Journal of Tropical Forest Science 12(3): 472 – 481

FIRE IMPACT ON POPULATION STRUCTURE AND DIVERSITY OF TREE SPECIES IN WEST USAMBARA CAMPHOR ZONE FORESTS

S. M. S. Maliondo*, R. E. Malimbwi, R. P. C. Temu*, E. Constantine* & E. Zahabu****

Faculty of Forestry & Nature Conservation, Sokoine University of Agriculture, Morogoro, Tanzania

Received January 1998

MALIONDO, S. M. S., MALIMBWI, R. E., TEMU, R. P. C., CONSTANTINE, E. & ZAHABU, E. 2000. Fire impact on population structure and diversity of tree species in West Usambara camphor zone forests. A study was carried out in Lushoto, Tanzania, with the aim of comparing the burnt and unburnt parts of the same forest and determining the economic impact of fire on camphor tree production following an unplanned fire. Two plots of one hectare each were established, one in the burnt and the other in the unburnt part of Magamba forest near Grewal, Lushoto. One hundred percent sampling was done for trees ≥ to 5 cm dbh; trees <5 cm dbh and regenerants were recorded in randomly located quadrants of 5 × 5 m and 2 × 2 m respectively. All trees with dbh greater or equal to 5 cm were identified and measured for dbh and height. Volume, total and relative density, dominance, frequency and hence importance value index (IVI) and Shannon-Wiener index of diversity (H') for each species were calculated. A total of 1045 stems ha^{-1} consisting of 30 species were obtained in the burnt plot and 1606 stems ha^{-1} with 38 species in the unburnt one. Basal areas were 36 m^2 ha^{-1} and 42 m^2 ha^{-1} in the burnt and unburnt plots respectively. *Ocotea usambarensis* (camphor) was the dominant species in both plots with 57% and 33.7% of the total basal area. The frequency of this species was also the highest with values of 13 and 10 in the two plots respectively. *Ocotea usambarensis, Macaranga capensis, Trichocladus ellipticus, Rapanea melanophloeos, Syzygium guineense* and *Ficalhoa laurifolia* were the most important species with IVI values of between 106 and 15.3 of 300 possible, *O. usambarensis* being the highest in all areas. The Shannon-Wiener indices of diversity were 2.16 and 2.16 in the burnt and unburnt plots respectively indicating a high species diversity in this forest community. About 33 275 trees ha^{-1} <10 cm dbh were burnt completely and 525 stems ha^{-1} with >10 cm dbh died due to fire. Of the 525 dead trees ha^{-1}, 331 were camphor with a volume of 188 m^3 ha^{-1} of which about 180 m^3 ha^{-1} was contributed by trees > 20cm dbh.

Key words: Montane rain forest - unplanned fire impact - biodiversity - camphor zone - regenerants

MALIONDO, S. M. S., MALIMBWI, R. E., TEMU, R. P. C., CONSTANTINE, E. & ZAHABU, E. 2000. Kesan kebakaran terhadap struktur populasi dan kepelbagaian spesies pokok di hutan zon kapur barus di Barat Usambara. Kajian dijalankan di Lushoto, Tanzania untuk membandingkan antara kawasan yang terbakar dengan kawasan yang tidak terbakar di hutan yang sama dan menentukan kesan ekonomi bagi kebakaran terhadap pengeluaran pokok kapur barus selepas berlaku kebakaran yang tidak dirancang. Dua petak daripada setiap sehektar ditubuhkan, satu di kawasan yang terbakar dan satu lagi di kawasan yang tidak terbakar di hutan Magamba berhampiran Grewal, Lushoto. Satu peratus pensampelan dilakukan pada pokok bergaris pusat aras dada ≥ hingga 5 cm; pokok bergaris pusat aras dada <5 cm dan regeneran dicatatkan di lokasi kuadran secara rambang masing-masing

