FLORISTIC OBSERVATIONS ON FOREST TYPES IN WESTERN SURINAME. I.

BY

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SUMMARY

Some rain and savanna forests of western Suriname (Corantijn R., Winana Creek; Upper Marataka R.; Upper Nickerie R;) were studied and their composition was compared with that of forests of other parts of Suriname and Guyana. The savanna forests of western Suriname proved to be much related to Guyanan (*Walaba-* and *Dakama-*) savanna forests as described by DAVIS & RICHARDS (1934) and FANSHAWE (1952). On the other hand, there was less relationship as regards rain forests of western Suriname when compared with ones of Guyana and other parts of Suriname, except for the *Demerara greenheart* forest of the Upper Marataka R., which was closely related to the *Demerara greenheart* forests of Guyana as described by DAVIS & RICHARDS (1934).

In addition an upland rain forest was studied near Blanche Marie falls, Upper Nickerie R., which proved to be very much like that of the Stofbroekoe Mts., eastern Suriname, as described by SCHULZ (1960).

Species/area curves for some rain and savanna forests are given.

The geographical distribution of some common western Surinam tree species was studied; of the seventeen species studied one was endemic for Suriname.

An annotated list of all species of trees and palms occurring in the explored areas is provided.

INTRODUCTION

From April to July 1965 three short botanical explorations were made in the western part of Suriname. For data on climate, geology, and soil of Suriname one is referred to LINDEMAN & MOLENAAR (1959). The expedition-team consisted of P. J. M. MAAS (plant taxonomist), R. ELBURG (tree-plotter), J. A. TAWJOERAN (assistant), and four other native assistants. The three following regions were explored (see fig. 1): Winana Creek (Kaboeri Creek, Corantijn R.); Snake Creek (Upper Marataka R.); Blanche Marie falls, Paris Jacob Creek, and Kamisa falls (Upper Nickerie R.).

The main object of this exploration was to collect herbarium material of trees (shrubs and herbs) for the Surinam Forest Service (LBB). The floristic composition of the different forest types was investigated by studying 10×10 m and 20×50 m plots. Old forest lines were followed or new lines were cut. At each 100 m-point a plot of 10×10 m was laid out; at most kilometer-points a plot of 20×50 m was intercalated. In

these quadrats all trees over 10 m in diameter were recorded and their diameter was measured at breast-height. At the same time notes were made of the position of the plot, the soil, the exposition, the shrub- and herb-layer, etc.

The data gathered in the quadrats are mainly based on the vernacular names used by the tree-plotter, R. ELBURG; his names were immediately checked on the list of vernacular names given by LINDEMAN in "Bomenboek voor Suriname" (1963); when a vernacular name covered more than one species, a specimen of the tree concerned was collected for later identification; herbarium material was also collected from trees unknown to the tree-plotter. The herbarium collection, consisting of ca 200 trees and 150 herbs and shrubs was identified by J. C. LINDEMAN, K. U. KRAMER, P. J. M. MAAS, and other staff members of the Utrecht Herbarium; the Myrtaceae were identified by R. MCVAUGH from the Michigan University, U.S.A.

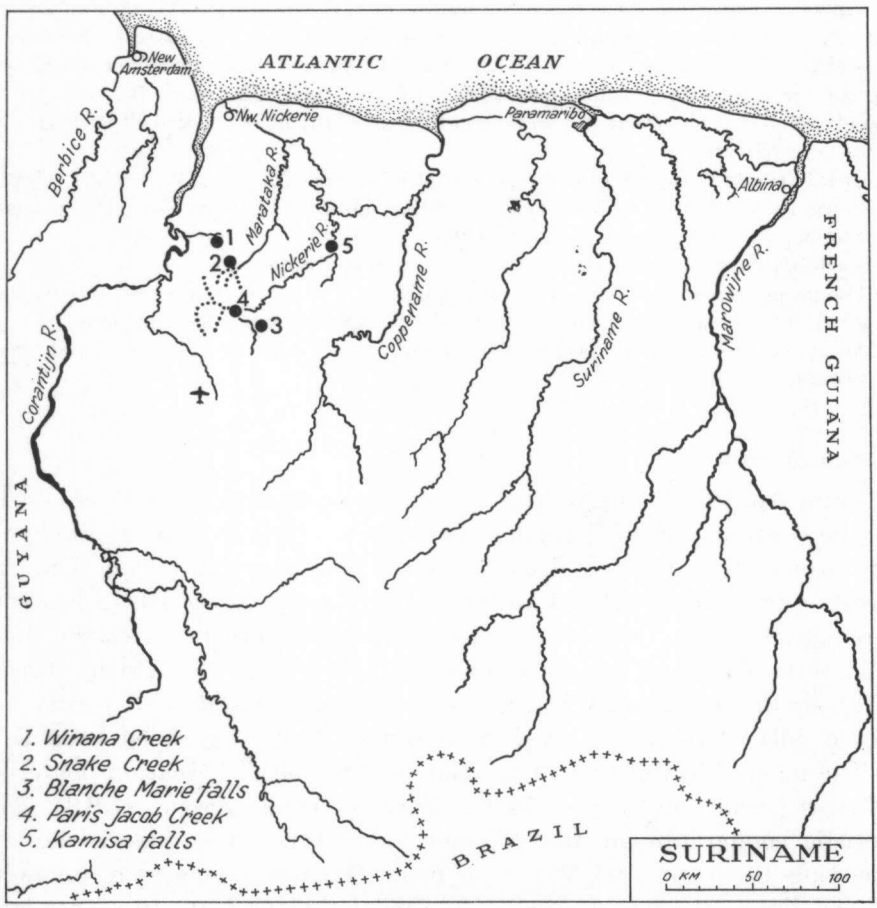

Fig. 1. Sketch map of Suriname.

