COMPARISON OF THE WOODY STRUCTURE IN A REGRESSIVE ZAMBEZIAN SUCCESSION, WITH EMPHASIS ON HIGH TERMITARIA VEGETATION (LUISWISHI, SHABA, ZAÏRE)

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COMPARISON OF THE WOODY STRUCTURE IN A REGRESSIVE ZAMBEZIAN SUCCESSION, WITH EMPHASIS ON HIGH TERMITARIA VEGETATION (LUISWISHI, SHABA, ZAÏRE) ([1])

BY

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ABSTRACT. – From the comparison of the vegetation developed on high termite mounds in Upper Shaba in dry evergreen forest, woodland and wooded savanna environment arises the fact that the first vegetation type possesses the largest number of peculiar woody plants. Basal area shows weak differences (31.1 to 24.3), highest figures occuring in woodland where three tree species are easily dominant : *Haplocoelum foliolosum, Combretum collinum* and *Boscia corymbosa.* The global synthesis at the three biotopes level confirms that basal area is a useful approach towards their distinction. The Luiswishi wooded savanna is distinguishable from Western and Southern African wooded savannas by a greater species diversity and especially by the greater number of main woody species. Available ground water and above all fire are the main driving forces controlling the evolution of Upper-Shaban vegetation.

RÉSUMÉ. – *Comparaison de la structure ligneuse dans une série régressive zambézienne, en particulier de la végétation établie sur les hautes termitières (Luiswishi, Shaba, Zaïre).* – La comparaison de la végétation observée sur les hautes termitières au Shaba méridional en forêt dense sèche, en forêt claire et en savane boisée montre que le premier milieu présente le nombre d'essences propres le plus élevé. La surface terrière est dans l'ensemble peu variable (31,1 à 24,3), les valeurs les plus élevées étant notées en forêt claire où dominent nettement trois espèces : *Haplocoelum foliolosum, Combretum collinum* et *Boscia corymbosa.* La synthèse globale au niveau de ces trois milieux confirme que la surface terrière constitue une critère utile pour leur distinction. La savane boisée de la Luiswishi se distingue des savanes boisées ouest-africaines et sud-africaines par une plus grande diversité spécifique et surtout par le plus grand nombre d'espèces ligneuses importantes. Les réserves en eau du sol et surtout le feu sont les facteurs fondamentaux orientant l'évolution de la végétation au Shaba méridional.

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INTRODUCTION

The observations made in Shaba by several authors (SCHMITZ 1950, DELVAUX 1958, SYMOENS & BINGEN-GATHY 1959) and in Zambia (WHITE 1968) show, as recalled by MENAUT (1983), that fire control greatly modifies the structure of the miombo woodland. The herbaceous layer disappears and the woody understorey develops, leading to a dense dry forest (FANSHAWE 1969, MALAISSE 1984). But these changes are slow. It is noteworthy that TRAPNELL (1959) found that the canopy remained unaltered and still characteristic of a miombo woodland, after being protected from fire for twenty consecutive years. It took almost thirty years for the miombo dominants to die and their saplings to be suppressed by the vigorous evergreen thicket growth (WHITE 1968). DELEVOY (1938) found, in miombo, that the shoot density of woody plants initially increased but soon declined rapidly.

The change from wooded savanna to woodland is also slow as indicated by several comments dealing with the Zambezian region. BOALER & SCIWALE (1966) found that the basal area of trees ($\geqslant$ 5 cm diameter at 130 cm above ground level) increased as follows :

years since cultivation	10	20	25	50	100	mature miombo
basal area ($m^2 . ha^{-1}$)	1	2	2	8	12	14

Similar results (basal area of 14 after c. 50 years) were observed by STRANG (1974) in Zimbabwe. LAWTON (1978), from observations brought out in north-eastern Zambia, was able to describe the basic dynamic patterns of the vegetation, by identifying four broad ecological species-groups. Species of the chipya group develop small patches of canopy that favour the establishment of the *Uapaca* group, which in turn protects the regeneration of the *Brachystegia-Julbernardia* woodland canopy or the evergreen forest canopy. This colonization process does not take place at uniform speed and several authors have noted, as well for Western Africa as for Southern Africa, the existence of sharp accelerations in the species richness and density evolution.

Thus, several authors recognize the existence of successions in the Zambezian Region vegetation. The usual steps of the regressive series are dry evergreen forest, woodland, wooded savanna, tree to shrub savanna and grassy savanna. The woody vegetation of the three first types of this serie has been compared in an earlier study (MALAISSE 1982) based on normal upland vegetation and ignoring the high termitaria. The present paper analyses this last aspect and adds these results to obtain a global synthesis.

STUDY AREA AND METHODS

The Luiswishi plots are situated 28 km NE of Lubumbashi (11°29'05" S and 27°36'10" E) at an altitude of 1208 m. Here, on the same pedological parent material, sandstone of the Kaponda series (SYS & SCHMITZ 1959), three different vegetation types have developed : dry evergreen forest, woodland and wooded savanna (MALAISSE 1973).

The dry evergreen forest belongs to the *Entandrophragmo-Diospyretum hoyleanae*, and is generally considered to be the climax forest on the laterite soils surrounding Lubumbashi.

The Luiswishi woodland is dominated by *Marquesia macroura*, and forms the first stage of climax alteration. It belongs to the *Brachystegio-Marquesietum*. In some places it shows dense dry forest physiognomy whilst in parts of the dry evergreen forest the vegetation is evolving towards a climax under an older *Marquesia*-dominant tree layer. The grass layer of the wooded savanna is dominated by *Loudetia simplex*. Locally, mainly around high termitaria, there are woodland patches which (from the point of view of the woody layer) are similar to the woodland features of the *Marquesia* open forest.

The present study first compares the woody vegetation developed on high termitaria within the three vegetation types. For these we established the density per hectare of the termite mounds, their basal circumference and their total height, as well as that of the uneroded chimney. From these observations the basal areas and volumes (excluding the chimney) are calculated. These measurements cover 25 termite mounts in dry evergreen forest and wooded savanna, and 50 in woodland.

The woody inventory was made on ten termitaria in dry evergreen forest, on 50 termitaria in woodland and on 25 termitaria in the wooded savanna. Detailed analysis gives precise measures of the floristic composition, species density, presence, basal area and ecological characteristics. The woody inventory includes all stems with a diameter equal to or greater than 5 cm at 1.3 m in height. Stems with a diameter less than 5 cm were counted and identified but not taken into account for basal area data. Circumference measurements were facilitated by the absence of buttresses and grooves.

Reference material has been deposited at the Jardin Botanique national de Belgique (BR) at Meise, and duplicates at the Herbarium of Lubumbashi University (LSHI).

Lastly the original results from high termite mounds have been integrated into a global synthesis on the structure of the three vegetation types studied.

RESULTS

High termitaria characteristics

Characteristics measured for the termite mounds on the three vegetation types are resumed in Table 1. At Luiswishi, their density, as well as their mean level area, decreases from the most densely wooded to the most open vegetation. On the other hand, the total height is greatest in woodland, so that the highest individual volumes are found in this environment. The above ground volume per hectare of deplaced earth diminishes greatly from dry evergreen forest places to those in wooded savanna (1133 m^3 per hectare in dry evergreen forest, as against 831 and 387 respectively in woodland and wooded savanna).