**Department of Forest Biology, P.O. Box 3010, Morogoro, Tanzania.*
***Department of Forest Mensuration and Management P.O. Box 3013, Morogoro, Tanzania.*

5 × 5 m dan 2 × 2 m. Kesemua pokok yang bergaris pusat lebih atau sama dengan 5 cm dikenal pasti dan disukat bagi garis pusat aras dada dan ketinggian. Isipadu, jumlah dan kepadatan relatif, dominans, kekerapan dan indeks nilai kepentingan (INK) dan indeks kepelbagaian Shannon-Wiener (*H'*) bagi setiap spesies dikira. Sejumlah 1045 batang ha^{-1} mengandungi 30 spesies diperoleh di petak yang terbakar dan 1606 batang ha^{-1} dengan 38 spesies di kawasan tidak terbakar. Luas pangkal masing-masing ialah 36 m^2 ha^{-1} dan 42 m^2 ha^{-1} di petak yang terbakar dan di petak yang tidak terbakar. *Ocotea usambarensis* (kapur barus) ialah spesies dominan di kedua-dua petak dengan 57% dan 33.7% daripada jumlah luas pangkal. Kekerapan spesies ini juga adalah tertinggi dengan nilai masing-masing ialah 13 dan 10 di dua petak. *Ocotea usambarensis, Macaranga capensis, Trichocladus ellipticus, Rapanea melanophloeos, Syzygium guineense* dan *Ficalhoa laurifolia* merupakan spesies yang paling penting dengan nilai INK antara 106 dengan 15.3 daripada 300, *O. usambarensis* paling tinggi di kesemua kawasan. Kepelbagaian indeks Shannon-Wiener masing-masing ialah 2.16 dan 2.16 di petak yang terbakar dan di petak yang tidak terbakar menunjukkan kepelbagaian spesies yang tinggi di dalam komuniti hutan ini. Kira-kira 33 275 pokok ha^{-1} garis pusat aras dada <10 cm terbakar sepenuhnya dan 525 batang ha^{-1} dengan garis pusat aras dada >10 cm mati akibat kebakaran. Daripada 525 pokok mati ha^{-1}, 331 ialah pokok kapur barus dengan isipadu 188 m^3 ha^{-1}, dengan kira-kira 180 m^3 ha^{-1} disumbangkan oleh pokok yang bergaris pusat >20 cm.

Introduction

The montane rain forests of West Usambara, which is a part of the Eastern Arc mountain forests that stretch from Southeast Kenya to Southwest Tanzania, are well known for their species richness and diversity (MLNRT 1989). The moist forests of the Usambaras are unusually rich in endemic species of flora and fauna compared to other Eastern Arc forests (Hedberg & Hedberg 1987). Since the mid-1960s, however, these forests have been impacted by expansion of peasant agriculture, large-scale logging operations, and illegal harvest of timber and fuelwood.

There is increasing recognition that disturbance is a major force moulding the development, structure and functions of forests. Historically, wild fires were uncommon in the montane forests of Tanzania. In recent years, however, prolonged droughts have resulted in abnormal accumulation of fuel load in the montane forests and as a result fires occur more frequently and burn more intensely than under normal non-drought conditions. However, the impact of fire on montane forest species composition and diversity is unknown. This study was carried out to take advantage of an unplanned fire which occurred in 1997 at West Usambara Catchment Forest, in Magamba Forest Project near Grewal, Lushoto, Tanzania.

The objectives were to compare the burnt and unburnt parts of the same forest, determine the preburned structure of the burned part of the forest and determine the economic impact of fire on camphor tree production.

Materials and methods

Study area

The Magamba Forest Project owned by the Ministry of Lands, Natural Resources and Tourism, Tanzania, tends about 350 ha of natural hardwood regeneration series and 30 000 ha of catchment forest. These forests are managed for water and gene pool conservation, control of soil erosion and to some extent, for timber exploitation (Pocs

1988). The major tree species of economic importance in the studied forest is *Ocotea usambarensis* (camphor).