GENERAL CHARACTERISTICS AND ECOLOGY OF THE VEGETATION TYPES

1. Savanna forest

Savanna forest consists of two stories, the highest trees reaching to about 30 m. This type of forest is very light. The number of species is relatively small. The undergrowth is rich in saplings of the leading trees. Palms are scarce to frequent. There are few lianas. The herb layer is very poor in species. The soil consists of white to light brown coarse sand, covered by a humous layer 0–10 cm thick.

2. Rain forest

This consists of more than two stories, the highest reaching to about 50 m. This forest is rather dark. The number of species is large. The undergrowth is rich in saplings of the leading trees. Palms are frequent, rarely infrequent. There are mostly few lianas. The herb layer is rather poor in species (except in upland rain forest, where it is rich in species). The soil is loamy to sandy, occasionally with ferro-bauxite gravel.

SAVANNA FOREST (see table 1)

A I. Savanna forest at Winana Creek (Corantijn R.), 17 plots of 100 m², total area 1700 m².

– Number of species: 12.

– Soil: white, coarse sand, covered by a 0–10 cm thick humous layer and abundant litter of *Dimorphandra conjugata*.

– Leading trees: *Aspidosperma excelsum* (*zwart parelhout*), *Dimorphandra conjugata* (*dakama*), *Catostemma fragrans* (*barmani*), and *Matayba opaca* (*zwarte gawetri*).

– Shrub layer: many saplings of *Ocotea schomburgkiana* and *Catostemma fragrans*, only few of *Aspidosperma excelsum* and *Eperua falcata*; *Cephaëlis* sp. and *Conomorpha magnoliifolia*; palms absent.

– Herb layer: very poor in species, mainly *warimbo* (Marantaceae spp.), *Bromelia alta* L. B. Smith, and *Leandra* sp. (10710).

The percentages of some trees in two grouped size classes are:

	All trees >10 cm diameter	All trees >40 cm diameter
Eperua falcata	2.6	–
Aspidosperma excelsum	29.5	–
Dimorphandra conjugata	25.6	81.8

The maximum diameter in the area was for *Dimorphandra conjugata*, five trees having a diameter between 85 and 95 cm.

This forest type with its strong dominance of *Aspidosperma excelsum* and *Dimorphandra conjugata* is nearest to the *Dakama* faciation of the *Eperua-Eperua* association as has been described by Fanshawe (1952)

TABLE 1

Savanna forest vegetations in western Suriname. Abbreviations: A I and A II (Winana Creek), B (Snake Creek), C (Paris Jacob Creek), D (Kamisa falls). Total number of trees > 10 cm in diameter; the number of trees per ha is given within parentheses.

Species	A I 1700 m²	A II 3700 m²	B 4700 m²	C 500 m²	D 1000 m²
Aspidosperma excelsum	23(136)	41(111)	26(55)	4(80)	–
Catostemma fragrans	10(59)	19(51)	41(87)	6(120)	–
Eperua falcata	2(12)	58(157)	58(123)	–	–
Dimorphandra conjugata	20(118)	28(76)	–	–	–
Licania stricta	1(6)	8(22)	15(32)	1(20)	1(10)
Licania micrantha			10(21)	3(60)	2(20)
Matayba opaca	10(59)	9(24)	11(23)	–	–
Eschweilera corrugata	1(6)	5(13)	22(47)	1(20)	–
Ocotea schomburgkiana	6(35)	4(11)	17(36)	–	–
Couepia guianensis	–	–	4	1	1
switi boontje (*Inga* spp.)	–	1	4	1	–
Swartzia bannia	2	2	–	–	–
marmeldoos (*Duroia* sp. or *Amajoua* sp.)	–	3	2	–	–
Couepia cognata	–	–	5	–	3
Bombax cf. *surinamensis*	–	–	–	1	2
Parinari campestris	–	–	–	–	12(120)
Licania apetala	–	–	–	–	9(90)
Humiria balsamifera	–	–	–	–	4
Dicorynia guianensis	–	–	–	–	3
Other species	3	18	51	10	25
Total	78	196	266	28	62
Total per ha	459	530	566	560	620

from Guyana, and close to the *Dimorphandra conjugata* variant of wet savanna forest as has been described for Suriname by HEYLIGERS (1963).

A II. Savanna forest at Winana Creek (Corantijn R.), 2 plots of 1000 m² and 17 plots of 100 m², total area 3700 m².
– Number of species: 25.
– Soil: white, coarse sand, covered by a 0–10 cm thick humous layer and abundant litter of *Dimorphandra conjugata*.
– Leading trees: *Eperua falcata* (*walaba*), *Aspidosperma excelsum* (*zwart parelhout*), *Dimorphandra conjugata* (*dakama*), and *Catostemma fragrans* (*barmani*).
– Shrub layer: many saplings of *Eperua falcata*, *Castostemma fragrans*, and *Ocotea schomburgkiana*; palms rather frequent, a.o. *nanai-maka* (*Bactris* vs. *humilis*) and *Attalea sagotii* (*bergi-maripa*).
– Herb layer: rather poor in species, mainly *warimbo* (Marantaceae spp.), *popokaitongo* (*Heliconia* sp.), and *Bromelia alta* L. B. Smith.

