

Forest Ecological Studies of the Montane Forest of Mt. Pangrango, West Java

IV. Floristic Composition along the Altitude

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Introduction

Mt. Pangrango was revisited by the author in October 1976, and during that period, the permanent plot diameters were re-measured and the vertical distribution of species was studied by placing 6 plots ($20 \times 50 \text{ m}^2 \times 4$, $20 \times 20 \text{ m}^2 \times 2$) from 1700 m up to 2800 m on the mountain. In this paper, the vertical distributional pattern of species along the gradient will be described from the point view of floristic composition.

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Methods of Survey

The field survey was carried out throughout the month of October 1976. The detailed information about the plots surveyed is shown in Table 1 (details of plots 1, 6 and 9 have already been reported in the 1st and the 2nd paper of this series^{1,2}). The plots were selected as far as possible at physical aspects where the slope was not so steep and where a primary forest condition had been maintained. The size of plot for trees over 10 cm DBH was 1000 m² from plot 2—plot 5 and 400 m² for plots 7 and 8. Trees between 4.5 to 10 cm DBH and taller than 1.3 m were measured in 25 to 100 m² size plots. All the trees mentioned above were identified and measured for DBH. Total height (H) and the height of the lowest living branch (H_B) of some of the representative trees were measured and the remaining trees were estimated in each stand by comparing

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Table 1 Outline of the Plots Studied

	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9
Altitude (m)	1600	1700	1900	2100	2300	2400	2600	2800	3000
Inclination	3°	10°	14°	10°	20°	20°	12°	32°	7°
Direction	N40°W	W	N10°W	N5°W	N10°W	N	N70°W	N40°E	N55°W
Plot Size	D ≥ 10	1ha.	1000m ²	1000m ²	1000m ²	1000m ²	400m ²	400m ²	400m ²
	4.5 ≤ D < 10	1ha.	1000m ²	1000m ²	400m ²	100m ²	400m ²	400m ²	400m ²
	H > 1.3, D < 4.5	1000m ²	100m ²	100m ²	100m ²	25m ²	100m ²	25m ²	100m ²
	Ground vegetation	10m ²	100m ²	100m ²	100m ²	25m ²	5m ²	25m ²	25m ²

them with measured trees. Species in the ground vegetation were recorded in 25 to 100 m² subplots.

Results

Description of the plots studied

Plot-1 (1600 m)

As the detailed information about this plot has already been reported in the first paper of this series¹⁾, only the important features will be mentioned here.

The plot was situated about 20 minutes walk from Cibodas Mountain Garden. On accurate measurement of altitude, this plot was found to be located at 1600 m above sea level, not 1550 m as indicated in the 1st paper of this series. The slope was very gentle and the aspect N 40° W. The stand could be divided into five layers. In the 1st layer, *Schima wallichii*, *Castanopsis javanica*, *Persea rimosa*, *Lithocarpus pseudomoluccus*, and *Vernonia arborea* were dominant. The highest tree reached 41.5 m. In the 2nd layer, besides the above mentioned species, *Decaspermum fruticosum*, *Polyosma ilicifolia*, *P. integrifolia* were dominant between 26–15 m. In the 3rd layer (15–6 m), *Saurauia pendula* was the most dominant species, followed by *Turpinia sphaerocarpa*, *Symplocos fasciculata* and *Ficus ribes*. In the 4th layer (6 m to ground vegetation), *Strobilanthes cernua* and *Ardisia fuliginosa* were overwhelmingly predominant, and then among palms *Pinanga coronata*, among tree ferns *Cyathea raciborskii* and among herbs *Nicolaia solaris* were the main species in each life form.

As for the ground vegetation, many saplings of shrubby species, such as *Saurauia pendula*, *Strobilanthes cernua*, *Psychotria divergens*, *Ardisia fuliginosa*, *Rubus moluccanus*, *Saurauia reinwardtiana*, *Talauma candollii* were observed. Saplings of woody climbers, such as *Tetrastigma* sp., *Cissus adnata*, *Ficus lanata*, *Ficus trichocarpa*, *Piper baccatum*, *Piper cilibracteum*, *Tetrastigma papillosum* were reported. *Cyathea raciborskii*, *Thelypteris heterocarpa*, and *Nephrolepis acuminata* among the ferns and *Elatostema paludosum*, *Cyrtandra picta*, *Zinger inflexum* and *Arisaema filiforme* among the herbs were also observed.

Epiphytic species were quite abundant, for instance, *Asplenium nidus*, *Oleandra musifolia*, *Nephrolepis acuminata* and *Elaphoglossum callifolium* among the ferns, *Appendicula ramosa*, *Liparis pallida* and *Malaxis blumei* among the orchids, *Fagraea ceilanica*, *Schefflera scandens*, *Medinilla verrucosa*, *M. laurifolia*, *Vaccinium lucidum* and *Agalmyla parasitica* among the treelets, and *Ficus lanata*, *Piper baccatum*, *Rhaphidophora pinnata*, *Ficus sagittata* and *Tetrastigma dichotomum* among the woody climbers were recorded.

During the second visit in 1976, measurement of diameter increment was carried out. In the process of measurement, we found nearly 30 fallen and/or killed trees in the plot. But the total physiognomy had not changed. The result of this measurement will be reported in a separate paper.

Plot-2 (1700 m)

This plot was located at 1700 m in altitude and the slope was 10° westward. The most conspicuous species was *Podocarpus imbricatus* which was abundant even in the sur-

Table 2 Floristic Composition of Plot 2 (1700 m) (Not including broken trees)
 a) Trees over 10 cm DBH. b) Trees under 10 cm DBH and over 4.5 cm DBH.
 c) Trees under 4.5 cm DBH and taller than 1.3 m in height. These notes are the same as in Table 3-7. N, Number; R.D., Relative Dominance per each plot size.

(a) $D \geq 10$

Species	I		II		III		IV		Total	
	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %
<i>Schima Wallichii</i> ssp. <i>noronhae</i> (Reinw. ex Bl.) Bloembergen	4	38.2	3	14.3	1	4.2			8	33.03
<i>Polyosma integrifolia</i> Bl.			3	27.8	3	12.8			6	4.72
<i>Turpinia sphaerocarpa</i> Hassk.					4	26.0			4	1.14
<i>Castanopsis javanica</i> (Bl.) DC.			3	21.3	2	6.6			5	3.48
<i>Podocarpus imbricatus</i> Bl.	2	47.3	1	3.6					3	38.58
<i>Engelhardia spicata</i> Lech. ex Bl.	1	4.9	1	10.4	1	7.6			3	5.86
<i>Vernonia arborea</i> Buch. -Ham.	2	9.6							2	7.75
<i>Astronia spectabilis</i> Bl.					1	4.2			1	0.19
<i>Lithocarpus rotundatus</i> (Bl.) A. Camus.			2	10.5					2	1.57
<i>Saurauia pendula</i> Bl.					2	7.2			2	0.32
<i>Acronodia punctata</i> Bl.			1	6.2					1	0.92
<i>Syzygium gracilis</i> (Korth.) Amsh.			1	4.4					1	0.65
<i>Myrsine hasseltii</i> Bl. ex Scheff.					1	13.1			1	0.58
<i>Macropanax dispermus</i> (Bl.) O.K.					1	7.2			1	0.31
<i>Omalanthus populneus</i> (Geisel) Pax			1	1.5					1	0.23
<i>Hypobathrum frutescens</i> Bl.							1	100.0	1	0.20
<i>Manglietia glauca</i> Bl.					1	4.5			1	0.20
<i>Acronychia laurifolia</i> Bl.					1	3.7			1	0.16
<i>Symplocos fasciculata</i> Zoll.					1	3.0			1	0.13
	9	100.0	16	100.0	19	100.0	1	100.0	45	100.0

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(b) $4.5 \leq D < 10$

Species	III		IV		Total	
	N	R.D. %	N	R.D. %	N	R.D. %
<i>Polyosma integrifolia</i> Bl.	6	21.9			6	19.96
<i>Hypobathrum frutescens</i> Bl.	5	19.7			5	17.97
<i>Turpinia sphaerocarpa</i> Hassk.	3	9.6	2	49.8	5	13.19
<i>Persea rimosa</i> (Bl.) Kosterm.	5	15.0			5	13.66
<i>Acronychia laurifolia</i> Bl.	1	3.0	1	33.8	2	5.74
<i>Castanopsis javanica</i> (Bl.) DC.	2	7.6			2	6.89
<i>Flacourtia rukam</i> Z. & M.	2	3.6			2	3.32
<i>Beilschmiedia madang</i> (Bl.) Bl.	1	5.0			1	4.55
<i>Litsea diversifolia</i> Bl.	1	3.6			1	3.26
<i>Lithocarpus pseudomoluccus</i> (Bl.) Rehd.	1	2.8			1	2.59
<i>Engelhardia spicata</i> Lech. ex Bl.	1	2.6			1	2.34
<i>Acronodia punctata</i> Bl.	1	2.4			1	2.19
<i>Symplocos javanica</i> (Bl.) Kurz			1	16.4	1	1.45
<i>Vernonia arborea</i> Buch.-Ham.	1	1.6			1	1.45
<i>Viburnum lutescens</i> Bl.	1	1.6			1	1.45
	31	100.0	4	100.0	35	100.0