Ocotea usambarensis (Family: Lauraceae) is an important tree species growing naturally in mountain rain forests of Tanzania, Kenya, Uganda, Malawi and Zambia (Mwamba 1986, Renvall & Niemela 1993). It is an evergreen tree which grows up to 40 m height and may attain dbh of 1.5 m (Kimaryo 1971). The species occurs between 900 and 2740 m altitude (Bryce 1967) with an average annual rainfall ranging between 1150 and 3050 mm (Mugasha 1978). Temperatures are never very high in the camphor zone and range between 7 and 27 °C. Soils are generally acidic loams which may be shallow or deep, and the tree prefers well-drained areas such as steeper slopes of small watershed ridges separating streams (Pitt-Schenkel 1938, Mugasha 1978). Regeneration is by seed (but this is unreliable), coppicing and through root suckers (Mugasha 1978). Harvesting is by selection and the wood is one of the best utility hardwoods.

Data collection and analysis

Two plots of one hectare each were established, one in the burned area and the other in an adjacent unburned part of the same forest. These two plots were observed to have the same soil type, slope, aspect and history and gave a matrix of data for comparison.

Each plot was subdivided into 25 subplots (20 × 20 m). Within each subplot all trees and shrubs alive, dead and resprouting ≥ 5 cm dbh were recorded and measured for dbh, and the height of the tree closest to each subplot center was also measured. Trees < 5cm dbh were counted in four, 25 m^2 quadrants within each 4 randomly selected subplots. Seedlings < 1 m height were counted in a total of five 4 m^2 quadrants in 5 different randomly selected subplots.

From the collected data the following parameters were calculated:

- Density (N= number of stems per hectare)
- Basal area (G)

- Frequency
- Relative density, basal area and frequency
- Importance value index (IVI) for a species
- Shannon-Wiener index of diversity (H')

- Volume (V):

$$V = \Sigma(0.00007854 \,.\, D_i^2 \,.\, H_i \,.\, f) \,/\, A$$

where
V is total tree volume per hectare in m^3,
D_i and H_i are dbh (cm) and height (m) respectively of the ith tree in a plot of area A(ha). f is tree form factor which was assumed to be 0.5 (Kielland–Lund 1982).

Results and discussion

Density

A total of 1045 stems ha^{-1} with dbh greater than or equal to 5 cm were recorded from 30 species in the burnt area while 1606 stems ha^{-1} from 38 species were recorded in the unburnt plot (Appendices 1, 2 & 3). *Ocotea usambarensis* (camphor) had the highest density with 373 and 266 trees ha^{-1} in the unburnt and burnt plots respectively. The abundance of *O. usambarensis* is a useful indicator of montane rain forest (Hall 1980). Figures 1 and 2 show the distribution of stems per ha^{-1} by dbh classes in both the burnt and unburnt plots respectively. In the unburnt plot the distribution of stem numbers follows the expected reversed J-shaped trend as is the case with most undisturbed forests (Philip 1983, Malimbwi & Mgeni 1991). There were about 32 600 stems ha^{-1} of dbh < 5 cm (Table 1).

Ocotea usambarensis was negatively impacted by fire. Within the burnt plot, of the total 373 stems per hectare of camphor, 89% were dead, 9% were recovering and 2% alive.

Dominance

The total basal area of trees with dbh greater than or equal to 5 cm was 36 m^2 ha^{-1} and 42 m^2 ha^{-1} in the burnt and unburnt plots respectively. By far the most dominant species in both plots was *O. usambarensis* representing 57 and 33.7% of the total basal areas in the two plots respectively. About 78% of the basal area (16.3 m^2 ha^{-1}) was accounted for by dead camphor trees killed by fire. Ten species had more than 1% relative dominance, 7 of which occurred in both plots (Appendices 1, 2 & 3). This shows that the sites do not differ much.