Floristic structure

The woody plant inventories of the high termite mound vegetation in the three biotopes is given in Appendix 1 to 3. These results emphasize preliminary remarks already published (Malaisse 1976, 1978a). Comparison of these inventories shows wide differences (Table 2) : 113 different woody species were found on the 85 high termitaria studied, only 13 of which were common to all three types. Table 3 shows that four distribution patterns dominate. These are, in decreasing order of importance, (a) the group of plants the distribution of which is

confined to high termite mounds scattered in dry evergreen forest (31 species) ; (b) species found only on woodland termite mounds (23 species) ; (c) those found on mounds both in the wooded savanna and in woodland ; and lastly (d) those only existing on mounds in wooded savanna.

Figure 1 defines the evolution of the floristic diversity in the three vegetation types in terms of the number of termite mounds inventoried. Dry evergreen forest shows the greatest floristic diversity.

TABLE 1

High termite mound evolution in the regressive series : dry evergreen forest – woodland – wooded savanna (Luiswishi, Upper Shaba)

	Dry evergreen forest	Woodland	Wooded savanna
Number of termite mounds studied	25	50	25
Number of termite mounds per hectare	4.7	3.3	2.5
Mean basal area (m^2)	191.2	174.1	159.9
Mean total height (m)	4.16 ± 1.64	5.05 ± 1.33	3.20 ± 1.15
Mean total height excluding chimney (m)	3.37 ± 1.34	4.17 ± 1.17	2.59 ± 1.07
Individual mean volume (m^3)	241.0	255.8	154.8
Basal area ($m^2.ha^{-1}$)	898.6	565.5	399.6
Aboveground volume, excluding chimney ($m^3.ha^{-1}$)	1133	831	387
Mean basal area of termite mound vegetation			
– m^2/termite mound	0.5076	0.5403	0.3891
– m^2/ha of vegetation concerned	2.3859	1.7559	0.9728
– m^2/ha of termite mound	26.5509	31.0701	24.3437

TABLE 2

Evolution of the composition and basal area ($m^2.ha^{-1}$) of the woody vegetation developped on high termitaria scattered in a regressive series of the Zambezian region : dry evergreen forest – woodland – wooded savanna

	Dry evergreen forest	Woodland	Wooded savanna
1. *Brachystegia spiciformis* var. *schmitzii*	4.5664	0	0
2. *Entandrophragma delevoyi*	2.6862	0	0
3. *Combretum gossweileri*	1.6746	0	0
4. *Sterculia* aff. *tragacantha* (Malaisse 12808)	0.7454	0	0
5. *Aidia micrantha* var. *msonju*	0.6391	0	0
6. *Rubiaceae* (Malaisse 13169)	0.6212	0	0
7. *Diospyros* sp. 2 (Malaisse 13193)	0.5708	0	0
8. *Mimusops zeyheri*	0.5012	0	0
9. *Canthium* sp. 1 (Malaisse 12836)	0.3442	0	0
10. *Albizia adianthifolia*	0.2958	0	0
11. *Elaeodendron buchananii*	0.1663	0	0

	Dry evergreen forest	Woodland	Wooded savanna
12. *Zanha golugensis*	0.1643	0	0
13. *Ritchiea quarrei*	0.0852	0	0
14. *Parinari excelsa*	0.0830	0	0
15. *Canthium gueinzei*	0.0599	0	0
16. *Canthium afzelianum*	0.0587	0	0
17. *Rothmannia whitfieldii*	0.0581	0	0
18. *Ficus artocarpoides*	0.0397	0	0
19. *Diospyros hoyleana* subsp. *hoyleana*	0.0395	0	0
20. *Rawsonia lucida*	0.0361	0	0
21. *Melodorum gracile* subsp. *englerianum*	0.0345	0	0
22. *Sclerocarya birrea*	0.0327	0	0
23. *Ipomoea pharbitiformis*	0.0302	0	0
24. *Opilia celtidifolia*	0.0294	0	0
25. *Phyllanthus* sp. 1 (Malaisse 12685)	0.0266	0	0
26. *Ficus rhodesiaca*	0.0230	0	0
27. *Craterosiphon schmitzii*	0.0224	0	0
28. *Allophylus abyssinicus*	0.0204	0	0
29. *Monanthotaxis schweinfurthii* var. *schweinfurthii*	0.0203	0	0
30. *Sorindeia katangensis*	0.0165	0	0
31. *Uvaria angolensis* var. *angolensis*	0.0111	0	0
32. *Ochna afzelii*	1.4077	0.0374	0
33. *Julbernardia globiflora*	0.6369	0.0485	0
34. *Maytenus heterophylla*	0.3238	0.1954	0
35. *Strychnos lucens*	0.1983	0.0069	0
36. *Ochna puberula*	0.1881	0.0590	0
37. *Cremaspora triflora*	0.0528	0.0248	0
38. *Combretum acutifolium*	0.0438	0.0118	0
39. *Landolphia parvifolia* var. *parvifolia*	0.0148	0.0134	0
40. *Artabotrys monteiroae*	0.0615	0.3138	0
41. *Tarenna neurophylla*	0.0097	0.0737	0
42. *Mystroxylon aethiopicum*	10.0222	0.2240	0.4568
43. *Diospyros lycioides* var. *sericea*	0.7016	0.2650	0.0540
44. *Euclea schimperi*	0.4437	0.0684	0.0380
45. *Combretum celastroides*	0.2528	0.1354	0.1290
46. *Haplocoelum foliolosum*	1.4430	8.3246	1.2308
47. *Combretum collinum*	0.6494	5.5919	0.9683
48. *Boscia corymbosa*	0.1741	4.4566	1.3107
49. *Euphorbia ingens*	0.0143	0.3186	0.0707
50. *Grewia flavescens* var. *flavescens*	0.1113	0.2556	0.0461
51. *Maerua friesii*	0.1525	0.1571	0.0355
52. *Lannea discolor*	0.4026	0.8594	1.9653
53. *Vitex fischeri*	1.5026	1.1243	1.7629
54. *Ziziphus mucronata* subsp. *rhodesica*	0.1757	0.4636	0.5539
55. *Ficus* sp. 3	0	0.5271	0
56. *Diospyros mweroënsis*	0	0.3432	0
57. *Brachystegia spiciformis* var. *latifoliolata*	0	0.3133	0
58. *Pterocarpus angolensis*	0	0.1593	0
59. *Combretum mossambicense*	0	0.1536	0
60. *Hippocratea africana*	0	0.0997	0
61. *Tarenna neurophylla*	0	0.0690	0
62. *Ritchiea* (Malaisse 12461)	0	0.0517	0
63. *Adenia gummifera* var. *gummifera*	0	0.0477	0
64. *Byrsocarpus tomentosus*	0	0.0471	0