(c) $D < 4.5, H > 1.3$

Species	N	R.D. %
<i>Ardisia fuliginosa</i> Bl.	6	16.11
<i>Lasianthus</i> sp.	5	17.37
<i>Litsea diversifolia</i> Bl.	4	18.95
<i>Polyosma ilicifolia</i> Bl.	2	12.53
<i>Syzygium gracilis</i> (Korth.) Amsh.	2	8.11
<i>Psychotria montana</i> Bl.	2	2.00
<i>Cyathea junghuhniana</i> (Kunze) Copel	1	10.74
<i>Glochidion macrocarpum</i> Bl.	1	7.89
<i>Litsea resinosa</i> Bl.	1	2.95
<i>Symplocos fasciculata</i> Zoll.	1	2.95
<i>Psychotria divergens</i> Bl.	1	0.42
	26	100.00

roundings of the plot where we were able to find large standing-dead, and all sizes of individuals of the species. Surrounding the larger sized trees, no second layer species could be seen and the penetration of sunshine was very rich at that spot. The total floristic composition was very similar to that of plot 1 except for the prominence of *Podocarpus imbricatus*. The woody climbers and moss were more infrequent than in plot 1. *Elatostema* sp. was abundant in the ground vegetation. Table 2 is a list of species in 3

categories, ie, trees larger than 10 cm DBH, trees between 4.5–10 cm DBH and trees higher than 1.3 m in height and less than 4.5 cm DBH. Individual number and relative dominance on the basis of basal area are given. According to this table, the 1st layer species are *Schima wallichii*, *Podocarpus imbricatus*, *Vernonia arborea* and *Engelhardia spicata*. This composition is very similar to plot 1. In the 2nd layer, *Polyosma integrifolia*, *Castanopsis javanica* and *Lithocarpus rotundatus* were found in addition to above mentioned species. The last two species, which were 1st layer species in plot 1, indicate a change of position in stratification. In the 3rd layer, *Turpinia sphaerocarpa* and *Saurauia pendula* were observed, which is very similar to plot 1. Trees between 4.5–10 cm DBH were mainly dominant in the 3rd and 4th layers. The dominant species were *Polyosma integrifolia*, *Hypobathrum frutescens* and *Persea rimosa*. The last one was dominant in the higher strata in plot 1. Trees higher than 1.3 m in height and less than 4.5 cm DBH were rather different from the upper layer species, such as *Ardisia fuliginosa*, *Lasianthus* sp. and *Litsea diversifolia* followed by *Polyosma ilicifolia*, *Psychotria montana* and *P. divergens*. Five *Fagraea obovata* (woody climber), 5 *Cyathea junghuhniana* (3 m in height and 6 cm DBH) and one *Musa acuminata* (3 m in height and 6 cm DBH) were measured and standing-dead or broken trees of *Schima wallichii*, *Acronychia laurifolia*, *Apodytes cambodiana*, *Turpinia sphaerocarpa* and *Astronia spectabilis* were observed.

Species observed in the ground vegetation were as follows: *Elatostema* sp., *Hedychium roxburghii*, *Arisaema filiforme*, *Lycianthes laevis* among the herbs; *Freycinia insignis* among the climbing herbs; *Tetrastigma dichotomum* and *Ficus sagittata* among the woody climbers; *Strobilanthes cernua* and *Litsea diversifolia* were most abundant among the trees and next came *Psychotria divergens* followed by *Ardisia fuliginosa*, *Hypobathrum frutescens*, *Lithocarpus pseudomoluccus*, *Mycetia cauliflora* and *Rubus moluccanus*; *Molineria capitulata* among the palms; *Coniogramme fraxinea*, *Cyathea spinulosa*, *Diplazium esculentum*, *Athyrium japonicum*, *Diplazium pallidum*, *Thelypteris callosa*, *Dryopteris hirtipes*, *Thelypteris opaca*, *T. truncata*, *T. heterocarpa*, *Cyathea junghuhniana* and *Polystichum aculeatum* among the ferns.

In the epiphytic group, the following species were observed: *Smilax zeylanica* and *Scindaptus* sp. among smaller lianas; *Freycinia insignis*, *Ficus lanata*, *Tetrastigma dichotomum* and *Polygonum chinense* among the climbers; *Medinilla laurifolia*, *Schefflera scandens* and *Agalmyla parasitica* among treelets the middle species was especially abundant; *Asplenium caudatum*, *A. nidus*, *Coniogramme fraxinea*, *Davallia trichomanoides*, *Elaphoglossum callifolium*, *Hymenophyllum junghuhnii*, *Lycopodium piscium*, *Nephrolepis acuminata* and *Selliguea heterocarpa* among the ferns.

Plot-3 (1900 m)

This plot was set out on the flat point about 1900 m in altitude across a dry river bed in which large conglomerate was abundant. The slope was 14° in a N 10° W direction. *Podocarpus imbricatus* was abundant. Five layers [1st layer (34–20 m), 2nd layer

(20–8 m), 3rd layer (8–4 m), 4th layer (4 m–60 cm) and ground vegetation] were recognized. In the ground vegetation, species of *Molineria*, *Calanthe*, *Zinger* and *Strobilanthes* were conspicuous and *Balanophora* appeared together with many of the epiphytic orchids. The white flower of *Dendrobium montanum* was impressive.

The 1st layer species were still *Schima wallichii* and *Podocarpus imbricatus* and in the 2nd layer, we found *Acronodia punctata*, *Neolitsea javanica* and *Acer laurinum* besides *Schima wallichii*. *Castanopsis javanica* appeared in the 3rd layer in smaller numbers, mixed with *Macropanax undulatus*, *M. dispermus*, *Polyosma ilicifolia* and *Acronodia punctata* as well as the smaller individuals of taller species such as *Glochidion macrocarpum*. *Ficus sagittata*, *Schefflera scandens* and *Smilax macrocarpa* which all belong to the climber group, were also found in this class beside larger climbers like two specimens each of *Ficus sagittata* and *Tetrastigma pergamaceum*. Two *Cyathea orientalis* (10 cm DBH) also appeared.

In the ground vegetation, the following species were observed: *Pilea* sp. among the herbs was abundant followed by *Begonia robusta*; *Strobilanthes cernua* was dominant among the trees followed by *Piper sulcatum*, *Strobilanthes blumei*, *Rubus moluccanus*, *Psychotria divergens* and *Eupatrium riparium*; *Hoya* sp., *Smilax macrocarpa*, and *S. odoratissima* among the smaller lianas; *Piper abbreviatum*, *Medinilla laurifolia*, *Psychotria sarmentosa* and *Clematis smilacifolia* among the larger lianas; *Calanthe flava* among the orchids; *Asplenium caudatum*,

Table 3 Floristic Composition of Plot 3 (1900 m)

(a) $D \geq 10$

Species	I		II		III		Total	
	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %
<i>Schima wallichii</i> ssp. <i>noronhae</i> (Reinw. ex Bl.) Bloemb.	6	50.1	8	38.1	1	2.3	15	42.55
<i>Acronodia punctata</i> Bl.			3	15.6	4	14.1	7	4.64
<i>Neolitsea javanica</i> (Bl.) Back.			5	26.3	1	1.5	6	5.44
<i>Macropanax dispermus</i> (Bl.) O.K.			1	3.7	3	9.0	4	1.70
<i>Macropanax undulatus</i> (Wall. ex G. Don) Seem.					4	11.2	4	1.20
<i>Acer laurinum</i> Hassk.			2	2.6	2	3.6	4	0.91
<i>Podocarpus imbricatus</i> Bl.	3	49.9					3	34.56
<i>Polyosma ilicifolia</i> Bl.					3	16.9	3	1.81
<i>Prunus</i> sp.			1	5.2	1	9.7	2	2.08
<i>Engelhardia spicata</i> Lech. ex Bl.			1	4.9	1	1.8	2	1.17
<i>Symplocos laurina</i> (Retz.) Wall.			1	1.2	1	1.2	2	0.38
<i>Castanopsis javanica</i> (Bl.) DC.					1	26.2	1	2.82
<i>Lindera polyantha</i> (Bl.) Boerl.			1	2.3			1	0.47
<i>Ardisia javanica</i> DC.					1	1.3	1	0.14
<i>Acronychia laurifolia</i> Bl.					1	1.3	1	0.14
	9	100.0	23	100.0	24	100.0	56	100.00

(b) $4.5 \leq D < 10$

Species	II		III		IV		Total	
	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %
<i>Macropanax dispermus</i> (Bl.) O.K.			9	19.9	4	29.5	13	20.30
<i>Polyosma ilicifolia</i> Bl.			8	25.1			8	18.60
<i>Schima wallichii</i> spp. <i>noronhae</i> (Reinw. ex Bl.) Bloemb.	1	32.3	4	11.8	1	8.0	6	12.54
<i>Macropanax undulatus</i> (Wall. ex G. Don) Seem.			4	9.9	1	19.3	5	10.94
<i>Acronodia punctata</i> Bl.			4	11.5			4	8.54
<i>Neolitsea javanica</i> (Bl.) Back.	2	67.7			1	7.5	3	6.17
<i>Castanopsis javanica</i> (Bl.) DC.			2	10.0			2	7.40
<i>Glochidion macrocarpum</i> Bl.			2	4.5			2	3.36
<i>Prunus</i> sp.			1	2.9			1	2.15
<i>Meliosma nervosa</i> K. & V.			1	2.6			1	1.93
<i>Brassaiopsis glomerulata</i> (Bl.) Regel					1	9.7	1	1.82
<i>Elaeocarpus stipularis</i> Bl.					1	7.3	1	1.37
<i>Myrsine affinis</i> D.C.			1	1.8			1	1.37
<i>Persea rimosa</i> (Bl.) Kosterm.					1	7.0	1	1.32
<i>Saurauia micrantha</i> Bl.					1	6.3	1	1.19
<i>Ardisia laevigata</i> Bl.					1	5.4	1	1.02
	3	100.0	36	100.0	12	100.0	51	100.00

(c) $H > 1.3, D < 4.5$

Species	N	R.D. %
<i>Lasianthus</i> sp.	12	24.06
<i>Macropanax dispermus</i> (Bl.) O.K.	9	25.84
<i>Acronodia punctata</i> Bl.	3	6.63
<i>Ardisia laevigata</i> Bl.	3	2.87
<i>Glochidion rubrum</i> Bl.	2	8.75
<i>Dichroa febrifuga</i> Lour.	2	0.75
<i>Macropanax undulatus</i> (Wall. ex G. Don) Seem.	1	7.38
<i>Ficus sagittata</i> Vahl	1	6.97
<i>Symplocos fasciculata</i> Zoll.	1	6.97
<i>Schefflera scandens</i> (Bl.) Vig.	1	2.87
<i>Castanopsis javanica</i> (Bl.) DC.	1	2.39
<i>Brassaiopsis glomerulata</i> (Bl.) Regel	1	2.12
<i>Glochidion macrocarpum</i> Bl.	1	1.37
<i>Daphniphyllum glaucescens</i> Bl.	1	0.62
<i>Neolitsea javanica</i> (Bl.) Back.	1	0.27
<i>Smilax macrocarpa</i> Bl.	1	0.14
	41	100.00

Coniogramme sp., *Dryopteris* sp. and *Pteris excelsa* among the ferns.

In the epiphytic species, the following were observed: *Vaccinium lucidum*, *V. laurifolium*, *Peperomia* sp. and *Schefflera scandens* among the treelets; *Ficus sagittata*, *Psychotria sarmentosa* and *Pyrus* sp. among the climbers; *Eria* sp., *Appendicula ramosa*, *Dendrobium conspicuum*, *D. montanum* among the orchids; *Asplenium caudatum*, *A. longissimum*, *Elaphoglossum callifolium*, *Hymenophyllum* sp., *Lycopodium phlegmaria*, *Nephrolepis* sp., *Polypodium* sp. and *Polypodium feei* among the ferns.