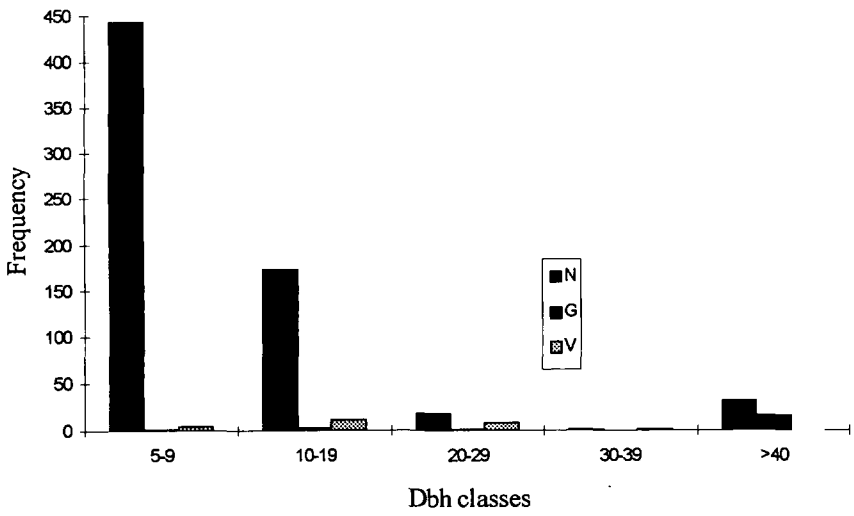

Figure 1. Distribution of *N*, *G* and *V* by dbh classes in the burnt plot

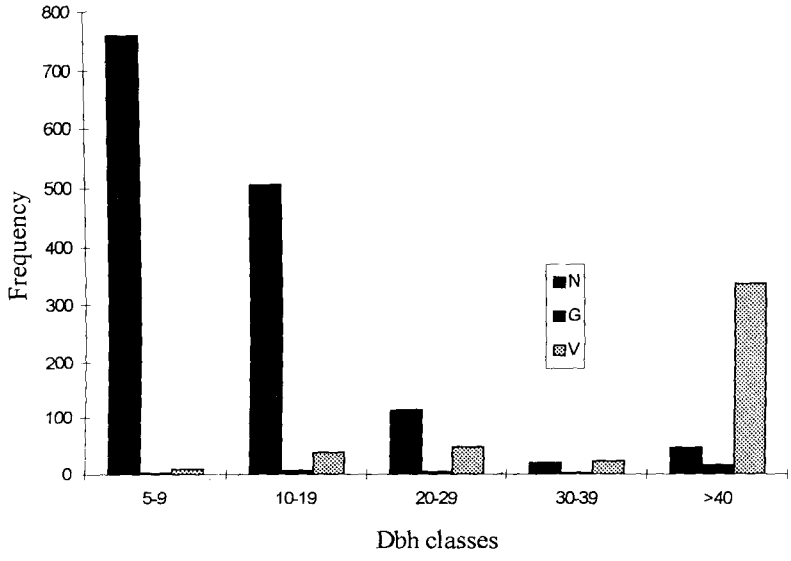

Figure 2. Distribution of *N*, *G* and *V* by dbh classes in the unburnt plot

Table 1. Distribution of number of stems, basal area and volume per ha by dbh classes

Unburnt plot				Burnt plot			
Dbh classes (cm)	*N*	*G*	*V*	Dbh classes (cm)	*N*	*G*	*V*
<1	28 500						
1–4	4 100						
Total	32 600						
5–9	919	3.81	11.56	5–9	244	0.98	2.94
10–19	474	6.70	37.70	10–19	381	6.2	37.3
20–29	127	5.45	50.60	20–29	287	13.0	124
>30	86	25.7	529	30–39	104	9.21	119
				>40	29	6.93	134

Frequency

About 9 species were found to occur in more than 10 sampled subplots of which 6 occurred in both plots. This confirms further similarities in composition and distribution between the 2 plots. *Ocotea usambarensis* is ranked higher with relative frequency values of 13 and 10 in the burnt and unburnt plots respectively (Appendices 1, 2 & 3), again emphasising the dominance of the species in composition and distribution.