	Dry evergreen forest	Woodland	Wooded savanna
65. *Feretia aeruginescens*	0	0.0470	0
66. ?	0	0.0368	0
67. *Baphia capparidifolia* subsp. *bangweolensis*	0	0.0199	0
68. *Erythrococca bongensis*	0	0.0181	0
69. *Bridelia duvigneaudii*	0	0.0152	0
70. *Phyllanthus muellerianus*	0	0.0120	0
71. *Phyllanthus guineensis*	0	0.0113	0
72. *Baphia bequaertii*	0	0.0097	0
73. *Pavetta schumanniana*	0	0.0035	0
74. *Ficus* sp. 4	0	0.0031	0
75. *Diospyros* sp. 1 (Malaisse 12300)	0	0.0024	0
76. *Landolphia kirkii*	0	0.0024	0
77. *Vangueriopsis lancifolia*	0	0.0024	0
78. *Commiphora thermitaria*	0	0.5599	0.4995
79. *Fagara chalybea*	0	0.4752	0.3871
80. *Hymenodictyon parvifolium* subsp. *scabrum* var. *fimbriolatum*	0	0.3834	0.1699
81. *Markhamia obtusifolia*	0	0.1446	0.1002
82. *Azanza garckeana*	0	0.0850	0.0060
83. *Dictyophleba lucida*	0	0.0453	0.0367
84. *Adenia rumicifolia* var. *rumicifolia*	0	0.0386	0.0052
85. *Balanites aegyptiaca*	0	0.4229	1.6664
86. *Combretum molle*	0	0.6663	1.6291
87. *Diplorhynchus condylocarpon* subsp. *mossambicensis*	0	0.2710	1.3440
88. *Pseudolachnostylis maprouneifolia*	0	0.0783	0.9174
89. *Ficus dekdekena*	0	0.4441	0.8232
90. *Allophylus alnifolius*	0	0.6724	0.8060
91. *Parinari curatellifolia*	0	0.0824	0.5309
92. *Cassia singueana*	0	0.0024	0.4422
93. *Lonchocarpus nelsii* subsp. *katangensis*	0	0.0372	0.3503
94. *Erythrina abyssinica*	0	0.0384	0.2513
95. *Steganotaenia araliacea*	0	0.0301	0.2467
96. *Schrebera trichoclada*	0	0.0418	0.1965
97. *Vangueria infausta*	0	0.0075	0.0982
98. *Cissus schmitzii*	0	0.0038	0.0299
99. *Dichrostachys cinerea* subsp. *nyassana*	0	0.0117	0.0129
100. *Pericopsis angolensis*	0	0	1.9646
101. *Albizia antunesiana*	0	0	1.4132
102. *Pterocarpus tinctorius*	0	0	0.3960
103. *Strychnos innocua*	0	0	0.3397
104. *Flacourtia indica*	0	0	0.2891
105. *Securidaca longepedunculata* var. *parvifolia*	0	0	0.1861
106. *Annona senegalensis*	0	0	0.1257
107. *Combretum zeyheri*	0	0	0.0295
108. *Canthium* sp. 2 (Malaisse 12674)	0	0	0.0289
109. *Strychnos spinosa*	0	0	0.0237
110. *Canthium crassum*	0	0	0.0204
111. *Terminalia mollis*	0	0	0.0182
112. *Afzelia quanzensis*	0	0	0.0095
113. *Sterculia quinqueloba*	0	0	0.0070

TABLE 3

Distribution patterns of plants on high termitaria scattered in a regressive succession (Shaban-Zambian domain)

Distribution patterns			Number of species
Dry evergreen forest	Woodland	Wooded savanna	
+++	.	.	31
++	+	.	8
+	++	.	2
+++	++	+	4
+	++	+	6
+	++	+++	3
.	+++	.	23
.	++	+	7
.	+	++	15
.	.	+++	14
Total			113

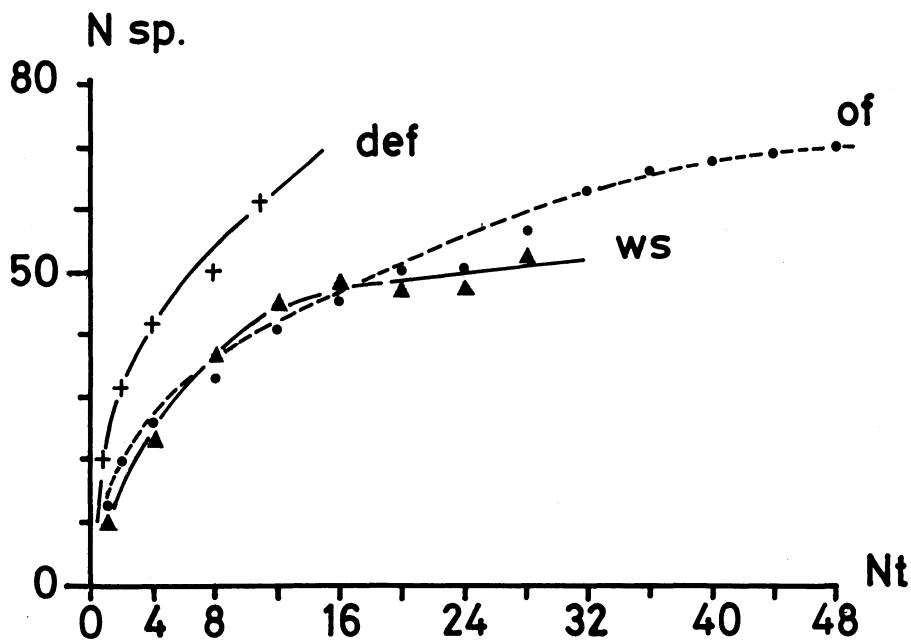

FIG. 1. – Comparison of species richness (N sp) according to the number of termite mounds (N t) sampled (def : dry evergreen forest ; of : woodland ; ws : wooded savanna).

Tree presence and tree density

Appendices 4 to 6 present data on tree presence, whilst tree density is only specified for woodland (Appendix 7), where the inventory takes nearby one hectare into account. Comparison of these data indicates both the existence of a small number of species important in all the biotopes (*Haplocoelum foliolosum, Vitex fischeri* and *Mystroxylon aethiopicum*) and on the other hand of dominant species characteristic of each biotope (*Diospyros hoyleana* for dry evergreen forest, *Diospyros mweroënsis* and *Byrsocarpus tomentosus* for woodland, and *Pericopsis angolensis* for wooded savanna). As far as density is concerned, high termite mound vegetation in woodland is clearly dominated by *Haplocoelum foliosoum,* having nearly 900 stems per hectare of termite mounds.

Total basal area

Detailed results on basal area are shown in Annexes 8 to 10. Table 2 resumes these. Two opposing tendencies are apparent. On the one hand, in woodland, the presence of three dominant species, whose basal area represents 72,9% of the whole should be noted, whilst in the savanna no particular species is dominant.

Floristic and phytomass structure

The floristic and phytomass structure of a stand can simultaneously be expressed by the species-dominance curve (Brunig & Klinge 1976), which represents the contribution of each species to the stand basal area. The species are plotted in order of their contribution in percent of the stand total. The species-dominance of the termite mound vegetation in the three biotopes are shown in Fig. 2. The curve for woodland shows the flattest trend, suggesting that competitive exclusion is weak and that random distribution of ecological niches prevails. This means that distribution is largely governed by chance instead.