Plot-4 (2100 m)

This plot was located at 2100 m in altitude where two slopes respectively N 20° W and N 10° E in direction, encountered each other and made a 10° degree slope. Compared with plot 3, the physiognomy of this stand was much nicer in the sense of height growth, stratification and floristic composition, and it had maintained a better primary forest condition. The highest tree reached nearly 30 m and the 1st layer species such as *Podocarpus imbricatus*, *Schima wallichii*, *Acer laurinum* were dominant up to 23 m. In the 2nd layer, (23–17 m), *Glochidion macrocarpum* as well as the above mentioned species appeared. The 3rd layer (17–8 m) was mainly occupied by *Polyosma ilicifolia*.

One side of the plot was sloped into a steep valley and one gap was found in one

Table 4 Floristic Composition of Plot 4 (2100 m)

(a) $D \geq 10$

Species	I		II		III		IV		Total	
	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %
<i>Schima wallichii</i> ssp. <i>noronhae</i> (Reinw. ex Bl.) Bloemb.	14	59.1	10	26.2	5	15.1			29	46.73
<i>Polyosma ilicifolia</i> Bl.			13	52.0	12	47.1			25	16.81
<i>Macropanax undulatus</i> (Wall. ex G. Don) Seem.			1	0.9	4	14.3	2	59.9	7	1.94
<i>Acer laurinum</i> Hassk.	2	15.4	2	8.1					4	12.15
<i>Astronia spectabilis</i> Bl.	1	8.1	1	1.8	2	4.1			4	6.16
<i>Prunus arborea</i> (Bl.) Kalkman	1	4.4	1	3.4					2	3.75
<i>Podocarpus imbricatus</i> Bl.	1	2.2			1	3.7	1	18.6	3	1.93
<i>Lithocarpus elegans</i> (Bl.) Hatus. ex Soepadmo, comb.			2	2.3	1	1.7			3	0.71
<i>Acronodia punctata</i> Bl.	1	3.4			1	13.8			2	3.43
<i>Weinmannia blumei</i> Planch.	1	5.2							1	3.41
<i>Glochidion macrocarpum</i> Bl.	1	2.3							1	1.52
<i>Symplocos laurina</i> (Retz.) Wall.			1	4.2					1	1.04
<i>Lithocarpus tijsmannii</i> (Bl.) Rehd.			1	1.0					1	0.25
<i>Geniostoma arboreum</i> (Reinw.) O.K.							1	21.6	1	0.17
	22	100.0	32	100.0	26	100.0	4	100.0	84	100.00

(b) $4.5 \leq D < 10$

Species	II		III		IV		Total	
	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %
<i>Polyosma ilicifolia</i> Bl.	1	56.7	7	53.4	2	100.0	10	58.18
<i>Schima wallichii</i> ssp. <i>noronhae</i> (Reinw. ex Bl.) Bloemb.	1	43.3	1	5.5			2	11.10
<i>Lithocarpus tijsmannii</i> (Bl.) Rehd.			2	13.8			2	10.35
<i>Macropanax undulatus</i> (Wall. ex G. Don) Seem.			1	9.5			1	7.12
<i>Acer laurinum</i> Hassk.			1	6.8			1	5.09
<i>Platea latifolia</i> Bl.			1	5.9			1	4.40
<i>Astronia spectabilis</i> Bl.			1	5.0			1	3.76
	2	100.0	14	100.0	2	100.0	18	100.00

(c) $H > 1.3, D < 4.5$

Species	N	R.D. %
<i>Lasianthus</i> sp.	13	23.02
<i>Polyosma ilicifolia</i> Bl.	11	19.78
<i>Schima wallichii</i> ssp. <i>noronhae</i> (Reinw. ex Bl.) Bloemb.	10	12.89
<i>Ardisia javanica</i> DC.	2	4.96
<i>Eurya obovata</i> (Bl.) Korth.	2	1.93
<i>Lithocarpus elegans</i> (Bl.) Hatus. ex Soepadmo, comb.	2	0.83
<i>Elaeocarpus stipularis</i> Bl.	1	10.48
<i>Geniostoma arboreum</i> (Reinw.) O.K.	1	6.27
<i>Macropanax undulatus</i> (Wall. ex G. Don) Seem.	1	5.93
<i>Engelhardia spicata</i> Lech. ex Bl.	1	2.89
<i>Podocarpus imbricatus</i> Bl.	1	2.41
<i>Astronia spectabilis</i> Bl.	1	1.72
<i>Vernonia arborea</i> Buch.-Ham.	1	1.24
<i>Ardisia laevigata</i> Bl.	1	1.10
<i>Myrsine affinis</i> DC.	1	1.10
<i>Neolitsea javanica</i> (Bl.) Back.	1	0.90
<i>Elaeocarpus oxypyren</i> K. & V.	1	0.76
<i>Glochidion macrocarpum</i> Bl.	1	0.76
<i>Acer laurinum</i> Hassk.	1	0.41
<i>Symplocos sessilifolia</i> (Bl.) Gürke	1	0.34
<i>Glochidion</i> sp.	1	0.28
	55	100.00

of the 10×10 m subplots. The amount of moss was little and the epiphytes were becoming rarer than in the lower plots. The climber species were rich in number but small as individuals and the larger sized ones were scarce. Rather unusual species were present in this plot such as *Acer laurinum*, *Weinmannia blumei*, *Leptospermum flavescens* and

Symplocos laurina. The highest tree fern reached about 7 m in height and three *Cyathea orientalis* (H=4 m) and one *C. latebrosa* were found. *Leptospermum flavescens* grew parallel along the slope and only the crown portion was erect. Broken individuals of *Polyosma ilicifolia* and *Acer laurinum* were also found.

The lower layer of this plot was very rich, and the most dominant species was *Lasianthus* sp. followed by *Polyosma ilicifolia* and *Schima wallichii*. Elements of the subalpine zone, such as *Ardisia javanica*, *Eurya obovata* and *Myrsine affinis* began to appear. Many of the saplings of taller species such as *Lithocarpus elegans*, *Podocarpus imbricatus*, *Vernonia arborea* and *Glochidion macrocarpum* were also found.

In the ground vegetation, the following species were observed: *Lasianthus* sp., *Polyosma ilicifolia*, *Acer laurinum*, *Mycetia cauliflora*, *Astronia spectabilis*, *Schima wallichii*, *Rubus alpestris* and *Acronodia punctata* among the trees and shrubs; *Cyrtandra picta* (75% of coverage), *Pilea* sp., *Arisaema* sp. and *Disporum chinense* among the herbs; *Molineria* sp. among the palms in sunny spots; *Medinilla laurifolia* and *Tetrastigma dichotomum* in climbers; *Asplenium caudatum*, *Coniogramme* sp., *Cyathea ratebrosa*, *C. orientalis*, *Dryopteris* sp., *Elaphoglossum callifolium*, *Lycopodium* sp., *Plagiogyria glauca* and *Pteris excelsa* among the ferns.

In the epiphytic species, the following were observed; *Eria* spp., *Eria flavescens*, and *Bulbophyllum* sp. among the orchids; *Aeschynanthus* sp., *Medinilla laurifolia*, *Vaccinium laurifolium* and *V. lucidum* among the treelets; *Smilax odoratissima*, *Kadsura scandens*, *Piper cilibracteum*, *Pyrus* sp., *Psychotria sarmentosa*, *Rubus lineatus* and *Tetrastigma dichotomum* among the climbers; *Asplenium caudatum*, *A. longissimum*, *Elaphoglossum* sp., *Humata* sp., *Hymenophyllum* sp., *Polypodium* sp., and *Polypodium feei* among the ferns.

Plot-5 (2300 m)

This plot, situated at 2300 m in altitude, was rather xeric and one large dead tree was found in one of the 10 m × 10 m subplots whose surroundings had quite a number of saplings of *Podocarpus imbricatus*. At one sunny point in a gap, tree ferns reached 14 m in height. Standing dead individuals of *Podocarpus imbricatus*, *Polyosma ilicifolia* and *Cyathea tomentosa* were conspicuous in the plot. The highest tree was a *Lithocarpus elegans* (H=27 m). Species in the 1st layer were *Lithocarpus elegans*, *Schima wallichii*, and *Astronia spectabilis*. The 2nd layer was dominated mainly by *Polyosma ilicifolia*, *Myrsine affinis* and *Eurya obovata*. Species in the 3rd layer were *Polyosma ilicifolia* as a dominant and *Ardisia javanica*. Saplings of taller species such as *Podocarpus imbricatus*, *Lithocarpus elegans* and *Schima wallichii* were also present.

As indicated in Table 5, within the species of larger than 10 cm DBH, *Polyosma ilicifolia*, *Myrsine affinis* and *Eurya obovata* increased their individual numbers and reached the same level in basal area as *Lithocarpus elegans* or *Schima wallichii*. These facts show

Table 5 Floristic Composition of Plot 5 (2300 m)

(a) $D \geq 10$

Species	I		II		III		Total	
	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %
<i>Polyosma ilicifolia</i> Bl.	2	4.0	30	32.8	2	53.8	34	16.36
<i>Myrsine affinis</i> DC.	9	10.1	16	16.6			25	12.68
<i>Eurya obovata</i> (Bl.) Korth.	3	9.9	14	24.4			17	15.79
<i>Acronodia punctata</i> Bl.	1	3.2	6	6.7	1	22.0	8	4.84
<i>Lithocarpus elegans</i> (Bl.) Hatus. ex Soepadmo, comb.	8	27.2					8	15.71
<i>Schima wallichii</i> ssp. <i>noronhae</i> (Reinw. ex Bl.) Bloemb.	4	18.4	3	2.8			7	11.75
<i>Astronia spectabilis</i> Bl.	3	21.8	2	15.9			5	19.16
<i>Neolitsea javanica</i> (Bl.) Back.	1	2.4	1	0.4			2	1.58
<i>Syzigium gracilis</i> (Korth.) Amsh.	1	0.9			1	24.1	2	0.75
<i>Lithocarpus tjijsmannii</i> (Bl.) Rehd.	1	2.0					1	1.18
<i>Meliosma nervosa</i> K. & V.			1	0.5			1	0.19
	33	100.0	73	100.0	4	100.0	110	100.00