The percentages of some of the leading trees in two grouped size classes are:

	All trees >10 cm diameter	All trees >40 cm diameter
Eperua falcata	29.6	2.5
Aspidosperma excelsum	20.9	12.5
Dimorphandra conjugata	14.3	62.5

A large difference with the foregoing forest type, apart from the high percentage of *Eperua falcata*, is the presence of *Aspidosperma excelsum* in the diameter-class > 40 cm.

The maximum diameter recorded in this area was for *Dimorphandra conjugata*, having nine trees with a diameter between 80 and 110 cm.

An arrangement of the trees by families gives the following percentages:

Papilionaceae	45%	Lecythidaceae	3%
Apocynaceae	21%	Sapotaceae	2%
Bombacaceae	10%	Rubiaceae	2%
Sapindaceae	5%	Lauraceae	2%
Chrysobalanaceae	5%	Remaining fam.	5%

The preponderance of two papilionaceous species, namely *Eperua falcata* and *Dimorphandra conjugata*, accounts for the high percentage of this family. The high percentage of Apocynaceae is due to the abundance of *Aspidosperma excelsum*.

This forest is intermediate between the savanna forest described under A I and *Walaba-Parelhout* rain forest (see E I). Floristically it shows much resemblance with the *Eperua-Eperua* association of *Walaba* forest as has been described for Guyana by FANSHAWE (1952); it also resembles the *Walaba* forest of DAVIS & RICHARDS (1934), and the *Dakama-Walaba* forest as mentioned by LINDEMAN (1959). In the Guyanan forest types just mentioned some of the leading trees are the same as those of the Winana Creek, namely *Eperua falcata*, *Catostemma fragrans*, *Aspidosperma excelsum*, and *Eschweilera corrugata*. *Eperua grandiflora*, however, one of the two dominant trees in the Guyanan *Walaba* forest, has not been collected during our expedition to western Suriname, but it should not be ruled out, that a part of the trees named "*Walaba*" by the tree-plotter, possibly belongs to that species.

B. Savanna forest at Snake Creek (Marataka R.), 3 plots of 1000 m² and 17 plots of 100 m², total area 4700 m².

– Number of species: 46 (see also fig. 2).

– Soil: white to brownish white, coarse sand.

– Leading trees: *Eperua falcata* (*walaba*), *Catostemma fragrans* (*barmani*), *Aspidosperma excelsum* (*zwart parelhout*), and *Eschweilera corrugata* (*oemabarklak*).

– Shrub-layer: many saplings of *Eperua falcata*, *witte gawetri* (Sapindacea

sp.), *Matayba opaca*, *Aspidosperma excelsum*, *Catostemma fragrans*, and *Ocotea schomburgkiana*; palms abundant, a.o. *Astrocaryum sciophilum* (*boegroemaka*), *Oenocarpus bacaba* (*koemboe*), *nanai-maka* (*Bactris* vs. *humilis*), and *Attalea maripa* (*maripa*).

– Herb layer: poor in species, mainly *paloeloe* (*Heliconia sp.*), *masoesa* (*Renealmia* sp.), *Bromelia alta* L. B. Smith, *warimbo* and *pagara-wiwiri* (Marantaceae spp.).

The percentages of the leading trees in two grouped size classes are:

	All trees >10 cm diameter	All trees >40 cm diameter
Eperua falcata	21.8	62.5
Catostemma fragrans	10.5	–
Aspidosperma excelsum	9.8	–
Eschweilera corrugata	8.3	–

The percentage of 62.5 for *Eperua falcata* in the larger diameter-class is surprisingly high when compared with the 0% and 2.5% in the same class of both samples at Winana Creek .

An arrangement of the trees by families gives following percentages:

Papilionaceae	24%	Lauraceae	7%
Apocynaceae	15%	Sapindaceae	5%
Chrysobalanaceae	13%	Sapotaceae	4%
Bombacaceae	11%	Myrtaceae	3%
Lecythidaceae	9%	Remaining fam.	9%

There are three important differences with the Winana Creek savanna forest A II:

1. the much lower percentage of Papilionaceae (24 versus 45%), due to the absence of *Dimorphandra conjugata*.
2. a rather high percentage for Chrysobalanaceae (13 versus 5%).
3. a much higher percentage for Lecythidaceae (9 versus 3%).

This forest is still more related to the Guyanan *Walaba* forest than the Winana Creek forest described under A II. According to DAVIS & RICHARDS (1934), the *Walaba* forest has a wide distribution in the coastal region and interior of Guyana, and in Suriname.

C. Savanna forest at Paris Jacob Creek (Nickerie R., west bank), 5 plots of 100 m², total area 500 m².

– Number of species: 18.

– Soil: white to light brown, coarse sand, covered with a humous layer ca 10 cm thick.

– Leading trees: *Catostemma fragrans* (*barmani*), *Aspidosperma excelsum* (*zwart parelhout*), and *Licania micrantha* (*grootbladige zwarte foengoe*).

– Shrub layer: saplings of *Catostemma fragrans*, *Ocotea schomburgkiana*, and *apra-oedoe* (*Pouteria* sp.); *Rhabdodendron amazonicum*; few palms, all belonging to *Astrocaryum sciophilum* (*boegroe-maka*).

– Herb layer: poor in species, *Bromelia alta* L. B. Smith, Marantaceae spp., *kleine paloeloe* (*Heliconia* sp.).

This forest has some of the leading trees in common with the preceeding savanna forest vegetations, namely *Catostemma fragrans*, *Aspidosperma excelsum*, and *Licania micrantha*; *Eperua falcata*, however, is completely absent.