Familial Importance Value (FIV)

A Familial Importance Value (FIV) was developed for the woodland termite mound vegetation and values for each family were calculated as follows (Mori *et al.* 1983):

$$\text{FIV} = \frac{\text{number of species in family}}{\text{total number of species}} \text{ (relative diversity)} + \frac{\text{number of trees in family}}{\text{total number of trees}}$$

$$\text{(relative density)} + \frac{\text{basal area of family}}{\text{total basal area}} \text{ (relative dominance)} \times 100$$

The values for the 10 most important families are listed in table 4.

TABLE 4

Familial importance values for the woodland termite mound vegetation

Family	FIV	Number of species	Number of individuals	Basal area (m^2)
1. Sapindaceae	79.8	2	878	8.9970
2. Combretaceae	40.7	4	248	6.4054
3. Capparaceae	28.5	2	187	4.5083
4. Rubiaceae	14.5	5	59	0.9154
5. Euphorbiaceae	14.5	6	57	0.4535
6. Fabaceae	10.3	5	21	0.2645
7. Ebenaceae	9.7	3	46	0.6722
8. Apocynaceae	9.5	4	33	0.3321
9. Celastraceae	8.4	3	32	0.5191
10. Caesalpiniaceae	6.5	3	6	0.3642
11. Remaining families	77.6	23	342	6.0814
Totals	300.0	60	1909	29.5131

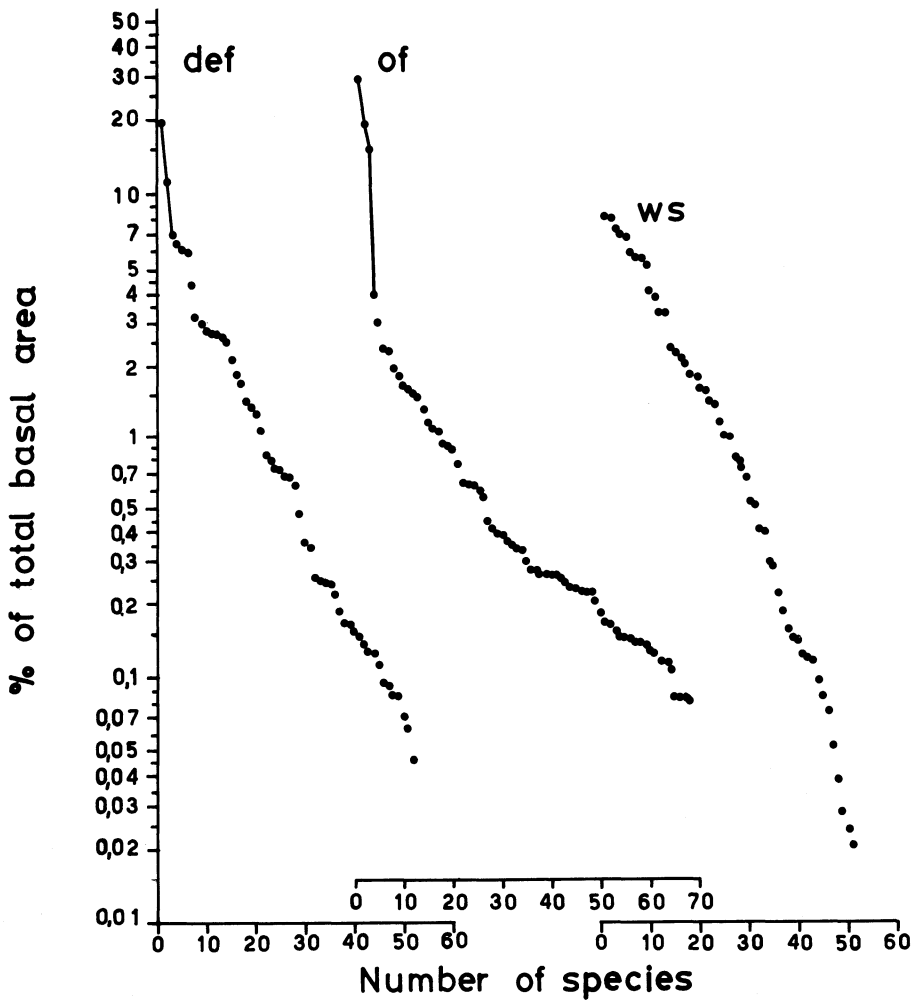

FIG. 2. — Dominance-diversity curves for the Luiswishi site termite mound vegetation (def : dry evergreen forest ; of : woodland ; ws : wooded savanna).

GLOBAL SYNTHESIS

The above-mentioned results which deal with high termitaria may be amalgamated with those based on normal upland vegetation at the same site (MALAISSE 1982) in order to produce a global synthesis of this regressive Zambezian succession. The main features of this succession are presented in table 5. Its analysis permits to ascertain the relative constancy of species diversity for the vegetation developed on the high termite mounds scattered in the three biotopes, contrary to the normal upland vegetation. As far as the basal area is concerned, the global synthesis data fit well in the general system proposed by MALAISSE (1982) for characterizing the Zambezian vegetation types.

TABLE 5

Global characteristics (tree diversity, tree density and basal area) in a Zambezian regressive succession

Vegetation type	Dry evergreen forest	Woodland	Wooded savanna
Area investigated			
Normal upland vegetation (ha)	1	5	5
Termitaria number	10	50	25
ha	0.19	0.87	0.40
Global synthesis (ha)	1.19	5.87	5.40
Species diversity (number trees)			
Normal upland vegetation	67	72	37
Termitaria	53	61	50
Global synthesis	**95**	**112**	**74**
Relative area (%)			
Normal upland vegetation	91.01	94.34	96.00
Termitaria	8.99	5.66	4.00
Stem density ($\geq$ 5 cm DBH . ha^{-1})			
Normal upland vegetation	1463	570	340
Termitaria	2165	2202	1456
Global synthesis	**1526**	**662**	**385**
Basal area (m^2 . ha^{-1})			
Normal upland vegetation	33.68	19.26	4.72
Termitaria	26.55	31.07	24.34
Global synthesis	**33.04**	**19.93**	**5.50**

DISCUSSION

The aim of the present study is to quantify the three major vegetation types of the main regressive series of the Zambezian region from data relating to the woody layers. The specific composition, the stem density and their basal area have been the subject of careful studies which allow several conclusions.

It should first be noted that, if the insertion in the global synthesis of the observations dealing with high termite mounds slightly reduces the contrasts between the three stages, as previously defined, the conclusions established on the basis of normal upland vegetation (MALAISSE 1982) still apply, namely :

	Basal area ($m^2 . ha^{-1}$)
Herbaceous savanna	< 1
Shrub and tree savanna	1 to 5
Wooded savanna	5 to 15
Woodland	15 to 25
«Muhuluteous» woodland	25 to 30
Dry evergreen forest	30 to 40

MALAISSE (1982) has set up a long list giving the number of ligneous stems for diverse tropical woody vegetations. But the data presented generally only deal with stems over 10, or even 20 cm in girth. Such an approach badly fits or is unsuitable for woodland comparisons. On the other hand several inventories carried out in savannas are based on thickness classes measurements taken on diverse heights and which generally do not allow comparisons between sites. We are, on the contrary, well-informed on diversity and relative importance of woody stems in woodlands. For instance, as well for the Guinean shrubby savannas at Lamto as for the South African savanna at Nysvley, four species represent in number of individuals more than 90% of the woody stock (MENAUT 1977, LUBKE *et al.* 1983) and six species make 97% in the shrubby steppe of Fété Olé (BILLE 1977). Data relating to the Luiswishi wooded savanna do not agree with the previous figures. In Shaba indeed the four main woody species only represent 43.2% of the woody stock, and no less than 17 species have to be taken into account in order to reach 90%.