(b) $4.5 \leq D < 10$

Species	II		III		Total	
	N	R.D. %	N	R.D. %	N	R.D. %
<i>Myrsine affinis</i> DC.	1	29.1	6	81.9	7	59.24
<i>Acronodia punctata</i> Bl.	2	45.8	1	7.5	3	23.98
<i>Polyosma ilicifolia</i> Bl.	1	25.0	1	4.6	2	13.39
<i>Syzigium gracilis</i> (Korth.) Amsh.			1	5.9	1	3.39
	4	100.0	9	100.0	13	100.00

(c) $H > 1.3, D < 4.5$

Species	N	R.D. %
<i>Polyosma ilicifolia</i> Bl.	10	46.69
<i>Ardisia javanica</i> DC.	8	37.32
<i>Lithocarpus elegans</i> (Bl.) Hatus. ex Soepadmo, comb.	3	4.52
<i>Schima wallichii</i> ssp. <i>noronhae</i> (Reinw. ex Bl.) Bloemb.	1	10.66
<i>Podocarpus imbricatus</i> Bl.	1	0.81
	23	100.00

that this plot was situated at the transition zone between the montane and the subalpine zone. The ground vegetation was poor; *Carex* sp. sporadically appeared at about 30 cm in height and saplings of *Podocarpus imbricatus* and species of ferns such as *Blechnum*

sp., *Cyathea latebrosa*, *Dryopteris* sp., *Plagiogyria glauca*, *Polypodium* sp. and *Polystichum* sp. were observed. The epiphytic species became much rarer; only *Vaccinium laurifolium*, *Schefflera* sp. and *Schefflera scandens* were seen among the climbers and treelets, as well as *Asplenium caudatum*, *Elaphoglossum* sp. and *Hymenophyllum* sp. among the ferns could be seen.

Plot-6 (2400 m)

As detailed information about this plot has already been presented in the 2nd paper of this series²⁾, we repeat only the essential points here. The plot was situated at the junction of both the slopes from Mt. Pangrango and Gede. The slope was a 20° incline to the north. The highest tree reached 22 m. Almost all of the trunks were covered by moss but not so heavily as the ones on the summit. The trunks were erect. Ground vegetation was rich and tree ferns were abundant, but epiphytic species were scarce. This stand was divided into 4 layers stratified as follows: 1st layer (22–15 m), 2nd layer (15–5 m), 3rd layer (5–1 m) and 4th layer (below 1 m). The main components of the 1st layer were *Schima wallichii*, *Symplocos sessilifolia*, *Acronodia punctata* and *Daphniphyllum glaucescens*. Species dominant in both 1st and 2nd layers were *Myrsine affinis*, *Polyosma ilicifolia* and *Acronodia punctata*. *Ardisia javanica* was extensive in the 3rd layer and saplings of taller species and *Cyathea crenulata* were also found.

The ground vegetation consisted of saplings of taller species such as *Daphniphyllum glaucescens*, *Schima wallichii*, *Podocarpus imbricatus*, *Myrsine affinis* and of saplings of shrubby species such as *Polyosma ilicifolia*, *Acronodia punctata*, *Ardisia javanica* and *Symplocos* sp. Saplings of lianas such as *Lonicera javanica*, and *Nertera granadensis* among the creeping herbs were found. *Cyperus* sp. and *Viola pilosa* among the herbs and *Blechnum patersonii*, *Lycopodium serratum*, *Plagiogyria glauca*, *Polypodium feei*, *Davallia* sp. and *Dryopteris* sp. among the ferns were also found.

Almost all the number plates which were fitted in 1970 had rotted mainly because of sulfur from the crater of Mt. Gede. The physiognomy of the stand appeared to have become denser in the ground vegetation and the saplings of *Podocarpus imbricatus* and *Usnea* on many of the branches were noteworthy. Of the climbers only 3 individuals were found of which the largest was 6 cm in DBH. Epiphytic ferns grew sporadically. The height of *Cyathea crenulata* reached 6 m. Species among the epiphytes were as follows: *Dendrobium hasseltii* and *Eria* sp. among the orchids; *Schefflera* sp., *Vaccinium laurifolium* and *Lonicera javanica* among the climbers; *Asplenium caudatum*, *Elaphoglossum califolium*, *Hymenophyllum* sp. *Polypodium* sp. and *Polypodium feei* among the ferns.

Plot-7 (2600 m)

This plot was set out at a place where *Leptospermum flavescens* and *Podocarpus imbricatus* were prominent. The slope was 12° in a N 70° W direction. *Podocarpus imbricatus* was

not included in this plot. *Leptospermum fravescens* showed long trunks extended parallel to the slope and only the crown part stood erect, just like *Acer laurinum* at lower altitudes. Moss and epiphytic species were also richer than in plot 6. The saplings of *Podocarpus imbricatus* were abundant and a large individual of 50 cm DBH and 25 m in height was found near the plot.

As indicated in Table 6, *Myrsine affinis* and *Polyosma ilicifolia* were dominants, the former species dominating the 1st layer, the latter the 2nd layer. *Symplocos sessilifolia* and *Acronodia punctata* came next of these. Although *Leptospermum fravescens* was infrequent in terms of individual numbers, this was a very conspicuous species, just like *Podocarpus imbricatus* found in the 4.5–10 cm class, and showing a high growth rate for its diameter.

Table 6 Floristic Composition of Plot 7 (2600 m)

(a) $D \geq 10$

Species	I		II		III		Total	
	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %
<i>Myrsine affinis</i> DC.	26	38.0	3	22.8	1	13.4	30	34.67
<i>Polyosma ilicifolia</i> Bl.	13	25.4	12	47.8	5	86.6	30	31.01
<i>Symplocos sessilifolia</i> (Bl.) Gürke	10	15.4	3	7.3			13	13.56
<i>Acronodia punctata</i> Bl.	5	7.2	4	19.8			9	9.07
<i>Daphniphyllum glaucescens</i> Bl.	2	2.4	1	2.4			3	2.32
<i>Leptospermum fravescens</i> J.E. Smith	1	9.1					1	7.33
<i>Eurya obovata</i> (Bl.) Korth.	2	1.8					2	1.46
<i>Schefflera</i> sp.	1	2.7					1	0.59
	60	100.0	23	100.0	6	100.0	89	100.00

(b) $4.5 \leq D < 10$

Species	I		II		III		Total	
	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %
<i>Polyosma ilicifolia</i> Bl.	2	15.2	14	35.7	8	47.3	24	35.51
<i>Myrsine affinis</i> DC.	2	33.5	10	31.3	2	11.4	14	26.66
<i>Acronodia punctata</i> Bl.	2	31.0	6	15.7	1	3.8	9	15.01
<i>Symplocos sessilifolia</i> (Bl.) Gürke	1	11.0	6	9.8	1	7.5	8	9.44
<i>Geniostoma arboreum</i> (Reinw.) O.K.			1	1.1	2	13.5	3	4.03
<i>Ardisia javanica</i> DC.					3	8.6	3	2.17
<i>Neolitsea cassia</i> (L.) Kosterm.			1	3.4			1	2.03
<i>Photinia notoniana</i> W. & A.			1	2.9			1	1.75
<i>Podocarpus imbricatus</i> Bl.	1	9.4					1	1.41
<i>Rhododendron retusum</i> (Bl.) Benn.					1	5.2	1	1.30
<i>Eurya obovata</i> (Bl.) Korth.					1	2.8	1	0.70
	8	100.0	39	100.0	19	100.0	66	100.00

(c) $H > 1.3, D < 4.5$

Species	N	R.D. %
<i>Acronodia punctata</i> Bl.	2	19.16
<i>Ilex</i> sp.	2	3.84
<i>Symplocos sessilifolia</i> (Bl.) Gürke	2	51.10
<i>Daphniphyllum glaucescens</i> Bl.	1	6.65
<i>Eurya obovata</i> (Bl.) Korth.	1	3.41
<i>Polyosma ilicifolia</i> Bl.	1	10.96
<i>Schefflera</i> sp.	1	4.88
	10	100.00

But there was no meaning in division of the trees at 10 cm DBH since the physiognomy of the subalpine zone had become more remarkable. Among five *Cyathea crenulata*, one individual reached 8 m in height and the average height of three *Cyathea orientalis* was around 3 m. We found three *Schefflera* sp. and one *Vaccinium laurifolium*. The real length of *Leptospermum fravescens* was found to be 24 m with a 70.3 cm DBH, but the natural height reached only 10 m. Two broken *Symplocos sessilifolia* were observed. The lower species were scarce in both individual number and species number. *Acronodia punctata*, *Ilex* sp. and *Symplocos sessilifolia* were rather abundant. In the ground vegetation, the saplings of *Podocarpus imbricatus* were notable and *Carex* sp. and *Myriactis javanica* among the herbs, *Diplazium* sp. and *Dryopteris* sp. among the ferns were found. Among the epiphytes, *Lonicera javanica*, *Vaccinium laurifolium* and *Schefflera* sp. among the climbers as well as *Elaphoglossum callifolium*, *Humata* sp., *Hymenophyllum* sp. and *Ctenopteris millefolia* among the ferns were enumerated.

Plot-8 (2800 m)

This plot was located on a steep slope (32°, aspect N 40° E) about 2800 m in altitude. We found many gaps in the surroundings and if we took a 20 m × 20 m plot, at least one gap was included in one of the 10 m × 10 m subplots. Fallen trees as well as standing-dead were quite abundant in this area. Natural height was low. Many of the species trailed along the ground and only the crown part stood erect. As for the total physiognomy, *Myrsine affinis*, *Viburnum coriaceum*, *Symplocos sessilifolia*, *Photinia notoniana* and *Eurya obovata* were found in the 1st layer and *Schefflera* sp. was found only a little below the position of the above mentioned species and *Cyathea speciosa* was found even further below. The differences between this and the next summit plot can be summarized as the existence of smaller trees of *Myrsine affinis* or *Symplocos sessilifolia* in the small middle layer between the upper layer and the ground vegetation.