D. Savanna forest at Kamisa falls (Nickerie R., west bank), 10 plots of 100 m², total area 1000 m².
– Number of species: 27.
– Soil: light brown, loamy sand, occasionally with ferrite gravel.
– Leading trees: *Parinari campestris* (*rode foengoe*), *Chaetocarpus schomburgkianus* (*fomang*), and *Humiria balsamifera* (*meri*).
– Shrub layer: *Clusia fockeana*, *Bombax flaviflorum*, *mispel* (Melastomatacea sp.), *Humiria balsamifera*, *Rhabdodendron amazonicum*, *Palicourea guianensis*, and *Coccoloba* sp; palms rather frequent, especially *Oenocarpus bacaba* (koemboe).

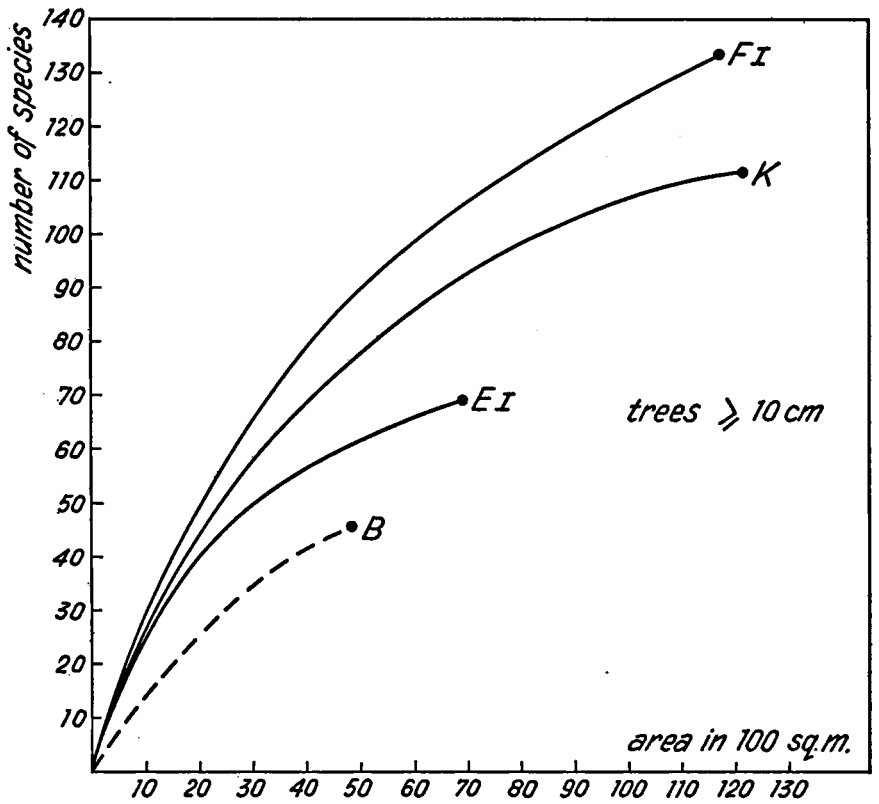

Fig. 2. Species/area curves of rain and savanna forest in western Suriname for trees of 10 cm in diameter or over. Abbreviations: FI (Snake Creek, rain forest); K (Blanche Marie falls, upland rain forest); EI (Winana Creek, Walaba-Parelhout rain forest); B (Snake Creek, savanna forest).

– Herb layer: poor in species, *paloeloe* (*Heliconia* sp.), *Scleria bracteata* Cav., and *warimbo* (Marantaceae sp.).

This forest totally differs from the four just discussed. It forms a transition to the local savanna wood, which may be demonstrated by savanna wood elements like *Bombax flaviflorum*, *Coccoloba* sp., *Clusia fockeana*, and *Scleria bracteata*.

RAIN FOREST

E I. Rain forest at Winana Creek (Corantijn R.) (see table 2), 2 plots of 1000 m² and 48 plots of 100 m², total area 6800 m².

– Number of species: ca 70.

– Soil: dark brown to white sand.

TABLE 2

Walaba-Parelhout forest at Winana Creek (Corantijn R.) Trees > 10 cm diameter in an area of 6800 m².

Species	Diameter class in cm					Total number of trees	Number of trees per ha.
	10–20	20–31	31–41	41–61	> 61		
Eperua falcata	31	16	8	3	2	60	88
Aspidosperma excelsum	17	6	9	10	1	43	63
Eschweilera corrugata	12	4	1	2	–	19	28
Bocageopsis multiflora var. *multiflora*	16	2	–	–	–	18	26
Catostemma fragrans	8	5	–	1	–	14	20
Licania stricta	10	3	1	–	–	14	20
Licania ovalifolia	3	2	4	1	–	10	15
Couepia guianensis	6	2	1	–	–	9	13
tingimoni (*Protium polybotryum* and *P.* vs. *insigne*)	6	2	–	–	–	8	12
Toulicia pulvinata	6	2	–	–	–	8	21
Gustavia hexapetala	7	1	–	–	–	8	12
rode bosgujave (*Myrtaceae* spp.)	6	1	–	–	–	7	10
bosmangro (*Tovomita choisyana* and/or *T. carinata*)	6	–	–	–	–	6	9
switi boontje (*Inga* spp.)	4	1	1	–	–	6	9
apra-oedoe (*Pouteria* spp.)	4	1	–	–	–	5	7
Licania apetala	5	–	–	–	–	5	7
Loxopterygium sagotii	3	2	–	–	–	5	7
Chaetocarpus schomburgkianus	3	–	1	–	–	4	6
hoogland manbarklak (*Eschweilera* sp.)	2	2	–	–	–	4	6
Goupia glabra	1	1	2	–	–	4	6
Trattinickia demerarae	2	–	–	1	–	3	4
50 other species	51	19	9	7	1	87	128
Total	209	72	37	25	4	347	510