As far as characteristic species are concerned, in the Zambezian wooded savanna at Luiswishi, only twelve woody plant species may be regarded as characteristic of the savanna community, although a total of 37 species has been recorded. These figures agree very well with the data published by LUBKE & THATCHER (1983) for a South African *Burkea africana* savanna at Nysvley, where only eleven woody plant may be regarded as characteristic of the savanna community, although a total of 31 species has been recorded. Only the four dominant woody species (*Burkea africana, Ochna pulchra, Terminalia sericea* and *Strychnos pungens*) are always present. The same authors have followed the fluctuations that occur over a eight years period in the Nysvley savanna. They have found that there is a constant change in the composition, abundance of species and standing crop, the savanna being in a dynamic state. Discussing the problem of savanna vegetational succession in North-Western Nigeria, SANFORD *et al.* (1982) present some evidence indicating that, while girth size class distribution may remain more or less constant, taxonomic composition is apt to vary within each succession. STRANG (1974) also observed floristic changes accompanying changes in density and basal area. *Terminalia sericea* is overflowed after seven years by *Hymenocardia acida*, whilst the main canopy dominants (*Brachystegia* ssp. and *Julbernardia* ssp.) did not become prominent until about twenty years had elapsed. HOPKINS (1983) reviews the succession on African abandoned savanna farms and concludes to the existence of considerable variation related to the severity of the dry season, soil moisture relations and the degree of burning. The same author pitpoints that knowledge of this process comes from many observations in many areas, but in no case all the stages have been observed on the same site. SPICHIGER & LASSAILLY (1981) observed in the region of Béoumi (Central Ivory Coast) that even if anthropic pressure plays an important rôle in vegetation evolution, the forest dynamism still remains latent.

Stability and resilience of savannas, mainly of its most characteristic feature, the woody grass vegetation ratio, have been discussed by WALKER & NOY-MEIR (1982). According to them the structure of African savannas is primarily determined by competition between woody and grass plants for available soil water ; modifying factors being fire, herbivores and soil nutrients. As far as the Luiswishi plots are concerned, available water and fire are fundamental. MALAISSE & KAPINGA (1985) have compared the hydric balance of the three Luiswishi vegetation types. They observed that the substitution of the dry evergreen forest by the woodland produces a clear decrease of the soil water reserves, whilst the next step in environmental degradation, the savanization has less impact on water reserves.

Regarding fire, SANFORD (1982) points out that general reviews on fire ecology are too numerous to list. The same author mentions, of fundamental importance, the works of BARLETT (1955-1957), RAMSAY & ROSE INNES (1963), DAUBENMIRE (1968), RAISON (1979) and BROOKMAN-AMISSAH *et al.* (1980). In miombo woodland the time of burning is an important factor (LAWTON 1978, MALAISSE 1978b) as suggested elsewhere in Africa (MONNIER 1981, DEVINEAU *et al.* 1984, etc.). The fact that severe burning eliminates some species is generally recognized. This is, for instance, emphasized by GELDENHUYS (1977) in a study on savanna communities in Kavango (Namibia). The introduction of fires produced also an increase in the smaller plants as the parent species produced new suckers from the much-branched rootstocks, as observed by LUBKE & THATCHER (1963) in the Nysvley savanna. At the same site, RUTHERFORD (1981) noted that the ratio of new basal shoots to the number of old basal shoots killed by fire was greater than 1 (1.88 in *Ochna pulchra* and 1.30 in *Burkea africana* for instance). For the Guinean shrubby savanna of Lamto, the examination of the girth classes diagram brings out the difficulty for young woody stems to overcome fires (MENAUT 1977). In miombo, BOALER & SCIWALE (1966) found that, between five and fifteen years, fire decreased as the woody plant density increased, then it slowly increased due to competitive thinning of the woody plants until an equilibrium was achieved in mature miombo. Observations carried out in the Luiswishi wooded savanna confirm the above statements and in conclusion, it should be reminded that fire is undoubtedly the greatest controlling factor of the woody species of the African woodland ecosystems.

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Appendix 1

Full inventory of 10 high termitaria (total surface : 0.19 ha) scattered in the Luiswishi dry evergreen forest

Diameter classes (cm)	5.0-9.9	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	50.0-54.9	Total
1. *Entandrophragma delevoyi*	–	–	–	–	–	–	1	1
2. *Brachystegia spiciformis* var. *schmitzii*	13	8	6	2	–	2		31
3. *Julbernardia globiflora*	–	1	–	–	1			2
4. *Combretum gossweileri*	14	5	3	2				24
5. *Haplocoelum foliolosum*	13	7	2	1				23
6. *Sterculia tragacantha*	–	1	–	2				3
7. *Combretum mechowianum*	–	1	1	1				3
8. *Albizia adianthifolia*	1	–	–	1				2
9. *Ochna afzelii*	9	8	4					21
10. *Rubiaceae* (Malaisse 13169)	13	6	1					20
11. *Mystroxylon aethiopicum*	9	4	2					15
12. *Vitex fischeri*	3	2	7					12
13. *Mimusops zeyheri*	5	5	1					11
14. *Diospyros* sp. 2 (Malaisse 13193)	–	5	1					6
15. *Diospyros hoyleana* subsp. *hoyleana*	38	2						40
16. *Aidia micrantha* var. *msonju*	22	4						26
17. *Canthium* sp. 1 (Malaisse 12836)	18	2						20
18. *Combretum celastroides*	15	2						17
19. *Euclea schimperi*	11	5						16
20. *Strychnos lucens*	9	2						11
21. *Maytenus heterophylla*	7	3						10
22. *Zanha golungensis*	3	3						6
23. *Grewia flavescens* var. *flavescens*	5	1						6
24. *Ritchiea* sp. (Malaisse 12802)	5	1						6
25. *Lannea antiscorbutica*	1	4						5
26. *Elaeodendron buchananii*	3	2						5
27. *Boscia corymbosa*	1	2						3
28. *Ochna puberula*	2	1						3
29. *Ziziphus mucronata* subsp. *rhodesica*	–	2						2
30. *Parinari excelsa*	–	1						1
31. *Ficus artocarpoides*	–	1						1
32. *Ritchiea quarrei*	8							8
33. *Rothmannia whitfieldii*	6							6
34. *Cremaspora triflora*	6							6
35. *Artabotrys monteiroae*	5							5
36. *Canthium gueinzei*	5							5
37. *Canthium afzelianum*	4							4
38. *Combretum acutifolium*	3							3
39. *Diospyros lycioides* var. *sericea*	3							3
40. *Melodorum gracile* subsp. *englerianum*	2							2
41. *Rawsonia lucida*	2							2
42. *Allophylus abyssinicus*	2							2
43. *Sclerocarya birrea*	2							2
44. *Craterosiphon schmitzii*	2							2
45. *Opilia celtidifolia*	2							2
46. *Monanthotaxis schweinfurthii* var. *schweinfurthii*	2							1
47. *Landolphia parvifolia*	1							1
48. *Ipomoea pharbitiformis*	1							1
49. *Sorindeia katangensis*	1							1
50. *Phyllanthus* sp. (Malaisse 12685)	1							1
51. *Euphorbia ingens*	1							1
52. *Uvaria angolensis* var. *angolensis*	1							1
53. *Ficus rhodesiaca*	1							1
Total	282	91	28	9	1	2	1	414