As indicated in Table 7, *Myrsine affinis* dominated the 1st layer followed by *Schefflera* sp. and *Eurya obovata*. *Polyosma ilicifolia* was now absent. Ten *Cyathea crenulata* were

Table 7 Floristic Composition of Plot 8 (2800 m)

(a) $D \geq 10$

Species	I		II		Total	
	N	R.D. %	N	R.D. %	N	R.D. %
<i>Myrsine affinis</i> DC.	16	42.5			16	41.61
<i>Schefflera</i> sp.	10	22.6	3	100.0	13	24.26
<i>Eurya obovata</i> (Bl.) Korth.	6	20.0			6	19.59
<i>Symplocos sessilifolia</i> (Bl.) Gürke	4	5.1			4	4.95
<i>Viburnum coriaceum</i> Bl.	3	7.6			3	7.46
<i>Symplocos laurina</i> (Retz.) Wall.	1	0.6			1	0.62
<i>Photinia notoniana</i> W. & A.	1	1.6			1	1.52
	41	100.0	3	100.0	44	100.00

(b) $4.5 \leq D < 10$

Species	I		II		Total	
	N	R.D. %	N	R.D. %	N	R.D. %
<i>Myrsine affinis</i> DC.	13	46.8	7	46.0	20	46.63
<i>Symplocos sessilifolia</i> (Bl.) Gürke	5	21.5	3	31.1	8	23.96
<i>Schefflera</i> sp.	2	11.5	1	15.9	3	12.63
<i>Eurya obovata</i> (Bl.) Korth.	2	8.7	1	7.0	3	8.28
<i>Viburnum coriaceum</i> Bl.	1	6.2			1	4.63
<i>Symplocos laurina</i> (Retz.) Wall.	1	5.2			1	3.86
	24	100.0	12	100.0	36	100.00

(c) $H > 1.3, D < 4.5$

Species	N	R.D. %
<i>Symplocos sessilifolia</i> (Bl.) Gürke	12	33.08
<i>Myrsine affinis</i> DC.	10	44.71
<i>Symplocos laurina</i> (Retz.) Wall.	4	7.55
<i>Lonicera javanica</i> (Bl.) DC.	3	5.14
<i>Vaccinium laurifolium</i> (Bl.) Miq. var. <i>laurifolium</i>	1	9.52
	30	100.00

found of which the largest reached 13.5 cm DBH and 8 m in height. Two *Vaccinium laurifolium* among the woody climbers and standing dead specimens of each of *Eurya obovata*, *Schefflera* sp. and *Symplocos sessilifolia* were observed. As shown in the Table, species in the class $H > 1.3, D < 4.5$ were rather rich compared with plot 7, i.e., together *Symplocos sessilifolia* and *Myrsine affinis* occupied nearly 80%, followed by *Symplocos laurina*.

In the ground vegetation, among the herbs, *Elatostema* sp. was dominant and *Carex* sp., *Ranunculus javanica*, *Sanicula elata* and *Viola pilosa* were found and *Primula prolifera*

was present in sunny places. *Rubus alpestris* and *Myrsine affinis* among the trees, and *Balanophora elongata* also occurred. Concerning ferns, *Blechnum patersonii*, *Plagiogyria glauca* and *Woodwardia* sp. were seen. In the epiphytic species, *Dendrobium hasseltii* among the orchids, *Nertera granadensis* among the creeping herbs and *Asplenium caudatum*, *Elaphoglossum* sp., *Hymenophyllum* sp., *Polypodium* sp. and *Polypodium feei* among the ferns were observed. No climbers occurred.

Plot-9 (3000 m)

As this plot has already been described in the 2nd paper of this series²⁾, only the outline will be mentioned here. This plot was situated on a flat area attained after climbing up the steep slope to the summit. Almost all of the trees except for *Vaccinium laurifolium* stood erect. Trunks were so densely covered by moss that the visible tree size looked much larger than the real size. Tree density was very high, and the highest trees did not exceed 10 m. This stand could be recognized to have a 2nd layer. The 1st layer was occupied by *Myrsine affinis*, *Photinia notoniana*, *Eurya obovata* and *Vaccinium varingiaefolium*. In 1970, the under part of this layer was poor in small trees, but this time, we found some small sized *Symplocos* sp. in the narrow layer between the tree layer and the ground vegetation.

In the ground vegetation, the following species were recorded: *Symplocos* sp., *Symplocos sessilifolia* and *Myrsine affinis* among the trees; *Rubus lineatus* and *Lonicera javanica* among the climbers; *Nertera granadensis* among the creeping herbs; *Carex* sp., *Ranunculus javanicus*, *Myriactis javanica*, *Swertia javanica* and *Viola pilosa* among the herbs; *Plagiogyria glauca*, *Athyrium* sp., *Dryopteris adnata* and *Elaphoglossum callifolium* among the ferns. Several number plates which were fixed in 1970 were still readable. No special change in the physiognomy was observed.

Discussion

Names of a species occurring in each sample plot are shown in Table 8. Species are arranged in order of number from Plot 1 (1600 m) up to 3000 m.

This table is confined to trees larger than 10 cm DBH. The total number of species counted was 81 and 57 species were found in Plot 1. This is because Plot 1 is far larger in size than the others, which may have resulted in some underestimation the upper plots;

Frequently appearing species (numbers in parenthesis show frequency) are *Acronodia punctata* (7) and *Schima wallichii* (6) as well as *Polyosma ilicifolia* (6) followed by *Myrsine affinis* (4) and *Eurya obovata* (4). Besides these species, species which appeared discontinuously in separate plots can also be assumed to be distributed continuously.

From such considerations, 14 species may be regarded as of higher dominancy

Table 8 List of species name with their number and relative dominance on the basis of basal area. The order is arranged from the lower to the upper plot of the mountain. Only trees larger than 10 cm DBH are shown. (Broken trees included) /ha.

Species	P-1		P-2		P-3		P-4		P-5		P-6		P-7		P-8		P-9	
	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %
<i>Schima wallichii</i> ssp. <i>noronhae</i> (Reinw. ex Bl.) Bloemb.	47	25.12	80	32.31	150	42.55	290	43.63	70	11.68	53	5.88						
<i>Saurauia pendula</i> Bl.	46	2.24	20	0.31														
<i>Castanopsis javanica</i> (Bl.) DC.	37	21.01	50	3.40	10	2.82												
<i>Persea rimosa</i> (Bl.) Kosterm.	30	7.61																
<i>Turpinia sphaerocarpa</i> Hassk.	24	1.23	60	1.57														
<i>Lithocarpus pseudomoluccus</i> (Bl.) Rehd.	22	4.83																
<i>Decaspermum fruticosum</i> var. <i>polymorphum</i> (Bl.) Bakh. f.	20	0.76																
<i>Vernonia arborea</i> Buch.—Ham.	19	4.64	20	7.58														
<i>Symplocos fasciculata</i> Zoll.	16	0.49	10	0.13														
<i>Polyosma integrifolia</i> Bl.	16	1.37	60	4.62														
<i>Polyosma ilicifolia</i> Bl.	15	1.20			30	1.81	260	16.28	340	16.25	399	18.84	750	26.50				
<i>Ficus ribes</i> Reinw. ex Bl.	10	0.29																
<i>Macropanax dispermus</i> (Bl.) O.K.	7	1.23	10	0.31	40	1.70												
<i>Flacourtia rukam</i> Z. & M.	6	0.37																
<i>Syzygium antisepticum</i> (Bl.) Merry & Perry	6	2.36																
<i>Astronia spectabilis</i> Bl.	5	0.21	20	1.61			40	5.75	50	19.04								
<i>Castanopsis argentea</i> (Bl.) DC.	5	0.11																
<i>Lithocarpus rotundatus</i> (Bl.) A. Camus	5	5.75	20	1.54														
<i>Mischocarpus fuscescens</i> Bl.	5	0.36																
<i>Saurauia blumiana</i> Bl.	5	0.25																
<i>Villebrunea rubescens</i> (Bl.) Bl.	5	0.14																
<i>Antidesma tetrandrum</i> Bl.	4	0.11																
<i>Lithocarpus indutus</i> (Bl.) Rehd.	4	1.45																
<i>Pygeum parviflorum</i> Teysm. et Benn.	4	1.17																
<i>Syzygium rostratum</i> (Bl.) DC.	4	0.30																

Table 8 (Continued)

Species	P-1		P-2		P-3		P-4		P-5		P-6		P-7		P-8		P-9		
	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	
<i>Viburnum sambucinum</i> Bl.	4	0.25																	
<i>Acronychia laurifolia</i> Bl.	3	0.58	10	0.16	10	0.14													
<i>Casearia tuberculata</i> Bl.	3	0.50																	
<i>Eurya acuminata</i> DC.	3	0.10																	
<i>Lithocarpus elegans</i> (Bl.) Hatus. ex Soepadmo, comb.	3	0.81					30	0.67	80	15.60									
<i>Litsea resinosa</i> Bl.	3	0.68																	
<i>Manglietia glauca</i> Bl.	3	0.16	10	0.19															
<i>Michelia montana</i> Bl.	3	0.70																	
<i>Platea latifolia</i> Bl.	3	3.62																	
<i>Acronodia punctata</i> Bl.	2	0.22	10	0.90	70	4.64	20	3.20	80	4.81	345	22.72	225	7.75					
<i>Dysoxylum alliaceum</i> Bl.	2	0.14																	
<i>Elaeocarpus stipularis</i> Bl.	2	0.05																	
<i>Engelhardia spicata</i> Lech. ex Bl.	2	1.96	30	5.73	20	1.17													
<i>Hypobathrum frutescens</i> Bl.	2	0.04	10	0.19															
<i>Litsea mappacea</i> (Bl.) Boerl.	2	0.13																	
<i>Pithecellobium clypearia</i> (Jack) Bth.	2	0.33																	
<i>Pyrenaria serrata</i> Bl.	2	0.03																	
<i>Saurauia reinwardtiana</i> Bl.	2	0.03																	
<i>Cinnamomum parthenoxylon</i> (Jack) Meissn.	1	1.61																	
<i>Cinnamomum sintoc</i> Bl.	1	0.31																	
<i>Glochidion macrocarpum</i> Bl.	1	0.26					10	1.42											
<i>Gordonia excelsa</i> (Bl.) Bl.	1	1.79																	
<i>Ilex cymosa</i> Bl.	1	0.07																	
<i>Lithocarpus tijsmannii</i> (Bl.) Rehd.	1	0.48					10	0.23	10	1.17									
<i>Macropanax undulatus</i> (Wall. ex G. Don) Seem.	1	0.02			40	1.20	70	1.81											
<i>Meliosma ferruginea</i> Bl.	1	0.02																	
<i>Podocarpus imbricatus</i> Bl.	1	0.38	30	37.74	30	34.56	30	1.80											
<i>Prunus arborea</i> (Bl.) Kalkman	1	0.02					30	6.23											