– Dominant trees: *Eperua falcata* (*walaba*) and *Aspidosperma excelsum* (*zwart parelhout*).
– Shrub layer: few saplings of the leading trees; palms abundant, especially *Oenocarpus bacaba* (*koemboe*), *nanai-maka* (*Bactris* vs. *humilis*), *Attalea sagotii* (*bergi-maripa*), *Astrocaryum sciophilum* (*boegroe-maka*), and *Iriartea exorrhiza* (*inai-prasara*).
– Herb layer: *warimbo* (Marantaceae spp.), *kleine paloeloe* (*Heliconia* sp.) *Renealmia floribunda* K. Sch. (*masoesa*), and *Mapania macrophylla* (Boeck.) K. Sch. (*hoogland anansi-wawai*).

TABLE 3

Zwart Parelhout forest at Winana Creek (Corantijn R.) Trees > 10 cm diameter in an area of 9000 m².

Species	Diameter class in cm					Total number of trees	Number of trees per ha.
	10–20	20–31	31–41	41–61	> 61		
Aspidosperma excelsum	67	16	17	20	7	127	141
apra-oedoe (*Pouteria* sp.)	23	4	–	–	–	27	30
Eschweilera corrugata	21	4	–	–	–	25	28
Goupia glabra	6	7	6	4	–	23	26
Licania stricta	19	3	–	–	–	22	24
Bocageopsis multiflora var. *multiflora*	15	3	–	–	–	18	20
Licania apetala	9	4	1	1	–	15	17
Rhabdodendron amazonicum	15	–	–	–	–	15	17
Casearia macrophylla	10	3	–	–	–	13	14
tingimoni (*Protium polybotryum* and *P.* vs. *insigne*)	11	2	–	–	–	13	14
Catostemma fragrans	7	2	3	–	–	12	13
rode bosgujave (Myrtaceae sp.)	9	1	1	–	–	11	12
Couepia guianensis	9	1	–	–	–	10	11
Parinari campestris	5	2	1	–	–	8	9
marmeldoos (*Duroia* sp. or *Amajoua* sp.)	7	–	–	–	–	7	8
switi boontje (*Inga* spp.)	3	3	1	–	–	7	8
Casearia javitensis	6	–	–	–	–	6	7
Manilkara bidentata	1	–	1	2	2	6	7
Trattinickia demerarae	4	1	–	1	–	6	7
Gustavia hexapetala	5	1	–	–	–	6	7
Eschweilera subglandulosa	5	–	–	–	–	5	6
Chaetocarpus schomburgkianus	3	1	–	–	–	4	4
78 other species	109	23	9	13	3	157	174
Total	369	81	40	41	12	543	603

There were two dominant tree species in this forest, namely *Eperua falcata* and *Aspidosperma excelsum*, together forming ca 30% of all trees with a diameter of 10 cm or over. Therefore, this forest may be called *Walaba-Parelhout* forest.

The maximum diameter recorded in this area was 90 cm for *Diplotropis purpurea* and *pakoeli* (*Rheedia* sp. or *Platonia* sp.).

The leading families (see also table 10) were Papilionaceae (19%), Apocynaceae (13%), and Chrysobalanaceae (11%).

The *Walaba-Parelhout* forest is intermediate between the savanna forest A II and the next forest type (*Zwart Parelhout* forest). The number of species of the *Walaba-Parelhout* forest takes an intermediate position between that of savanna forest and that of rain forest, as can be concluded from the species/area curve in fig. 2.

Its floristic composition was different from that of any other rain forest type recorded for Suriname, Guyana, or Brazil; it was somewhat related only to Guyanan rain forests, having in common *Aspidosperma excelsum* and *Bocageopsis multiflora* var. *multiflora*.

E II. Rain forest at Winana Creek (Corantijn R.) (see table 3), 4 plots of 1000 m² and 50 plots of 100 m², total area 9000 m².
- Number of species: ca 100.
- Soil: light to dark brown, or brownish sand.
- Dominant tree: *Aspidosperma excelsum* (*zwart parelhout*)
- Shrub layer: few saplings of the leading trees; palms abundant, a.o. *Oenocarpus bacaba* (*koemboe*), *Astrocaryum sciophilum* (*boegroe-maka*), *nanai-maka* (*Bactris* vs. *humilis*), *Attalea sagotii* (*bergi-maripa*), and *Iriartea exorrhiza* (*ingi-prasara*).
- Herb layer: *warimbo* (Marantaceae spp.), *kleine paloeloe* (*Heliconia* sp.), *Renealmia floribunda* K. Sch. (*masoesa*), and *Mapania macrophylla* (Boeck.) K. Sch. (*hoogland anansi-wawai*).

As can be seen from table 3, *Aspidosperma excelsum*, the black and deeply fluted trunks of which give a very typical aspect to this forest, was strongly dominant; for that reason it is here called *Zwart Parelhout* forest. *Goupia glabra* was represented in one 1000 m² plot by 17 trees, but in the remaining plots (8000 m²) only by 6 trees. The abundance of *Goupia glabra*, which is a strongly light-demanding species, is an indication for a former disturbance of the vegetation of this plot.