APPENDIX 2

Full inventory of 50 high termitaria (total surface: 0.87 ha) scattered in the Luiswishi woodland

Diameter classes (cm)	5.0-9.9	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	55.0-59.9	70.0-74.9	Total
1. *Ficus* sp. 3	1	1	1	1	–	–	–	–	–	–	1	5
2. *Balanites aegyptiaca*	–	–	–	1	–	1	–	–	–	1		3
3. *Boscia corymbosa*	38	31	38	28	7	5	–	1	1			149
4. *Combretum collinum*	30	19	37	34	20	7	2	2				151
5. *Brachystegia spiciformis* var. *latifoliolata*	1	–	1	–	–	–	1	1				4
6. *Haplocoelum foliolosum*	510	184	59	16	11	1	1					782
7. *Vitex fischeri*	10	15	9	4	1	1	2					42
8. *Combretum molle*	6	4	6	7	–	1						24
9. *Lannea discolor*	6	3	4	4	4	2						23
10. *Commiphora thermitaria*	5	9	1	2	3	1						21
11. *Ficus dekdekena*	7	3	4	4	–	1						19
12. *Diospyros mweroënsis*	1	2	–	–	3	1						7
13. *Azanza garckeana*	–	–	–	–	–	1						1
14. *Hymenodyction parvifolium* subsp. *scabrum* var. *fimbriolatum*	21	9	–	–	1							31
15. *Ziziphus mucronata* subsp. *rhodesica*	28	15	7	1								51
16. *Fagara chalybea*	30	14	4	1								49
17. *Mystroxylon aethiopicum*	10	6	2	1								19
18. *Pterocarpus angolensis*	4	2	2	1								9
19. *Parinari curatellifolia*	1	1	1	1								4
20. *Pseudolachnostylis maprouneifolia*	–	–	1	1								2
21. *Julbernardia globiflora*	–	–	–	1								1
22. *Allophylus alnifolius*	76	18	2									96
23. *Euphorbia ingens*	39	5	2									46
24. *Grewia flavescens* var. *flavescens*	31	7	2									40
25. *Diospyros lycioides* var. *sericea*	22	9	1									32
26. *Markhamia obtusifolia*	16	4	1									21
27. *Diplorhynchus condylocarpon* subsp. *mossambicensis*	7	6	5									18
28. *Rubiaceae* (Malaisse 12459)	13	–	1									14
29. *Tarenna neurophylla*	8	3	1									12
30. *Euclea schimperi*	5	1	1									7
31. ?	5	1	1									7

APPENDIX 2 *(continued)*

Full inventory of 50 high termitaria (total surface : 0.87 ha) scattered in the Luiswishi woodland

Diameter classes (cm)	5.0-9.9	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	55.0-59.9	70.0-74.9	Total
32. *Hippocratea africana*	–	1	3									4
33. *Ochna puberula*	–	3	1									4
34. *Ochna afzelii*	2	–	1									3
35. *Lonchocarpus nelsii* subsp. *katangensis*	–	1	1									2
36. *Combretum celastroides*	68	3										71
37. *Ritchiea* (Malaisse 12461)	33	5										38
38. *Dictyophleba lucida*	10	1										11
39. *Artabotrys monteiroae*	5	5										10
40. *Maytenus heterophylla*	7	2										9
41. *Adenia gummifera* var. *gummifera*	8	1										9
42. *Schrebera trichoclada*	5	2										7
43. *Erythrina tomentosa*	1	2										3
44. *Bridelia duvigneaudii*	1	1										2
45. *Dichrostachys cinerea* subsp. *nyassana*	1	1										2
46. *Baphia bequaertii*	–	1										1
47. *Byrsocarpus tomentosus*	11											11
48. *Steganotaenia araliacea*	8											8
49. *Adenia rumicifolia* var. *rumicifolia*	7											7
50. *Baphia capparidifolia* subsp. *bangweolensis*	6											6
51. *Phyllanthus muellerianus*	3											3
52. *Phyllanthus guineensis*	3											3
53. *Landolphia parvifolia* var. *parvifolia*	3											3
54. *Combretum acutifolium*	2											2
55. *Vangueriopsis lancifolia*	1											1
56. *Pavetta schumanniana*	1											1
57. *Cissus schmitzii*	1											1
58. *Erythrococca bongensis*	1											1
59. *Cassia singueana*	1											1
60. *Landolphia kirkii*	1											1
61. *Strychnos lucens*	1											1
Total	1122	401	200	108	50	22	6	4	1	1	1	1916

APPENDIX 3

Full inventory of 25 high termitaria (total surface : 0.40 ha) scattered in the Luiswishi wooded savanna

Diameter classes (cm)	5.0-9.9	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	Total
1. *Balanites aegyptiaca*	5	–	2	1	3	3	–	1	15
2. *Albizia antunesiana*	2	1	2	–	1	2	1	1	10
3. *Pseudolachnostylis maprouneifolia*	2	3	1	2	1	–	–	1	10
4. *Pterocarpus tinctorius*	1	–	–	–	–	–	–	1	2
5. *Boscia corymbosa*	20	11	2	2	1	1	1		38
6. *Pericopsis angolensis*	3	3	8	3	3	2	1		23
7. *Flacourtia indica*	3	1	–	2	1	1	1		9
8. *Parinari curatellifolia*	1	1	–	–	–	1	1		4
9. *Vitex fischeri*	3	5	7	8	1	1			25
10. *Combretum collinum*	5	4	2	5	–	1			17
11. *Lonchocarpus nelsii* subsp. *katangensis*	1	1	–	1	–	1			4
12. *Securidaca longepedunculata* var. *parvifolia*	1	–	–	–	–	1			2
13. *Lannea discolor*	21	11	6	7	3				48
14. *Haplocoelum foliosum*	16	6	4	4	2				32
15. *Diplorhynchus condylocarpon* subsp. *mossambicensis*	12	6	3	5	2				28
16. *Combretum molle*	8	5	3	6	4				26
17. *Strychnos innocua*	8	3	–	–	1				12
18. *Erythrina abyssinica*	3	2	–	–	1				6
19. *Ficus dekdekena*	12	3	4	3					22
20. *Cassia singueana*	2	3	3	1					9
21. *Allophylus alnifolius*	39	7	3						49
22. *Fagara chalybea*	24	4	1						29
23. *Ziziphus mucronata* subsp. *rhodesica*	15	11	1						27
24. *Mystroxylon aethiopicum*	8	4	5						17
25. *Commiphora thermitaria*	2	3	7						12
26. *Schrebera trichoclada*	2	5	1						8
27. *Hymenodyction parvifolium* subsp. *scabrum* var. *fimbriolatum*	3	1	2						6
28. *Annona senegalensis*	3	1	1						5
29. *Stereospermum kunthianum*	1	–	1						2
30. *Steganotaenia araliacea*	13	5							18
31. *Combretum celastroides*	13	1							14
32. *Vangueria infausta*	9	1							10
33. *Euphorbia ingens*	6	1							7
34. *Markhamia obtusifolia*	4	2							6
35. *Diospyros lycioides* subsp. *sericea*	3	1							4
36. *Grewia flavescens* var. *flavescens*	1	1							2
37. *Combretum zeyheri*	–	1							1
38. *Strychnos spinosa*	–	1							1
39. *Euclea schimperi*	–	1							1
40. *Canthium crassum*	–	1							1
41. *Dictyophleba lucida*	5								5
42. *Maerua friesii*	3								3
43. *Cissus schmitzii*	3								3
44. *Dichrostachys cinerea*	2								2
45. *Canthium* sp. 2 (Malaisse 12674)	2								2
46. *Afzelia quanzensis*	1								1
47. *Sterculia quinqueloba*	1								1
48. *Azanza garckeana*	1								1
49. *Adenia rumicifolia* var. *rumicifolia*	1								1
50. *Terminalia mollis*	1								1
Total	295	121	69	50	24	14	5	4	582