Importance value index (IVI)

The importance value index (IVI) lumps together three ecological parameters, density, basal area and frequency. *Ocotea usambarensis, Macaranga capensis, Trichocladus ellipticus, Rapanea melanophloeos, Syzygium guineense* and *Ficalhoa laurifolia* were the most important species with IVI values of between 106 and 15.3 (of the 300 possibles). *Ocotea usambarensis* is conspicuous in the IVI ranking, accounting for 106 and 60 scores of the 300 possible in the burnt and unburnt plots respectively (Appendices 1, 2 & 3).

Shannon-Wiener index of diversity (H')

This index is most widely used because it combines species richness and evenness and is not affected by sample size (Pielou 1975, Krebs 1989, Kent & Coker 1992) and in addition it puts more emphasis on rare species. For biological communities the Shannon-Wiener index of diversity (*H'*) does not exceed 5.0 (Washington 1984, cited by Krebs 1989). The Shannon-Wiener indices of diversity calculated using natural logarithms, were 2.16 and 2.16 in the burnt and unburnt plots respectively (Appendices 1, 2 & 3), indicating high species diversity in this forest.

Management implications and recommendations

The damage caused by fire in this forest is high and has affected both its structure and composition. About 33 275 trees ha^{-1} <10 cm dbh are assumed to be completely burnt and 525 trees ha^{-1} >10 cm dbh died due to the fire. Of the 525 dead trees ha^{-1}, 331 were camphor with 188 m^3 volume ha^{-1} and of this 180 m^3 ha^{-1} were contributed by trees of >20 cm dbh (Figure 3). In order to restock the burned part of the forest, it is recommended to salvage and sell the burnt trees of desirable size under strict supervision; this will open the forest floor hence enhancing camphor regeneration. Furthermore leaving the dead trees is likely to provide breeding sites for pests and therefore, dead trees should be removed as a sanitary measure. There should also be well-defined fire prevention measures.

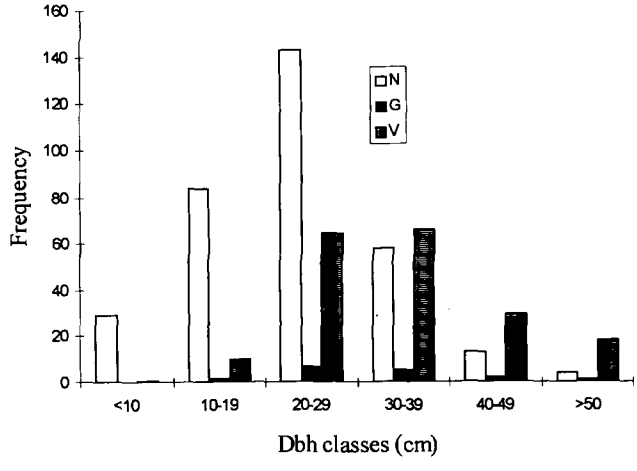

Figure 3. Diameter distribution of dead camphor trees

References

BRYCE, J. M., 1967. *The Commercial Timbers of Tanzania.* Forest Division, Utilization Section. Ministry of Natural Resources and Tourism. Dar es Salaam, Tanzania. 138 pp.

HALL, J. B. 1980. Succession in a natural forest at Mazumbai. Pp. 24–38 in Hedberg, I. & Persson, E. (Eds.) *Research for Conservation of Tanzania Catchment Forests.* Uppsala.

HEDBERG, I. & HEDBERG, O. 1987. *The SAREC Supported Integrated Usambara Rain Forest Project. Tanzania Report for the Period 1983–1984.* Department of Systematic Botany, Uppsala University; Faculty of Forestry, Sokoine University, Morogoro, Tanzania. 11 pp.