The largest diameters in this forest were 80–90 cm for *Manilkara bidentata*, *Hymenaea courbaril*, and *Aspidosperma excelsum*.

The Apocynaceae were strongly dominant in this forest with a percentage of 28% (see table 10); besides, the Chrysobalanaceae (12%), Sapotaceae (9%), and Lecythidaceae (8%) belong to the leading families. Some differences with the *Walaba-Parelhout* forest were the low percentage of Papilionaceae (2% versus 19%), and the higher percentages of Apocynaceae (28% versus 13%) and Sapotaceae (9% versus 4%).

Many of the leading species were also met with in the *Walaba-Parelhout* forest, namely *Aspidosperma excelsum*, *Eschweilera corrugata*, *Bocageopsis multiflora* var. *multiflora*, *Licania stricta*, and *Catostemma fragrans*. A striking difference, however, was the complete absence of *Eperua falcata*.

The floristic composition of this forest could not be well compared with that of any other from Guyana, Suriname, or Brazil. It showed only some resemblance to the *Goupia-Swartzia-Aspidosperma* assemblage of evergreen seasonal forest as has been described for Guyana by FANSHAWE (1952) with which it had in common *Goupia glabra* and *Aspidosperma excelsum*.

F I. Rain forest at Snake Creek (Marataka R.) (see table 4), 5 plots of 1000 m² and 75 plots of 100 m², total area 12.500 m².
– Number of species: ca 135.
– Soil: brown, loamy sand.
– Leading trees: *Aspidosperma excelsum* (*zwart parelhout*), *Chaetocarpus schomburgkianus* (*fomang*), and *hoogland-manbarklak* (*Eschweilera* sp.).
– Shrub layer: mayn saplings of the leading trees, *Hirtella* sp., *wanapisi* (Lauracea sp.), *apra-oedoe* (*Pouteria* spp.), *gawetri* (Sapindaceae spp.), *zwarte foengoe* (*Licania stricta* and *Licania micrantha*); *Astrocaryum sciophilum* (*boegroe-maka*) abundant, other palms like *nanai-maka* (*Bactris* vs. *humilis*) and *Oenocarpus bacaba* (*koemboe*) rare.
– Herb layer: *Rapatea paludosa* Aubl. (*anansi-wawai*), *kleine paloeloe* (*Heliconia* sp.), *warimbo* (*Marantaceae* spp.) *dagoe-alesi* (*Ichnanthus* sp.), and *Renealmia floribunda* K. Sch. (*masoesa*).

The two leading species of this forest, namely *Aspidosperma excelsum* and *Chaetocarpus schomburgkianus*, together represented nearly 20% of all trees with a diameter of 10 cm or over.

The largest diameter recorded in this area was 110 cm for *Dipteryx odorata*.

The leading families (see table 10) were Apocynaceae and Lecythidaceae (both 12%), Euphorbiaceae (10%), and Chrysobalanaceae (9%). Remarkable was the relatively high percentage of Euphorbiaceae, due to the large number of trees of *Chaetocarpus schomburgkianus*; in the two Winana Creek rain forest samples this family did not reach more than 2%. Another conspicuous feature is the relatively low percentage of Papilionaceae, namely 6%.

This forest is closely related to both Winana Creek rain forests, sharing the following species: *Aspidosperma excelsum*, *Bocageopsis multiflora* var. *multiflora*, *Licania stricta*, *switi boontje* (*Inga* spp.), etc. Some floristic differences are the high percentage of *Chaetocarpus schomburgkianus*, the presence of *ijzerhart* (*Swartzia* sp.), and the low percentage of *Eschweilera corrugata*.

The number of species in this forest is very high when compared with that of the other rain forest types studied (see fig. 2).

F II. Rain forest at Snake Creek (Marataka R.), (see table 5), one plot of 1000 m² and 9 plots of 100 m², total area 1900 m².
– Number of species: 28.
– Soil: greyish to brown, loamy sand.
– Dominant trees: *Ocotea rodiaei* (*Demerara-groenhart*) and *Mora gonggrijpii* (*moraboekea*).

TABLE 4

Rain forest at Snake Creek (Marataka R.). Trees > 10 cm diameter in an area of 12.500 m².

Species	Diameter class in cm					Total number of trees	Number of trees per ha.
	10–20	20–31	31–41	41–61	> 61		
Aspidosperma excelsum	20	16	15	13	1	65	52
Chaetocarpus schomburgkianus	26	12	6	2	–	46	37
hoogland-manbarklak (*Eschweilera* sp.)	22	5	1	1	–	29	23
Licania stricta	18	2	1	–	–	21	17
Eperua falcata	7	3	3	4	1	18	14
Gustavia hexapetala	15	–	–	–	–	15	12
switi boontje (*Inga* spp.)	10	2	1	–	–	13	10
Bocageopsis multiflora var. *multiflora*	9	3	–	–	–	12	10
Ocotea glomerata	12	–	–	–	–	12	10
Cordia laevifrons	8	3	–	–	–	11	9
apra-oedoe (*Pouteria* spp.)	9	1	–	–	–	10	8
Licania micrantha	7	2	–	1	–	10	8
Eschweilera poiteaui	4	2	2	1	–	9	7
ijzerhart (*Swartzia* sp.)	4	2	–	3	–	9	7
Goupia glabra	4	–	1	2	1	8	6
Eschweilera corrugata	4	2	2	–	–	8	6
Protium neglectum	7	1	–	–	–	8	6
srébébé (*Iryanthera paraënsis* or *I. hostmannii*)	8	–	–	–	–	8	6
Tetragastris hostmannii	–	4	3	1	–	8	6
Loxopterygium sagotii	4	2	1	–	–	7	6
Rhabdodendron amazonicum	7	–	–	–	–	7	6
Virola melinonii	–	3	2	2	–	7	6
113 other species	155	48	27	18	3	251	201
Total	360	113	65	48	6	592	474

– Shrub layer: many saplings of the dominant trees; *Astrocaryum sciophilum* (*boegroe-maka*) infrequent.