APPENDIX 4

Presence of the most frequent woody species for 10 high termitaria scattered in the Luiswishi dry evergreen forest (diameter greater than 5 cm at 1.3 m height)

Mystroxylon aethiopicum	8	*Brachystegia spiciformis* var. *schmitzii*	5
Vitex fischeri	7	*Aidia micrantha* var. *msonju*	5
Haplocoelum foliolosum	7	*Ritchiea* (Malaisse 12461)	4
Diospyros hoyleana subsp. *hoyleana*	7	*Diospyros lycioides* var. *sericea*	4
Rubiaceae (Malaisse 13169)	6	*Maytenus heterophylla*	4
Ochna afzelii	6	*Rothmannia withfieldii*	4
Lannea discolor	5	*Canthium* sp. 1 (Malaisse 12836)	4
Combretum celastroides	5	*Ziziphus mucronata* subsp. *rhodesica*	4
Combretum collinum	5	*Sorindeia katangensis*	4
Combretum gossweileri	5	*Cremaspora triflora*	4

APPENDIX 5

Presence of the most frequent woody species for 50 high termitaria scattered in the Luiswishi woodland (diameter greater than 5 cm at 1.3 m height)

Haplocoelum foliolosum	47	*Hymenodictyon parvifolium* subsp. *scabrum* var. *fimbriolatum*	16
Combretum collinum	40	*Lannea discolor*	16
Boscia corymbosa	35	*Mystroxylon aethiopicum*	15
Allophylus alnifolius	33	*Commiphora thermitaria*	14
Fagara chalybea	25	*Diospyros lycioides* subsp. *sericea*	11
Ziziphus mucronata subsp. *rhodesica*	25	*Rubiaceae* (Malaisse 12459)	11
Grewia flavescens var. *flavescens*	21	*Adenia gummifera* var. *gummifera*	10
Vitex fischeri	20	*Byrsocarpus tomentosus*	10
Ritchiea (Malaisse 12461)	17	*Combretum molle*	9
Euphorbia ingens	16	*Combretum celastroides*	9

APPENDIX 6

Presence of the most frequent woody species for 25 high termitaria scattered in the Luiswishi wooded savanna (diameter greater than 5 cm at 1.3 m height)

Lannea discolor	19	*Commiphora thermitaria*	8
Combretum molle	15	*Combretum collinum*	7
Allophylus alnifolius	15	*Haplocoelum foliolosum*	7
Vitex fischeri	14	*Albizia antunesiana*	6
Ziziphus mucronata subsp. *rhodesica*	12	*Mystroxylon aethiopicum*	6
Fagara chalybea	11	*Ficus dekdekena*	6
Boscia corymbosa	10	*Cassia singueana*	6
Pericopsis angolensis	9	*Vangueria infausta*	5
Balanites aegyptiaca	9	*Steganotaenia araliacea*	5

APPENDIX 7

Density, in individuals per hectare, of the most abundant woody species on the high termitaria scattered in the Luiswishi woodland (inventory of 0.87 hectare, diameter greater than 5 cm at 1.3 m height)

Haplocoelum foliosum	899	*Grewia flavescens* var. *flavescens*	46
Combretum collinum	174	*Ritchiea* (Malaisse 12461)	44
Boscia corymbosa	149	*Diospyros lycioides* var. *sericea*	37
Allophylus alnifolius	110	*Hymenodictyon parvifolium* subsp. *scabrum* var. *fimbriolatum*	36
Combretum celastroides	82	*Combretum molle*	28
Ziziphus mucronata subsp. *rhodesica*	59	*Lannea discolor*	26
Fagara chalybea	56	*Commiphora thermitaria*	24
Euphorbia ingens	53	*Markhamia obtusifolia*	24
Vitex fischeri	48	*Ficus dekdekena*	22

APPENDIX 8

Listing, in decreasing size of the percentage of the total basal area, of the woody species observed on high termitaria scattered in the Luiswishi dry evergreen forest

1. *Brachystegia spiciformis* var. *schmitzii*	19.30	28. *Ritchiea* sp. (Malaisse 12802)	0.64
2. *Entandrophragma delevoyi*	11.35	29. *Grewia flavescens* var. *flavescens*	0.47
3. *Combretum gossweileri*	7.08	30. *Ritchiea quarrei*	0.36
4. *Vitex fischeri*	6.35	31. *Parinari excelsa*	0.35
5. *Haplocoelum foliolosum*	6.10	32. *Artabotrys monteiroae*	0.26
6. *Ochna afzelii*	5.95	33. *Canthium gueinzei*	0.25
7. *Mystroxylon aethiopicum*	4.23	34. *Canthium afzelianum*	0.25
8. *Sterculia* aff. *tragacantha*	3.15	35. *Rothmannia whitfieldii*	0.25
9. *Diospyros lycioides* var. *sericea*	2.96	36. *Cremaspora triflora*	0.22
10. *Combretum mechowianum*	2.74	37. *Combretum acutifolium*	0.18
11. *Aidia micrantha* var. *msonju*	2.70	38. *Ficus artocarpoides*	0.17
12. *Julbernardia globiflora*	2.69	39. *Diospyros hoyleana* subsp. *hoyleana*	0.17
13. Rubiaceae (Malaisse 13169)	2.63	40. *Rawsonia lucida*	0.15
14. *Zanha golungensis*	2.41	41. *Melodorum gracile* subsp. *englerianum*	0.15
15. *Mimusops zeyheri*	2.12	42. ?	0.14
16. *Euclea schimperi*	1.87	43. *Ipomoea pharbitiformis*	0.13
17. *Lannea discolor*	1.70	44. *Opilia celtidifolia*	0.12
18. *Canthium* sp. 1 (Malaisse 12836)	1.45	45. *Phyllanthus* sp. (Malaisse 12685)	0.11
19. *Maytenus heterophylla*	1.37	46. *Ficus rhodesiaca*	0.10
20. *Albizia adianthifolia*	1.25	47. *Craterosiphon schmitzii*	0.09
21. *Combretum celastroides*	1.07	48. *Allophylus abyssinicus*	0.09
22. *Strychnos lucens*	0.84	49. *Monanthotaxis schweinfurthii* var. *schweinfurthii*	0.09
23. *Ochna puberula*	0.79	50. *Sorindeia katangensis*	0.07
24. *Ziziphus mucronata* subsp. *rhodesica*	0.74	51. *Landolphia parvifolia* var. *parvifolia*	0.06
25. *Boscia corymbosa*	0.74	52. *Uvaria angolensis* var. *angolensis*	0.05
26. *Elaeodendron buchananii*	0.70	53. *Rubiaceae* (Malaisse 12459)	0.04
27. ?	0.69		

