anacardiaceae | *Dialium indum* L. | Keranji | 44 | 1.8 | 3.8 | 1.9 | 7.4 | 29.6 | 0.9 | 4.4 |
| Euphorbiaceae | *Parastemon urophyllus* A.C. DC. | Bentan | 36 | 1.4 | 2.2 | 3.1 | 6.7 | 48.7 | 1.1 | 10.8 |

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