– Herb layer: only *Rapatea paludosa* Aubl. (*anansi-wawai*) and *dagoe-alesi* (*Ichnanthus* sp.).

The two dominant species, *Ocotea rodiaei* and *Mora gonggrijpii*, together accounted for nearly 50% of all trees > 10 cm in diameter. Their percentages in some diameter classes are given below:

	10–20 cm	20–40 cm	>40 cm
Ocotea rodiaei	1	56	40
Mora gonggrijpii	23	16	30

Ocotea rodiaei is almost completely restricted to Guyana (see also p. 289). It has also been recorded from Suriname and Venezuela, but in both countries near the Guyanan frontier.

TABLE 5

Demerara-groenhart forest at Snake Creek (Marataka R.). Trees >10 cm diameter in an area of 1900 m².

Species	Diameter class in cm					Total number of trees	Number of trees per ha.
	10–20	20–31	31–41	41–61	> 61		
Ocotea rodiaei	1	14	10	4	–	29	152
Mora gonggrijpii	17	4	3	2	1	27	142
Goupia glabra	14	–	–	–	–	14	74
Palicourea guianensis	7	–	–	–	–	7	37
Tapirira guianensis	3	1	1	–	–	5	26
Aspidosperma excelsum	2	2	1	–	–	5	26
srébébé (*Iryanthera paraënsis* or *I. hostmannii*	4	–	–	–	–	4	21
Catostemma fragrans	2	1	–	–	–	3	16
hoogland-manbarklak (*Eschweilera* sp.)	3	–	–	–	–	3	16
Alchornea triplinervia var. *laevigata*	2	1	–	–	–	3	16
Dendrobangia boliviana	2	–	1	–	–	3	16
Eperua falcata	2	–	1	–	–	3	16
tingimoni (*Protium* sp.)	2	–	–	–	–	2	10
granboesi-papaja (*Pourouma* sp.)	1	–	–	–	–	1	5
Rhabdodendron amazonicum	1	–	–	–	–	1	5
13 other species	10	3	–	3	–	16	84
Total	73	26	17	9	1	126	633

This forest type is related to the Guyanan *Greenheart* forest as has been described by DAVIS & RICHARDS (1934); it has in common with that forest type *Ocotea rodiaei*, *Goupia glabra*, *Aspidosperma excelsum*, *srébébé* (*Iryanthera* sp.), *Catostemma fragrans*, and *Eperua falcata*. The subdominant trees of the Guyanan *Greenheart* forest, however, are different i.e. *Pentaclethra macroloba*, *Eschweilera sagotiana*, and *Licania venosa*. There is also a difference in the diameter of *Ocotea rodiaei* between this Snake Creek forest and the *Greenhaert* forest of DAVIS & RICHARDS. In the latter 60% of all *greenhearts* had a diameter over 61 cm, but in the former not a single tree reached such a diameter!

G I. Rain forest at Paris Jacob Creek (Nickerie R., west bank) (see table 6), 5 plots of 1000 m² and 35 plots of 100 m², total area 8500 m².
– Number of species: ca 100.
– Soil: light brown to dark brown, loamy sand (rarely black clay).
– Elevation: 0–100 m.
– Leading trees: *Aspidosperma excelsum* (*zwart parelhout*), *Leonia glycycarpa* (*taja-oedoe*), and *Eperua falcata* (*walaba*).
– Shrub layer: many saplings of *switi boontje* (*Inga* spp.), *Licania stricta*, *tingimoni* (*Protium* spp.), *Leonia glycycarpa*; *lele-tiki* (*Rinorea* spp.);

TABLE 6

Rain forest at Paris Jacob Creek (Nickerie R., west bank). Trees > 10 cm in diameter in an area of 8500 m².

Species	Diameter class in cm					Total number of trees	Number of trees per ha.
	10–20	20–31	31–41	41–61	> 61		
Aspidosperma excelsum	11	2	3	15	6	37	44
Leonia glycycarpa	31	–	–	–	–	31	36
Eperua falcata	12	8	5	4	–	29	34
switi boontje (*Inga* spp.)	13	4	–	–	–	17	20
Eschweilera corrugata	10	3	1	–	–	14	16
hoogland-bébé (*Pterocarpus* sp.)	4	7	–	1	–	12	14
kototiki (*Simaba cedron* and/or *Mabea piriri*)	12	–	–	–	–	12	14
Rheedia benthamiana	11	–	–	–	–	11	13
Licania apetala	6	4	1	–	–	11	13
ijzerhart (*Swartzia* sp.)	7	–	1	1	–	9	11
tingimoni (*Protium* spp.)	9	–	–	–	–	9	11
Eschweilera odora	7	–	1	–	–	8	9
Parinari campestris	3	1	–	4	–	8	9
Tetragastris hostmannii	4	2	2	–	–	8	9
Chaetocarpus schomburgkianus	1	2	3	1	–	7	8
Eschweilera subglandulosa	4	2	1	–	–	7	8
Licania micrantha	3	2	2	–	–	7	8
Licania stricta	4	2	–	–	–	6	7
jari-jari (*Annonaceae* spp.)	5	1	–	–	–	6	7
lele-tiki (*Rinorea* spp.)	6	–	–	–	–	6	7
apra-oedoe (*Pouteria dura* 11012 a.o.)	5	–	–	–	–	5	6
manletter (*Moraceae* spp.)	3	2	–	–	–	5	6
Jacaranda copaia	3	2	–	–	–	5	6
zwarte pisi (*Lauraceae* spp.)	3	2	–	–	–	5	6
76 other species	86	47	24	16	4	177	208
Total	263	93	44	42	10	452	504

Astrocaryum sciophilum (*boegroe-maka*) and *Attalea maripa* (*maripa*) frequent.