Table 8 (Continued)

Species	P-1		P-2		P-3		P-4		P-5		P-6		P-7		P-8		P-9		
	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	N	R.D. %	
<i>Saurauia nudiflora</i> DC.	1	0.03																	
<i>Tarenna laxiflora</i> (Bl.) K. & V.	1	0.03																	
<i>Viburnum coriaceum</i> Bl.	1	0.02													75	7.46			
<i>Viburnum lutescens</i> Bl.	1	0.02																	
<i>Turpinia montana</i> (Bl.) Kurz			10	0.29															
<i>Myrsine hasseltii</i> Bl. ex Scheff.			10	0.56															
<i>Syzygium gracilis</i> (Korth.) Amsh.			10	0.64					20	0.74									
<i>Omalthus populneus</i> (Geisel) Pax			10	0.23															
<i>Neolitsea javanica</i> (Bl.) Back.					60	5.44			20	1.57									
<i>Ardisia javanica</i> DC.					10	0.14													
<i>Acer laurinum</i> Hassk.					40	0.91	50	12.50											
<i>Prunus</i> sp.					20	2.08													
<i>Lindera polyantha</i> (Bl.) Boerl.					10	0.47													
<i>Symplocos laurina</i> (Retz.) Wall.					20	0.38	10	0.97							25	0.62			
<i>Weimannia blumei</i> Planch.							10	3.18											
<i>Geniostoma arboreum</i> (Reinw.) O.K.							10	0.15			50	0.90							
<i>Leptospermum flavescens</i> J.E. Smith							10	2.17					50	20.10					
<i>Myrsine affinis</i> DC.									250	12.60	399	22.39	775	29.93	400	41.61	1158	20.99	
<i>Eurya obovata</i> (Bl.) Korth.									180	16.34	80	4.27	50	1.24	150	19.59	806	22.47	
<i>Meliosma nervosa</i> K. & V.									10	0.19									
<i>Daphniphyllum glaucescens</i> Bl.												50	7.09	75	1.98				
<i>Symplocos sessilifolia</i> (Bl.) Gürke												80	15.90	350	11.99	100	4.95	202	4.54
<i>Schefflera</i> sp.													25	0.50	325	24.26	50	0.74	
<i>Photinia notoniana</i> W. & A.												27	1.40		25	1.52	50	1.03	
<i>Vaccinium laurifolium</i> (Bl.) Miq.												25	0.61				25	0.31	
<i>Schefflera rugosa</i> (Bl.) Harms																	50	1.00	
<i>Symplocos</i> sp.																	50	1.36	
<i>Vaccinium varingiaefolium</i> (Bl.) Miq.																	1425	47.56	

than is apparent from this Table. These species are as follows; (First number in parenthesis is a actual occurrence in a plot, and the second number is an estimated frequency of appearance by adding the number in non-existent plots to those in existent plots.). *Polyosma ilicifolia* (6-7), *Astronia spectabilis* (4-5). *Lithocarpus elegans* (3-5), *Glochidion macrocarpum* (2-4), *Lithocarpus tijsmannii* (3-5), *Macropanax undulatus* (3-4), *Viburnum coriaceum* (2-8), *Syzigium gracilis* (2-4), *Neolitsea javanica* (2-3): *Symplocos laurina* (3-6), *Geniostoma arboreum* (2-3), *Leptospermum fravescens* (2-4), *Photinia notoniana* (3-4) and *Vaccinium laurifolium* (2-4).

On the contrary, species which occurred only once throughout the plots amount to 41, i.e. over half the total.

Species which show a high frequency may be thought to have a broad distribution area on this mountain but this does not mean that they are real dominants. It is necessary to check the frequently occurring species to see how dominant they are in each plot in terms of relative dominance.

Acronodia punctata, which is the most frequently occurring species, shows a 0.22% relative dominance at 1600m and again a less than 5% level of relative dominance up to 2300 m; the largest amount can be found at 2400 m as 22.7%, decreasing to 7.8% at 2600 m. So the optimum point of the distribution of the species can be considered as 2400 m. Although this species is distributed widely along the slop, the dominant point is restricted to this 2400 m altitude.

Schima wallichii, whose relative dominance is already 25% at 1600 m, increases this amount as the slope is ascended, and reaches its largest value, 44% at 2100 m thereafter decreasing until 2400 m. From 1600 m up to 2100 m, the relative dominance of this species is always the highest in each plot. So, this species is considered to be dominant in each plot from 1600 to 2100 m on this mountain.

Myrsine affinis, which appeared at 2300 m, increases as the slope is ascended, and reaches its highest peak at 2800 m. The optimum distribution point of this species is considered to be at 2800 m.

Like the preceding species, *Eurya obovata* appears from 2300 m but in very small numbers from 2400 m to 2600 m, increasing from 2800 to 3000 m. The optimum point of this species is regarded as a little higher than *Myrsine affinis*. Although counts of the actual occurrence of *Astronia spectabilis* registered only 4, this species can be regarded as present in the 1900 m plot because of its presence at 1700 m and 2100 m, even though the amount was very small. The largest value was found at 2300 m as 19% and it did not reappear farther up.

Podocarpus imbricatus, which occurred as only one stem at 1600 m, shows a very high relative dominance value, around 35% at 1700 and 1900 m. Although this species is found up to 2100 m as shown in this Table, the actual distribution reached 2600 m.

The optimum point of this species may be considered as 1700–1900 m.

Symplocos sessilifolia appears from 2400 m with a maximum amount of 16% and gradually decreases with increasing altitude.

As mentioned above, frequently occurring species are not always the dominant species and they have their own optimum point of distribution. Fig. 1 shows the altitudinal change of individual number of the species mentioned above, adding also *Castanopsis javanica* and *Engelhardia spicata*, which indicates a increasing trend with al-

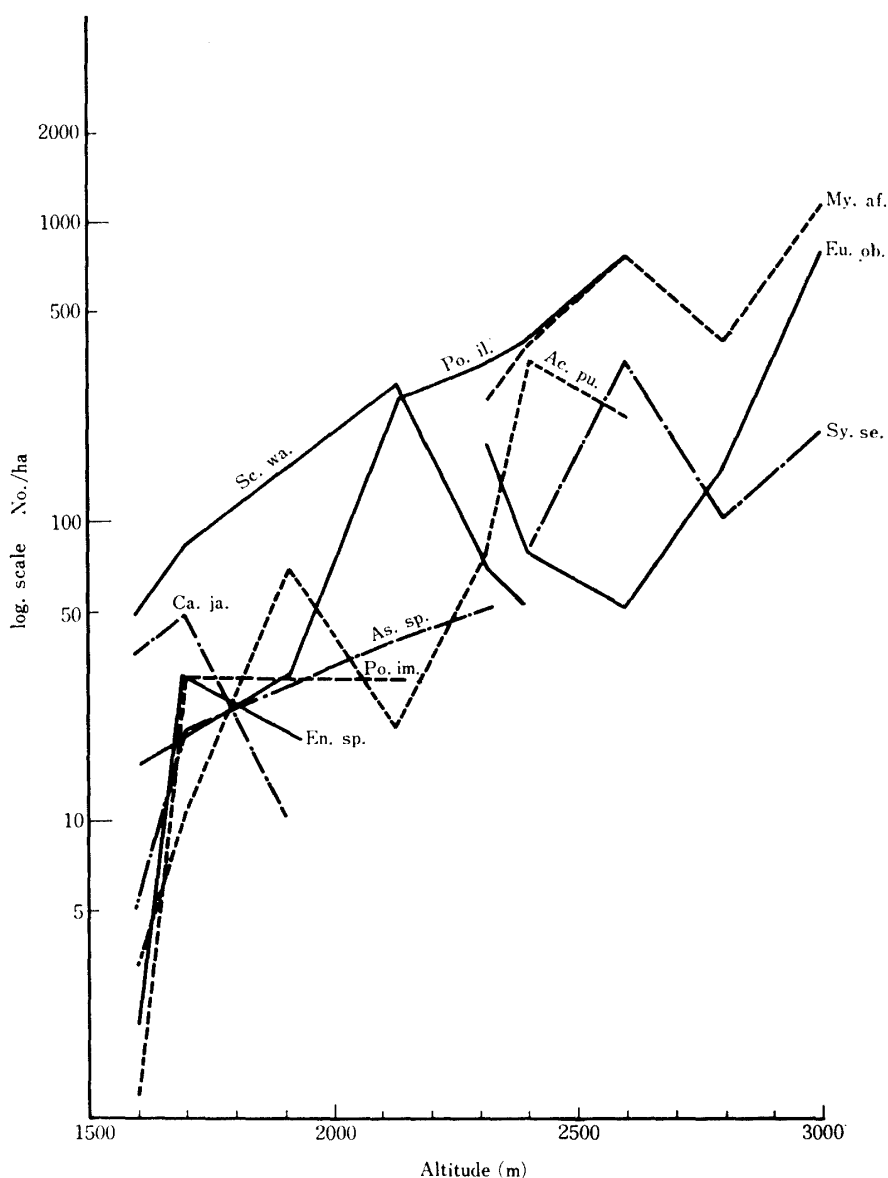


Fig. 1 Altitudinal change of individual number of main species.

Key to symbols; Ac. pu., *Acronodia punctata*; As. sp., *Astronia spectabilis*; Ca. ja., *Castanopsis javanica*; En. sp., *Engelhardia spicata*; Eu. ob., *Eurya obovata*; My. af., *Myrsine affinis*; Po. il., *Polyosma ilicifolia*; Po. im., *Podocarpus imbricatus*; Sc. wa., *Schima wallichii*; Sy. se., *Symplocos sessilifolia*.

titude. On the species unit, however, *Castanopsis javanica* and *Engelhardia spicata* show their peak at 1700 m and *Podocarpus imbricatus* has no clear peak. *Schima wallichii* has its maximum at around 2100 m. *Astronia spectabilis*, *Acronodia punctata*, and *Polyosma ilicifolia* show increasing trends, especially the last species with a steep increasing tendency. Among the subalpine species, *Symplocos sessilifolia* has the lowest peak at 2600 m and *Myrsine affinis* and *Eurya obovata* show their peak at the summit.