APPENDIX 9

Listing, in decreasing size of the percentage of the total basal area, of the woody species observed on high termitaria scattered in the Luiswishi woodland

1. *Haplocoelum foliolosum*	28.51	35. *Ochna puberula*	0.20
2. *Combretum collinum*	19.15	36. *Ritchiea* (Malaisse 12461)	0.18
3. *Boscia corymbosa*	15.26	37. *Maytenus*	0.17
4. *Vitex fischeri*	3.85	38. *Julbernardia globiflora*	0.17
5. *Lannea discolor*	2.94	39. *Adenia gummifera* var. *gummifera*	0.16
6. *Allophylus alnifolius*	2.30	40. *Byrsocarpus tomentosus*	0.16
7. *Combretum molle*	2.28	41. *Feretia aeruginescens*	0.16
8. *Commiphora thermitaria*	1.92	42. *Dictyophleba lucida*	0.16
9. *Ficus* sp. 3	1.81	43. *Schrebera trichoclada*	0.14
10. *Fagara chalybea*	1.62	44. *Adenia rumicifolia* var. *rumicifolia*	0.13
11. *Ziziphus mucronata* subsp. *rhodesica*	1.59	45. *Erythrina abyssinica*	0.13
12. *Ficus dekdekena*	1.52	46. *Ochna afzelii*	0.13
13. *Balanites aegyptiaca*	1.45	47. *Lonchocarpus nelsii* subsp. *katangensis*	0.13
14. *Hymenodictyon parvifolium* subsp. *scabrum* var. *fimbriolatum*	1.31	48. ?	0.13
15. *Diospyros mweroënsis*	1.18	49. *Steganotaenia araliacea*	0.10
16. *Euphorbia ingens*	1.09	50. *Cremaspora triflora*	0.09
17. *Brachystegia spiciformis* var. *latifoliolata*	1.07	51. *Baphia capparidifolia* subsp. *bangweolensis*	0.07
18. *Diplorhynchus condylocarpon* subsp. *mossambicensis*	0.93	52. *Erythrococca bongensis*	0.06
19. *Diospyros lycioides* var. *sericea*	0.91	53. *Bridelia duvigneaudii*	0.05
20. *Grewia flavescens* var. *flavescens*	0.88	54. *Landolphia parvifolia* var. *parvifolia*	0.05
21. *Mystroxylon aethiopicum*	0.77	55. *Phyllanthus muellerianus*	0.04
22. *Pterocarpus angolensis*	0.55	56. *Combretum acutifolium*	0.04
23. *Maerua friesii*	0.54	57. *Dichrostachys cinerea* subsp. *nyassana*	0.04
24. *Combretum mossambicensis*	0.53	58. *Phyllanthus guineensis*	0.04
25. *Markhamia obtusifolia*	0.50	59. *Baphia bequaertii*	0.03
26. *Combretum celastroides*	0.46	60. *Vangueria infausta*	0.03
27. *Hippocratea africana*	0.34	61. *Strychnos lucens*	0.02
28. *Artabotrys monteiroae*	0.31	62. *Cissus schmitzii*	0.01
29. *Azanza garckeana*	0.29	63. *Pavetta schumanniana*	0.01
30. *Parinari curatellifolia*	0.28	64. *Ficus* sp. 4	0.01
31. *Pseudolachnostylis maprouneifolia*	0.27	65. *Landolphia kirkii*	0.01
32. *Rubiaceae* (Malaisse 12459)	0.25	66. *Diospyros* sp. (Malaisse 12300)	0.01
33. *Tarenna neurophylla*	0.24	67. *Cassia singueana*	0.01
34. *Euclea schimperi*	0.23	68. *Vangueriopsis lanciflora*	0.01

APPENDIX 10

Listing, in decreasing size of the percentage of the total basal area, of the woody species observed on high termitaria scattered in the Luiswishi wooded savanna

1. *Lannea discolor*	7.96	27. *Schrebera trichoclada*	0.80
2. *Pericopsis angolensis*	7.96	28. *Securidaca longepedunculata* var. *parvifolia*	0.75
3. *Vitex fischeri*	7.14	29. *Hymenodyction parvifolium* subsp. *scabrum* var. *fimbriolatum*	0.69
4. *Balanites aegyptiaca*	6.75	30. *Combretum celastroides*	0.52
5. *Combretum molle*	6.60	31. *Annona senegalensis*	0.51
6. *Albizia antunesiana*	5.73	32. *Markhamia obtusifolia*	0.41
7. *Diplorhynchus condylocarpon* subsp. *mossambicensis*	5.45	33. *Vangueria infausta*	0.40
8. *Boscia corymbosa*	5.31	34. *Stereospermum kunthianum*	0.30
9. *Haplocoelum foliolosum*	4.99	35. *Euphorbia ingens*	0.29
10. *Combretum collinum*	3.92	36. *Diospyros lycioides* var. *sericea*	0.22
11. *Pseudolachnostylis maprouneifolia*	3.72	37. *Grewia flavescens* var. *flavescens*	0.19
12. *Ficus dekdekena*	3.34	38. *Euclea schimperi*	0.15
13. *Allophylus alnifolius*	3.27	39. *Dictyophleba lucida*	0.15
14. *Pappea ugandensis*	2.37	40. *Maerua friesii*	0.14
15. *Ziziphus mucronata* subsp. *rhodesica*	2.24	41. *Cissus schmitzii*	0.12
16. *Parinari curatellifolia*	2.15	42. *Combretum zeyheri*	0.12
17. *Commiphora thermitaria*	2.02	43. *Canthium* sp. 2 (Malaisse 12674)	0.12
18. *Mystroxylon aethiopicum*	1.85	44. *Strychnos spinosa*	0.10
19. *Cassia singueana*	1.79	45. *Canthium crassum*	0.08
20. *Pterocarpus tinctorius*	1.60	46. *Terminalia mollis*	0.07
21. *Fagara chalybea*	1.57	47. *Dichrostachys cinerea* subsp. *nyassana*	0.05
22. *Lonchocarpus nelsii* subsp. *katangensis*	1.42	48. *Afzelia quanzensis*	0.04
23. *Strychnos innocua*	1.38	49. *Sterculia quinqueloba*	0.03
24. *Flacourtia indica*	1.17	50. *Azanza garckeana*	0.02
25. *Erythrina abyssinica*	1.02	51. *Adenia rumicifolia* var. *rumicifolia*	0.02
26. *Steganotaenia araliacea*	1.00		