KENT, M. & COKER, P. 1992. *Vegetation Description and Analysis: A Practical Approach.* Belhaven Press, London. 363 pp.

KIELLAND-LUND, J. 1982 Structure and morphology of four forest and woodland communities of the Morogoro area, Tanzania. Pp. 69–93 in Dierschke, H. (Ed.) *Struktur und Dynamic von Waldern.* Vaduz.

KIMARYO, P. E. 1971. Regeneration of *Ocotea usambarensis* Engl. at Sungwi, West Usambara, Tanzania. Silviculture Research Note No. 21. Division of Forestry, Dar es Salaam. (Unpublished).

KREBS, C. J., 1989. *Ecological Methodology.* Harper Collins Publishers, New York. 65 pp.

MALIMBWI, R. E. & MGENI, A. S. M. 1991. Preliminary results from the permanent sample plot program at Mazumbai Forest Project. Pp. 47–53 in *Proceedings of the IUFRO Conference on Multi-Product Inventory of Tropical Mixed Forests.* August 5–9, 1991 Arusha, Tanzania.

MLNRT. 1989. *Tropical Forest Action Plan for Tanzania 1990/91 - 2007/08.* Ministry of Lands, Natural Resources and Tourism (MLNRT), Dar es Salaam.

MWAMBA, B. K. 1986. The ecology and distribution of *Ocotea usambarensis* in the Uluguru mountains. A special project report. Faculty of Forestry, Sokoine University of Agriculture, Morogoro, Tanzania. (Unpublished).

MUGASHA, A. G. 1978. Tanzania natural forests' silvicultural research review report. Tanzania Silvicultural Technical Note (New Series) No. 39. Division of Forestry, Dar es Salaam, Tanzania. (Unpublished).

RENVALL, P. & NIEMELA, T. 1993. *Ocotea usambarensis* and its fungal decayers in natural stands. *Bulletin Jardin Botanique National de Belgique* 62: 403–414.

PHILIP, M. S. 1983. *Measuring Forests and Trees.* University of Dar es Salaam. 338 pp.

PITT-SCHENKEL, C. J. W. 1938. Some important communities of warm temperate rain forest at Magamba, Tanganyika Territory. *Journal of Ecology* 26: 50–80.

PIELOU, E. C. 1975. *Ecological Diversity.* John Wiley & Sons, Inc. New York. 165 pp.

POCS, T. 1988. The importance of catchment forests to Tanzania. Professorial inaugural lecture, Sokoine University of Agriculture. (Unpublished).