Fig. 2 shows the change of basal area in each species with altitude. Although the total basal area tends to decrease with increasing altitude, each species shows a similar trend to that of Fig. 1, i.e., *Castanopsis javanica* and *Engelhardia spicata* have their peak around the lowest part and *Podocarpus imbricatus* as well as *Schima wallichii* show a larger amount between 1800 and 2200 m. *Polyosma ilicifolia*, *Acronodia punctata* and *Astronia spectabilis* show a very similar pattern, each with a gradual change of the maximum point between 2300–2600 m. The peaks for the 3 subalpine species are at 2400 m (*Symplocos sessilifolia*), 2600 m (*Myrsine affinis*) and 3000 m (*Eurya obovata*). On a plot basis, *Myrsine affinis* shows the highest value at 2800 m but note that on the species unit, the highest point is 2600 m.

The facts mentioned here are a presence or absence of the species in terms of number and basal area. Further important and essential problem may be how the species grow in the community and how they change their habitat (niche) along the gradient.

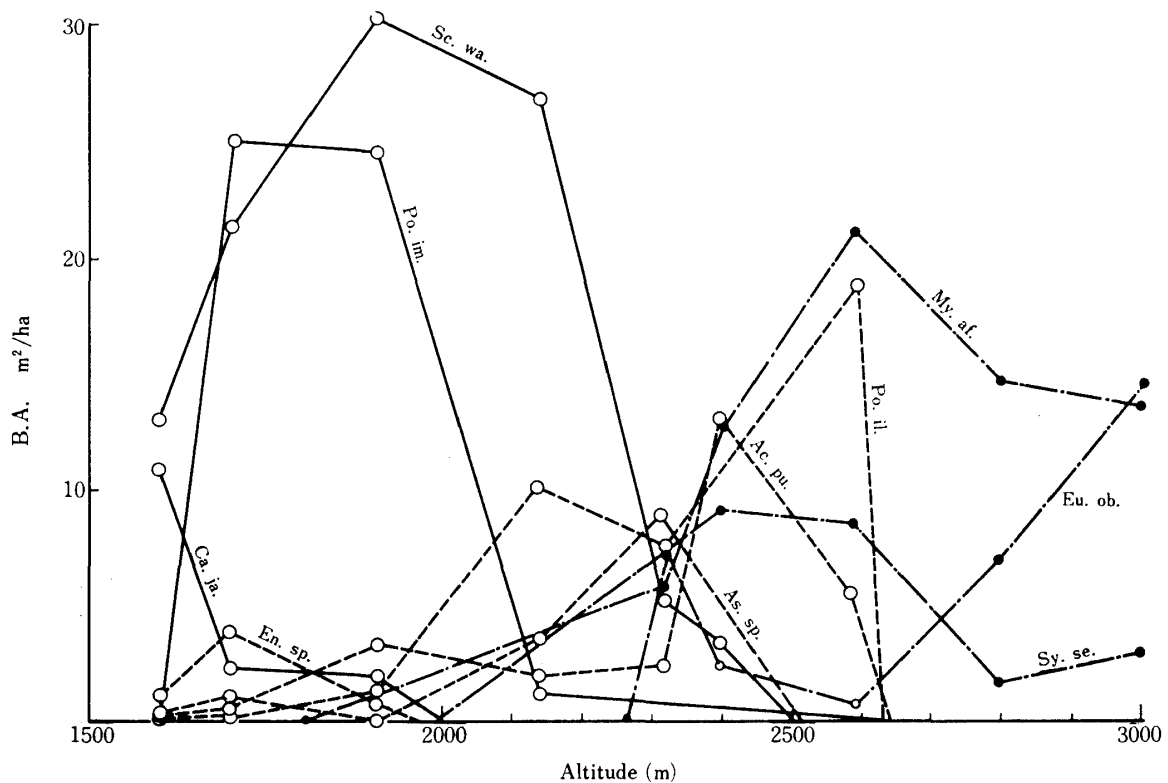


Fig. 2 Altitudinal change of basal area of main species. Symbols are the same as in Fig. 1.

Focussing on this subject, vertical stratification along the gradient will be described in a succeeding paper.

References

- 1) Yamada, I. 1975. "Forest Ecological Studies of the Montane Forest of Mt. Pangrango, West Java. I. Stratification and Floristic Composition of the Montane Rain Forest Near Cibodas," *Tonan Ajia Kenkyu (South East Asian Studies)*, Vol. 13, No. 3, pp. 402-426.
- 2) ———, 1976 a. *Ditto*. II. Stratification and Floristic Composition of the Forest Vegetation of the Higher Part of Mt. Pangrango. *Ditto*. Vol. 13, No. 4, pp. 513-534.

Appendix

List of all the smaller plants found on the ground (I) and trees (II)

(I)

(a) Small trees, shrubs and palms the ground

Species	P-1 (1600)	P-2 (1700)	P-3 (1900)	P-4 (2100)	P-5 (2300)	P-6 (2400)	P-7 (2600)	P-8 (2800)	P-9 (3000)
Acer laurinum Hassk.				○					
Acronodia punctata Bl.				○		○			
Ardisia fuliginosa Bl.	○	○							
Ardisia javanica DC.						○			
Astronia spectabilis Bl.				○					
Daphniphyllum glaucescens Bl.						○			
Dichroa sylvatica (Reinw. ex Bl.) Merr.						○			
Eupatorium riparium Reg.			○						
Eurya obovata (Bl.) Korth.						○			
Hypobathrum frutescens Bl.		○							
Lasianthus sp.				○					
Lithocarpus pseudomoluccus (Bl.) Rehd.		○							
Litsea diversifolia Bl.		○							
Molineria capitulata (Lour.) Herb.		○	○	○					
Mycetia cauliflora Reinw.		○		○					
Myrsine affinis DC.						○		○	○
Piper sulcatum Bl.			○						
Podocarpus imbricatus Bl.					○	○	○		
Polyosma ilicifolia Bl.				○		○			
Polyosma integrifolia Bl.						○			
Psychotria divergens Bl.	○	○	○						
Rubus alpestris Bl.				○				○	
Rubus moluccanus L.	○	○	○						
Saurauia pendula Bl.	○								
Saurauia reinwardtiana Bl.	○								
Schima wallichii ssp. noronhae (Reinw. ex Bl.) Bloemb.				○	○				

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a) (continued)

Species	P-1 (1600)	P-2 (1700)	P-3 (1900)	P-4 (2100)	P-5 (2300)	P-6 (2400)	P-7 (2600)	P-8 (2800)	P-9 (3000)
<i>Strobilanthes blumei</i> Bremek.			○						
<i>Strobilanthes cernua</i> Bl.	○	○	○						
<i>Symplocos sessilifolia</i> (Bl.) Gürke						○			○
<i>Symplocos</i> sp.						○			○
<i>Talauma candollii</i> Bl.	○								
<i>Turpinia sphaerocarpa</i> Hassk.		○							
<i>Vaccinium laurifolium</i> var. <i>ellipticum</i> (Bl.) Sleum.						○			
<i>Vaccinium laurifolium</i> (Bl.) Miq. var. <i>laurifolium</i>						○			
<i>Viburnum coriaceum</i> Bl.						○			

b) Lianas on the ground

Species	P-1 (1600)	P-2 (1700)	P-3 (1900)	P-4 (2100)	P-5 (2300)	P-6 (2400)	P-7 (2600)	P-8 (2800)	P-9 (3000)
<i>Cissus adnata</i> Roxb.	○								
<i>Clematis smilacifolia</i> Wall.			○						
<i>Ficus lanata</i> Bl.	○								
<i>Ficus sagittata</i> Vahl		○							
<i>Ficus trichocarpa</i> Bl.	○								
<i>Freycinia insignis</i> Bl.		○							
<i>Hoya</i> sp.			○						
<i>Lonicera javanica</i> (Bl.) DC.						○			○
<i>Malaxis</i> sp.	○								
<i>Medinilla laurifolia</i> (Bl.) Bl.			○	○					
<i>Nertera granadensis</i> (Mutis ex L.f.) Druce						○		○	○
<i>Piper abbreviatum</i> Opiz			○						
<i>Piper baccatum</i> Bl.	○								
<i>Piper cilibracteum</i> DC.	○								
<i>Piper sulcatum</i> Bl.	○								
<i>Piper</i> sp.	○								
<i>Psychotria sarmentosa</i> Bl.			○						
<i>Rubus lineatus</i> Reinw. ex Bl.									○
<i>Scindapsus hederaceus</i> (Z.&M.) Miq.	○								
<i>Smilax macrocarpa</i> Bl.			○						
<i>Smilax odoratissima</i> Bl.			○						
<i>Smilax</i> sp.	○								
<i>Tetrastigma dichotomum</i> (Bl.) Planch.		○		○					
<i>Tetrastigma papillosum</i> (Bl.) Planch.	○								
<i>Tetrastigma</i> sp.	○								

c) Ferns on the ground

Species	P-1 (1600)	P-2 (1700)	P-3 (1900)	P-4 (2100)	P-5 (2300)	P-6 (2400)	P-7 (2600)	P-8 (2800)	P-9 (3000)
<i>Asplenium caudatum</i> Forst.			○	○					
<i>Asplenium</i> sp.	○								
<i>Athyrium japonicum</i> (Thunb.) Copel.		○							
<i>Athyrium</i> sp.									○
<i>Blechnum patersonii</i> (R. Br.) Mett.						○		○	
<i>Blechnum</i> sp.					○				
<i>Coniogramme flaxinea</i> (Don) Diels		○							
<i>Coniogramme</i> sp.			○	○					
<i>Cyathea junghuhniana</i> (Kunze) Copel.		○							
<i>Cyathea latebrosa</i> (Wall. ex Hook.) Copel.				○	○				
<i>Cyathea orientalis</i> (Kunze) Moore				○					
<i>Cyathea raciborskii</i> Copel.	○								
<i>Cyathea spinulosa</i> Wall. ex Hook.		○							
<i>Davallia</i> sp.						○			
<i>Diplazium dilatatum</i> Bl.	○								
<i>Diplazium esculentum</i> (Retz.) Sw.		○							
<i>Diplazium pallidum</i> (Bl.) Moore	○	○							
<i>Diplazium</i> sp.	○						○		
<i>Dryopteris adnata</i> (Bl.) v.A.v.R.									○
<i>Dryopteris hirtipes</i> (Bl.) O.K.	○	○							
<i>Dryopteris</i> sp.	○		○	○	○	○	○		
<i>Egenolfia appendiculata</i> (Willd.) J. Sm.	○								
<i>Elaphoglossum callifolium</i> (Bl.) Moore				○					○
<i>Lycopodium serratum</i> Thunb.						○			
<i>Lycopodium</i> sp.				○					
<i>Nephrolepis acuminata</i> (Houtt.) Kuhn	○								
<i>Plagiogyria glauca</i> (Blume) Mett.				○	○	○		○	○
<i>Polypodium feei</i> (Bory) Mett.						○			
<i>Polypodium</i> sp.					○				
<i>Polystichum aculeatum</i> Schott		○							
<i>Polystichum</i> sp.					○				
<i>Pteris excelsa</i> Gaud.			○	○					
<i>Thelypteris callosa</i> (Bl.) K. Iwats.		○							
<i>Thelypteris heterocarpa</i> (Bl.) Ching	○	○							
<i>Thelypteris opaca</i> (Don) Reed		○							
<i>Thelypteris truncata</i> (Poir. in Lam.) K. Iwats.		○							
<i>Trichomanes</i> sp.	○								
<i>Woodwardia</i> sp.								○	