– Herb layer: *warimbo* (Marantaceae spp.), *dagoe-alesi* (*Ichnanthus* sp.),

The maximum diameter was rceorded for a tree of *ingi-pipa* (*Couratari* sp.) with 95 cm.

The leading family (see table 10) is Papilionaceae (17%), followed by Apocynaceae and Chrysobalanaceae (both 10%), Violaceae and Lecythidaceae (both 9%). Especially the percentage of Violaceae is surprisingly high.

This forest resembles the rain forests of the Winana Creek and Snake Creek very much; it shares the following species: *Aspidosperma excelsum*, *Eperua falcata*, *Eschweilera corrugata*, and *switi boontje* (*Inga* spp.). A

difference is the presence of *Leonia glycycarpa* and the rather high percentage of *hoogland-bébé* (*Pterocarpus* sp.).

G II. Rain forest at Paris Jacob Creek (Nickerie R., east bank) (see table 7), 3 plots of 1000 m² and 23 plots of 100 m², total area 5300 m².
– Number of species: 88.
– Soil: light brown to dark brown, loamy sand.
– Leading trees: *switi boontje* (*Inga* spp.), *Cordia laevifrons* (*hoogland-tafrabon*).
– Shrub layer: saplings of *Licania stricta*, *hoogland-bébé* (*Pterocarpus* sp.), and *jari-jari* (Annonaceae spp.); *lele-tiki* (*Rinorea* spp.); lianas rather frequent, a.o. *sekrepatoe-trapoe* (*Bauhinia* sp.); palms frequent, a.o. *Astrocaryum sciophilum* (*boegroe-maka*) and *Attalea maripa* (*maripa*).

TABLE 7

Rain forest ar Paris Jacob Creek (Nickerie R., east bank). Trees > 10 cm diameter in an area of 5300 m².

Species	Diameter class in cm					Total number of trees	Number of trees per ha.
	10–20	20–31	31–41	41–61	> 61		
switi boontje (*Inga* spp.)	8	3	–	–	–	12	23
Cordia laevifrons	9	1	–	–	–	10	19
Eschweilera corrugata	3	1	4	2	–	10	19
Eschweilera subglandulosa	5	2	–	–	–	7	13
granboesi-papaja (*Pourouma laevis* and *P. minor*)	–	4	3	–	–	7	13
Carapa guianensis	5	2	–	–	–	7	13
Eperua falcata	1	1	1	4	–	7	13
kototiki (*Simaba cedron* and/or *Mabea piriri*)	7	–	–	–	–	7	13
Guarea kunthiana	3	3	–	–	–	6	11
Matayba opaca	6	–	–	–	–	6	11
Tetragastris hostmannii	4	2	–	–	–	6	11
Tetragastris altissima	3	3	1	2	–	6	11
njamsi-oedoe (*Nyctaginaceae* spp.)	5	–	–	–	–	5	9
prasara-oedoe (*Guapira* sp.)	4	–	1	–	–	5	9
okro-oedoe (*Sterculia* spp.)	3	1	1	–	–	5	9
boroma (*Pourouma* sp.)	2	3	–	–	–	5	9
ingi-pipa (*Couratari* sp.)	2	–	–	–	2	4	8
Gustavia hexapetala	3	1	–	–	–	4	8
hoogland-bébé (*Pterocarpus* sp.)	3	1	–	–	–	4	8
Leonia glycycarpa	4	–	–	–	–	4	8
boegoe-boegoe (*Swartzia* sp.)	2	1	1	–	–	4	8
Licania stricta	1	–	3	–	–	4	8
tingimoni (*Protium* spp.)	4	–	–	–	–	4	8
Aspidosperma excelsum	–	–	–	3	–	3	6
64 other species	60	26	14	11	6	117	221
Total	144	55	29	23	8	259	489

– Herb layer: *warimbo* and *pagara-wiwiri* (Marantaceae spp.), and *kleine paloeloe* (*Heliconia* sp.).

The most remarkable floristic feature of this forest type was the very low number of trees of *Aspidosperma excelsum* (6 trees/ha versus 43 trees/ha at the west bank).

The maximum diameter was recorded for *ingi-pipa* (*Couratari* sp.) with 170 cm!

The leading families (see table 10) were Lecythidaceae (12%), Papilionaceae (11%), Mimosaceae, Meliaceae, and Burseraceae (all 7%). A large difference with the rain forests of Snake Creek and Winana Creek was the very low percentage of Apocynaceae (3%), and the comparatively high percentages of Meliaceae, Burseraceae, and Moraceae (6%).

This forest is closely allied to the forest at the west bank of the Paris Jacob Creek, sharing trees as *Eperua falcata*, *Eschweilera corrugata*, *Eschweilera subglandulosa*, *switi boontje* (*Inga* spp.), etc. The only large difference is the low percentage of *Aspidosperma excelsum*, as already mentioned above.

(To be continued)