Appendix 1. List of tree species found at Magamba forest, West Usambara

Spp. code	Local name	Botanical name
1	Mkulo	*Ocotea usambarensis*
2	Mkumba	*Croton* sp.
3	Mkombeti	*Trichocladus ellipticus*
4	Mwandala	*Ptaeroxylon obliquum*
5	Long'e	*Cyathea manniana*
6	*Mshwizo*	*Rapanea melanophloeos*
7	Mdaria/mdarila	*Dialiopsis africana*
8	Monho/monko	*Bersama abyssinica*
9	Mozanyiko	*Ilex mitis*
10	Tendele	*Cussonia spicata*
11	Podo	*Podocarpus usambarensis*
12	Talawanda	*Markhamia hildebrandtii*
13	Sumbati	*Polyscias fulva*
14	Mshihwi	*Syzygium guineense*
15	Mzusu	*Celstis durandtii*
16	Mkuka	*Ficalhoa laurifolia*
17	Mtunda-kungulu/muhungulu	*Rhus natalensis*
18	Gogoleka/goweka	*Mussaendra arcuata*
19	Unknown 1	
20	Mamata	*Maytenus acuminata*
21	Msharashara/msharaka	*Spirostachys africana*
22	Mmavi/kihaghushamavi	*Premna chrysoclada*
23	Kigwandi	*Dasylepis leptophylla*
24	Kinghongolo	*Sapium ellipticum*
25	Kinghuvaghuva/kihumbahumba	*Psilotrichum africanum*
26	Mtonde/mtotwe	*Erythrococca fischeri*
27	Unknown 2	
28	Mgeangea/teri/mteli	*Maesa lanceolata*
29	Mkalambati	*Commiphora zimmermannii*
30	Mdaga	*Clutia mollis*
32	Mrefu/mlefu	*Ehretia bakeri*
36	Mshegheshe	*Myrica salicifolia*
38	Ng'wati	*Syzygium* sp.
39	Mtonte	*Memecylon brenanii*
40	Mshunduzi	*Macaranga capensis*
41	Nekazito	*Cassipourea* sp.
43	Mkoko	*Thespesia danis*
45	Ntakua	*Ochna holstii*
50	Muwambe	*Tabernaemontana holstii*
57	Mnangu	*Grewia tembensis*
58	Ng'weng'we	*Dracaena deremensis*
59	Kiongoa/muhongora	*Rhus vulgaris*
60	Unknown 3	
61	Unknown 4	
62	Unknown 5	
63	Mzindanguuwe	*Blighia unijugata*
64	Mshinga	*Trema orientalis*
65	Mjavikai	*Clausena anisata*
98	Mnywamee (climber)/kiawamee	*Euphorbia nilotica*
99	Kihaghio	*Sida acuta*

Appendix 2. Summary of calculated parameters for the burnt block

Spp. code	*N*	*G*	*V*	Frq.	Rel. frq.	Rel. dom.	Rel. den.	IVI	*H'*
1	373	21	272	25	13.228	57.0833	5.694	106.004	0.368
2	171	5.146	50.747	21	11.111	14.161	16.364	41.635	0.296
3	186	3.472	29.313	24	12.698	9.554	17.799	40.051	0.307
4	6	0.138	1.034	3	1.587	0.38	0.574	2.541	0.03
5	21	0.1	0.241	4	2.116	0.227	2.01	4.353	0.079
6	40	1.1	9.157	16	8.466	3.025	3.828	15.318	0.125
7	6	0.1	0.469	5	2.646	0.22	0.574	3.44	0.03
8	1	0.0	0.243	1	0.529	0.086	0.096	0.711	0.007
9	3	0.1	1.169	3	1.587	0.348	0.287	2.222	0.017
10	1	0.0	0.478	1	0.529	0.135	0.096	0.76	0.007
11	12	0.4	4.417	8	4.233	1.115	1.148	6.496	0.051
12	22	0.5	5.288	5	2.646	1.47	2.105	6.221	0.081
13	28	0.4	3.132	11	5.82	1.171	2.679	9.671	0.097
14	48	2.1	26.859	16	8.466	5.865	4.593	18.924	0.141
15	3	0.1	0.696	2	1.058	0.21	0.287	1.556	0.017
16	1	0.0	0.178	1	0.529	0.07	0.096	0.695	0.007
17	15	0.3	2.789	5	2.646	0.904	1.435	4.985	0.061
18	2	0.0	0.086	1	0.529	0.05	0.191	0.771	0.012
19	18	0.1	0.465	8	4.233	0.297	1.722	6.253	0.07
20	17	0.3	1.926	4	2.116	0.742	1.627	4.486	0.067
21	17	0.4	3.298	6	3.175	1.068	1.627	5.869	0.067
22	9	0.1	0.626	4	2.116	0.162	0.861	3.14	0.041
23	1	0.0	0.016	1	0.529	0.014	0.096	0.639	0.007
24	6	0.0	0.039	1	0.529	0.043	0.574	1.146	0.03
25	32	0.4	2.971	7	3.704	1.212	3.062	7.978	0.107
26	2	0.0	0.191	2	1.058	0.091	0.191	1.341	0.012
27	1	0.0	0.243	1	0.529	0.086	0.096	0.711	0.007
28	1	0.0	0.085	1	0.529	0.042	0.096	0.667	0.007
29	1	0.0	0.153	1	0.529	0.062	0.096	0.687	0.007
30	1	0.0	0.323	1	0.529	0.105	0.096	0.729	0.007
Total	**1045**	**36.3**	**418.065**	**189**	**100**	**100**	**100**	**300**	**2.158**