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d) Herbs on the ground

Species	P-1 (1600)	P-2 (1700)	P-3 (1900)	P-4 (2100)	P-5 (2300)	P-6 (2400)	P-7 (2600)	P-8 (2800)	P-9 (3000)
<i>Amomum hochreutineri</i> Val.	○								
<i>Amomum pseudo-foetens</i> Val.	○								
<i>Arisaema filiforme</i> Bl.	○	○							
<i>Arisaema</i> sp.				○					
<i>Balanophora elongata</i> Bl.								○	
<i>Balanophora</i> sp.			○						
<i>Begonia robusta</i> Bl.			○						
<i>Calanthe flava</i> (Bl.) Hassk.			○						
<i>Carex</i> sp.							○	○	○
<i>Coleus galeatus</i> (Poir.) Bth.	○								
<i>Cyperus</i> sp.						○			
<i>Cyrtandra picta</i> Bl.	○			○					
<i>Cyrtandra</i> sp.	○								
<i>Disporum chinense</i> (Ker-Gawl.) O.K.				○					
<i>Elatostema paludosum</i> (Bl.) Hassk.	○								
<i>Elatostema</i> sp.	○	○						○	
<i>Forrestia marginata</i> (Bl.) Back.	○								
<i>Forrestia</i> sp.	○								
<i>Hedychium roxburghii</i> Bl.		○							
<i>Lycianthes laevis</i> (Dunal) Bitt.	○	○							
<i>Musa acuminata</i> Colla	○								
<i>Myriactis javanica</i> (Bl.) DC.							○		○
<i>Pilea</i> sp.			○						
<i>Primula prolifera</i> Wall.								○	
<i>Ranunculus javanicus</i> Bl.								○	○
<i>Sanicula elata</i> Ham. ex D. Don								○	
<i>Swertia javanica</i> Bl.									○
<i>Viola pilosa</i> Bl.						○		○	○
<i>Zinger infllexum</i> Bl.	○								

(II)

a) Epiphytic treelets and others on the trees

Species	P-1 (1600)	P-2 (1700)	P-3 (1900)	P-4 (2100)	P-5 (2300)	P-6 (2400)	P-7 (2600)	P-8 (2800)	P-9 (3000)
<i>Aeschynanthus horsfieldii</i> R. Br.	○								
<i>Aeschynanthus</i> sp.				○					
<i>Agalmyla parasitica</i> (Lamk) O.K.	○	○							
<i>Diplycosia heterophylla</i> Bl.	○								
<i>Fagraea ceilanica</i> Thunb.	○								
<i>Fagraea</i> sp.	○								

a) (continued)

Species	P-1 (1600)	P-2 (1700)	P-3 (1900)	P-4 (2100)	P-5 (2300)	P-6 (2400)	P-7 (2600)	P-8 (2800)	P-9 (3000)
<i>Ficus deltoidea</i> Jack.	○								
<i>Ficus sinnata</i> ssp. <i>cuspidata</i> (Reinw. ex Bl.) Corner	○								
<i>Hedychium roxburghii</i> Bl. var. <i>roxburghii</i>	○								
<i>Ilex spicata</i> Bl.	○								
<i>Medinilla laurifolia</i> (Bl.) Bl.	○	○		○					
<i>Medinilla speciosa</i> (Reinw. ex Bl.) Bl.	○								
<i>Medinilla verrucosa</i> (Bl.) Bl.	○								
<i>Peperomia</i> sp.			○						
<i>Polygonum chinense</i> L.		○							
<i>Procris frutescens</i> Bl.	○								
<i>Rhododendron javanicum</i> (Bl.) Benn.	○								
<i>Schefflera lucescens</i> var. <i>rigida</i> (Bl.) Bakh. f.	○								
<i>Schefflera scandens</i> (Bl.) Vig.	○	○	○						
<i>Schefflera</i> sp.	○				○	○	○		
<i>Usnea</i> sp.	○					○			
<i>Vaccinium laurifolium</i> var. <i>ellipticum</i> (Bl.) Sleum.	○								
<i>Vaccinium laurifolium</i> (Bl.) Miq. var. <i>larifolium</i>	○		○	○	○	○	○		
<i>Vaccinium lucidum</i> (Bl.) Miq.	○		○	○					

b) Epiphytic lianas on the trees

Species	P-1 (1600)	P-2 (1700)	P-3 (1900)	P-4 (2100)	P-5 (2300)	P-6 (2400)	P-7 (2600)	P-8 (2800)	P-9 (3000)
<i>Actinidia callosa</i> Lindl. var. <i>callosa</i>	○								
<i>Alyxia reinwardti</i> Bl.	○								
<i>Cissus adnata</i> Roxb.	○								
<i>Dendrotrophe umbellata</i> (Bl.) Miq.	○								
<i>Dissochaeta leprosa</i> (Bl.) Bl.	○								
<i>Elaeagnus conferta</i> Roxb.	○								
<i>Embelia pergamacea</i> DC.	○								
<i>Embelia ribes</i> Burm. f.	○								
<i>Embelia</i> sp.			○						
<i>Ficus lanata</i> Bl.	○	○							
<i>Ficus sagittata</i> Vahl	○		○						
<i>Ficus trichocarpa</i> Bl.	○								
<i>Freycinetia insignis</i> Bl.	○	○							
<i>Kadsura scandens</i> (Bl.) Bl.	○	○	○	○					
<i>Lonicera javanica</i> (Bl.) DC.						○	○		
<i>Mussaenda frondosa</i> L.	○								

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b) (continued)

Species	P-1 (1600)	P-2 (1700)	P-3 (1900)	P-4 (2100)	P-5 (2300)	P-6 (2400)	P-7 (2600)	P-8 (2800)	P-9 (3000)
<i>Piper baccatum</i> Bl.	○								
<i>Piper cilibracteum</i> DC.	○			○					
<i>Psychotria sarmentosa</i> Bl.	○		○	○					
<i>Pyrus</i> sp.			○	○					
<i>Rhaphidophora pinnata</i> (L.f.) Schott	○								
<i>Rubia cordifolia</i> L.	○								
<i>Rubus lineatus</i> Reinw. ex Bl.				○					
<i>Smilax macrocarpa</i> Bl.	○								
<i>Smilax odoratissima</i> Bl.				○					
<i>Smilax zeylanica</i> L.		○							
<i>Tetrastigma dichotomum</i> (Bl.) Planch.	○	○		○					

c) Epiphytic ferns on the trees

Species	P-1 (1600)	P-2 (1700)	P-3 (1900)	P-4 (2100)	P-5 (2300)	P-6 (2400)	P-7 (2600)	P-8 (2800)	P-9 (3000)
<i>Asplenium caudatum</i> Forst.	○	○	○	○	○	○		○	
<i>Asplenium longissimum</i> Bl.			○	○					
<i>Asplenium nidus</i> L.	○	○							
<i>Asplenium thunbergii</i> Kunze	○								
<i>Asplenium</i> sp.	○								
<i>Coniogramme fraxinea</i> (Don) Diels		○							
<i>Crypsinus macrochasmus</i> (Bak.) Copel.	○								
<i>Ctenopteris millefolia</i> (Bl.) Copel.							○		
<i>Davallia trichomanoides</i> Bl.	○	○							
<i>Davallia</i> sp.	○								
<i>Elaphoglossum callifolium</i> (Bl.) Moore	○	○	○			○	○		
<i>Elaphoglossum petiolatum</i> (Sw.) Urban	○								
<i>Elaphoglossum</i> sp.	○			○	○			○	
<i>Humata</i> sp.				○			○		
<i>Hymenophyllum junghuhnii</i> v.d.B.	○	○							
<i>Hymenophyllum</i> sp.	○		○	○	○	○	○	○	
<i>Lomariopsis spectabilis</i> (Kunze) mett.	○								
<i>Lycopodium phlegmaria</i> L.	○		○						
<i>Lycopodium piscium</i> (Hert.) Tagawa & K. Iwats.		○							
<i>Nephrolepis acuminata</i> (Houtt.) Kuhn	○	○							
<i>Nephrolepis</i> sp.			○						
<i>Oleandra musifolia</i> (Bl.) Presl.	○								
<i>Polypodium feei</i> (Bory) Mett.			○	○		○		○	
<i>Polypodium</i> sp.	○		○	○		○		○	
<i>Selliguea heterocarpa</i> Bl.		○							
<i>Trichomanes</i> sp.	○								

d) Epiphytic orchids on the trees

Species	P-1 (1600)	P-2 (1700)	P-3 (1900)	P-4 (2100)	P-5 (2300)	P-6 (2400)	P-7 (2600)	P-8 (2800)	P-9 (3000)
<i>Agrostophyllum</i> sp.	○								
<i>Appendicula ramosa</i> Bl.	○		○						
<i>Bulbophyllum uniflorum</i> (Bl.) Hassk.	○								
<i>Bulbophyllum</i> sp.	○			○					
<i>Cyperorchis rosea</i> (J.J.S.) Schltr	○								
<i>Dendrobium conspicuum</i> Bakh. f.			○						
<i>Dendrobium hasseltii</i> (Bl.) Lindl.						○		○	○
<i>Dendrobium montanum</i> J.J.S.			○						
<i>Dendrobium</i> sp.			○						
<i>Eria fravescens</i> (Bl.) Lindl.				○					
<i>Eria</i> sp.			○	○		○			
<i>Liparis pallida</i> (Bl.) Lindl.	○								
<i>Liparis</i> sp.	○								
<i>Malaxis blumei</i> (Boerl. & J.J.S.) Bakh. f.	○								