Appendix 3. Summary of calculated parameters for the unburnt block

Spp. code	*N*	*G*	*V*	Frq.	Rel. frq.	Rel. dom.	Rel. den.	IVI	*H'*
1	266	14.0	245.253	24	9.796	33.69	16.563	60.049	0.298
2	64	1.3	17.432	22	8.98	3.159	3.985	16.123	0.128
3	139	3.0	29.473	21	8.571	7.271	8.655	24.497	0.212
5	499	2.337	7.51	18	7.347	5.607	31.071	44.025	0.363
6	23	0.388	3.73	12	4.898	0.931	1.432	7.261	0.061
7	5	0.034	0.162	3	1.224	0.083	0.311	1.618	0.018
9	3	0.019	0.067	1	0.408	0.046	0.187	0.641	0.012
11	9	0.9	14.604	5	2.041	2.089	0.56	4.69	0.029
12	4	0.1	0.64	1	0.408	0.203	0.249	0.86	0.015
13	18	0.1	0.716	9	3.673	0.356	1.121	5.151	0.05
14	30	3.7	69.095	21	8.571	8.909	1.868	19.349	0.074
16	338	11.2	185.36	21	8.571	26.889	21.046	56.506	0.328
18	9	0.3	2.341	5	2.041	0.613	0.56	3.215	0.029
19	1	0.0	0.011	1	0.408	0.009	0.062	0.48	0.005
20	33	0.4	2.631	8	3.265	0.932	2.055	6.252	0.08
21	5	0.2	2.548	4	1.633	0.514	0.311	2.458	0.018
22	55	0.3	1.017	10	4.082	0.679	3.425	8.186	0.116
23	1	0.0	0.011	1	0.408	0.009	0.062	0.598	0.005
25	15	0.2	1.122	7	2.857	0.428	0.934	4.219	0.044
26	1	0.1	0.544	1	0.408	0.127	0.062	0.598	0.005
32	1	0.0	0.126	1	0.408	0.048	0.062	0.519	0.005
36	2	0.0	0.048	2	0.816	0.031	0.125	0.972	0.008
38	5	0.3	3.556	4	1.633	0.63	0.311	2.574	0.018
39	2	0.5	10.748	2	0.816	1.275	0.125	2.216	0.008
40	3	0.3	4.448	1	0.408	0.661	0.187	1.256	0.012
41	1	0.0	0.085	8	3.265	0.037	0.062	3.364	0.005
43	1	0.0	0.085	3	1.224	0.037	0.062	1.324	0.005
45	1	0.0	0.007	1	0.408	0.007	0.062	0.477	0.005
50	1	0.0	0.004	13	5.306	0.005	0.062	5.373	0.005
57	1	0.0	0.301	1	0.408	0.009	0.062	0.48	0.005
58	13	0.1	0.301	1	0.408	0.18	0.809	1.398	0.039
59	20	0.984	15.678	3	1.224	2.36	1.245	4.83	0.055
60	3	0.013	0.04	1	0.408	0.031	0.187	0.626	0.012
61	3	0.351	5.859	1	0.408	0.842	0.187	1.437	0.012
62	1	0.005	0.016	1	0.408	0.012	0.062	0.482	0.005
63	1	0.0	0.4	1	0.408	0.023	0.062	0.493	0.005
64	28	0.5	3.476	5	2.041	1.238	1.744	5.023	0.071
65	1	0.0	0.054	1	0.408	0.027	0.062	0.498	0.005
Total	1606	41.7	628.846	245	100	100	100	300	2.164